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Consiglio per la ricerca in agricoltura
e l'analisi dell'economia agraria

Council for Agricultural Research and Economics

REPORT 2020

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MINISTERO POLITICHE AGRICOLE
ALIMENTARI E FORESTALI

Table of contents

PRE-PRINT

Editor and Curator: ***Stefano Vaccari***

Scientific and technical coordinator: ***Monica Vacca***

Support to realization: ***Rosanna Agarossi, Monia Capparelli, Angela Russo***

Presentation by the President of CREA, Prof. Carlo Gaudio

CREA – Council for Agricultural Research and Economics - is the leading Italian research organization dedicated to agriculture, agri-food supply chains, food-science and nutrition, and socio-economics issues.
CREA in its nowadays's organizational structure – introduced by Law 23 December, nr. 190 ("Disposizioni per la formazione del bilancio annuale e pluriennale dello Stato"/ "Provisions for the establishment of the State's annual and multiannual budget") which disposes the fusion of the previous Council for Agricultural Research (CRA) and of the National Agro-Economics Institute (INEA) – is a historical public body engaged in many activities related to the promotion of in-depth environmental culture and surveys about the Italian agronomic scenario. CREA also supports the interaction among institutions (national and international) and productive scenarios of the Country. CREA's history covers the last 150 years. Its origins, indeed, can be attributed to Camillo Benso Conte di Cavour, first Minister of Agriculture of the Italian Kingdom. Cavour founded the Network of Agronomic Stations in the second half of XIX century.

This network was the initial core of the present CREA research centers organization. The Agronomic Stations were involved in experimental and specialized activities and increased in number between 1860 and 1880. Research activity basically concerned plant physiology, agricultural land in its physical, chemical and biological aspects, the study of fertilizers and soil fertility. A century later, in 1967, to better implement and organize this experimental stations' network (Law D.P.R. 23/11/1967 n. 1318) the Agricultural Research and Experimentation Institutes (IRSA) were set up under the supervision of the Ministry of Agriculture and Forestry, having the same scientific consideration as the cientific institutions of Universities, ISRA counted 29 Research Institutes and 125 specialized operational sections, throughout the national territory.

In 2004 the IRSA were re-organized into CRA, the Council for Agricultural Research, a country-wide institution with general scientific competence within the field of agriculture, agroindustry, food, fishery, and forestry (D. Lgs. n. 454/99). The most recent reorganization dates back to 2015 when CREA obtained its present structure: a main headquarter and 12 specialized Research Centers. CREA disposes of prestigious infrastructures, with over 5,000 ha of experimental fields, specialized laboratories, advanced experimental equipments, greenhouses, fruit germplasm and zootechnical collections. Each CREA center looks back to a long and interesting history reflecting the development of the agricultural sector and agro-food chain in Italy over the time. CREA staff made important contributions to knowledge and progress, readily available to farmers through its important network on the national territory.

The Experimental Agronomic Stations of the Kingdom of Italy introduced by Cavour, and lateron the IRSA, the CRA and now CREA have been and are still today the hinge between research and the productive world, thanks to the extraordinary intuition pursued by Cavour in order to guarantee Italian agriculture a research service, experimentation, dissemination and information. It is therefore a real pleasure and a great honor for me to present this volume, which collects the most important and essential information on CREA's scientific activity. The aim of this volume is to to provide the interested public with an overview of the precious results of CREA's immaterial capital. It is made up of over 2,000 researchers, technical and administrative staff whose intellectual and scientific work ranges from genomics to the environment, from food and nutrition to bioinformatics, from food engineering and processing to bioeconomy, from certification to protection of our agricultural products, from olive and citrus cultivation to floriculture, from the protection of forests and wood to animal husbandry, from viticulture to cereal culture, from aquaculture to horticulture and fruit cultivation, from genomics to the studies of the most advanced genetic techniques.

CREA's mission is clearly outlined by the management of its research activities, which include all experimental and methodological aspects in the field of agro-food and bio-economics, mainly, but also comprises the transfer of results to applied and productive contexts. Some recent figures may help tro understnd the quality of the work done: In 2020, 634 scientific papers were published in scientific journals, mainly of international outreach, 799 projects are under implementation, the majority of which in cooperation with international research institutes, European bodies and the Italian Ministry for Agriculture and Forestry. Thanks to these numbers, CREA positions itself as the first Italian research institution in the agro-food sector.
A special mentioning has to be dedicated to the translational aspect of CREA's work has to be mentioned as it represents the essential *fil rouge* for such a wide range of different research activities, with the ultimate aim of creating the greatest possible integration between basic and applied research regarding the most advanced topics in the sectors of agri-food, food and nutrition, agricultural politics and economics.

An inestimable capital that must be supported, encouraged, strengthened, because it represents the true lifeblood of an institution that has already given so much and will continue to do for the progress of the agri-food sector in Italy and in the world.

1. SUMMARY OF RESULTS

Stefano Vaccari,
CREA Director-General

2020 was a terrible year all over the world. Covid-19 pandemic drastically reduced contacts and activities, with negative economic impacts, also for the research community.Nevertheless, the Italian agri-food sector showed a great capacity of resilience, ensuring the availability of high quality food to the nation, while at the same time continuing to export in considerable amounts of agricultural products. Even in this 2020, Italian agriculture was at the top in Europe, in terms of added value! CREA has been involved in this effort: research activities did not stop and the 12 Centers, 80 operative branches and over 2,200 employees continued working to reach results in all agro-food and environmental fields.

Some 2020 activity numbers: 799 research projects under implementation, with 634 publications mainly on scientific Journals. 200 young university graduates (PhD students and holders of Research Grants) collaborated at CREA in developing innovative knowledge and technologies. Research activities were dedicated to the whole agro-food system, from genomics, to mechanical and electronic technology, traditional varietal improvement, predictive models for increasing the sustainability of agricultural activity, reduce pesticides and increase the ability of plants to withstand water stress and other adversities. An intense activity focused on plant parasites, both on the, unfortunately always more numerous newly introduced ones and on those traditionally present on the territory. The success in fighting the Brown Marmorated Stink Bug (*Halyomorpha halys* Stål) is one example. Animal welfare, development of specific solutions for the many realities of Italian agriculture, enhancement of production and natural resources, water and soil *in primis*, and development of the smaller supply chains have also seen important scientific progress in 2020, as well as research in the field of wood and forests: *inter alia*, CREA provides scientific support for the elaboration of the National Forest Inventory and Carbon Tanks.

44 patents, 195 plant rights and over 500 varieties were registered in the national registers. Through participation in different national and international tables and working groups, institutional partnerships, dissemination events, certification and other services, in 2020 the staff of CREA has entered into (and/or guaranteed the continuity of) scientific and technical cooperation in 826 initiatives.

Worth to note is also the technical and scientific support given by CREA to the Italian Ministry of Agriculture and Forestry, to the Regions and the Autonomous Provinces. High-quality documents on technical and programmatic issues, in line with the legal European and international context, have been produced as a result of the involvement of CREA expertise in hundreds of tables and commissions. An example is the work done for the new phase of the Common Agricultural Policy (CAP) of the European Commission. This contribution was possible due to tight cooperation among CREA, the Ministry and the Regions in relation to the analysis of different aspects of the CAP and politics in rural development. CREA is indeed the core of the Rural National Network (RRN), the operative structure set up to improve implementation and management of the Rural Development Plan (RDP).

In the field of food and nutrition, CREA (following the previous INRAN tradition) also in 2020 continued to develop research which allows Italy more and more to demonstrate globally the validity of its nutritional model. For over 70 years we have been developing the "Tables of Food Composition", a database providing information for every kind of analysis in the nutritional field. In the Nutriscore-Nutrinform Battery comparison, CREA provided the Italian Government with scientific support to demonstrate how fallacious and distortive the Nutriscore system is for consumers.

Also during the pandemic, CREA has guaranteed the maintenance and enhancement of the extraordinary heritage of plant and animal collections, which is unique worldwide. We remember with pride that CREA holds germplasm collections of worldwide importance for grape, olive trees and most cereal species. Overall, there are 119 existing collections. In the following pages world' academics and citizens may appreciate in detail the CREA research lines, with references to Centers and personnel involved.

CREA hopes to have been able to give, even in the troubled year 2020, a small contribution to the advancement of world research in the agri-food sector and food: we are committed to do better and better!

Summary table of CREA Activities 2020

PRODUCTS and CROSS- CUTTING ISSUES	Research Activities	Scientific Publications	PhD Scholarships, Research Grants and Scholarships	Various services (*)	Patents	Plant variety rights and Varieties registered	Collections	TOTAL ACTIVITIES
2.1 Cereals and Industrial Crops	53	28	19	89	3	148	18	*358*
2.2 Animal and Dairy Productions	68	37	28	37	8	54	4	*236*
2.3 Grapes and Wine	97	42	5	38	4	288	2	*476*
2.4 Fruit	50	33	19	19	1	62**	8	*192*
2.5 Vegetable and Ornamental crops. Nursery	42	25	16	43	1	31	5	*163*
2.6 Olive and Oil	30	29	27	4	1		2	*93*
2.7 Fishery and Aquaculture	7	3	4	8	1			*23*
2.8 Minor supply chains and medicinal plants	18	5	9	10	4	47	5	*98*
2.9 Forest and Wood Production	47	27	3	30	1	63	2	*173*
3.1 Genomics, Biotechnologies and Bioinformatics	31	39	11	7			8	*96*
3.2 Plant protection and Resilience	76	28	20	98			18	*240*
3.3 Sustainibility (ecosystems, climate, water, land)	83	65	8	83	5		9	*253*
3.4 Technological Innovations	65	47	15	24	14		1	*166*
4. Food, Nutrition and Food Waste	72	152	3	197	1		37	*462*
5. Bioeconomy and Agricultural Policies	60	74	13	139				*286*
TOTAL	799	634	200	826	44	695	119	3.315

(*) Working tables / working groups, institutional partnerships, certifications, disseminations, other services
(**) varieties registered in updating

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CREA RESEARCH IN 2020

2.213 CREA people who work for Italian Research

81% Researchers and Technicians

75 operational offices

41 analysis laboratories

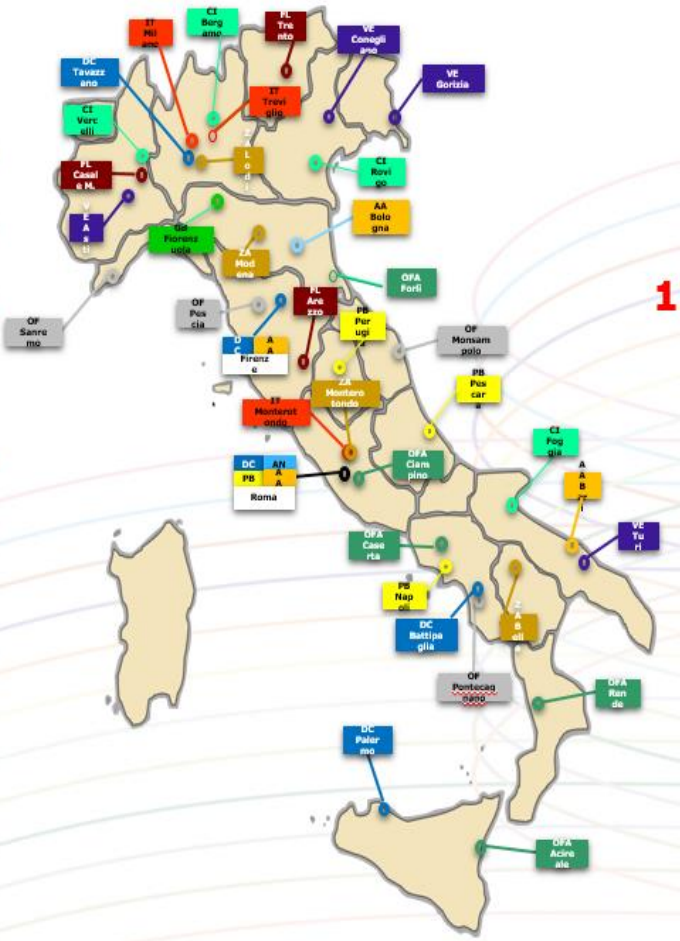
approx.. 5,000 hectares of land for research

799 Active scientific research

634 scientific publications

200 doctorates, research grants and scholarships

approx.. 830 initiatives for services and support to research and institutions



12 Research centres

- Genomics and Bioinformatics
- Agriculture and Environment
- Plant Protection and Certification
- Engineering and Agro-Food Processing
- Food and Nutrition
- Agricultural Policies and Bioeconomy
- Animal Production and Aquaculture
- Forestry and Wood
- Cereals and Industrial Crops
- Viticulture and Enology
- Vegetable and Ornamentals crops
- Olive, Citrus and Tree Fruit

CREA RESEARCH LINES BY PRODUCTS

2.1. CEREALS and INDUSTRIAL CROPS

Cereals are the basis of human nutrition and an essential component of the Mediterranean diet, they occupy the largest cultivated areas of the planet, and constitute the largest world trade exchanges for agri-food commodities. According to ISTAT (2020), in Italy, grain cereals constitute a total of (about 46% of the areas cultivated with arable crops including temporary and alternate fodder. Durum wheat is the main crop in terms of cultivated area, with about 1.22 Mhas, and with a production of about 4 Mt. For Italy, the supply chain of durum wheat for pasta production is one of the pillars of agri-food exports and one of the witnesses of the "Made in Italy" brand. Worldwide, the demand for cereals as a whole is continuously growing, having reached record levels in 2020, with a significant reduction in stocks and a consequent increase in prices. These data suggest an increase in production and consumption also in 2021. A great challenge for cereal production in national and European crop systems is the application of the principles of the Green Deal of the European Commission, which foresees for the agricultural sector to help progressively redesigning the entire food and non-food production system, with a view to sustainability and reduction of inputs. Another issue addressed by cereal production, both in organic and conventional systems, is the need to replace monocroppings by crop rotations, to conserve soil fertility and biodiversity and to contribute to the reduction of inputs, while assuring economic sustainability in such crop diversification systems.

CREA contributes with its research to achieving a sustainable intensification, promoting ansd enhancing the "Made in Italy" supply chains in the national cereal sector without increasing related environmental costs, but on the contrary by reducing them. The achievement of this general objective passes through researches lines focusing on various specific targets, and carried out with increasingly multidisciplinary approaches; examples of this interdisciplinarity comprise: a) physiological, genetic and genomic studies targeted at better understanding of the mechanisms influencing species' adaptation and tolerance to environmental stresses generated by climate change, b) biotechnological tools based on assisted evolution techniques to increase resistance to pathogens and water use efficiency, c) agronomic and precision agriculture to reduce the impact of crop systems on the soil and agro-ecosystems, d) biochemical, metabolomic and genetic improvement to enhance the nutritional and functional quality of the products; e) high-throughput phenotyping and genomic modeling to innovate plant breeding processes.

Industrial crops have always represented an opportunity for the diversification of cereal production systems, both at the agronomic level for crop rotation, and with a view to product diversification and farmers' income. In recent years, alongside traditional industrial crops for Italy such as potato, sugarbeet, sunflowers, canning tomato, and, to a lesser extent, oil rapeseed, both new species and alternative industrial uses of traditional species have been added. In fact, an irreversible process is underway to replace petroleum chemistry with so-called green chemistry and in general with stronger involvement of the biobased industry, which uses industrial plants and other renewable sources for the production of biomolecules and commonly used products. The use of industrial crops for the production of biomass and biomolecules is in line with the circular economy objective of the European Green Deal, and an increasing number of industries throughout the country are turning to biobased products.Within this dynamic scenario, CREA works not only on traditional supply chains, but also targets its research at new agro-industrial crops and production chains (cardoon, false safflower, camelina, rucola, hemp) which allow to exploit the useful components and fractions of biomass in a perspective of circular economy, and to develop biorefinery systems for the production of bio-products and energy from renewable sources. Scientific knowledge is applied to the research in progress, often by multidisciplinary approaches, for the development of breeding programs, conservation agriculture techniques, soil fertilization with the use of biomass and green manure, cultivation of agroecological crops to increase the content of organic carbon in the soil and the replacement of synthetic fertilizers, development of pesticides based on active ingredients of natural origin, biodegradable and compostable materials such as mulching films, and the evaluation of their efficacy.

All the above research is supported by projects dedicated to the conservation, the phenotypical characterization (morpho-physiological, biochemical, metabolomic, genomic) and the exploitation of the large collections of cultivated germplasm present in the CREA Centers. These collections, which range from cereals such as soft and hard wheat, rice, maize, sorghum and oats, to industrial species for food use, such as potatoes and beets, are the backbone of the activity aimed at achieving better adaptation to climate change, with a relative increase in productivity and quality, in balance with a reduced use of resources. The biodiversity collections also constitute an important reservoir of variability for breeding programs, which are still in progress, and which have led to

the release of varieties suitable for different agricultural systems (conventional, organic, etc.); parts of these collections also include ancient genotypes of which it is interesting to study quality and adaptation to the changed environmental conditions.

2.1.1 Research and research products - Cereals and Industrial Crops

Products/main topics	*Acronym and Research Title*	*Aims*	*Person in charge and CREA Centres*	*Partnership/ Financing Body*	*Scientific Publications*	*Other Research products* [1]
BRASSICA	**NUTRIEN** Evaluation of Brassica genotype.	Studies for the qualitative evaluation and improvement of plant materials with bio-fumigating activity through chemical and biological approaches.	L. Lazzeri, CREA-CI	Nutrien S.p.A.	Matteo M, Lorenzo D'Avino L, Ramirez-Cando LJ, Pagnotta E, Angelini LG, Spugnoli P, Tavarini S, Ugolini L, Foschi L, Lazzeri L. Camelina (Camelina sativa L. Crantz) under low-input management systems in northern Italy: yields, chemical characterization and environmental balance. Italian Journal of Agronomy, 2020 doi.org/10.4081/ija.2020.1519	Webinar 25/09/2020
NATIVE MEDITERRANEAN CROPS	**COMETA** Native Mediterranean crops and their valorization with advanced green chemistry technologies.	1. Analyze and validate low-input non-food farming systems in marginal areas of Southern Italy as catalysts for the activation of agro-industrial chains. 2. Obtain fractions (seeds, hypogeal and epigeal biomass) suitable to be converted through advanced low-impact green chemistry technologies into bioproducts of interest for agriculture and industries.	L. Morra, **CREA-CI** CREA-IT CREA-ZA	MUR	1) E. Piragine, L. Flori, L. Di Cesare Mannelli, C. Ghelardini, E. Pagnotta, R. Matteo, L. Lazzeri, A. Martelli, V. Miragliotta, A. Pirone, L. Testai, V. Calderone. "Eruca Sativa Mill. Seed Extract promotes anti-obesity and hypoglycemic effects in mice fed with a high-fat diet." Accepted 19-Oct-2020, Phytotherapy Research. 2020; 1-8 Wiley (UK) https://doi.org/10.1002/ptr.6941 2) Martelli, A., Piragine, E., Citi, V., Testai, L., Pagnotta, E., Ugolini, L., Lazzeri, L., Di Cesare Mannelli, L., Manzo, O.L., Bucci, M., Ghelardini, C., Breschi, M.C. And Calderone, V., 2020. "Erucin exhibits vasorelaxing effects and antihypertensive activity by H2S-releasing properties." British journal of pharmacology, 177(4), pp. 824-835	1 Research Grant.
BRASSICACEAE* AND *SOLANACEAE	**SUSINCER** SUStaINable use of bioactive compounds from *Brassicaceae* and *Solanaceae* wastes for CERreal crop protection (2020-2023).	Characterization and valorization of bioactive compounds extracted from wastes of *Brassicaceae and Solanaceae* and promote their reuse in sustainable agriculture for the protection of corn and wheat from attacks by fungal and insect pathogens.	C. Balconi, **CREA-CI** CREA-IT CREA-PB	Cariplo Fundation	Sustainable Use of Bioactive Compounds from Solanum Tuberosum and Brassicaceae Wastes and by-Products for Crop Protection—A Review. Pacifico D, Lanzanova C, Pagnotta E, Bassolino L, Mastrangelo AM, Marone D, Matteo R, Lo Scalzo R, Balconi C. Molecules 2021, 26(8), 2174; https://doi.org/10.3390/molecules26082174	https://notte-dei-ricercatori.sharevent.it/it-IT/; GiornataDivulgativa: https://www.crea.gov.it/web/cerealicoltura-e-colture-industriali/-/1920-2020-la-maiscoltura-di-bergamo-festeggia-il-suo-centenario-all-orto-botanico-lorenzo-rota; Intervista televisiva: https://www.crea.gov.it/web/cerealicoltura-e-colture-industriali/-/la-ricerca-crea-sul-mais-stasera-ospite-di-agrilinea-tv-1; https://agronotizie.imagelinenetwork.com/difesa-e-diserbo/2020/10/06/difesa-fungicida-per-mais-e-frumento-il-futuro-passa-dalla-ruc ola/68148;:

[1] *prototypes; dissemination activities (conferences, seminars, reports, sites and videos, etc.); training activities (scholarships, research grants and PhD scholarships)*

						https://www.radarmagazine.net/index.php/2020/10/19/difendere-le-colture-di-cereali-con-patate-e-rucola.
WHEAT / BIODIVERSITY	**AGENT** Activated GEnebank NeTwork.	Create a European atlas of the genotypic and phenotypic diversity, also using existing phenotypic data collected over the years and so far not accessible to the community; integrate genotypic and phenotypic diversity, creating models for genomic selection; improve data quality and efficiency, create an IT infrastructure for the management of genetic resources and new data deriving from the project.	P. Vaccino, N. Pecchioni CREA-CI	**European Commission** [1]		1 Research grant.
ORGANIC CEREALS / LEGUMES	**BIODIVERSITTY2FOOD** Local and old cereal and legume varieties to increase the economic, environmental and social susteinability of the organic supply chian of regione Marche.	Strengthen the organic production chain of arable crops in regione Marche, through the experimentation and promotion of technological and organizational solutions aimed at the recovery, characterization and valorization of old varieties of cereals and legumes.	P. De Vita, CREA-CI	Marche Region		
CEREALS	**CLIMAQUALITEC EoI 967 SYSTEMIC-** Agricultural biotechnology for nutrition quality of food crops in different agro-climate scenario. Challenges and perspectives in potato and cereal crops.	Explore transversal solutions, identify knowledge gaps and develop pathways towards a food system that is resilient and able to meet societal challenges.	G. Mandolino, **CREA-CI** CREA-AN CREA-IT	39 public research institutions of 8 different Europen countries /MIPAAF-- **European Commission**		8 July 2020 1st Consortium SYSTEMIC project Board Meeting.
CEREAL CHAIN - GRAIN CROPS	**AGROFILIERE** Integrated digital technologies for the sustainable strengthening of agri-food production and processing.	1. Implement advanced digital and mechatronic applications for cereals and other grain crops. 2. Develop a Field Phenomics Platform equipped with experimental pheno-mobile for the digitized detection of multiple phenotypic parameters.	P. Menesatti, **CREA-IT** CREA-CI	MIPAAF	Pecorella I., F. fania, C.V.G. Azevedo, N. Santacroce, N. Pecchioni, P. de Vita. Exploitation of RGB indices from UAV imagery to estimate soil coverage ability in durum wheat and related traits(in preparation).	
CEREALS	**CERESBIO** Cereals resistant to seed borne fungal diseases suitable for organic agriculture. Subproject DIBIO.	Develop new resistant cultivars to control diseases caused by fungal pathogens and transmitted by seed.	P. De Vita, CREA-CI	MIPAAF		2 Scholarships.

[1] Leibniz-Institut (De); Vir (Ru); Ihar-Pib (Pl); Institute Of Plant Genetic Resources (Bg); Vvi (Cz); Tel Aviv University (Il); Magyar Tudomanyos Akademia Agrartudomanyi Kutatokozpont (Hu);Inia (Es); Stichting Wageningen Research (Nl); Incda (Ro); Nppc (Sk); Aegean Agricultural Research Institute (Tr);Universitat Zurich (Ch);Eurice (De); Icarda (Lebanon) Inra (Fr); Kew Gardens (Uk); Ipgri (It); Wbf (Ch)/European Commission.

CEREALS / INDUSTRIAL CROPS	**RGV-FAO** Germplasm collections of cereals and industrial crops.	Maintenance and multiplication of collections according to a unique and internationally recognized protocol; enrichment of collections by finding new germplasm and exchange, through MTA, of genetic resources with the national and international scientific community. Part of the activity is aimed at optimizing the management of the germplasm banks of the Center, according to international standards and organizing the data collected in a database that will be integrated into PlantaRes.	P. Vaccino, CREA-CI	MIPAAF	1) Pagnotta, E., Montaut, S., Matteo, R., Rollin, P., Nuzillard, J-M., Lazzeri, L., Bagatta, M., 2020. Glucosinolates in Reseda lutea L.: Distribution in plant tissues during flowering time. Biochemical systematics and ecology, 90, Article number 104043. Elsevier (USA) https://doi.org/10.1016/j.bse.2020.104043 2) José Sanchez del Pulgar, Massimo Lucarini, Altero Aguzzi, Paolo Gabrielli, Bruno Parisi, Daniela Pacifico, Giuseppe Mandolino, Ginevra Lombardi-Boccia Glycoalkaloid Content in Italian Potato Breeding Clones Improved for Resistance against Potato Tuber Moth (Phthorimaea operculella Zeller). Potato Res. (2020). https://doi.org/10.1007/s11540-020-09474-w 3) Taranto et al., 2020 "Whole genome scan reveals molecular signatures of divergence and selection related to important traits in durum wheat germplasm." Frontiers in genetics 11 (2020): 217 4) Taranto et al. 2020 "Characterization of Celiac Disease-Related Epitopes and Gluten Fractions, and Identification of Associated Loci in Durum Wheat." Agronomy 10.9 (2020): 1231.	
CEREALS / HOPS / YEASTS	**BE^2R** From Field to Glass.	Promote the development of the Apulian agricultural beer production with a strong territorial identity, using local and self-produced ingredients: cereals, hops, yeasts.	M. Savino, CREA-CI	Puglia Region		
INDUSTRIAL CROPS	Industrial supply chains-secondary metabolites (flavonoids, carotenoids)	Epigenetic mechanisms for adaptation to stress.	L. Bassolino, CREA-CI CREA-GB	self funded	Moglia A, Florio FE, Iacopino S, Guerrieri A, Milani AM, Comino C, Barchi L, Marengo A, Cagliero C, Rubiolo P, Toppino L, Rotino GL, Lanteri S, Bassolino L. Identification of a new R3 MYB type repressor and functional characterization of the members of the MBW transcriptional complex involved in anthocyanin biosynthesis in eggplant (S. melongena L.). PLoS One, 2020, 15(5):e0232986. doi: 10.1371/journal.pone.0232986.	
OIL CROPS	**AGROENER** Energy from agriculture: sustainable innovations for bioeconomy.	Evaluate non-food oil crops for the self-production of biofuels and / or lubricants in tractors and for other agricultural uses. Define two green chemistry chains starting from two oil crops, Crambe abyssinica and Carthamus tinctorium, to evaluate potential uses of oil and co-products in agriculture	P. Menesatti, CREA-IT CREA-CI	MIPAAF	Fanigliulo R, Pochi D, Bondioli P, Grilli R, Fornaciari L, Folegatti L, Malaguti L, Matteo R, Ugolini L, Lazzeri L. Semi-refined Crambe abyssinica (Hochst. EX R.E.Fr.) oil as a biobased hydraulic fluid for agricultural applications. Biomass Conversion and Biorefinery. (2021) https://doi.org/10.1007/s13399-020-01213-y	
GRAIN-MALT- BEER SUPPLY CHAIN	**INNO.MALTO** Innovation in grain-malt-beer supply chain.	Increase the value of the cereals-malt-beer supply chain, by placing on the market an innovative type of product (malt) characterized by a strong local character ("100% Sicilian") and high quality properties.	M.Palumbo, CREA-CI	Sicilian Region		

SUSTAINABLE CEREAL SUPPLY CHAIN	**FILIGRANO** Innovations in the Campania cereal supply chain: from high quality sustainable production to differentiated storage.	Strengthen the Campania cereal supply chain through the experimentation and promotion of technological and organizational solutions aimed at improving cultivation techniques, the use of digital technologies and the management of storage for homogeneous batches.	P. De Vita, **CREA-CI** CREA-IT	Sicilian Region		1 Research grant.
WHEAT	**POIGA** Added value: naturally enriched with bioactive molecules.	Valorization of 4 ancient grains originating in Campana (Saragolla, Marzellina, Romanella e Ianculedda) through a series of recovery, characterization and enhancement activities.	P. De Vita, CREA-CI	Campania Region		
WHEAT	**SARAB** Saragolla from Abruzzo region.	Morpho-physiological and genetic characterization of ancient grains population, Saragolla.	A. Rascio, CREA-CI	Abruzzo Region		Characterization of 11 populations of Saragolla Abruzzese and one Pugliese by morpho-physiological descriptors and by molecular markers..
WHEAT	**SAGRAL** Saragolle and the ancient Lucanian grains preserved.	The recovery and the morphological, molecular and biochemical characterization of ecotypes, local populations, obsolete varieties is a possibility to identify genotypes suitable for the conditions of water scarcity and sustainability of the agro-ecosystem.	P. De Vita, CREA-CI	Basilicata Region		
DURUM WHEAT	**Wh-ITALY** (New Breeding Techniques) for a sustainabe breeding of durum wheat. sottoprogetto del progetto BIOTECH.	1. Produce lines of durum wheat durum wheat lines improved for gluten tolerance through genome editing. 2. Obtain improved durum wheat lines for durable resistance to fungal pathogens via cisgenesis. 3. Acquire skills on genome editing, transformation and in vitro culture techniques	D. Trono, CREA-CI	MIPAAF		1. costrutti per genome editing 2. 20 cisgenic lines T0 containing the Lr67 gene conferring lasting resistance to powdery mildew and all leaf rusts. To be brought into omozigosity by self-fertilization . 2 Research grants.
DURUM WHEAT	**BIODURUM**	1. Identify and implement innovative and sustainable agronomic paths. 2. Evaluate and apply agro-ecological methodologies and mechanical innovations based on digital technologies. 3. To recover, develop and enhance old and new genetic materials of durum wheat to be used for organic cultivation. 4. Evaluate the sustainability of cereal production systems and the effects of the innovations introduced.	M.Palumbo, **CREA-CI** CREA-AA CREA-IT, CREA-PB	MIPAAF	1) Iocola I. et al. (Palumbo M. Virzì N. and Canali S.), 2020. An Actor-Oriented Multi-Criteria Assessment Framework to Support a Transition Towards Sustainable Agricultural Systems Based on Crop Diversification. Sustainability 12 (13): 5434; doi: 10.3390/su12135434. 2) Iocola I. et al., 2020. A multi-criteria qualitative tool for the sustainability assessment of organic durum wheat-based farming systems designed through a participative process. Italian Journal of Agronomy (accepted). Marone et al., 2020 "Genome-wide association mapping of prostrate/erect growth habit in winter durum wheat." International journal of molecular sciences 21.2 (2020): 394	1 REsearch grants. Software BIODURUM_MCA:. Disponibile a link: http://www.sinab.it/sites/default/files/share/BioDurum_MCA.pdf Events: 1) Conference web, 26/11/2020. Rafforzamento sistemi produttivi del grano duro biologico italiano. Risultati finali del progetto BioDurum- "BioDurum_MCA", strumento informatico per valutare la sostenibilità delle aziende cerealicole biologiche.

DURUM WHEAT	**DUROSTRESS** Stratégies d'adaptation du blé dur aux stress hydriques et thermiques.	Agronomically and genetically characterize wheat lines / varieties tolerant to water and thermal stress.	P. De Vita, N. Pecchioni, CREA-CI	Arvalis, Inrae Diascope, Inrae Ge2Pop, Florimond Desprez, Ragt, Iniav (Portugal), Ministero Agricoltura francese		
DURUM WHEAT	**Durum wheat supply chain**. Plant-microbe interactions. .	Studying the biological processes of the rhizosphere involved in the interactions between the roots and radical exudates of a plant with the surrounding environment (microbial communities).	A.Iannucci, CREA-CI	self funded	Iannucci A., Canfora L., Nigro F., De Vita P., Beleggia R. Relationships between root morphology, root exudate compounds and rhizosphere microbial community in durum wheat. Applied Soil Ecology, 2020, 158 103781 doi: 10.1016/j.apsoil.2020.103781	
DURUM WHEAT	**Durum wheat supply chain**. Adaptation to abiotic stresses .	Studying physiological and molecular mechanisms involved in the resistance to hyperosmotic stress in durum wheat.	D. Trono, CREA-CI	self funded	Menga V. and Trono D. The Molecular and Functional Characterization of the Durum Wheat Lipoxygenase TdLOX2 Suggests Its Role in Hyperosmotic Stress Response. Plants, 2020, 9(9):1233. doi: 10.3390/plants9091233.	
CEREALS/ TECHNOLOGICAL INNOVATIONS /BIODIVERSITY	**IN.TE.GRA** Technological Innovation Durum Wheats.	Provide new products based on organic and functional cereals, with a high nutraceutical value and introduce, in the context of cultivation practices, precision agriculture in the current context of cereal sector in Sicily..	M.Palumbo, CREA-CI	Sicilian Region		
DURUM WHEAT/ PROCESS AND PRODUCT INNOVATIONS	**INNOGRANO** Process and product innovations in the durum wheat supply chain.	Development of new materials by innovative genetic and agronomic methodologies.	P. De Vita, CREA-CI	MISE/ **European Commission**	Ficco, D., Beleggia, R., Pecorella, I., Giovanniello, V., Frenda, A. S., & Vita, P. D. Relationship between Seed Morphological Traits and Ash and Mineral Distribution along the Kernel Using Debranning in Durum Wheats from Different Geographic Sites. Foods, 2020, 9(11), 1523.	1Fellowship.
DURUM WHEAT	**PIGRANI** Use of pigmented grains for the development of food products treacable and with high nutritional value.	Development and application of combined technologies for the production of pigmented grains enriched with bioactive compounds on a large scale and for the formulation of flours and end-products.	P. De Vita, CRE-CI	MISE		
DURUM WHEAT	**RiBioFru** Reduction of the environmental impact in a traditional cereal area (BN) through the organic cultivation of ancient varieties of durum wheat.	Interventions of animations and training.	P. De Vita, CREA-CI	Campania Region		1 Fellowship.
DURUM WHEAT /GENETIC BREEDING	**Genomic Selection in Durum Wheat.** Development of genomic selection methods in durum wheat.	Development of advanced breeding methods for durum wheat.	N. Pecchioni, P. De Vita, CREA-CI	Own funds (income from royalties of the Cappelli variety))		1 PhD Scholarship.
DURUM WHEAT	**SOFT Smart Organic Farming Tecniques-**	Implementation of an environmentally and technically-	P. De Vita, CREA-CI	Puglia Region		

	Innovations to improve the sustainable productivity of organic farms engaged in the Apulian herbaceous and industrial crops sector - Smart Organic Farming Tecniques.	economically efficient organic supply chain model for the organic production of high quality durum wheat, legumes and industrial tomatoes.				
DURUM WHEAT	**SolACE** Solutions for improving Agroecosystem and Crop Efficiency for water and nutrient use.	SolACE's overarching goal is to help European agriculture facing the challenge to deal with more frequent combined limitations of water and nutrients in the coming decades, through the design of novel crop genotypes and agroecosystem management innovations to improve water and nutrient (i.e. N and P) use efficiency.	N. Pecchioni, P. de Vita, CREA-CI	Inra, Ait, Fibl, Jhi, Ku,Su,Slu,Ucl,Ue,Uhoh,Unew,Upm, Agroscope, Arvalis, Con.Cer, Dcm, Ecaf, It, Leaf, Ömki, Solynta, Sp, Syngenta, Agrobiota	INRAE, IT, AIT, CREA, FIBL, JHI, KU, SU, SLU, UCL, UNEW, UPM, AGROSCOPE, ARVALIS, CON.CER, DCM, ECAF, IT, LEAF, ÖMKI, SOLYNTA, SP, SYNGENTA, AGROBIOTA	1 Research grant.
WHEAT/ GENOTYPIC ADAPTATION	**Durum wheat supply chain.** Adaptation to abiotic stresses.	Studying mechanisms and methods for the evaluation of the genotypic adaptation to the "global warming ".	A. Rascio, CREA-CI	self funded	1) Rascio, A., Santis, G. D., & Sorrentino, G. A Low-Cost Method for Phenotyping Wilting and Recovery of Wheat Leaves under Heat Stress Using Semi-Automated Image Analysis. Plants, 2020, 9(6), 718. 2) Rascio, A., & Fiorillo, F. Indoor characterization of three durum wheat genotypes exposed to drought and heat stress during early vegetative growth stages. African Journal of Plant Science, 2020, 14(11), 436-442.	Development of a semi-automatic quantitative method for the kinematic analysis of withering and of a method for the comparative phenotization of genotypes under controlled conditions.
WHEAT/ PEST CONTROL	**Durum wheat supply chain.** Plant extracts to control weeds.	Use of plant extracts for weeds control in durum wheat.	A. Spina, CREA-CI	self funded	Carrubba A., Labruzzo A., Comparato A., Muccilli S., Spina A. (2020). Use of plant water extracts for weeds control in durum wheat (Triticum turgidum L. subsp. durum Desf.). Agronomy 2020, 10, 364: 1-19. doi:10.3390/agronomy10030364	
WHEAT/ CLIMATE TOLERANCE	**Durum wheat supply chain.** Adaptation to abiotic stresses.	Studying the mechanisms of tolerance to heat stress in wheat.	V.Rossi, CREA-CI	China Agrigultural University Beijing (Mingming Xin)	Tian X., Wang F., Zhao Y., Lan T., Yu K., Zhang L., Qin Z., Hu Z., Yao Y., Ni Z., Sun Q., Rossi V., Peng H., Xin M. Heat shock transcription factor A1b regulates heat tolerance in wheat and Arabidopsis through OPR3 and jasmonate signalling pathway. Plant Biotech Journal, 2020, Volume 18, Issue 5, 1109-1111, doi.org/10.1111/pbi.13268	
DURUM WHEAT	**Durum wheat supply chain.** Hyposodic bread.	Development of savory durum wheat breads low in sodium.	A. Spina, CREA-CI	self funded	Spina A., Arena E. (2020). Pane iposodico di grano duro a lunga conservazione. Tecnologie Alimentari, n. 5: 24-26; ; Arena, E.; Muccilli, S.; Mazzaglia, A.; Giannone, V.; Brighina, S.; Rapisarda, P.; Fallico, B.; Allegra, M.; Spina, A. (2020). Development of Durum Wheat Breads Low in Sodium Using a Natural Low-Sodium Sea Salt. Foods 2020, 9, 752. doi:10.3390/foods9060752.	
DURUM WHEAT	**Durum wheat supply chain.** New formulations and new commodities.	Studying new formulations and new raw materials for durum wheat food supply chains.	F. Sciacca, CREA-CI	self funded	Melilli M.G., Di Stefano V., Sciacca F., Pagliaro A., Bognanni R., Scandurra S., Virzì N., Gentile C. and Palumbo M., 2020. Improvement of Fatty Acid Profile in Durum Wheat Breads Supplemented with Portulaca oleracea L. Quality Traits of Purslane-Fortified Bread. Foods 2020, 9, 764; DOI: 10.3390/foods9060764.	

DURUM WHEAT BIO	**ANFRUBIAMBI** Use of ancient varieties of durum wheat grown organically to reduce the environmental impact in the Avellino site.	Interventions of animations and training.	P. De Vita, CREA-CI	Sicilian Region		2 Fellowships.
RICE, WHEAT	**DIBIO- CONCIABIO** Main seed-borne pathogens in *Triticum* spp. and *Oryza sativa:* dressing and other defense strategies for organic agriculture.	Identify recent biological control methods effective against the main seed borne phytopathogens present in Italy for two of the most important cereal productions: rice and wheat, common and durum.	L.Tamborini **CREA-DC** P.Vaccino, **CREA-CI** CREA-AA	MIPAAF		1 Research grant.
SUNFLOWER	**PERMA** Study of the races of *Peronospora* of Sunflower in Marche Region to contain the fungal pathogen.	The project aims to identify the *P. halstedii* races currently present in the main cultivation areas of the Marche region, for agricultural and seed production, as a prototype for a more complete knowledge of the spread of the pathogen also in the other Italian areas cultivated with this crop.+	A. Del Gatto, CREA-CI	Marche Region		
MAIZE	**ATTIVAREE** Oltrepò Biodiverso - Creation in Oltrepò site of the Ottofile Pavese corn chain, a recovered traditional local variety. (2018-2020).	1.Enhancement and protection of the traditional maize germplasm, in particular the OTTOFILE PAVESE MAIZE (conserved as VA61 in the Germplasm Bank of the Centre). 2.Building a supply chain based on this local product of excellence that responds to the market. 3. Prepare the dossier for the registration of the 'Ottofile' maize of Pavia in the register of conservation varieties.	C. Balconi, CREA-CI	Cariplo Fundation		Technical-scientific supervision of the Dossier for the registration of the local variety "Ottofile pavese" submitted for registration in the Conservation Variety Register of Lombardia Region.
MAIZE / BIODIVERSITY	**EVA MAIZE** European PGRFA Evaluation Network - (2020-2022).	Multiplication and valorization of maize accessions stored in the European germplasm banks (genotyping and field evaluation in various countries).	C. Balconi, CREA-CI	**European Commission** 1		LoA20HQ169 Agreement EVA-maize-CREA-CI:Deliverable 1.1. Multiplication of 42 maize accessions; Deliverable 1.2 Supply of data deriving from the ReGen 88 project, for publication in the Eurisco database.
MAIZE	**Maize supply chain** Adaptation to abiotic stresses	Studying mechanisms and epigenetic markers of drought stress adaptation in maize.	V.Rossi, CREA-CI	self funded	Forestan C., Farinati S., Zambelli F., Pavesi G., Rossi V., Varotto S. Epigenetic signatures of stress adaptation and flowering regulation in response to extended drought and recovery in Zea mays. Plant Cell and Environment, 2020, Vol.43 issue 1 55-75 https://doi.org/10.1111/pce.13660	
MAIZE	**GEMMA** Maize genotypes of Lombardy and microbiome: new perspectives for the control of toxigenic fungi and	Provide effective responses to manage fungal diseases and abiotic stresses by enhancing the biodiversity, consisting of the varieties of Lombard maize and the	C. Balconi, CREA-CI	Lombardia Region		

1 Agroscope, Switzerland; BPGV-INIAV, Portugal; Bayer-Crop Science, Germany; DEFI Genetics SA, Switzerland; Euralis, France; INRAE, France; Instituto Politecnico de Coimbra, Portugal; KWS, Germany; IPK, Germany; Limagrain, France; Maize Research Institute Zemun Polje, Serbia; MAS Seeds, France; CSIC, Spain; RAGT 2n SAS, france; Suceava Genebank, Romania; Syngenta Crop Protection AG, Switzerland; University of Zagreb, Croatia/**European Commission**

	adaptation to climate change "- (2020-2023).	endophytic microorganisms within the varieties themselves.				
MAIZE	**MIRALO** Analysis of MAize lines for the development of hybrids with efficient root system, to be used in Lombardia.	Identification of maize lines for the production of hybrids with a more efficient root system to increase yield and quality, and in relation to their compatibility and use in the specific conditions of the Lombardy area	G. Mazzinelli, CREA-CI	Lombardia Region		
MAIZE	**P.S.G.O.-Km 0 BOLIVIA** Small seeds, great opportunities, family agro-ecology and 0 Km supply chains in Bolivia.	Cooperation between Italy and Bolivia to collect and conserve indigenous maize biodiversity; enrichment of the CREA-CI maize germplasm bank with Bolivian "criollo" germplasm to create new pigmented varieties of corn, "morado" and violet type, rich in bioactive compounds with antioxidant properties.	C. Balconi, CREA-CI	**European Commission** [1]		
MAIZE	**Cereal supply chain - secondary metabolites (flavonoids, carotenoids).**	Regulation of anthocyanin synthesis.	S.Suriano, CREA-CI	self funded	Suriano, S., Iannucci, A., Codianni, P., Fares, C., Menga, V., Russo, M., Marciello, U., Troccoli, A. Carotenoids and tocols content in genotypes of colored barley. Journal of Cereal Science Volume 96, 2020, 103110 https://www.sciencedirect.com/science/article/pii/S0733521020308018	
POTATO	**INNORT 3.0-** Innovations in industrial horticulture.	Identification of a technical strategy with low environmental impact for the containment of hypogeal pests and fungi of the potato peel in the fucense potato sector, with consequent reduction of production waste.	L. Lazzeri, CREA-CI	Abruzzo Region		
POTATO/MAIZE	**RESILIENT** Good Practices for the protection and cultivation of local varieties of potatoes and maize in inland areas.	Provide farmers with information and knowledge on Good Practices for the cultivation of traditional local varieties of potatoes and recover traditional ecotypes through remediation and reintegration into the supply chain.	D. Pacifico, CREA-CI	Lombardia Region		Congress on line (27.9. 2020): Resilient project the good practices for the protection and cultivation of traditional Lombard local varieties of potatoes and maize in inland areas.
INDUSTRIAL TOMATO CROPS	**RIUSIAMO** Re-use of wastewater in agriculture.	Creation of an Operative Group to carry out a research and transfer project for a rational use of waste water in agriculture, such as irrigation of industrial tomato crops.	M. Rinaldi, CREA-CI	Puglia Region		
RICE	**SUSRICE** Creation of a new rice plant ideotype with improved resilience and sustainability through the insertion of traits that	1. Increase water and nitrogen use efficiency. 2. Modify the architecture of the rice plant by introducing, through genome editing and cisgenesis, the genes responsible for	P. Vaccino, **CREA-CI** CREA-GB	MIPAAF		1) Caratterizzazione dei tre geni target nei genotipi dotati degli alleli efficaci e in Vialone Nano. 2) Costruzione dei costrutti per l'editing dei tre geni DRO1, IPA1 ed NRT1.1B in Vialone Nano. 3) Messa a

[1] Associazioni in Bolivia: FDUO, CGM, RENACC, AGRECOL - Università in Bolivia: Universitad Autonoma Tarija; Universitad Mayor de san Simon (UMSS); Universitad Mayor de Chuquisaca (UMRPSFXCH)/AICS - Agenzia Italiana per la Cooperazione allo sviluppo

	influence the adaptability of the crop.	the characters in the traditional Italian variety of Vialone Nano rice.				punto di un protocollo per l'ottenimento di calli da Violone Nano per GE.
RICE	**NEURICE** New commercial EUropean RICE (*Oryza sativa*) harbouring salt tolerance alleles to protect the rice sector against climate change and apple snail (*Pomacea insularum*) invasion.	Identify and introduce genetic variations in European rice varieties to produce salinity-tolerant commercial varieties in order to (i) mitigate the effects of salinisation and deterioration of water quality in Mediterranean basins due to climate change and (ii) to avoid yield losses after seawater treatments carried out in rice fields to control the parasite Apple snail (*Pomacea insularum*).	S. Monaco, **CREA-CI** CREA-GB	**European Commission** 1		Rice lines carrying tolerance genes to I57, 1 of which under evaluation for registration in the national register.
RICE / ORGANIC SYSTEMS	**Risobiosystems** Research and experimentation of national organic rice production systems	Project aimed at carrying out technical-scientific studies and insights to support and protect the national organic rice production systems and carried out by Universities and Research bodies with excellent skills on the subject, with the involvement and participation of stakeholders and operators in the sector ..	N. Pecchioni, S. Monaco, **CREA-CI** CREA-DC CREA-PB	MIPAAF		https://www.risoitaliano.eu/crea-ecco-le-rese-di-risobiosystem/; http://sinab.it/bionovita/risobiosystems-video-da-una-giornata
CONSERVATION AGRICULTURE – MEDITERRANEAN AREA	**CAMA** Research-based participatory approaches for adopting Conservation Agriculture in the Mediterranean Area.	Genetic improvement of pea and alfalfa for Mediterranean environments. Understand and overcome the barriers that prevent the adoption of CA in the Mediterranean basin. Test and validate new AC techniques in the field, measuring the positive effects on soil properties and conservation, on the water use efficiency and plant development.	M. Rinaldi, **CREA-CI** CREA-ZA CREA-PB CREA-AA	PRIMA Fundation [2]	Castellini et al., 2020. Doi:10.3390/su12125019	Website: http://www.camamed.eu/en/index
TOBACCO	**Ta.Ke.To** Tuscan Kentucky tobacco: quality production and sustainable agronomic practices respecting the environment.	1. Preserve and improve the quality of soils through the addition of organic matter from compost and green manure. 2. Introduce formulations with toxicological and residual profiles of lower environmental impact for the control of P. syringae bacteriosis.3. Reduce the number of interventions with synthetic insecticides for the defense of tobacco from the flea (Epitrix hirtipennis).	L. del Piano, CREA-CI	Toscana Region		1 Research grant.

1 Universitat De Barcelona-Spain, Centre De Recerca En Agrigenomica Csic-Irta-Uab-Ub-Spain, CIRAD-France, University Of Glasgow-United Kingdom, Institut De Recerca I Tecnologia Agroalimentaries-Spain, Instituto De Agrobiotecnologia Rosario S.A. – Argentina, Institute Of Crop Science, Caas-China, Càmara Arrossera Del Montsià-Spain, IRIS_Spain, Centre Français Du Riz-France/**European Commission**

[2] APOSOLO (Portugal), INIAV (Portugal), ARVALIS (France), Univ. di Lleida (Spain), IAMZ-CIHEAM (Spain), CSIC (Spain) HAO-Demeter (Greece), INRAT (Tunisie), APAD (Tunisie), INRA (Morocco), ENSA (Algerie)/PRIMA Fundation - Call 2019 Section I – H2020

2.1.2 Patents and Services

Patents

INDUSTRIAL PATENTS

Products/main topics	Denomination	Inventors	CREA research Centres
Cereals	Peptides having a protective effect against the inflammatory activity of 31 43 of gliadin in celiac disease(IT + USA) *Co-ownership: Istituto Superiore Sanità*	L. Cattivelli P. De Vita D.B.M. Ficco	CREA-GB
Cereals	Sowing machine for contrasting weeds (IT)	P. De Vita	CREA-CI
Cereals	Process for the production of durum wheat pasta with high nutritional potential (IT)	A.Arcangeli A.Cammerata E. Gosparini R.Mortaro D.Sgrulletta S. Bellato R. Ciccoriti V. Del Frate G. Terracciano	CREA-IT

PLANT VARIETY RIGHT

Products	Denomination	Inventors	CREA research Centres		Products	Denomination	Inventors	CREA research Centres
oat and red oat	**GENZIANA**	L. Cattivelli D. Pagani M. Baronchelli	CREA-GB		2-row barley	**ALIMINI**	D. Pagani M. Stanca R. Alberici V. Terzi N. Faccini	CREA-GB
oat and red oat	**BIONDA**	M. Motto	CREA-CI		2-row barley	**AZZURRO**	R. Alberici M. Baronchelli L. Cattivelli N. Faccini D. Pagani	CREA-GB
oat and red oat	**PRIMULA**	M. Motto	CREA-GB		2-row barley	**DASIO**	N. Pogna	CREA-CI
oat and red oat	**TEOBD40**	M. Motto	CREA-CI		2-row barley	**DORIA**	M. Baravelli N. Pecchioni A. Gianinetti M. Baronchelli F. Reggiani	CREA-GB
spelt wheat	**ROSSELLA**	P. Codianni	CREA-CI		2-row barley	**ESOPO**	G. Tacconi D. Pagani A. Gianinetti F. Reggiani M. Baronchelli	CREA-GB
emmer	**PADREPIO**	P. Codianni	CREA-CI		2-row barley	**FUTURA**	F. Rizza D. Pagani R. Alberici I. Tagliaferri	CREA-GB
einkorn	**HAMMURABI**	L. Gazza N. Pogna	CREA-IT		2-row barley	**GIADA**	N. Faccini	CREA-GB
einkorn	**ANTENATO**	A. Brandolini	CREA-ZA		2-row barley	**LG ARAGONA**	D. Pagani R. Alberici A. Tondelli	CREA-GB
einkorn	**NORBERTO**	L. Gazza P. Cacciatori	CREA-IT		2-row barley	**NURE**	N. Pogna	CREA-GB
durum wheat	**BRADANO**	N.Pogna	CREA-CI		2-row barley	**PLACIDIA**	D. Pagani A. Gianinetti I. Tagliaferri M. Baronchelli G. Tacconi	CREA-GB
durum wheat	**CHIARA**	N. Di Fonzo	CREA-CI		2-row barley	**PONENTE**	M. Motto	CREA-GB
durum wheat	**CICLOPE**	M. Palumbo M. Cambrea A. Spina S. Licciardello N. Virzi'	CREA-CI		2-row barley	**SCHEGGIA**	R. Alberici D. Pagani N. Faccini F. Rizza A. Gianinetti M. Baravelli	CREA-GB
durum wheat	**GHIBLI**	N. Di Fonzo	CREA-CI		2-row barley	**SIRIO**	M. Baronchelli A. Gianinetti N. Faccini D. Pagani	CREA-GB
durum wheat	**LESINA**	N. Pogna	CREA-CI		2-row barley	**SPAZIO**	R. Alberici A. Tondelli N. Faccini S. Delbono	CREA-GB
durum wheat	**NADIF**	G. Palumbo P. De Vita N. Pecchioni A. Gallo	CREA-CI		2-row barley	**VEGA**	M. Motto	CREA-GB

durum wheat	**SANT'AGATA**	M. Palumbo M. Cambrea A. Spina N. Di Fonzo N. Virzi'	CREA-CI		2-row barley	**ZACINTO**	M. Motto	CREA-GB
durum wheat	**SFINGE**	N. Di Fonzo	CREA-CI		6-row barley	**ALDEBARAN**	M. Motto	CREA-GB
durum wheat	**SORRISO**	N. Di Fonzo	CREA-CI		6-row barley	**ALISEO**	N. Pogna	CREA-GB
durum wheat	**TURCHESE**	N. Di Fonzo	CREA-CI		6-row barley	**SCIROCCO**	M. Motto	CREA-GB
soft wheat	**SALVIA**	N. Pogna	CREA-ZA		potato	**DORIBEL**	F. Govoni B. Parisi	CREA-CI
maize	**LO1208**	Cra-Mac	CREA-CI		potato	**UNIDEA**	B. Parisi	CREA-CI
maize	**LO1240**	A. Verderio G. Mazzinelli	CREA-CI		potato	**DUCATO**	E. Lupotto G. Vale'	CREA-CI
maize	**LO1264**	Cra-Mac	CREA-CI		rice	**ONICE**	E. Lupotto G. Vale'	CREA-CI
maize	**LO1285B**	Cra-Mac	CREA-CI		brown mustard	**ISCI TOP**	M. Montanari L.Lazzeri B. Parisi R. Matteo	CREA-CI
maize	**LO1301**	Cra-Mac	CREA-CI		triticale	**SATIRO**	N. Faccini D. Pagani F. Rizza M. Baronchelli	CREA-GB
2-row barley	**AIACE**	M. Motto	CREA-GB		triticale	**SILENO**	N. Faccini D. Pagani F. Rizza R. Alberici	CREA-GB
2-row barley	**AIRONE**	N. Pogna	CREA-GB		triticale	**FLASH**	N. Faccini F. Rizza R. Alberici D. Pagani G. Tacconi F. Reggiani	CREA-GB
2-row barley	**ALASTRO**	Crea-GB	CREA-GB		triticale	**LG ERGON**	N. Faccini I. Tagliaferri D. Pagani G. Tacconi	CREA-GB
2-row barley	**ALCE**	R. Alberici M. Baravelli D. Pagani N. Faccini	CREA-GB		triticale	**OCEANIA**	M. Motto	CREA-GB
2-row barley	**ATLANTE**	R. Alberici L. Cattivelli N. Faccini D. Pagani F. Reggiani	CREA-GB					

CREA VARIETIES INCLUDED IN THE ITALIAN OFFICIAL LISTS

Products	*Denomination*	*CREA research Centres*	*Products*	*Denomination*	*CREA research Centres*
oat and red oat	**Rogar 8**	CREA- CI	soft wheat	**Salmone**	CREA-IT
oat and red oat	**Genziana**	CREA-GB	soft wheat	**Salvia**	CREA-IT
oat and red oat	**Ava**	CREA-IT	soft wheat	**Salice**	CREA-ZA
oat and red oat	**Marisa**	CREA-IT	sunflower	**Elly**	CREA-CI
oat and red oat	**TEOBD40**	CREA-IT	sunflower	**Fabio**	CREA-CI
tall oatgrass	**Gala**	CREA-ZA	maize	**Nero spinoso**	CREA-CI
small naked oat	**Irina**	CREA- CI	maize	**Rostrato rosso di Rovetta**	CREA-CI
small naked oat	**Luna**	CREA-IT	maize	**Scagliolo di Carenno**	CREA-CI
spelt wheat	**Benedetto**	CREA-CI	2-row barley	**Dasio**	CREA-CI
spelt wheat	**Giuseppe**	CREA-CI	2-row barley	**Alce**	CREA-GB
spelt wheat	**Maddalena**	CREA-CI	2-row barley	**Arda**	CREA-GB
spelt wheat	**Pietro**	CREA-CI	2-row barley	**Astartis**	CREA-GB
spelt wheat	**Rita**	CREA-CI	2-row barley	**Cometa**	CREA-GB
spelt wheat	**Rossella**	CREA-CI	2-row barley	**Doria**	CREA-GB
emmer	**Davide**	CREA-CI	2-row barley	**Nure**	CREA-GB
emmer	**Giovanni Paolo**	CREA-CI	2-row barley	**Pariglia**	CREA-GB
emmer	**Padrepio**	CREA-CI	2-row barley	**Sfera**	CREA-GB
einkorn	**Antenato**	CREA-IT	2-row barley	**Sirio**	CREA-GB
einkorn	**Hammurabi**	CREA-IT	2-row barley	**Zacinto**	CREA-GB
einkorn	**Monlis**	CREA-IT	6-row barley	**Aldebaran**	CREA-GB

einkorn	Norberto	CREA-IT	6-row barley	Aliseo	CREA-GB
einkorn	Monili	CREA-ZA	6-row barley	Explora	CREA-GB
durum wheat	Adamello	CREA-CI	6-row barley	Scirocco	CREA-GB
durum wheat	Bradano	CREA-CI	6-row barley	Diomede	CREA-CI
durum wheat	Bronte	CREA-CI	potato	Antea	CREA-CI
durum wheat	Cappelli	CREA-CI	potato	Golden Queen	CREA-CI
durum wheat	Chiara	CREA-CI	potato	Mehari	CREA-CI
durum wheat	Ciclope	CREA-CI	potato	Melrose	CREA-CI
durum wheat	Faridur	CREA-CI	potato	Ninfa	CREA-CI
durum wheat	Fortore	CREA-CI	potato	Ricciona di Napoli	CREA-CI
durum wheat	Gargano	CREA-CI	potato	Unidea	CREA-CI
durum wheat	Lesina	CREA-CI	Rice	Agata	CREA-CI
durum wheat	Nadif	CREA-CI	rice	Ducato	CREA-CI
durum wheat	Natal	CREA-CI	rice	Lomello	CREA-CI
durum wheat	Ofanto	CREA-CI	rice	Onice	CREA-CI
durum wheat	Sant'Agata	CREA-CI	rice	Opale	CREA-CI
durum wheat	Saragolle Lucana	CREA-CI	rice	Ribe (Euribe)	CREA-CI
durum wheat	Sfinge	CREA-CI	rice	Roma	CREA-CI
durum wheat	Sorriso	CREA-CI	rice	Vialone nano	CREA-CI
durum wheat	Turchese	CREA-CI	brown mustard	ISCI20	CREA-CI
durum wheat	Varano	CREA-CI	brown mustard	ISCI99	CREA-CI
durum wheat	Valnova	CREA-IT	triticale	Altair	CREA-GB
soft wheat	Risciola	CREA-CI	triticale	Oceania	CREA-GB
soft wheat	S.Pastore	CREA-IT	triticale	Quark	CREA-GB
soft wheat	Salgemma	CREA-IT			

Services

Collections

Products/ main topics	*Description*	*Person in charge*	*CREA research Centres*
oats (***Avena sativa***)	970 accessions of national and international origin, different ploidy levels (diploids, tetraploids and hexaploids), both cultivated and wild	R. Redaelli	CREA-CI
sugar beet *Beta vulgaris*	approximately 300 accessions including wild genotypes.	I. Alberti	CREA-CI
Brassicaceae , Resedaceae	48 food and non-food species of *Brassicaceae*, belonging to 27 different genera. In some cases, more accessions are available Stored in the medium and long term, available upon request .	M. Bagatta, L. Malaguti	CREA-CI
tetraploid wheats	1600 genotypes, including diverse accessions of *Triticum turdigum* spp. *Genotyped* with SNPs type molecular markers. Stored at 7°C and periodically renewed in open field .	P. De Vita	CREA-CI
durum wheat	*Triticum turgidum* ssp. *durum*: approximately 400 accessions, stored at controlled conditions (temperature and humidity), renewed on a three year base, available upon request.	F. Sciacca, M. Palumbo	CREA-CI
durum wheat	12 accessions of the ancient wheat Saragolla (11 from Abruzzo Region and 1 from Puglia), stored at controlled conditions (temperature and humidity); not available upon request.	A. Rascio	CREA-CI
durum wheat- experimental population	Two set of Introgression Lines (ILs) derived by the cross of the durum wheat elite variety PR22D89 with one accession of *T. dicoccoides* and one of *T. carthlicum* (consisted of 130 e 150 lines, respectively).	D. Marone	CREA-CI
durum wheat- experimental population	MAGIC population (F4-like) of 900 lines, obtained by crossing 16 parental lines of diverse geographical origin.	D. Marone	CREA-CI

durum wheat- experimental population	NAM population (Nested Association Mapping) composed by 3500 lines derived from the cross of cv Cappelli with 35 ancient and modern grain varieties.	N. Pecchioni, P. De Vita	CREA-CI
common wheat	43 accessions, stored at controlled conditions (temperature and humidity), renewed on a three year base, available upon request.	F. Sciacca, M. Palumbo	CREA-CI
common wheat	4800 genotypes, encompassing old and new varieties, both national and international, populations of ancient wheats. Stored at 4°C and periodically renewed in open field.	P. Vaccino	CREA-CI
sunflower	25 male sterile lines, stored via cryopreservation.12 lines diversified for the evaluation of *Peronospora* races.	A.Del Gatto	CREA-CI
maize (*Zea mays L)*	over 5000 accessions stored *ex-situ* in cold chamber at 7°C and periodically renewed: around 1.200 varieties (over 600 italian and inbred lines), accessions of international origin (Europa, Stati Uniti, Bolivia, Messico) consisted of 1800 inbred lines and 600 landraces.	C.Balconi, P. Valoti	CREA-CI
barley (*Hordeum vulgare*)	about 100 accessions, stored at controlled conditions (temperature and humidity), renewed on a three year base, available upon request.	F. Sciacca, M. Palumbo	CREA-CI
potato (*S. tuberosum L)*	85 accessions, maintained in *in vitro* culture with 8 replicates, available upon request.	D. Pacifico	CREA-CI
castor bean	13 monoic and gynoic lines.	A. Del Gatto	CREA-CI
rice	700 accessions of *Oryza sativa* ssp *japonica,* 4 lines of *O. sativa* ssp. *indica* and 5 of *O. glaberrima* and of wild relative *O. rufipogon*. Storage at 4°C and periodically renewed in the open field.	P. Vaccino	CREA-CI
tobacco and other species of the genus *Nicotiana*	The collection consists of over 1000 accessions of *Nicotiana tabacum* (of international origin like Burley, Bright, Kentucky, Orientali, Subtropicali, Havana e diverse varietal constitutions), 130 of *Nicotiana rustica* as well as others 60 species of the genus *Nicotiana*.Storage in cold room. Availability of small seeds stocks upon request.	L.del Piano	CREA-CI

Others services

Products / main topics	***Description***	***Person in charge***	***CREA research Centres***
Agrochemical Test Centre			
bioformulate	Conduct of effectiveness tests for the evaluation of a new bioformulate as herbicide, desiccant in potato, spollonants in wine -Gep test at Caserta Test Centre	V.Battaglia, E. Lahoz	CREA-CI
bioformulate on tobacco	Consultancy on anti-budding tests of a bioformulate on tobacco - GEP TEST at Caserta Test Centre	E.Lahoz, F. Raimo	CREA-CI
biopesticide on drupaceae	Conduct of effectiveness tests for the evaluation of a new biopesticide for the control of moniliosis on Drupaceae - GEP TEST at Caserta Test Centre.	V. Battaglia, E. Lahoz	CREA-CI
tobacco	Conduct of effectiveness tests against downyard tubacin on tobacco - GEP TEST at Caserta Test Centre.	V. Battaglia, E. Lahoz	CREA-CI
GMO Analysis Center for second instance			
soybean and maize seeds	Assessement of the presence of heterologous DNA and quantification of GMO content via RT-qPCR analysis	H. Hartings	CREA-CI
VCU Trials National Variety REgistry			
sugar beet	Agronomic tests and chemical analysis	I. Alberti	CREA-CI
rapeseed, soy, flax, sunflower, sorghum, safflower and cotton	Chemical analyses: acidic composition, oil yield, protein yield, glucosinolate content, tannin content, anti-nutritional factors for registration to the National Variety Registry (MiPAAF, CREA-DC)	L. Lazzeri, L. Malaguti	CREA-CI
durum wheat	Agronomic Tests Registry for the registration to the National Variety Registry (MiPAAF, CREA-DC)	M. Palumbo	CREA-CI
durum wheat, common wheat, triticale, oats, barley, einkorn spelled, spelled, spelled, fodder species	Agronomic tests for the registration to the National Registry of Varieties (MiPAAF, CREA-DC)	A. Troccoli, A. Gallo	CREA-CI
sunflower, rapeseed (autumn and spring), safflower, beetroot, sorghum	Agronomic tests.	A. Del Gatto	CREA-CI
grain maize and chopped maize	Agronomic tests for the registration to the National Registry of Varieties.	G. Mazzinelli	CREA-CI
sorghum x Sudanese grass	Agronomic tests and analysis of dry matter.	G.Mandolino	CREA-CI
National Network - Recommended List Trials			
durum and common wheat	Varietal evaluation tests.	A.Troccoli	CREA-CI

durum and common wheat, barley for zootechny and malt supply chains	Varietal evaluation tests in Puglia, Molise and Campania.	A. Troccoli	CREA-CI
durum and common wheat, barley for zootechny and malt supply chains	Varietal evaluation tests in Sicilia. .	N.Virzì, M. Palumbo	CREA-CI
sunflower and rapeseed	National network of varietal evaluation trials.	A.Del Gatto	CREA-CI
maize hybrid varieties for grain and whole chopped supply chains	National network.	G.Mazzinelli	CREA-CI
maize mycotoxin	Monitoring Network.	S.M. Locatelli	CREA-CI
Third party service and Open field experimentation for third parties			
sugar beet	Chemical analysis of sugar beet samples.	I.Alberti	CREA-CI
onion	Open field evaluation trial of short and long cycle onion lines	N.Pecchioni,A.Troccoli	CREA-CI
wheat	Contract for research on the spread of wheat rust present on the national territory.	D.Marone, A.M.Mastrangelo	CREA-CI
durum wheat	Provision of physical analysis services as part of the project "creation of varieties of durum wheat having quality parameters in compliance with international standards, of high productivity and ecological stability	P.De Vita	CREA-CI
durum wheat	Evaluation tests of Israeli lines of durum wheats in hot-arid Mediterranean environments	N. Virzì	CREA-CI
durum wheat	Evaluation tests of new formulations for the fertilization of durum wheat in the Mediterranean area.	N.Virzì	CREA-CI
durum wheat	Evaluation of durum wheats varieties.	P.De Vita	CREA-CI
durum wheat	Evaluation of different fertilising products on the quali-quantitative response of durum wheat.	N.Pecchioni, A.Troccoli, A. Gallo	CREA-CI
durum wheat	Evaluation of advanced breeding lines of durum wheats.	P.De Vita	CREA-CI
durum wheat	RAGT - Evaluation of durum wheats genotypes.	P.De Vita	CREA-CI
durum wheat	Evaluation of durum wheats genotypes.	P.De Vita	CREA-CI
sunflower	Varietal evaluation tests on sunflower.	A.Del Gatto	CREA-CI
maize	Contract for research on study and comparison of the effect of microbial consortia in the early stages of development of the maize plant	C. Lanzanova	CREA-CI
maize	Technical-scientific consultancy for the Eastern Lario Valle San Martino Mountain Community, regarding the improvement of productivity, the quality of the cultivation, conservation and transformation phases of Scagliolo di Carenno Corn.	Paolo Valoti, C. Balconi	CREA-CI
technical means	Evaluation tests of the effectiveness of technical means	A.Gallo	CREA-CI
new durum wheat genotypes	Agreement of Plant Breeding -Agronomic and qualitative evaluation of new genotypes of durum wheat derived by i) Co So synthetic population ii) selection of materials to start the registry tests, iii) plant material selected for varietal development, iv) activity of maintenance of seed purity.	P. De Vita	CREA-CI
new durum wheat genotypes	Agreement of Plant Breeding-Evaluation of new durum wheat genotypes	P.De Vita	CREA-CI
Brassicaceae pomace oil and flour	Use of raw and refined pomace oil as a technical fluid to be used as power supply of agricultural machinery for the olive grove. Study of pomace oil and Brassicaceae flour based formulations.	L.Lazzeri	CREA-CI
rice	Contract for the realization of an experimental trial of rice both in the field and phytotron for the multiplication and evaluation of lines in the selection phase	M.Canella	CREA-CI
rice	Contract for the construction of a demonstration field of rice with Clearfield technology.	M. Canella	CREA-CI
rice	Service contract for the cultivation of experimental rice plots	M. Canella	CREA-CI
various	Contract for technical-logistic collaboration service.	P. Vaccino	CREA-CI

Working tables / working groups / institutional partnerships / Centre journals / Editorial Board of Journals

Products/main topics	*Description*	*Person in charge*	*CREA research Centres*
International boards			
desertification	DesertNet International network - - Network for international research on desertification.	A. Rascio	CREA-CI
wheat	AWAS (Adaptation of Wheat to Abiotic Stress) Expert Working Group in Wheat Initiative work space Referenti A. Rascio, CREA-CI.	A. Rascio	CREA-CI
wheat	European Working Group (EWG) in Wheat Initiative work space: Global Wheat Germplasm Conservation and Use Community -Working group for the: "conservation and use of wheat germplasm"	A. Rascio, M. Palumbo	CREA-CI
durum wheat	Wheat Initiative - Expert Working Group (EWG) on Durum Wheat Genomics and Breeding.	M.Palumbo	CREA-CI
durum wheat, barley	EVA – Wheat and Barley - Network - Multiplication and exploitation of wheat and barley genetic accessions stored in European germplasm banks; distribution to the partners involved in the Network through "SMTA" for genotyping and evaluation in the field, sharing of the results in the EURISCO database	P. Vaccino	CREA-CI
maize	EVA – Maize - Network - Multiplication and exploitation of maize genetic accessions stored in European germplasm banks; distribution to the partners involved in the Network through "SMTA" for genotyping and evaluation in the field, sharing of the results in the EURISCO database.	C. Balconi, R.Redaelli, P. Valoti, N. Pecchioni	CREA-CI
maize	MAIZE WORKING GROUP - European Cooperative Programme for Plant Genetic Resources (ECPGR) MAIZE working group.	C. Balconi	CREA-CI
plant genetic resources	European Cooperative Programme for Plant Genetic Resources (ECPGR) wheat working group.	P. Vaccino, A. Rascio	CREA-CI
food losses	Global research network on reduction of food losses & food waste (FLW).	A. Rascio	CREA-CI
Centre journals	Maydica - A journal devoted to maize and allied species - ISSN: 2279-8013 https://journals-crea.4science.it/index.php/maydica	C. Balconi	CREA-CI
Editorial Board			
hemp	Guest Editor (2020) for the Special issue "Genetics and Functional Genomics in *Cannabis sativa* L.", for the journal Plants.	R. Paris	CREA-CI
mycotoxin	Guest Editor (2020) for the Special issue "Analytical Methods for Mycotoxin Analysis", for the journal Molecules.	S. M. Locatelli, C. Lanzanova	CREA-CI
various	Editorial board of the journal Archives of Agriculture Research and Technology (AART)	A. Spina	CREA-CI
various	Topic Editor for the journal Plants	L. Bassolino	CREA-CI
various	Associate Editors of the journal Frontiers in plant science/Plant Breeding.	A.M. Mastrangelo, N. Pecchioni	CREA-CI
various	Editorial board of the journal Current Genomics.	A.M. Mastrangelo	CREA-CI
various	Guest Editor (2020) for the Special issue "Transcriptional and Posttranscriptional Gene Regulation in Plants", for the journal International Journal of Molecular Sciences"".	A.M. Mastrangelo	CREA-CI
various	Associate Editor Italian Journal of Agronomy.	M. Rinaldi	CREA-CI
various	Associate Editor Euphytica.	N. Pecchioni	CREA-CI
Public Engagement	Non-profit activities carried out by the CREA-CI Centre having educational, cultural and developmental value for the society including the organization of public events (e.g. European Researchers' Night 2020), the management of the Centre's website and dissemination initiatives dedicated to students	D. Pacifico	CREA-CI
Working table			
bioeconomy	Working table "Apulian Cluster for the Bioeconomy" - Coordinated and promoted by the SPRING Cluster with Assobiotec – Federchimica- University of Bari, Puglia Region	A. Rascio	CREA-CI
maize	Working table MiPAAF and working groups. Working table of the corn sector (Mipaaf DM n. 31929 of 06.05.2019) and working groups (Mipaaf DG PQAI 2 Prot. 53395 del 24.07.2019) established with the aim of preparing the Sector Plan.	N. Pecchioni C. Balconi, S.M. Locatelli, G. Mazzinelli	CREA-CI
rice and other cereals	Working table and working groups Member of the technical commission of the Italian Standardization Body UNI/CT 003/GL 22 " Rice and other Cereals	P. Vaccino	CREA-CI
Working group			
organic farming	Participant to technical working group at MIPAAF on rotations allowed in organic farming	M. Rinaldi	CREA-CI
cereal	The Italian association of Cereal Science and Technology (Associazione Italiana Scienza e Tecnologia dei Cereali - AISTEC). Board of Directors - Secretary .	R. Redaelli	CREA-CI
cereal sypply chain	Cereal supply chain at MiPAAF, Dep. of European and International Policies and Rural Development, Directorate General for International Policies and the European Union, PIUE IV.	S. M. Locatelli	CREA-CI

biological contaminants	GLM Mycotoxins Working Group (MiPAAF): planning, design, starting and implementation of projects on biological contaminants (e.g. mycotoxins) of agricultural production and their derivatives	S. M. Locatelli	CREA-CI
plant phenotyping	CREA representative in the JRU Phen-Italy Assembly - National Platform for Plant Phenotyping.	N. Pecchioni	CREA-CI
plant breeding	Working group Scientific technical committee CERMIS - Centro ricerche e sperimentazione per il miglioramento vegetale.	P. De Vita	CREA-CI
autumn and spring cereals	Working group Commission dedicated to the coordination of test trials for registration of autumn and spring cereals - participation as an expert in qualitative analyses of bread wheat	P.Vaccino	
conservation varieties	Working group Sicilia Region Regional Department of Agriculture, Rural Development and Mediterranean Fisheries. Commission for evaluating applications for registration in the national register of varieties conservation	M. Palumbo	CREA-CI
various	The Georgofili Academy (Accademia dei Georgofili). Member of the expert group for the initiative "L'Accademia risponde"	R. Redaelli	CREA-CI
various	The national Academy of Agriculture (Accademia Nazionale di Agricoltura) Bologna. Correspondent Academic - Cultural and dissemination activities.	P. De Vita	CREA-CI
various	The Georgofili Academy (Accademia dei Georgofili), Firenze. Academic Aggregate - North-West Section - Cultural and dissemination activities.	N. Pecchioni	CREA-CI
various	Board of Professors of the PhD Course "Gestione della Innovazione nei sistemi agro-alimentari della Regione mediterranea" of University of Foggia.	P. De Vita	CREA-CI
various	Board of Professors of the PhD Course "Scienze Tecnologie e Biotecnologie Agroalimentari" of the University of Modena and Reggio Emilia	N. Pecchioni	CREA-CI
various	The Association of Graduates in Agricultural and Forestry Sciences (Associazione Laureati in Scienze Agrarie e Forestali-ADAF) President - Cultural and dissemination activities	P. De Vita	CREA-CI
various	Working group M.U.R. – Commission of experts for the preparation of the "National Research Plan" (Piano Nazionale della Ricerca - PNR 2021-2027) Topic: Sustainable Technologies, Agri-food, Natural and Environmental Resources - Management of agricultural resources.DM 969 del 03.07.2020.	N. Pecchioni	CREA-CI

2.2 ANIMAL AND DAIRY PRODUCTIONS

Research carried out by CREA in this field can be roughly divided into three large areas: economic and environmental sustainability; ethical and health sustainability; and product quality.

Economic and environmental sustainability are closely interlinked since the challenge faced by animal production systems is to minimize negative outputs. To this goal, relevant topics are the optimization of animal diets aiming at limiting waste, nitrogen leaks and GHG emissions, and the use of by-products in animal nutrition, *Life Cycle Assessment* analyses of complex biological systems, manure management especially concerning carbon sink and biogas production including studies of anaerobic microbiology, and biodiversity within and across breeds of farm animals. Very intense research activities carried out at the experimental farms of CREA-ZA are focused on Precision Livestock Farming, both on bovine breeds in general and on buffalo in particular, and on breeding for drought resistance of leguminous plants and forages used as feed. Also, the data generated at the experimental farms of the Centre serve for the development of genetics and genomics approaches aimed at increasing the twinning rate in cattle and ~~to~~ at expanding heterosis of crosses, necessary to extend the productive life of dairy cows. Both reserches aim to increase the Italian production of beef calves.

Ethical and health sustainability includes studies in the context of Organic Animal Farming and Animal Welfare in conventional production systems. Research also relates to phytoextracts with potential activity against microbes an parasites, in order to reduce the use of synthetic medicines. Of particular relevance are furthermore studies conducted at CREA-ZA on innate immunity, in order to identify new cytofluorimetric markers~~,~~
and their genomic basis, to be used for early detection of inflammations or as criteria for the selection of more resilient animals. Also, genetic and genomic trials based on field data are performed, with the purpose to increase resistance against bovine mastitis.

The Italian tradition of high quality animal products is worldwide known. Research on dairy (cow, buffalo and sheep) and meat products covers a large portion of CREA-ZA activity under many regards. Different factors are studied: effects of different fertilization schemes in the cultivation of forages, of heat stress, of welfare status, of milk heat treatments, of new types of vegetal rennin. Furthermore, new innovative controls during cheese production are being tested, and dairy microbic populations are studied, also including by metagenomic approaches.

2.2.1 Research and research products - Animal and Dairy Productions

Products/main topics	*Acronym and Research Title*	*Aims*	*Person in charge and CREA Centres*	*Partnership/ Financing Body*	*Scientific Publications*	*Other Research products* [1]
PRECISION AGRICULTURE	**CERESO** Optimization of the inputs for the sustainability of Lucanian Cereal cropping systems.	Contribute to the realization of a modular platform for precision agriculture. .	R. Rossi, CREA-ZA	Basilicata Region		
HUSBANDRY/ protection	**DIBIO subp.INSOBTEC** Difesa degli allevamenti e delle colture.	Bio-based technologies to support the production and quality of organic vegetable seeds.	M.L. Manici, **CREA-AA** CREA-IT	MIPAAF		
ANIMAL FEEDING	**GENLEG** Genomic selection for yield, drought stress tolerance and protein content in forage and grain legume crops.	Genomic selection for yield and quality in alfalfa, pea and soybean.	P. Annicchiarico, CREA-ZA	MIPAAF	-	1 Post-doc fellowship.
ANIMAL FEEDING	**INVITE** Innovation in plant Variety Testing in Europe to foster the introduction of new varieties better adapted to varying biotic and abiotic conditions and to more sustainable crop management practices.	Novel DUS and VCU criteria for alfalfa and soybean varieties.	C. Delogu, **CREA-DC** CREA-GB CREA-ZA	19 Partners: Austria, Belgium, Germany, Ireland, The Netherlands, UK, Czech Republic, Spain, Switzerland, Hungary, France / **European Commission**		1 Post-doc fellowship.
ANIMAL FEEDING / hemp	**CANAPRO** Enhancement of the hemp supply chain through product and process innovation.	To identify the hemp varieties most suitable for the Lombard environment and for transformation purposes; to develop growth models both for open field and greenhouse cultivation; to evaluate the yield and quality of extra-seasonal production of greenhouse-grown hemp; to identify varieties with the highest oil yield; to enhance hemp products in animal nutrition.	M. Povolo, CREA-ZA	Lombardia Region		webinar on the results and activities of the first year of the project . 1 Postdoc fellowship.
ANIMAL FEEDING / lucerne	Alfalfa breeding.	Breeding of 2/4-constituent S2 synthetics with divergent traits influencing forage quality and production for the constitution of semi-hybrids or synthetics in alfalfa	C. E.L. Scotti, CREA-ZA	self funded	Carelli et al. (2020) Plant Breeding 139:834-844	
ANIMAL FEEDING/ leguminous plants	Maintenance and multiplication of the TILLING lines of *Medicago truncatula*, model species for legumes.	Maintenance and multiplication of the TILLING lines; use of the collection for functional genomic studies on genes of interest (secondary metabolite biosynthesis, root-escreted phytases).	C. E.L. Scotti, CREA-ZA	*In house*	Carelli et al. (2020) The model legume Medicago truncatula: chapter 4.3	

[1] *prototypes; dissemination activities (conferences, seminars, reports, sites and videos, etc.); training activities (scholarships, research grants and PhD scholarships)*

ANIMAL FEEDING / pea, lucerne	**CAMA** Research-based participatory approaches for adopting Conservation Agriculture in the Mediterranean Area.	Pea and alfalfa breeding for Mediterranean environments. .	M. Rinaldi, **CREA-CI** CREA-AA CREA-PB	12 Partners: France, Greece, Morocco, Portugal, Spain, Algeria, Tunsia/ **European Commission**	1)Castellini Mirko, Giglio Luisa, Modugno Francesca. Sampled Soil Volume Effect on Soil Physical Quality Determination: A Case Study on Conventional Tillage and No-Tillage of the Soil under Winter Wheat. Soil Syst., 2020, 4, 72. 2)Mirko Castellini, Alessandro Vittorio Vonella, Domenico Ventrella Michele Rinaldi Giorgio Baiamonte. 2020. Determining Soil Hydraulic Properties Using Infiltrometer Techniques: An Assessment of Temporal Variability in a Long-Term Experiment under Minimum- and No-Tillage Soil Management. Sustainability 2020, 12, 5019; doi:10.3390/su12125019	1 Post-doc felloship.
ANIMAL FEEDING / silk worm	**SILK PLUS**	Obtaining feed and food from silkworm pupae	S. Cappellozza, CREA-AA	Veneto Region		
ANIMAL FEEDING / digestates from biogas plants	**AGRI-HUB** Development and technological integration of a high-throughput platform for the sustainable improvement of agrofood productive chains.	To develop and integrate a high-throughput platform for the sustainable improvement of agrofood productive chains.	C. E.L. Scotti, CREA-ZA	Lombardia Region		4 Research grants. 1 Post-doc fellowship.
ANIMAL FEEDING / fodder, legumes. /genetic resources	**RGV-FAO** Three-year program 2020-2022 for the conservation, characterisation, use and valorisation of agro-food plant genetic resources	Conservation and characterisation of plant genetic resources of forage and grain legume crops.	I. Verde, **CREA-OFA** CREA-AA, CI DC, FL GB, IT OF, VE	MIPAAF	Pecetti et al. (2020) Field Crops Res. 256:107907	1 Post-doc fellowship.
ANIMAL FEEDING / forage/corn shredded/ environmental sustainability/ precision agriculture	**MENTAL** Improvements and new technologies in lombardy agriculture.	1. Manage the cultivation of corn for silage using precision agriculture methods.2. Fine-tune the workflow that takes place in the PA on two test fields: acquisition of soil and crop information.3. Processing and storing the information in GIS. 4. Using the information in defining site-specific doses of technical media and producing prescription maps; applying site-specific rates.	G. Cabassi, CREA-ZA	Lombardia Region		1 Research grant. Cycle of 12 webinars with broad participation of professionals and farmers. Final conference with 200+ attendees. Dissemination publications and article in Precision Agriculture under consideration.
ANIMAL FEEDING / einkorn	Breeding of einkorn	Breeding of einkorn.	A. Brandolini, CREA-ZA	self funded	1) Volante, A., Yilmaz, V. A., Hidalgo, A., Brandolini, A. (2020). Genetic Resources and Crop Evolution, 1-10. https://doi.org/10.1007/s10722-020-00923-6; 2) Talini, R., Brandolini, A., Miculan, M., Brunazzi, A., Vaccino, P., Pè, M.E., Dell'Acqua, M. 2020. The Plant Journal. 102:555-568. doi: 10.1111/tpj.14650	3 varieties (Monlis, Antenato, Monili) registered in the National Register, one variety (Antenato) with EU patent .
ANIMAL FEEDING / white lupin	**LIVESEED** Improving the performance of organic agriculture by boosting organic seed and plant breeding efforts across Europe.	White lupin breeding for organic farming. .	P. Annicchiarico, CREA-ZA	34 Partners: Austria, Bulgaria, Danimarca, francia, Germania, Grecia, Paesi Bassi, Polonia, Regno Unito, Spagna, Svizzera, Svezia, Ungheria, Portogallo, Lettonia, Romania/ **European Commission**		1 Post-doc fellowship.

ANIMAL FEEDING / pea	**REMIX** Redesigning European cropping systems based on species MIXtures.	Pea plant breeding fo intercropping with cereals. .	P.Annicchiarico , CREA-ZA	23 Partners: France, Belgium, China, Denmark, Germany, Greece, Holland, Poland, UK, Spain, Sweden, Switzerland, Hungary/ **European Commission**		2 Post-doc fellowships**.**
ANIMAL FEEDING/ maize	**CONSENSI** Optimization of Fertilization using Sensors and Precision Agriculture techniques.	1. Optimization io nitrogen fertilization for livestock feed crops with particular reference to corn, through the efficient integration of algorithms and improved data exchange between mapping systems (of soil, vegetative vigor and production) and use of variable rate distribution systems of liquid or solid manure and mineral fertilizer.2.Improving, also, the sustainability of livestock production in Lombardy and the fertility of the land of cereal farms, through the maximization of the efficiency of use of effluent as primary source of organic matter, nitrogen and phosphorus, through the techniques of site-specific distribution of precision agriculture.	G. Cabassi, CREA-ZA	Lombardia Region		
DOMESTIC ANIMALS/ animal biodiversity	Risk evaluation of genetic erosion in domestic animal breeds of Lazio region.	Analyses of trend of inbreeding over time in the rare breeds of Lazio Region. Strategies to maintain animal domestic biodiversity.	L.Buttazzoni CREA-ZA	Lazio Region		Report to the Region.
BEE/ ligustica bees	**INNOVAPE** Innovative tools to support the beekeeping sector for the enhancement of ligustica bees	Establishment of an Operating Group, partnership aimed at creating a plan for the development of a process to develop an innovative process /service for the beekeeping sector, in the field of honey selection and product.	E. Carpana, CREA-AA	Emilia Romagna Region		
BEE/ protection	**Mipaaf 1308 - 2020 F2.** National Three-year Program 2020-22 in favor of the beekeeping sector, for the improvement of the production and marketing of beekeeping products - Ministerial sub-program - year 2020	Research aimed at combating diseases and hive attackers.	E.Carpana, CREA-AA	MIPAAF		
BEE/ herd book/ breeding	**LG** Tenuta del Libro genealogico e miglioramento genetico delle api.	Monitoraggio e coordinamento della selezione e dell'allevamento di api regine appartenenti alle sottospecie autoctone italiane; gestione dei 3 Albi Nazionali (Allevatori Api Italiane, Esperti in Analisi sensoriale, Esperti in origine geografica del miele).	C. Costa, CREA-AA	MIPAAF		

BEE/ enhancement of production	**Mipaaf 1308- 2020 F1.** National Three-year Program 2020-22 in favor of the beekeeping sector, for the improvement of the production and marketing of beekeeping products - Ministerial sub-program - year 2020.	Quality improvement of beekeeping products through physico-chemical and microbiological analyzes, typing studies based on botanical and geographical origin.	G. L. Marcazzan, CREA-AA	MIPAAF		Publication: I MIELI ITALIANI: un patrimonio unico di qualità e tipicità. www.informamiele.it
DAIRY CATTLE / animal feed/legumes wasste	**MILK BIOACTINCAPS** Use of microencapsulated bioactive compounds from food industry waste as feed supplements to improve the fermentation attitude and nutraceutical value of milk.	Extraction of phenolic compounds from food industry waste, such as the external teguments of legumes, and their characterization and microencapsulation, to be used in diets for dairy cows to improve the fermentative aptitude of milk, as well as to formulate milk and dairy products fortified with these bioactive ingredients.	L. Sepe, CREA-ZA	MIPAAF		
DAIRY CATTLE/ precision feeding	**EVOLAT** Precision feeding with pomace from extra virgin olive oil: modulation of the metabolism of dairy cows for the development of new products.	Rumen microbiota analysis.	R. Pastorelli, CREA-AA	MIPAAF		
DAIRY AND BEEF CATTLE/ precision feeding	**AUTOFEED** Feeding automation for cattle farms in Lombardy	Aims at improving the dairy and beef cattle's welfare that result in an improved quality and sustainability of their production thanks to the adoption of mechanized and automatic devices for feeding administering.	C. Bisaglia, CREA-IT	Lombardia REgion		Dissemination (website) https://autofeed.crea.gov.it/
DAIRY CATTLE/ disease management / precision livestock	**CTRL-C-MAST** Synergies between sensors and laboratory analysys for mastitis monitoring and rational drug use: informative and demonstrative actions.	Enhance the knowledge of how to use all data gathered from precision livestock farming technologies in dairy farms with automatic milking systems to improve on farm management of mastitis, by reducing infectious disease incidence and antibiotic use to treat, control or prevent mastitis..	F. Petrera - CREA-ZA	Lombardia Region	F. Petrera (2020). Mastiti, robot di mungitura e riduzione dell'uso degli antibiotici. Informatore Zootecnico, 20: 30-35.	
DAIRY CATTLE/ precision livestock	**PLF-NODRUG** precision Livestock Farming for the reduction of antibiotics in the dairy farm.	Definition of a risk model of contracting mastitis following the omission of the use of an antibiotic for prophylactic purposes at the time of drying the cows, using all the information available in the farm, in order to enhance the preventive approach to ensure state of health and welfare of dairy cows.	F. P. Abeni, CREA-ZA	Lombardia Region		1 Post doc fellowship.
DAIRY CATTLE AND BUFFALOES	**AGRIDIGIT PLF4Milk** Digital technologies in the bovine and buffalo milk supply chain.	1. Application of precision animal husbandry techniques in dairy cattle and buffalo species, enhancing the integration between different systems and robotics as a tool for automatic feedback. 2. Assessment of individual methane emission, welfare and thermal stress trough a sensor	F. P. Abeni, CREA-ZA	MIPAAF		2 Post doc fellowships.

		approachparticolare agli stress termici, tramite sensori.				
BEEF CATTLE / beef carbon footprint	**LIFE BEEF CARBON** Demostration actions to mitigate the carbon footprint of beef production in France, Ireland, Italy and Spain	The Project goals to develop a BEEF CARBON ACTION PLAN, aimed at reducing beef carbon footprint by 15% over 10 years in 4 countries producing beef in Europe: France, Ireland, Italy and Spain.	L. Migliorati, CREA-ZA	Idele (Francia); Teagasc (Irlanda), Asoprovac (Spagna)/ **European Commission**	O'Brien, D., Herron, J., Andurand, J., Caré, S., Martinez, P., Migliorati, L., Moro, M., Pirlo, G., and Dollé, J-B. 2020. LIFE BEEF CARBON: A common framework for quantifying grass and corn based beef farms' carbon footprints -- Animal, Vol.14, Fasc.4, pagg.834-845. Doi:10.1017/S1751731119002519-	2 Post doc fellowships
BEEF CATTLE / sustainable beef farming systems	**SUSTAINBEEF** Codefinition and assessment of sustinable beef farming systems based on feeds not suitable as food**.**	Reduce competition between humans and animals (beef cattle) for edible food sources. Specific objectives: 1. To define a set of environmental, social and economic indicators to compare the sustainability of different beef production systems; 2. To define potential scenarios for the evolution of more sustainable cattle farming systems in the main EU beef production regions.	G. Pirlo, CREA-ZA	Walloon Agricultural Research Center (B), INRA, Teagasc, IDELE, Walloon Livestock Association, Iniversity of Bonn, Univeristy College Dublin / MIPAAF-**European Commission**	Mosnier et al, 2021. Evaluation of the contribution of 16 European beef production systems to food security. Animal Pirlo, 2020. Sostenibilità, la competizione tra animali e uomo per le risorse alimentari. Pianeta PSR, n. 49.	
DAIRY CATTLE/ environmental efficiency / digital and precision zootechnics.	**DIGITAL MILK** Milk production in Lombardy towards a digital and precision zootechnics.	Demonstrate that the introduction of digital technologies with which to improve the performance and welfare of cows has effects on efficiency and environmental sustainability.	F. P. Abeni, CREA-ZA	Lombardia Region	R. Marino, A. Gastaldo, A. Menghi, F. Petrera, G. Pirlo, F. Abeni (2020). Latte digitale: la frontiera dell'innovazione Informatore Zootecnico, 20: 37-38,	1 Post doc fellowship.
MILK CATTLE, DONKEYS, GOATS/ innovative cheeses	**INNOPROLATTE** Application of process and product innovations for the development of the milk chain in Basilicata Region.	Providing process and product innovations immediately applicable, to the dairy sector of Basilicata Region, concerning differents dairy species (bovine, donkey and goat). Specific objectives: 1. Innovative cheeses with vegetable rennet. 2. Innovative cheeses with donkey milk. 3. Vegetable fibers and innovative cheeses. 4. Innovative dairy products based on goat's milk	S. Claps, CREA- ZA	Basilicata Region		1 Paper on an informative journal. 3 field days. Webinar on 14 december 2020, on the results concerning cheeses by vegetable rennet. Film production on the YouTube channel within the CREA BREAK initiative for innovation.
DAIRY BUFFALOES/ animal welfare and sustainability	**IZS ME 8/18 RC** Study of animal welfare and sustainability of the dairy buffalo production chain using a multidisciplinary approach.	To develop an integrated information system on animal welfare and environmental performance of the supply chain.	M. C. Scatà, CREA-ZA			
DAIRY BUFFALO / health and animal welfare	**IZS ME 11/20 RC** Differential Somatic Cell Count (DSCC) and Animal Welfare in the Italian Mediterranean Buffalo: approach multidisciplinary.	1. To validate the Differential Somatic Cell Count (DSCC) parameter in the buffalo species and to evaluate the correlation between udder health and AWRA (Animal Welfare Risk Assessment). 2. To improve the decision-making process, as part of the udder health management, the implementation of anti-microbial treatment programs with related economic impact and public health (AMR)	G. De Matteis, CREA-ZA	Ministero della Salute		

BUFFALOES/ animal health and welfare	**IZS ME 09/19 RC** Development of advanced molecular and flow cytometric methods for the diagnosis of tuberculosis in buffalo	To develop multicolours flow cytometric panels and intracytoplasmic labeling protocols in the buffalo species for the determination of cytokines involved in the to tuberculosis infection response.	G. De Matteis, CREA-ZA	Washington State University, WA, US/ Ministero della Salute		
BUFFALO MEAT/ high quality	**INNOBUF** Innovative technologies of breeding and process for the qualitative enhancement of the buffalo meat on Lazio.	The general objective of the project is to improve competitiveness of buffalo farms in Lazio, by implementing a high-quality meat production line. The changes that will be introduced concern new technologies for tenderizing of meat of adult buffaloes and raising the 6-month-old buffalo calf.	S. Failla, CREA-ZA	Lazio Region		
AUTOCHTHONOUS GOAT/ animal biodiversity	**ACCASATA** Adaptation and conservation of native genetic resources in the goat species in Basilicata Region.	Conservation strategies and valorization of animal biodiversity.	S. Claps, CREA- ZA	Basilicata Region	Sarah Currò, Carmen L. Manuelian, Massimo De Marchi, Arianna Goi, Salvatore Claps, Luigi Esposito & Gianluca Neglia (2020). Italian local goat breeds have better milk coagulation properties than cosmopolitan breed, Italian Journal of Animal Science, 19:1, 593-601. DOI: 10.1080/1828051X.2020.1772130	Series of six on-line workshops: 9, 11, 16, 18, 23 and 25 June 2020.
AUTOCHTHONOUS CROPS/ green chemistry	**COMETA** Autochthonous Mediterranean crops and their valorisation with advanced green chemistry technologies.	Testing the use of geophysical tecnologies for the estimation of root biomass.	R. Rossi, **CREA-ZA** CREA-IT CREA-CI	MUR		
RABBITS	**ΩRABBIT** Food for health benefit.	The general objective of the project is to evaluate the implication of diets, supplemented with linseed and algae rich in omega-3 fatty acids, on meat quality and on reproductive characteristics of rabbit. .	S. Failla - CREA-ZA	Ministero dell'istruzione, dell'università e della ricerca; INRAE (Francia); VALOREX (Francia); COPRI (Francia); APRI (Egypt); GIPAC (Tunisia); ESA-MATEUR (Tunisia); ENMV (Tunisia).		
PIG FARM EFFLUENTS/ biorefinery	Pig slurry valorization with a view to biorefinery.	To reduce the environmental impact due to inappropriate disposal through solutions designed to protect the farmer's income .	R. Marchetti, **CREA ZA** CREA - AA	self funded	1Conversion of waste cooking oil into biogas: perspectives and limits Marchetti, R., Vasmara, C., Bertin, L., Fiume, F. Applied Microbiology and Biotechnology, 2020, 104(7), pp. 2833–2856 Enhancing methane yield from giant reed (Arundo donax L.) through thermoalkaline pre-treatment and co-digestion with pig slurry Vasmara, C., Marchetti, R., Cianchetta, S., Galletti, S., Ceotto, E. European Biomass Conference and Exhibition Proceedings, 2020, pp. 481–483	
Medical plants / extracts	**HERBAL** Agreement (sub-contracting) with the scope of the Research Project "Herbs and Mountain plants as an alternative medication for anthelmintic treatments in livestock species	Evaluation of extracts obtained from plants for the use in veterinary medicine	P. Fusani, CREA-FL	Fondazione Edmund Mach		

ORGANIC SUPPLY CHAIN	**COMAZOO** Contract with an agroindustrial company.	Support for the development of an organic supply chain and the management of regional projects.	D. Bochicchio CREA-ZA	COMAZOO scarl		
LIVESTOCK SUPPLY CHAIN/ emissions	**N-control** Reduction of greenhouse gas and ammonia emissions in the livestock supply chain	Demonstration of the effect of biochar in reducing GHG and ammonia emissions from soil and animal effluents.	C. E.L. Scotti, **CREA-ZA** CREA - AA	Lombardia Region		Webinar 'Riduzione delle emissioni di GHG e ammoniaca nella filiera zootecnica' (16.12.2020).
CHEESES	**TEMPRO** Effects of raw milk storage temperature on the safety and quality characteristics of Provolone Valpadana PDO cheese.	The objective is to evaluate the possibility of increasing the storage temperature of raw milk for the production of Provolone Valpadana PDO cheese spicy type, to increase the pro-technological microflora and optimize the management of the production chain. Effects on the quality of the cheese evaluated by surveys on changes in microbiological, safety, chemical, physical and nutritional characteristics of the cheese.	D. Carminati, **CREA-ZA** CREA-AN	MIPAAF		1 early workshop.
CHEESES	**NEWTECH** New technologies for cheese production.	1. To evaluate the usefulness of the plant DNA circulating in raw milk and bacterial DNA in cheese to distinguish the geographical origin of Grana Padano PDO on a molecular basis and, at the same time, differentiate the PDO product from similar 2. To study the effects of using powdered milk in the production of fresh cheeses such as crescenza and mozzarella, evaluating the effects on processing technology, dairy yield and product quality. 3. Todevelop a low-cost portable spectrophotometric system for the analysis and monitoring in the boiler of the milk coagulation phase, in order to optimize the efficiency of process controls, with particular reference to Grana technology.	G. Giraffa, CREA-ZA	MIPAAF	1) Tidona F., et al. 2020. Application of recombined milk to produce Crescenza-type cheese in laboratory-scale cheesemaking: implications on technology and sensory properties. *Foods* 9, 928 2)Bardelli T. et al. 2020. Extracellular and intracellular DNA for bacterial profiling of long-ripened cheeses. FEMS Microbiol. Lett. 367 (13) 3) Zago M.et al. 2020. Evaluation of bacterial communities of Grana Padano cheese by DNA metabarcoding and DNA fingerprinting analysis. Food Microbiol. 93, 103613 '	Seminar "Strumenti innovativi per la valutazione della qualità e tracciabilità di Grana Padano", Desenzano del Garda, 16.12.2020.
CHEESES	**CHEESEKO** Increase the knowledge on Italian cheeses to develop the Korean Market.	Introduce the knowledge on various aspects related to the manufacture and quality of Italian cheeses in order to identify the products that best suit the tastes of the Korean consumer in order to favor the export of Italian cheeses to South Korea. .	D. Carminati, CREA-ZA	CHOHEUNG CORPORATION (Korea)		
BUFFALO CHEESES	**GREENBUF** Buffalo cheeses produced with vegetable rennet and enriched with natural antioxidants.	Effect of the methods of harvesting, drying and use of Cynara cardunculus flowers on its coagulant activity - Effect of milk enrichment with plant extracts with high antioxidant content on the nutraceutical characteristics of the cheese.	T .Zottola	Ministero della Salute		
GOAT CHEESES AND COSMETICS	**CAPRINI ERBOSI** Innovative goat cheeses and cosmetics based on medicinal	Research, experimentation and validation in the dairy sector based on goat's milk, with rennet from wild herbs from Campania region and officinal plants, and cosmetics	L. Sepe, CREA-ZA	Campania Region		

	and spontaneous Mediterranean herbs.	based on milk and goat whey, for innovative products with nutraceutical properties.				
INNOVATIVE CHEESES	**FORMAGGI LUCANI PLUS** Diversification of the Lucanian cheeses and their nutraceutical characteristics.	1) Study and development a dairy pilot plant (prototype) for optimizing the infiltration of pate and / or other nutraceutical extracts in the cheese, ensuring high quality standards and at the same time a considerable saving of labor. 2) chemical-physical, nutritional and organoleptic characterization of the products	S. Claps, CREA- ZA	Basilicata Region		2 News letters. Project Presentation Conference.
CHEESE/ valorization	**CANESTRUM CASEI** Development of a synergy model aimed to Qualify and Valorize the Natural Historic Cheese of Southern Italy in the Sicilian, Sardinia, Calabria, Basilicata and Campania Regions.	The project aims to focus the attention on those products at risk of extintion or those who have objective difficulties in terms of their qualification and exploitation in the market. Sixteen traditional cheeses were selected (Ager selection), among the cheese production in the Southern Italy: i) Characterization and integration of missing information by specific research activities; ii) Research and development of marketing and communication strategies; iii) Stakeholders' training	S. Claps, CREA- ZA	Fondazione Cariplo		Oral communication during the conference "Project CANESTRUM CASEI Valorization of historical cheeses of Southern Italy", Colliano, 18 February 2020. Claps S. 2020. I formaggi storici Lucani: tradizione e innovazione. Un binomio possibile? 1 Research grant .
ANTIMICROBIAL FORMULATIONS	Development of multi-targeting and nano-engineered "green" formulations with antimicrobial and anti-parasitic activity.	Identification and validation of the combined activity of plant extracts and nanoparticles biosynthesized in them with degradative activity against biofilms produced by microorganisms and with antibacterial activity towards microbial pathogens of human and animal concern. Scale up for process development for multi-targeting and nanoengineered "green" formulations with antibiofilm and antibacterial activity.	P. Del Serrone, CREA-ZA		(AlSalhi MS, Devanesan S, Atif M, AlQahtani WS, Nicoletti M, Serrone PD. Valutazione del potenziale terapeutico di nanoparticelle di ossido di zinco sintetizzate in modo sostenibile, derivate dall'estratto di semi di finocchio. Int J Nanomedicine. 2020 Oct 20; 15:8045-805.	
MILK	**MIQUALAT** Improvement of the nutritional quality and health image of milk for the contents of functional molecules with prebiotic and protective action.	The Identification of gene loci with effect on nutraceutical characteristics of milk will provide for the purpose of genetic improvement for "naturally" healthy milk characteristics.	A. Crisà, CREA-ZA	MIPAAF		1. Thesis entitled "Functional molecules with antioxidant and prebiotic action in bovine milk: bioinformatic analysis of public databases", as part of the degree course in biotechnology (class L-2) at the DIBAF department of the University della Tuscia, academic year 2019/20, graduate student Emanuele Tufarini. 2. Participation in the Virtual EAAP Annual Meeting 1-4 December 2020 in which the project and some preliminary results were presented. 3. Video production on the youtube channel within the CREA BREAK initiative for

						innovation.4. Press review by the CREA press office. 5. Interviews published on Repubblica and Agronotizie online; 4 Research grants
FRESH MILK/ valorization	**CALAFRE** Cheese making with fresh milk.	Enhance Italian cow's milk through the production of cheeses with milk processed within 48 hours of milking; study the chemical, nutritional, sensory and digestive characteristics to identify the markers of these cheeses. Identify the chemical, nutritional and digestive markers of buffalo mozzarella produced with milk processed within 60 hours of milking. Track both cheeses and buffalo mozzarella produced with fresh milk through NIR spectroscopy and electronic nose.	L. Buttazzoni, CREA-ZA	MIPAAF	Rinaldi, S.; Palocci, G.; Di Giovanni, S.; Iacurto, M.; Tripaldi, C. (2021). Caratteristiche chimiche e stabilità ossidativa della mozzarella di bufala prodotta con cagliata fresca e congelata. Molecules, 26, 1405-1422.	
SHEEP AND GOAT/ livestock hygiene	**AZAI** Livestock action in Alta Irpinia area.	Identification of the major criticalities, from the hygienic-sanitary and production point of view, in the sheep and goat farms in the Alta Irpinia area.	S. Claps, CREA- ZA	Regione Campania		
SHEEP AND GOATS / milk and cheese	**SANSINUTRIFEED** Production of feed with nutraceutical value through the use oil industry by-products with study of the effects on animal welfare and milk and cheese quality.	Production of new and competitive feeds with "nutraceutical value" (use of by-products rich in polyphenols from virgin destoned olive cake dried at low temperature and "powder" extracted from vegetation water), capable of improving the nutraceutical characteristics of milk and cheeses and animal welfare.	S. Claps, **CREA- ZA** CREA -OFA CREA - PB	Ministero dello Sviluppo Economico		
SHEEP AND GOATS/ animal welfare	**BASC** Animal welfare for consumers' health. Dairy products from animals treated with natural medical device.	Use of natural extracts for the treatment of parasitosis in sheep and goats. Animal dairy products in farming systems obteined without the use of conventional drugs.	S. Claps, CREA- ZA	Campania Region		
SHEEP AND GOAT AUTOCHTHONOUS BREEDS/ biodiversity	**COLAUTOC** Seed bank collection of native sheep and goat breeds and strategies for their maintenance and increase in numbers.	1. Ex-situ maintenance of sheep and goat endangered breeds and new breeds identified at risk. 2. Application of reproductive biotechnologies. 3. Dissemination of genetic material of high genealogy in the Basilicata region.	L. Sepe, **CREA-ZA** CREA-PB	Basilicata REgion		1 research grant.
PASTURES	**PASCOLANDO** Sustainable management of pastures-Information and demonstration activities in Alpe Andossi.	Dissemination of knowledge, demonstration of good practices and innovations for the sustainable management of agricultural areas of particular environmental importance and of pasture farms, even through the introduction of agronomic practices that are advantageous for operators and relevant to biodiversity.	M. Povolo, CREA-ZA	Lombardia Region		

CHICKEN, RABBITS	**PERILBIO** Promotion and enhancement of long-term devices in organic agriculture.	Establishment of an experimental poultry house with digital technology and remote control. Alternative and opern air rearing methods for organic rabbits.	D. Ceccarelli, **CREA-OFA** CREA-PB CREA-AA	MIPAAF	1)Ciaccia C., Diacono M., Testani E., Fiore A., Farina R., Montemurro F., Canali S., Mele G., Ceccarelli. D. 2020. Participatory Action Research for the Co-design of a Long-Term Experiment: the Basilicata Case Study. XLIX Convegno Nazionale della Società Italiana di Agronomia, 16-18 settembre; 2)Ciaccia C., Mele G., Testani E., Fiore A., Montemurro F., Diacono M. La Ricerca al servizio del territorio: il caso studio Lucano di ricerca partecipativa. Agrifoglio (sottomesso uscirà quest'anno) 3)Ciaccia C., Diacono M., Canali S., Testani T., Montemurro F., Ferlito F., Roccuzzo G., Campanelli G., Di Pierro M., Mele G., Ranuzzi M., Grasselli O., Ceccarelli D. 2020. Long-term experiments as a tool for governing the transition towards new food systems: an Italian trajectory. Organic World Congress, Rennes 21-27 September, SCI-381	Technical days "La coltivazione del fico in Basilicata: valutazione delle cultivar locali per l'introduzione nel nuovo DSLP Perilbio".
CHICKEN	**TIPIBIO** Poultry strains suitable to organic agricolture and integrated crop-poultry farming..	Research of adaptability indexes to find chicken genetic lines able to cope with organic system.	L. Buttazzoni, CREA-ZA	MIPAAF		Informational video.
ZOOTECHNICAL WASTE	**BIOMASS HUB** BIOMetAno per una Società Sostenibile: sviluppo di un laboratorio italiano di circular economy dal biometano.	1) Distribution of renewable fertilizers obtained from effluents and agronomic evaluation.2) Development of variable rate distribution equipment for liquid and palatable organic wastewater. 3) Integration of renewable fertilizer management into a webgis platform for farm fertilization management.	G. Cabassi, **CREA-ZA** CREA-IT	Lombardia Region		1 Postdoc fellowship .
LIVESTOCK/ bioeconomy	**AGROENER** Energy from agriculture: sustainable innovations for the bioeconomy.	The project is focused on anerobic digestion processes of agricultural wastes to increase biogas production efficiency.	L. Buttazzoni - **CREA-ZA** CREA-IT	MIPAAF	Manfredini, A., Chiariotti, A., Santangelo, E., Rossi, E., Renzi, G. e Dell'Abate, M.T., 2020. Valutazione del valore biologico delle frazioni organiche solubili dei digestati di sansa di pomodoro. J. of Soil Sci. and Plant Nutrition, pp.1-14. https://doi.org/10.1007/s42729-020-00361-4. 3.	2 research grants (https://www.mdpi.com/2073-4441/12/6/1752) Evento:Workshop FBN-CREA
CROP-LIVESTOCK SYSTEMS	**LUCAN CEREALS** Sustainable crop management for the standardization of the Lucanian cereal production techniques.	Introduction of tecniques and technologies of proximal sensing for crop-livestock systems.	R Rossi, **CREA-ZA** CREA-AA	Basilicata Region		
FORAGE SYSTEMS	**FOREST:COMP** Valorisation of green forest waste in the on-farm compost production chain	Assement of ecosystem services in forage systems by soil quality index.	R.Rossi, CREA-ZA	Basilicata Region		
PIG	**EDIT** Effect of diets with different protein intake on the incidence of enteritis in weaning piglets at 30 kg.	To identify a diet that contributes to reducing the incidence of post weaning diarrhea in piglets.	V. Faeti, CREA-ZA	Associazione Nazionale Allevatori Suini		

PIG	**POWER** Power to strengthen welfare and resilience in organic pig production	To investigate the effects of different outdoor concrete paddock designs on the behavior of pigs in the finishing phase, on the health and hygiene of the paddocks. This will improve animal welfare and reduce nutrient losses (WP1); to study the effects of the type of farrowing paddock, as well as better genetics on maternal behavior and piglet mortality (WP2); to investigate the effects of different management strategies (eg iron or probiotic administration, prolonged breastfeeding) on the growth and health of piglets during lactation and after weaning (WP2); to identify and field test examples of best practices of different combinations of housing and grazing systems, considering productivity, feed efficiency, animal health and manure / pasture management (WP3); to evaluate the overall effect of the innovative solutions identified in WP 1-3, on the cost effectiveness, system resilience and ecological footprint of a variety of systems practiced throughout Europe (WP4); to provide guidelines for organic pig producers across Europe aimed at developing economically competitive ecological pig systems with high standards for animal welfare (WP5).	D. Bochicchio, CREA- ZA	Istituzioni internazionali, MIPAAF e UE1		
AUTOCHTHONOUS PIGS, SHEEP, GOAT AND HORSES / biodiversity	**STAVALESCO** Standardization, stabilization and valorization of ancient native genetic types (TGA) in pigs, sheep, goats and horses	Standardization, stabilization and enhancement of native genetic types by evaluating the growth performance, production and qualitative characteristics of the products.	S. Claps, CREA- ZA	Basilicata REgion		

2.2.2 Patents and Services

Patents

INDUSTRIAL PATENTS

Products/ main topics	*Denomination/Description*	*CREA inventors*	*CREA research Centres*

1 University of Natural Resources and Life Sciences (BOKU), Austria; Aarhus University, Dept. Agroecology (AUAGRO), Denmark; Center of Development for Outdoor Livestock Production (UHF), Denmark; Institut national de la recherche agronomique (INRA), France; Johann Heinrich von Thünen Institute, Institute of Organic Farming (TI-OL), Germany; Wageningen Livestock Research (WUR), The Netherlands; Research Institutes of Sweden (RISE), Sweden; Research Institute of Organic Agriculture (FiBL), Switzerland / **MIPAAF-European Commission**

silkworms	Method to feed silkworms (IT)	S. Cappellozza	CREA-AA
silkworms	Silkworm cocoon cleaning tool , comb with multiple tools and machine incorporating comb (IT)	F. Motto A. Saviane	CREA-AA
silkworms	Method for raising silkworm larvae and their derived uses (IT)	S. Cappellozza A. Saviane	CREA-AA
silkworms	Leaf cutting machine for animal feeding, especially silkworms (IT)	A.Assirelli S. Cappellozza	CREA-IT
wax of animal origin	Method and installation for the purification of animal wax from chemical substances (IT + PO)	R.Colombo M. Boi	CREA-AA
insects	Procedure and apparatus for automatic insect sorting (IT)	A. Assirelli G. Cabassi S. Cappellozza C. Costa S. Figorilli L. Marinoni F. Pallottino A. Saviane	CREA-AA
mastitis inflammation in dairy animals	Method and kit for determining the presence of mastitis inflammation in dairy animals (EN)	G. De Matteis	CREA-ZA
dairy product	Dairy product and method for the production of that dairy product (IT + FR + ES)	V. Fedele, S. Claps L. Sepe, F. Paladino	CREA-ZA

PLANT VARIETY RIGHTS – Forage species

Products	*Denomination*	*CREA autors*	*CREA research Centres*
lucerne	**COSTANZA**	P. Annicchiarico	CREA-ZA
fodder peas	**FRASER**	B. Parisi M. Di Candilo P. Ranalli	CREA-CI
white clover	**GIGA**	P. Annicchiarico	CREA-ZA

CREA VARIETIES INCLUDED IN THE ITALIAN OFFICIAL LISTS -Forage species

Products	*Denomination*	*CREA research Centres*	*Products*	*Denomination*	*CREA research Centres*
Dactylis	**Dora**	CREA-ZA	perennial ryegrass or English ryegrass.	**Pamir**	CREA-ZA
Dactylis	**Jana**	CREA-ZA	sainfoin	**Tetim**	CREA-ZA
Dactylis	**Padania**	CREA-ZA	fodder peas	**Coraline**	CREA-CI
lucerne	**Alfitalia**	CREA-ZA	fodder peas	**Fraser**	CREA-CI
lucerne	**Buttero**	CREA-ZA	fodder peas	**Pantera rosa**	CREA-ZA
lucerne	**Camporegio**	CREA-ZA	sulla	**Centauro**	CREA-ZA
lucerne	**Centauro**	CREA-ZA	berseem clover	**Nilodi**	CREA-ZA
lucerne	**Colosseo**	CREA-ZA	berseem clover	**Sacromonte**	CREA-ZA
lucerne	**Costanza**	CREA-ZA	berseem clover	**Saniros**	CREA-ZA
lucerne	**Equipe**	CREA-ZA	white clover	**Giga**	CREA-ZA
lucerne	**Gamma**	CREA-ZA	white clover	**L. 107/66 Espanso**	CREA-ZA
lucerne	**Iside**	CREA-ZA	white clover	**Trefor**	CREA-ZA
lucerne	**L. 202 Bresaola**	CREA-ZA	persian clover	**Accadia**	CREA-ZA
lucerne	**Lodi**	CREA-ZA	persian clover	**Rusty**	CREA-ZA
lucerne	**Pegaso**	CREA-ZA	purple meadow clover	**Isella**	CREA-ZA
lucerne	**Robot**	CREA-ZA	purple meadow clover	**L. 148/30 Longevo**	CREA-ZA
lucerne	**Verbena**	CREA-ZA	purple meadow clover	**L. 69 Valente**	CREA-ZA
harding grass	**Partenope**	CREA-ZA	purple meadow clover	**Milo**	CREA-ZA
Festuca arundinacea	**Fovea**	CREA-ZA	subterranean clover	**Antas**	CREA-ZA
Festuca arundinacea	**Magno**	CREA-ZA	subterranean clover	**Campeda**	CREA-ZA
Festuca arundinacea	**Tanit**	CREA-ZA	subterranean clover	**Limbara**	CREA-ZA
timothy	**Toro**	CREA-ZA	subterranean clover	**Losa**	CREA-ZA

birdsfoot trefoil	**Franco**	CREA-ZA	**subterranean clover**	**Tanca**	CREA-ZA
italian ryegrass and Westervoldico ryegrass	**Crema**	CREA-ZA	**common vetch**	**Mirabella (118/7)**	CREA-ZA
italian ryegrass and Westervoldico ryegrass	**L. 17 Asso**	CREA-ZA	**velvety vetch**	**Orsara**	CREA-ZA
italian ryegrass and Westervoldico ryegrass	**Menichetti**	CREA-ZA			

Services

Collections

Products/ main topics	*Description*	*Person in charge*	*CREA research Centres*
Maremmana cattle breed	CREA-ZA manages a herd of Maremmana cattle of over 100 head in its farm in Monterotondo near Rome. The Maremmana is a native Italian breed of long-horned cattle, extremely resilient to poor, hot environments, where it is used to produce crossbred calves. The breed is at risk of genetic erosion. Interest in this breed is growing due to climate change.	S. Concetti	CREA-ZA
Lipizzan horses	CREA-ZA manages the State Stud Farm of Lipizzan Horses (ASCAL) in Montelibretti, near Rome. The horses fully descend from stallions and mares bred in Lipica (now in Slovenia) before the First World War. The herd has been kept in complete genetic isolation for over 120 years. It consists of 12 stallions from 6 paternal lines, 33 broodmares from 11 female families and foals.	L. Buttazzoni	CREA-ZA
Microorganisms of dairy interest	At CREA-ZA in Lodi, a collection of about 5000 strains and isolates of lactic acid bacteria of dairy origin and industrial interest is present and maintained, including a database with the main taxonomic, physiological, and molecular information. In the collection there are also bacteriophages of thermophilic lactic bacteria and bacterial strains of harmful or pathogenic species, of dairy origin, useful for challenge tests or to study their behavior in the industrial practice.	G. Giraffa	CREA-ZA
Altamurana breed	CREA-ZA manages in the Bella farm a flock of about 120 heads of Altamurana sheep breed. The Altamurana is an autochthonous endangered breed, and only few purebred animals still exist. The breed is also known as "Moscia" (Limp) for its slightly wrinkled and falling wool fleece (mattress wool). The breed is extremely resilient to poor and hot environments where it was reared to produce crossed lambs and some milk (Murgia country land near Bari - Apulia region). There is an increasing interest in this breed due to its resistance to tick's bites and the current climatic changes.	S. Claps	CREA-ZA

Products/main topics	*Description*	*Person in charge*	*CREA research Centres*
Technical and scientific assistance			
prevention of antibiotic resistance	National Antibiotic Resistance Plan Strategy Coordination Group PNCAR SG Research & Innovation. "AMR Research Priority Lines".	P. Del Serrone	CREA-ZA
genetic improvement	Support to the Ministry of Agriculture for the revision of European and national legislation on genetic improvement. Participation in the development of the national certification scheme for the welfare of farmed animals. Formulation of opinions on a variety of subjects of zootechnical interest. Evaluation of poultry genotypes for inclusion in private production specifications.	L. Buttazzoni, G. Catillo, G. Pirlo, R. Steri, M. Guarino Amato	CREA-ZA
organic animal production	Scientific and technical support to the Ministry of Agriculture for the implementation and revision of organic farming regulations.	M. Guarino Amato	CREA-ZA
Scientific technical consultancy service			
pig feeding	Review, update and extension of the "Feeding guidelines for sows and pigs" published online by ANAS.	V. Faeti	CREA-ZA
lactid acid bacteria of industrial interest.	Scientific cooperation for the industrial valorization and exploitation of microorganisms of dairy interest coming from the CREA-ZA collection.	G. Giraffa	CREA-ZA
***L. delbrueckii* strains subsp. *lactis*.**	Scientific collaboration for the identification and characterization of L. delbrueckii strains for the formulation of new starter cultures.	G. Giraffa	CREA-ZA
new coagulants for the dairy industry.	Scientific cooperation to evaluate the industrial performance of new coagulants for mozzarella cheese.	G. Giraffa	CREA-ZA
pig- genetic program of the Italian Large White breed.	Targeted production of breeding males selected within the genetic program of the Italian Large White breed.	V. Faeti	CREA-ZA
organic livestock	Scientific technical support to companies and industries for the development of organic productions.	D. Bochicchio	CREA-ZA
Analyses for third parties			
milk and butter	Determination of fatty acid composition of milk and butter (ISO methods 15884:2002, 15885:2002; Contarini et al., 2013).	M. Povolo	CREA-ZA
butter	Determination of sugar content in lactose free butter (HPAEC-PAD method UNI/TS 11687:2017).	L. Monti	CREA-ZA
milk for infants	Determination of milk whey protein percentage in cow's milk infant formulas (SDS-CE method).	L. Monti	CREA-ZA
cow milk	Determination of milk fat purity (ISO method 17678).	M. Povolo	CREA-ZA
Training for teachers of Agricultural Technical Institutes			
precision livestock farming	Training on precision livestock farming techniques and tools 12 training modules (GIS Technologies, ISOBUS, Sensing, Satellite Monitoring, Data Management).	G. Cabassi	CREA-ZA-IT

Certifications

Products /main topic	*Description*	*Person in charge*	*CREA research Centres*
poultry	**Evaluation of poultry genetic types for outdoor production.**	M.Guarino Amato	CREA-ZA
seed	Official testing for registration of new varieties to the national Register.	L. Borrelli	CREA-ZA
pigs	**Evaluation of pig genetic types for PDO production.**	L.Buttazzoni	CREA-ZA

Other services

Working tables / working groups / institutional partnerships / Centre journals / Editorial Board of Journals

Products/main topics	*Description*	*Person in charge*	*CREA research Centres*
buffaloes	Collaboration with the Italian Embassy in Indonesia and with Indonesia Agency for Agriculture Research and Development (IAARD)-Directorate General of Livestock Services and Animal Health (DGLSAH) for the introduction of buffalo breeding.	V. L. Barile	CREA-ZA
buffaoles	International Buffalo Federation (IBF).Secretariat and Editorial Activities.	V. L. Barile	CREA-ZA

internal areas	National Rural Network-National Strategy for Internal Areas (SNAI).Working group set up within the NRN to support the development of internal areas.	D. Bochicchio	CREA-PBZA
poultry	EU Commission EIP Agri Focus Group .Antibiotic reduction in poultry farming.	M. Guarino Amato	
emissions	Global Research Alliance - Livestock Research Group https://globalresearchalliance.org/The Global Research Alliance on Agricultural Greenhouse Gases brings countries together to find ways to grow more food without growing greenhouse gas emissions. Livestock Research Group is focused on reducing the emissions intensity of livestock production systems and increasing the quantity of carbon stored in soils supporting these systems.	G. Pirlo	CREA-ZA
sustainability of livestock supply chain.	FAO/LEAP Partnership-http://www.fao.org/partnerships/leap/en/The Livestock Environmental Assessment and Performance (LEAP) Partnership is a multi-stakeholder initiative committed to improving the environmental performance of livestock supply chains while ensuring their economic and social viability. It includes three stakeholder groups: the private sector, FAO Member Countries and NGOs	D. Meo Zilio	CREA-ZA
environmental footprint	Technical Advisory Board on Environmental Footprint (TAG on ENV). The Commission's Directorate General for Environment (DG Environment) decided to register an informal expert group with a view to provide advice and expertise to the Commission regarding the Environmental Footprint methods. The Product Environmental Footprint (PEF) and Organization Environmental Footprint (OEF) methods are annexed to the Commission Recommendation on the use of common methods for measuring and communicating the life cycle environmental performance of products and organizations (2013/179/EU).	G. Pirlo	CREA-ZA
milk and dairy products	*Italian Standardization Body (UNI).* Sub Committee UNI/CT 003/SC 09 "Milk and derivatives.	G. Contarini, M. Povolo	CREA-DC ZA
nutrition and animal health	Technical Committee on Nutrition and Animal Health of the Department of Health. Technical and scientific support to the production of legislation in the field of animal nutrition and welfare.	L. Buttazzoni	
population genetics	IGGC (International Goat Genome Consortium) International Partnership Collaboration to the multi-year international research program VarGoats (http://www.goatgenome.org/vargoats.html). Activities within the working groups "Population genetics analyses and population history domestication reconstruction	A. Crisà, R. Steri	CREA-ZA
dairy markets	International Dairy Federation (FIL-IDF). Participation in the Standing Committee on Analytical Methods for Composition (SCAMC).	M. Povolo, L. Monti	CREA-ZA
sustainable livestock production	Animal Task Force http://animaltaskforce.eu/The Animal Task Force is a European Public-Private Partnership of research organizations and farmers and industry organizations, working together on a sustainable and competitive European livestock production sector by fostering knowledge development and innovation in the whole animal production chain.	G. Pirlo	CREA-ZA
dairy, beef and dual purpose cattle breeds, buffaloes, pigs, horses, sheep, goats, rabbits and poultry.	Central Technical Committees of Breeding Organization. Active participation in more than 20 Technical Commissions for the management of genetic programs in dairy, beef and dual purpose cattle breeds, buffaloes, pigs, horses, sheep, goats, rabbits and poultry..	L. Buttazzoni, G. Catillo, G. Pirlo, R. Steri	CREA-ZA
goat genomic characterization	ADAPTMAP international initiative. ADAPTMAP represents an international effort developed to improve coordination among otherwise independent projects for the genotyping, re-sequencing and phenotyping of goat breeds. CREA participates by providing some goat breeds and expertise for the analysis of genomic data.	A. Crisà, R. Steri	CREA-ZA
animal genetic resources	National Focal Point for FAO activities Italian National Focal Point in the "Global Strategy for the Management of Animal Genetic Resources"	L. Buttazzoni	CREA-ZA
forage species	Working group set up by the Ministry of Agricultural, Food and Forestry Policies for the revision of criteria and technical procedures for the variety registration of forage species included in the National Register, and for the definition of criteria and procedures for forage species newly admitted to the National Register of varieties.	A. Giulini, L. Pecetti	CREA-ZA
organic animal production	National technical roundtable.Organic farming (organic livestock section)	M. Guarino Amato	CREA-ZA

2.3 GRAPES and WINE

The research activity on Viticulture and Enology of CREA is focused on "Sustainability". This word implies that any aspect of technical and scientific improvement is driven by the equilibrium among all considered factors. We aim to obtain an optimal balance between the three main factors (i) human input, (ii) respect of the environment and (iii) characteristics of the species of interest, which in our case is grapevine and table grape, along the entire production chain. Our attention is focused on four major macro-areas, i) precision-agriculture in the field; ii) characterization, valorization and improvement of biological resources; iii) sustainable orchard and vinery management; iv) innovation methods for traceability, valorization and characterization of grape and wine.

Grapevine (650.000 ha) and table grape (70.000 ha) represent, probably, the most advanced sector of the Italian agriculture, in terms of value and reputation of the "System Italy"., Viticulture is a highly relevant and driving sector, both in terms of consumption of processed products and environmental reflections. Even during this year 2020, in spite of the pandemic affecting the Italian economy, wine has given similar income as in previous years, if not even increasing percentage of production.

Technical advances and biological knowledge enable for many solutions to reduce human inputs, in particular digital and other applications recently developed in the field of robotics, sensors, devices for decision support (DSS), and related software. A new deal in agriculture, and viticulture may benefit more than other primary sectors, is already in place. Mathematical modelling applied to climate records allows for the development of very efficient models to optimise the management and control of insects and pathogens. Also, irrigation and fertilization, based on distant imaging and proximal and distal sensoring, allow for precise distribution of water and nutrition supply only in case when needed, thus avoiding dispersion and undesired pollution of the environment. In the vinery, our primary objective is to save energy, but we are also working on the reduction of the use of sulfur dioxide, as well as on the development of novel technologies for the stabilization of red wines and sparkling wine refinery. Most of these activities are caried out within Regional Research Programs (RRP) where private companies and farmers are directly involved, leading the projects according to their needs, in promoting technical and research improvements. CREA Research Center for Viticulture and Enology is the reference point for the National Grapevine Varieties Collection of the Ministry of Agriculture, Food and Forestry Policies, where all registered varieties cultivated in Italy are hosted. The collection further comprises Italy's biggest collection of micro-organisms used in enology.

Our natural vocation for the recovery, conservation and valorization of old and new grapevine and table grape varieties and their use in breeding is a crucial aspect of our actvities. The recovery of old autochthonous varieties particularly aims at the valorization of their close link with their original terroir, while breeding research is directed to exploring the still unknown genetic potential in both grapevine and table grape materials. Specifically, we follow several breeding programs in all Regions of the Italian territiry where our Center is present (Veneto and Friuli, Piedmont, Tuscany, Latium and Apulia), and we further cooperate with Universities and other research institutes in Campania, Basilicata, Calabria and Siciliy, in order to collect old varieties and impollinate the best known varieties with pollen of resistant local varieties. Our collections currently comprise more than 20.000 seedlings which are resistant to the main fungal pathogens and are currently under evaluation. Most of our breeding activities also involve private companies and producer consortia, in order to transfer as quickly as possible the research products to the market and valorize them commercially. At the moment, 36 new seedless table grape varieties are in the course of registration. Our Center disposes of two biotechnological laboratories for the introduction and application of new breeding technologies like genome editing and cisgenetic approaches, both for grapevine and table grape. In particular, for table grape we aim to obtain seedless varieties deriving from the most famous Italian varieties like Italia and Regina, while for grapevine we aim to improve Italian varieties (Glera, Sangiovese, Primitivo) for biotic (fungi) and abiotic (water stress) resistance. Once they are obtained, new varieties are assessed for characteristics related to vinification, quality assessment and metabolomic assessment, with the most recent metabolomic

protocols and platforms. In collaboration with Universities and other research Centers, we participate in national and international projects to introduce all these advanced technologies and new varieties. Sustainability in viticulture and enology is pursued by a considerable number of projects focusing on appropriate orchard management: grassing instead of weeding (especially chemical weeding), water usage control, organic and alternative fertilization, canopy growth control, photosynthetic efficiency and disease control. In these last cases, emerging diseases and pests are studied in-depth in order to identify sustainable control management strategies as an alternative to standard chemical controls. Biotechnological approaches (double stranded RNA spreading) and natural biological control (competitive organisms and parasitoids) are examples of alteratives to synthetic chemical compounds. Finally, we focus our attention also on circular economy due to its potentiality in viticulture and enology; in fact, a relevant amount of waste material may become source of new economy, by recovering interesting metabolites for pharmaceutical, cosmesis and nutraceutical goals, as well as energy recovery or saving through composting field or seller residues.

2.3.1 Research and research products - Grapes and Wine

Product/main topics	*Acronym and Research Title*	*Aims*	*Person in charge and CREA Centres*	*Partnership/ Financing Body*	*Scientific Publications*	*Other Research products* [1]
BIOMOLECULES	**NAT4MORE** Natural molecules on the surface of bioactive materials for modulating the host response to implants.	Development of bioactive surfaces used in implantology to guarantee the healing of the tissues adhering to the implant. The surfaces (titanium and glass) are obtained by functionalization through the grafting of natural biomolecules (polyphenols from grape pomace and derivatives of chitin from crustaceans).	A. Bosso, CREA-VE	Innovation Center (Islanda), Genis (SME Islanda), Univeridae de São Paulo (Brasile)/ MUR		1 conference World Biomaterials Congress (WBC) - Glasgow 19-24/V/2020.
DOCG PROSECCO and CARTIZZE/ biodiversity	**BODICA** Study on the landscape and biodiversity of Cartizze.	The project aims to deepen and disseminate knowledge of the landscape and biodiversity elements that distinguish the wine-growing area of DOCG Prosecco and Cartizze in particular.	F. Gaiotti, CREA VE	Consorzio DOCG Prosecco Conegliano Valdobbiadene	1 book "The hidden reachness of Conegliano Valdobbiadene Prosecco Superiore DOCG"	
PLANT PROTECTION	**La Vialla** Sustainable plant protection approaches.	Use of company waste products, with a biostimulating action, to reduce the use of copper against downy mildew.	R. Perria, CREA-VE	Fattoria La Vialla srl		
DIGITALIZATION	**Transfarm 4.0** Innovation in digital viticulture	European project aiming to the proximal and distal control of grapevine growth and vineyard digital management.	D. Tomasi, CREA-VE	**European Commission**		
GRAPEVINE SUPPLY CHAIN	**INNOWINE** Innovation in grapevine supply chain.	Support and accompany the innovation processes of the local wineries through training courses.	A. Bosso, CREA-VE	Fondimpresa		A.Bosso, A.Asproudi, F. Bonello, A. Costantini, M.C. Cravero, M. Guaita, S. Motta, L. Panero, M. Petrozziello, L. Pulcini E C. Tsolakis hanno tenuto lezioni formative (totale 630 ore) presso 5 Aziende vitivinicole piemontesi:. workshop "Progetto INNOWINE I

[1] *prototypes; dissemination activities (conferences, seminars, reports, sites and videos, etc.); training activities (scholarships, research grants and PhD scholarships)*

						solfiti in enologia: caratteristiche ed effetti" (8 ore).
GRAPEVINE SUPPLY CHAIN	**LIFE GREEN GRAPES** New approaches for protection in a modern sustainable viticulture: from nursery to harvesting.	Improve the pest control response of grape varieties and increase of microbial biodiversity throughout the viticultural production chain, from the nursery to the production of wine and table grapes, through the use of decision support systems and resistance-inducing natural products.	P. Storchi, **CREA-VE** CREA-AA CREA-DC	Cyprus University of Technology/ **European Commission**		4 webinar (platform GoTo Webinar (16 e 23 luglio, 23 e 30 ottobre 2020). 3 webinar (https://www.lifegreengrapes.eu/news/) , 2 conferences, 1 training course
GRAPEVINE SUPPLY CHAIN	**INVITENNET**	GO (operative group) PSR Lazio for regional funds.	CREA-VE	Lazio Region		
GRAPEVINE SUPPLY CHAIN	**OENOMED** Mediterranean protected areas: sustinable viticulture and development.	Sustainable development in the wine production chains of the Mediterranean Protected Areas.	P. Cirigliano, CREA-VE	Libano-Tunisia - Francia - Italia/ **European Commission**		
GRAPEVINE SUPPLY CHAIN	Research Agreement ARSIAL/CREA-VE	Institutional collaboration for the regional wine sector.	Direzione CREA-VE	ARSIAL		
FERTILIZATION MANAGEMENT	**FERTESSECO** Evaluation of three ecofriendly products.	Determination of the fertilizer efficiency of three liquid ecofriendly products in addition to the basic fertilization. The crop examined is maize and the test is carrried out in a sandy- loamy soil in the province of Pordenone.	F. Golinelli, CREA VE	ESSECO srl Trecate (NO)		
IRRIGATION MANAGEMENT	**IRRIVISION** Rational management of irrigation based on artificial vision.	Development of an innovative technology based on electronic sensors and an artificial vision system for "precision" irrigation in the vineyard.	F. Gaiotti, CREA VE	Veneto Region	Proceeding XIII International Terroir congress. Gaiotti et al. Terroir valorization strategies in a reformed denomination area the Prosecco case study.	Webinar presentation of results 1° year 23/06/2020.
IRRIGATION MANAGEMENT	**IRRIVIT 6** Rational water supply in table grape cultivation.	Introduction on 9 table grape farms located on Apulia and Sicilyregions an efficient water irrigation management, use of DSS to monitoring grape disesases and introduction of cover crops in vineyard to increase soil biodiversity and soil organic matter.	G. Masi, CREA-VE	CHECK FRUIT Srl		Protocols of irrigation techonology.
IRRIGATION MANAGEMENT	**ECOFISIOVIT** Ecophysiology in organinc table grape	Evaluation of the effects of irrigation management on vine growth, canopy microclimate, through physiological measurements in organic table grapes vines.	L. Tarricone, CREA-VE	Istituto Agronomico Mediterraneo IAM	A method to predict the time of harvesting based on water consumption and changes in berry composition of table grapes (cv. Superior seedless) under plastic sheet covering. L. Tarricone1a, G. Dragonetti2 V. Verrastro: Acta Hortic. (in press).	
INNOVATIVE PACKAGING	**IMPRESA** Metrological Infrastructure for Food Safety.	IMPreSA is a research infrastructure funded by the Piedmont Region and participated by CREA, INRIM, CNR and IZST, created mainly for the development of innovative materials for food packaging that will provide companies in the food and wine sector with scientific skills, analytical instrumentation and metrological support.	M. Petrozziello, CREA-VE	Piemonte Region		

ENOLOGICAL INDUSTRY	**SOVIALE** Chemical characterization of byproducts in enological industry for their use in food chain (integrators) and enology (tannins).	Chemical and oenological characterization of extracts from winemaking by-products (grape pomace, skins and seeds) and comparison with the chemical composition (data from the bibliography) of other by-products from grapes of different cv or from other plant products with interesting nutraceutical and nutritional properties.	A. Bosso, CREA-VE	Cassa di Risparmio di Torino Foundation	Bosso a. et al (2020). Polyphenolic Composition and In Vitro Antioxidant Activity of Red Grape Seeds as Byproducts of Short and Medium-Long Fermentative Macerations. Foods vol 9.	
STARTERS	**SELECO** Research and selection of ecotypic yeasts to obtain starters that for wineries.	Research and selection of ecotypic yeasts to obtain starters that for wineries.	E.Vaudano, CREA- VE	Sinergo Soc. Coop		Report on the results of the trial. Dissemination of results, meetings with farms.
NUTRACEUTICS	Scientific and technological cooperation agreement.	Development of public prevention measures for overweight, obesity and related diseases; identification and production of nutraceuticals with anti-inflammatory and hypocholesterolemic properties.	R. A. Milella, CREA-VE	IRCCS - Istituto Nazionale di Ricovero e Cura a Carattere Scientifico "Saverio de Bellis"	1) Tutino, V et al (2020) Flavonoid and Non-Flavonoid Compounds of Autumn Royal and Egnatia Grape Skin Extracts Affect Membrane PUFA's Profile and Cell Morphology in Human Colon Cancer Cell Lines. Molecules 2020, 25, 3352. 2)Tutino, V. et al (2020) Stearoyl-CoA Desaturase-1 Enzyme Inhibition by Grape Skin Extracts Affects Membrane Fluidity in Human Colon Cancer Cell Lines. Nutrients, 12(3), 693. 3)Gigante, I. et al. (2020). Autumn Royal and Egnatia Grape Extracts differently modulate Cell Proliferation in Human Colorectal Cancer Cells. Endocrine, metabolic & immune disorders drug targets.	
SUSTAINABILITY	**INNOFRUIT** Sustainability and innovation in table grape cultivation.	Promote the recovery of competitiveness and profitability of Apulian table grape producers compared to the main competitors, working organically on the improvement of the product offered and on the efficiency and sustainability of the entire production process**.**	A. R. Caputo, **CREA-VE** CREA-AA	Puglia Region		
SUSTAINABILITY	**NUOVAVITE** Toward a Veneto new model in viticulture.	Looking for a new strategic management of the Veneto' vineyard based on soil sosteinable approach and considering new natural products against grapevine disease.	D. Tomasi CREA-VE	Veneto Region		
SUSTAINABILITY, IMPROVEMENT OF TECNOLOGIES	**INNOVALUPPOLO** Sustinable innovation for hop cultivation.	Introduction of sustainable innovations for the development of the hops supply chain.	K. Carbone **CREA-OFA** CREA-VE- DC - IT - VE- PB	MIPAAF		Internal report on the results.
BY-PRODUCTS	**SNIPS** Natural byproducts from plant matrices for highly funtional food preparatione.	Adoption of eco-sustainable vineyard management protocols aimed at the grapes' healthiness and the increase of secondary metabolites. Adoption of biotechnological protocols for the production of preparations rich in bioactive components from winemaking waste.	R. A. Milella, CREA-VE	Puglia Region		

FRUIT SPECIES GRAPE, CITRUS, OTHER	**PERILBIO** Promotion and strengthening of Long-term experiments (LTEs) in organic farming.	1.Maintenance and enhancement of the organic Long-term experiments (LTEs) of CREA. 2. Consolidation and improve of the relationship network with the organic farmers.3.- Realization of 3 new organic LTEs in poultry, cuniculture and mariculture.4. Drafting of the National plan for research and innovation for organic agriculture.5. Enhancement of research and experimentation activities already carried out with the support of the MiPAAF.	D. Ceccarelli, CREA OFA CREA-PB, CREA-AA, CREA-OF, CREA-ZA.	MIPAAF	1)Ciaccia C., Diacono M., Testani E., Fiore A., Farina R., Montemurro F., Canali S., Mele G., Ceccarelli. D. 2020. Participatory Action Research for the Co-design of a Long-Term Experiment: the Basilicata Case Study. XLIX Convegno Nazionale della Società Italiana di Agronomia, 16-18 settembre. 2) Ciaccia C., Mele G., Testani E., Fiore A., Montemurro F., Diacono M. La Ricerca al servizio del territorio: il caso studio Lucano di ricerca partecipativa. Agrifoglio (sottomesso uscirà quest'anno) 3) Ciaccia C., Diacono M., Canali S., Testani T., Montemurro F., Ferlito F., Roccuzzo G., Campanelli G., Di Pierro M., Mele G., Ranuzzi M., Grasselli O., Ceccarelli D. 2020. Long-term experiments as a tool for governing the transition towards new food systems: an Italian trajectory. Organic World Congress, Rennes 21-27 September, SCI-381.	Technical days (31.8.2020; 1. 2.09.2020) Azienda Sperimentale CREA-AA Campo 7- Metaponto (MT). 3 schoolarships 2 Research grants. Techincal day "La coltivazione del fico in Basilicata: valutazione delle cultivar locali per l'introduzione nel nuovo DSLP Perilbio.
SPARKLING	**SPUMAPULIA** Sparkling process for the relaunch of the viticulture in North-Central areas of Puglia region	Enhance the typical oenological productions of Central-Northern Puglia by effectively implementing sparkling techniques to obtain new sparkling wines and low alcoholic beverages (based on wine / must) representing the typicity of the Apulian territory and seize the opportunities offered by the markets.	M. F. Cardone, CREA-VE	Puglia Region	Velenosi, M.; Crupi, P.;Perniola, R.; Marsico, A.D.; Salerno, A.; Alexandre, H.; Archidiacono, N.; Ventura, M.;Cardone, M.F. Color Stabilization of Apulian RedWines through the Sequential Inoculation of Starmerella bacillaris and Saccharomyces cerevisiae. Molecules 2021, 26, 907. https://doi.org/10.3390/molecules26040907	1° .12. 2020_Presentation Conference
SWEET WINES	**AMARONEBERTA**Confronto tra diverse condizioni di appassimento dell'uva Corvina.	Effects of traditional and modern post-harvest withering conditions on Corvina grapes composition and wine sensory profile.	D. Tomasi CREA-VE	Bertani Domains s.r.l.		
INNOVATION TECHNOLOGIES	**VINTES** Grapewine from Sannio region applied and innovation technologies.	Development of small and medium-sized wine companies of Sannio area, through suitable disease control and treatment reduction.	P. Storchi, CREA-VE	Campania Region		Presentation Conference 05.03.2020 Gaurdia San Framondi (BN).
INNOVATION TECHNOLOGIES	**KATTIVO** Treatments with innovative technologogy of variable rate, reduction of pesticides with low and propontionated to the canopy.	Development of a technological kit that, applied to traditional airblast sprayers used in viticulture, allows the distribution of phytosanitary products in a "variable" manner depending on the volume of the canopy to be treated, thus reducing the release of pollutants into the environment and waste of resources (eg water, fuel)..	P. Storchi, CREA-VE	Toscana Region		Presentation Conference Accademia Georgofili, 12.11.2020.
TREATMENTS/ biostimulants	**AdriUVA 2.0** Treatment efficacy on table grape bunch of biostimolants, effect on browning and cracking at	The project aims to evaluate the effectiveness of the biostimulants PRODEXP6 and DRY-K30 on the containment of plant diseases respectively known as "browning" and "cracking" on	A. D. Marsico, CREA - VE	K-Adriatica spa	(1) FT-NIR Analysis of Intact Table Grape Berries to Understand Consumer Preference Driving Factors. Basile T., Marsico A.D., Cardone M.F., Antonacci D., Perniola R. Foods. 2020 Jan; 9(1): 98. doi.:	

	ripening, storage and shelf-life.	susceptible varieties of table grapes, both at harvest, during cold storage and in shelf-life..			10.3390/foods9010098. (2) NIR Analysis of Intact Grape Berries: Chemical and Physical Properties Prediction Using Multivariate Analysis.	
TABLE GRAPE	**INNOFRUIT** Sustainability and innovation in table grape cultivation	Development of public prevention measures for overweight, obesity and related diseases; identification and production of nutraceuticals with anti-inflammatory and hypocholesterolemic properties.	A. Caputo, **CREA-VE,**CREA-AA	Puglia Region	-	
TABLE GRAPE	**VALNUVAUT** Valorization of New Breed varieties of Puglia.	The aim of the project is to respond to the need for innovation in the Apulian viticulture sector by increasing the range of table grape cultivars that adapt to the pedoclimatic context of the Mediterranean areas.	R. Perniola, CREA-VE	Puglia Region		18.12. 2020_ Presentation Conference
TABLE GRAPE	**NuVaUT** Breeding of table grape in Puglia region.	The aim of the project is to respond to the need for innovation in the Apulian viticulture sector by increasing the range of table grape cultivars that adapt to the pedoclimatic context of the Mediterranean areas.	R. Perniola, CREA-VE	Consorzio Nu.Va.UT		36 new table grape varieties adapted to the territory of southern Italy.
TABLE GRAPE	**BIOFERT-VIT-TWO** Novel composted product efficacy in table grape management..	Evalaution of vine performance of 'Italia' table grape in relation to organic soil amendment vs mineral fertilization and inter-row cover crop.	G. Masi, **CREA-VE** CREA- AA	Tersan Puglia Spa		
VINEYARD	**FD.NEW** Searching for the causes of the new Flavescence dorée epidemics in Veneto region.	Seraching for the causes of the Flavescence dorée epidemics in vineyard by means of: identification of potential new vevctors and wild host reservoirs, molecular characterization of aggressive and mild pathogen strains.	E. Angelini, CREA-VE	Veneto Region	Sylvie Malembic-Maher, Delphine Desqué, Dima Khalil, Pascal Salar, Jean-Luc Danet, Marie- Pierre Dubrana-Ourabah, Sybille Duret, Ibolya Ember, Zoltan Acs, Michelle Della Bartolla, Alberto Matterrazi, Luisa Filippin, Slobodan Krnjajic, Ivo Toševski, Frederike Lang, Barbara Jarausch, Maria Kölber, Jelena Jović, Elisa Angelini, Nathalie Arricau-Bouvery, Michael Maixner, Xavier Foissac 2020. New insights into the emergence of the grapevine Flavescence dorée epidemics in Europe. PloS Pathogen 16(3): e1007967. doi.org/10.1371/journalppat.1007967	1) W. Chitarra, S. Bressan, M. Bottura, E. Angelini, P. Mutton, M. Unich, A. Zanzotto, 2020. Focus sulle fitopatie più dannose nel 2020 nei vigneti di Veneto, Friuli Venezia-Giulia, Trentino e Alto Adige. Atti incontro tecnico "Bilancio fitosanitario viticolo 2020" - online, 27/11/2020.
VINEYARD	**OZOPLUSWINE** Ozonized water for an integrated control strategy in grapevine.	Assessment of the effectiveness if ozonized waterand chitosan treatments in vineyards to control the main fungal diseases of grapevine: downy and powdery mildew and grey muld, by using a new experimental field spraying tool.	E. Angelini, CREA-VE	Veneto Region		
VINEYARD	**BIOTECH–VITECH** Novel biotechnologies for italian agriculture - new breeding technologies for	VITECH aims to use the new biotechnologies for breeding of wine and table vines and rootstocks to increase sustainability and competitiveness of the	R. Velasco, **CREA-VE** Tutti i Centri CREA	MIPAAF	Giudice G†, Moffa L†, Varotto S, Cardone MF, Bergamini C, De Lorenzis G, Velasco R, Nerva L*, Chitarra W*, 2021. Novel and emerging biotechnological crop protection	

	sustainability and competitivity in viticulture.	supply chain. We intend to improve both table and wine elite varieties, as well as rootstocks the characteristics of resistance to biotic and abiotic stress and quality characteristics such as apyrenia for table grapes..			approaches. Plant Biotechnology Journal (in press). doi.org/10.1111/pbi.13605. *Equally contributed as senior authors; †Equally contributed as first authors.	
VINEYARD	**ESCINTERFIRE** Vaccination in viticulture against Esca disease.	The project will introduce sustainable and environmental friendly approches to mitigate the esca grapevine syndrome in order to valorise the Veneto region viticulture and its products. The project follows the objective to achieve a more sustainable agriculture helping the agriculturists and by following the 2030 sustainable development agenda.	L. Nerva, CREA-VE	Veneto Region		
VINEYARD	**OM.VITOSC**	Evaluation of organo-mineral formulation and its application in the Tuscany hill landscape.	P. Cirigliano, CREA VE	Soc. Srl SCAM		Webinar presentation of results 23/06/2020.
VINEYARD	**GESOVIT2** Innovations for the sustainable management of the vineyard and for the definition of the environmental sustainability certification criteria of the wine farm.	Development of an innovative technology based on electronic sensors and an artificial vision system for "precision" irrigation in the vineyard.	F. Gaiotti, CREA VE	Friuli Region	1 Proceeding XIII International Terroir congress. Gaiotti et al. TERROIR VALORIZATION STRATEGIES IN A REFORMED DENOMINATION AREA: THE PROSECCO CASE STUDY.	1 demo days
VINEYARD	**BIOTICES** Cultivar Ceasanese characterization.	Regional biotypes in th eviticulture of Olevano Romano and nearby landscape, particulraly for the Cesanese variety.	CREA-VE	Comune di Olevano Romano (RM)		
VINEYARD	**CREACONVIVO** La gestione sostenibile del vigneto.	Canopy and disease management to reduce the negative impact on environment due to vineyard practices. The project aims to lead the vineyard towards a more sustainable approach.	D. Tomasi CREA-VE	Consorzio Agrario TV-BL, Gruppo VIVO		
VINEYARD	**TECNICASOVESCIO** Greening technologies t improve soil physical features.	Looking for new techiniques of soil grassing using different grass species (leguminous, graminaceous, etc) and varieties and adopting new sowing machineries.	D. Tomasi CREA-VE	Az. Santa Margherita s.p.a.		
WINE	M**ETABARCODING** Metabarcoding- Study of the biodiversity and dynamics of the microbiome capable of producing biogenic amines by Metabarcoding: evaluation of their role as potential allergens.	The research project has the following specific objectives: to know the levels of AB contamination in Langhe, Roero and Monferrato wines; determine the biodiversity of the wine microbiome through Metabarcoding; Identify if there are critical control points during the vinification; Develop a know-how on the "biogenic amines theme" to be a point of reference in the area of wine control; Estimate the prevalence of wine intolerance symptoms in a sample of the adult population.	E.Vaudano, A. Costantini, CREA-VE	Ministry of Health	Cerutti, Crescio Costantini, Acutis, Vaudano, Peletto 2020. Wine intollerance: a pilot study. Italian journal of Food Science Vol. 32 No. 4	

WINE	**CALA.pro.Vin** Valorization of grapewine from Calabria for promotion of wine quality**.**	Recovery of ancient Calabrian wine grape varieties, physical and chemical grape analysis, sanitary status evaluation with special interest on grapevine virus diseases, registration in the National Register of Grapevine varieties. Production of dessert and sparkling wines.	A. Caputo, CREA VE	Calabria Region		
WINE	**GLU-PRO** Study of the effect of the application of enzymes on wine stability and sensory profile.	The aims of the project are: evaluation of the effect of experimental proteases on protein stability in Moscato; evaluation of the effect of glucanases on Chardonnay; evaluation of the sensory profiles of wines obtained from fermentations in which glucanases have been used.	E.Vaudano, A. Costantini, CREA-VE	Oenobrands		Internal report on the results of the trial. Dissemination of results, meetings with tastings and discussion with farms.
WINE	**MO-NUT** Study of the effect of different formulations and dosages of nutrients on alcoholic fermentation, on the aromatic composition and on the sensory profile of wine.	The project has the following aims: identification of the best nutrient formulation for yeasts; evaluation of the impact of nutrients on the aromatic composition of wine; evaluation of the effect of nutrients on the sensory profile of wine.	E. Vaudano, A. Costantini, CREA-VE	Oenobrands		Internal report on the results of the trial. Dissemination of results, meetings with tastings and discussion with farms.
WINE	**PANECO** New product based on plant fatty acids in viticulture.	Evaluation of a mix of esters plant derived for decrement of odors and antispread effect.	M. E.M. D'Arcangelo, CREA-VE CREA-AA	Paneco Ambiente s.r.l./ Fin Piemonte		
WINE	**VINIRES** Innovative wines from vine varieties resistant to the main fungal diseases and agronomic techniques to increase the typicity and sustainability of wine production in the GAL-Prealpi Dolomiti territory.	Development of the methods for agronomic management of vineyards of the resistant varieties Johanniter, Bronner, Souvignier gris and Cabernet Cortis at medium altitudes in foothill environment. Development of winemaking protocols (yeasts and nutrients types, maceration conditions, relaying) most suitable to produce innovative wines and sparkling wines of high quality using these grapes.	R. Flamini, M. Gardiman, CREA-VE	Veneto Region		Poster presentation "VINIRES-Vini innovativi da varietà resistenti alle principali ampelopatie della vite e tecniche agronomiche per incrementare tipicità e sostenibilità delle produzioni vinicole nel territorio del GAL Prealpi Dolomiti" al Webinar L'innovazione al servizio dell'agricoltura: le esperienze dei GO, 23/06/2020; Article " Valle di Seren, il progetto Vinires funziona promosse quattro varietà di vite resistente", Corriere delle Alpi 13 giugno 2020; Articolo " Meno chimica nel vino con i vitigni resistenti vendemmia 2019 positiva", Corriere delle Alpi 27 giugno 2020.02/2020, 1 Tesi di Laurea.
WINE	**MoGU** Study of the effect of different formulations and dosages of nutrients on alcoholic fermentation, on the aromatic composition and on the sensory profile of wine.	The project has the following aims: identification of the best nutrient formulation for yeasts; evaluation of the impact of nutrients on the aromatic composition of wine; evaluation of the effect of nutrients on the sensory profile of wine.	R. Flamini CREA VE Conegliano	**European Commission**		Intervento al convegno: "Vita di malga tra passato, presente e futuro" tenuto nell'ambito della manifestazione "Oltre Le Vette" 2020, Cesiomaggiore (BL) 4/10/2020.

WINE	Evaluation of the anthocyanins composition in wines produced by resistant varieties.	To study the qualitative and quantitative composition of single anthocyanins monoglucosides and diglucosides present in wines produced by some varieties of vines resistant.	R. Flamini CREA-VE	UNIUD		
WINE	**PAM** Chemical and organoleptic characterization of wines from different Italian regions.	The study of the chemical composition and organoleptic characteristics of 40 autochthonous commercial wines from different Italian regions produced in 2020 to be presented on the market finalized to express an overall qualitative evaluation of the products, is performed.	R. Flamini CREA-VE	Gruppo PAM-Panorama S.p.A		
WINE	**STAVIRO** Additive and coadiuvants for red wine stabilization.	Evaluation of the effectiveness of 10 adjuvants and 10 enological additives on the colloidal stability of red wines (analytical checks after treatments and during bottle aging).).	A. Bosso, CREA-VE	Azienda DAL CIN Gildo Spa		
WINE	**EnoPEF** Applied technologies based of pulsed electric fields in enology	Study of the efficacy of Pulsed Electric Fields, applied to fermentation lees, on the extraction of mannoproteins from yeast cell walls during the aging of white wines sur lies. Comparison between different operating conditions and the use of glucanasic enzymes.	A. Bosso, CREA-VE	JU.CLA.S. - s.r.l.		
WINE	**QUALSHELL** Implementation of processes for quality estimation of grape and process control.	Implementation of the project idea regarding the development of a rapid procedure for controlling the ripeness of red grapes, with DISAFA and INRIM, and implementation of a system for the control of MLF and the oxidative evolution of red wines.	A. Bosso, CREA-VE	Piemonte Region		Kick-off (9/12 /2020).
WINE	**Vermouth** Study of innovative alternatives to the flavoring and sweetening of special wines and of Vermouth di Torino for the improvement of their quality.	The project aims to limit the use of sugars by replacing them with natural sweeteners, such as Stevia, preserving the quality characteristics of the wines.	F.Bonello, CREA- VE	Cassa di Risparmio di Torino Fonudation		Presentation of experimental wines at the last edition of Vinitaly.
WINE	**SESAMO** Study of the oenological, historical, environmental and viticultural peculiarities of the "Aleramico" Monferrato for the enhancement of barrel aged Grignolino wine.	Research on traditional Grignolino wine aged in wood, through the study of its aromatic and polyphenolic composition, key information to improve their shelf-life and promotion.	M. Petrozziello, CREA- VE	Cassa di Risparmio di Torino Fonudation		
WINE	**AROSE** Aromatic and sensorial characterization of Verduno Pelaverga wine	Analysis of the aromatic profile of Pelaverga wines both from a compositional and sensorial point of view, also using recently acquired olfactometric techniques.	M. Petrozziello, CREA VE	Cassa di Risparmio di Cuneo Fonudation	Petrozziello M. et al (2020) Volatile composition and olfactory profile of Verduno Pelaverga wine. Poster presentato al congresso Oeno-IVAS, In Vino Analytica Scientia Symposium (Bordeaux).	

WINE	**PERLAGE** Fermentation of berries from grapevine resistant varieties.	Study and development of an innovative fermentation protocol for the vinification of grapes from disease-resistant varieties.	T. Nardi, CREA-VE	Perlage Srl		
GRAPEVINE	**TROPICSAFE** Insect-borne prokaryote-associated diseases in tropical and subtropical perennial crops.	Identify sustainable management strategies for the control of serious diseases of grapevine, citrus and palm crops in the tropical and subtropical areas, by means of disease and vector survey, field control trials and genetic resistance.	E. Angelini, **CREA- VE** CREA-PB	19 partners esteri/ **European Commission**	1)N Bertazzon, et al 2020. Le risposte di difesa di due varietà diversamente sensibili alla Flavescenza dorata della vite: studi recenti e prospettive. Atti Giornate Fitopatologiche, 2, 437-446; 2) Casarin S.,et al 2020. A grapevine genetic linkage map to find out quantitative trait loci responsible for lower susceptibility to flavescence dorèe. Proceedings of the SIGA-SEI-SIBV-SIPAV Web Workshop "Young Scientists for Plant Health", 16/12/2020, ISBN 978-88-944843-1-1, Poster Communication Abstract – PH.21	
GRAPEVINE	**DIVINE** Control of grapevine infectious disease and nematodes.	Identify and try integrated strategies against infectious degeneration of grapevine and nematodes by means of natural compounds and biological control agents in highly vocated grapegrowing areas, with valutation of the economic balance of the adopted solutions and training directed to grapegrowers o the Veneto region.	E. Angelini, CREA- VE	Veneto Region	1)Vally Forte, Nadia Bertazzon, Michela Panzeri, Luisa Filippin, Manuel Gallo, Lorena Dalla Cia, Elisa Angelini, 2020. Diffusione della virosi della degenerazione infettiva in aree ad alta vocazione viticola del Veneto. Atti Giornate Fitopatologiche, 2, 453-458; 2) G. D'errico, F. Vinale, R. Marra, S. L Woo, E. Angelini, S. Di Giorgi, F. P. D'errico, M. Lorito, 2020. Nematofauna presente nei vigneti veneti. Atti Giornate Fitopatologiche, 1, 303-310.	1 training course for winegrowers.
GRAPEVINE	**ESCA ZEOFIX** Esca disease management	Verify the effect of curative treatments on vines with symptomatology of Esca disease.	P. Storchi, CREA-VE	I.S.L.A. srl		
GRAPEVINE	**MIDIFENDO** Competitive microorganisms against flavenscence doree.	Find a preventive defense method against Flavescence dorée, a disease causing significant damage in viticulture, especially in organic wine-growing farms.	V. Forte, CREA VE	Veneto Region	Bertazzon N., Forte V., Filippin L., Casarin S., Angelini E., 2020. Le risposte di difesa di due varietà diversamente sensibili alla Flavescenza dorata della vite: studi recenti e prospettive. Atti Giorbnate Fitopatologiche.	Flavescenza dorata. Conegliano Valdobbiadene, magazine, luglio 2019, pp70-71 / MI.DI.FEN.DO. Uso di MIcrorganismi nella DIfesa della vite contro la FlavEsceNza DOrata: cooperazione per migliorare la competitività e la sostenibilità delle aziende biologiche. RRNN 2020
GRAPEVINE	**BIOPROTEC**. grapvine as product model for fruit conservation aginst microrganisms.	The project aims to identify and isolate natural antgonists and new technologies to contain the botritis during post harvest.	T.Nardi e W. Chitarra, CREA-VE	Cariverona Foundation		
GRAPEVINE	**VITE 4.0** plant protection innovation for a sustainable viticulture.	The project will implement integrated pest management strategies by using combined approaches such as agronomic, metabolic, genetic and molecular analyses. Conventional and alternative pesticides, together with beneficial microbes will be used against the main biotic stresses in grapevine. At the end, the influce on	W. Chitarra, CREA-VE	Cassa di Risparmio di Cuneo Foundation	Bertazzon, N., Chitarra, W., Angelini, E., & Nerva, L. (2020). Two new putative plant viruses from wood metagenomics analysis of an esca diseased vineyard. Plants, 9(7), 835.	

		product quality and quantity of the selected strategies will be investigated.				
GRAPEVINE	**DIBIO-BIOPRIME** Natural compounds and microragnisms for plant protection in Mediterranean organic farming.	The project aim to reduce or substitute the use of pesticides in cereals culture, horticulture, viticulture and seed tanning. The innovation brought by project is the use of natural compounds, such as essential oils and natural molecules, already well characterized for their pharmacological activity and for which already exists a large scale production with low costs. The selected molecules will be used to induce the priming state in the selected colture	V. Terzi, **CREA-GB** CREA-VE CREA-ZA CREA-AA	MIPAAF	Orsoni, N. et al . (2020). Double Gamers—Can Modified Natural Regulators of Higher Plants Act as Antagonists against Phytopathogens? The Case of Jasmonic Acid Derivatives. International journal of molecular sciences, 21(22), 8681. Nerva L., et al (2020) Double-stranded RNAs (dsRNAs) against grey mold (Botrytis cinerea): a promising sustainable tool for grapevine protection. Biomolecules Nerva, L., et al (2020). Isolation, molecular characterization and virome analysis of culturable wood fungal endophytes in esca symptomatic and asymptomatic grapevine plants. Environmental microbiology. Balestrini, R. et al (2020). Photosynthetic Traits and Nitrogen Uptake in Crops: Which Is the Role of Arbuscular Mycorrhizal Fungi?. Plants, 9(9), 1105. Bertazzon, N., Chitarra, W., Angelini, E., & Nerva, L. (2020). Two new putative plant viruses from wood metagenomics analysis of an esca diseased vineyard. Plants, 9(7), 835.	
GRAPEVINE	**PVsensing** Innovation sensor for prevention of peronospora infections in vineyeard.	Demostration project and validation in the field of an innovative management of the pathogen control in particular regarding Plasmopara viticola, optimixzation of the treatments with low dosage and less waste of product.	A. Zanzotto, CREA-VE	AVEPA- Veneto Region		Publications, events, webinars Website: https://www.rovitisveneto.it/
GRAPEVINE	**ROVITIS 4.0** Autonomous robot for efficient and sustainabke management of vineyards.	Development and use of 2 robot prototypes able to execute in full autonomy operations in the vineyard, particularly pathogen control tratment.	A. Zanzotto, **CREA-VE** CREA.IT	University of Maribor (Slovenia)/AVEPA-Veneto REgion		Publications, events, webinars. Website: https://pvsensing.it/ 2 prototypes
GRAPEVINE	**CUPROSUP** Alternative strategies to copper in viticulture to cope with climate change.	The main goal of the project is to identify canopy management techniques, alternative formulations or in association / alternation with copper, use of weather stations with predictive model of downy mildew infections of the vine, with the ultimate aim of reducing the use of copper in viticulture.	V.Terzi**, CREA-GB** CREA-VE CREA.CI	MIPAAF	Hunter et al., 2020 Grapevine physiological response to row orientation-induced spatial radiation and microclimate changes. OENO One,54, (2), 411-433.	
GRAPEVINE	**OLTRE.BIO** Over BIO management innovation in organic cherries and table grape cultivation-	Transfer of innovations in agronomic techniques in organic farming and optimization of organic table grape post-harvest..	L. Tarricone, CREA-VE CREA-AA	Puglia Region		

GRAPEVINE	**GS-UVA DA TAVOLA** Azioni di studio e divulgazione finalizzate alla riduzione e ottimizzazione dell'uso di pesticidi in coltivazioni di uva da tavola, e all'individuazione di buone pratiche agronomiche al fine di preservare l'ambiente e le api.	Definition of new specific phytosanitary and agronomic guidelines, to be adopted in the supply chain of table grapes , currently marketed under the brand Carrefour Quality Chain; with the aim of eliminating and/or limiting the use of active substances harmful to wild pollinators and bees. .	S. Landi, **CREA-DC** CREA-AA CREA-VE CREA-OFA	GS S.p.A.		Presentation "Disciplinari di produzione Filiera Qualità -Carrefour Uva da Tavola".
GRAPEVINE	**NEM-PYT 1** Valutazione del formulato Nemaguard SC in viticoltura da tavola.	Evaluation of the effect of commercial and concentrated suspension of an garlic extract on budbreak of grapevines.	L. Tarricone, CREA-VE	CBC (Europe) Srl		
GRAPEVINE	**MAT ILSA C ON** Valutare l'efficienza antiperonosporica e l'anticipo della maturazione dell'uva di un prodotto idrolizzato enzimatico di fabacee.	Evaluation of the efficiency of the fertilizer product ILSA C-on (ex AA380) in the vineyard, though the study of the ripening curve.Evaluation of the ability to decrease the use of the copper for the control of downy mildew, in line with the new needs of sustainable agriculture.	F. Golinelli, CREA VE	ILSA Spa Arzignano (VI)		
GRAPEVINE	**VIVIUMBRIA** Recupero e valorizzazione del germoplasma viticolo dell'Alto Orvietano - Città della Pieve.	Characterization and enhancement of the autochthonous germplasm of Umbria and of the wines obtained.	P.Storchi, CREA-VE	Umbria Region		Iscrizione di un vitigno al registro nazionale delle varietà di vite.
GRAPEVINE	**VIRES.BANFI** Valutazione qualitativa di vititgni di nuova introduzione nel comprensorio di Montalcino.	Study of phytosanitary management methods with a view to improving environmental sustainability.	P.Storchi, CREA-VE	Azienda Banfi srl società agricola		Prove di degustazione dei vini e analisi sensoriale con panel addestrato.
GRAPEVINE	**SEL.ARGIANO** Progetto di selezione clonale della vite.	Clonal selection of cv Sangiovese for the production of Brunello di Montalcino wine.	P.Storchi, CREA-VE	Azienda Tenuta di Argiano spa società agricola		

GRAPEVINE	**ERSA_SNP** Ricostruzione del pedigree dei vitigni del Friuli Venezia Giulia con l'analisi del DNA.	Pedegree analysis of old varieties of Friuli-Venezia Giulia	M. Crespan, CREA-VE	Germania e Slovenia/ERSA	1) Crespan M., Migliaro D., Larger S., Pindo M., Petrussi C., Stocco M., Rusjan D., Sivilotti P., Velasco R., Maul E. (2020) Unraveling the genetic origin of 'Glera', 'Ribolla gialla' and other autochthonous grapevine varieties from Friuli Venezia Giulia (northeastern Italy). Scientific Reports, 10:7206, https://doi.org/10.1038/s41598-020-64061-w 2) Crespan M. (2020) post sul blog Science and Wine, https://www.ciencia-e-vinho.com/2020/06/14/about-the-origin-of-glera-ribolla-gialla-and-others-grapevine-varieties-grown-in-friuli-venezia-giulia-north-east-italy/ 3). Crespan M. (2020) Vi spiego le origini di Glera, Ribolla gialla e altre varietà del Friuli Venezia Giulia. Pubblicato in L'intervento il 14 luglio 2020. https://www.cronachedigusto.it 4) Crespan M. (2020). Alla ricerca delle origini di Glera e Ribolla gialla. Indagine sul genoma delle varietà viticole. L'Informatore Agrario, Inserto Vite & Vino, 5: 46-48. 5). Crespan M. (2020). Alla scoperta dell'origine genetica del Glera, della Ribolla gialla e altre varietà autoctone del Friuli-Venezia Giulia. L'Enologo, 9: 47-48	
GRAPEVINE	**Virosi vite**	Evaluation of GPGV presence into Algerian grapevine.	M. Crespan ed E. Angelini, CREA-VE	Algeria/ autofinanziamento	Bertazzon N., Rahali M., Angelini E., Crespan M., Migliaro D. (2020) First report of Grapevine Pinot gris virus (GPGV) infecting grapevine in Algeria. Plant Disease Notes, DOI: 10.1094/PDIS-04-20-0723-PDN	
GRAPEVINE	**GLERES** Breeding of Glera to main fungal diseases	The project aims to obtain new progeny of Glera variety for the production of Prosecco vine, new varieties resistant to the main patogen of grapevine and promote new sustainable practice to decrease pesticides in viticulture.	D. Migliaro, CREA-VE	Confagricoltura Treviso		
GRAPEVINE	**RGV-FAO**	Conservation, characterization, use and evaluation of new genetic resources for feed and food. specifically this unit is devoted to the conservation of the 5.000 accession of grapevine into the CREA collection.	I. Verde, C**REA-OFA** CREA-VE -AA - CI -DC - FL -GB -IT -OF -OFA – ZA	MIPAAF		
GRAPEVINE	**BIONET 2017-2022** Rete regionale per la biodiversità agraria – Conservazione della biodiversità di interesse agrario del Veneto.	Conservation of old italian varieties from Veneto in Conegliano collection.	M. Gardiman, CREA-VE	Veneto Region		.

GRAPEVINE-WINE	**POFACS** Storage capability, quality and secutity in horticulture.	To make available new knowledge, new products and innovative processes aimed at improving shelf life, quality, safety and sustainability. To reach this goal, we intend to perform activities, which aims at the integrated introduction of innovations in the various sensitive phases of the supply chain (choice of genotypes, cultivation and defense techniques, technologies to be used in processing and conservation, marketing)	T. Cardi, **CREA-OF** CREA-VE CREA-OF CREA-GB CREA-OFA	MUR		
GRAPEVINE-WINE	**BIOFOSF-WINE** Tools for solving fosfites residues problem in organic grapevine.	Identificazione delle cause di contaminazione da acido fosfonico (fosfito) ed etil-fosfonico in uve e vini biologici e studio della dinamica del fosfito suolo-pianta.	A. Trinchera, CREA-AA	MIPAAF	1)Trinchera A., Parisi N., Baratella V. Roccuzzo G., Soave I, Bazzocchi C. Fichera D., Finotti M. Riva F., Mocciaro G., Brigliadori M., Lazzeri L. (2020). Assessing the Origin of Phosphonic Acid Residues in Organic Vegetable and Fruit Crops: The Biofosf Project Multi-Actor Approach", Agronomy 2020, 10(3), 421. 2) Trinchera A., Bazzocchi C., Fichera D. (2020). Fosfito, il fantasma del biologico. Terra e Vita 3: 64-66 Trinchera A. "Il progetto BIOFOSF-WINE: individuazione delle cause di contaminazione da fosfiti nei vini biologici".	International Workshop: "Why phosphonic acid residues in organic wine? The Italian BIOFOSF-WINE project", BIOFACH 2020, Norimberga 15 feb 2020. Webinar: "LMR fosfiti nel vino biologico: i passi avanti del nuovo decreto", Webinar (Unione Italiana vini e Federbio), 3 ago 2020. Trinchera A. "Il progetto BIOFOSF-WINE: attività e contributo al nuovo decreto sugli LMR nei prodotti biologici", webinar ad invito FEM, 10 ago 2020.
VINEYARD	**PROSIT** Digital platform for soil management in the vineyard.	Development of an online digital platform for soil management in the vineyard.	P. Storchi,**CREA.-VE**, CREA-AA	Toscana REgion	D'Avino L., 2020. Perché l'agricoltura potrebbe salvarci dai cambiamenti climatici, Ecquologia visibile al sito https://ecquologia.com/category/ efficienza/chimica-verde/ (accertato il 10/11/2020).	Webinar 26 11 2020 "La mappatura digitale dei suoli toscani" di L. D'Avino (https://www.goprosit.it/wp-content/uploads/2020/12/Lorenzo_DAvino.pdf
VITICULTURE	**VIT-VIVE** Innovation models for development, testing and application of sustainable protocols in Veneto viticulture.	Novel strategies in plant protection, rduction of pesticides, soil and water management, weed and pest within a sustainable farm economy.	R. Velasco, CREA-VE	Veneto Region		
VITICULTURE	**GECOSA** Conservative strategies for Sardinia viticulture.	Analysis of a new model to manage the Sardinian vineyards considering some issues linked with soil conservation, vine nutrition, grape quality and wine quality profile.	D. Tomasi CREA-VE	Agenzia Laore Sardegna		
PRECISION VITICULTURE	**CAMPI CONNESSI** Precision agriculture and connectivity.	Identify the interactivity needs of digital systems by putting the farmers in a position to know in detail problems of interconnectivity and to choose and know how to direct the technology offer in the direction of the ever greater compatibility of the multiple technological components of the crop production system.	R. Perria, CREA-VE	Toscana Region		
PRECISION	**SUVISA** Digital viticulture.	Implementation of decision support systems at different spatial scales, for the management of soils and plants, evaluation	P. Storchi, CREA-VE CREA-AA	MIPAAF	Storchi P., Velasco R. (2020). *Viticoltura digitale per il miglioramento della sostenibilità delle produzioni.* RRN Magazine, 9: 37.	

		of monitoring systems of production and of the main adversities of the vine.				
VITICULTURE	**LIFE WINEgRover**	Precision viticulture and its impact on the environment, human health and air quality to the standard management	P.Cirigliano, CREA VE	Spagna e Portogallo/**European Commission**		
PRECISION	**PuVIoT** Puglia vitivinicola dell'Internet of Things.	Introduction in different wine grape area of Apulia region of precision viticulture.	G. Masi, CREA-VE	Regione Puglia		
REGENERATIVE VITICULTURE	**REVINE** Regenerative agricultural approaches to improve ecosystem services in Mediterranean vineyards.	Apply regenerative agriculture techniques in viticulture in different Mediterranean areas in combination with the introduction of new resistant genotypes in order to preserve the water resource and soil fertility, control soil erosion and create chemical-physical conditions suitable to favor the presence of beneficial soil microorganisms and favor a better adaptation of viticultural crops in response to climate change.	R.Perniola, CREA-VE	Istituzioni internazionali Privati e Commissione europea1		
GRAPEVINE VARIETIES	**Ri.Vi.Parco** Discovery and valorization of germplasm in the Cilento National Parc.	Protection and promotion of viticultural biodiversity of Campania with the ambition of helping to qualify the production and improve the competitiveness of wine sector, proceeding to the technical and legal recognition of the new plant variety.	A. R. Caputo e F. Cecchini, CREA-VE	Ente Parco Nazionale del Cilento, Vallo di Diano e Alburni		Technical and scientific files of new plant varieties (wine grape varieties).
GRAPEVINE VARIETIES	**Ri.Vi.Parco2-** Discovery and valorization of germplasm in the Cilento National Parc 2.	Repetition of the vinifications, already started in the previous Ri.Vi.Parco agreement, in distinct vintages, so as to asses the seasonal variable and allow a more balanced and significant evaluation of the varietal characteristics.	A.R. Caputo, M.Morassut, CREA-VE	Ente Parco Nazionale del Cilento, Vallo di Diano e Alburni		
GRAPEVINE VARIETIES	**RIV.AL.VIT** Monitoring and valorization of intravarietal variability within Uva di Troia	To select biotypes with the highest possible level of phenotypic stability of weak type, in order to spread material certainly more healthy and representative of the variability of the vine population under investigation	A. Caputo, CREA VE	Azienda Vinicola Rivera S.p.A.		
GRAPEVINE VARIETIES	**RESVIT** Cecking resistant varieties adaptation to different environments.	To set up a new disease resistant grapevine varieties collection (60 genotypes) in order to examine resistence to diseases and to define the wines quality and plant productivity.	D. Tomasi CREA-VE	Società Cattolica Agricola a r.l.		

1 Cyprus University of Technology (CUT)Vasiliko Oinopoieio Kyperoundas Ltd (VOK) Vlassides Winery Ltd (VW) Associação para a Investigação e Desenvolvimento de Ciências (FCiências.ID): Biosystems and Integrative Sciences Institute (BioISI) and Marine and Environmental Sciences Centre (MARE) Instituto Nacional de Investigação Agrária e Veterinária, I.P. (INIAV) AVIPE - Associação de viticultores do concelho de palmella (AVIPE) Agricultural University of Athens (AUA) Tyrnavos Coop Winery & Distillery (ACT) Agricultural Research Center (ARC) Regional Centre of Agriculture Research of Sidi Bouzid CRRA) Burgundy School of Business (BSB)/MUR- **European Commission**

GRAPEVINE VARIETIES	**PRIM.VITI.VAAZ** Monitoring and valorization of intravarietal variability within Primitivo clones in the farm TERRE DEI VAAZ.	Characterization of "Primitivo Storico" accessions present within the Estate Terre dei Vaaz," located in a typical area of wine grape cultivation (Sammichele of Bari and area of the DOC Gioia del Colle), in order to identify a typical clone/variety of Primitivo "Storico". Study of a modified bush training system and individuate the best rootstock grafting combination of Primitivo variety.	G. Masi, CREA-VE	TERRE DEI VAAZ Società Agricola Semplice	Masi, G.,Ivone, W.,Verrastro, V. (2020). "Il lungo viaggio del vitigno Primitivo". Volume: Dalle Murge allo Jonio-Territori e risorse di Puglia. DIELLE Comunicazione ISBN 978-88-9004903-3 pp.(240-242	
NURSERING	**VITISBIO** Developement of sustainable and organic strategies in nurseries and vineyarda.	Control of grapevine pathogens during the different steps of multiplication, propagation and commercializatin of grapevine in organic management: esca and other trunk diseases, grapevine yellows associated to phytoplasmas, virus diseases, with particular concern to massal selection.	E. Angelini, CREA- VE	Regione Friuli	Nadia Bertazzon, Vally Forte, Elisa Angelini, 2020. Fast transmission of grapevine Pinot gris virus (GPGV) in vineyard. Vitis, 59: 29-34. 2)Battiston E., Angelini E., Divittini A.V., 2020. Viti centenarie per salvare la biodiversità viticola. L'Informatore agrario, 31, 44-45.	
NURSERING AND INNOVATION	**INNOCORE** Nursering innovation and traceability in Piedmont.	CREA-VE reaserchers work on the biochemical and ecophysiological charcterization among different rootstock/scion genotype interactions in hazelnut. The objective is to define the main ecophysiological feature and resposes to drought.	W. Chitarra, CREA-VE	Cassa di Risparmio di Cuneo Foundation		

2.3.2 Patents and Services

Patents

INDUSTRIAL PATENTS

Denomination/ Description	*Authors/Inventors*	*CREA research Centres*
Non-invasive method to measure the water content of a leaf (IT + EPO *[FR + DE]*) *Co-titolarità: CNR + Università Pisa (IT) Co-titolarità: Università Pisa (EPO)*	P.Storchi M.Pagano	CREA-VE
Ochratoxin A degradation to alpha ochratoxin (ES + USA + EPO *[FR + DE + IT + RO]*)	E. Garcia Moruno F. Doria A. Costantini	CREA-VE
Nucleotide and amino acid sequences of phytoplasmas responsible for golden flavescence (IT + EPO *[FR + DE + CH]*)	E. Angelini L. Filippin	CREA-VE
Procedure for malolactic fermentation with strains of Pediococcus d.(ES)	E. Garcia Moruno A. Costantini F. Bonello M. C. Cravero	CREA-VE

PLANT VARIETY RIGHT

Denomination/ Description	*Authors*	*Denomination/ Description*	*Authors*	*Denomination/ Description*	*Authors*	*Denomination/ Description*	*Authors*	*Denomination/ Description*	*Authors*
Aika	D.Antonacci	**Daunia**	D.Antonacci	**Joha**	C.Bergamini	**Medunio**	D.Antonacci C.Bergamini M.F. Cardone L. R. Forleo A. D. Marsico	**Sturni**	D.Antonacci
Apenestae	D.Antonacci	**Dertum**	D.Antonacci	**Juventaium**	D.Antonacci			**Tarentum**	D.Antonacci
Appia	D.Antonacci	**Egnatia**	D.Antonacci	**Leuka**	R.Perniola M.F.Cardone D.Antonacci			**Triviani**	A. D.Marsico L. R.Forleo C.Bergamini
Azetium	D.Antonacci	**Gall ianum**	D.Antonacci C.Bergamini						
Barese	D.Antonacci								

Barium	D.Antonacci		M.F.Cardone L.R.Forleo A. D.Marsico R.Perniola R.Velasco		R.Velasco L.R .Forleo A. D Marsico C.Bergamini		R.Perniola R. Velasco		D.Antonacci R. Perniola M.F. Cardone
Barolum	D.Antonacci					**Mesania**	D.Antonacci		
Brundisium	D.Antonacci					**Murex**	A. D.Marsico L. R.Forleo C.Bergamini D.Antonacci R.Perniola M.F. Cardone	**Turese**	D.Antonacci
Butuntum	D.Antonacci			**Locreuse**	D.Antonacci A. D.Marsico L. R.Forleo R.Perniola M. F.Cardone C.Bergamini			**Ursi**	C.Bergamini D.Antonacci R.Perniola A.D.Marsico M.F. Cardone L.R. Forleo.
Canusium	D.Antonacci					**Netium**	D.Antonacci		
Celiae	D.Antonacci	**Genusia**	D.Antonacci			**Norba**	D.Antonacci		
Cerina	D.Antonacci C.Bergamini M.F.Cardone L.R. Forleo A. D.Marsico R.Perniola R.Velasco	**Itria**	R.Perniola						
		Japigia	D.Antonacci M.F.Cardone D.Antonacci L.R.Forleo A.D.Marsico C. Bergamini	**Lupiae**	D.Antonacci	**Peucetia**	D.Antonacci	**Vaaz**	C.Bergamini
				Maula	D.Antonacci	**Pugliese**	D.Antonacci	**Vigilarum**	D.Antonacci
						Siris	D.Antonacci		

CREA VARIETIES INCLUDED IN THE ITALIAN OFFICIAL LISTS

Clone denomination /Reference varieties	Clone denomination /Reference varieties	Clone denomination /Reference varieties	Clone denomination /Reference varieties	Clone denomination /Reference varieties	Clone denomination /Reference varieties	Clone denomination /Reference varieties	Clone denomination /Reference varieties
I - ISV CONEGLIANO 1	I - ISV SAVARDO 7 *CABERNET FRANC N.*	I - ARSIAL-CRA 228_*CESANESE D AFFILE N.*	I - ISV-CV 69 *GARGANEGA B.*	I - ISV-F-V6 *MERLOT N.*	I - ISV-F1 TOPPANI *PINOT GRIGIO G.*	I - ISV - VCR 6 *S.O.4*	I - ISV-F 6 *TOCAI FRIULANO B.*
I - ISV CONEGLIANO 1 *106-8*	I - ISV SAVARDO 8 *CABERNET FRANC N.*	I - ARSIAL-CRA 232_*CESANESE D AFFILE N.*	I - ISV-CV 84 *GARGANEGA B.*	I - ISV-F-V5 *MERLOT N.*	I - CRAVIT ERSA FVG 152 *PINOT GRIGIO G.*	I - 2 ISV - ICA PG *SAGRANTINO N.*	I - ISV-F 8 *TOCAI FRIULANO B.*
I - ISV CONEGLIANO 1 *110 RICHTER*	I - ISV 101 *CABERNET FRANC N.*	I - ISV CONEGLIANO 1_CHARDONNAY B.	I - ISV-CV 24 *GARGANEGA B.*	I - ISV sn - V 11 *MERLOT N.*	I - ISV 15 *PINOT NERO N.*	I - 9 ISV *SANGIOVESE N.*	I - CRAVIT-ERSA FVG 202 *TOCAI FRIULANO B.*
I - ISV CONEGLIANO 1 *1103 PAULSEN*	I - CRAVIT-ERSA FVG 300 *CABERNET FRANC N.*	I - ISV 4 CHARDONNAY B.	I - ISV - CV 11 *GARGANEGA B.*	I - ISV sn - V 12 *MERLOT N.*	I - 2007 ISV-C VI VA 2 "Canaja" *PINOT NERO N.*	I - ISV RC 1 *SANGIOVESE N.*	I - CRAVIT-ERSA FVG 203 TOCAI FRIULANO B.
I - ISV CONEGLIANO 1 *140 RUGGERI*	I - CRAVIT-ERSA FVG 301_*CABERNET FRANC N.*	I - ISV 5 *CHARDONNAY B.*	I - ISV - CV 18 *GARGANEGA B.*	I - ISV sn - V 14 *MERLOT N.*	I - CRAVIT - ERSA FVG 700 *PRIMITIVO N.*	I - ISV 2 *SANGIOVESE N.*	I - ISV - C VI 2 *TOCAI ROSSO N.*
I - ISV CONEGLIANO 1 *1447 PAULSEN*	I - CRAVIT-ERSA FVG 302 *CABERNET FRANC N.*	I - CRAVIT - ERSA FVG 100_*CHARDONNAY B.*	I - ISV sn 29 Angelini *GARGANEGA B.*	I - CRAVIT ERSA FVG 355 *MERLOT N.*	I - CRAVIT G 4 *PRIMITIVO N.*	I - CRA VIC BC SF6 *SANGIOVESE N.*	I - ISV - C VI 3 *TOCAI ROSSO N.*
I - ISV CONEGLIANO *161.49 C.*	I - ISV-F-V5 *CABERNET SAUVIGNON N.*	I - CRAVIT - ERSA FVG 101_*CHARDONNAY B.*	I - ISV-ESAV 10 *GLERA B.*	I - CRAVIT ERSA FVG 356_*MERLOT N.*	I - CRAVIT 1 V *PRIMITIVO N.*	I - CRA-BR 1141 *SANGIOVESE N.*	I - ISV - C VI 17 *TOCAI ROSSO N.*
I - ISV CONEGLIANO 2 *161.49 C.*	I - ISV-F-V6 *CABERNET SAUVIGNON N.*	I - CRAVIT - ERSA FVG 102 *CHARDONNAY B.*	I - ISV-ESAV 14 *GLERA B.*	I - CRAVIT ERSA FVG 357 *MERLOT N.*	I - ISV-V2 *RABOSO PIAVE N.*	I -CRA-BR 1872 *SANGIOVESE N.*	I - CRAVIT - ERSA FVG 210 *TRAMINER AROMATICO Rs.*
I - ISV CONEGLIANO 1 *17-37*	I - ISV 2 *CABERNET SAUVIGNON N.*	I - CRAVIT - ERSA FVG 103 *CHARDONNAY B.*	I - ISV-ESAV 19 *GLERA B.*	I - ISV-CV 87 *MOLINARA N.*	I - ISV-V1 *RABOSO VERONESE N.*	I - ISV CONEGLIANO 1 *SAUVIGNON B.*	I - CRAVIT - ERSA FVG 212 *TRAMINER AROMATICO Rs.*
I - ISV CONEGLIANO 1 *225 RUGGERI*	I - ISV 105 *CABERNET SAUVIGNON N.*	I - CRAVIT - ERSA FVG 104 *CHARDONNAY B.*	I - 2007 ISV-VA 4 (Serprina) *GLERA B.*	I - ISV-CV 100 *MOLINARA N.*	I - ISV-V2 *ABOSO VERONESE N.*	I - ISV-F 2 *SAUVIGNON B.*	I - 1 ISV - ICA PG *TREBBIANO SPOLETINO B.*
I - ISV CONEGLIANO 1 *3309 C.*	I - ISV 117 *CABERNET SAUVIGNON N.*	I - CRAVIT - ERSA FVG 105 *CHARDONNAY B.*	I - 2007 ISV-VA 6 *GLERA B.*	I - ISV-CV 3 *MOLINARA N.*	I - ISV-F1 *REFOSCO DAL PEDUNCOLO ROSSO N.*	I - ISV-F 3 *SAUVIGNON B.*	I - ARSIAL-CRA 437 *TREBBIANO TOSCANO B.*

I - ISV CONEGLIANO 1 *34 E.M.*	I - CRAVIT-ERSA FVG 311 *CABERNET SAUVIGNON N.*	I - CRAVIT - ERSA FVG 106 *CHARDONNAY B.*	I - 2007 ISV-VA 7 *GLERA B.*	I - ISV 5 *MOSCATO BIANCO B.*	I - ISV-F4 TOPPANI *REFOSCO DAL PEDUNCOLO ROSSO N.*	I - ISV-F 5 *SAUVIGNON B.*	I - ARSIAL-CRA 546 *TREBBIANO TOSCANO B.*
I - ISV CONEGLIANO 1 *41 B*	I - CRAVIT-ERSA FVG 312 *CABERNET SAUVIGNON N.*	I - CRAVIT - ERSA FVG 107 *CHARDONNAY B.*	I - 2007 ISV-VA 8 *GLERA B.*	I - CRAVIT-ERSA FVG 135 *MOSCATO BIANCO B.*	I - ISV ERSA FVG 402 *REFOSCO DAL PEDUNCOLO ROSSO N.*	I - CRAVIT-ERSA FVG 190 *SAUVIGNON B.*	I - CRA VIC BC SF7 *TREBBIANO TOSCANO B.*
I - ISV CONEGLIANO 1 *420 A*	I - CRAVIT-ERSA FVG 313 *CABERNET SAUVIGNON N.*	I - CRAVIT - ERSA FVG 108 *CHARDONNAY B.*	I - ISV 2 *GLERA LUNGA B.*	I - ISV - V 5 *MOSCATO GIALLO B.*	I - ISV ERSA FVG 403 *REFOSCO DAL PEDUNCOLO ROSSO N.*	I - CRAVIT-ERSA FVG 191 *SAUVIGNON B.*	I - 10 ISV *VERDICCHIO BIANCO B.*
I - ISV CONEGLIANO 1 *57 RICHTER*	I - CRAVIT-ERSA FVG 314 *CABERNET SAUVIGNON N.*	I - ISV - R 4 *CHENIN B.*	I - ISV 3 *GLERA LUNGA B.*	I - ISV - V 13 *MOSCATO GIALLO B.*	I - CRAVIT - ERSA FVG 390 *REFOSCO NOSTRANO N.*	I - CRAVIT-ERSA FVG 192 *SAUVIGNON B.*	I - ARSIAL-CRA 549 *VERDICCHIO BIANCO B.*
I - ISV CONEGLIANO 1 *775 PAULSEN*	I - CRAVIT ERSA FVG 315 *CABERNET SAUVIGNON N.*	I - ARSIAL-CRA 223 *CILIEGIOLO N.*	I - ISV CONEGLIANO 1 *GOLLA*	I - CRAVIT-ERSA FVG 130 *MOSCATO OTTONEL B.*	I - ISV 6 *REGINA B.*	I - CRAVIT-ERSA FVG 193 *SAUVIGNON B.*	I - ARSIAL-CRA 553 *VERDICCHIO BIANCO B.*
I - ISV CONEGLIANO 1 *779 PAULSEN*	I - CRAVIT ERSA FVG 316 *CABERNET SAUVIGNON N.*	I - 8 ISV *COCOCCIOLA B.*	I - G 109 ISV - ICA PG *GRECHETTO B.*	I - ISV sn-CLe 56 *NEGRO AMARO N.*	I - ISV 9 *REGINA B.*	I - CRAVIT-ERSA FVG 194 *SAUVIGNON B.*	I - ISV - V2 *VERDISO B.*
I - ARSIAL-CRA 489 *ALEATICO N.*	I - ARSIAL-CRA 402 *CANAIOLO BIANCO B.*	I - ISV-CV 7 *CORVINA N.*	I - 2007 ISV-VA 1 *INCROCIO MANZONI 2.15 N.*	I - ISV sn-CLe 64 *NEGRO AMARO N.*	I - CRAVIT - ERSA FVG 180 *RIBUELE B.*	I - CRAVIT-ERSA FVG 195 *SAUVIGNON B.*	I - ISV - V 21 *VERDISO B.*
I - CRA VIC BC SF3 *ALEATICO N.*	I - CRA VIC BC SF4 *CANAIOLO NERO N.*	I - ISV-CV 48 *CORVINA N.*	I - ISV CONEGLIANO 1 *KOBER 5 BB*	I - ISV sn-CLe 71 *NEGRO AMARO N.*	I - ISV CONEGLIANO 1 *RIESLING ITALICO B.*	I - CRAVIT-ERSA FVG 196 *SAUVIGNON B.*	I - ISV - F2 *VERDUZZO FRIULANO B.*
I - Cravit - Assam PU 9B *ALEATICO N.*	I - ISV-VCR 24 *CARDINAL N.*	I - ISV-CV 78 *CORVINA N.*	I - SMA-ISV 317 *LAMBRUSCO A FOGLIA FRASTAGLIATA N.*	I - ISV sn-CLe 87 *NEGRO AMARO N.*	I - ISV-3 *RIESLING RENANO B.*	I - CRAVIT-ERSA FVG 197 *SAUVIGNON B.*	I - CRAVIT-ERSA FVG 223 *VERDUZZO FRIULANO B.*
I - Cravit - Assam PU 2L *ALEATICO N.*	I - ISV-F-V5 *CARMENERE N.*	I - ISV-CV-146 *CORVINA N.*	I - ISV-R6 *MALBECH N.*	I - TCG 2 ISV *PASSERINA B.*	I - ISV-F1 TOPPANI *RIESLING RENANO B.*	I - CRAVIT-ERSA FVG 198 *SAUVIGNON B.*	I - ISV-V5 *VERDUZZO TREVIGIANO B.*
I - Cravit - Assam PU 6M *ALEATICO N.*	I - CRAVIT ERSA FVG 324 *CARMENERE N.*	I - ISV-CV 13 *CORVINA N.*	I - ISV CONEGLIANO 1 *MALVASIA ISTRIANA B.*	I - 1 ISV *PECORINO B.*	I - CRAVIT-ERSA FVG 170 *RIESLING RENANO B.*	I - CRAVIT-ERSA FVG 199 *SAUVIGNON B.*	I - Sirena 1 *VERMENTINO B.*
I - Cravit *Assam PU 10T*	I - CRAVIT ERSA FVG 325 *CARMENERE N.*	I - ISV CV 2 *CORVINONE N.*	I - ISV-F6 *MALVASIA ISTRIANA B.*	I - ISV CONEGLIANO 1 *PICOLIT B.*	I - ISV CONEGLIANO 1 *RIPARIA GLOIRE*	I - CRAVIT - ERSA FVG 430 *SCHIOPPETTINO N.*	I - Marem 1 *VERMENTINO B.*
I - Cosa 1 *ANSONICA B.*	I - ARSIAL-CRA 838 *CESANESE COMUNE N.*	I - ISV CV 3 *CORVINONE N.*	I - 2007 ISV-VA 101 *MALVASIA ISTRIANA B.*	I - ISV-F4 *PICOLIT B.*	I - ISV - CV 73 *RONDINELLA N.*	I - ISV CONEGLIANO 1 *SCHWARZMANN*	I - Marem 3 *VERMENTINO B.*
I - Settefinestre 1 *ANSONICA B.*	I - A5 *CESANESE D AFFILE N.*	I - ISV CV 7 *CORVINONE N.*	I - SMA - ISV 222 *MANZONI BIANCO B.*	I - ISV-F6 *PICOLIT B.*	I - ISV - CV 76 *RONDINELLA N.*	I - ISV - R1 *SYRAH N.*	I - Sileno 1 *VERMENTINO B.*
I - Settefinestre 2 *ANSONICA B.*	I - A8 *CESANESE D AFFILE N.*	I - ISV CONEGLIANO 1 *COSMO 10*	I - SMA - ISV 237 *MANZONI BIANCO B.*	I - CRAVIT - ERSA FVG 160 *PICOLIT B.*	I - ISV - CV 23 *RONDINELLA N.*	I - CRAVIT - ERSA FVG 410 *SYRAH N.*	I - Sileno 3 *VERMENTINO B.*
I - Settefinestre 3 *ANSONICA B.*	I - A9 *CESANESE D AFFILE N.*	I - ISV CONEGLIANO 1 *COSMO 2*	I - ISV - V 1 *MARZEMINO N.*	I - CRAVIT - ERSA FVG 161 *PICOLIT B.*	I - ISV - CV 3 *ROSSIGNOLA N.*	I - CRAVIT ERSA FVG 435 *TAZZELENGHE N.*	I - CRA VIC LOR 5 *VERMENTINO B.*
I - ARSIAL-CRA 618 *BELLONE B.*	I - A10 *CESANESE D AFFILE N.*	I - ISV C VI 4 *DURELLA B.*	I - ISV - V 13 *MARZEMINO N.*	I - CRAVIT - ERSA FVG 370 *PIGNOLO N.*	I - ISV - CV 7 *ROSSIGNOLA N.*	I - ISV CONEGLIANO 1 *TELEKI 5 C.*	I - 1 ISV - CSV *VERNACCIA NERA N.*
I - ARSIAL-CRA 231 *BOMBINO BIANCO B.*	I - A19 *CESANESE D AFFILE N.*	I - ISV C VI 6 *DURELLA B.*	I - ISV - V 14 *MARZEMINO N.*	I - CRAVIT-ERSA FVG 140 *PINOT BIANCO B.*	I - ISV - CV 9 *ROSSIGNOLA N.*	I - ISV CONEGLIANO 1 *TELEKI 8 B. FERRARI*	I - ISV C VI 4 *VESPAIOLA B.*
I - ISV CONEGLIANO 1 *CABERNET FRANC N.*	I - A20 *CESANESE D AFFILE N.*	I - ISV C VI 13 *DURELLA B.*	I - ISV-F-V2 *MERLOT N.*	I - CRAVIT-ERSA FVG 141 *PINOT BLANCO B.*	I - ISV CONEGLIANO 1_*RUPESTRIS DU LOT*	I - ISV-F2 *TERRANO N.*	I - ISV C VI 9 *VESPAIOLA B.*
I - ISV-F-V4 *CABERNET FRANC N.*	I - A21 *CESANESE D AFFILE N.*	I - ISV-C VI 8 *DURELLA B.*	I - ISV-F-V4 *MERLOT N.*	I - CRAVIT-ERSA FVG 142 *PINOT BLANCO B.*	I - ISV - VCR 4 *S.O.4*	I - ISV-F 3 *TOCAI FRIULANO B.*	I - ISV C VI 16 *VESPAIOLA B.*

Services

Certifications

Products/main topics	Description	Person in charge	CREA research Centres
management of certification services for the clonal grapevine material (nurseries)	This service aims to certificate "Mother stocks" and "Initial category vine cuttings" and "Base category vine cuttings" essential for first moltiplication, by nurseries, where is produced the entire "Italian Vineyard", for table and grapevine. This service certificates also the vine cuttings produced in Italy but coming from other EU Countries.	C.G. Zavaglia	CREA-VE
national register of grapevine varieties	Management and certification at molecular level for registered varieties or under registration into the '**Registro Nazionale delle Varietà di Vite'**. Publication and updating into the National genetic databank located on MiPAAF website.	D. Migliaro, C. G. Zavaglia	CREA-VE

Collections

Products/main topics	Description	Person in charge	CREA research Centres
microrganisms of enological interest	Maintaining and enrichment of the collection at CREA-VE The cepage, moreover, are used for several projects and university degrees. During the climate changes are occurring, having germplasm collection is extremely important as source of biodiversity	G.M. Vaudano, Costantini Pulcini	CREA-VE
grapevine germplasm collection of over 3.500 accessions in Susegana (TV) Arezzo and Turi (BA)	Care, management and valorization of genetic resources collected in the grapevine collection of CREA, Center of Research in Viticulture and Enology.	D. Migliaro, M. Giust, R. Carraro	CREA-VE

Other services

Products/main topics	Description	Person in charge	CREA research Centres
characterization service of grapevine varieties	This service is offered to public and private entities under payment of regular fees and allows to identify the vrieties of grapevine through the molecular evaluation of genomic DNA and comparizson with a rich database organized during long lasting of experience, further international databases or the National Register of grapevine varieties	C. Bergamini	CREA-VE
management of the National Reigister of grapevine varieties for MiPAAF	The software is hosted at MiPAAF under the address http://catalogoviti.politicheagricole.it and describe all the varieties and clones registered at the official National Register of Grapevne varieties (the only varieties allowed for cultivation in italy) For each variety can be registered ampelographic description, pictures, nursery production cultivationa areas and type of wines produced. Site checking per day is over 500 and since it exists over 800.000.	C.G. Zavaglia	CREA-VE
external service for characterization service of grapevine varieties and technical support for forensic	This service is offered to public and private entities under payment of regular fees and allows to identify the vrieties of grapevine through the molecular evaluation of genomic DNA and comparizson with a rich database organized during long lasting of experience, further international databases or the National Register of grapevine varieties	D. Migliaro M. Crespan Susegana (TV)	CREA-VE
analytical service of pests and pathogens of grapevine	In this service are executed specialistic analysis for diagnostic in plant pathology and pests, specifically viruses, bacteria and phytoplasmas, then dangerous insects, leafhoppers, mealybugs, and moths. This service includes, depending on type and severity, field supervision, symptoms severity definition, biological indexing, seriology analysis (ELISA), molecular analysis via PCR, in vitro culture recovery, entomological analysis, insects capturing. Clonal sanification (DM 24/06/2008), certificate for plant propagationa (DM 07/07/2006) and export. CREA Viticulture and Enology is one of the accredited center by the MiPAAF for this type of certification(legge 21/06/1991, n. 192). regarding nurseries, consortia, cooperative, farms, phytosanitary regional services, consulting and technical offices, other research centers.	E. Angelini V. Forte, L. Filippin	CREA-VE
phytosanitary certification for the viral status of grapevine plant material in the South of Italy	This service is dedicated to serch of evidence of viruses in grapevine: Grapevine leafroll associated virus 1, 2 e 3, Grapevine fanleaf virus, Arabis mosaic virus, Grapevine virus A e B, Grapevine rupestris stem pitting associated virus, Grapevine fleck virus (physanitary certificate).	M. Gasparro	CREA-VE

efficacy assessment of insecticides, bactericides or other syntetical or natural products	This service guarantees specific analysis to evluate efficacy of registered products against pathogens, particularly bacteria and phytoplasmas, and main dangerous insects, particularly moths and leafhoppers. Activities are performed in vitro or controlled conditions as well as in the fields. The service includes project description and execution, sometimes also with external support. Sampling, analytical studies and statistical analysis are performed. In case of not yet registered products, studies are performed under controlled conditions, or, if in the fields, with support of authorized test centers support.	E. Angelini, V. Forte, L. Filippin	CREA-VE
evaluation of efficacy of novel pesticides (BPC linee EPPO)	Efficacy of alternative phytosanitary products	M.E.M D'Arcangelo	CREA-VE
evaluation of competitive microbiological products (BPC linee EPPO)	Efficacy of competitiva microbioogical products (Trichoderma spp.)	M.E.M D'Arcangelo	CREA-VE
efficacy of resistance inductor (BPL-BPC linee EPPO)	Efficacy of microbiological resistance inductor (Saccharomyces spp.)	M.E.M D'Arcangelo	CREA-VE
characterization of microrganisms for enology	Identification and research microrganims present in must sample/wine through in vitro isolation and molecular DNA analaysis	E Garcia-Moruno A Costantini L Pulcini	CREA-VE
estimation level of Brettanomyces bruxellensis mediante qPCR/analysis 4-etilphenols in wines via GCMS	Quantification of contaminants (Brettanomyces bruxellensis) directly from wine matrices via quantitative PCR, GCMS (ethylphenols) produced by contaminant microrganisms	A Costantini M Petrozziello	CREA-VE
analysis of yeast dominance	Evaluation of yeast dominance in starters for the alcholic fermentation through in vitro isolation and following molecular analysis	E Vudano E Garcia-Moruno, A Costantini L Pulcini	CREA-VE
analysis of yeast dominance	Panel of experts trained to sensorial analysis in wine but also other alcholic products	M.C. Cravero F. Bonello, M. R. Lottero	CREA-VE
Institute for management of clima revealed by climate stations for the PNS-ISTAT	Climate data for ISTAT analysis	M.E.M D'Arcangelo	CREA-VE
management of the National Reigister of grapevine varieties for MiPAAF	The software is hosted at MiPAAF under the address http://catalogoviti.politicheagricole.it and describe all the varieties and clones registered at the official National Register of Grapevne varieties (the only varieties allowed for cultivation in italy) For each variety can be registered ampelographic description, pictures, nursery production cultivationa areas and type of wines produced. Site checking per day is over 500 and since it exists over 800.000.	C.G. Zavaglia	CREA-VE

Working tables / working groups / institutional partnerships / Centre journals / Editorial Board of Journals

Products/main topics	*Description*	*Person in charge*	*CREA research Centres*
Working group for the preparation of the new PAC (Decreto 288 del 8 marzo 2018 DG CREA	Definition of new indicators for the sustainable agriculture for Mipaaf	M.E.M D'Arcangelo	CREA-VE
Working group for the plant protection (DM Mipaaf 30 giugno 2016 n. 0017713)	Supply specialistic experiences for the definition of the new PAN and for the new rules regarding the use of plant pesticides	M.E.M D'Arcangelo	CREA-VE
Working group to supply data to PNS-ISTAT	Definition of new indicators and analytical forms Circolo 13 for Agricolture, Forestry and Fisheries within PNS (Piano Nazionale di Statistica)	M.E.M D'Arcangelo	CREA-VE
Working group to supply data to PNS-ISTAT	Definition of new indicators and research projects Circolo 10 "Ambiente e Territorio within PNS (Piano Nazionale di Statistica)	M.E.M D'Arcangelo	CREA-VE
CREA – SIAN	Providing data for Public Research Institution within PNS (Piano Nazionale di Statistica)	M.E.M D'Arcangelo	CREA-VE
Wine commission for DOP and IGP MiPAAF	Commission for Product Certification of Origin	A.Bosso	CREA-VE

Enology Commission OIV	Technology and Specification groups of the Enology commission OIV	A. Bosso	CREA-VE
Enology Commission OIV	Joint Group of Enology and Microbiology (group TECMIC)	A. Bosso	CREA-VE
Technical scientific Committee OIV		A. Bosso	CREA-VE
Enology Commission OIV		S. Motta	CREA-VE
Viticulture Commission OIV	Genetics Group	R. Velasco	CREA-VE
Viticulture Commission OIV	Genetics Group	R Carraro	CREA-VE
Viticulture Commission OIV	Genetics Group	C Bergamini	CREA-VE
Viticulture Commission OIV	Genetica Group	E Angelini	CREA-VE
Viticulture Commission OIV	Vineyard protection Group	E Angelini	CREA-VE
Viticulture Commission OIV	Vineyard protection Group	P Storchi	CREA-VE
Enology Commission OIV	Analytical methods Group	E.Garcia Moruno	CREA-VE
Hop Technical round Table	Working group	M.C.Cravero, F. Bonello	CREA-VE
Permanent group MIPAAF-sector reproduction grapevine material, evaluation of registration of new varieties and clones	This service evaluate the new application for registration of dessier related to novel varieties and clones to e registered into the National Register of VarietiesToday the number of varieties is 589 for grapevines for 1445 clones, 182 for table grapes, with 52 clones, 46 rootstocks with 46 cloens	C. G. Zavaglia	CREA-VE
OIV - Organisation Internationale de la Vigne et du Vin	Cooperation activity for revision and updating of descriptors (ampelography and agronomic) of grapevine varieties	D. Migliaro, R. Carraro, C. G. Zavaglia, M. Giust, M. Gardiman	CREA-VE
AEG-VIT-IS - Enhancing quality and quantity of Vitis genetic resources in AEGIS	Cooperation activity for description of guidelines for management of grapevine collections	D. Migliaro, R. Carraro, M.Gardiman	CREA-VE

2.4 FRUIT

CREA's tradition in fruit tree research dates back to more than a century. Nowadays, activitiesd are focused on supply chain improvement through the application of new technologies for breeding, propagation, sustainable production, enhancement of fruit quality, and utilization of by-products. Furthermore, conservation, phenotyping, genotyping, and valorisation of fruit crop, olive and citrus genetic resources are essential elements of the work.
In order to enhance fruit and citrus crop supply chains, CREA is developing the following research fields:

- *Varietal innovations through traditional breeding and new biotechnology (NBT), aimed at obtaining new varieties and rootstocks with improved production, quality and strength characteristics.* In the face of climate change, which has a major impact on agriculture, and in order to support sustainable production, breeding can make a crucial contribution by systematically selecting those characteristics which increase the plants' ability to maintain high production levels and quality performance required by the fruit and citrus markets, also under the pressure of biotic and abiotic stresses.
- *Conservation, phenotyping, genotyping, and valorisation of fruit crop and citrus genetic resources (agrobiodiversity), also trough breeding actions, to support sustainable and "Made in Italy" quality production.* Actions aimed at the maintenance, expansion and study of the germplasm collections and the deepening of knowledge on the traits of the conserved accessions, which are a valuable reservoir of genes for breeding programs. Main objectives are the recovery and conservation of autochthonous varieties, but also the extension of the genetic base of a wider range of species by collection and acquisition of material in Italy and abroad, the sustainable use of the germplasm conserved in the collections, the reintroduction into cultivation of indigenous varieties for local and niche markets, through collaboration with communities of small farmers.
- *Optimization of production methods to increase the adaptability of fruit and citrus crops to climate change*. Implementation of monitoring of the physiological responses in the soil-plant-atmosphere continuum, particularly for the adaptation to climate change in the hot-dry environment and for an efficient use of inputs.
- *Implementation of digitalisation strategies for an agricultural system based on the use of precision farming tools.* Considering the rapid technological progress, studies are carried out on the use of *ad hoc* sensors for the monitoring of the trees' growing conditions, on the implementation and validation of digitalized platforms to support decisions on orchards management and the use of precision farming tools.
- *Development and optimization of resilient agro-technical production processes dealing with climate change, with a high degree of biodiversity in organic farming.* In consequence of the increase of organic farming, both in terms of of cultivated areas and consumption patterns, the planned activities aim to define and optimize technically resilient routes facing climate change enabling to ensure a high degree of functional biodiversity. The OFA Center disposes of long-term experimental devices for carrying out research activities supporting surveys in the field of organic farming.
- *Application of integrated and organic systems for fruit and citrus crops protection, by developing diagnostic systems and the study of active compounds with low environmental impact and toxicological level.* This research activity comprises the study the biology and spread of economically and biologically harmful pests, the identification methods to contrast diseases and phytophagous agents, the development of diagnostic systems, geo-referenced and remote monitoring, sustainable use of plant protection products, detection of organisms harmful to crops by means of an integrated system for the proper protection of crops, which also includes the study of active substances with a low environmental impact and a low level of toxicology, in addition to the use of combinations of grafts incompatible with specific phytophagic and pathogens.
- *Development of new methods for monitoring, tracking and tracing fruit and citrus crops production, to guarantee quality, origin and provenance of the products.* Research activity aims to identify tools and methodologies to provide customers with the highest guarantee of quality, origin and provenance of products (geographical or organic or integrated farming).
- *Application of innovative technologies and biotechnologies for the extension of the shelf-life of both fresh and processed products, and for waste utilisation from agri-food industry.* In particular we focus on the reduction of product loss during processing and marketing, the maintenance of quality, nutraceutical and sensory characteristics of pre- and post-harvest products, the lengthening of shelf-life of fresh and processed products, organoleptic and nutraceutical characterization of the products, studies on allelopathic activity and the development of techniques for the exploitation of waste from the agro-food industry, in the field of nutraceuticals and cosmetics, and as a source of organic matter for recycling.

2.4.1 Research and research products - Fruit

Products/main topics	*Acronym and Research Title*	*Aims*	*Person in charge and CREA Centres*	*Partnership/ Financing Body*	*Scientific Publications*	*Other Research products* [1]
CITRUS	**SIRPA**	Identification and use of natural biotechnological remedies to be used to defend the "tristeza", caused by the phloem virus Citrus tristeza closterovirus (CTV), which causes a progressive deterioration of the plants, leading them to death.	C.Licciardello, CREA-OFA	Sicilian Region		Webinar 18.12.2020 .1 Research fellowship.
CITRUS	**DANSTAR** Research Agreement.	Antifungal efficacy assessment of a biocontrol agent against postharvest rots of citrus fruit.	M. C. Strano, CREA-OFA			
CITRUS	F**RUITIMPRESA** Research Agreement.	Generation of new citrus cultivars.	G. Russo, CREA-OFA		Arlotta et al Disease Resistant Citrus Breeding Using Newly Developed High Resolution Melting and CAPS Protocols for Alternaria Brown Spot Marker Assisted Selection. Agronomy 2020, 10, 1368.	
CITRUS, OTHER	**PERILBIO** Promotion and strengthening of Long-term experiments (LTEs) in organic farming.	1.Maintenance and enhancement of the organic Long-term experiments (LTEs) of CREA. 2. Consolidation and improve of the relationship network with the organic farmers.3.- Realization of 3 new organic LTEs in poultry, cuniculture and mariculture.4. Drafting of the National plan for research and innovation for organic agriculture.5. Enhancement of research and experimentation activities already carried out with the support of the MiPAAF.	D.Ceccarelli, **CREA- OFA** CREA-PB, AA, OF, ZA	MIPAAF	1)Ciaccia C., Diacono M., Testani E., Fiore A., Farina R., Montemurro F., Canali S., Mele G., Ceccarelli. D. 2020. Participatory Action Research for the Co-design of a Long-Term Experiment: the Basilicata Case Study. XLIX Convegno Nazionale della Società Italiana di Agronomia, 16-18 settembre. 2) Ciaccia C., Mele G., Testani E., Fiore A., Montemurro F., Diacono M. La Ricerca al servizio del territorio: il caso studio Lucano di ricerca partecipativa. Agrifoglio (sottomesso uscirà quest'anno) 3) Ciaccia C., Diacono M., Canali S., Testani T., Montemurro F., Ferlito F., Roccuzzo G., Campanelli G., Di Pierro M., Mele G., Ranuzzi M., Grasselli O., Ceccarelli D. 2020. Long-term experiments as a tool for governing the transition towards new food systems: an Italian trajectory. Organic World Congress, Rennes 21-27 September, SCI-381;	3 Technical Days 31 august - 2 september Experimental farm of CREA-AA. Metaponto (MT. 3 Scholarships for postgraduate.2 Research grants.
ORANGES, MANDARINS	**CITRUS** Improvement by Sustainable Biotechnologies.	Use of the New Breeding Techniques (cisgenesis and genome editing) to be used to improve qualitative traits of citrus fruits, such as the enrichment of oranges in healthy compounds and the production of seedless mandarin and mandarin-like fruits	L. Cattivelli CREA-GB CREA-OFA	MIPAAF	1)Salonia et al. 2020. New Plant Breeding Techniques in Citrus for the Improvement of Important Agronomic Traits. A Review. Frontiers in Plant Science 11 (1234): 1-15. doi.org/10.3389/fpls.2020.01234 2)Poles et al., 2020. Recent Advances of In Vitro Culture for the Application of New Breeding Techniques in Citrus. Plants 9 (8), 938. doi.org/10.3390/plants9080938 3) Catalano et al., 2020. Target-Genes Reveal Species and Genotypic Specificity of Anthocyanin Pigmentation in Citrus	

[1] *prototypes; dissemination activities (conferences, seminars, reports, sites and videos, etc.); training activities (scholarships, research grants and PhD scholarships)*

					and Related Genera. Genes 11 (7), 807. doi.org/10.3390/genes11070807	
CAROBS	**IN-SYDE-CAR** Innovative systems for the development of the Carob supply chain.	Phytopathological monitoring of carob stands and product traceability of the carob food chain..	A. Giovino, CREA-DC	Sicilian Region		
CHESTNUT	**URCOFI IV - Special Project on chestnut** Coordination unit and strengthening of surveillance, research, testing, monitoring and training in phytosanitary field	Bio-agronomic, qualitative and molecular characterization of chestnut ecotypes that show resistance/tolerance to the attack of the gall wasp.	M. Petriccione, CREA-OFA	Campania Region		1 Scholarship.
CHERRIES, PLUMS	**ECPGR *Prunus* Aligment** Testing, Use and Alignment of genetic data to distinguish unique and characterized accessions in Prunus, 2018-2020.	Morphological characterization and harmonization of genetic profiles of sweet cherry and plum accessions of various European origin (*Prunus* WG)	D. Giovannini, CREA-OFA	International Institutions and European Commission 1	Hilde Nybom, Daniela Giovannini, Matthew Ordidge, Harald Stein Hjeltnes, Jasmin Grahic, Fuad Gasi. 2020. ECPGR recommended Simple Sequence Repeat locifor analyses of European plum (Prunus domestica)collections. GeneticResources(2020),1 (1)40–48	
DRUPACEOUS	**TESS** Targeted Engineering of Stone fruit tree genomes for resistance to Sharka.	The research aims at developing stone fruit trees resistant to Sharka through the CRISPR/Cas9-mediated editing of host susceptibility genes. It is carried out through the exchange of know-how and personnel among partners for the establishment of an interdisciplinary workgroup with great expertise.	S. Micali, CREA-OFA	INRA - Institut National de la Recherche Agronomique/ Bordeaux (Francia), INIA - Instituto de Investigaciones Agropecuarias/ Santiago del Cile/**European Commission**		
FIG/WEEVIL	**DI.COL:FICO** New phytosanitary emergencies in Tuscany: the fig tree weevil, Aclees sp. cf. foveatus.	Agreement on research activities focused on the fig tree weevil in Tuscany.	E. Gargani, CREA-DC		E. Gargani, G.P. Barzanti, A. Strangi, G. Mazza, C. Benvenuti, R. Frosinini, P.F. Roversi, I. Cutino, 2020 - *Aclees* sp. cf. *foveatus*, a real threat to *Ficus carica* in the Mediterranean area. Acta Horticulturae, in press	
NUT	**CORYNE**	Corylynnova Nebrodi: Characterization, conservation and promotion of the Hazelnut germplasm, genetic sanitary certification in the plant nursery businnes; quality improvement of nut.	R. Rizzo, CREA-DC CREA-AN	Sicilian Region		
FRUIT AND VEGETABLES SUPPLY CHAINS	**OFS** Fresh and Sustainable Fruit and Vegetables.		M. Petriccione, CREA-OFA	PO "Il Solco Maggiore"		

1 University of Reading (UK); Latvia University of Agriculture (Lituania); INRAE (Francia); Julius Kuhn-Institute (Germania); Hellenic Agricultural Organization "Demeter" (Grecia);Njoes naeringsutvikling (Norvegia); Estonian University of Life Sciences (Estonia); University of Copenhagen (Danimarca);National Agricultural Research and Innovation Centre (Ungheria); NIAB EMR (UK); IBBR-CNR (Italia); SLU (Svezia); Croatian Centre for Agriculture, Food and Rural Affairs (Croazia); CRA-W (Belgio); Research and Breeding Institute of Pomology Holovousy Ltd (Repubblica Ceca)/ European Commission

STRAWBERRY	**APOSCALIGERA** Strawberry breeding APOSCALIGERA Verona_year 2020 -Joint development contract for the establishment and development of new strawberry genotypes for the Verona area 2018-2022	The aim of the project is the creation of new strawberry varieties through specific genetic research actions with traditional breeding techniques.	G.Baruzzi, CREA-OFA	APO Scaligera Verona	1. Sbrighi P.; Turci P.; Baruzzi G.; Birolli M.; Ballini L., 2020 - Contrazione produttiva, ma spazio a innovazione e tipicità in Valle Padana. Rivista di Frutticoltura e Ortofloricoltura, N° 3: 18-22; 2.Diffusione commerciale delle varietà di fragola: Agnese (domanda privativa comunitaria 2020 1251), Callas (2020 1252).	
STRAWBERRY	**PIR project** Constitution of new strawberry genotypes with low winter cold requirements suitable for southern areas, metapontino in particular	Obtaining new strawberry genotypes, with low winter chilling requirements LWCR (Low Winter Chilling Requirement), through specific genetic research actions carried out with traditional breeding methods.	G.Baruzzi, CREA-OFA	Piraccini Secondo s.r.l. – Cesena		
STRAWBERRY	**FRAGOLA CALABRIA** Contratto di sviluppo congiunto per la costituzione di nuovi genotipi di fragola per le aree calabresi.	Proseguire l'azione progettuale di miglioramento genetico legata al territorio calabrese, oltrechè l'attività di piena valorizzazione delle selezioni in avanzata fase di studio, già ottenute con precedenti azioni progettuali.	G.Baruzzi, CREA-OFA	ARSAC –Calabria Region		
STRAWBERRY	**BREEDING FRAGOLA ROMAGNA** Accordo di collaborazione per l'esecuzione di un progetto di ricerca su fragola in Romagna.	Svolgimento di un'attività di breeding fragola per la Romagna finalizzata all'ottenimento di nuove varietà di fragole adatte alle coltivazioni romagnole attraverso specifiche azioni di ricerca genetica realizzate con metodologie di breeding tradizionali.	G.Baruzzi, CREA-OFA	New Plant		
STRAWBERRY	**LAIMBURG Project** - Breeding project "The tasty strawberry of South Tyrol 2016-2020" 5th year.	The objective of this activity is the continuation of the breeding project started in 2011 in collaboration with LAIMBURG, and aimed at obtaining new strawberry genotypes, with high requirements in winter chilling, through specific genetic research actions carried out with traditional breeding methods.	G.Baruzzi, CREA-OFA	Centro di Sperimentazione agraria e forestale LAIMBURG		
STRAWBERRY	**AMICA FRAGOLA** 3° year - Friendly FRUIT Project-Climate-Kic, research and development on strawberry.	1.Selection of strawberry genotypes best suited to protected strawberry cultivation in southern Italy and good yield and quality performance. 2. Evaluation of eco-friendly practices to disinfest soil pre-planting in strawberry.	D. Giovannini e G. Baruzzi, CREA-OFA	INRAE (Francia); DANONE		Alternatives to soil chemical disinfection in strawberry' TRAINING DAY DANONE FOR HORTICULTURAL AGRONOMISTS, Trento, 8 ottobre 2020
SOCIAL FARM	**RE.M.O. ISAR** NEtwork for an Operational Model of Social Integration in Rural Area.	Design and development of workshops aimed at young people, for the dissemination of rural reception practices aimed at people with disabilities, fragile and immigrants; activation of a local network between producers, processors and rural reception operators "For	M. Petriccione, CREA-OFA	Campania Region		

		all"; diversification of agricultural businesses in educational and/ or social farms.				
FRUIT CULTIVATION	**SIMODROFILA**	Validation of an innovative control system of D. Suzukii and other relevant phytophagous.	M. R. Tabilio, CREA-OFA CREA-IT	Lazio Region		Technical day - hi-tech 27 luglio 2020; Dissemination (website, depliant), 2 eventsi.
KIWI	**JINGOLD S.P.A.** Determination need in cold for the exit from dormancy and need in heat useful to budding of kiwi cultivars Jintao, Jinyan, Dong Hong	Determination of the cold requirement for the exit from dormancy and the hot requirement useful for the budding of the kiwi cultivars Jintao, Jinyan, Donghong.	L. Gaeta, CREA-AA	INGOLD S.P.A.		
KIWI	**KIMOR_KIRIS** La moria del kiwi – Approfondimento sull'eziologia e strumenti di prevenzione e difesa	Insights on physiological aspects involved in the onset of kiwifruit early decline syndrome as a consequence of environmental, agronomical and phytopatological factors, in order to prevent the onset of this disorder in new plantations and to propose possible remedies for existing orchards.	L.Bardi, CREA IT	AGRION Fondazione per la ricerca l'innovazione e lo sviluppo tecnologico dell'agricoltura piemontese	Bardi, L. (2020) Early Kiwifruit Decline: A Soil-Borne Disease Syndrome or a Climate Change Effect on Plant–Soil Relations? Front. Agron., May 2020, Volume 2, Article 3 doi.org/10.3389/fagro.2020.00003; Bardi Laura, Nari Luca, Morone Chiara, Faga Maria Giulia, Malusà Eligio (2020) Possible Role of High Temperature and Soil Biological Fertility on Kiwifruit Early Decline Syndrome. Frontiers in Agronomy, 2, pag.13, DOI=10.3389/fagro.2020.580659; https://www.theguardian.com/world/2020/oct/08/mystery-disease-killing-italys-kiwi-fruit-trees-baffles-scientists.	https://www.crea.gov.it/-/il-crea-su-gente-la-moria-del-kiwi-favorita-dagli-effetti-dei-cambiamenti-climatici; https://www.crea.gov.it/-/moria-del-kiwi-gestione-del-suolo-e-alte-temperature-fra-i-possibili-fattori-scatenanti- https://www.raiplayradio.it/programmi/glisbandatidiradio2/archivio/puntate
KIWI	**QUALITYKIWI** Innovations for the improvement of qualitative standards of Kiwi in Lazio	Implementation of a DSS to manage irrigation, fertilization and disases of kiwi	L. Riccioni, CREA DC	Lazio Region		
KIWI	**URCOFI V** Unit of coordination and enhancement of surveliance, research, monitoring and training activities in the phytosanitary sector.	1) Monitoring of Pseudomonas syringae pv actinidiae on kiwifruit and of Xanthomonas arboricola pv juglandis on walnut 2) Molecular diagnosis of Pseudomonas syringae pv actinidiae.	M. Petriccione, CREA-OFA CREA-DC	Campania Region		1 Scholarship
CITRUS	**ARMONIA** Research Agreement.	Generation of new citrus cultivars.	G. Russo, CREA-OFA	Armonia	Arlotta et al . Disease Resistant Citrus Breeding Using Newly Developed High Resolution Melting and CAPS Protocols for Alternaria Brown Spot Marker Assisted Selection. Agronomy 2020, 10, 1368.	2 Grants.
APPLE	**VR_NORDEST**	Identification of apple cultivars suitable for cultivation in the lowland, with commercial and agronomic characteristics such as to replace the current ones, no longer appreciated by the market, possibly with genetic resistance to pathogens, using rootstocks suitable to replant as well as resistant to fungal soil diseases, to improve production performance.	G.Baruzzi, G. Caracciolo CREA-OFA	Organizzazione produttori Nord Est		

APPLE, PEAR	**BRE.ME.PE**	Implementation of a breeding activity, carried out in collaboration between CREA and NEW PLANT, aimed to obtaining new varieties of apple and pear, mainly suitable and fit for the cultivation environments of lowland of Northern Italy, through specific genetic research actions carried out with traditional breeding methods.	G.Baruzzi E G. Caracciolo CREA-OFA	NEW PLANT	1. Caracciolo G., Magri A., Petriccione M., Maltoni M. L., Baruzzi G., 2020. Influence of cold storage on pear physico-chemical traits and antioxidant systems in relation to superficial scald development. Foods (9), 1175. 2. Caracciolo G., Pallotti G., Sirri S., Baruzzi G., 2020. Italia protagonista nel breeding. Le nuove selezioni del CREA di Forlì. Frutticoltura, 8: 24-27.	
POMEGRANATE	**GRANATUM** Agronomic innovations to improve the quality of pomegranate fruits and the competitiveness of farms in short supply chains.	1. Improvement of the agronomic performance of pomegranate cultivars. 2. Evaluation of different agronomic practices on the qualitative traits and biological activities of the fruit. 3. Definition of biochemical and molecular index for fruit characterization; 4) Evaluation of economic and environmental sustainability and consumer preferences.	M. Petriccione, CREA-OFA	Campania Region		Conference"GRANATUM-Innovare attraverso la tradizione".
HAZELNUT	**PAV-NOC 3** Reaseacrh agreement on pathogens affecting hazelnut	Monitoring and diagnosis of fungal pathogens affecting hazelnut in specialized orchards of Piemonte and Campania..	S. Vitale, CREA-DC	SAGEA	S. Vitale, et al.(2020) Terra e Vita n.16 https://terraevita.edagricole.it/ortofrutta/nocciole-avariate-in-aumento-conoscere-per-limitare-i-danni/	
HAZELNUT	**SYNGENG** In vitro trials aimed at testing the efficacy of difenoconazole and fludioxonil against Fusarium lateritium, causal agent of the gray necrosis of Hazelnut (GN).	Evaluate the efficacy of TWO active ingredients (SCORE®25-EC and GEOXE®) against Fusarium lateritium by assessing their activity in vitro with biometric tests carried out on substrates to which the above-mentioned chemicals are added.).	S. Vitale, CREA-DC	Syngenta italia SpA		
HAZELNUT	**FERRERO** Research agreement on "rotten hazelnut" disease.	Monitoring of fungal microorganisms involved in the "rotten hazelnut" disease.	S. Vitale, CREA-DC	Ferrero Trading Lux		
HAZELNUT	**FERRERO**	Isolation, identification and characterization of several pathogen bacteria in hazelnut located in Georgia and Serbia; Development of sustainable defense strategies in the field for the containment of plant diseases; Evaluation of endotherapy and thermotherapy to contain Xanthomonas arboricola pv. corylina	M. Scortichini, CREA-OFA	Ferrero Trading Lux		
HAZELNUT	**DERINOCCIO** Research and production experimentation on the reduction of the drift of phytosanitary treatments in hazelnut groves	Reduction of pesticide inputs through the use of anti-drift nozzles and by adjusting the sprayer.	M. Biocca, CREA-IT			
WALNUT	**IN-NOCE** Evaluation of agronomical and yield performance of walnut cv. Chandler grafted vs. micropropagated – fourth year of funding	Comparative evaluation of the agronomical and yield performance of two nursery types of plants (grafted vs. micropropagated) of walnut cv. *Chandler*.	D. Giovannini, CREA-OFA	VITROPLANT ITALIA S.R.L.		

WALNUT	**PORT.NOC** Evaluation of rootstocks for tolerance/resistance to *Phytophthora and black-line* and valorisation of compatible *Juglans Regia* varieties" – 2° period of activity	Definition of protocols for in vitro propagation in *Juglans microcarpa, J. major*, and their hybrids with *J. regia* and in *J. Regia*, for their micrografting and for CLRV sanification of *Juglans spp.* genotypes applying in vitro culture techniques.	S. Vitale, **CREA-DC** CREA-FL CREA-OFA	MIPAAF	Gentile, A., Frattarelli, A., Urbinati, G., Caboni, E. Effect of $CaCl_2$, paclobutrazol and salicylic acid on *in vitro* rooting of walnut (*Juglans regia* L.). Acta Horticulturae, 2020, 1285, pp. 1–7	
PEAR	**ESPERA** Circular Economy and sustainability of the "PGI Mantovana" pear supply chain	The aim of the ESPERA project is the overall improvement of the management of the "PGI Mantovana" pear supply chain, combining technological innovations with the reconfiguration of production, storage and distribution processes, within the paradigms of circular economy and sustainability.	M. Vanoli, CREA-IT	Lombardia Region	Vitale et al. Frutticoltura https://rivistafrutticoltura.edagricole.it/tag/nocciola-avariata/. Scarpari et al. Mycological Progress 19:317–328. https://doi.org/10.1007/s11557-020-01562-y	kick-off meeting.
PEACH	**RESEARCH, INNOVATION AND DEVELOPMENT OF THE "SH" (STONY HARD) TRAIT ON PEACH- STONY HARD–** 7th year	Increasing knowledge and verify market potential of the innovative Stony Hard trait	D. Giovannini, CREA-OFA	AOP Italia Società Consortile a r. l.	1. Serra, S.; Anthony, B.; Masia, A.; Giovannini, D.; Musacchi, S., 2020 - Determination of biochemical composition in peach (prunus persica l. batsch) accessions characterized by different flesh color and textural typologies. Foods 9-10; 2. Cirilli M., Micali S., Aranzana M.J., Arus P., Babini A., Barreneche T., Bink M.C., Cantin C.M., Ciacciulli A., Cos-Terrer J., Drogoudi P., Eduardo I., Foschi S., Giovannini D., Guerra W., Liverani A., Pacheco I., Pascal T., Quilot-Turion B., Verde I., Rossini L., Bassi D. 2020. The multi-site PeachRefPop collection. Plant Physiology Jul2020, pp.01412.2019; DOI: 10.1104/pp.19.01412; 3. Eduardo I., de Tomas C., Alexiou K.G., Giovannini D., Pietrella M., Carpenedo S., Bassols Raseira M.C., Batlle I., Cantin C., Aranzana MJ., Arús P. 2020. Fine mapping of the peach pollen sterility gene (Ps/ps) and detection of markers for marker-assisted selection. Mol Breeding, 40, 57. https://doi.org/10.1007/s11032-020-01139-3	
PEACH , APRICOT, CHERRY	**BIOPAC** Innovation and sustainability in tha management of organic orchards: Peach, Apricot and Cherry.	The general aim of BIOPAC is to define solutions to the main problems concerning the organic fruit sector and, in particular, to strengthen the stone fruit production chains (peach, apricot, cherry)	D. Ceccarelli, CREA OFA CREA- AA	MIPAAF	Ciaccia, C., Ceccarelli, D., Antichi D., Canali, S. 2020. Long-term experiments on agroecology and organic farming: the Italian long-term experiment network. In "Long Term Farming Systems Research. Ensuring Food Security in Changing Scenarios". G.S. Bhullar and A. Riar (Eds.). Academic Press (UK). ISBN: 978-0-12-818186-7. 183- 196. Ceccarelli, D., Ciaccia, C., Canali, S. 2020. I dispositivi sperimentali di lungo periodo per l'agricoltura biologica. In: BIOREPORT 2019. L'agricoltura biologica in Italia. Abitabile C. Marras F. Viganò L. (Eds). Rete Rurale Nazionale 2014-2020, pp. 161-179. Tabilio M.R.,Colacci M., Ceccaroli C., Assennato M.,Ceccarelli D. Andamento delle popolazioni di D. Suzukii in differenti condizioni: confronto tra ciliegeto biologico e convenzionale. Atti Giornate Fitopatologiche, 2020, 1, 211-216; Chiesa S.G., Angeli G., Fiaschetti M.,Tabilio M.R., Cristofaro M., Ipla Mora I., Ioriatti C. 2020 .Validazione della tecnica dell'insetto sterile per la gestione della mosca della frutta Ceratitis capitata in meleto. Atti Giornate Fitopatologiche 1, 141-146; Ciaccia, C., Ceglie, F. G., Burgio, G., Madžarić, S., Testani, E.,	2 Scholarships for postgraduate

					Muzzi, E., Mimiola, G. & Tittarelli, F_Participatory Research towards Food System Redesign: Italian Case Study and Perspectives. Sustainability, 11(24)pp12 https://www.mdpi.com/2071-1050/11/24/7138.	
LOCAL FRUIT CROPS	**BIO.FRU.PARCO** Recovery, enhancement and characterization of accessions of fruit germplasm of the Cilento, Vallo di Diano and Alburni National Park.	Conservation, bio-agronomic and molecular characterization of fruit crops located in Cilento, Vallo di Diano and Alburni National Park.	A. Nunziata, CREA-OFA	Parco Nazionale del Cilento e del Vallo di Diano		
FRUIT CROPS VARIOUS	**BIOLOGICO A+++** Pilot management system of the low-entropy organic farm, through the interpretation of the environmental factor, the prevalent use of natural preparations and the use of precision farming techniques..	Implementation of a pilot management system for organic farms, through the interpretation of the environmental factor, and use of natural preparations in order to obtain functional foods.	M. Amenta, CREA-OFA CREA-CI	Sicilian Region		
FRUIT CROPS VARIOUS	**FREECLIMB -**Fruit crops resilience to climate change in the Mediterranean Basin.	The crucial objective of the project is the widening of the availability of germplasms and breeding materials and the revaluation of local varieties resilient with respect to the future climate scenarios foreseen for the Mediterranean area.	M.Caruso, CREA-OFA	15 partners di 9 paesi Mediterranei / **European Commission**	Russo et al. Identification of field tolerance and resistance to mal secco disease in a citrus germplasm collection in Sicily. Agronomy 2020, 10, 1806.	
FRUIT CROPS VARIOUS	**FRUFUN** Low environmental impact production of innovative functional foods with fruit produced by agricultural enterprises in the Sabine area.	Carry out all the animation activities useful for organizing the cooperation around the initial project idea up to the establishment of the Operating Group.	T. M. P. Cattaneo, CREA-IT	Lazio Region		https://nutrifrutta.com/; poster: https://www.crea.gov.it/web/ingegneria-e-trasformazioni-agroalimentari/-/giornata-divulgativa-g.o.-frufun; due eventi divulgativi.https://youtu.be/vvZZDL-YZWk; https://digital.makerfairerome.eu/#/mfr/108/event; e stand Maker Faire, Roma al link: https://digital.makerfairerome.eu/#/mfr/107/brand
FRUIT CROPS VARIOUS	**INNOFRUIT** Sustainability and innovation in table grape cultivation.	Promote the recovery of competitiveness and profitability of Apulian table grape producers compared to the main competitors, working organically on the improvement of the product offered and on the efficiency and sustainability of the entire production process.	A.R. Caputo **CREA-VE** CREA-AA	Puglia Region		
FRUIT CROPS VARIOUS	**preHLB** Preventing HLB epidemics for ensuring citrus survival in Europe.	Adoption of preventive measures in the short, medium and long term to be used to	C.Licciardello, CREA-OFA	The project involves 24 partners, 21 of them are	Poles et al., 2020. Recent Advances of In Vitro Culture for the Application of New Breeding Techniques in Citrus. Plants 9 (8), 938. doi.org/10.3390/plants9080938	

		deal with the phytosanitary emergency caused by the bacterium HLB.		International (EU and no-EU)/**European Commission**		
FRUIT CROPS VARIOUS	**FF_IPM** In silico-boosted, pest prevention and off-season focused IPM against new and emerging fruit flies.	Development and validation of strategies for integrated management of *Ceratitis capitata* populations control	M. R. Tabilio, CREA-OFA			
FRUIT CROPS VARIOUS	**FRU.BRA** Collaboration agreement for the experimentation and dissemination of genetic material of Italian fruit species obtained from CREA-OFA in Brazil.	Evaluation and dissemination of new genetic material of CREA in Brazil.	G.Baruzzi e G. Giovannini, CREA-OFA	UDESC, Università di Santa Catarina, Brasile		
FRUIT CROPS VARIOUS	**RGV FAO** Program	Conservation, characterization and valorization of plant genetic resources for agriculture and food.	I. Verde, **CREA-OFA** CREA- AA CREA-CI CREA-DC CREA-FL CREA-GB CREA-IT CREA-OF CREA-VE CREA-ZA	MIPAAF	1)Urbinati, G., Nota, P., Frattarelli, A., Lucioli, S., Forni, C., Caboni, E. Morpho-physiological responses of sea buckthorn (*Hippophae rhamnoides*) to NaCl stress. Plant Biosystems, 2020, 154(6), pp. 827–834. 2) Ceccarelli, D., Caboni, E. Nutraceutical and quality characterization of local Italian apple cultivars. Acta Horticulturae, 2020, 1297, pp. 323–326. 3) Caboni, E., Gentile, A., Frattarelli, A., Piombino, F., Forni, C., Monticelli, S. Further steps for application of droplet vitrification for cryopreservation of Pyrus and Prunus species. Acta Horticulturae, 2020, 1297, pp. 107–112. 4)Monticelli, S., Gentile, A., Forni, C., Caboni, E.Slow growth in 'Pisana' apricot and in 'Cerina' apple, two Italian cultivars Acta Horticulturae, 2020, 1285, pp. 117–124 5) Gaši F., Sehic J., Hjeltnes S.H., Ordidge M., Békefi Z., Benedikova D., Blouin-Delmas M., Drogoudi P., Giovannini D., Höfer M., Kaldmäe H., Lacis G., Lateur M., Toldam-Andersen T.B., Ognjanov V., Nybom https://link.springer.com/article/10.1007%2Fs10722-020-00901-y H. 2020. Genetic assessment of the pomological classification of plum Prunus domestica L. accessions sampled across Europe. Genet Resour Crop Evol. 6)Bujdosó G., Hrotkó K., Feldmane D., Giovannini D., Demirsoy H., Tao R., Ercisli S., Ertek N., Malchev S. 2020. What kind of sweet cherries do the final consumers prefer? South Western Journal of Horticulture, Biology and Environment, vol 11 (1):37-48.	Webinar SOI (Società Orticola Italiana) "Attualità e prospettive della coltura in vitro del nocciolo".
FRUIT CROPS VARIOUS /NBT	**BIOSOSFRU** Next generation BIOtechnological approaches for a better productivity and SUStainability of FRUit crops.	New Breeding Techniques applied to fruit crops for the development of varieties with superior agronomic traits and resistant to biotic stresses.	L. Cattivelli, **CREA-GB;** responsabile BIOSOSFRU: I.Verde, CREA-OFA CREA- DC	MIPAAF		4 Research grants
FRUIT CROPS VARIOUS /LOCAL	**DICOVALE** Diversity, conservation and valorization of local genetic	1. Conservation of endangered genetic resources (GRs) and other GRs of several fruit crops 2. Morpho-physiological and	M. Petriccione, CREA-OFA	Campania Region		Conference "Preservation of biodiversity to improve sustainable

GENETIC RESOURCES	resources of fruit crops in Campania region (Italy).	agronomic characterization of local RGs 3. Genetic-molecular characterization of local RGs. 4. Recovery of reproduction / multiplication material of local RGs.				development in Campania region (Italy)". 3 Research grants.
GRAPES/ ORGANIC CHERRIES	**OLTRE.BIO** Innovative management of cherry growing and organic viticulture	It promotes an integrated, endogenous and sustainable development of the table grape and cherry cultivation chain in organic management.	L. Tarricone, **CREA-VE** CREA-AA	Puglia Region		

2.4.2 Patents and Services

Patents

INDUSTRIAL PATENTS

Products/Main topics	*Denomination/Description*	*Authors/Inventors*	*CREA research Centres*
Citrus	Method for the production of an extract from citrus by-products from citrus processing (IT)	G.Ballistreri ,M. Amenta ,S. Fabroni, P.Rapisarda	CREA-OFA

PLANT VARIETY RIGHT

CITRUS	*Denomination*	*Authors*	*CREA research Centres*	*CITRUS*	*Denomination*	*Authors*	*CREA research Centres*
mandarin orange	**EARLY SICILY**	Russo G. Recupero S.	CREA-OFA	**mandarin**	**SWEET SICILY**	Russo G. Recupero S.	CREA-OFA
mandarin	**GALATEA**	Russo G. Caruso M. Licciardello C. Caruso P.	CREA-OFA	**mandarin**	**TACLE**	CREA-OFA	CREA-OFA
mandarin	**IONIO**	Russo G. Caruso M.	CREA-OFA	**ornamentale (hybrid arancio dolce)**	**ARCOBAL**	Recupero S., Russo G.	CREA-OFA
mandarin	**RED SUNSET**	Caruso M. Russo G.	CREA-OFA	**grapefruit**	**BELLINI**	Russo G. Licciardello C. Caruso M. Caruso P.	CREA-OFA
mandarin	**SUN RED**	Russo G. Licciardello C. Caruso P.	CREA-OFA	**rootstock (citrus hybrid e poncirus)**	**F16 P12**	Russo G. Recupero S.	CREA-OFA
OTHER FRUIT SPECIES	*Denomination*	*Authors*	*CREA research Centres*	*OTHER FRUIT SPECIES*	*Denomination*	*Authors*	*CREA research Centres*
apricot	**ISCHIA**	Pennone F.	CREA-OFA	**pear**	**TURANDOT**	Rivalta L.	CREA-OFA
apricot	**PROCIDA**	Pennone F.	CREA-OFA	**peach**	**ADAMI-NATASHA**	Fideghelli C. Della Strada G.	CREA-OFA
strawberry	**AGNESE**	Sbrighi P. Baruzzi G. Faedi W.	CREA-OFA	**peach**	**ALIBLANCA**	Liverani A.	CREA-OFA
strawberry	**ARGENTERA**	Faedi W. Baruzzi G. Sbrighi P.	CREA-OFA	**peach**	**ALICE COL**	Liverani A. Giovannini D.	CREA-OFA
strawberry	**BRILLA**	Faedi W. Baruzzi G. Sbrighi P.	CREA-OFA	**peach**	**ALIPERSIE'**	Liverani A.	CREA-OFA
strawberry	**CALLAS**	Sbrighi P. Faedi W. Baruzzi G.	CREA-OFA	**peach**	**ALIROSADA**	Liverani A.	CREA-OFA

strawberry	**CRAPO 135**	Faedi W. Baruzzi G. Sbrighi P.	CREA-OFA	peach	**ALITOP**	Liverani A.	CREA-OFA
strawberry	**GARDA**	Faedi W. Baruzzi G. Sbrighi P.	CREA-OFA	peach	**AUTUNNO**	Fideghelli C. Della Strada G.	CREA-OFA
strawberry	**IRMA**	Faedi W. Baruzzi G.	CREA-OFA	peach	**CORNELIA**	Cutuli M. Terlizzi M. Sartori	CREA-OFA
strawberry	**JONICA (2)**	Faedi W.Sbrighi P.Baruzzi G.	CREA-OFA	peach	**GILDA ROSSA**	Nicotra A. Moser L.	CREA-OFA
strawberry	**LIA**	Faedi W.Baruzzi G.	CREA-OFA	peach	**GRETA**	Nicotra A. Moser L.	CREA-OFA
strawberry	**PIRCINQUE (2)**	Faedi W., Baruzzi G.	CREA-OFA	peach	**LIVIA**	Cutuli M. Terlizzi M. Sartori A.	CREA-OFA
strawberry	**TECLA**	Faedi W., Baruzzi G.	CREA-OFA	peach	**LOLITA**	Nicotra A. Moser L.	CREA-OFA
raspberry	**ALPENGOLD**	De Salvador F. R. Pititto A. Gadler L.	CREA-OFA	peach	**LUCILLA**	Cutuli M. Terlizzi M. Sartori A.	CREA-OFA
raspberry	**ERIKA (2)**	De Salvador F. R. Pititto A. Gadler L.	CREA-OFA	peach	**MARILYN**	Nicotra A. Moser L.	CREA-OFA
raspberry	**ROME BRIGHT**	De Salvador F.R., Proietti G., Puleo P., Engel P.	CREA-OFA	peach	**ORION**	Fideghelli C. Della Strada G.	CREA-OFA
raspberry	**RUBYFALL**	De Salvador F. R. Pititto A. Gadler L.	CREA-OFA	peach	**PIATTAFORONE**	Giovannini D. Liverani A.	CREA-OFA
apple	**CREA 105**	Baruzzi G. Faedi W. Bergamaschi M.	CREA-OFA	peach	**PIATTAFORTWO**	Giovannini D. Liverani A.	CREA-OFA
apple	**FORLADY**	Baruzzi G. Faedi W. Bergamaschi M.	CREA-OFA	peach	**ROME STAR**	Fideghelli C. Della Strada G.	CREA-OFA
apple	**GOLDEN ORANGE**	A.Bergamini	CREA-OFA	peach	**SAGITTARIA**	Insero O.	CREA-OFA
pear	**AIDA**	Rivalta L.	CREA-OFA	peach	**VENUS**	Fideghelli C. Della Strada G. Liverani A	CREA-OFA
pear	**BOHEME**	Rivalta L.	CREA-OFA	routstocks (*melograno non pollonifero*)	**PJERED ONE**	Preka P. Cherubini S.	CREA-OFA
pear	**CARMEN**	Rivalta L.	CREA-OFA	routstocks (*susino - affine per pesco*)	**PENTA**	Nicotra A. Moser L.	CREA-OFA
pear	**CREA 194**	Baruzzi G.Faedi W.Rivalta L.Sirri S.	CREA-OFA	routstocks (*susino - affine per pesco*)	**TETRA**	Nicotra A. Moser L.	CREA-OFA
pear	**FALSTAFF**	Faedi W. Sirri S. Rivalta L.	CREA-OFA				

Services

Certificatios

Products/main topics	*Denomination/Description*	*Person in charge*	*CREA research Centres*
strawberry	**Strawberry certification service** Activity related to the production of certified strawberry plants in Veneto	G.Baruzzi	CREA-OFA
strawberry	**Strawberry certification service.** Contract for the realization of the genetic-sanitary certification service of the plant propagation material of the strawberry (Malga and Scala varieties).	G.Baruzzi	CREA-OFA
fruit and eucalyptus	**Examination Office for PVR, fruit and eucalyptus** DUS-tests on behalf of CPVO (peach, plum, kiwi, pistachio, eucalyptus), GEVES (plum), Italian Ministry for Agriculture (peach).	F. Gervasi , e G. Pignatti	CREA-OFA CREA-FL

Collections

Products/main topics	*Denomination/Description*	*Person in charge*	*CREA research Centres*
citrus	**Citrus germplasm collection** The CREA citrus germplasm collection consists of about 700 accessions belonging to the Genus Citrus and to related Genera, grown in open field and screenhouses.	G. Russo, M. Caruso P.Caruso , C. Licciardello	CREA-OFA
anona and avocado	**Anona and avocado collection .** contains about 20 selections, 8 of which are anone .	G. Russo, G.Cicciarello	CREA-OFA
cherry apricot apple pear peach almond plum stone chestnut walnut, nashi, rowan, quince, sour cherry, kaki, pomegranate avocado etc	**Fruit collection at the experiemental farm in Pignataro Maggiore, Caserta.** The Caserta varietal collection is maintained outdoors, in the Area Nova farm in Pignataro Maggiore (CE), and consists of over 1,200 accessions (cultivars and accessions of the local germplasm) of cherry, apricot, apple, pear, peach, almond, plum, stone, chestnut and walnut, but also minor fruit species (nashi, rowan, quince, sour cherry, kaki, pomegranate, Japanese medlar, medlar, prickly pear and fig) and tropical ones (avocado and feijoa)	M. Petriccione, A. De Luca	CREA-OFA
cherry strawberry, apple, pear, peach and nectarine	**. Fruit and strawberry varietal collection at the experiemental farm in Magliano, Forlì** The collection gathers around 1230 accessions between modern and traditional varieties of cherry, strawberry, apple, pear, peach and nectarine. About 200 accessions are also present in vitro, under slow growth conditions..	D.Giovannini, G. Baruzzi	CREA-OFA
peach	**Peach RefPop.** Peach reference collection, consisting of 400 accessions comprising varieties and progenies. It contains and gathers the biodiversity existing in the species, coming from the collections of various European institutions (INRA, IRTA, University of Milan, CREA). The collection is shared at European level with 'copies' in different sites: Greece, Spain (2 locations) and Italy (2 locations). At CREA-OFA in Rome, the varietal collection without progenies is maintained.	S. Micali	CREA-OFA
peach, plum, apple, pear, apricot, cherry and others	**In vitro collection of fruit species in the frame work of the RGV-FAO Program .** In vitro conservation in slow growth condition of more than 80 fruit autochtonous varieties of peach, plum, apple, pear, apricot, cherry and others..	E. Caboni, S. Lucioli, S. Monticelli	CREA OFA
complex biological and ecological processes	**Long term experiment in organic management "Maintenance of organic orchands - MAIOR"** "MAIOR" "MAIOR" is the long-term experiment (LTE) in organic farming of the Research Centre for Olive, Fruit and Citrus Crops in Rome. MAIOR represents a "Living Laboratory" of agroecology and organic agriculture and can be considered a patrimonial research center that allows the long-term study of the complex biological and ecological processes on which the functioning of the cultivation system is based. MAIOR is part of the LTEs network of the Council for Agricultural Research and Economics (CREA).	D. Ceccarelli	CREA OFA
pome fruit, stone fruit, dried fruit, small fruit, subtropical species); peach, apricot, walnut, hazelnut, raspberry and blueberry.	**Centro Nazionale Germoplasma Frutticolo (CNGF).** The Rome location hosts the National Centre of Fruit Germoplasm (CNGF) on an area of **30 ha**, established in 2001 with funding from MiPAAF. Currently, it preserves over 5,000 accessions of over twenty species of fruit trees (pome fruit, stone fruit, dried fruit, small fruit, subtropical species). In Rome there are also multivarietal collections of modern varieties of peach, apricot, walnut, hazelnut, raspberry and blueberry.	I.Verde	CREA- OFA

Technical panels/working groups/institutional partnerships

Products/main topics	*Denomination/Description*	*Person in charge*	*CREA research Centres*
biodiversity	**FAO National Focal Point State of the World's Biodiversity for Food and Agriculture**	I. Verde	CREA-OFA
sweet and sour cherry	**Sweet and sour cherry Working Group nel Network Europeo EUFRIN (European Fruit Research Institutes Network)** European researcher network aimed to promote joint research actions on the evaluation of sweet cherry varieties	D. Giovannini	CREA- OFA
corroborants	**Steering committee on Plant Strenghteners - Italian Ministry of Agricultural, Food and Forestry policies (MiPAAF)** The committee has adisory functions at Italian level on regulation about placement on the market of plant strenghteners in organic farming.	G. Roccuzzo	CREA-OFA
propagating material for fruit trees	**MiPAAF -Permanent working group for plant protection - Propagating material for fruit trees, vegetables and ornamental plants.** Technical body with consultative and proactive tasks for seeds and plant propagating materials sector.	D. Ceccarelli, M. Cutuli, G.Baruzzi, M.Caruso	CREA- OFA
peach, apricot	**Apricot and Peach Working Group nel Network Europeo EUFRIN (European Fruit Research Institutes Network)** - Network of European researchers aimed to promote joint research actions on evaluation of apricot and peach varieties and rootstocks.	D. Giovannini	CREA- OFA
plant genetic resources	**FAO National Focal Point - Intergovernamental Technical Group on Plant Genetic Resources for Food and Agriculture (ITWG-PGR).**	I. Verde	CREA- OFA
plant genetic resources	**FAO- National Focal Point - Commission on Genetic Resources for Food and Agriculture (CGRFA)**	I. Verde	CREA- OFA
plant genetic resources	**FAO-National Focal Point International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)**	I. Verde	CREA- OFA
plant genetic resources	**Berry Working Group nell'ambito del Programma Europeo per le Risorse Genetiche**	G.Baruzzi	CREA- OFA

plant genetic resources	**Prunus Working Group nell'ambito del Programma Europeo European Community Programme for Genetic Resources**	D. Giovannini	CREA- OFA
integrated systems	**Accademia dei Georgofili- Working Group** "Integrated systems "Livestock, crop, forestry"	A.Rosati	CREA- OFA
fruit species	**CPVO Examination Offices Meeting**- Technical working group involving all Technical Liason Officers of the european Examination Offices.	F. Gervasi	CREA- OFA
fruit species	**CPVO Fruit Expert Meeting**- Technical working group involving all the responsible for DUS technical examination (fruit species) of UE	F. Gervasi	CREA- OFA
ornamental species	**CPVO - Ornamental Expert Meeting-** Technical working group involving all the responsible for DUS technical examination (ornamental species) of UE.	F. Gervasi, G. Pignatti	CREA-OFA - FL
apple and pear varieties and rootstock	**Apple and pear variety and rootstocks testing Working Group in the Eurpean Fruit Research Institutes Network (EUFRIN-**European researcher network to joint research actions on the evaluation of apple and pear varieties and rootstock	G. Caracciolo	CREA-OFA

2.5 VEGETABLE AND ORNAMENTAL CROPS. NURSERY

The horticultural sector is characterized by highly intensive production processes: at the European level, productions generate about one quarter of the value of agricultural production, harvested on 3% of the whole agriculturalturasly used surface. The sector covers a very high variability in terms of species, products and uses. While food crops play an important role for nutritional and health aspects linked to the consumption of fresh products while presenting particular problems of conservation and transport, ornamental species, important for hedonistic aspects, are particularly affected by fluctuations of economic cycles. For both sectors, the intensification of crops both in protected cultivation and in the open air represents a challenge for environmental sustainability in agricultural production, to be addressed at a multidisciplinary and integrated level. CREA conducts research aimed at improving production, both from a quantitative and qualitative point of view, with particular attention to approaches based on innovative technologies and methodologies, which also promote environmental and economic sustainability.

Breeding, both through classic/participatory and innovative approaches and based on genomics and genome editing, is the main tool to introduce resistance/tolerance to biotic and abiotic stresses and enhance the quality of productions. The projects active in 2020 mainly relate to tomatoes, peppers, aubergines, asparagus and basil. They also aim to select new genotypes suitable for organic cultivation. At the same time, emphasis is put on the recovery, conservation, characterization and enhancement of genetic resources of agricultural interest.We also carry out studies focusing on the increase of sustainability of greenhouse and open field crops, through the optimization of fertigation and the promotion of environmentally friendly crop protection methods, to reduce chemical inputs. Aspects related to microbial fertility and soil pathogens are also evaluated. These goals are also pursued through advanced decision support systems such as the use of sensors, digital technologies and forecasting models. Sustainable use of water is promoted not only through the optimization of fertigation but also through studies related to the possibility of water reuse, even if of low quality (e.g. high salinity), through closed-cycle soilless systems in protected cultivation or, in the open field, through agricultural systems management models that envisage the recovery and reuse of rainwater, favoring its infiltration into the soil by living mulch. This results in the reduction in runoff which at the same time also protects the esource "soil" by limiting erosion. Soil quality is also promoted through the use of different composts, such as those obtained from pomace or solid digestate obtained from the transformation of buffalo manure into biogas for energy production. The valorization of these wastes not only improve soil fertility by increasing the organic matter content and enhancing soil microbial biodiversity, which has a suppressive effect with respect to specific pathogens, but also uses strategies in accordance with the implementation of agricultural systems based on circular economy. The improvement of environmental sustainability, both in the horticultural and nursery sectors, is also pursued by studying innovative plant technologies to reduce energy costs for heating greenhouses and evaluating the possibility of using new materials as growing substrate.As regards organic farming, a long-term experimental trial is active at the Monsampolo del Tronto branch of the Center for Vegetable and Ornamental Crops, where both research and dissemination activities are carried out for the sake of the scientific community, the general public and policy makers. Organic agronomic systems are also being investigated at the Metaponto branch of the Center for Agriculture and the Environment, with conducts studies on agrotechnics, intercropping, fertilization, and weed management.

In the floricultural sector, particularly interesting are the studies aimed at the use of flowers in human nutrition, which explore the organoleptic and nutritional characteristics, the microbiological and toxicological safety, as well as the use for the preparation of transformed products. From the naturalistic point of view, important is the activity carried out for the protection of spontaneous populations of orchids at risk of extinction, in order to counteract their current decline.

2.5.1 Research and research products – Vegetable and Ornamental crops. Nursery

Products/ main topic	Acronym and Research Title	Aims	Person in charge and CREA Centres	Partnership/ Financing Body	Scientific Publications	Other Research products [1]
RED GARLIC	**AGLIOSANO** Phytosanitary requalification of two varieties of Aglio Rosso in Lazio.	Restoration, from a phytopathological standpoint, of native varieties of Aglio Rosso di Proceno e Castelliri through: monitoring, treatment of pathogeneic fungi, and in vitro virus elimination.	A. Taglienti	ARSIAL		
MINOR CROPS	**DIVERIMPACTS** Diversification through Rotation, Intercropping, Multiple cropping, Promoted with Actors and value-Chains Towards Sustainability.	Studio per potenziare la diversificazione colturale nelle aziende attraverso lo strip cropping e l'introduzione di colture minori per favorire la creazione di nuove catene di valore.	G.Campanelli, **CREA-OF** CREA-AA CREA-CI, CREA-PB	Istituzioni internazionali e Commissione europea2		
VARIOUS CROPS	**ABC** Campania AgroBiodiversity: propagation, consarvation and characterization of autochthonous herbaceous plant genetic resources.	1. to multiply and to store in situ and ex situ herbaceous local plant varieties of Campania Regione; to characterize them at morphophysiological, agronomical, biochemical/chemical/nutritional and molecular level; 3. set-up a public database containing all the information about characterization results; 4. expand knowledge about italian and european legislation and databases available on vegetable biodiversity (Concertation action); 5. dissemination of all the results obtained with the project (Accompanyingazione action).	M. Zaccardelli, CREA- OF CREA- DC	Regione Campania		4 Research Fellowships.
EDIBLE FLOWERS	**ANTEA** Edible flowers: innovation for the development of a cross-border supply chain.	Sviluppare la filiera dei fiori eduli.	B. Ruffoni, CREA- OF	EPLEFPA Antibes - CREAM Nice - Université Mont Blanc Chambéry	Marchioni I, Colla L, Pistelli La, Ruffoni B, Tinivella F, Minuto G. 2020 Different growing conditions can modulate metabolites content during post-harvest of Viola cornuta edible flowers. Advances in horticultural sciences 34 (1S), 61-69 - Copetta A, Marchioni I, Mascarello C, Pistelli L, Cambournac I, Dimita R, Ruffoni B. Polianthes tuberosa as edible flower: in vitro propagation and nutritional properties. International Journal of Food Engineering 6(2):57-62 - Marchioni I, Pistelli la, Ferri B, Copetta A, Ruffoni B, Pistelli Lu, Najar B (2020). Phytonutritional content and aroma profile changes during postharvest storage of edible flowers. Frontiers in Plant Science 11, 590968 doi: 10.3389/fpls.2020.590968 - Lucarini M, Copetta A,	www.interregantea.eu

[1] *prototypes; dissemination activities (conferences, seminars, reports, sites and videos, etc.); training activities (scholarships, research grants and PhD scholarships)*

2 FRANCIA - INRA, AGROSOLUTION; ROMANIA - AIDER; OLANDA - ERF; SVIZZERA - BA, FiBL; POLAND - PZ, IUNG PIB; BELGIO - BIOFORUM, CRA W, INAGRO; SVEZIA - HS; ITALIA - CREA, FEDERBIO; GERMANIA - CALS; INGHILTERRA - LEAF, ORC; UNGHERIA - OMKI/

					Durazzo A, Gabrielli P. Lombardi-Boccia G, Lupotto E, Santini A, Ruffoni B (2020) A snapshot on food allergies a case study on edible flowers. Sustainability, 12, 8709 doi: 10.3390/su12208709- Drava G, Iobbi V, Govaerts R, Minganti V, Copetta A, Ruffoni B, Bisio A (2020) Trace elements in edible flowers from Italy: further insights into health benefits and risks to consumers. Molecules 25, 2891; doi:10.3390/molecules25122891 - Marchioni I, Najar B, Ruffoni B, Copetta A, Pistelli Lu, Pistelli La (2020). Volatilomic analysis of four edible flowers from Agastache genus. Molecules, 24:4480-1 Italian / French recipe book - 50 posters of the activities carried out - participation in various international conferences - 40 fact sheets on edible flowers - propagation and cultivation protocols - nutritional and qualitative characteristics - 4 position papers sulle pagine WEB.	
EDIBLE FLOWERS	**BIOFIORI**	Food processing from edible flowers.	B. Ruffoni, CREA- OF	Liguria Region		
FLOWERS, TREES	**VERDECITTÀ** The renewal of trees in the cities - Green, Beauty and Health: The Made in Italy of Italian Nursery.	Improving the perception of the importance of urban greenery in cities by municipal administrations and citizens.	G. Burchi, CREA-OF	MIPAAF		
FLOWERS HISTORIC GARDENS	**MONVER Green world**	Training in the green supply chains: ornamental crops - garden maintainance - historic garden - landscaping.	B. Ruffoni, CREA- OF	INRA Villa Thuret Antibes - EPLEFPA Antibes - CFPPA Savoie - GIP Fipam Nice/**European Commission**		
EGGPLANTS	**WAKE-APT** Seed WAKE-up with APTamers: a new technology for dormancy release and improved seed priming strategy.	Develop new protocols for seed priming, new tools to quantify germination aptitude and molecular markers for the early discrimination of good quality seed lots.	L.Toppino, **CREA-GB** CREA-CI	Cariplo Foundation	Forti C, Ottobrino V, Bassolino L, Toppino L, Rotino GL, Pagano A, Macovei A, Balestrazzi A.Molecular dynamics of pre-germinative metabolism in primed eggplant (Solanum melongena L.) seeds. Horticulture Research, 2020, 1;7:87. doi: 10.1038/s41438-020-0310-8.	
EGGPLANTS, SECONDARY METABOLITES	Industrial supply chains-secondary metabolites (flavonoids, carotenoids).	Epigenetic mechanisms for adaptation to stress.	L. Bassolino, **CREA-CI** CREA-GB		Moglia A, Florio FE, Iacopino S, Guerrieri A, Milani AM, Comino C, Barchi L, Marengo A, Cagliero C, Rubiolo P, Toppino L, Rotino GL, Lanteri S, Bassolino L. Identification of a new R3 MYB type repressor and functional characterization of the members of the MBW transcriptional complex involved in anthocyanin biosynthesis in eggplant (S. melongena L.). PLoS One, 2020, 15(5):e0232986. doi: 10.1371/journal.pone.0232986.	
SPONTANEOUS ORCHIDS	**LIFE-Orchids** Improving the conservation status of critically endangered orchid communities in selected	To undertake orchid reinforcement and reintroduction in two different geographic and ecological contexts in North-Western Italy, namely, the Regional Park of Portofino in Liguria and the	A. Giovannini, CREA-OF	Czech Union for Nature Conservation (ČSOP)/**European Commission**		

	habitats in Northwestern Italy	Regional Park of Po and Orba in Piedmont. To establish within both Parks "orchid micro-reserves" OMRs given over to long-term monitoring of orchids and associated vegetation types. To provide enduring protection of orchid communities in the project areas through management and land purchase. To expand the surface area of the target habitat in both Parks by selective shrub-clearing, tree cutting, elimination of invasive alien species and sowing of typical species. To draw up propagation protocols for nine endangered orchid species. To encourage other stakeholders, Natura 2000 site managers and professional conservationists, to use the techniques and methods demonstrated in the project. To implement land stewardship approaches with local landowners and farmers. To increase community awareness and public engagement on the importance of the target habitats, SCIs and local orchid species..				
VEGETABLES	**RIADAg** Reduction of the agriculture environmental impact by disseminating the agrobiodiversity..	To transmit the knowledge and the eco-friendly cultivation techniques regarding the autochthonous vegetables ecotypes cultivated into the agro acerrano-mariglianese district in Campania Region.	M.Zaccardelli, CREA OF	Campania Region		
VEGETABLES	**ASPASS** Innovazione varietale e colturale per un'ASPAragicoltura Siciliana sostenibile di Successo.	Trasferimento alle aziende coinvolte nel progetto di innovazione varietale, di protocolli sostenibili di coltivazione e caratterizzazione biochimica dell'*Asparagus officinalis L.*	G. Rotino, **CREA-GB** CREA-DC	Sicilian Region		
VEGETABLES	**FERTORT** Fertilizzanti in rotazioni di lungo periodo.	Valutazione dell'efficacia agronomica potenziale di prodotti biostimolanti e/o ammendanti della ditta Tersan nelle condizioni pedologiche e climatiche dell'arco Ionico Metapontino, in rotazioni colturali orticole, e coinvolgimento attivo della ditta Tersan tra i portatori di interesse del progetto PERILBIO.	D. Ceccarelli, **CREA-OFA** CREA-PB, CREA-AA, CREA-OF CREA-ZA	TersanPuglia S.p.A.		
VEGETABLES	**HARMORESCOLL** Setting up an EU system for harmonized collections of reference isolates, controls and differentials to facilitate disease resistance testing.	Setting up of a reference material collection including pests and vegetable control varieties to be used in DUS (Distinguibility, Uniformity, Stability) resistence testing developed in variety registration and in breeding programs.	L. Sigillo, CREA- OF	GEVES-SNES (FR), Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA) (SP), Naktuinbouw (NL), European Seed Association (EU), Science and Advice for Scottish Agriculture (SASA) (UK), Bayer (NL), Enza Zaden (NL), HmClause (FR), Rijk Zwaan (NL), Sakata (FR/ Community Plant Variety Office/		

				European Commission)		
VEGETABLES	**MODELLI** Implementation of management models for the agriculture systems aimed to preserve the water resources.	Encourage the self-handling and the employment of different organic compounds (compost from olive wastes, compost teas and microorganisms accumulator) to be used for horticulture and olive growing.	M. Zaccardelli, CREA- OF	Campania Region		
VEGETABLES	**MODIFORTI** Models for protection of horticultural crops.	1) development and validation of predictive models; 2) development of an alert system on a territorial basis.	E. Marinelli, CREA-DC	Lazio Region		
VEGETABLES	**QUALIMEC** Improvement of quality properties in aubergine and artichoke using genome editing and dysgenesis approaches**.**	Improving the quality of eggplant and artichoke and resistence to wilt disease of eggplant..	A.Haegi, CREA-DC	MIPAAF		
ORGANIC VEGETABLES	**DIBIO sottoprogetto INSOBTEC** Defense of breeding and crops	Reduction of non-farm inputs for the defense of organic production through an agro-ecological approach bio-based technologies to support the production of organic vegetable seeds and management of mechanical interventions.	M. L. Manici, **CREA-AA**, CREA-IT	MIPAAF		
ORGANIC VEGETABLES	P**ERILBIO** Promotion and strengthening of long-term devices in organic farming systems.	Maintenance and scientific studies on organic long-term experiments.	D. Ceccarelli, **CREA-OFA** CREA-AA CREA-PB CREA-OF CREA-ZA	MIPAAF	Ciaccia C., Diacono M., Testani E., Fiore A., Farina R., Montemurro F., Canali S., Mele G., Ceccarelli. D. 2020. Participatory Action Research for the Co-design of a Long-Term Experiment: the Basilicata Case Study. XLIX Convegno Nazionale della Società Italiana di Agronomia, 16-18 settembre.	Technical days 31/8 1-2/9 2020 CREA-Metaponto (MT) 3 scholarships.2 research grants ricerca. Informative events: CREA BREAK https://www.youtube.com/watch?v=sJf6fCasf8Y&list=PLuHR_wWt4GLUk6_248FAjCvocgjYu60em&index=44
ORGANIC VEGETABLES	**BIOFORT** Development of novel methodologies for organic horticulture from the nursery to the field.	Setting up of innovative biological defence protocols applied to the cultivation of horticultural species in greenhouse, in Lazio Region.	M. Zaccardelli, CREA OF	Lazio Region		
ORGANIC VEGETABLES	**DIBIO** sottoprogetto **BIOPRIME**	Composti naturali e microorganismi per la difesa ed il PRIming di colture BIOlogiche Mediterranee.	V. Terzi **CREA-GB**, CREA-AA VE, ZA	MIPAAF		
ORGANIC VEGETABLES	**GREENRESILIENT** Organica and biodynamic vegetable production in low-energy GREENhouse-sustainable RESILIENT and innovative food production systems.	Approccio agroecologico alla produzione biologica in serra, nelle differenti regioni europee, per la realizzazione di agroecosistemi solidi, adattati alle differenti condizioni climatiche, produttivi e sostenibili da un punto di vista economico ed ambientale.	F. Tittarelli **CREA-AA** CREA-CI	MUR	Tittarelli F. (2020) Organic Greenhouse Production: Towards an Agroecological Approach in the Framework of the New European Regulation—A Review. Agronomy, 10, 72; doi:10.3390/agronomy10010072 Tittarelli F., Alsanius B.W., Kemper L., Koefoed Petersen K., Willekens K. (2020) GREENRESILIENT – applying agroecology to organic greenhouse production. Acta Hortic. 1296. ISHS 2020 DOI 10.17660/ActaHortic.2020.1296.139. Proc.Int.Symp.	

					On Advanced Technologies and Management for Innovative Greenhouses – GreenSys 2019. Eds: P.E. Bournet et al.: 1099 - 1105	
ORGANIC VEGETABLES	**SUREVEG** Core Organic "Strip-cropping and recycling of waste for biodiverse and resoURce-Efficient intensive VEGetable production".	Verificare l'efficacia agronomica di compost vegetali in un contesto di coltivazione a strisce in ambiente di coltivazione con il metodo biologico.	G. Campanelli **CREA-OF** CREA AA	**European Commission** 1		
ORGANIC VEGETABLES	I**NNOVABIO** Application of innovative methods for the traceability of organic farming products.	Developing of a protocol for the traceability of organic production compared to conventional ones .	S. Fabroni, **CREA-OFA** CREA-OF CREA.AA	MIPAAF		
PROTECTED VEGETABLE	**FERTISELE** Sustainable management of fertility at Piana Sele Valley regarding the conventional and IV gamma organic production processes under greenhouse, by employing high quality soil organic improvers derived from the local zootechnical sector.	Promote the development of circular economy concept based on the set up of high value digested manure to be employed into the biogas production. Moreover, efforts will be placed in the vermicompost manufacturing to be used in protected horticulture alone or in combination with traditional cultivation techniques (i.e., solarization and cover crops), with the final goal to reduce the soil stress and to support the horticultural productions.	M. Zaccardelli, CREA OF	Campania Region		
HORTICULTURE AND AROMATIC SPECIES	**BIO4FOOD** High quality and nutrient rich food through crop waste-derived biostimulant and biopesticide.	Valorizzazione di biomasse di scarto/residui di piante orticole e aromatiche attraverso la produzione di biostimolanti, biopesticidi e biofertilizzanti da impiegare in agricoltura biologica.	M. Diacono, CREA-AA	**European Commi** 2		
HORTICULTURE, FLOWER AND AROMATIC SPECIES	**RGV/ORFLORA** Three-year program 2020-2022 for the conservation, characterization, use and enhancement of plant genetic resources for food and agriculture" - "Recovery, conservation and enhancement of horticultural, flower and aromatic species" -	Conservation, characterization, use and valorization of horticultural, floricultural and aromatic genetic resources for food and agriculture.	N. Ficcadenti CREA-OF	MIPAAF	Guijarro-Real C, Navarro A, Esposito S, Festa G, Macellaro R, Di Cesare C, Fita A, Rodríguez-Burruezo A, Cardi T, Prohens J, Tripodi P* (2020) Large scale phenotyping and molecular analysis in a germplasm collection of rocket salad (*Eruca vesicaria*) reveal a differentiation of the gene pool by geographical origin. Euphytica 216:53	
HORTICULTURE AND FLOWER SPECIES	**AGRIDIGIT Agrofiliere** Integrated digital technologies for the sustainable reinfocement of agrifood yields.	Improved digital and mechatronic applications for vegetable and ornamental produce chains.	C. Pane, CREA-OF CREA-IT	MIPAAF		

1 DANIMARCA - Aarhus University (AU-FOOD); BELGIO - Institute for Agricultural and Fisheries Research (ILVO); OLANDA - Louis Bolk Institute (LBI); OLANDA - Wageningen University (WU); FINLANDIA - Natural Resources Institute Finland; SPAGNA -Centre for Automation and Robotics (CAR)/ ***European Commission***

2 Ghent University/Fac of Bioscience Engineering/Horticell lab; Faculty of Bioscience engineering / Department of Plants and Crops - Belgium (Coordinatore) ILU - Institute for Food and Environmental Research - Germany Abdelmalek Essaadi University, Faculty of Sciences and Techniques of Tangier (FSTT) Department of Biology- Morocco CICERO Center for International Climate Research - Norway/**European Commission**

HORTICULTURE AND FLOWER SPECIES	**SUBSED** Sustainable substrates for agriculture from dredged remediated marine sediments: from ports to pots.	To demonstrate the suitability of phytoremediated dredged sediment to be reused as a growth substrate for the cultivation and the production of ornamental and food crop species.	S. Nin, CREA-OF	Università di Miguel Hernandez de Elche (Orihuela, Spagna); Caliplat Viveros s.l. (Murcia, Spagna)/**European Commission**	Tozzi et al. (2020). Il sedimento marino per i nuovi substrati. Colture Protette, 8: 48-51.	
PEPPERS	**G2P-SOL** Linking genetics resources, genomes and phenotypes of solanaceous crops	Genomics, phenomic and breeding for valorization of genetic resources in pepper.	P. Tripodi, CREA- OF CREA-GB	**European Commission** 1		
ORNAMENTAL PLANTS	**INTRAVIVA** Creare valore aggiunto per il settore regionale delle piante ornamentali, tramite l'introduzione di innovazioni tecnologiche e di processo nella fase post-produzione di confezionamento e trasporto di prodotti vivaistici.	Migliorare le condizioni di trasporto di piante ornamentali a media e lunga distanza al fine della conservazione della qualità del prodotto ornamentale durante il trasporto.	G. Burchi, CREA-OF	Regione Toscana	F.Mencarelli, R.Cerreta, A.Bellincontro, G.Burchi, M. Begliomi, 2020. Trasporti oltre oceano:innovare per ridurre lo stress delle piante. Il FLoricultore 9: 44-47	
TOMATOES	**iGUESS-MED** Innovative Greenhouse Support System in the Mediterranean Region: efficient fertigation and pest management through IoT based climate control.	Developing, validating and transferring an pioneering Decision Support System (DSS) for the Mediterranean tomato greenhouses.	A. Navarro Garcia, CREA-OF	Università di Almeria (Spagna) Fundacion CAJAMAR (Spagna), Grupo La Caña (Spagna), Centre Régional des Recherches en Horticulture et Agriculture Biologique (Tunisia) Akedniz University (Turchia)/**European Commission**		2 Research Fellowships.
TOMATOES	**IMODDUS**	Gentotipizzazione tramite SNP varietà di pomodoro.	R. Bravi, CREA-DC	Naktuinbouw (NL)-GEVES (F)-NEBIH (H)- DGAV (P)-COBORU (Poland)DUS centre of MOA (China)-KSVS(republic of Korea)-MAFF (Japan)/CPVO		Kick- off meeting- Scelta varietà,invio campioni,estrazione DNA

1 WAGENINGEN (The Netherlands), THE JAMES HUTTON INSTITUTE (United Kingdom), THE HEBREW UNIVERSITY OF JERUSALEM (ISRAEL), LEIBNIZ - INSTITUT FUER PFLANZENGENETIK UND KULTURPFLANZENFORSCHUNG (Germany), UNIVERSITAT POLITECNICA DE VALENCIA (Spain), UNIVERSITA DEGLI STUDI DI TORINO (Italy), INRA (France), THE VOLCANI CENTRE (ISRAEL), Eurice (Germany), INSTYTUT HODOWLI I AKLIMATYZACJI ROSLIN (Poland); CENTRO INTERNACIONAL DE LA PAPA (Perù), PHENOMNETWORKS LTD (Israel), MARITSA VEGETABLE CROPS RESEARCH INSTITUTE(Bulgaria), ASIAN VEGETABLE RESEARCH AND DEVELOPMENT CENTER (Taiwan), BLUMEN GROUP SPA (Italy), Sativa (Italy)/ **European Commission**

TOMATOES	**LIVESEED** Improve performance of organic agriculture by boosting organic seed and plant breeding efforts across Europe.	Participatory tomato breeding.	G. Campanelli e S. Sestili, **CREA-OF** CREA-ZA	**European Commission** 1		1 Degree thesis.
TOMATOES	**EXCALIBUR** Exploiting the multifunctional potential of belowground biodiversity in horticultural farming.	Migliorare la resistenza delle colture (pomodoro, melo, fragola) a stress biotici/abiotici mediante bioinoculi microbici multifunzionali realizzati in funzione della biodiversità nativa del suolo.	S.Mocali, **CREA-AA** CREA-IT CREA-PB	**European Commission** 2	http://doi.org/10.3389/fmicb.2020.01904;2.http://doi.org/10.3389/fpls.2020.535005;3.https://zenodo.org/record/4262470#.YBQZIOhKiUk;.http://doi.org/10.3390/microorganisms8111655;5.http://doi.org/10.3389/fpls.2020.01068;.http://doi.org/10.3390/microorganisms8101506; http://doi.org/10.1186/s407930200364;.http://doi.org/10.3389/fpls.2020.00270;9.https://doi.org/10.1534/g3.119.400716;10.DOI10.36959/718/603;https://doi.org/10.1093/femsec/fiaa119	Main events: European Geoscience Union (EGU) General Assembly, May 2020; CREA- Italian Society of Soil Science - School of Soil Biodiversity and Bioindication, 'Exploring the native soil biodiversity to promote crop productivity and sustainability' June 17th 2020.
TOMATOES	**BIOTECH CISGET** Cisgenesis and genome editing in tomato.	Application of cisgenesis and genome editing in tomato breeding (abiotic and biotic stress; quality)	A. Nicolia, **CREA-OF** CREA-GB	MIPAAF		3 Research Fellowships.
BIOLOGICAL TOMATOES	**BRESOV** Breeding for Resilient, Efficient and Sustainable Organic Vegetable production.	Breeding for sustainable food production in tomato.	P. Tripodi, **CREA-OF** CREA-IT, CREA-CI	**European Commi** 3	S. Esposito, T.Cardi, G. Campanelli, S.estili, M. J.Díez, S. Soler, J.Prohens, P. Tripodi* (2020) ddRAD sequencing-based genotyping for population structure analysis in cultivated tomato provides new insights into the genomic diversity of Mediterranean 'da serbo' type long shelf-life germplasm. Horticulture Research 7 (134) 1-14	1 Research Fellowship.
TOMATOES AND POTATOES	**PHYLIB - 3**	The biology and epidemiology of '*Candidatus* Liberibacter solanacearum' and potato phytoplasmas and their contribution to risk management in potato and other crops.	V. Ilardi, S. Bertin, CREA-DC	*SASA (GB); AGES (AT); FPS (BE), ANSES (FR); VNIIKR (RU); CFIA (CA), MOA (CY); UKUZ (CZ); UNIBO (IT); PPCRI (TR); LAES (EE); ARO (IL), FN3PT (FR), MINPOLJ (RS); DAFM (IE); UWI (WI); UNIBL*		

1 IFOAM (Belgio), FIBL (Svizzera), AEGILOPS (Grecia), AGES (Austria), AGROLOGICA (Danimarca), AGROSCOPE (Svizzera), AREI (Lettonia), ATK (Ungheria), (BINGENHEIMER SAATGUT (Germania), BIONEXT (Olanda), BIOSELENA (Bulgaria), BNN (Germania), CULTIVARI (Germania), DE BEERSCHE HOEVE (Olanda), University of Wageningen (Olanda), FELDSAATEN (Germania), INRAE (Francia), ESAC (Portogallo), ITAB (Francia), IUNG (Polonia), VIVAS (Portogallo), LOUIS BOLK (Olanda), OMKI (Ungheria), ORC (Inghilterra), SATIVA (Germania), SEAE (Spagna), SEGES (Danimarca), NARDI (Romania), UBIOS (Francia), University of Evora (Portogallo), Unikassel (Germania), VITALIS (Olanda), Università di Valencia (Spagna)/**European Commission**

2 1) Research Institute of Horticulture (PL) 2) Research Centro ricerche produzioni vegetali soc. Coop. (IT) 4) Advisor Natural History Museum (UK) 5) Research NIAB East Malling Research (UK) 6) Research Kmetijski Institut Slovenije - Agricultural Institute of Slovenia (SI) 7) Research Università degli Studi di Torino (IT) 8) Research Koninklijke Nederlandse Akademie Van Wetenschappen (KNAW) (NL) 9) Research Kobenhavns Universitet (DK) 10) Research Technische Universitaet Graz 11) Research Inoculumplus (F) 12) SME Universidad de Granada (ES) 13) Research Intermag sp. z o.o. (PL) 14) SME NSF Euro Consultants (B) 15) SME Kompetenzzentrum Obstbau Bodensee (DE) 16) Extension service Fördergemeinschaft Ökologischer Obstbau e.V. (DE)**/ European Commission**

3 ROPEAN SEED ASSOCIATION (Belgium), UNIVERSIDAD DE ALMERIA (Spain), UNIVERSIDADE DE TRAS-OS-MONTES E ALTO DOURO (Portugal), RICP (Czechia), FIBL (Switzerlad), VEGENOV-BBV), France), THE UNIVERSITY OF LIVERPOOL (UK), UNIVERSITAT POLITECNICA DE VALENCIA (Spain), STATIUNEA DE CERCETARE DEZVOLTARE PENTRU LEGUMICULTURA BACAU (Romania), BEIJING ACADEMY OF AGRICULTURE AND FORESTRY SCIENCE (China), ZHEJIANG ACADEMY OF AGRICULTURAL SCIENCES (China), UNIVERSITE DE TUNIS EL MANAR (Tunisia), SERVICIO REGIONAL DE INVESTIGACION Y DESARROLLO AGROALIMENTARIO DEL PRINCIPADO DE ASTURIAS (Spain), PROSPECIERARA (Switzerland), INRA (France), TERRE D'ESSAIS (France), Eurice (Germany), UNIVERSITA POLITECNICA DELLE MARCHE (Italy), ITAKA SRL (Italy), UNIVERSITY OF CATANIA (Italy)/ **European Commission**

				(BiH); NHM (UK); CIP (EC); MPI (NZ)/ MPAAF **European Commissio**		
GREENHOUSE	**ALCOTRA INNOV** Innovation in the Mediterranean Alps.	Innovation in the mountain economy - thermal management of greenhouses	O. Arimondo, CREA-OF	Metropole Nice - CCI NIce - Communauté Riviera Francaise Nice - GECT Parc Mercantour/ **European Commission**		
GREENHOUSE/ bioeconomy	**AGROENER** Energia dall'agricoltura: innovazioni sostenibili per la bioeconomia.	Aumentare l'efficienza degli impianti di riscaldamento delle serre attraverso l'utilizzo di innovativi impianti di distribuzione del calore e di fonti energetiche alternative ai combustibili.	G. Burchi, **CREA-OF** CREA- IT CREA-DC CREA-AA CREA-CI CREA-OFA	MiPAAF	Fedrizzi, M., Terrosi, C., Cacini, S., Burchi, G., Cutini, M., Brambilla, M., Bisaglia, C., Pagano, M., Figorilli, S., Costa, C., Massa, D. (2020). Evaluation of Coaxial Pipes for Basal Heating as Alternative for Energy Saving in Heating System for Leafy Vegetables. International Mid-Term Conference of the Italian Association of Agricultural Engineering (pp. 603-610). Springer,Cham. Terrosi, C., Cacini, S., Burchi, G., Cutini, M., Brambilla, M., Bisaglia, C., Massa, D., Fedrizzi, M. (2020). Evaluation of compressor heat pump for root zone heating as an alternative heating source for leafy vegetable cultivation. Energies 13(3), 745	
ORMAMENTAL NURSEY	**AUTOFITOVIV** Good practices for self-control and sustainable phytosanitary management in ornamental nursery.	Development of phytopathological prevention and alert systems for the decrease the use of "chemical" plant protection products and for the management of the main phytoparasites borne by the nursery sector and management of phytosanitary emergencies related to extraordinary weather trends.	B.Nesi, **CREA-OF** CREA-DC	Toscana Region		Workshop "AUTOFITOVIV Project and and preview on the work done", 03/11/2020 (http://meeting.georgofili.it/eventi/accesso/9)

2.5.2 Patens and Services

Patents

INDUSTRIAL PATENTS

Products /main topics	*Denomination/Description*	*Authors/Inventors*	**CREA research Centres**
greenhouse	**Natural vetilation greenhouse (IT + MA + DZ + TN) Co-owner Opus et Vita firm**	L. Santonicola	CREA-OF

PLANT VARIETY RIGHTS - Vegetables species

Products	*Denomination/Description*	*Authors/Inventors*	**CREA research Centres**
helichrysum	**HYBCRAMAR4**	C. Cervelli	CREA-OF
melon	**NAD**	N. Ficcadenti, S. Sestili, G. Campanelli, A. Natalini	CREA-OF

CREA VARIETIES INCLUDED IN THE ITALIAN OFFICIAL LISTS- Vegetables species

Products	Denomination	CREA research Centres	Products	Denomination	CREA research Centres
asparagus	**Ercole**	CREA-GB	onion	**Marica**	CREA-GB
asparagus	**Eros**	CREA-GB	onion	**Monica**	CREA-GB
asparagus	**Franco**	CREA-GB	onion	**Morena**	CREA-GB
asparagus	**Giove**	CREA-GB	onion	**Morgana**	CREA-GB
asparagus	**Italo**	CREA-GB	fennel	**Chiarino**	CREA-OF
asparagus	**Vittorio**	CREA-GB	endive	**Ascolana**	CREA-OF
asparagus	**Zeno**	CREA-GB	eggplant	**Partena**	CREA-OF
asparagus	**Athos**	CREA-GB	eggplant	**Partenone**	CREA-OF
asparagus	**Marco**	CREA-GB	peppe	**Graffito**	CREA-OF
chard	**Sibilla**	CREA-OF	pepper	**Romital**	CREA-OF
cauliflower	**Noverde**	CREA-OF	pepper	**Vulcan**	CREA-OF
cauliflower	**Noviese**	CREA-OF	tomato	**Polluce 88-083**	CREA-OF
cauliflower	**Tardux**	CREA-OF	tomato	**SAAB CRA**	CREA-OF
chicory	**Monterosa**	CREA-GB	tomato	**Trasformi'**	CREA-DC
chicory	**Moreno**	CREA-GB	leek	**S.Giovanni 90**	CREA-OF
onion	**Borettana**	CREA-GB			

Services

Collections

Products/main topics	Description	Person in charge	CREA research Centres
cucurbitaceae , leguminoseae , solanaceae,etc	ABC.Maintenance of a collection of about 300 accessions of local cultivars of herbaceous species belonging to different botanical families including Leguminosae, Solanaceae, Cucurbitaceae and Graminaceae	M.Zaccardelli P. Tripodi	CREA-OF
pathogenic fungi and bacteria	Collection of pathogenic fungi and bacteria in long and short term storage	L. Sigillo	CREA-OF
vegetable crops species	Collection of 2500 accessions of vegetable crop species of agricultural interest	P. Tripodi	CREA-OF
asian and american species	Collection of 118 Hydrangea accessions among botanical, Asian and American species, as well as some hybrids and cultivars on the market	B. Nesi	CREA-OF
local varieties of herbaceous species	BANGECAR MANAGEMENT OF THE REGIONAL GERMOPLASM BANK AND CHARACTERIZATION OF LOCAL VARIETIES OF HERBACEOUS SPECIES FROM THE MARCHE REGION, PROJECT "BIODIVERSITY AND GENETIC RESOURCES - L.R. 12/2003" Maintenance of 486 accessions of autochthonous and susceptible to genetic erosion genotypes of different herbaceous species of agricultural interest	S. Sestili	CREA-OF

Other Services

Products/main topics	Description	Person in charge	CREA research Centres
Activities carried outfor third parties			
photovoltaic accumulators	**CNR ICCOM** Experimentation on the use of new photovoltaic accumulators for use in covered structures in nursery gardening.	D.Massa	CREA-OF
hemp	**ORNABIS.** Development of new hemp genotypes for ornamental purposes and study of propagation systems in vivo and in vitro.	G. Burchi	CREA-OF
green and purple cauliflower	**EARLY-CAV Genetic improvment of green and purple cauliflower-**Obtaining genetic material in selection for the production of pure lines of green and purple types of cauliflower for the constitution of F1 hybrids with precocity characteristics suitable for short cycles and autumn harvests	N. Ficcadenti	CREA-OF
ornamental crops- controlled release fertilizers	**ICFERT Controlled release fertilizers** Studies on the effects of controlled release fertilizers on the performance of potted ornamental crops	D. Massa	CREA-OF
compost, produzione e analisi di tè di compost e accumulatore di microrganismi	**CARPENATURAM.**Trasferimento dei metodi di produzione del tè di compost e degli accumulatori di microrganismi e loro analisi microbiologiche.	M. Zaccardelli	CREA-OF

content of compounds with nutraceutical and health benefits in fruit trees	**NUTRISALFRUTTI. Content of compounds with nutraceutical and health benefits in fruit trees-** Measurement of total anthocyanins, total phenols, resveratrol, simple sugars and organic acids in two table grape varieties grown under 4 different photomodulating protective cover sheets.	G. Mennella	CREA-OF
registered varieties and possible violations of exclusive rights of UE patented cultivars	**PRIVA LANTIPP** Evaluation of phenotypic morphological differences between 4 registered varieties of 4 ornamental species, of which the client company owns the exclusive rights, and 4 other varieties which are presumed to be the same registered varieties mentioned above, but sold by another company under another first name.	G. Burchi	CREA-OF
botanical gardens	**Framework Convention for Hanbury Gardens GBH-** Collaboration agreement between GBH and CREA-OF to work on the joint development of initiatives, scientific activities and research programs, including the organization of training courses and other activities of common interest	F. Monroy	CREA-OF
***Inula viscosa* in the production and protection of lettuce tomato spinach**	**INORT .** Study and evaluate the possible use of *Inula viscosa* extracts in the improvement of growth, production quality and protection of lettuce, tomato and spinach plants..	D. Prisa	CREA-OF
fungal and bacterial diseases	**DIAGO_19_20.** Diagnoses of fungal and bacterial diseases on *Dianthus* spp. and *Ranunculus* spp. to allow good practice of disease controls in farm	L. Sigillo	CREA-OF
cut flower hudrangea	**MiGeHydra 3 Genetic improvement of cut flower hydrangea.** Establish new genetic material of Hydrangea spp. for cut flower market through intra- and interspecific crossings and in vitro techniques.	B. Nesi	CREA-OF
various	**DIFARMA.** Experimental trials under controlled conditions on the effect of osmotic stress on the content of secondary metabolites in vegetable productions	D. Massa	CREA-OF
pesticides in watermelon and zucchini crops	**GS ANG-ZUC 20 - Study and dissemination actions aimed at reducing and optimizing the use of pesticides in watermelon and zucchini crops, and identifying good agronomic practices in order to preserve the environment and bees -** Definition of new guidelines for low impact watermelon and zucchini crops for bees	C. Pane	CREA-OF
industrial tomatoes	**IOF -Innovative agronomic techniques to raise the dry matter content and the brix degree of industrial tomatoes** Verify and transfer to the professional organizations of the tomato industry the results of scientific research relating to the agronomic management techniques with the aim of improving the quality of the raw material for industrial processing (brix ° and dry matter) through the adoption of innovative agronomic techniques	M. Parisi	CREA-OF
buttercup, cabbage and tomato	**CHABAMICRO - Evaluation of chabazitic zeolites with added microorganisms on ornamental and vegetable plants .** Assess the application of chabazitic zeolitites with added microorganisms in growing media for the improvement of the production quality of buttercup, cabbage and tomato..	D. Prisa	CREA-OF
Solanaceae	**ESARES_19_20. Evaluation of resistance to soil-borne fungal pathogens in genotypes of the genus *Solanum*** Resistance evaluation with standardized method, in controlled condition, of rootstocks of *Solanum torvum, S. aethiopicum, S. melongena x S. aethiopicum, S. sisymbriifolium* and *S. lycopersicum* and their hybrids to tracheoverticilliosis, fusariosis and *Pyrenochaeta lycopersici*.	L. Sigillo	CREA-OF
plant-derived substances and endophytic fungi	A**TTIVI.BIO Biostimulant activity of plant-derived substances and endophytic fungi on plants .** Evaluation of the biostimulatory activity of protein hydrolysates and endophytic fungi by in vivo and in vitro bioassays	M.T Cardarelli	CREA-OF
lettuce varieties	**ARCA 2010.** Realization of agronomic tests aimed to lettuce varieties comparison.	M. Zaccardelli	CREA-OF
local varieties of sweet pepper	**BIODIVER -** Identification polymorphic markers able to discriminate local varieties of sweet pepper retreived from the area of Lazio region	P. Tripodi	CREA-OF

Working tables / working groups / institutional partnerships

Products/main topics	*Description*	*Person in charge*	*CREA research Centres*
precision agriculture	**Regional observatory of precision agriculture, Campania Region Osservatorio Regionale Agricoltura di Precisione.** Support to the Campania Region for the diffusion policies of precision agriculture	C. Pane	CREA-OF
organic agricultural production and agroecology	**SOI, Società di Ortoflorofrutticoltura Italiana- Working Group Organic farming and Agro- ecology** Working group on the importance and dissemination of organic agricultural production	D. Prisa	CREA-OF
registration criteria	**MiPAAF working group for updating registration criteria of horticultural crops** Working group that deals with updating the registration criteria for vegetables	P.Tripodi	CREA-OF

specialized vegetable collections	**SOI, Società di Ortoflorofrutticoltura Italiana- Working Group "Specialized Vegetable Collections**Working group that mainly deals with raising awareness of the protection of greenery by enhancing cultural and recreational aspects of ornamental collecting and monitoring and censoring, including in a database, the public and private Specialized Vegetable Collections, both public and private, present on the Italian territory.	M.Antonetti, B.Nesi, D.Prisa, S.Nin, G. Burchi, M.Cardarelli, C.Cervelli	CREA-OF
soilless crops	**SOI, Società di Ortoflorofrutticoltura Italiana- Working Group "Soilless crops"** Working group of the Italian Society of Horticultural Science, coordinator Daniele Massa, activities in the field of containerized crops grown in substrate or hydroponically.	D. Massa, S. Cacini, D. Prisa,	CREA-OF
fertilization	**MOA BAAFS Collaboration agreement between CREA Vegetable and Ornamental Crops and Beijing Academy of Agriculture and Forestry Sciences** Development of protocols for efficient fertilization in vegetable crops	D.Massa	CREA-OF
corroborating products	**Technical Commission MiPAAF for products used as invigorating, enhancers of the natural defenses of plants** Evaluation of corroborating products in conventional agriculture	M.T. Cardarelli	CREA-OF
nursey	**SOI, Società di Ortoflorofrutticoltura Italiana- Working Group Nursery**Working group aimed at assessing the evolution of individual production sectors, varietal innovation to respond to changing climatic and environmental conditions while respecting the new requirements of breeding forms and systems.	D.Prisa, S.Nin, G. Burchi	CREA-OF
fertilizers	**Working Group GL 02 (Soil Improver and Growing Media), under Fertilizer Committee UNI CT/406 of UNICHIM (Association for the unification in the chemical industry sector)** Working Group GL 02 (Soil Improver and Growing Media), under Fertilizer Committee UNI CT/406 of UNICHIM (Association for the unification in the chemical industry sector) Working group involved in standardization projects releated to analytical standard provided for in European Regulation about fertilizers (FPR UE 1009/19), soil improver (organic and inorganic), growing media, compost and digestated. The GL 02, under the Fertilizer Committee, interfaces with CEN Committees (Euroean Commitee for Standardization) and ISO and, specifically, drawn up documents by CEN TC 223 - Soil improvers and growing media are properly analysed and voted	S. Cacini	CREA-OF
fertigation	**EUVRIN- International working group on fertigation of horticultural species** EuropeanVegetable Research Institutes Network,WGFertilisation and Irrigation,WG Greenhouse Crops).	D.Massa	CREA-OF
pesticides	**New CAP scientific technical table "Defense - sustainable use of pesticides"** Support table for the new CAP (Common Agricultural Policy)	C. Pane	CREA-OF
nursery	**Technical Table of the Nursery Sector, MiPAAF**Meeting and discussion table of the problems of the horticultural sector created by MiPAAF in 2012, which includes producers, traders, designers and maintenance of greenery, associations, cooperatives and public and private research bodies	G.Burchi	CREA-OF
plant novelties	**SOI, Società di Ortoflorofrutticoltura Italiana- Working Group Plant Novelties** Working group with the aim of sharing issues related to tools and methods for the establishment, characterisation and protection of new plants in horticulture.	D.Prisa	CREA-OF
vegetables of agricultural interest	**Accademia dei gerorgofili "Accademia Risponde" working group "vegetables"** Working group that deals with responding to specific problems relating to vegetables of agricultural interest.	P. Tripodi, L. Sigillo	CREA-OF
officinal plants	**Working group "Research and training" of the technical table of officinal plants set up by MiPAAFT, Department of competitive policies for agri-food, horse racing and fishing** Working group that deals with research in the field of medicinal species.	M.T.Cardarelli	CREA-OF
post harvest	**SOI, Società di Ortoflorofrutticoltura Italiana- Working Group Post-harvest** Working group on the importance of the post-harvest sector as a whole of those processes that aim to maintain the organoleptic and marketable characteristics of the product	D.Prisa, G.Burchi	CREA-OF
sustainabiliy	**MiPAAF fruit and vegetable national technical table. Working Group on sustainability** Identify problems and needs relating to the sustainability of the fruit and vegetable sector.	A. Venezia	CREA-OF
plant protection	**Permanent working group on plant protection - MiPAAF** Technical table between MiPAAF DISR V and stakeholders involved in sectors of interest of the office regarding plant protection issues.	T. Cardi	CREA-OF
registration criteria	**MiPAAF working group for updating registration criteria of horticultural crops** Working group that deals with updating the registration criteria for vegetables	P.Tripodi	CREA-OF
variety registration	**UPOV, International Union for the Protection of New Varieties of Plants. Technical Working Party for Vegetables TWV49 - 54th Session** Working group to discuss about the UPOV technical guidelines for vegetables that are used for variety description in the framework of Variety Registration and for Plant Breeder's Right.	L. Sigillo	CREA-OF
genetic resources	**EUVRIN- International Working Group on Genetic Resources** European Vegetable Research Institutes Network: WG Genetic Resources, Breeding and Seed Production**.**	T.Cardi	CREA-OF
operational programs	**MIPAAF National Strategy on sustainable operational programs for the fruit and vegetable sector. Steering group in charge of the evaluation process** Evaluation of the National Strategy for the recognition and control of fruit and vegetable producer organizations and their associations, operational funds and operational programs.	T. Cardi, A.Venezia	CREA-OF
ornamental and flower species	**Technical and scientific board of ornamental and flower species of the Tuscany Region** Working group aimed to protection and enhancement of the heritage of local breeds and varieties of agricultural, zootechnical and forestry interest referred to the RL 64/2004.	B. Nesi	CREA-OF

nursery	**SOI, Società di Ortoflorofrutticoltura Italiana- Working Group Nursery** Working group aimed at assessing the evolution of individual production sectors, varietal innovation to respond to changing climatic and environmental conditions while respecting the new requirements of breeding forms and systems.	D.Prisa, S. Nin, G.Burchi, S. Cacini, M.Cardarelli	CREA-OF

2.6 OLIVE AND OIL

The olive sector is strategic for Italy, where over 60 million plants are grown on over one million hectare. Italy is also proud to be the country with the highest olive biodiversity in the world.

CREA inherits over one hundred years of tradition in the olive-oil research field and boasts the world's largest olive germplasm collection.

Concerning the productive chain, the following were the most important research lines developed and followed during 2020:

- *Varietal innovation through traditional breeding and innovative biotechnologies;*
- *Biodiversity valorisation to support sustainable and quality production;*
- *Identification of sources of resistance to biotic and abiotic agents by screening of olive germplasm;*
- *Optimisation of cultivation techniques, digitalisation and precision farming improving strategies, comparing and assessing the environmental and economic sustainability of different innovative productive models;*
- *Application of integrated systems for the protection of olive tree based on the identification, control and prevention of plant diseases, also through the study of compounds with low environmental impact;*
- *Product quality in the olive supply chain through process and product innovations for the processing industry;*
- *Development of new methods for chemical, molecular and digital traceability of olive oil;*
- *Application of innovative technologies and biotechnologies for the reuse of wastes and by-products of the olive oil industry;*
- *Adaptation strategies to the effects of climate change for olive trees;*
- *Consolidation of interactions among operators across the olive and olice oil supply chains, with particular reference to the consortia for the protection of products of European origin denomination, typical product or organic production labels;*
- *Management and phenotyping of olive germplasm collections;*
- *Development of tools and strategies to ensure full accessibility of food label information.*

About olive oil, our research embraces the entire olive-oil supply chain, from cultivation to production of oil and secondary products, including food safety activities, above all related to raw material production, breeding, physiology, biology and defense systems, as well as processing technologies, the quality of olive oil products, nutrition and health, and the traceability of oils. In the field of labelling, specific research has also been carried out to provide more information to customers with visual limitations, through a specific "speaking label" (labelCert™).

CREA has interdisciplinary scientific skills, employing graduated researchers in Chemistry, Chemistry and Pharmaceutical Technologies, Food Sciences and Technologies, Agricultural Sciences, Biological Sciences, and qualified technicians with considerable experience on the different stages along the supply chain.

Finally, many CREA researchers and technicians are also professional testers of virgin olive, are enrolled in the national register of tasters and Heads of Panel for the sensory evaluation of olive oils.

2.6.1 Research and research products – Olive and Oil

Products/main topics	Acronym and Research Title	Aims	Person in charge and CREA Centres	Partnership/ Financing Body	Scientific Publications	Other Research products [1]
OLIVE-OIL SUPPLY CHAIN / by-products	**SANSINUTRIFEED** Production of feed with nutraceutical value through the use of by-products of the oil industry with study of the effects on animal welfare and milk and cheese quality.	Production of new and competitive "nutraceutical value" feeds (use of by-products rich in polyphenols - virgin destoned olive cake dried at low temperature and "powder" extracted from growing water) capable of improving the functional characteristics of milk and cheeses and animal welfare.	S Claps CREA-ZA, CREA-OFA	MISE/**European Commission**	2 Conference Proceedings	1 Research grant. Messa a punto di un metodo di essiccazione della sansa ottenuta da frantoio "a due fasi" tale che il prodotto essiccato conservi elevato il contenuto di molecole bioattive e sia idoneo all'uso zootecnico. Produzione di sansa priva di nocciolino e ricca in fenoli, presso frantoi da laboratorio e industriali e presso sansifici. Sviluppo di un metodo innovativo di essiccazione delle sanse denocciolate, conservativo per il contenuto in molecole bioattive. Produzione di sansa e paté di oliva a ridotto contenuto di umidità ed essiccata "ricca di fenoli" da utilizzare come integratore alimentare, mediante processi innovativi, compreso lo spray drying, ed economicamente competitivi, da includere neI mangimi. Caratterizzazione chimica e chimico-fisica del suo contenuto in molecole bioattive
OLIVE-OIL SUPPLY CHAIN/ by-products	**FRASCA** The sustainable use of the by-products of the olive-oil supply chain to improve the health and quality of Calabrian autochthonous podolic cattle.	The objectives of this project concern the study of the effects of food supplementation with by-products of the olive-oil supply chain in the diet of autochthonous Calabrian podolic cattle on production performance, food intake and animal welfare parameters.	I. Muzzalupo, CREA-OFA	Calabria Region	-	
OLIVE-OIL SUPPLY CHAIN	**INNO_OLIVO&OLIO** Innovation And Transfer Along The Olive-Oil Supply Chain For Sustainability And Quality Of Processes And Products - Olive & Oil Operating Group.	Identification of innovation and transfer along the olive-oil supply chain for sustainability and quality of processes and products.	M. Mastrorilli, CREA-AA	Basilicata Region		

[1] *prototypes; dissemination activities (conferences, seminars, reports, sites and videos, etc.); training activities (scholarships, research grants and PhD scholarships)*

OLIVE GERMPLASM/ phytosanitary defense	**SALVAOLIVI** Safeguarding and enhancement of the Italian olive germplasm with research actions in the phytosanitary defense sector.	The objectives of the project are the assessment of new phytosanitary risks also linked to climate change and trade. It provides for the identification of harmful organisms at risk of introduction, the identification of emerging or re-emerging diseases; the study of plant / pathogen interaction; the development of meteorological forecasting models and the development of protocols for early diagnosis of symptomatic and asymptomatic material.	F. Faggioli, **CREA-DC** CREA OFA, CREA-AA	MIPAAF	1)Santilli, E.; Riolo, M.; La Spada, F.; Pane, A.; Cacciola, S.O. First Report of Root Rot Caused by *Phytophthora bilorbang* on Olea europaea in Italy. Plants 2020, 9, 826.; 2. Riolo, M.; Evoli, M.; Schena, L.; Aloi, F.; Santilli E.; Ruano-Rosa, D.; Agosteo, G.E.; Pane, A.; La Spada, F.; 2)Santilli, E.; Riolo, M; Pellicori, V., D.; Briccoli Bati, C. Valorizzare le cultivar di olivo contro la rogna. L'informatore agrario 2020, 23, 57-61;3)Riolo M.; La Spada F.; Aloi F.; Giusso del Galdo G.; Santilli E.; Pane A.; Cacciola S.O. *Phytophthora* diversity in two diffent types of plant conservation sites. In e 1st International Electronic Conference on Plant Science, 1–15 December 2020.https://iecps2020.sciforum.net/.4)G. Licciardello, M. C. Strano, P. Caruso, M. Sciara, P. Bella, G. Sorrentino, S. Di Silvestro. Identification and characterization of *Colletotrichum acutatum*, *C. gloeosporioides* and *C. kahawae* subsp. *ciggaro* isolates associated with olive anthracnose in Sicily. Submitted to: Plant Pathology.	4 Research grants. 1 Scholarship.
VIRGIN OLIVE OIL / techonologies	**REVOILUTION** technologies improvement.	Characterization of the chemical-physical and sensory qualities of virgin olive oil obtained from frozen olive paste.	I.Muzzalupo, CREA-OFA	AGE s.r.l.s		
OIL/ traceability	**OLIVOSMART** Traceability and accessibility models	Development of Trust-three an automatic, safe, simple, versatile, certified and economical traceability system; accessible label for the oil bottle.	S. Zelasco, **CREA-OFA** CREA-FL	Sisspre s.r.l.		Traceability system and accessible label. webinar on accessibility models 13.07. 2020
TABLE OLIVES	**DEAOLIVA** Quality, sustainability and operational safety improvement in table olives debittering through innovative pilot scale processe	1.Innovative technological implementations 2.Quality control of fermented products through microbiological and chemical analysis of olives and fermentation brines 3.Textural, sensory and chemical / nutritional control of products	B. Lanza, **CREA-IT** CREA-OFA CREA-AN	MIPAAF	3 pubblicazioni, 3 comunicazioni a congressi	kick-off meeting, website. 1 research grant.
TABLE OLIVES	**MICROLIVE**	Improvement of plant production factors and rhizosphere management in Calabrian olive farms; ° Development and enhancement of new agri-food products (table olives) capable of improving	I. Muzzalupo, CREA-OFA	Calabria Region		

		positioning on the market and determining a higher degree of healthiness and / or quality of the same.				
TABLE and OIL OLIVE	**ALIVE** Characterization and enhancement of table and dual purpose OLIVE.	It focuses on the enhancement of new olive varieties with dual aptitude (table and oil) and on the characterization of the main Italian table olive varieties through the analysis of the following characteristics: a) morphological, b) bio-agronomic, c) resistance to biotic and abiotic stresses; d) molecular and the identification of the organoleptic characteristics of the same, in order to achieve typical quality productions.	I. Muzzalupo CREA-OFA	MIPAAF	1- Muzzalupo I., G. Badolati, A. Chiappetta, N. Picci, R. Muzzalupo (2020). In vitro antifungal activity of olive (Olea europaea) leaf extracts loaded in chitosan nanoparticles. FRONTIERS IN BIOENGINEERING AND BIOTECHNOLOGY. 8:151. doi: 10.3389/fbioe.2020.00151	webinar professional training course 17/12/2020 - Innovation in Calabrian table olive growing. Presentation of the project "Characterization and Enhancement of OLIVES for the table and with dual aptitude - ALIVE -. 1 Scholarship.
OLIVE and OLIVE OIL	**INNOLITEC** Technological innovations in the olive for oil and table olive supply chain.	Development of technologically advanced and sustainable research lines in the olive oil and table olive sectors and in the valorisation of secondary products of the olive oil industry..	F. V. Romeo, **CREA-OFA** CREA-IT	MIPAAF	Lanza et al. (2020). Olive Pâté by Multi-Phase Decanter as Potential Source of Bioactive Compounds of Both Nutraceutical and Anticancer Effects. Molecules.	2 Research grants. 3 Scholarships. 1 Postdoctoral Fellowship.
OLIVE and OLIVE OIL/ traceability	**INFOLIVA** Informed traceability and processing/product innovations in the olives for oil and table olives supply chain	Development of advanced Infotracing systems for the valorisation of high quality Italian oils. Optimisation of a protocol for production of olive mill wastewater phenolic extracts.	C. Costa, **CREA-IT** CREA-OFA	MIPAAF	7 Pubblicazioni	1 Prototype ; 1 Ph.D; 1 Research grant. 1 Scholarship. Webinar
OLIVE ORCHARDS	**GEN4OLIVE** Mobilization of Olive genetic resources through pre-breeding activities to face the future challenges and development of an intelligent interface to ensure a friendly information availability for end users.	To scale up the olive pre-breeding activities through a multi-actor approach and visualize the information through an intelligent user-friendly interface by implementing also the machine learning utilities.	E. Perri, CREA-OFA	**European Comi** a1		
SOCIAL OLIVE ORCHARDS	**Fa.Re.** Farm 3.0 Learning by playing on the network.	1.To disseminate and re-discover, through recreational/experiential activities, the main agro-food chains and derived products. 2.Transfer knowledge with scientific rigour through a simple language suitable for children to promote the creation of a memory of territories and taste.	E. Santilli, CREA-OFA	Calabria Region	ISBN 978-88-31276-04-7 Farm 3.0 Learning by playing on the network. E-book and app 97888831276016	
TRADITIONAL OLIVE ORCHARDS/ production improvement	**MOLTI** Improvement of production in traditional and intensive olive groves.	Improve pruning and soil management for the recovery of traditional olive orchards and implmentation of cultivation techniques in high-density groves with national olive cultivats	E. M. Lodolini, **CREA-OFA** CREA AA, CREA IT	MIPAAF		Divulgative presentation in the frame of the technical workshop titled Aggiornamento tecnico sulla potatura e gestione dell'oliveto' 2 Scholarships. 1 Research grant.
OLIVE ORCHARDS, OILS	**ODIN** Extra virgin olive oil digital management.	Characterization and traceability of olive groves and oils from the countryside of Terranova da Sibari (CS)	I. Muzzalupo, CREA-OFA	Calabria Region	1- Muzzalupo I., G. Badolati, A. Chiappetta, N. Picci, R. Muzzalupo (2020). In vitro	3 Scholarships.

1 Università di Cordoba (UCO),University of Granada , Univ. of Jaen, Spagna; Hellenic Agricultural Organisation "DIMITRA". Institute of Olive Tree and Subtropical Plants (DEMETER), Grecia; Olive Research Institute. Ministry of Agriculture and Forestry, Izmir (ORI) Turchia; SANTA CRUZ INGENIERIA SL, Spagna; Institut National de la Recherche Agronomique – Centre Regional de Marrakech, INRA,Marocco; Technological Corporation of Andalusia Foundation, FCTA, Spagna; Gálvez Productos Agroquímicos, S.L.U. (Galpagro), Spagna; Cámbrico Biotech, S.L., Spagna; Hellenic Union of Nurseries (EFE); Grecia; FOCOS GbR, Germania; ANKARA UNIVERSITESI, Turchia; Centre National de la Recherche Scientifique , Francia/**European Commission**

					antifungal activity of olive (Olea europaea) leaf extracts loaded in chitosan nanoparticles. Frontiers in Bioengineering and Biotecchnology. 8:151. doi: 10.3389/fbioe.2020.00151 2- I. Muzzalupo, A. Caputo, C. Rocca, A. Chiappetta. (2019). Diversity of arbuscular mycorrhizal fungi and of plant growth promoting bacteria in the rhizosphere of Olea europaea in four areas of Calabrian region.	
OLIVE	**REGEROLI** Creation of a high-altitude collection field for the study of olive biodiversity and the quality of its products	Selection of varieties suitable for cultivation at high altitudes and evaluation of the quality of the oil.	E. Perri, CREA-OFA	ENTE PARCO SILA		
OLIVE ORCHARDS, OIL/ management	**O.R.G.OLI.O. LUCANO** Optimization of Profitability and Management of Olive Oils and Production Processes of Lucan Oil.	To scale up the olive pre-breeding activities through a multi-actor approach and visualize the information through an intelligent user-friendly interface by implementing also the machine learning utilities.	A.F. Modugno, **CREA-AA,** CREA-OFA	Basilicata Region		
OLIVE ORCHARDS phytosanitary defense	**XYRE** Monitoring insect vectors of *X. fastidiosa* in Calabria Region	Identify the possible ways of spreading *Xylella fastidiosa* in the Calabria Region - they are based on the monitoring of the insect vectors of the bacterium X. fastidiosa in order to predict a possible spread of the disease also in Calabrian olive groves. preventively assess any disease containment measures even before infection on adult olive trees - Support and interact with regional technicians in monitoring *Xylella fastidiosa* on the Calabrian territory.	V. Vizzarri, CREA-OFA	Calabria Region		
OLIVE ORCHARDS / phytosanitary defense	**BIOSAVEX** Olive Biodiversity for Saving Salento from *Xylella*	Individuare accessioni di olivo resistenti a *Xylella fastidiosa* mediante osservazioni e saggi di laboratorio sui nuovi campi sperimentali di Leccino e sulle piante (differenti cvs) presenti ei campi collezione/sperimentali già realizzati e di valutare le caratteristiche produttive/agronomiche. Ulteriori obiettivi consistono nel trasferimento agli operatori di conoscenze e di protocolli rapidi di propagazione delle cultivar di olivo risultate tolleranti/resistenti e nella reallizzazione di sezioni incrementali del germoplasma selezionato	R. Leogrande, CREA-AA	Puglia Region		
OLIVE ORCHARDS / phytosanitary defense	**Oli.Di.X.I.It.** Olive production and protection from *Xylella fastidiosa* and its vectors in Italy.	Development of a molecular diagnostic protocol for the identification and characterization of bacteria and the acquisition of new strategies for the containment of the bacterium and vector insects in order to avoid their dissemination in pest-free areas but also with the aim of achieving a possibility of coexistence with the bacterium in the now infected areas.The three-year project envisages an interdisciplinary approach aimed at tackling different strategies for the control of the *Xylella fastidiosa* bacterium and vector insect in traditional olive groves.	S. Loreti, **CREA-DC** CREA OFA	MIPAAF		

OLIVE ORCHARDS / biodiversity	**BIOVALSILA** Enhancement, protection and promotion of Biodiversity in the Sila National Park.	To create a sensory journey through the typical agri-food productions of the Sila National Park and the MAB-Riserca della Biosfera Man and the Biosphere area and create innovative information strategies to allow children to become aware of the agri-food treasures of the territories in which they live.	E. Perri, CREA-OFA	Parco Nazionale della Sila	Ebook and APP Biovalsila Project: a sensory journey of knowledge of the productions of the Sila National Park and the Mab Area - Biosphere Reserve ISBN9788897692942.	
OLIVE ORCHARDS / phytosanitary defense	**CAOL** Research contract.	Evaluation of a new formulation based on kaolin in the fight against olive fly in Calabria.	V. Vizzarri, CREA-OFA	BIOGARD		The results of the research confirmed BIOGARD's request for registration of the new formulation.
OLIVE ORCHARDS/ hi-tech monitoring	**Mon.Oli.Tech** Hi-Tech monitoring for the sustainable management of the olive grove ecosystem of Lazio.	Creation of an Operating Group, acting animation and design of innovative systems for the Hi-Tech monitoring of crop hardness in olive cultivation.	M. Biocca, **CREA-IT** CREA-AA, CREA-DC	Regione Lazio		Dissemination (website,, depliant), 2 events
OLIVE ORCHARDS / genomics	**OLGENOME** Completion of the olive tree genome sequencing, trascriptome analysis and gene annotatio.	Obtaining the entire genome sequence of the olive tree (Olea europaea L., cv Leccino), through a combined BAC to BAC approach and whole genome shotgun sequencing (WGS)	F. Carbone, **CREA-OFA** CREA-GB	MIPAAF	Publications and conference proceedings 1.Salimonti A., Forgione I., Sirangelo T.M., Puccio G., Mauceri A., Mercati F., Sunseri F., Carbone F. 2021 A complex gene network defines the flower induction and differentiation in Olea europaea L. Submitted to MDPI Genes (ISSN 2073-442) Manuscript-ID: genes-1092596 2.Sirangelo T.M., Lo Feudo G., Forgione I., Zelasco S., Salimonti A., Carbone F. 2020 The OLGENOME web portal: a user-friendly working tool for project partners and results dissemination. Proc. SIGA Young Web Meeting, July 7th,, Abstract SY39 3.Forgione I., Salimonti A., Sirangelo T.M., Puccio G., Mercati F., Sunseri F., Carbone F. 2020 Comparative profiling of axillary buds from 'ON' and 'OFF' branches reveals a complex gene network in OLEA EUROPAEA. Proc. SIGA Young Web Meeting, July 7th, Abstract Oral Communication Abstract SY16	Project website: http://olgenome.crea.gov.it: Dissemination events: Sirangelo T., 2020 Strategies for scientific dissemination without barriers. A case study: the OLGENOME portal. Invited relator at the webinar "Accessibility of food information for blind people", Rende, Italy, July 13th 2 Postdoctoral Fellowship.
OLIVE ORCHARDS / genomics/biotechnologies	**GENOLICS** In vitro regeneration of olive cultivars and search for allelic variants for the use of modern biotechnologies.	Obtaining an efficient regeneration system and identifying editable mutations for future applications of modern biotechnologies.	L. Cattivelli, **CREA-GB** CREA-OFA CREA-OF	MIPAAF		2 Research grants.
OLIVE ORCHARDS/ ecosystem services	**BIODIVERSIFY** Boost ecosystem services through high	Increasing biodoversity in the agrosystems by larger rotations, intercropping and agroforestry, to incrase	A. Rosati, CREA-OFA	Algeria, Tunisia, Francia, Germania, Grecia,		

	Biodiversity-based Mediterranean Farming sYstems.	environmental and economic sustainability and resilience in Mediterranean Aagriculture.		Spagna/**European Commission**		
QUALITY OLIVE GROWING	**TRIECOL** Transfer of innovations in agriculture and eco-sustainable development for quality olive growing.	The triecol project aims to inform operators in the agricultural, agri-food and olive-growing sectors through conferences, seminars, workshops and demonstration activities, aimed at disseminating the most important issues that most afflict the sector, creating a fundamental dialogue between the world of Scientific Research and the modern agricultural entrepreneur increasingly oriented towards technological innovation and the need to overcome the devastating effects of climate change.	E. Santilli, CREA-OFA	Calabria Region		
ITALIAN OLIVE GROWING/ monitoring	**OLIVEMAP** Mapping of investment needs and monitoring of Italian olive growing.	The project is divided into two work packages and has the objective of mapping the investment needs in the olive oil sector.	N. Puletti, **CREA-FL** CREA - PB	MIPAAF		webinar (30.6. 2020). 2 pubblications((Terra e vita; Olivo e olio).
TRADITIONAL OLIVE GROWING/ phytosanitary defense	**DI.OL** Defense project from organisms in traditional and intensive olive growing.	The objectives of the project are to address the main problems inherent in the defense of olive crops, in traditional and intensive / super-intensive production systems, the use of entomopathogenic organisms (fungi, nematodes) that can contribute to the reduction of olive fly populations and integrate with other defense strategies. It is also planned to evaluate the substances that have a repellent effect against easily usable olive fly populations and control of margaronia and other emerging harmful arthropods, including alien species of phytosanitary importance.	P.Roversi, **CREA-DC** CREA-OFA	MIPAAF		1 Research grant.
OLIVE GROWING / climate services	**MED-GOLD** Turning climate-related information into added value for traditional MEDiterranean Grape, OLive and Durum wheat food systems.	The Med-Gold project aims to develop climate services, tailored to the end-users needs, for olive, cereals and grapes.	A. Rosati, CREA-OFA	Spagna, Portogallo, Grecia/**European Commission**		1 Research grant.

2.6.2 Patents and Services

Patents INDUSTRIAL PATENTS

Products/main topics	*Description*	*Authors/Inventors*	*CREA Centres*
olive	**Equipment for pitting olives (IT)**	P. Toscano M. Cutini C. Bisaglia	CREA-IT

Services

Collections

Products/main topics	*Description*	*Person in charge*	*CREA Centres*
olivo -collection	Collececco, near Spoleto, hosts important olive variety collection, with over 350 genotypes.	E.Perri, A.Rosati	CREA-OFA
olive germplasm collection	CREA-OFA in Rende manages the collection field in Mirto (CS) in collaboration with ARSAC. The Mirto collection is one of the largest in the world and enters the international network of collections of the International Olive Council (COI). It has also been the subject of various grants as part of different projects aimed at the authentication, conservation, rehabilitation and enhancement of the germplasm.	E.Perri	CREA-OFA

Technical panels/working groups/institutional partnerships

Products/main topics	*Description*	*Person in charge*	*CREA Centres*
Working Group- MIPAAF	WP4 Agroecology	A. Rosati	CREA-OFA
Working group - Accademia dei Georgofili	Integrated system "Livestock, crop, forestry".	A. Rosati	CREA-OFA
Expert group -COI	Methods of analysis of olives and oils and olive germplasm.	E. Perri	CREA-OFA
Expert group – MIPAAF	Olive oil chemistry and standards.	E .Perri	CREA-OFA

2.7 FISHERY and AQUACULTURE

Research carried out at CREA-ZA in the aquaculture sector targets at the expansion of productions and their economic and environmental sustainability. Both aspects are studied for marine and freshwater fish and shellfish farming. Italy is among the main producers of shellfish in Europe.

The economic and environmental sustainability of aquaculture needs to improve, especially in feed production. Aquafeed production has enormously increased in recent years, with projections of further growth. Despite the growing trend in the use of plant-based raw materials in aquafeed, fishmeal and fish oil are still the key components of the feeds in aquaculture. Further increase in carnivorous fish production, typical of the Western World, will depend on the capability to identify new and effective feed ingredients not competing with humans (i.e. by-products, insects, microalgae).

Ecological compatibility of fish farming and the environmental footprint across the fish production chain, of increasing consumer sensitivity, are addressed by research at CREA-ZA with the aim to acquire a better knowledge of impacts generated by production activities and of techniques to reduce or mitigate negative outputs. The development of Life Cycle Assessment models in aquaculture, where interactions with the environment are very complex, will allow to quantify the ecological impacts of productions and, in the case of shellfish farming, to verify the CO_2 sequestration capacity by farmed mollusk shells.

The above-mentioned topics are also dealt with by several CREA-ZA researches dedicated to organic aquaculture, a sector which is still young with respect to other certified livestock production sectors, but capable to also highlight topics useful to improve the sustainability of conventional farms.

2.7.1 Research and research products – Fish and Aquaculture

Products/main topics	*Acronym and Research Title*	*Aims*	*Person in charge and CREA Centres*	*Partnership/ Financing Body*	*Scientific Publications*	*Other Research products* [1]
AQUACULTURE/ FARMED CARNIVOROUS FISH/ nutrition	**SUSHIN** Novel ingredients and underexploited feed resources to improve sustainability of farmed fish species: growth, quality, health and food safety issues - SUSHIN (SUstainable fiSH feeds INnovative ingredients).	Optimization of feeding strategies for carnivorous fish species of commercial interest through the formulation of efficient diets, which guarantee animal welfare, at low cost and sustainable with innovative ingredients or from under-exploited supply chains.	L. Buttazzoni, CREA-ZA	AGER Foundation	Pulcini D., Capoccioni F., Franceschini S., Martinoli M., Tibaldi E. 2020. Skin Pigmentation in Gilthead Seabream (Sparus aurata L.) Fed Conventional and Novel Protein Sources in Diets Deprived of Fish Meal. Animals 2020, 10, 02138; doi:10.3390/ani10112138; Veroli, M., Martinoli, M., Caprioli, R., Angelici, C., Pulcini, D., and Capoccioni, F. (2021). Population structure and dynamics of the invasive Procambarus clarkii (Girard, 1852) in a Tiber river Ramsar site, Central Italy. International Journal of Aquatic Biology 9, 23–32.	2 Postdoc fellowships

[1] *prototypes; dissemination activities (conferences, seminars, reports, sites and videos, etc.); training activities (scholarships, research grants and PhD scholarships).*

AQUACULTURE / statistics	**AQUADATA2** Data collection and elaboration of aquaculture production activities carried out in Italian marine- fresh- and brackish waters, in compliance with Regulation (EC) no. 762/2008 - Years 2019-2020-2021 .	Data Collection and elaboration of national aquaculture production for the period 2019-2020-2021 following Reg. (EC) 762/2008	L. Buttazzoni, CREA-ZA	MIPAAF	D. Pulcini, F. Capoccioni, M. Martinoli, L. Buttazzoni "L'acquacoltura italiana nel contesto europeo: produzioni, trend, innovazione" - Aquafarm 2020, Pordenone.	
AQUACULTURE/ **o**rganic aquaculture	**PERILBIO** Promotion and strengthening of long-term devices in organic agriculture" WP3	Long-term experimental prototype for MARICULTURE and feeding trials. 1) Prototype built-up consisting of 2 floating marine cages for organic aquaculture trials; 2) Feeding tests using innovative and sustainable ingredients, in terms of well-being, environment and productivity.	D. Ceccarelli, **CREA-OFA** PB AA-OF	MIPAAF		Pulcini D., Capoccioni F. "La ricerca in acquacoltura: i progetti del CREA" Capraia Smart Island Filiera Ittica - Innovazione e sostenibilità: sfide, metodi e tecnologie - Online September 2020 2 post doc fellowships
MICROALGAE/ DAIRY/ waste treatment	**MIREAZOC** Microalgae for the treatment and enhancement of livestock waste and dairy by-products.	Use of microalgae for the treatment and enhancement of livestock waste and dairy by-products.	A. Tava, CREA-ZA	Cariplo Foundation	Bongiorno et al. (2020) Sustainability 12:8779	3 post-doc fellowship and 1 research grant
MUSSELS	**AQUACULTURE202**0 Institutional and technical/scientific support for the implementation of the Aquaculture Strategic Plan in Italy (2014-2020): supporting actions for organizational coordination, for farms innovation and research and for the knowledge improvement and technological transfer.	1) Institutional assistance to the Italian Ministry of Agriculture in the European and Mediterranean context; 2) Setting up and technical coordination of a multistakeholders at national level; 3) Technical-scientific study on environmental performances of italian shellfish farming.	L. Buttazzoni, **CREA-ZA** L. Tudini, CREA-PB	MIPAAF	F. Capoccioni, M. Martinoli, D. Pulcini "Il recente andamento della molluschicoltura in Italia (2014 al 2017): impianti, produzioni e valore delle principali specie allevate" VIII Convegno Nazionale Soc- It. di Ricerca Applicata alla Molluschicoltura «Gestione delle applicazioni giuridiche sul rischio ambientale e sanitario».	Stand- Aquafarm 2020 – Pordenone 2 Post Doc Fellowships
MUSSELS	**VALUESHELL** Economy, environmental externalities and policies of the mussel farming sector in Italy: institutional and technical-scientific support activities for the implementation of the italian Aquaculture Strategic Plan for 2014-2020.	1) Updated knowledge about the mussel production chain in the national and community context; 2) Evaluation of the environmental impacts associated with mussel farming; 3) Identification of the main policies directly and / or indirectly supporting the sector; 4) Identification of future intervention strategies with stakeholders and sector operators.	L.Tudini, **CREA-PB** CREA-ZA	MIPAAF		2 Postdoc fellowships
MARINE SPECIES/ biodiversity	**HOLOTURIA** Stock assessment of Holothuria spp. populations in the italian coastal marine habitats, development of lipid biomarkers for stocks characterization and study on the economic impact of legal and illegal fishery.	1) Preliminary tock assessment of the genus Holothuria along the Italian coasts; 2) Characterization and discrimination of different species and / or stocks of the genus Holothuria through the use of lipid biomarkers; 3) Economic analysis of the legal and illegal market.	L. Buttazzoni, CREA-ZA	MIPAAF		

2.7.2 Patents and Services

Patents INDUSTRIAL PATENTS

Products/main topics	Denomination/Description	Authors/Inventors	CREA Centres
mussels	System and method for mussels identification and selection (IT)	C. Costa P. Menesatti F. Antonucci F. Pallottino	CREA-IT

Services

Products /main topics	Description	Person in charge	CREA Centres
Technical and scientific assistance			
fish and aquaculture/legislation	Technical support to the revision of the European legislation on conventional aquaculture for General Direction of Fishery and Aquaculture of the Ministry of Agriculture (MIPAAF).	D. Pulcini, F. Capoccioni	CREA-ZA
fish and aquaculture/ statistics	National Data collection on aquaculture for EUROSTAT database.	D. Pulcini, F. Capoccioni	CREA-ZA
organic animal production /legislation	Scientific and technical support to the Office for Organic productions of the Ministry of Agriculture (MIPAAF) for the revision of organic farming regulations.	F. Capoccioni, D.Pulcini M. Guarino Amato	CREA-ZA
Analisi conto terzi			
fish and aquaculture/ingredients and feeds	Analysis of in vitro digestibility of ingredients and feeds for aquaculture.	C. Tripaldi	CREA-ZA

Working tables / working groups / institutional partnerships

Products /main topics	Description	Person in charge	CREA Centres
fish and aquaculture/ stakeholders	**Italian Aquaculture Platform (ITAQUA)**Coordination of the multi-stakeholder platform for aquaculture (ITAQUA - http://piattaformaitaqua.it/	L. Tudini, F. Capoccioni,D. Pulcini	CREA-PB CREA-ZA
fish and aquaculture/ statistics	**National Focal Point of the ""General Fisheries Commission for the Mediterranean"" (GFCM) of FAO** for the activities related to the collection and transmission of data on national aquaculture.	F. Capoccioni	CREA-ZA

2.8 MINOR SUPPLY CHAINS and MEDICINAL PLANTS

Grain legumes are of great importance in human nutrition, due to their high protein content and their relevance in the context of healthy and balanced diets; in recent years, the food market has recorded an increase in the consumption of vegetable proteins and, in parallel, an increase in areas of cultivation of these species throughout Italy. In addition to economic and food-related reasons, farmers are looking for increasingly sustainable cultivation protocols, and for this reason grain legumes are strategic species, able to guarantee more balanced alternations and / or species associations in productive systems, as an alternative to cereal monocroppings, a better adaptation of crops to the territorial vocation, etc. Furthermore, legumes are essential in organic farming and they adapt well to Italian marginal environments. Finally, the 2014-2020 European Common Agriculturl Policy (CAP) favored the production of legumes for their nitrogen-fixing capacity, thus responding to the European commitments of greening as EFA (ecological areas of interest), and qualifying farmers for access to coupled aid.

Concerning these species, CREA carries out research aimed at various objectives and through increasingly multidisciplinary approaches; for example: i) agronomy, precision farming and soil microbiology to promote new cultivation models for better adaptation to climate change, ii) chemical and biochemical characterizations to identify materials of superior food quality, iii) genomic and advanced phenotyping approaches to identify plant materials better suited to different environments and tolerant to different biotic and abiotic stresses. Thanks to the collaboration of researchers with different scientific backgrounds, breeding activities continue in order to offer innovative varieties to the various agricultural stakeholders. Furthermore, studies aimed at the conservation of genetic resources and the enhancement of traditional legumes are also carried out.

Since the reintroduction of industrial hemp cultivation (*Cannabis sativa* L.) in Italy in 1997, following the circular from the Ministry of Agriculture and Forestry no. 794 of 2 December 1997, hemp cultivation saw a renewed interest among farmers. The intended use of hemp has significantly changed over the years, in search of its stable inclusion in the Italian agricultural panorama, of which up to the 1960es it was protagonist. Hemp research was initially aimed at updating and adapting the traditional dioecious varieties of hemp-used throughout the last century and particularly well adapted to specific cultivation areas-to the European regulations fixing the maximum amount of THC content allowed in mature inflorescences. Subsequently, farmers' requests directed research towards the development of new varieties, including monoecious ones, to allow the employment of agricultural machinery also used for other crops' management and harvesting. Finally, in recent years the exponential growth of therapeutic, nutraceutical and cosmetic applications of hemp derivatives (inflorescences for the extraction of active ingredients and oil from the seed) has led to the need to develop real regulations for the various sectors, including specific protocols.

As the largest agricultural research Institution of the Country, CREA has played a leading role in research and innovation in the hemp sector since the very beginning, with the development of rapid THC control tools for assisted breeding, with studies to identify the genetic base of traits of greatest importance for the biosynthesis of compounds of pharmaceutical interest (cannabinoids), for the flavor industry (terpenes), as well as with plant breeding efforts to release a number of new monoecious and dioecious varieties of fiber hemp, and of the only two Italian varieties suitable for pharmaceutical use. These two cultivars are protected at EU level under the CPVO (Community Plant Varities Office) and have been officially supplied to the Military Chemical Pharmaceutical Plant of Florence for the national production of THC-based drugs.

Flax (*Linum usitatissimum*) has the characteristics required by the EU to be included in integrated and sustainable agricultural systems: it is a "low input" crop with high adaptability and rusticity, easy to rotate within cereal cultivation systems and easily mechanized, with a short vegetative cycle. In recent decades, the maximization of the use of renewable plant biomass in a circular economy perspective has given way to a growing interest in flax as product of high added value and with great potential for future development: for fiber (straw and crop residues), in the green building sector (panels for thermal and acoustic insulation), as biocomposites and packaging, and in the transport industry, for oil in the food, nutraceutical and cosmetic sector (high content of Omega 3, carotenoids, vitamin E) and in the industrial sectors for the production of lubricants, polyols, biopolymers and bioplastics, resins, paints, enamels, linoleum, inks, etc. CREA has played a significant role in the recovery, conservation and characterization of flax accessions from various parts of the world. The research activity accompanying the conservation of this germplasm also concerns the study of agronomic practices best suited for cultivation of flax in anticipation of its reintegration into the crop systems.

For medicinal and aromatic plants, research aimed at the production of bioactive molecules/multifunctional active ingredients is relevant. At the CREA Centers involved in the above outlined researches, collections of the different genetic resources are maintained. The research, also conducted in the context of agreements with private parties, has allowed the production of various plant rights and the release on the market of several varieties with innovative and relevant traits impacting on different aspects of the supply chains.

2.8.1 Research and research products – Minor supply chains and medicinal plants

Product/Main topic	Acronym and Research Title	Aims	Person in charge and CREA Centres	Partnership/ Financing Body	Scientific Publications	Other Research products [1]
AROMATIC SPECIES/ *O. basilicum*	**BIOTECH GEO**-Genome editing for the improvement of the resistance of *Ocimum basilicum* to *Peronospora belbharii.*	Application of genome editing in *Ocimum basilicum* to improve resistance to Peronospora.	M. Savona, CREA-OF	MIPAAF		1 Research grant.
HEMP	**CCF** Hemp for fiber production in Campania Region.	Reintroducing fiber hemp into crop systems. 2. Evaluate the best performing varieties in Campania environments, update agrotechnics. 3. Improving the mechanical harvesting, maceration and scutching phases to produce a quality yarn. 4. Exploitation of by-products to produce compostable and spray paints.	D.Cerrato, **CREA-CI** CREA-PB CREA-IT	Campania Region		
HEMP	**PROCAFAA** Hemp production for fiber, food and other uses	Chemical, physical and nutritional characterization of hemp and its products.	M. Montanari CREA-CI	Veneto Region		
HEMP	**PROHEMPIL** Project for the holistic revaluation of hemp beyond GDP.	The project aims to create a local hemp supply chain which, in a widely multidisciplinary research approach, will evaluate and promote alternative strategies for the production of foods with high added value based on hemp and the recovery, recycling and reuse of processing and transformation waste for applications in the nutraceutical and / or cosmeceutical, biomaterials and textile fields..	F. Raimo, **CREA-CI** CREA-PB	Campania Region		
HEMP	**MAIDET** Innovative Analytical Methods for the DEtermination of THC in plant matrices.	Innovative methods for detecting THC in hemp such as molecular techniques, NIR, colorimetric technologies and quality analysis in hemp derived products (metabolic fingerprinting, composition of hemp seed flours, presence of mycotoxins).	G. Mandolino, CREA-CI	MIPAAF		1) Development of new hemp lines with low THC content, 2) Identification of genes responsible for the synthesis of the main cannabinoids (THC and CBD) and development of molecular markers for the different isoforms of the gene encoding for THC synthase; point of portable devices based on NIR spectroscopy for the rapid quantification of THC in the field (UniRoma); 4) Development of rapid colorimetric laboratory

[1] *prototypes; dissemination activities (conferences, seminars, reports, sites and videos, etc.); training activities (scholarships, research grants and PhD scholarships)*

						assays for the determination of THC (Un. Piemonte Orientale); 5) Characterization of the content in polar and non-polar metabolites of the inflorescences of some of the main varieties of hemp currently in use in Italy; 6) Qualitative and technological characterization of flours obtained from hemp seed; 7) Identification of mycotoxins present on the seed of some of the main varieties of hemp used in Italy. n. 1 Research grant
HEMP	**FiSiCa** Creation of short supply chains for the production of hemp oils and flours in Sicilia Region.	Explore the innovative potential of hempiculture in hot-arid environments, with the aim of creating a supply chain in Sicilia Region for the production of high quality oil and flour and the creation of nutraceutical foods, through the optimization of cultivation practices, processes of transformation and qualification of the skills of the operators.	N. Virzì, CREA-CI	Sicilian Region		
HEMP	**UNIHEMP** Use of industrial hemp biomass for energy production and new biochemicals.	Selection and characterization of new hemp varieties.	R. Paris, **CREA-CI** CREA-AA CREA-DC	MUR	1) G. Santunione, E. Turi, R. Paris, E. Francia, M. Montanari, G. Cannazza, 2020. Production and use of co-composted biochar as soil amendment for Cannabis sativa sp. growth. 28th European Biomass Conference Proceedings, 2020, pp. 113-117; 2) Bassolino, L.; Buti, M.; Fulvio, F.; Pennesi, A.; Mandolino, G.; Milc, J.; Francia, E.; Paris, R. In Silico Identification of MYB and bHLH Families Reveals Candidate Transcription Factors for Secondary Metabolic Pathways in Cannabis sativa L.. Plants, 2020, 9(11), 1540. DOI: 10.3390/plants9111540	1 Scholarship. 2 Research grants.
CHICKPEA/ Proteic variability	**Filiera cece** Effetto del sistema di coltivazione sulla composizione del cece.	Studiare la variabilità della composizione proteica e dei composti antiossidanti (tocoli e acidi fenolici) in un set di varietà di cece coltivati in biologico e convenzionale.	C. Fares, CREA-CI		De Santis M.A., Rinaldi M., Menga V., Codianni P., Giuzio L., Fares C., Flagella Z. Influence of organic and conventional farming on grain yield and protein composition of chickpea genotypes. Agronomy 2021, 11(2), 191. doi.org/10.3390/agronomy11020191	
DIFFERENT MINOR CROPS	**FINNOVER** Innovative strategies for the development of cross-border green supply chains.	Development of green supply chains linked to aromatic, medicinal plants, buds and mushrooms for the extraction of multifunctional active ingredients.	B. Ruffoni, F. Monroy, CREA- OF	Institut Sophie Agribiotech Nice (Francia) - NIXE Sarl Nice - CCI Nice (Francia) - Université Sophia Antipolis Nice (Francia)/**European Commission**	Monroy F. (2020) UV-Vis spectral dataset of distillation wastewaters from the production of essential oils of lavender cultivars and other aromatic plant species	

					[Data set]. Zenodo. http://doi.org/10.5281/zenodo.4407442	
DIFFERENT MINOR CROPS	**ABC** Campania AgroBiodiversity: propagation, consarvation and characterization of autochthonous herbaceous plant genetic resources.	The goal of the project is: 1. to multiply and to store in situ and ex situ herbaceous local plant varieties of Campania Regione; to characterize them at morphophysiological, agronomical, biochemical/chemical/nutritional and molecular level; 3. set-up a public database containing all the information about characterization results; 4. expand knowledge about italian and european legislation and databases available on vegetable biodiversity (Concertation action); 5. dissemination of all the results obtained with the project (Accompanyingazione action).	M. Zaccardelli, **CREA- OF** CREA- DC	Campania Region		4 Research Fellowships.
DIFFERENT MINOR CROPS	**DIVERIMPACTS**.	Diversification through Rotation, Intercropping, Multiple cropping, Promoted with Actors and value-Chains Towards Sustainability	G. Campanelli, **CREA- OF** CREA- AA CREA-CI, CREA-PB	FRANCIA - INRA, AGROSOLUTION; ROMANIA - AIDER; OLANDA - ERF; SVIZZERA - BA, FiBL; POLAND - PZ, IUNG PIB; BELGIO - BIOFORUM, CRA W, INAGRO; SVEZIA - HS; ITALIA - CREA, FEDERBIO; GERMANIA - CALS; INGHILTERRA - LEAF, ORC; UNGHERIA - OMKI/ **European Commission**	-	-
LEGUMES (CHICKPEA, BEAN, LENTIL, LUPIN)	**INCREASE** Intelligent Collections of Food Legumes Genetic Resources for European Agrofood Systems.	The general aim will be to simplify the conservation and the employment of legume plant genetic resources with the final scope to support the biodiversity and to increase their use in the agriculture. Notably, the project aimed to catalogize and characterize the genetic resources belonging to four main species of legumes, that are of great European interest (chickpea, bean, lentil and lupine), by promoting their conservation and employment in the Europe. Thus, the project will improve the methodologies and methods that could be applied to any single genetic resource, with special attention to those cultivated.	M.Zaccardelli, CREA- OF	USASK, IPK, MPG, SERIDA, INRA, SCDL Bacau, IGR PAN, UCP, TERRES INOVIA, KIS, BRGV Suceava, CNRS, FAO, ICARDA/**European Commission**		1 research grant Kick-off Meeting del 01.05 2020.

***LEGUMINOSAE* / LUPINE**	**LEGUPLUS** Evaluation of alternative legumes for sustainable and functional pig nutrition.	Selection of fixed lines of common beans with a reduced content of antinutritional factors (lectins), a variety of blue lupine and one of white lupine (free from bitter quinolizidine alkaloids and with high protein content), development of new feed formulations and in vivo evaluation in piglets.	A. Spina, CREA-CI	MIPAAF		
GRAIN LEGUMES	**LEGUBIOCER** Introduction of grain legumes for food chain consumption and innovations in cultivation techniques, to increase the income of organic cereal farms in Campania.	Promote the introduction of grain legumes in the organic cereal systems of the internal areas of Campania Region, thusm favoring the transfer of innovations in the cultivation technique of both grain legumes and wheat, like the introduction of a new seeder (Seminbio) more suitable for sowing in organic, combined or not with the technique of false sowing and minimal tillage. Furthermore, the introduction of seed tanning with rhizobia, PGPR microorganisms / antagonists and mycorrhizae is proposed. The project also includes an economic analysis of the proposed innovations and a widespread dissemination activity throughout the territory	M. Zaccardelli, **CREA - OF** CREA- CI CREA- PB	Campania Region		
GRAIN LEGUMES	**PROLEGU** Improvement program based on grain legumes for human consuption.	Improvement of grain legumes productivity by using rhizobia able to carry out biological Nitrogen fixation	A. Carboni, **CREA-CI** CREA-OF CREA-AN CREA-IT	MIPAAF	L. Caproni, L. Raggi, A. Carboni and V. Negri, 2020. Reconstructing a common bean landrace for sustainable agriculture. Landraces.	
FLAX	**INFLAME** Improvement of secondary metabolites production for human health by flax cell in vitro technology.	Optimize the production of bioactive molecules from flax cell cultures.	B. Ruffoni, CREA - OF	Cariplo Foundation		
LUPINE/ animal feed	**CREALUP** Creation of the lupine supply chain with innovative varieties free from bitter alkaloids, in organic agricultural systems to support Sicilian animal husbandry.	Introduction of sweet lupine in the organic cereal-zootechnical crop systems, as a new possible area of feed production, based on the prevalent use of locally produced food resources.	A. Spina, CREA-CI	Sicilian Region		1. Webinar CREA BREAK for innovation 2020: let's discover lupine in roadshow 2. Webinar 15-12-20 "Introduction in Sicily of new sweet lupine varieties for the innovation of herbaceous cultivation systems and organic animal husbandry"

MEDICINAL PLANTS	**Val.Inn.P.O**. Validation of innovative protocols for the cultivation of officinal plants of nutraceutical interest.	Providing agribusinness companies involved in the project with sustainable plant protection and cultivation protocols for aromatic sicilian plants, in order to extract bioactive compunds used in the agrifood industry and in the protection of agricultral crops. In particular the focus will be placed on two species: Oregano (Origanum vulgare L.) and Rosemary (Rosmarinus officinalis L.).	M.M. Mammano e G. Fascella, CREA - DC	Sicilian Region		
QUINOA	**QUINOA PUGLIA Region** :reinforcement of the supply chain in Puglia .	Spreading the cultivation of quinoa in Puglia, consolidating the supply chain from the farmer to the producer, through the optimization of agronomic practices, linked, above all, to the control of weeds and harvesting. Establish an Operating Group for the resolution of problems related to the cultivation and processing of quinoa including niche products (celiacs, vegans) with a view to environmental, economic and social sustainability.	G. De Santis, **CREA-CI** CREA-IT	Puglia Region		A variety of quinoa under registration.

2.8.2 Patents and Services

Patents PLANT VARIETY RIGHT -Minor supply chain

Products	*Denomination*	*Authors*	*CREA Centres*
hemp	**Carmaleonte**	G. Grassi	CREA-CI
	Carmono	G. Grassi	CREA-CI
	Cinbol	G. Magagnini, G. Grassi	CREA-CI
	Cinro	G. Grassi	CREA-CI
	Ermo	G. Grassi	CREA-CI
kidney bean	**Achille**	B. Parisi	CREA-CI
	Buran	B. Parisi	CREA-CI
	Eracle	B. Parisi	CREA-CI
	Ettore	B. Parisi	CREA-CI
	Grecale	B. Parisi	CREA-CI
runner bean	**Arechi**	P.Ranalli B. Parisi	CREA-CI
quinoa	**Quigiudy-1**	G. De Santis	CREA-CI

CREA VARIETIES INCLUDED IN THE ITALIAN OFFICIAL LISTS

Products	Denomination	CREA Centres	Products	Denomination	CREA Centres
hemp	**Asso**	CREA-CI	kidney bean	**Levante**	CREA-CI
	Carmagnola	CREA-CI		**Libeccio**	CREA-CI
	Camaleonte	CREA-CI		**Luxor**	CREA-CI
	Codimono	CREA-CI		**Merit**	CREA-CI
	CS	CREA-CI		**Mirabile**	CREA-CI
	Eletta Campana	CREA-CI		**Ponente**	CREA-CI
	Fibranova	CREA-CI		**Radames**	CREA-CI
	Fibrante	CREA-CI		**Talento**	CREA-CI
		-		**Ulisse**	CREA-CI
kidney bean	**Achille**	CREA-CI		**White Top**	CREA-CI
	Adone	CREA-CI		**Montalbano**	CREA-GB
	Buran	CREA-CI		**Giulia**	CREA-OF
	Ciclope	CREA-CI		**Occhio di luna**	CREA-OF
	Efesto	CREA-CI		**Solfi**	CREA-OF
	Eracle	CREA-CI	runner bean	**Arechi**	CREA-CI
	Ettore	CREA-CI		**Kaimano**	CREA-CI
	Fiorino	CREA-CI		**Kondor**	CREA-CI
	Furore	CREA-CI			
	Grecale	CREA-CI			

Services

Collections

Products/main topics	Description	Person in charge	CREA Centres
hemp *Cannabis sativa* L.	about 300 accessions stored at controlled conditions (temperature and humidity)	M. Montanari	CREA-CI
common bean *Phaseolus vulgaris* L.	about 1000 accessions (landraces, local varieties, wild relatives, breeding lines, experimental populations for genetic studies, improved varieties, etc)	A. Carboni	CREA-CI
Leguminosae	about 300 accessions of local cultivars of herbaceous species belonging to different botanical families including *Leguminosae, Solanaceae, Cucurbitaceae* and *Graminaceae*	M. Zaccardelli, P. Tripodi	CREA-OF
Linum usitatissimum	282 accessions of different origin, 40% for fibre production, 31% for oil and the remainder with a dual or unknown aptitude. stored in the medium and long term, renewed on a five year base, available upon request	M. Bagatta, M. Montanari	CREA-CI
pathogenic fungi and bacteria	**Pathogen Collection** Collection of pathogenic fungi and bacteria in long and short term storage	L. Sigillo	
herbaceous species	**BANGECAR** – Management of the regional germoplasm bank and characterization of local varieties of herbaceous species from the Marche region, project "Biodiversity and genetic resources - R. L.12/2003. Maintenance of 486 accessions of autochthonous and susceptible to genetic erosion genotypes of different herbaceous species of agricultural interes	S. Sestili	CREA-OF
white, blue and yellow lupine	Lupinus albus, 35 accessions, Lupinus angustifolius, 3 accessions, Lupinus luteus, 3 accessions, stored in cold chamber, renewed on annual base, as backup seeds are maintained under vacuum and in airtight jars, small quantities are available upon request	A. Spina	CREA-CI

Other services

Products/main topics	Description	Person in charge	CREA Centres
aloe vera	**BIOALOV - Biostimulants and microorganisms for the qualitative improvement of *Aloe vera* growing and protection** Evaluate the use of biostimulants and microorganisms in the qualitative improvement of organic growing and protection of Aloe Vera. Indications will also be given on how to optimise cultivation conditions in greenhouses and how to set up a small laboratory for the first treatment of harvested leaves	D.Prisa	CREA-OF
hemp	**VCU Registration Trials - Chemical analysis for the determination of THC in hemp varieties under registration.**	G. Mandolino	CREA-CI
hemp	**Analysis of the content of Δ9-Tetrahydrocannabinol (Δ9- THC) in fiber hemp -AGEA 2019-2020** Collaboration agreement for the control of the tetrahydrocannabinol THC content of hemp on the cultivated surfaces reported in the single application.	G. Mandolino	CREA-CI
hemp	**ORNABIS - Development of hemp genotypes for ornamental purposes.** Development of new hemp genotypes for ornamental purposes and study of propagation systems in vivo and in vitro.	G. Burchi	
medical hemp	**Agreement with SCFM of Florence, Italy, for the supply of medical hemp var. CINRO and CINBOL cuttings and mother plants**	M. Montanari, I. Alberti	CREA-CI
chickpea	S**OREMARTEC - Varietal comparison of chickpeas** Identify the best chickpea varieties	M.Zaccardelli	CREA-OF
grain legumes	**Varietal evaluation and reproduction tests of grain legume lines**	A. Del Gatto	CREA-CI
blue rosemary	**Activities of propagation and cultivation** in small pots of aromatic plants of numerous species and varieties for the realization of demonstration and didactic areas at the structure of the client company. A bibliographic survey will also be carried out, with its summary report, on the most important phytochemical and agronomic characteristics of these species, with particular attention to the composition and properties of the essential oil.	C. Cervelli	CREA-OF

Technical tables/working groups/institutional partnerships

Products/main topics	Description	Person in charge	CREA Centre
industrial hemp	**National Working Table for Industrial Hemp of MiPAAF** (DM Mipaaf n. 9385830 del 17/12/2020	G. Mandolino, R. Paris	CREA-CI
officinal plants	**Working group 1. "Research and training" of the technical table of officinal plants** set up by MiPAAFT, Department of competitive policies for agri-food, horse racing and fishing. Working group that deals with considering the point of research in the field of medicinal species .	M. Cardarelli	CREA - OF

2.9 FORESTS AND WOOD PRODUCTIONS


In the forest sector, the most significant strategic research issues concern sustainable management of forests and timber plantations, the conservation of natural resources and biodiversity, as well as the enhancement of wood and non-wood products of forests and forest plantations.
Our researches are consistent with the new objectives of the European Common Agricultural Policy (CAP) and its Green Deal, as well as with the strategy on "Biodiversity for 2030" and the objective of adaptation to climate change. Activities are aimed at ensuring the availability of timber supplies for the national industry and for energy production, to protect forest genetic resources, to develop tools, techniques and methods for monitoring, planning and the sustainable management of forests and timber plantations.

Actions aimed at enhancing the resilience of forest ecosystems essentially concern the development of forecasting models which consider the role of forests in mitigating climate change. Efficient data collection and forest management protocols easy to apply in the forest planning process are developed by implementing short-term growth forecasting models for the different species, in response to climatic variables, in which resilience and resistance of forests to disturbance events are jointly assessed.
Conservation and improvement of forest genetic resources are carried out through selection and by conventional and innovative genetic breeding programs aimed at improving overall adaptability and tolerance to biotic and abiotic stresses. In comparative plots distributed all over the national territory, the adaptive phenotypic characters of the various genotypes are detected through digital ICT technologies to allow evaluation of numerous individuals at a larger scale. The maintenance and expansion of models of *in situ* dynamic conservation, of assisted gene flow and assisted migration activities are considered essential for the long-term assessment of the migration capacity of forest species under the pressure of climate change. The research carried out so far made it possible to obtain important results, to be promptly transferred to the production sector. In particular, the selection and constitution of clones of poplar and willow characterized by high adaptability, productivity and resistance to biotic and abiotic disturbances is considered of economic interest for the timber supply chain, both in Italy and in Europe. To offer income opportunities to farmers in disadvantaged mountain areas, research is also conducted on biodiversity of food, aromatic and medicinal alpine plants subject to harvesting from spontaneous populations, to obtain non-wood forest products.
Other research lines supporting the forest-wood supply chain concern the use of innovative geomatic technologies for the quantification of forest parameters such as biomass, wood volumes, dendro-structural characteristics and tree growth, as well as of the ecological and phenological characteristics of forest stands. For this, various technologies are tested and validated, such as laser and proximal optical sensors (Terrestrial Laser Scanner, photography), transported by drones, planes or satellites, together with satellite sensors available on a large scale in open access (Copernicus-Sentinel). Particular attention is also paid to the identification of information relating to logistics and availability of data on climate scenarios to contribute, on the one hand, to wood security and, on the other, to the creation of forest districts using adaptive planning with high technological content (precision and smart forestry).
Land suitability and land availability of woody crops for the generation of bioenergy are estimated by using an integrated data system with national coverage, whereas the poplar area is monitored annually with the use of satellite images in order to set up and develop a semi-automatic system for the mapping of specialized poplar cultivation. Another aspect of interest is the ecological and economic evaluation of the use of harvesting residues from forest plantations. In mixed agroforestry plantations, based on the cultivation of poplar and other fast-growing species combined with shrubs and herbaceous species, studies are carried out on the interactions with the agricultural crops and the effects on biodiversity, in order to enhance their ecological role and the ability to adapt to climate change.
Studies and research in support of the National Forest Inventory aim at quantifying and enhancing ecosystem services of forests as well as monitoring and inventorying forests and trees outside forests, with a view to ecosystem resilience and sustainable management of natural resources and landscapes. The methods for multi-scalar estimation are based on remote and proximal observation, on the use of predictive models and on socio-economic investigations. Other investigations concern the ecological role of dead wood in forests, carbon storage, monitoring of land use, assessment of ozone and pollutant damage on forests and urban and peri-urban vegetation, development of tree- and stand-growth models to support the inventory of forest resources, improving the ability to predict the growth of forests in relation to climate change.

2.9.1 Research and research products – Forests and wood

Products/main topics	Acronym and Research Title	Aims	Person in charge and CREA Centres	Partnership/ Financing Body	Scientific Publications	Other Research products [1]
AGROFORESTRY	**AGROMIX** AGROforestry and MIXed farming systems - Participatory research to drive the transition to a resilient and efficient land use in Europe (Call: H2020-SFS-2019-2).	Provide guidance to European farms for a transition to resilient and effective cropping systems that include mixed cropping systems (agricultural crops and livestock) and agroforestry systems (trees and agricultural crops and / or livestock).	P. M. Chiarabaglio, CREA-FL	**European Commission** [2]		
AGROFORESTRY	**NEWTON** Network for the agrofirestry in Tuscany.	Promoting agroforestry (AF) through the diffusion of innovative technical-scientific knowledge among all stakeholders, in order to enhance and promote the traditional innovative AF systems.	M. C. Manetti, CREA-FL	Regione Toscana		
BIOENERGY	**AGROENER** Energy from agriculture: sustainable innovations for the bioeconomy	Harvesting and work systems optimization, with focus on forest plantations in mediterranean areas and harvesting residuals for bioenergy.	P. Menesatti **CREA-IT** CREA-FL	MIPAAF	Fusaro Lina; Gualtieri Maurizio; Manes Fausto; Marchetto Aldo; Mircea Mihaela; Paoletti Elena; Piersanti Antonio; Rogora Michela; Salvati Luca; Salvatori Elisabetta; Leonardi Cristina	
BIOENERGY	**DAFNE RINNOBIO** Renewable Energy: Advanced statistical analysis of the relationship between mechanization and recovery of lignocellulosic biomass.	Exchange of knowledge on renewable energy and lignocellulosic biomass recovery.	P. Corona, CREA-FL			
INNOVATIVE BIOPRODUCTS	**AlpLinkBioEc**o Analysis of resources and implementation actions for the development of added value chains.	Analysis of the potential use of forest-wood resource for the production of innovative bio-products (bio-plastics, bio-textile)	A. Paletto CREA-FL		"A literature review on forest bioeconomy with bibliometric network analysis" (Journal of Forest Science);"Towards a comprehensive development of eco-innovation indicators in forestry sector: an application in the Italian Alps" (Annals of Silvicultural Research).	1 Scholarships
COPPICE / chestnut, beech	**AMISEL** Multi-functionality and economic value of chestnut coppice;	Definition of innovative silvicultural methods for the management of two important forest types present in Monte Amiata: chestnut coppices and beech stands.	M. C. Manetti, CREA-FL		1) Manetti M.C., Conedera M., Marcolin E., Pividori M., Maltoni A., Pelleri F. 2020. Nuove linee guida per i cedui di castagno. Castanea, 17: 23-25. 2) Manetti M.C., Marcolin E., Pividori M., Zanuttini R., Conedera	

[1] *prototypes; dissemination activities (conferences, seminars, reports, sites and videos, etc.); training activities (scholarships, research grants and PhD scholarships.*

[2] COVENTRY UNIVERSITY, UK ; EESTI MAAULIKOOL, EE ; STICHTING WAGENINGEN RESEARCH, NL; AGRIFOOD AND BIOSCIENCES INSTITUTE, UK; Agroecology Europe, BE; REVOLVE, ES; UNIVERSIDAD DE EXTREMADURA, ES ; CRANFIELD UNIVERSITY, UK; MVarc, PT ;EIGEN VERMOGEN VAN HET INSTITUUT VOOR LANDBOUW, EN;VISSERIJONDERZOEK, BE ;PROGRESSIVE FARMING TRUST LTD LBG, UK; EIDGENOESSISCHES DEPARTEMENT FUER WIRTSCHAFT, BILDUNG UND FORSCHUNG, CH ; DEVELOPPEMENT DE L'AGRICULTURE ET DE L'ESPACE RURAL : AGRIDEA, CH; UNIVERSITE DE LIEGE, BE; ASSOCIATION FRANCAISE D AGROFORESTERIE, DES RACINES ET DES CIMES, FR ; HOCHSCHULE TRIER, DE/**EC**

	Enhancement and differentiation of beech forest stands.				M. 2020. Coppice Woodlands and Chestnut Wood Technology. In: The Chestnut Handbook: Crop and Forest Management. Edited by Gabriele Beccaro, Alberto Alma, Giancarlo Bounous, José Gomes-Laranjo, 275-295.	
FOREST CONSERVATION/ good practices	**GOPROFOR** Good practices Implementation Network for Forest biodiversity conservation.	The project is aimed at exchanging experiences and Good Practices for managing the biodiversity of Natura 2000 forest habitats, identifying common objectives and priorities linked to climate change (resilience, endurance and adaptation), conservation of natural capital (and of the flow of Ecosystem.	A. Cutini, **CREA-FL** CREA-PB	**European Commission**		3 workshops 26/02/2020-27/02/2020-28/02/2020
FOREST ECOSYSTEMS/ beech	**AFORCLIMATE** Adaptation of forest management to climate variability: An ecosystem-based approach.	General Objective: to maintain and improve the efficiency of Beech forests ecosystems, through effective forestry, programmed on the basis of climatic cycles. Specific Objective: Definition of a method for measuring the predisposing and predictive climatic factors of specific phenological, growth and forest resilience behaviors such as renewal and seed production and subsequent adoption of the method by the project partners.	U. Chiavetta, CREA-FL	**European Commission**	1 pubblicazione scientifica sulla seconda rivista scientifica internazionale indicizzata su ISI WoS Proietti R., Antonucci S., Monteverdi M. C., Garfì V., Marchetti M.; Plutino M., Di Carlo M., Germani A., Santopuoli G., Castaldi C., Chiavetta U. 2020 - Monitoring spring phenology in Mediterranean beech populations through in situ observation and Synthetic Aperture Radar methods. Remote Sensing of Environment 248. doi:10.1016/j.rse.2020.111978	2 meetings "Tavolo tecnico su foreste e cambiamento climatico"; "Foreste e cambiamenti climatici, approccio e prime analisi sullo stato dell'arte" alla 1° Conferenza Europea LIFE GoProFor "LIFE E RETE NATURA 2000.1 Research grant.
ENERGY CROPS / dissemination/ cultivation techniques	**SUSCACE** Scientific Support for Agricultural Conversion towards Energy Crops.	The project has the purpose of: i) providing technical and scientific support to stakeholders, finding solutions to the problems identified by themselves;ii) making available to the farmers technological innovations strategic for the outcome of the supply chains; iii) sharing with the stakeholders of the agro-energy sector the most recent acquisitions of scientific research in order to help them in the choices of energies crops species, varieties and cultivation techniques in the different specific environment; iv) disseminating the technologies developed by training the farmers in the new technologies utilization.	L. Pari, **CREA-IT** CREA-FL CREA-CI CREA-AA	MIPAAF		
INVENTORY / dendrometric parameters	**PianForTrento** Statistical processing aimed at evaluating alternative methods of dendrometric sampling in corporate forest planning.	Statistical analysis of forest plans data for the evaluation of alternative sampling methods for the inventory of dendrometric parameters in the forest management plans of Trentino.	P. Gasparini, CREA-FL	Provincia Autonoma di Trento		

ECONOMETRICS / fire prevention	**PREVAIL** Statistical and econometric analysis of the efficiency of fire-fighting activities in the countries of Mediterranean Europe.	Support to the econometric analysis of fire prevention activities in Italy and Mediterranean countries.	P. Corona, CREA-FL			
Medical plants/ extracts	**HERBAL** Agreement (sub-contracting) with the scope of the Research Project "Herbs and Mountain plants as an alternative medication for anthelmintic treatments in livestock species	Evaluation of extracts obtained from plants for the use in veterinary medicine.	P.Fusani	Fondazione Edmund Mach		
Fertilization/ poplar and eucalyptus	**Omya** Poplar and eucalyptus OMYA trials.	1. Response of Poplar to Calcium Fertilization (field trial and greenhouse pot trial study). 2. Response of poplar to foliar application of calcium.3. Use of bio stimulant to increase drought resistance and transplanting stress of Eucalyptus. 4. Response of Eucalyptus to Calcium and Phosphorus fertilization on acidic soils.	G. Facciotto CREA-FL	Omya International		
FOREST WOOD SUPPLY CHAIN	**FOR.CIRCULAR** Decision Support System to improve the performance of the forest-wood supply chain in a circular bioeconomy perspective.	The aim of the project is to improve efficiency and increase sustainability of forest-wood supply chain in order to reduce the environmental impacts and dependence on non-renewable energy sources (fossil fuels) in accordance with the objectives of the National Strategy for Sustainable Development and Paris Agreement on Climate Change.	A. Paletto, **CREA-FL** CREA-AA	Ministero Ambiente	1. "Il ruolo del settore forestale nella Strategia Nazionale per lo Sviluppo Sostenibile (SNSvS)".2 "Measuring and assessing forest-based circular bioeconomy to implement the National Sustainable Development Strategy in Italy".	1 Schoolarship
SUPPLY CHAIN/POPLAR SYSTEM	**VigoForPoplar** A short supply chain in the poplar system to enhance quality productions.	Create a chain for poplar cultivation with mutual benefits between the participants.	P.M. Chiarabaglio CREA-FL	Regione Piemonte		
URBAN FORESTRY	**LIFE VegGap** Vegetation for Urban Green Air Quality Plans.	VEG-GAP will provide and disseminate new information in urban areas regarding i) the simultaneous contribution of ecosystems as a source of atmospheric pollution removal; ii) the effects of ecosystems on urban air temperature (thermal island effect) and, consequently, on atmospheric pollution; iii) the risks to human health and forest ecosystems caused by climate change with particular reference to air pollution. The project aims to raise the awareness of stakeholders on the role of plant biodiversity, on the extension of green areas and on their relationship with pollution levels, in particular for	S. Fares, CREA-FL	**European Commission**	Fares S*, Conte A, Alivernini A, Chianucci F, Grotti M, Zappitelli I, Petrella F, Corona P (2020). Testing Removal of Carbon Dioxide, Ozone, and Atmospheric Particles by Urban Parks in Italy. Environmental Science & Technology. 54: 14910–14922. - doi: 10.1021/acs.est.0c04740. *Corresponding author.	

		ozone concentrations (O3). The proposed approaches promote an integrated vision in space and time of pollution and the role of green spaces / ecosystems to counter it. The project will also provide support to the local strategy for the management of green infrastructures and to raise awareness among those interested in protecting and enhancing green areas.				
SUPPLY CHAIN / Douglas fir	**Do.Na.To.** Natural plantations of douglasia in Tuscany.	Priority objectives: - to create a Tuscan supply chain of Douglas fir; - enhance the Douglas fir timber by identifying alternative and more profitable forms of uses, compared to current destinations; - revitalize the nursery chain of postime and increase the availability of timber in the long term; - reduce the costs and social conflicts of the cultivation of Douglas fir.	C. Monteverdi, CREA-FL	Toscana Region		
FOREST INVENTORIES	**INFC CUFA IFNI3-RIL-1** Activities to support the design, implementation and management of the third National Inventory of Forests and forest Carbon sinks (INFC2015). Third executive plan, Part 1	Monitoring of the survey and field data storage for the third National Forest Inventory INFC2015; data quality control of diameter increment data; start of the review and implementation of the calculation procedures and estimators to be applied for the production of the final results.	P. Gasparini, CREA-FL	CUFA	Di Cosmo L., Giuliani D., Dickson M.M., Gasparini Patrizia, 2020 - An individual-tree linear mixed-effects model for predicting the basal area increment of major forest species in Southern Europe. Forest Systems 29 (3), e019, 13 pages (2020) eISSN: 2171-9845 https://doi.org/10.5424/fs/2020293-15500.	
FOREST INVENTORIES	**FWC934340- SC20** Use of National Forest Inventories data to harmonise and improve the current knowledge on forest increment in EuropeUse of National Forest Inventories data to harmonise and improve the current knowledge on forest increment in Europe..	Identify harmonized definitions and procedures among the European forest inventories for the estimation of the annual increase in the volume of forests and their application in a group of countries (DE, ES, FI, FR)	P. Gasparini, CREA-FL	*LUKE (FI), SLU (SE), INIA (ES), WSL (CH), IGN (FR), INCDS (RO), vTI (DE)*/ **European Commission**		
FOREST INVENTORIES	**INCF 2015 INVENTARIO FORESTALE NAZIONALE**	1. Collaudare i rilievi in campo del terzo inventario forestale nazionale INFC2015. 2. Analisi dei dati, revisione e implementazione delle procedure di calcolo, applicazione degli stimatori e produzione delle statistiche inventariali a livello nazionale e regionale.	P. Gasparini, CREA-FL	CUFA	P. Gasparini, A. Floris, M. Rizzo, A. Patrone, L. Credentino, G. Papitto, D. Di Martino, 2021. Il terzo inventario forestale nazionale italiano INFC2015: procedure, strumenti e applicazioni. Geomedia n. 6, 2020 (in stampa).	
FOREST INVENTORIES/ carbon sinks	**INFC CUFA IFNI3-RIL-2&3-** Activities to support the design, implementation and	Final testing of the field surveys of the third National Forest Inventory INFC2015; data analysis, review and implementation of calculation procedures, application of estimators and	P. Gasparini, CREA-FL	CUFA		

	management of the third National Inventory of Forests and forest Carbon sinks (INFC2015). Third executive plan, Part 2 and 3.	production of inventory statistics at national and regional level.				
FORESTRY MACHINERY	**DAFNE OPERA** Silvopastoral systems and production aspects related to mechanization in agriculture and forestry.	Multivariate and econometric analysis of experimental data on agricultural and forestry machinery in order to determine and validate a stochastic model for estimating their aging according to their conditions and time of use.	P. Corona, CREA-FL			
MONITORING CLIMATE CHANGE / ecosystems	**PROICOSMED PON** Strengthening of the ICOS-Italy Observation Network.	Strengthen the ICOS network (Integrated Carbon Observation System) in which CREA participates with the experimental site of Castelporziano. ICOS is an ESFRI strategic infrastructure of the European Community which includes marine, terrestrial and sites where the main atmospheric parameters are studied in order to monitor the impact of climate change on ecosystems.	S. Fares, CREA-FL	MUR	Fares S*, Conte A, Alivernini A, Chianucci F, Grotti M, Zappitelli I, Petrella F, Corona P (2020). Testing Removal of Carbon Dioxide, Ozone, and Atmospheric Particles by Urban Parks in Italy. Environmental Science & Technology. 54: 14910–14922. - doi: 10.1021/acs.est.0c04740. *Corresponding author. Otu-Larbi F, Conte A, Fares S, Wild O, Ashworth K (2020). Current and future impacts of drought and ozone stress on Northern Hemisphere forests. Global Change Biology. 1–17. - doi: 10.1111/gcb.15339.11. Pastorello G, Trotta C, …Fares S…. Papale D (2020). The FLUXNET2015 dataset and the ONEFlux processing pipeline for eddy covariance data. Scientific Data. 7: 225. - doi: 10.1038/s41597-020-0534-3. Savi F, Nemitz E, Coyle M, Aitkenhead M, Frumau K, Gerosa G, Finco A, Gruening C, Goded I, Loubet B, Stella P, Ruuskanen T, Weidinger T, Horvath L, Zenone T, and Fares S* (2020). Neural Network Analysis to Evaluate Ozone Damage to Vegetation Under Different Climatic Conditions. Frontiers in Forests and Global Change 3: 1–14. - doi: 10.3389/ffgc.2020.00042.	
MONITORING CLIMATE CHANGE	**PON CIR01_00019 ICOS** Strengthening of the ICOS-Italy Observation Network - Strengthening of human capital.	Strengthen the ICOS network (Integrated Carbon Observation System) in which CREA participates with the experimental site of Castelporziano with PostDoc grants	S. Fares, CREA-FL	MUR		
INVENTORY / MONITORING	**OLIVEMAP** Mapping of investment needs and monitoring of Italian olive growing.	The project is divided into two work packages and has the objective of mapping the investment needs in the olive oil sector.	N.Puletti, CREA-FL	MIPAAF		
MONITORING / forest growth	**CONECOFOR** Forest growth monitoring in the level II Italian ConEcoFor sites.	The project continues the monitoring of forest growth in the level II Italian plots of the national ConEcoFor network, following the protocols developed by the International Cooperative Programs (ICPs), running under the Convention on Long-Range Transboundary Air Pollution (CLRTAP)	A. Cutini e G. Bertini, CREA-FL	CUFA	Michel A, Prescher A-K, Schwärzel K, editors (2020) Forest Condition in Europe: The 2020 Assessment. ICP Forests Technical Report under the UNECE Convention on Long-range Transboundary Air Pollution (Air Convention). Eberswalde: Thünen Institute. https://doi.org/10.3220/ICPTR1606916913000	

MONITORING / woody growth	**CREAFORNEC** (Managemenet of NEC Italia monitoring infrastructure"Terrestrial Ecosystems and forest growth".	The project contributes to fulfil the needs of DIRECTIVE (EU) 2016/2284 on the establishment of national emissions ceilings of certain atmospheric pollutants, linking them to the impacts on ecosystems. The main objectives are: 1) to establish a network of monitoring sites that is fully representative of the Italian variety of freshwater, natural and semi-natural habitats and forest ecosystem types, by selecting additional representative forest ecosystems of the mediterranean basin and freshwater sites to cover broader ranges of (i) sensitivity to acidification (based on Acid Neutralizing Capacity) (ii) pressure (pollution loads) and (iii) phytoclimates; 2) to introduce and test a new set of indicators and develop new monitoring protocols to study the impacts of air pollution on biodiversity and air pollution chemistry and transparency. Action concerned: monitoring trees/stang growth	A. Cutini, CREA-FL	CUFA	Brunialti, G., Frati, L., Calderisi, M., Giorgolo, F., Bagella, S., Bertini, G., Chianucci, F., Fratini, R., Gottardini, E., Cutini, A. 2020 - Epiphytic lichen diversity and sustainable forest management criteria and indicators: A multivariate and modelling approach in coppice forests of Italy.. Ecological Indicators, 115, art. no.106358. DOI: 10.1016/j.ecolind.2020.106358	
MONITORING/ climatic parameters	**CASPOR2018** Monitoring network of climatic parameters and implementation of data in the research and management area of the Presidential Estate service of Castelporziano starting in 2018, optimization of the water resources of the Estate and monitoring of depositions and atmospheric particulate matter.	Study of the climate of the Presidential Estate of Castelporziano through the detection of the main climatic and environmental parameters as a function of maintaining the efficiency of the forest complex of the Estate.	S. Fares, **CREA-FL** CREA-AA	Segretariato Generale Presidenza della Repubblica - Servizio Tenuta Presidenziale di Castelporziano	Fares S*, Conte A, Alivernini A, Chianucci F, Grotti M, Zappitelli I, Petrella F, Corona P (2020). Testing Removal of Carbon Dioxide, Ozone, and Atmospheric Particles by Urban Parks in Italy. Environmental Science & Technology. 54: 14910–14922. - doi: 10.1021/acs.est.0c04740. *Corresponding author. Savi F, Nemitz E, Coyle M, Aitkenhead M, Frumau K, Gerosa G, Finco A, Gruening C, Goded I, Loubet B, Stella P, Ruuskanen T, Weidinger T, Horvath L, Zenone T, and Fares S* (2020). Neural Network Analysis to Evaluate Ozone Damage to Vegetation Under Different Climatic Conditions. Frontiers in Forests and Global Change 3: 1–14. - doi: 10.3389/ffgc.2020.00042. *Corresponding author. Fares S*, Alivernini A, Conte A, Maggi F (2019). Ozone and particle fluxes in a Mediterranean forest predicted by the AIRTREE model. Science of The Total Environment. - doi: 10.1016/j.scitotenv.2019.05.109 *Corresponding author.	
Landscape / *Eucalyptus*	Protection and enhancement of the Lazio landscape: reconstitution and management of eucalyptus windbreaks.	Provide specialist advice and eucalyptus planting material to support ARSIAL activities in the maintenance windbreaks in the Lazio region.	A. Alivernini, CREA-FL	ARSIAL LAZIO		
Breeding for resistant rootstocks / *Juglans microcarpa* and *J. major*	**PORTNOC2** Evaluation of rootstocks for tolerance / resistance to *Phytophtora* and Black-line and enhancement of compatible *Juglans regia* varieties.	Phenological analysis, multiplication and breeding of *Juglans microcarpa* and *J. major* plants and their hybrids with J. regia for the production of vigorous and resistant rootstocks to *Phytophtora* spp. and black-line.	Belisario, CREA-DC CREA-FL CREA-OFA	MIPAAF		

PLANNING AND MANAGEMENT/ European forests	**SPAN** Saproxylic Habitat Network: planning and management for European forests.	The project will preserve the value of the wood products that forests can sustainably deliver, maintaining a high productivity, while ensuring biodiversity protection. It will demonstrate management criteria that can be applied in different contexts to combine planning, production and biodiversity conservation, significantly improving the conservation status of forest species and habitats.	F. Ferretti, **CRE-FL** CREA-PB	European Forest Institute, Universitat Wurzburg/**European Commission**		
FOREST PLANNING	**FOLIAGE** Forest planning and earth observation for a wellgrounded.	Digitalize regional administrative procedures; Monitor woodland areas using remote sensing techniques applied to satellite images; Provide complete information on forest management in progress and the criticalities and potentialities of forest ecosystems.	CREA-IT	**European Commission**		
FOREST PLANNING	**SIELE** Redaction of a sperimental forest plan of Tenuta Siele (Piancastagnaio - Siena)	Elaoration of a sperimental forest plan of Tenuta Siele (Piancastagnaio - Siena)	P. Cantiani, CREA-FL	Unione dei Comuni Amiata Val d'Orcia		
SUSTAINABLE FOREST PLANNING	**GO SURF** Decision support for sustainable forest planning.	The aim of the project is to allow the bodies in charge (such as the Unions of Municipalities) to have an updated spatial database available, deriving from the integration of all the information sources available, thus improving the management capacity of the territory, in particular for the possibility of making choices aimed at maximizing the productivity of all ecosystem services by all forest types and various forms of management. For forest owners and companies in the forest-wood supply chain, the SURF system makes it possible to set up management activities by substantially reducing the costs necessary for the acquisition of information, while increasing the availability of information also for a range of ecosystem services which is generally not considered.	W. Mattioli, CREA-FL	Regione Toscana		
POPLAR CULTIVATION	**PRECISIONPOP** Development of a multi-scale monitoring system to support precision poplar cultivation in the Lombardy Region.	Developing a continuous, wall-to-wall mapping and monitoring system to support poplar plantation forestry in Lombardy Region, making use of remotely-sensed information coupled with aerial and in-situ proximal sensors at different spatial scales.	F. Chianucci, CREA-FL	Regione Lombardia	Publications; topic collection Res.: https://doi.org/10.1007/s10342-020-01300-9; https://doi.org/10.14214/sf.10247; https://doi.org/10.1139/cjfr-2019-0055;	
GENETIC IMPROVEMENT/ poplar clones	**BIOTECH PIOPPINGENE** Innovative genetic improvement of poplar clones for use in production chains.	Research activities are aimed to obtain new poplar clones with modified growth habit and lignin/cellulose wood composition for industrial feedstock and bioenergy utilizations. Secondary objectives are the development of protocols for in vitro regeneration of poplar cisgenic plants modified for gibberellin biosynthesis and lignin/cellulose content, and for the application of	L. Cattivelli, CREA-GB	MIPAAF		

		CRISPR/Cas9-based genome editing techniques with the aim of obtaining new polar genotypes.				
FOREST POLICY	**RRN2020** Program of basic activities to organize the permanent structures of the Network and produce fundamental outputs of the actions	Technical and operational support for the implementation of the national forest policy.	P. Corona, **CREA-FL** CREA-PB	MIPAAF	Colonico M., Di Salvatore L., Di Salvatore U., Corona P., 2020 - Strategie integrate per le aree interne e montane italiane: dai piani forestali di indirizzo territoriale alle reti di imprese. L'Italia Forestale e Montana, 75 (2): 55-67. https://doi.org/10.4129/ifm.2020.2.01 ; Corona P., 2020. Pianificazione forestale nel Testo Unico in materia di foreste e filiere forestali. Rassegna dell'Arma dei Carabinieri 67: 85-92.; Corona P., Becagli C., Cantiani P., Chianucci F., Di Salvatore L., Di Salvatore U., Romano R., Vacchiano G., Ferretti F., 2020. Elementi di orientamento per la pianificazione forestale alla luce del testo unico in materia di foreste e filiere forestali. Rete Rurale Nazionale 2014-2020, Scheda n. 22.1 e 22.2 - Foreste, Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria, Roma ISBN 978-88-3385-057-3 Coaloa D, Chiarabaglio PM, Giorcelli A, Pelleri F, Plutino M, Rosso L, Corona P (2020). Redditività di pioppeti ad alto fusto e di piantagioni di latifoglie a legname pregiato in Italia. Forest@ 17: 101-108. - doi: 10.3832/efor3595-017 Ienco A, Bernardini V, Scalercio S, Turco R, Corona P (2020). Aggiornamento sulla consistenza delle sugherete in Calabria. Forest@ 17: 30-32. - doi: 10.3832/efor3293-017	workshop"Forest research innovation potential in national and international scenarios" presso la sede di Arezzo del CREA - Centro di Ricerca Foreste e Legno, 29 Gennaio 2020; workshop 'Sugherete e valorizzazione della filiera sughericola' presso la sede di Rende del CREA - Centro di Ricerca Foreste e Legno, 12 Febbraio 2020
SEED PRODUCTION / forest tree species	**PASCIONA** Monitoring seed production of forest tree species, natural renegeneration and relationships with the wildlife in the Foreste Casentinesi, Monte Falterona, Campigna National Park.	Analyzing and predicting the production of seed of the most interesting forest tree species in order to correctly manage the main important forest ecosystems, their stability and conservation over time by means of the natural regeneration process; analyzing the relations between seed production of forest tree species and its importance from a a trophic point of view and the relations with the wildlife (ungulates) within the territory of National Park.	A. Cutini, CREA-FL	Parco Nazionale delle Foreste Casentinesi, Monte Falterona, Campigna	Bajocco, S., Ferrara, C., Bascietto, M., Alivernini, A., Chirichella, R., Cutini, A., Chianucci, F. 2021 - Characterizing the climatic niche of mast seeding in beech: Evidences of trade-offs between vegetation growth and seed production.Ecological Indicators, 121, art. no. 107139. DOI: 10.1016/j.ecolind.2020.107139 Tattoni, C., Chianucci, F., Ciolli, M., Ferrara, C., Marchino, L., Zanni, M., . . . Cutini, A. (2021). A comparison of ground-based count methods for quantifying seed production in temperate broadleaved tree species. Annals of Forest Science, 78(1) doi:10.1007/s13595-020-01018-z	
WOODY RESIDUES	**ARPAF CirculAlps** Innovation to foster sustainability and circular economy in Alpine forestry value chain.	Assessment of environmental impacts generated by the valorisation of woody residues for the bioenergy production.	A.Paletto, CREA-FL		Assessment of environmental impact of biomass power plants to increase the social acceptance of renewable energy technologies" (Heliyon); "Environmental and climate change impacts of eighteen biomass-based plants in the Alpine region: a comparative analysis" (Journal of Cleaner Production); "Offerta e domanda di biomasse legnose ad uso energetico in provincia di Trento: un'indagine conoscitiva" (Forest@); "Possible Opportunities to Foster the Development of Innovative Alpine Timber Value Chains with regard to Bio-Economy and Circular Economy"	
CLIMATE CHANGE AND RESILIENCE/ productivity of forests	**B4EST** Adaptive breeding for productive, sustainable and resilient forests under climate change.	The EU-funded project B4EST is intended to increase resilience and productivity of forests in presence of the climate change and other natural adversities, while maintaining the genetic diversity and the ecological benefits provided by the forest systems. These objectives will be pursued by	G.Nervo, CREA-FL	**European Commission**		

		transferring to the stakeholders (nurserymen, forestry technicians, forest land managers and owners, forest product users and forest policy makers) the results and the scientific knowledge obtained by the use of innovative breeding strategies aimed to improve the adaptability to the climate change of 8 species of relevant economic significance for the European forestry.				
FOREST GENETIC RESOURCES	**FAO-RGV** VI triennium Program "Implementation of the FAO Treaty on Plant Genetic Resources for Food and Agricolture", aimed at research and experimentation supporting the collection, characterization and evaluation of plant genetic resources.	-Revision of the inventory, reorganization, reintegration with new accessions and rejuvenation of the clonal collection of Castanea sativa. -Selection, genetic characterization and constitution of clonal archives of Pinus pinea with genotypes showing greater tolerance to Leptoglossus occidentalis -Conservation of accessions of species for food purposes: *Achillea moschata*, *Armoracia rusticana*, *Aruncus dioicus*, *Cicerbita alpina*, *Gentiana lutea.*	I.Verde, CREA-OFA	MIPAAF	de Dato GD, Teani A, Mattioni C, Aravanopoulos F, Avramidou E, Stojnic S, Ganopoulos IV, Belletti P, Ducci F (2020). Genetic analysis by nuSSR markers of silver birch (Betula pendula Roth) populations in their southern European distribution range. Frontiers in Plant Science, - doi: 10.3389/fpls.2020.00310 Aiello, N.; Marengo, A.; Scartezzini, F.; Fusani, P.; Sgorbini, B.; Rubiolo, P.; Cagliero, C. Evaluation of the Farming Potential of Echinacea Angustifolia DC. Accessions Grown in Italy by Root-Marker Compound Content and Morphological Trait Analyses. Plants 2020, 9, 873	
FORESTRY	**PRERECA** Collaboration agreement for updating activities concerning the Regional price list invested in agricultural and silvicultural projects, and in supporting the Standard costs regarding the PSR (Rural developing programme) Calabria 2014-2020.	Aim of the research: A) Identification of objective criteria for prices updates; analysis of the current market prices and comparison with the Regional price list ones, used in agricultural and silvicultural projects. Identification of qualitative and quantitative economic values for materials and labour, involved in projects concerning agricultural, silva-pastoral and processing farms. B) Calculation of Standard prices; identification of variables managing the trend of these Standard costs designed to build up a calculation model; collection, development and analysis of old Data Base regarding approved agricultural and silvicultural projects.	R. Turco, CREA-FL	Calabria Region		
SILVICULTURAL SECTOR	**ARIA MOUNTFOR** Scientific collaboration within the EFI-MOUNTFOR project.	Investigate whether business networks (in particular, the network contract) can constitute an effective entrepreneurial collaboration model for the enhancement of natural and human capital in inland areas, with particular reference to potential, criticalities and prospects for companies operating in the silvicultural sector.	P. Corona, CREA-FL		L. Di Salvatore (con M. Colonico, U. DI Salvatore, P. Corona), 2020 - Strategie integrate per le aree interne e montane italiane: dai piani forestali di indirizzo territoriale alle reti di imprese, in L'Italia forestale e montana, 75 (2): 55-67.	
CARBON SEQUESTRATION	**CARTER** Conservation and sequestration of carbon in the soil.	Contribute to the increase in the sequestration of carbon dioxide from the atmosphere and organic matter in the soil.	P. M. Chiarabaglio, CREA-FL	Veneto Region		
PRECISION FORESTRY	**AGRIDIGIT** Subproject SELVICOLTURA	The sub-project "Precision Forestry" represents the silvicultural and forestry component of a wider project proposal entitled AGRIDIGIT. This sub-	M. Donatelli, CREA-AA	MIPAAF		

		project aims to develop, test and transfer innovative methods, tools and technologies for the enhancement of the national forest heritage and the development of its production chains.				
LAND USE	**SAUS** Environmental sustainability of land use	Territorial analyzes on land use in Lazio, also through sociological surveys.	P. Corona, CREA-FL	Lazio Region		

2.9.2 Patens and Services

Patens INDUSTRIAL PATENTS

Products/ main topics	*Denomination/Description*	*Authors/Inventors*	*CREA Centres*
wood production	**Metodo speditivo supportato per la stima della massa legnosa di cataste organizzate** (IT) *Co-titolarità: CNR + Università Reggio calabria + Società F360)*	S. Figorilli C. Costa	CREA-IT

PLANT VARIETY RIGHT (poplar clones)

Products	*Denomination*	*Authors*	*CREA Centres*
eucalyptus	**VELINO**	G.MUGHINI	CREA-FL
eucalyptus	**VIGLIO**	G.MUGHINI	CREA-FL
poplar	**ALERAMO**	CREA-FL	CREA-FL
poplar	**BALDO**	CREA-FL	CREA-FL
poplar	**BRENTA**	G.LAPIETRA	CREA-FL
poplar	**DIVA**	CREA-FL	CREA-FL
poplar	**LENA**	G.LAPIETRA	CREA-FL
poplar	**MELLA**	G.LAPIETRA	CREA-FL
poplar	**MOLETO**	Gras Maria De Los Angeles, G. Nervo, A. Giorcelli, G. Allegro, L. Vietto, S. Bisoffi, G. Castro	CREA-FL
poplar	**MOMBELLO**	Gras Maria De Los Angeles, G. Nervo, A. Giorcelli, G. Allegro, L. Vietto, S. Bisoffi, G. Castro	CREA-FL
poplar	**MONCLAVO**	Gras Maria De Los Angeles, G. Nervo, A. Giorcelli, G. Allegro, L. Vietto, S. Bisoffi, G. Castro	CREA-FL
poplar	**OGLIO**	CREA-FL	CREA-FL
poplar	**ORION**	CREA-FL	CREA-FL
poplar	**SENNA**	Gras Maria De Los Angeles, G. Nervo, A. Giorcelli, G. Allegro, L. Vietto, S. Bisoffi, G. Castro	CREA-FL
poplar	**SOLIGO**	G. LAPIETRA	CREA-FL
poplar	**TARO**	G. LAPIETRA	CREA-FL
poplar	**TUCANO**	CREA-FL	CREA-FL

CREA CLONES INCLUDED IN THE ITALIAN OFFICIAL LISTS (poplar clones)

Products	*Denomination*	*CREA Centres*	*Products*	*Denomination*	*CREA Centres*
poplar	**Adda**	CREA-FL	poplar	**Dvina**	CREA-FL
poplar	**Aleramo (83.141.020)**	CREA-FL	poplar	**Eridano**	CREA-FL
poplar	**Arno**	CREA-FL	poplar	**Guardi**	CREA-FL
poplar	**Baldo**	CREA-FL	poplar	**Harvard**	CREA-FL
poplar	**Bellini**	CREA-FL	poplar	**I-154**	CREA-FL
poplar	**Boccalari**	CREA-FL	poplar	**I-214**	CREA-FL
poplar	**Brenta**	CREA-FL	poplar	**I-262**	CREA-FL

poplar	**Carpaccio**	CREA-FL	poplar	**I-45/51**	CREA-FL
poplar	**Cima**	CREA-FL	poplar	**I-455**	CREA-FL
poplar	**Diva (83.002.031)**	CREA-FL	poplar	**Imola (83.160.029)**	CREA-FL
poplar	**Jean Pourtet**	CREA-FL	poplar	**Orion**	CREA-FL
poplar	**Lambro**	CREA-FL	poplar	**Panaro**	CREA-FL
poplar	**Lena**	CREA-FL	poplar	**San Martino**	CREA-FL
poplar	**Lima**	CREA-FL	poplar	**Senna (83.002.011)**	CREA-FL
poplar	**Luisa Avanzo**	CREA-FL	poplar	**Sesia**	CREA-FL
poplar	**Lux**	CREA-FL	poplar	**Sile**	CREA-FL
poplar	**Mella**	CREA-FL	poplar	**Soligo**	CREA-FL
poplar	**Moleto (83.190.012)**	CREA-FL	poplar	**Stura**	CREA-FL
poplar	**Mombello (84.048.032)**	CREA-FL	poplar	**Taro**	CREA-FL
poplar	**Moncalvo (83.024.017)**	CREA-FL	poplar	**Timavo**	CREA-FL
poplar	**Neva**	CREA-FL	poplar	**Triplo**	CREA-FL
poplar	**Oglio**	CREA-FL	poplar	**Tucano (84.260.003)**	CREA-FL
poplar	**Onda**	CREA-FL	poplar	**Villafranca**	CREA-FL

Services

Collections

Products/ main topics	*Denomination/Description*	*Person in charge*	*CREA Centres*
Collections of Mediterranean conifers, *Robinia pseudoacacia, Juglans* sp., *Eucalyptus* sp	The collection includes several provenances from the primary and secondary range of distribution of *Pinus, Eucalyptus, Juglans, Robinia pseudoacacia*, planted starting from the mid-1970s of the last century and suitable for Mediterranean climate conditions.	various	CREA-FL
PORTNOC2	Evaluation of rootstocks for tolerance / resistance to *Phytophtora* and Black-line and enhancement of compatible *Juglans regia* varieties. Collection of grafted plants resistant to *Phytophtora* spp.	various	CREA-FL

Certifications

Products/ main topics	*Denomination/Description*	*Person in charge*	*CREA Centres*
CPVO-DUS Test *Eucalyptus*	**CPVO-DUS Test Eucalyptus:** Distinctness Uniformity Stability (DUS) test is carried out on some *Eucalyptus* clones as assignment of CPVO (Community Plant Variety Office). G.Pignatti, CREA-FL F. Gervasi, CREA-OFA.	G.Pignatti, F. Gervasi	CREA-FL, CREA-OFA

Other services

Products/ main topics	*Denomination/Description*	*Person in charge*	*CREA Centres*
national forest policy	Supporto tecnico e operativo all'attuazione della politica forestale nazionale.	P. Corona , A. Cutini	CREA-FL
urban development and territorial development	Supporto tecnico-scientifico ad Apincittà (Biomonitoraggio alveari in rete a Roma: progetto del Comune di Roma, Federazione Apicoltori Italiani, Carabinieri Forestali.	G. Pignatti	CREA-FL
biodiversity protection and parks	Tirocini volti alla formazione alla ricerca di studenti universitari in collaborazione con varie sedi universitarie, (Torino, Piemonte Orientale (Alessandria), Milano, Firenze, Tuscia (Viterbo), La Sapienza (Roma) e Calabria (Arcavacata, Cosenza).	various	CREA-FL
biodiversity protection and valorization	Collaborazione con Provincia Autonoma di Trento, Servizio Politiche Sviluppo Rurale ai progetti finanziati da MIPAAF per la realizzazione di azioni destinate alla tutela ed alla valorizzazione della biodiversità di interesse agricola ed alimentare.	P. Fusani	CREA-FL

Working tables / working groups / institutional partnerships / Centre journals / Editorial Board of Journals

Products/ main topics	*Denomination/Description*	*Person in charge*	*CREA Centres*

Ministerial Decree 34/2018	**'Working group of the Ministry of Agriculture, Food and Forestry Policies appointed to draw up the draft of the Ministerial Decree prescribed by the article 6 of the Governmental Decree 34/2018:** Coordination of the Working Group appointed by the Forestry Directorate of MIPAAF to draw up the draft of the Ministerial Decree	P. Corona	CREA-FL
Legislative Decree 386/03 and European Directive 1999/105 / EC	**Participation and coordination of regional and national institutional activities relating to the Poplar Observatory and the application of Legislative Decree 386/03 and European Directive 1999/105 / EC**	G. Pignatti	CREA-FL
Biodiversity of temperate forests	**COST CA18207- Biodiversity Of Temperate forest Taxa Orienting Management Sustainability by Unifying Perspectives**	F. Chianucci	CREA-FL
ciclo carbonio /gas serra	ICOS (Integrated Carbon Observation System) is a research infrastructure dedicated to the monitoring and study of the carbon cycle and other greenhouse gases in different sectors (terrestrial ecosystems, seas and oceans, atmosphere) and has been included in the ESFRI roadmap since 2006. The ICOS Italian network involves ten experimental stations covering nationally representative ecosystems: different types of forests, grasslands, cultivated land and shrubs. All stations must go through the ICOS standardization and quality control program in order to meet the high standards and receive the labeling for the measuring station. ICOS networks include three classes of stations: Class 1 stations are equipped with complete equipment to measure a larger set of predetermined ICOS variables, Class 2 stations are equipped to measure a predefined subset of ICOS variables, and associated sites, who provide data to the ICOS portal without having to comply with the protocols. The Castelporziano site coordinated by CREA in "Grotta di Piastra" (IT-Cp2) is the only national forest site proposed to receive a class 1 label by the end of 2021.	S. Fares	CREA-FL
forests, mitigation and adaption	**Coordination of the Working Group "Forests, between mitigation and adaptation" of the Italian Society of Silviculture and Forest Ecology** Working group on the forest mitigation and adaptation in the context of climate change, also to respond to new forest policy needs. CREA Coordinates the WG since February 2020	U. Chiavetta	CREA-FL
mountain ecosystem management	**'COST CA15226 CLIMO - Climate-Smart Forestry in Mountain Regions:** Management Committee for Italy in support of the Action, which is aimed in developing Climate-Smart Forestry (CSF) concept for European mountain regions.	F. Chianucci	CREA-FL
forest management and protection	**'Working group for the preparation of the first "Report on the state of forests in Italy (RaF-Italy)", Forestry Department, Ministry of Agricultural, Food and Forestry Policies (MiPAAF):** Support for the drafting of the Report - coordination of the Forest Management and Protection Working Group	P. Corona	CREA-FL
sustainable forest management	**Working group "Silviculture" of the Italian Society of Silviculture and Forest Ecology (SISEF).** Working group on the new approaches and good practices dealing with the main silvicultural systems and practices within the framework of the Sustainable Forest Management.	A. Cutini	CREA-FL
sustainable forest management	**EUFORGEN National focal point, componente Steering Committee, WP 7 - Development of a decision support tool for GCU** EUFORGEN – the European Forest Genetic Resources Programme – is an international cooperation programme that promotes the conservation and sustainable use of forest genetic resources in Europe as an integral part of sustainable forest management. EUFORGEN is a network of experts from its member countries and provides a platform for developing and implementing its pan-European conservation strategy.	G.de Dato	CREA-FL
forest inventory network	**European National Forest Inventory Network (ENFIN):** Network of European National Forest Inventories aimed at harmonizing national definitions and relevant procedures and promoting consistent forest information at the European level	P. Gasparini	CREA-FL
inventory of Mediterranean forest genetic resources	**Coordination of the working group WG4 Forest Genetic Resources in the Mediterranean Region – FAO Silva Mediterranea:** The working group on forest genetic resources is led by Italy. Its coordinator is Dr. Fulvio Ducci. The WG focuses on a new regional inventory of Mediterranean forest genetic resources, as well as the development of guidelines for the choice of genetic resources based on experimental criteria and other criteria reflecting their adaption to future climate change	F. Ducci	CREA-FL
forest growth monitoring	**Expert Panel "Forest Growth" - International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests)** The Expert Panel has the task to further develop the harmonised monitoring methods in the field of forest growth as laid down in the Manual. The Expert Panel closely cooperates with the Programme Co-ordinating Centre and the data centres in order to contribute to the data evaluation and quality assurance.	G. Bertini	CREA-FL

foliage and litterfall monitoring	**Expert Panel "Foliage and Litterfall" - International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests)** The Expert Panel has the task to further develop the harmonised monitoring methods in the field of foliage and litterfall as laid down in the Manual. The Expert Panel closely cooperates with the Programme Co-ordinating Centre and the data centres in order to contribute to the data evaluation and quality assurance.	A. Cutini	CREA-FL
mountain	**'FAO - Mountain partenship Focal Point CREA for the mountain partenship**: Participation at the activities of the FAO Mountain partnership.	P. Corona	CREA-FL
forest planning and management	**Coordination of the working group "forestal planning" of the SISEF Società Italiana di Selvicoltura ed Ecologia Forestale:** Working group on experiences and innovative ideas on forest planning and management. .	P. Cantiani e F. Ferretti	CREA-FL
medical and aromatic species	**'Medicinal and Aromatic Plants productive chain Technical board (MIPAAFT):** 'joining**,** since the beginning, to the Medicinal and Aromatic Plants productive chain Technical board, established by MIPAAF through DM 15391 of 12/10/2013, in the working groups "Research and Education" and "Varieties registers.	P. Fusani e N. Aiello	CREA-FL
poplar	**National Poplar Observatory (MiPAAF):** Participation in the work of the technical working group to support the Italian poplar supply chain with interactions with the International Poplar Commission (IPC)	G. Nervo	CREA-FL
poplar	**International Poplar Commission (IPC) - Member elected of the Executive Committee** The IPC is a statutory body of FAO founded in 1947 to facilitate the restoration of the degraded landscapes of Europe after the Second World War. It has 38 Member Nations on five Continents. Priorities are forest resources production, protection, conservation and utilization, with a view to sustaining livelihoods, land users, rural development and the environment. The Commission's work includes food security issues, climate change and carbon sinks, biodiversity conservation and resilience against biotic and abiotic threats and combating deforestation.	G. Nervo	CREA-FL
poplar	**International Poplar Commission (IPC), Working Party on 'Taxonomy, Nomenclature and Registration' - Technical Secretary:** It is one of the six-international, cross-disciplinary working parties of the IPC. It is appointed as the International Cultivar Registration Authority (ICRA) for the genus Populus and Salix by the Commission for Nomenclature and Cultivar Registration of the International Society for Horticultural Science (ISHS). The International Register of Populus Cultivars and the International Register of Salix Cultivars are periodically updated amended and reissued. New cultivars epithets are accepted if appropriately named following the rules of the International Code of Nomenclature for Cultivated Plants (ICNCP).	L. Vietto	CREA-FL
italian forest resources	**International reporting activities on forests, FAO-FRA2020 and FOREST EUROPE-State of Europe's Forests 2020 initiatives:** Internationa reporting through the participation in the activities of the working group at the MiPAAF for the compilation of national reports on the state of Italian forest resources as part of the FAO and FOREST EUROPE "Forest Resources Assessment FRA2020" and "State of Europe's Forests 2020" initiatives.	P. Gasparini	CREA-FL
forest genetic resources	**The FAO Commission on Genetic Resources for Food and Agriculture** (http://www.fao.org/plant-treaty/tools/toolbox-for-sustainable-use/details/en/c/1178190/) deals with the preservation of biodiversity for food and agriculture on the planet and promotion of its sustainable use for food security and human well-being and development around the world, for current and future generations. Fulvio Ducci is the National Focal point for forest genetic resources and is responsible for the Italian relations with the Commission and the European Regional Group (ERG) and coordinates the World inventory of forest genetic resources with regard to the National Report.	F. Ducci	CREA-FL
payment for ecosystem service	**'COST - Management Committee - COST Action CA15206 "Payment for Ecosystem Services (Forests for Water):** Representative of Italy in the COST Action CA15206 focuses on Payment for Ecosystem Services (PES)	A.Paletto	CREA-FL
medical and aromatic species	**'ECPGR - member of the Medicinal and Aromatic Working Group of the European Cooperative Programme for Plant Genetic Resources (ECPGR):** Member of the Medicinal and Aromatic Plants (MAPs) Working Group of ECPGR, a collaborative Programme among most European countries, aiming at ensuring the long-term conservation and facilitating the utilization of plant genetic resources in Europe, through the participation to Activity Grants launched within the Programme for the exchange of experiences among Group Members and the elaboration of reports aimed at the achievement of the goals of programme. .	P. Fusani	CREA-FL

cork	**Working group "Cork", wood production chain commitee of the Ministry of Agriculture, Food and Forestry Policies:** Working group in charge of updating the National Cork Plan**.**	G. Pignatti	CREA-FL
meteorology phenology and LAI	**Expert Panel "Meteorology, phenology and LAI' - International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests)**The Expert Panel has the task to further develop the harmonised monitoring methods in the fields of meteorology and phenology as well as in the field of leaf area index, as laid down in the Manual. The Expert Panel closely cooperates with the Programme Co-ordinating Centre and the data centres in order to contribute to the data evaluation and quality assurance.	F. Chianucci e A. Cutini	CREA-FL

3. CREA RESEARCH LINES BY CROSS CUTTING ISSUES

3.1. GENOMICS, BIOTECHNOLOGIES AND BIOINFORMATICS

The genome and its interaction with the environment determine the development and performance of every living species. Advanced genomics coupled with the most recent knowledge on bioinformatics are revolutionizing the way in which cultivated varieties are selected. **CREA supports the international competitiveness of Italy in the field of genetics and genomics for the most important Italian crops, according to a vision that makes the genomic know-how a strategic asset for national agriculture.**
The research of CREA in the genomics research area, is characterized by scientific excellence evidenced by the high quality of the publications combined with relevant ready-tuo use results, including analytical methods and protocols for traceability and food safety, patents and varieties selected through genomic assisted breeding.

The genomic research is being applied to many crop species, both annual plants and trees, in addition to the microbial communities of the soil, and, in a nutshell, they can be traced back to the following main themes:
Genome sequencing. CREA has participated in international initiatives focused on the sequencing of bread wheat, eggplant and olive genomes, and coordinated the international consortium for the sequencing of the durum wheat genome.
Study of genetic diversity and identification of genes ersponsible for important characters in cereal and vegetable species. Large collections of germplasm of barley, bread wheat, durum wheat, oats, rice, eggplant, asparagus and poplar have been assembled and genotyped with the most advanced technologies. The work led to the identification and characterization of genes/genomic regions for traits involved in adaptation to environmental and climatic changes, genes controlling plant development and coding for resistance to diseases. As an example, the following items are cited: resistance genes to *Pyrenophora graminea* and *P. teres* in barley, *Blumeria graminis*, *Puccinia tritrici* and *Fusarium* in bread and durum wheat, *Pyricularia oryzae* in rice, *Fusarium* in eggplant; genes responsible for the anthocyanin color of eggplant fruits and the accumulation of phytomelanins in black barley seeds, genes for the content of functional molecules (avenanthramides, beta-glucans) in oats, genes responsible for chloroplast mutations in barley, etc. This information is translated into plant selection programs to implement work assisted by molecular markers and genomic selection for knowledge-based plant breeding.
CREA bioinformatics facility. CREA has long-standing expertise in the field of bioinformatics dedicated to genome annotation, genomic selection, microbial genomics and metagenomics, analysis of pangenomes (allele mining, copy number variation, etc.). These skills have contributed to CREA's action in different genome sequencing programs of bread and durum wheat and olive trees, in the study of genomic diversity for adaptation to the environment in cereals, and in the identification of key genes for domestication of eggplant.
A platform for functional genomics and genome editing. CREA coordinates the BIOTECH project (a national project financed by the Ministry of Agriculture, Food and Forestry Polcies targeted at genome editing and cisgenesys) and has developed a platform for genome editing and cisgenesys in numerous agricultural species (e. g. barley, wheat, eggplant, tomato, kiwi, etc.). The research has led to the enhancement of knowledge on functional genomics on many genes, e. g. genes controlling spike fertility and seed size in cereals, shelf-life and development in tomatoes, response to *Pseudomonas syringae* in kiwifruit, etc.
Genome assisted breeding: models and programs for plant genetic improvement. CREA works for the development of genomic selection models applied to the main crop species, in collaboration with private industry partners. Genomic selection protocols and methods for marker-assisted introgression of resistant genes and other traits (forward and background selection) are operational for many *loci* of significant interest. This action underlies an intense technology transfer activity which has led to the registration of several varieties in partnership with private seed industries.
Genomic strategies for assessment of quality and safety and traceability along the agri-food production. CREA has developed advanced analytical protocols for varietal fingerprinting and for the identification and quantification of plant species, genomic tools for the study of kinship relationships between vines, diagnostic assays for the traceability of pathogens, characterizations of the metagenome, molecular knowledge on the interactions between plant and soil microbiota in relation to the safety and quality of crops both in conventional and organic farming. In this context, many collaborations have been activated with the private sector (food industry and large-scale distribution) and a patent has been registered that describes new peptides of plant origin with bactericidal activity.

3.1.1 Research and research products - Genomics Biotechnologies and Bioinformatics

Main topics/ Products	Acronym and Research Title	Aims	Person in charge and CREA Centres	Partnership/ Financing Body	Scientific Publications	Other Research products [1]
BIODIVERSITY/ cereals	**AGENT** Activated GEnebank NeTwork.	Create a European atlas of genomic diversity and phenotypic diversity, also activating phenotypic data collected over the years and so far not accessible; integrating genomic and phenotypic diversity, creating models for genomic selection; improve data quality and efficiency, create an IT infrastructure for the management of genetic resources and data deriving from the project.	P. Vaccino, CREA-CI	Leibniz-Institut (De); Vir (Ru); Ihar-Pib (Pl); Institute Of Plant Genetic Resources (Bg); Vvi (Cz); Tel Aviv University (Il); Magyar Tudomanyos Akademia Agrartudomanyi Kutatokozpont (Hu);Inia (Es); Stichting Wageningen Research (Nl); Incda (Ro); Nppc (Sk); Aegean Agricultural Research Institute (Tr);Universitat Zurich (Ch);Eurice (De); Icarda (Lebanon) Inra (Fr); Kew Gardens (Uk); Ipgri (It); Wbf (Ch)/**European Commission**		https://www.agent-project.eu/
BIODIVERSITY/ wheat/ old varieties/preservation, valorisation	**SGRANAVA** Salvaguardia e valorizzazione dei grani antichi della Valmarecchia.	Enhancement and protection of the ancient grains traditionally cultivated in Valmarecchia.	V. Terzi, CREA-GB	Emilia-Romagna Region		Ancient grain descriptive files.
BIOTECHNOLOGY/ citrus, resistance	**SIRPA** Development of resistance inductors to vascular pathogens of citrus fruits.	Identification and use of natural biotechnological remedies to be used to defend the "tristeza", caused by the phloem virus *Citrus* tristeza closterovirus (CTV), which causes a progressive deterioration of the plants, leading them to death.	C. Licciardello, CREA-OFA	Sicilian Region		Webinar 18.12.2020; 1 research grant .
BIOTECHNOLOGY/ kiwi	**BIOTECH-BIOSOSFRU** Next generation BIOtechnological approaches for a better productivity and SUStainability of FRUit crops..	Develop kiwifruit plants that are resistant to bacteriosis caused by Pseudomonas syringe.	L. Cattivelli, **CREA-GB**-coordinator BIOTECH, I. Verde CREA-OFA	MIPAAF	Michelotti et al. Comparative transcriptome analysis of the interaction between Actinidia chinensis var. chinensis and Pseudomonas syringae pv. actinidiae in absence and presence of acibenzolar-S-methyl. BMC Genomics 2018, 19: 585. doi: 10.1186/s12864-018-4967-4	https://www.crea.gov.it/en/-/biotech
BIOTECHNOLOGY/ eggplant	**BIOTECH - QUALIMEC** Miglioramento delle proprietà qualitative in melanzana e carciofo mediante approcci di genome editing e cisgenesi.	Develop aubergine lines with parthenocarpic fruit (without seeds) by gene editing and cis-genesis and lines resistant to fusarium.	L. Cattivelli, **CREA-GB** CREA-DC	MIPAAF		https://www.crea.gov.it/en/-/biotech

[1] *prototypes; dissemination activities (conferences, seminars, reports, sites and videos, etc.); training activities (scholarships, research grants and PhD scholarships).*

BIOTECHNOLOGY/ olive	**BIOTECH-GENOLICS** In vitro regeneration of olive cultivars and search for allelic variants for the use of modern biotechnologies.	Obtaining an efficient regeneration system and identifying editable mutations for future applications of modern biotechnologies.	L. Cattivelli, **CREA-GB** CREA-OFA CREA-OF	MIPAAF		2 Research grants.
BIOTECHNOLOGY/ barley/durum wheat	**BIOTECH-WHEADIT** Approcci di genome editing per ottimizzare la performance dei cereali tramite il controllo dei pathway ormonali.	Improve the yield of durum wheat and barley by modulating hormonal pathways; identify key genes that influence the size and number of seeds and modulate their activity thought genome editing.	L. Cattivelli, CREA-GB	MIPAAF	1) Desiderio et al. Characterization of the resistance to powdery mildew and leaf rust carried by the bread wheat cultivar 'Victo'. International Journal Molecular Science 2021, 22: 3109. doi: 10.3390/ijms2206310; 2) Adamski et al. A roadmap for gene functional characterisation in large genomes crops: lessons from polyploid wheat. eLife 2020, 9: e55646. doi: 10.7554/eLife.55646 1;3) Caselli et al. Crop reproductive meristems in the genomic era: a brief overview. Biochem Soc Trans 2020, doi:10.1042/BST20190441; 4)Mastrangelo, Cattivelli What makes bread and durum wheat different? Trends in Plant Science 2021, doi:10.1016/j.tplants.2021.01.004 1; 5)Ben Mariem et al. Assessing the evolution of wheat grain traits during the last 166 years using archived samples. Scientific Reports 2020, 10: 21828. doi: 10.1038/s41598-020-78504-x;6) Rodríguez-Suárez et al. Transcriptomics, chromosome engineering and mapping identify a restorer-of-fertility region in the CMS wheat system msH1. Theoretical Applied Genetics 2020, 133: 283–295. doi: 10.1007/s00122-019-03457-3 7) Bagnaresi and Cattivelli L. Ab-initio GO-based mining for tandem duplicate functional clusters in three model plant diploid genomes. PLoS One 2020, 15: e0234782. doi: 10.1371/journal.pone.0234782Alseekh et al. Mobile Transposable Elements Shape Plant Genome Diversity Trends in Plant Science, Month 2020, doi.org/10.1016/j.tplants.2020.08.003 8) Taranto et al. Characterization of Celiac Disease-Related Epitopes and Gluten Fractions, and Identification of Associated Loci in Durum Wheat. Agronomy 2020, 10, 1231 doi:10.3390/agronomy10091231; 9)Alseekh et al. Mobile Transposable Elements Shape Plant Genome Diversity Trends in Plant Science, Month 2020, doi.org/10.1016/j.tplants.2020.08.003	https://www.crea.gov.it/en/-/biotech
BIOTECNOLOGY/ tomato	**BIOTECH – CISGET** Cisgenesi e Genome editing in pomodoro.	To develop tomatoes with improved nutritional characteristics and a greater shelf life of the berry in post-harvest through the application of genome editing.	L. Cattivelli, **CREA-GB** CREA-OF	MIPAAF	1)Punzo et al. DRT111/SFPS Splicing Factor Controls Abscisic Acid Sensitivity during Seed Development and Germination. Plant Physiology_2020, 183, pp. 793–807 2) Tamburino et al. Cultivated Tomato (Solanum lycopersicum L.) Suffered a Severe Cytoplasmic Bottleneck during Domestication: Implications from Chloroplast Genomes. Plants 2020, 9, 1443; doi:10.3390/plants9111443	
GERMPLASM CHARACTERIZATION/ vegetables/cereals/ typical varieties	**CORE-save** COstituzione di una REte Regionale per la SAlvaguardia del Germoplasma Vegetale tradizionale lombardo.	Characterize, enhance and safeguard typical Lombard varieties (cereal and vegetable species)	L.Toppino, CREA-GB	Lombardia Region		http://coresave.unipv.it/

VARIETAL CERTIFICATION/ innovation testing	**INVITE** INnovations in plant VarIety Testing in Europe to foster the introduction of new varieties better adapted to varying biotic and abiotic conditions and to more sustainable crop management practices.	Develop new methodologies for varietal evaluation and certification in Europe.	V. Terzi, **CREA-GB** CREA-DC CREA-ZA	**European Commission** [1]	1)Morcia C et al. Moving from qPCR to Chip Digital PCR Assays for Tracking of some Fusarium Species Causing Fusarium Head Blight in Cereals. Microorganisms 2020, 8, 1307;2)Morcia C et al. A Chip Digital PCR Assay for Quantification of Common Wheat Contamination in Pasta Production Chain. Foods 2020, 9, 911 3)Cibecchini G et al. A Fast, Naked-Eye Assay for Varietal Traceability in the Durum Wheat Production Chain. Foods 2020, 9, 1691 4)Morcia C et al. Digital PCR: What Relevance to Plant Studies? Biology 2020, 9, 433 5)D'Onofrio et al. Parentage Atlas of Italian Grapevine Varieties as Inferred From SNP Genotyping. Front. Plant Sci. 2021, doi: 10.3389/fpls.2020.605934; 6) Zombardo et al. Transcriptomic and biochemical investigations support the role of rootstock-scion interaction in grapevine berry quality. BMC Genomics 2020, 21: 468. doi: 10.1186/s12864-020-06795; 7) Bertazzon et al. Grapevine comparative early transcriptomic profiling reveals that Flavescence dorée phytoplasma represses plant responses induced by vector feeding in susceptible varieties. BMC Genomics 2019, doi:10.1186/s12864-019-5908-6 362	https://www.h2020-invite.eu/
DEFENSE and PRIMING/ organic crops	**BIOPRIME** Riduzione di input di origine extra-aziendale per la difesa delle coltivazioni biologiche mediante approccio agroecologico.	Use natural compounds and microorganisms for the defense and priming of Mediterranean organic crops.	V. Terzi, **CREA-GB** CREA-AA CREA-ZA CREA-VE	MIPAAF	1) Simonin M et al. 2020 Influence of plant genotype and soil on the wheat rhizosphere microbiome: identification of a core microbiome across eight African and European soils. FEMS Microbiol Ecol. doi: 10.1093/femsec/fiaa067; 2) Tava et al. (2020) Molecules 25:2333	New microbial strains for crop protection.
GENETIC DIVERSITY/ *Brassica*	**BRASEXPLOR** Wide exploration of genetic diversity in *Brassica* species for sustainable production.	Using the genetic diversity in *Brassica* for sustainable production.	V. Terzi, CREA-GB	*INRA Le Rheu, INRA Montpellier, Ger USTHB, ITCMI, INRAA (Algeria) (Spagna); NGB (Egitto); INRAT (Tur (Slovenia)/ MUR* **European Comm**		https://www.geves.fr/news/brasexplor-genetic-diversity-in-meditteranean-brassic-vegetables-for-sustaining-crop-production/
GENETIC DIVERSITY/ hemp, flour and oil/ waste, bioeconomy	**CATERPILLAR** CAnapa TEssile peR la ProduzIone di aLimenti funzionaLi e di biomAsse pRoteiche per l'alimentazione animale.	Characterize hemp flour and oil for the formulation of dietary preparations for human consumption; production of additives for the feed industry from waste from fiber hemp processing.	V. M. C. Moliterni, CREA-GB	Emilia Romagna Region		

[1] Institut National de la Recherche Agronomique (INRA), FR; Universitaet Hohenheim (U Hohenheim) , DE; Forschungsinstitut Fur Biologischen Landbau Stiftung(FiBL), CH; Wageningen University (WU) , NL; Stichting Wageningen Research (WR), NL; Teagasc Agriculture and Food Development Authority (Teagasc); Ieinstitut de Recerca I Tecnologia Agroalimentaries, ES; The James Hutton Institute (BioSS), UK; Eidgenoessisches Department Fuer Wirtschaft, Bildung Und Forschung (Agroscope), CH; Centro di Sperimentazione Laimburg (RCL), IT;Centre Wallon De Recherches Agronomiques (CRA-W), BE; Community Plant Variety Office (CPVO), FR; Stichting Nederlandse Algemene Kwaliteitsdienst Tuinbouw (Naktuinbouw),NL; Bundessortenamt (BSA), DE; Groupe d'Etude et de Controle Des Varietes et des Semences (GEVES), FR; National Institute of Agricultural L Botany (NIAB), UK; Osterreichische Agentur Fur Gesundheit UndErnahrungssicherheit GMBH (AGES), AT; Central Institute For Supervising and Testing in Agriculture (UKZUZ) , CZ; Scottish Government (SASA), UK; Nemzeti Elelmiszerlanc-Biztonsagi Hivatal (NEBIH), HU; Association De Coordination Technique Agricole (ACTA), FR; European Seed Association (ESA) , BE; NPZ Innovation GMBH (NPZi), DE; Better3Fruit (B3F), BE; Arcadia International E.E.I.G. (Arcadia) , BE; INRA Transfert S.A. (IT) / **European Commission**

GENETIC DIVERSITY / *Solanaceae*	**GP2SOL** Linking genetic resources, genomes and phenotypes of solanaceous crops.	High resolution genomic characterization coupled with phenotyping for morphological characteristics and resistance to biotic and abiotic stress in solanaceae (tomato, eggplant, pepper and potato).	G. L Rotino, **CREA-GB** CREA-OF	[1] **European Commission**	Moglia et al. Identification of a new R3 MYB type repressor and functional characterization of the members of the MBW transcriptional complex involved in anthocyanin biosynthesis in eggplant (S. melongena L.). PLOS ONE 2020, doi:10.1371/journal.pone.0232986	http://www.g2p-sol.eu/
GENETIC DIVERSITY / wheat, barley	**EVA-WB ECPGR** European Evaluation network on wheat/barley.	European network for the evaluation and genetic characterization of common wheat, durum wheat and barley.	D. Barabaschi, CREA-GB	European Evaluation network (EVA) inserito all'interno dell'European Cooperative Programme for Plant Genetic Resources (ECPGR). https://www.ecpgr.cgiar.org/european-evaluation-network-eva/about-eva/ **European Commission-Biodiversity International**	1)Tcherkez et al. Elevated CO2 has concurrent effects on leaf and grain metabolism but minimal effects on yield in wheat. J Exp Bot 2020, doi: 10.1093/jxb/eraa330; 2)Toreti et al. Narrowing uncertainties in the effects of elevated CO2 on crops. Nature Food 2020, doi:10.1038/s43016-020-00195-4; 3)Blandino et al. Elevated CO2 Impact on Common Wheat (Triticum aestivum L.) Yield, Wholemeal Quality, and Sanitary Risk. J Agric Food Chemistry 2020, doi:10.1021/acs.jafc.0c02975	With reference to bread wheat, the sequencing of the genome was completed, the evolution of wheat was revisited on the basis of molecular data, a locus of resistance to fusarium was defined. The response of durum and bread wheat to the rise in atmospheric CO2 was also characterized. https://www.ecpgr.cgiar.org/european-evaluation-network-eva
GENETIC DIVERSITY/ barley	**GENDIBAR** Utilization of local genetic diversity for studying barley adaptation to harsh environments and for pre-breeding.	Genomic characterization of approximately 1000 barley landraces to support genetic improvement and adaptation to climate change in the Mediterranean area.	A. Fricano, CREA- GB	*École Nationale Supérieure Agronomique Max Planck Institut für Pflanzenzüchtun (Germany); Ain Shams University (E Universidad de Lleida (Spain); Agencia Consejo Superior de Investigaciones Científi University of Sfax (Tunisie)/MUR* **Eu Commission**	1)Bretani et al. Segmental duplications are hot spots of copy number variants affecting barley gene content. The Plant Journal 2020, 103:1073–1088. doi: 10.1111/tpj.14784	https://www.era-learn.eu/network-information/networks/prima/section-2-call-multi-topic-2018/utilization-of-local-genetic-diversity-to-understand-and-exploit-barley-adaptation-to-harsh-environments-and-for-pre-breeding
GENETIC DIVERSITY/ barley	**iBARMED** Innovative barley breeding approaches to soften the impact of climatic change in the Meiterranean Area.	Genetic improvement of barley through genomic selection to contrast climate change.	A. Fricano, CREA- GB	International Center for Agricultural Research in the Dry Areas (Morocco); Institute National de la Recherche Agronomique de Tunisie; University of Cukurova (Turkey); Agencia Estatal Consejo Superior de Investigaciones Científicas (Spain); Bahri Dagdas International Research		Four highly productive barley lines were selected and proposed for registration in the varietal register. https://www.ibarmed.com/

[1] Stichting Wageningen Research Netherlands The James Hutton Institute United Kingdom The Hebrew University Of Jerusalem Israel Leibniz - Institut Fuer Pflanzengenetik Und Kulturpflanzenforschung Germany ;Universitat Politecnica De Valencia Spain Institut National De La Recherche Agronomique France; The Agricultural Research Organisation Of Israel – The Volcani Centre Israel Eurice European Research And Project Office Gmbh Germany; Instytut Hodowli I Aklimatyzacji Roslin - Panstwowy Instytut Badawczy Poland Centro Internacional De La Papa Peru ;Phenom Networks Ltd, Israel; Ministry Of Food Agriculture And Livestock Turkey; Maritsa Vegetable Crops Research Institute Bulgaria; Asian Vegetable Research And Development Center Taiwan/

				Institute (Turkey)/ MIPAAF-**European Commission**		
GENETIC DIVERSITY/ poplar	**B4EST** Adaptive BREEDING for productive, sustainable and resilient FORESTs under climate change.	Develop advanced tools for the genetic characterization and improvement of tree and forest species.	A. Fricano, **CREA-GB** CREA-FL	**European Commission and others**[1]		A SNP array for forest species was developed and a collection of over 1000 poplar clones was characterized. https://b4est.eu//
GENOME EDITING/ stone fruits/ resistance	**TESS** Targeted Engineering of Stone fruit tree genomes for resistance to Sharka.	The research aims at developing stone fruit trees resistant to Sharka through the CRISPR/Cas9-mediated editing of host susceptibility genes. It is carried out through the exchange of know-how and personnel among partners for the establishment of an interdisciplinary workgroup with great expertise.	S. Micali, CREA-OFA	INRA - Institut National de la Recherche Agronomique/ Bordeaux (Francia), INIA - Instituto de Investigaciones Agropecuarias/ Santiago del Cile/**European Commission**		
METAGENOMICS/ soil	**DIVERFARMING** Crop diversification and low-input farming across Europe: from practitioners engagement and ecosystems services to increased revenues and chain organisation.	Develop and test the effect of low-input crop systems through soil microbiome analysis to increase crop productivity and quality.	L. Orrù, **CREA-GB** CREA-AA	[2] **European Commission and others**[3]		http://www.diverfarming.eu/index.php/en/
BREEDING/ asparagus	**PREBREASP** Prebreeding in asparago.	Prebreeding in asparago per aumentare la variabilità genetica nel germoplasma coltivato attraverso lo sviluppo di ibridi interspecifici e la selezione di linee resistenti a *Puccinia asparagi*.	A. Losa, CREA - GB	Rijk Zwaan		
BREEDING/ eggplant	**MIGLIORE** IMpiego di varIetà miGLIorate di specie Orticole diinteresse Regionale per un'agricoltura	Select aubergine varieties with high NUE (nitrogen use efficiency).	G. L. Rotino, CREA-GB	Sicilian Region		1 Scholarship

[1] Forest Commission Research Agency (FR); Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA); Stiftelsen Skogsbrukets Forskningsinstitut (SKOG); Natural Resources Institute Finland (LUKE); European Forest Institute (EFI); Uppsala Universitet (UU); University of Oulu (UOULU); Sveriges lantbruksuniversitet (Swedish University of Agricultural Sciences) (SLU) Natural Environment Research Council (NERC) Wageningen Research (WR) Centre International de Recherche Agronomique et de Développement (CIRAD) Norwegian Institute of Bioeconomy Research (NIBIO) Université Paul Sabatier Toulouse III(UPS) Finsilva Oyj (FINS) Altri Florestal (ALTRI) Inra Transfert (IT)/ **European Commission**

[2] Universidad Politécnica de Cartagena (Spain); Agencia Estatal Consejo Superior de Investigaciones Científicas (Spain); Asociación Regional de Empresas Agrícolas y Ganaderas de la Comunidad Autónoma de Murcia (Spain); Universidad de Córdoba (Spain); Wageningen University (The Netherland); University of Portsmouth Higher Education Corporation (UK); Universität Trier (Germany); Luke: Natural Resources Institute (Finland); University of Exeter UK); Università di Pécs (Hungary)/ **European Commission**

[3] Institut National de la Recherche Agronomique (INRA), FR; Universitaet Hohenheim (U Hohenheim) , DE; Forschungsinstitut Fur Biologischen Landbau Stiftung(FiBL), CH; Wageningen University (WU) , NL; Stichting Wageningen Research (WR), NL; Teagasc Agriculture and Food Development Authority (Teagasc); Ieinstitut de Recerca I Tecnologia Agroalimentaries, ES; The James Hutton Institute (BioSS), UK; Eidgenoessisches Department Fuer Wirtschaft, Bildung Und Forschung (Agroscope), CH; Centro di Sperimentazione Laimburg (RCL), IT;Centre Wallon De Recherches Agronomiques (CRA-W), BE; Community Plant Variety Office (CPVO), FR; Stichting Nederlandse Algemene Kwaliteitsdienst Tuinbouw (Naktuinbouw),NL; Bundessortenamt (BSA), DE; Groupe d'Etude et de Controle Des Varietes et des Semences (GEVES), FR; National Institute of Agricultural L Botany (NIAB), UK; Osterreichische Agentur Fur Gesundheit UndErnahrungssicherheit GMBH (AGES), AT; Central Institute For Supervising and Testing in Agriculture (UKZUZ) , CZ; Scottish Government (SASA), UK; Nemzeti Elelmiszerlanc-Biztonsagi Hivatal (NEBIH), HU; Association De Coordination Technique Agricole (ACTA), FR; European Seed Association (ESA) , BE; NPZ Innovation GMBH (NPZi), DE; Better3Fruit (B3F), BE; Arcadia International E.E.I.G. (Arcadia) , BE; INRA Transfert S.A. (IT) / **European Commission**

	sostenIbile ed a basso impatto ambientalE.					
BREEDING / tomato, eggplant	**SOLNUE** Miglioramento delle proprietà qualitative in melanzana e carciofo mediante approcci di genome editing e cisgenesi.	Identify and understand the genetic basis of nitrogen use efficiency (NUE) in tomato and eggplant in order to reduce the use of fertilizers.	G. L Rotino, CREA-GB	INRA-Montfavet (France); UPV Valencia (Spain); CSIC Valencia (Spain)/ MUR **European Commission**		https://www.era-learn.eu/network-information/networks/suscrop/1st-transnational-joint-call-on-sustainable-crop-production/tomato-and-ggplant-nitrogen-utilization-efficiency-in-mediterranean-environments
BREEDING/ barley	**BARISTA** Advanced tools for breeding BARley for Intensive and SusTainable Agriculture under climate change scenarios.	Develop advanced tools for the genetic improvement of barley through the application of modeling and performance prediction systems (genomic prediction, GP, and crop simulation modeling, CSM) capable of taking into account the effect of future climate scenarios.	L. Cattivelli, CREA-GB	Luonnonvarakeskus (Luke), Finland;Estación Experimental Aula Dei-CSIC, Spain;Martin-Luther-University, Germany;University of Goettingen, Germany;University of Copenhagen, Denmark;James Hutton Institute, United Kingdom;University of Tartu, Estonia;University of Silesia, Poland;SEGES Landbrug & Fødevarer F.m.b.A., Denmark;Estonian Crop Research Institute, Estonia/MUR **European Commission**	1)Faccini et al. Resistance of European spring 2-row barley cultivars to Pyrenophora graminea and detection of associated loci. Agronomy 2021, 11: 374. doi:10.3390/agronomy11020374	Genetic diversity in barley was characterized, new loci of resistance to pathogens were identified and genomic prediction and genomic selection models were built for the selection of lines suitable for future climate scenarios. https://www.barleyhub.org/projects/barista
BREEDING/ barley/water use efficiency	**WATER4AGRIFOOD**Miglioramento delle produzioni agroalimentari mediterranee in condizioni di carenza di risorse idriche.	Genetic improvement of barley for water use efficiency.	M. Mastrorilli, CREA- AA CREA-GB CREAPB	MUR		
BREEDING/ rice	**NEURICE** New commercial EUropean RICE *(Oryza sativa)* harbouring salt tolerance alleles to protect the rice sector against climate change and apple snail (*Pomacea insularum*) invasion-	Select rice varieties suitable for saline environments by introgressing loci for salt tolerance into the lines grown in Europe.	G. Valè, **CREA-GB** CREA-CI	**European Commission** [1]	1)Volante et al. Genome wide association studies for japonica rice resistance to blast in field and controlled conditions. Rice 2020, doi: 10.1186/s12284-020-00431	Two salt-tolerant rice lines were obtained and were proposed for registration. http://neurice.eu/

[1] Universitat de Barcelona, Spain; Centre de Recerca ed Agrigenomica CSIS-IRTA-UAB-UB Spain; Centre de Cooperation International en recherche agronomiche pour le development, France ; University of Glasgow, United Kingdom ; Institut de Recerca I Tecnologia Agroalimentaries, Spain ;Instituto de Agrobiotecnologia Rosario S.A, Argentina ; Institute of Crop Science, CAAS China ;Càmara Arrossera del Montsià i Secció de Crèdit, S.C.C.L. Spain ; Innovacio I Recerca Industriali I Sostenible SL, Spain Centre Français du Riz France /**European Commission**

NEW BREEDING TECHNIQUES/ orange, mandarin	**BIOTECH-CITRUS** Improvement by Sustainable Biotechnologies.	Use of the New Breeding Techniques (cisgenesis and genome editing) to be used to improve qualitative traits of citrus fruits, such as the enrichment of oranges in healthy compounds and the production of seedless mandarin and mandarin-like fruits	L. Cattivelli, **CREA-GB** CREA-OFA	MIPAAF	1.Salonia et al. 2020. New Plant Breeding Techniques in Citrus for the Improvement of Important Agronomic Traits. A Review. Frontiers in Plant Science 11 (1234): 1-15. doi.org/10.3389/fpls.2020.01234. 2. Poles et al., 2020. Recent Advances of In Vitro Culture for the Application of New Breeding Techniques in Citrus. Plants 9 (8), 938. doi.org/10.3390/plants9080938. 3. Catalano et al., 2020. Target-Genes Reveal Species and Genotypic Specificity of Anthocyanin Pigmentation in Citrus and Related Genera. Genes 11 (7), 807. doi.org/10.3390/genes11070807	1. PhD scholarship; 3 research grants; 1 scholarship.
NEW PROTOCOLS FOR SEED PRIMING/ eggplamt	**WAKE-APT** Seed WAKE-up with APTamers: a new technology for dormancy release and improved seed priming strategy.	Develop new protocols for seed priming, new tools to quantify germination aptitude and molecular markers for the early discrimination of good quality seed lots.	L. Toppino, CREA – GB	Fondazione Cariplo	1.Forti et al. Molecular dynamics of pre-germinative metabolism in primed eggplant (Solanum melongena L.) seeds. Horticulture Research 2020, 7:87 doi.org/10.1038/s41438-020-0310-8. 2. Toppino et al. A New Intra-Specific and High-Resolution Genetic Map of Eggplant Based on a RIL Population, and Location of QTLs Related to Plant Anthocyanin Pigmentation and Seed Vigour. Genes, 2020 doi:10.3390/genes11070745	https://www.wake-apt.it/
GENOME SEQUENCING / olive	**OLGENOME** Completamento del sequenziamento del genoma dell'olivo e annotazione dei geni.	Complete the sequencing of the olive genome (*Olea europaea* L., cv. Leccino) and develop genomic tools for the genetic improvement of the olive tree.	F. Carboni, CREA- OFA	MIPAAF	1)Salimonti A., Forgione I., Sirangelo T.M., Puccio G., Mauceri A., Mercati F., Sunseri F., Carbone F. 2021 A complex gene network defines the flower induction and differentiation in Olea europaea L. Submitted to MDPI Genes (ISSN 2073-442) Manuscript-ID: genes-1092596 2)Sirangelo T.M., Lo Feudo G., Forgione I., Zelasco S., Salimonti A., Carbone F. 2020 The OLGENOME web portal: a user-friendly working tool for project partners and results dissemination. Proc. SIGA Young Web Meeting, 7 Luglio, Abstract SY39 3) Forgione I., Salimonti A., Sirangelo T.M., Puccio G., Mercati F., Sunseri F., Carbone F. 2020 Comparative profiling of axillary buds from 'ON' and 'OFF' branches reveals a complex gene network in OLEA EUROPAEA. Proc. SIGA Young Web Meeting, 7 Luglio, Oral Communication Abstract SY16 Salimionti et al. Association; Study of the 5'UTR Intron of the FAD2-2 Gene With Oleic and Linoleic Acid Content in Olea europaea L. Frontiers Plant Sci 2020, doi:10.3389/fpls.2020.00066	http://olgenome.crea.gov.it 2 Assegni di ricerca. Eventi divulgativi: Strategie per una divulgazione scientifica senza barriere. Un caso studio: portale OLGENOME-webinar "L'accessibilità delle informazioni alimentari per le persone non vedenti".
INTEGRATED STRATEGIES/ durum wheat, biodiversity	**CEREALMED** Enhancing diversity in Mediterranean cereal farming systems	Combining genetic and agronomic strategies to increase the biodiversity of cereal farming systems in Mediterranean environments.	E. Mazzucotelli, **CREA-GB** CREA-CI CREA-AA	Consejo Superior de Investigaciones Científicas-Instituto de Agricultura Sostenible (CSIC,) Spain;Universidade de Santiago de Compostela, Spain; University of Athens, Greek; University of Adana, Turkey; Beni Swif University, Egypt;Institut National de la Recherche Agronomique-Morocco;American University of Beirut/ MUR	1)Taranto et al. Characterization of Celiac Disease-Related Epitopes and Gluten Fractions, and Identification of Associated Loci in Durum Wheat. Agronomy 2020, 10, 1231; doi:10.3390/agronomy10091231;2)Mazzucotelli et al. The Global Durum Wheat Panel (GDP): An international platform to identify and exchange beneficial alleles. Frontiers Plant Sci 2020, doi:10.3389/fpls.2020.569905);3)Nigro et al. Functional Validation of Glutamine synthetase and Glutamate synthase Genes in Durum Wheat near Isogenic Lines with QTL for High GPC. Int J Mol Sci 2020, doi: 10.3390/ijms21239253	A worldwide collection of reference germplasm for durum wheat has been developed with over 1000 fully genotyped lines. Genes for protein content and seed size were identified. The durum wheat reference genome was completed. http://www.cerealmed.eu/

TRASFORMATION OF FOOD SYSTEMS cereals/trasversal solutions	**SYSTEMIC** An integrated approach to the challenge of sustainable food systems: adaptive and mitigatory strategies to address climate change and malnutrition.	Explore transversal solutions, identify knowledge gaps and develop pathways for a transformation of the food system, which is climate resistant, sustainable and capable of addressing societal challenges.	L. Cattivelli, CREA-GB	Network of 42 Euroepean partners /MiPAAF- **European Commission**		https://systemic-hub.eu/

3.1.2 Patents and Services

Services

Collections

Products	*Description*	*Person in charge*	*CREA Centres*
asparagus	Maintenance, phenotypic and molecular characterization of a collection of about 200 asparagus lines	A. Losa	CREA-GB
oat	Maintenance, phenotypic and molecular characterization of a collection of about 500 cultivars, landraces and wild progenitors	V. Terzi	CREA-GB
common wheat	Maintenance, phenotypic and molecular characterization of a collection of about 500 accessions (common wheat) and 200 accessions (*Triticum aestivum* ssp compactum, sphaeroccoum, macha e spelta).	D. Barabaschi	CREA-GB
tetraploid wheat	Maintenance, phenotypic and molecular characterization of a collection 500 varieties/lines, 700 landraces, 400 farri selvatici.	E. Mazzucotelli	CREA-GB
eggplant	Maintenance, phenotypic and molecular characterization of a collection of about 400 accessions, cultivars, landraces and wild progenitors	L.Toppino	CREA-GB
barley	Maintenance, phenotypic and molecular characterization of a collection of a few thousand cultuvars, landraces and wild progenitors	A. Tondelli	CREA-GB
Rice	Maintenance, phenotypic and molecular characterization of a collection of about 500 cultivars, landraces and wild progenitors	C. Marè	CREA-GB
triticale	Maintenance, phenotypic and molecular characterization of a collection of about 200 triticale lines	N. Faccini	CREA-GB

Other services

Products	*Description*	*Person in charge*	*CREA Centres*
durum and common wheat, barley, triticale, oat/asparagus, eggplant	Realization of experimental fields with straw cereals and horticultural species.	N. Faccini(cereali), GL Rotino (orticole)	CREA-GB
various	Genetic analysis based on the use of molecular markers to support genetic selection, varietal identity, traceability of agricultural products and pathogens, varietal certification.	C. Marè, G. L Rotino	CREA-GB

Working tables / working groups / institutional partnerships

Main topics/ Products	*Description*	*Person in charge*	*CREA Centres*
wheat	**Wheat Initiative. International Agency**. https://www.wheatinitiative.org/	L.Cattivelli	CREA-GB
durum wheat	**EWG on durum wheat genomics and breeding.** https://www.wheatinitiative.org/durum-wheat-genomics-and-breeding.	L.Cattivelli	CREA-GB
genetic resources	**Div Seek** International Association https://divseekintl.org/	L. Cattivelli	CREA-GB
genetic resources	**European Cooperative Programme for Plant Genetic Resources (ECPGR)** Barley working group.	A. Tondelli	CREA-GB

genetic resources	**European Cooperative Programme for Plant Genetic Resources (ECPGR)** Oat working group.	V. Terzi	CREA-GB

3.2 PLANT PROTECTION AND RESILIENCE

The Communication of the European Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions (COM 846/2020 of 18.12.2020) and the "Recommendations to Member States on the related Common Agricultural Policy strategic plans", emphasize the strong connection between healthy people, healthy societies and a healthy planet". At the same times it is underlined that the European Common Agricultural Policy (CAP) will play a primary role in the management of the "transition to a sustainable food system" in terms of contribution to the EU's climate goals and environmental protection".

In this context, it is worth noting that a balanced socio-economic development and a truly sustainable management of food resources and environment are bound to rely on innovative strategies aimed at ensuring phytosanitary protection from pests and pathogens that may endanger the main agricultural and forest ecosystems.

This appears particularly true considering that Italy is a country of very rich biodiversity, where the wide range of production contexts has made the agricultural sector one of the most vital in the world and which applies to a wide range of local and typical products, each with their own peculiar requirements in terms of crop protection from adversities, with particular attention to dangerous phytophagous pests and pathogenic infections.

Most of the efforts of CREA are precisely directed to the development of skills and strategies towards the use/risks of pesticides in line with the objectives of the European "Green Deal". In this context, it is worth mentioning that, in recent years, the already complex situation has further evdenced the increasing need to contrast phytosanitary emergencies caused by devastating biological invasions of organisms/microorganisms severely affecting plants and crops. Moreover, it should be stressed that in a planet with over 5 millions of estimated insect species, rapid and unambiguous pest identification plays an essential role in the prevention of accidental introductions and in the management of emerging outbreaks caused by new alien organisms harmful to plants.

The problem is equally serious in the case of dangerous microorganisms.

The requirements in this area and the request for more reliable, economical and rapid diagnostic tests suitable to be used even at the entry points of the national territory, are growing hand in hand with the increased controls on trade to and from our country and with the evolution of the phytosanitary trade regulations defined by the EU Regulation 2016/2031 and more generally by all the agreements worldwide.

In fact, in order to protect the national agricultural production and ensure the absence of dangerous organisms and microorganisms both from commodities and from plants, there is a growing consensus on the need for more effective and rapid controls at the entry ports that may ensure prevention of accidental introductions from our country but also to different geographic locations.

Plant protection from adverse biotic factors is an emerging issue also in forest ecosystems. To this end, it is noteworthy that the most recent Commission documents include "plant diseases and parasitic infestations" together with drought, storms and floods among the main causes of forest deterioration. Furthermore, new studies investigating carbon stocks and related issues have shown that, in the coming years, only 5 alien species of forest interest might compromise more than 10% of the carbon stored in European forests if their entry or their spread from initial foci should not be stopped. That might lead to a scenario similar to that observed for the harmful and potentially invasive Pine Nematode that could further spread from the already devastated Portuguese pine forests.

Furthermore, new studies investigating on carbon stocks and related issues have shown that, in the years to come, only 5 alien species of forest interest might compromise more than 10% of the carbon stored in European forests, if their entry or their spread from initial *foci* should not be stopped. This might lead to a scenario similar to the one observed for the harmful and potentially invasive Pine Nematode which could further spread from the already devastated Portuguese pine forests.

3.2.1 Research and research products -Plant protection and resilience

Main topics/ prducts	*Acronym and Research Title*	*Aims*	*Person in charge and CREA Centres*	*Partnership/ Financing Body*	*Scientific Publications*	*Other Research products [1]*
NEXT GENERATION VARIETY TESTING/ durum and common wheat	**INNOVAR** Next generation variety testing for improved cropping on European farmland.	Enhancing and improving the efficiency and accuracy of tests conducted in Europe to register new plant varieties in the European Catalogue and decision-making processes.	A. Giulini/P. G. Bianchi, CREA DC	**European Commission**		
BIOFUMIGANTS	**NUTRIEN**	Studies for the qualitative assessment and improvement of plant materials with biofumigant action using chemical and biological approaches.	L. Lazzeri, CREA-CI		1) Matteo M, Lorenzo D'Avino L, Ramirez-Cando LJ, Pagnotta E, Angelini LG, Spugnoli P, Tavarini S, Ugolini L, Foschi L, Lazzeri L. Camelina (Camelina sativa L. Crantz) under low-input management systems in northern Italy: yields, chemical characterization and environmental balance. Italian Journal of Agronomy, 2020 doi.org/10.4081/ija.2020.1519	Webinar 25/09/2020: Approfondimento sulla Biofumigazione: una tecnica per contenere le avversità telluriche e migliorare la salute del suolo.
GENETIC SANITARY CERTIFICATION/ hazelnut	**CORYNE**	Corylynnova Nebrodi: Characterization, conservation and promotion of the Hazelnut germplasm, genetic sanitary certification in the plant nursery businnes; quality improvement of nut.	R. Rizzo, **CREA-DC** CREA-AN	Sicilian Region		
DIAGNOSTICS	**EURL-BAC** European Union Reference Laboratory for plant bacteria.	The activity of EURL is aimed at providing National Reference Laboratories (NRLs) with high standard methods for the detection of phytopathogenic bacteria, ensuring their high performance, providing scientific and technical support to the EU and other organisations and ensuring reference collections and quality standards of reagents used for diagnostic protocols. The Commission, for the period 2019-2021, has focused the activities on the priority pests designated among those listed as quarantine pests.	S. Loreti, **CREA-DC**	NVWA (Olanda), NIB (Slovenia), ILVO (Belgio)/ **European Commission**		1 Scholarship
DIAGNOSTICS	**EURL-VIR** European Union Reference Laboratory for Virology.	EURL's work is aimed at providing the National Reference Laboratories (NRLs) with high standard methods for the detection of viruses, viroids and phytoplasmas of plant	F. Fagioli, **CREA-DC**	NWVA - The Netherlands; NIB - Slovenia/ **European Commission**	Luigi M, Manglli A., Bertin S., Donati L., Tomassoli L., Ferretti L. & Faggioli F., 2020. Development and validation of a specific real-time PCR protocol for the detection of tomato leaf curl	1 Scholarship

[1] *prototypes; dissemination activities (conferences, seminars, reports, sites and videos, etc.); training activities (scholarships, research grants and PhD scholarships)*

		pathogensand, ensuring their high performance, providing scientific and technical support to the EU and other organisations and ensuring reference collections and quality standards of reagents used for diagnostic protocols. The Commission, for the period 2019-2021, has focusedthe activities on priority pests designated among those listed as quarantine pests.			New Delhi virus. European Journal of Plant Pathology DOI 10.1007/s10658-020-02038-1	
DIAGNOSTICS	**VALITEST** Validation of diagnostic tests to support plant health.	The main goal of the project is to improve the reliability of the diagnostics used in plant protection through different/correlated approaches and to validate diagnostic tests.	F. Fagioli , **CREA-DC**	16 partners di 9 nazioni europee: Francia, Italia, Belgio, Olanda, Slovenia, GB, Svizzera, Polonia e Germania/**European Commission**	Results of an interlaboratory test performance study for the evaluation of molecular methods to detect tomato brown rugose fruit virus in tomato and pepper leaves. Luigi M, Manglli A., Tomassoli L., Faggioli F., 2020. Tomato brown rugose fruit virus and c ucumber green mottle mosaic virus, two emerging tobamoviruses threatening tomato and cucurbit crops worldwide Association of Applied Biologists (2 December 2020)	https://www.valitest.eu/
DIAGNOSTICS NGS AND META BARCODING	**EUPHRESCO 2018-2023 – A275** Use of new diagnostic tools for the detection of Pantoea stewartii subsp. stewartii, from plant and seeds**.**	NGS technology and meta-barcoding for the characterization of isolates of *Pantoea stewartii* subsp. *stewartii.*	V. Scala,CREA-DC	Anses(Francia),NIB(Slovenia), Ages (Austria), Eurofins (Francia),FGBUVNIIKR(Russia)/**European Commission**		
DIAGNOSTICS/ citrus	**EUPHRESCO** 2019-A-318 -Sampling and analysis of asymptomatic Citrus fruits and leaf litter to detect the infection of *Phyllosticta citricarpa* (CBS-ETECT).	Development of diagnostic techniques for *Pyllosticta citricarpa* using asymptomatic material..	L. Riccioni, CREA DC	Anses (Francia), NIB (Slovenia), Inia (Spagna), Brasile, Tunisia/ **European Commission**		
PLANT PROTECTION/ dust and food mites.	**DUSTMITALY** Screening and investigation of the distribution and potentially sustainable control strategies of populations of medically-relevant dust and stored-food mite.	Implementation of either sanitary control programs or pest management programs in the context of agriculture and food conservation. Evaluation of biological and environmental parameters and their interactions that may enhance allergic reactions due to dust mites (house and workplace) and stored-food mites.	S.Simoni , CREA DC	Anallergo SpA		1. Research grant
PLANT PROTECTION / red garlic	**AGLIOSANO** Phytosanitary requalification of two varieties of Red Garlic in the Latium Region.	Restoration, from a phytopathological standpoint, of native varieties of Red Garlic of Proceno and Castelliri through: monitoring, treatment of pathogeneic fungi, and in vitro virus elimination..	A.Taglienti CREA-DC	ARSIAL		
PLANT PROTECTION / citrus	**preHLB** Preventing HLB epidemics for ensuring citrus survival in Europe**.**	Adoption of preventive measures in the short, medium and long term to be used to deal with the phytosanitary emergency caused by the bacterium HLB.	C.Licciardello, CREA-OFA	24 partners also extra EU/**European Commission**	Poles et al., 2020. Recent Advances of In Vitro Culture for the Application of New Breeding Techniques in Citrus. Plants 9 (8), 938. doi.org/10.3390/plants9080938	
PLANT PROTECTION/ Asparagus	**ASPASS** Varietal and agricultural innovation for a succesful and sustainable asparagus cultivation in Sicily.	Implementation and sharing with the agribusinness companies involved in the programs of varietal innovation of sustainable protocols for the cultivation and biochemical characterization of *Asparagus officinalis* L.	G. Rotino, **CREA-GB** CRE-DC	Sicilian REgion		

PLANT PROTECTION/ artichoke, eggplant	**QUALIMEC** Miglioramento delle proprietà Improvement of quality properties in aubergine and artichoke using genome editing and dysgenesis approaches.	Improving the quality of eggplant and artichoke and resistence to wilt disease of eggplant.	A.Haegi, **CREA-DC** CREA-GB	MIPAAF		
PLANT PROTECTION/ carob	**IN-SYDE-CAR** Innovative systems for the development of the Carob supply chain.	Phytopathological monitoring of carob stands and product traceability of the carob food chain..	A. Giovino, CREA-DC	Sicilian Region		
PLANT PROTECTION/ vegetables	**MODIFORTI** Models for protection of horticultural crops..	1) development and validation of predictive models; 2) development of an alert system on a territorial basis.	E. Marinelli, CREA-DC	Lazio Region		
PLANT PROTECTION/ *Cucurbitaceae*	**CUCURBIOMID** Ecofriendly strategies for the control of key pathogens of Cucurbitaceae in Lazio: Evaluation of biostimulants, microorganisms and plant hydrolates. .	1) Identify effective and eco-sustainable solutions to control/mitigate the destructive action of viruses of vegetable crops; 2) develop eco-sustainable control strategies, alternative to those currently used with a high environmental impact, for the control of insects vectors of viruses 3) Identify new control strategies of soli fungi and phytopathogenic bacteria.	L. Ferretti, CREA-DC	Lazio Region		
PLANT PROTECTION/ fig/weevil	**DI.COL:FICO** New phytosanitary emergencies in Tuscany: the fig tree weevil, Aclees sp. cf. foveatus.	Agreement on research activities focused on the fig tree weevil in Tuscany.	E. Gargani, CREA-DC		1. E. Gargani, G.P. Barzanti, A. Strangi, G. Mazza, C. Benvenuti, R. Frosinini, P.F. Roversi, I. Cutino, 2020 - *Aclees* sp. cf. *foveatus*, a real threat to *Ficus carica* in the Mediterranean area. Acta Horticulturae, in press	
PLANT PROTECTION / innovative phytotherapy	**FATA** Innovative phytotherapic treatments based on chitosan vectors.	The project aims to produce effective nanoparticles for the control of *Xylella fastidiosa.*	S. Loreti, CREA-DC	Puglia Region	Baldassarre et al., 2020. Sonication-Assisted Production of Fosetyl-AlmNanocrystals: Investigation of Human Toxicity and In Vitro Antibacterial Efficacy against Xylella fastidiosa. Nanomaterials (MDPI), 10, 1174.	Fosetyl-Al nanoparticles associated with chitosan nanocarriers have been synthesised to inhibit, in vitro, both planktonic bacterial growth and biofilm production and to control the multiplication of Xylella fastidiosa in artificially infected Nicotiana tabacum model plants. 1 Research grant.
PLANT PROTECTION / forests	**PHYFOR** Study on the diversity of phytoplasmas detected in European forests.	Monitoring the European forest by possible decline associated with the presence of phytoplasmas and their insect vectors, especially of exotic origin.	L.Ferretti, S. Bertin**, CREA-DC** CREA-VE	AGES (AT); ANSES (FR); NIB (SLO); THUENEN (DE); AGDIA EMEA (FR); IPEP (SRB)/ **European Commission**		
PLANT PROTECTION / durum and soft wheat /resistance to fungal pathogens	**CERESBIO** Identification of durum and soft wheat genotypes resistent to smut fungi (*Tilletia* spp.) and wheat fungal pathogens (*Fusarium culmorum*).	Selection of genotypes resistent to smut fungi and wheat fungal pathogens.	L. Riccioni, **CREA DC** CREA-CI	MIPAAF		1 Scholarship.

PLANT PROTECTION / fruit production in the Latium region	**SIMODROFILA**	Validation of an innovative control system of *Drosophila suzukii* and other relevant phytophagous.	M. R. Tabilio, **CREA-OFA** CREA-IT	Lazio Region		Disseminations (website depliant), 2 events
PLANT PROTECTION / kiwi	**QUALITYKIWI** Innovations for the improvement of qualitative standards of Kiwi in Lazio.	Implementation of a DSS to manage irrigation, fertilization and disases of kiwi.	**CREA-OFA** CREA DC CREA-IT	Regione Lazio		
PLANT PROTECTION / kiwi	**URCOFI VI** Unit of coordination and enhancement of surveliance, research, monitoring and training activities in the phytosanitary sector.	1. Monitoraggio di *Pseudomonas syringae* pv *actinidiae* su kiwi e di *Erwinia amylovora* su pomacee e piante spontanee 2. Diagnosi molecolare di *Pseudomonas syringae* pv *actinidiae.*	M. Petriccione, **CREA-OFA** CREA-DC	Regione Campania		1 Scholarship.
PLANT PROTECTION / agrotechniques	**METINBIO** Products used in biological agriculture.	Screening of products (phytosanitary products and corroborants) suitable for biological agriculture (Research line "Management of the data bank of phytosanitary products and corroborants suitable for organic agriculture - GESTI.PRO.FI.CO.BIO"). Technical and scientific support to Mipaaf for assessing the eligibility of products for organic farming.	A. Trinchera, **CREA-AA**, La Torre CREA-DC CREA-OFA	MIPAAF		
PLANT PROTECTION / hazelnut	**FERRERO**.	Isolation, identification and characterization of several pathogen bacteria in hazelnut located in Georgia and Serbia; Development of sustainable defense strategies in the field for the containment of plant diseases; Evaluation of endotherapy and thermotherapy to contain *Xanthomonas arboricola* pv. *corylina*	M. Scortichini CREA-OFA	Ferrero Trading Lux SA		
PLANT PROTECTION / hazelnut	**NOC.ERE.HAL** Research activities focused on high quality production of Hazelnut.	Experimental trials focused on *Halyomorpha halys* transmission and transmission efficiency of the dry rot (*Eremothecium coryli*) on Hazelnut.	S. Vitale, CREA-DC	Ferrero Trading Lux SA		
PLANT PROTECTION / hazelnut	**FERRERO** Research agreement on "rotten hazelnut" disease.	Monitoring of fungal microorganisms involved in the "rotten hazelnut" disease.	S. Vitale, CREA-DC	Ferrero Trading Lux SA	Vitale et al. Frutticoltura https://rivistafrutticoltura.edagricole.it/tag/nocciola-avariata/. Scarpari et al. Mycological Progress 19:317–328. https://doi.org/10.1007/s11557-020-01562-y	
PLANT PROTECTION / hazelnut	**PAV-NOC 3** Reaseacrh agreement on pathogens affecting hazelnut.	Monitoring and diagnosis of fungal pathogens affecting hazelnut in specialized orchards of Piemonte and Campania.	S. Vitale, CREA-DC	SAGEA	S. Vitale, et al.(2020) Terra e Vita n.16 https://terraevita.edagricole.it/ortofrutta/nocciole-avariate-in-aumento-conoscere-per-limitare-i-danni/	
PLANT PROTECTION / hazelnut	**SYNGENG** In vitro trials aimed at testing the efficacy of difenoconazole and fludioxonil against *Fusarium lateritium*, causal agent of the gray necrosis of Hazelnut (GN).	Evaluate the efficacy of TWO active ingredients (SCORE®25-EC and GEOXE®) against *Fusarium lateritium* by assessing their activity in vitro with biometric tests carried out on substrates to which the above-mentioned chemicals are added..	S. Vitale, CREA-DC	Syngenta italia SpA		

PLANT PROTECTION / walnut	**NOCETO 2019/2020** Research agreement focused on phytopathological diseases of Walnut..	Assistance for the identification and solution of phytopathological diseases, in particular Phytophthora spp. and fruit diseases such as NAB, that may occur, with identification and evaluation of control techniques; presence of Cherry leaf roll virus (CLRV) in particular in walnut groves created with hybrid rootstocks between black walnut and common walnut; biometric tests of in vitro efficacy of Signum and its active ingredients (Boscalid and Pyraclostrobin) against the main fungal pathogens responsible for NAB.	S. Vitale, CREA-DC	Soc. coo. agr. IL NOCETO		
PLANT PROTECTION / essential oils / land-snail rearing	**IN.T.A.E** **(**Innovation.techniques. Land-snail rearing) .	Implementation and sharing of protocols for the sustainable cultivation of native and introduced plant species of agricultural interest, rich in "Allantoin " and essential oils. The purpose is to provide diets used in land-snail rearing. Essential oils may be used to sanitize rearing facilities in protected areas.	G. Fascella, M. M. Mammano, CREA- DC	Sicilian Region		
PLANT PROTECTION / olive	**DI.OL** Plant protection in traditional and intensive olive farming.	Plant protection in traditional and intensive olive farming..	P.Roversi, **CREA-DC** CREA-OFA	MIPAAF	Torrini G., Mazza G., Benvenuti C., Simoncini S., Landi S., Frosinini R., Rocchini A., Roversi P.F., 2020. Entomopathogenic nematode sas potenzial biocontrol agents against Bactrocera oleae (Diptera: Tephritidae). – Biocontrol Science and Technology https://doi.org/10.1080/09583157.2020.1775177	1 Research grants.
PLANT PROTECTION / olive	**SALVAOLIVI** Protection and promotion of the Italian olive-growing heritage through research activities in the plant protection sector.	Investigation of the main adversities of Olive grove ecosystems to provide farmers with adequate skills in plant protection.	F. Faggioli, **CREA-DC** CREA-OFA CREA-AA	MIPAAF	1)Giuseppe Tatulli, Vanessa Modesti, Nicoletta Pucci, Valeria Scala, Alessia L'Aurora, Simone Lucchesi, Manuel Salustri, Marco Scortichini and Stefania Loreti 2021 Further In Vitro Assessment and Mid-Term Evaluation of Control Strategy of Xylella fastidiosa subsp. pauca in Olive Groves of Salento (Apulia, Italy). Pathogens 2021, 10, 85; 2)Valeria Scala, Nicoletta Pucci, Manuel Salustri, Vanessa Modesti, Alessia L'Aurora, Marco Scortichini , Marco Zaccaria, Babak Momeni, Massimo Reverberi, Stefania Loreti 2020 Xylella fastidiosa subsp. pauca and olive produced lipids moderate the switch adhesive versus non-adhesive state and viceversa. PLoS ONE 15(5): e0233013; 3)Santilli, E. Riolo, M.; La Spada, F.; Pane, A.; Cacciola, S.O. First Report of Root Rot Caused by Phytophthora bilorbang on Olea europaea in Italy. Plants 2020, 9, 826 ; 4)Riolo, M.; Evoli, M.; Schena, L.; Aloi, F.; 5)Riolo, M.; Schena, L.; Aloi, F.; Santilli, E.; Ruano-Rosa, D.; Agosteo, G.E.; Pane, A.; La Spada, F; 6)Santilli, E.; Riolo, M; Pellicori, V., D.; Briccoli Bati, C. Valorizzare le cultivar di olivo contro la rogna. L'informatore agrario 2020, 23, 57-61; 7)Riolo M.; La Spada F.; Aloi F.; Giusso del Galdo	4 Research grants. 2 Scholarships

					G.; Santilli E.; Pane A.; Cacciola S.O. Phytophthora diversity in two diffent types of plant conservation sites. In e 1st International Electronic Conference on Plant Science, 1–15 December 2020. https://iecps2020.sciforum.net/. 8) G. Licciardello, M. C. Strano, P. Caruso, M. Sciara, P. Bella, G. Sorrentino, S. Di Silvestro. Identification and characterization of Colletotrichum acutatum, C. gloeosporioides and C. kahawae subsp. ciggaro isolates associated with olive anthracnose in Sicily. Submitted to: Plant Pathology.	
PLANT PROTECTION / olive	**SPREMO** Application of "smart" technologies for monitoring, prevention and quick diagnosis of economically relevant diseases of the Olive tree.	Prevention of diseases, viruses and plant parasites in both plant nurseries and open field implementing rapid, economic and user-friendly diagnostic methods.	A. Giovino, CREA-DC	Sicilian Region		
PLANT PROTECTION / Calabrian olive/*Xylella*	**XYRE** Monitoring insect vectors of *Xylella fastidiosa* in Calabria Region	Identify the possible ways of spreading Xylella fastidiosa in the Calabria Region - they are based on the monitoring of the insect vectors of the bacterium *X. fastidiosa* in order to predict a possible spread of the disease also in Calabrian olive groves. preventively assess any disease containment measures even before infection on adult olive trees - Support and interact with regional technicians in monitoring Xylella fastidiosa on the Calabrian territory.	V. Vizzarri, CREA-OFA	Calabria Region		
PLANT PROTECTION / olive, grapewine, other fruit species	**QUALIFITO Lazio** Phytosanitary qualification of fruit, grapevine and olive germplasm native to the Lazio Region.	Sanitary qualification of fruit germplasm (pomacee, drupacee, pomegranate, hazelnut, chestnut, blueberry), olive and grapevine germplasm native to Latium in order to - select germplasm that is sanitarily valid or attempt to restore it - protect it from attacks of phytopathogenic microorganisms and thus allowing its better conservation; - encourage its cultivation by identifying or obtaining propagation material that complies with European and national phytosanitary regulations and can therefore be used by local producers.	L.Ferretti, CREA-DC	ARSIAL		
PLANT PROTECTION / potato	**SILAVIRUS** Investigations on the most common viruses and new strains of PVY on potatoes in the SILA territory.	Monitoring of sila potato germplasm against viral agents.	L.Tomassoli, CREA-DC	Consorzio Produttori Patate Associati		
PLANT PROTECTION / officinal plants	**Val.Inn.P.O.** Validation of innovative protocols for the cultivation of officinal plants of nutraceutical interest.	Providing agribusinness companies involved in the project with sustainable plant protection and cultivation protocols for aromatic sicilian plants, in order to extract bioactive compunds used in	M.M. Mammano e G. Fascella CREA- DC	Sicilian Region		

		the agrifood industry and in the protection of agricultral crops. In particular the focus will be placed on two species: Oregano (*Origanum vulgare* L.) and Rosemary (*Rosmarinus officinalis* L.).				
PLANT PROTECTION / tomato	**IMODDUS**	Genotypization of tomato varieties through SNP.	R. Bravi, **CREA-DC** CREA- DC	Naktuinbouw (NL)-GEVES (F)-NEBIH (H)-DGAV (P)- COBORU (Poland)DUS centre of MOA (China)- KSVS (republic of Korea)-MAFF (Japan)/CPVO/ **European Commission**		Kick- off meeting.
PLANT PROTECTION / tomato and pepper	**EUPHRESCO 2020-A-343 2020-A-343** Resistance breaking strains of Tomato spotted wilt tospovirus: distribution and evaluation of their impact on tomato and pepper production.	Study of the spread of TSWV 'Breacking resistent' isolates of tomato spotted wilt vius in tomato and pepper, evaluation of their genetic variability and their potential impact on crops, including the development of diagnostic protocols to detect their presence.	A. Gentili, CREA-DC	Department of Agriculture and Fisheries, Queensland, Australia; Mediterranean Agronomic Institute of Chania, Greece; Ministry of Agriculture Forestry and Food, Slovenia/ **European Commission**		
PLANT PROTECTION / rootstocks	**PORT.NOC** Evaluation of rootstocks for tolerance/resistance to *Phytophtora* and Black-Line and promotion of compatible *Juglans regia* varieties.	Identification, within the genus *Juglans*, of material resistant/tolerant to *Phytophthora* and possibly not subjected to blackline reactions. The promising material is suitable for the development of protocols for macro- and micro-multiplication aspects and grafting compatibility with the main commercial cultivars of *J. regia* (Lara and Chandler)	S. Vitale, **CREA-DC** CREA FL CREA OFA	MIPAAF		
PLANT PROTECTION / agrifood production	**ESPAS** Enhancement of native Sicilian and Tunisian plant species characterized by high nutritinal value and helth benefits.	Eco-sustainability of agrifood productions/ Integrated protection of agricultural crops/Nutraceuticals/ Protection and promotion of plant biodiversity.	M. M. Mammano e G. Fascella, **CREA-DC** CREA-AN	Institut National de Recherches en Génie Rural Eaux et Forêts (partner tunisino). Agence de Vulgarisation et de Formation Agricole (partner tunisino). Banque Nationale de Gènes de Tunisie (partner tunisino) /Regione Siciliana		
PLANT PROTECTION/ rice	**Suscettibilità varietale al brusone del riso.**	Characterization of the new varieties of rice and their susceptibility to the rice blast disease.	P. Titone, **CREA-DC** CREA-AA		Mongiano, Gabriele, Patrizia Titone, Simone Bregaglio, and Luigi Tamborini. 2020. "Susceptibility of Novel Italian Rice Varieties to Panicle Blast Under Field Conditions." bioRxiv, 2020.04.23.057554.https://doi.org/10.1101/2020.04.23.057554.(Accettata e in fase di pubblicazione anche su rivista ISI European Journal of Plan Protection) Pubblicazione in fase di revisione su rivista ISI Agricultural Systems	

PLANT PROTECTION/ rice	Data and model-based resources to support italian rice breeding.	Phenotypic characterisation of Italian rice germplasm and analysis of traits correlated with production, in order to support genetic improvement activities also by simulation modelling.	G.Mongiano, **CREA-DC** CREA-AA		1) Gabriele Mongiano, Patrizia Titone, Simone Pagnoncelli, Davide Sacco, Luigi Tamborini, Roberto Pilu, Simone Bregaglio, Phenotypic variability in Italian rice germplasm, European Journal of Agronomy, Volume 120, 2020, 126131, ISSN 1161-0301, https://doi.org/10.1016/j.eja.2020.126131.https://www.sciencedirect.com/science/article/pii/S1161030120301386).2) Bregaglio, Simone, Laura Giustarini, Eloy Suarez, Gabriele Mongiano, and Tommaso De Gregorio. 2020. "Analysing the Behaviour of a Hazelnut Simulation Model Across Growing Environments via Sensitivity Analysis and Automatic Calibration." Agricultural Systems 181: 102794. https://doi.org/https://doi.org/10.1016/j.agsy.2020.102794."	
PLANT PROTECTION / plant genetic resourses	**RGV-FAO** International Treaty on Plant Genetic Resources for Food and Agriculture.	Conservation and implementation of collections of edible berry roses, carob trees, fruit trees, grapevines and olive trees. Enhancement of the rosicultural germplasm for food purposes and establishment of a collection of Sicilian wild asparagus.	I.Verde, **CREA-OFA,**CREA-DC CREA-AA CREA- CI CREA-FL CREA-GB CREA- IT CREA-OF CREA-VE CREA- ZA	MIPAAF	1) Fascella G., Mammano M., Airò M., Giardina G., Lambardi M. 2020. Micropropagation of Mediterranean and exotic shrubs: protocols for endangered and high-value plant species. Acta Hort. 1285:51-56. 2) M. Luigi, A. Manglli, S. Bertin, L. Ferretti, F. Faggioli. 2020. Development and validation of a specific real-time PCR protocol for the detection of tomato leaf curl New Delhi virus. European Journal of Plant Pathology 157(10):1-6.	
PLANT PROTECTION / plant genetic resourses	**ABC**	Morphophysiological characterization of genetic resources of the region Campania.	**CREA-OF** CREA-DC	Campania Region		
PLANT PROTECTION / plant genetic resourses	**FITOVAR** Phytosanitary upgrading of native herbaceous genetic resources listed in the Voluntary Regional Register of the Lazio Region..	Identification of the causal agents of the main diseases in crops of herbaceous species of local protected varieties (Regional Law No 15/2000) in order to develop effective strategies for their control.	A. Infantino, CREA-DC	ARSIAL		
PLANT PROTECTION / RNA	**COST Action CA15223 IPLANTA-**Modifying plants to produce interfering RNA.	The Action will examine the scientific challenges in manipulating RNAi production for disease and pest control, and metabolic enhancement of plants.	V. Ilardi, CREA-DC	**European Commission** and others[1]		
PLANT PROTECTION / hop waste	**INNOVA.LUPPOLO** Sustainable innovations in hop cultivation.	1.Evaluation of the efficacy of products derived from hops or hop crop waste against arthropods (insects and mites) and fungal pathogens (CREA-DC Florence) fungal pathogens (CREA-DC Florence). 2 Improvement of the phytosanitary quality of hop propagation materials (CREA-DC Rome).	L. Ferretti, E. Gargani, CREA-DC	MIPAAF		

[1] Austria, Belgio, Bosnia - Herzegovina, Bulgaria, Croatia, Czech Republic, Danimarca, Estonia, Finlandia, Francia, Germania, Gracia, Ungheria, Irlanda, Israele, Latvia, Lituania, Paesi Bassi, Macedonia, Norvegia, Polonia, Portogallo Romania, Serbia, Slovakia, Slovenia, Spagna, Svezia, Svizzera, Turchia, UK/**European Commission**

PLANT PROTECTION / biological seed	**RISOBIOSYSTEMS** Research and experimentation of national organic rice production systems	Project aimed at carrying out technical-scientific studies and insights to support and protect the national organic rice production systems and carried out by Universities and Research bodies with excellent skills on the subject, with the involvement and participation of stakeholders and operators in the sector.	L. Tamborini, **CREA-DC** CREA-CI	MIPAAF	Pubblication ISI	
PLANT PROTECTION / biological seed	**DIBIO Subproject CONCIABIO.**	Implementation of alternative methods of tanning in order to restore seeds eligible for biological agriculture.	L. Tamborini, **CREA-DC** CREA-CI -AA	MIPAAF		
PLANT PROTECTION/ green house	**INTESA** Innnovation in technologies to support a sustainable development of Agro- industry.	Innovation, and know-how transfer focused on the sustainable management of the greenhouse industry through "pilot activities" aimed at reducing energy inputs by preventing water waste and decreasing phytosanitary treatments.	G. Gugliuzza, A. Giovino, CREA-DC	UTAP Tunisian Union of Agriculture and Fisheries - TUNISIA National School of Engineers of Sfax ENIS – TUNISIA l'Institut International de Technologie de Sfax - Tunisia/Regione Siciliana		
PLANT PROTECTION / National Phytosanitary Service	**PROTEGGO 1.2** Activities aimed at plant protection and support of the Central Phytosanitary Service.	In agreement with the new European phytosanitary discipline, defined by the Regulation (EU) 2016/2031, on the subject of contrasting harmful organisms and by the Regulation (EU) 2017/625, on the subject of official controls, the MIPAAF is making use of the support of CREA, for the implementation of a plan of activities directed in particular to: definition of the measures necessary to control/eradicate emerging harmful organisms, as identified by the National Plant Health Service; definition and development of analytical and diagnostic methods to support inspection and monitoring activities on the national territory; elaboration of a training and updating programme for all personnel involved in phytosanitary defence (agents, inspectors, laboratory technicians); implementation and joint management of databases and IT systems to ensure adequate support for the official control activities of the National Plant Health Service and of the subjects involved in the certification systems and to meet the new commitments envisaged under the new European plant health regime; improvement of the evaluation systems for new plant protection products; strengthening and management of reference variety collections for the enhancement of certification and control systems for propagation materials (seeds and fruit).	P.F. Roversi, **CREA-DC** CREA-VE	MIPAAF		

PLANT PROTECTION/ *Solanaceeae*	**PHYLIB 3** The biology and epidemiology of *Candidatus Liberibacter solanacearum* and potato phytoplasmas and their contribution to risk management in potato and other crops**.**	Investigations on '*Candidatus Liberibacter solanacearum*' and its vectors.	V. Ilardi, S. Bertin, CREA-DC	SASA (GB); AGES (AT); FPS (BE); ANSES (FR); VNIIKR (RU); CFIA (CA); MOA (CY); UKUZ (CZ); UNIBO (IT); PPCRI (TR); IAES (EE); ARO (IL); FN3PT (FR); MINPOLJ (RS); DAFM (IE); UWI (WI); UNIBL (BiH); NHM (UK); CIP (EC); MPI (NZ)/ MIPAAF-**European Commission**		
PLANT PROTECTION / fruit species	**BIOTECH -BIOSOS FRU** A new generation biotechnological approach aimed at improving the productivity and the sustainability of fruit tree species (UO.3	Acquiring resistance to plum pox virus (PPV) in *Prunus* spp. cisgenic clones and/or in those obtained through genome editing.	L.Cattivelli, **CREA-GB** CREA-OF CREA OFA CREA DC	MIPAAF	Baima S., De Giacomo M., Giovannelli V, Ilardi V., Pietrangeli B., Rastelli V. "Cisgenesis: EU perspective" capitolo di libro su invito della Springer.	
PLANT PROTECTION/ fruit tree species, grapevines, olive, potato	**RGV FAO VI TRIENNIO-** Preservation of plant agro-biodiversity through the conservation, implementation and verification of the health status of collections of fruit tree species.	1-Assessment of the health status and conservation of germplasm of fruit trees, grapevines and olive trees in the collection at the CCP and CP of Tormancina. 2- in vitro restoration of traditional potato ecotypes of agronomic interest.	L. Ferretti, CREA-DC	MIPAAF		
PLANT PROTECTION / soil	**EUPHRESCO 2019-A-324** Reliable detection of plant pathogens in soil.	Harmonised validated protocol for the extraction of total nuclear acid (TNA) from specific soilborne pathogens from soil.	A. Haegi, CREA-DC	Naktuinbouw (NL), ANSES (FR), Ministry of Agriculture (IL, CY, SI), UCD (IE) AFBINI (UK), AGES (AT), FNPPPT (FR)/**European Commission**		
PLANT PROTECTION/ soil	**BEAUBAS 2019** Evaluation of the activity of agrochemicals on target arthropods and degradation of devices used for sexual confusion techniques.	Final assessement of soil status and degradation after the incorporation of 'single-use' BIOOtwin® dispensers used in the control of the grapevine moth (Lobesia botrana, Den. & Schiff.) by sexual confusion techniques.	S.Simoni, CREA DC	CBC (Europe) s.r.l.		
PLANT PROTECTION / table grapes and nectarines	**GS UVA-TA-20** Carrefour Table Grapes and Nectarines contract/agreement.	Definition of specific phytosanitary specifications (new guidelines), to be adopted in the table grape sector cultivated in the Apulia and Sicily regions and in the peach-nectarine sector in the Campania, Apulia, Calabria and Sicily regions, currently marketed under the Carrefour Quality Chain brand.	S. Landi, **CREA-DC** CREA-AA CREA.OF CREA-VE CREA-OFA	CARREFOUR		
PLANT PROTECTION / varieties by genome editing	**PATHORES** Investigations on the resistance to pathogenic fungi and bacteria	Analyse and characterise different pathogens of species of agricultural interest and assess disease resistance of genetically modified ('genome	A. Infantino, CREA-DC	MIPAAF		

	for the screening of varieties obtained by genome editing.	edited') material in order to increase its productivity.				
PLANT PROTECTION / terraced vineyards	**SCREENBIO5TERRE20** Monitoring and biodiversity assessment of mesofauna on wine-growing areas in the Park.	Evaluation of soil biodiversity in terraced vineyards as an index of sustainability and the effect of treatments.	S.Simoni, CREA-DC	Min. Ambiente - Ente Parco Nazionale Cinque Terre		
PLANT PROTECTION / native grape varieties	**RISANAMENTOVITE** Elimination of viral pathogens from grape germplasm native to the region Lazio**.**	The aim of the project is to identify or obtain vine accessions belonging to varieties native to Lazio that are exempt from the ORNQs provided for by EU Regulation 2019/2072, in order to preserve germplasm in optimal phytosanitary conditions, to allow its marketing in compliance with the phytosanitary regulations in force and to have healthy primary sources as a starting point for the possible inclusion of these varieties in the channels of voluntary certification of propagation material.	A. Gentili, CREA-DC	ARSIAL		
PLANT PROTECTION / native grape varieties	**URCOFI VI** Unit of coordination and enhancement of surveilliance, research, monitoring and training activities in the phytosanitary sector.	Restoration of native grape varieties ("Forastera" and "Biancolella").	F. Faggioli A.Taglienti, **CEA-DC** CREA-OFA	Università Studi di Napoli		
PLANT PROTECTION / ornamental plant nursery	**AUTOFITOVIV** Good practice in the self- regulation and phytosanitary management of ornamental plant nursery businnes.	Implementation of integrated pest management strategies and control activities. Responsible of activity 'Acari	S.Simoni, **CREA DC** CREA-OF	Toscana Region		1 Research grant.
PLANT PROTECTION / *Xylella fastidiosa*	**XF-ACTORS** *Xylella fastidiosa* Active Containment Through a multidisciplinary - oriented Research Strategy	Multidisciplinary research project aimed at improving the study of plant-pathogen interaction, prevention, diagnosis and control of *Xylella fastidiosa*. The characterisation of lipid compounds of *Xylella fastidiosa* subsp. *pauca* was carried out respectively in vitro on pure culture of the bacterium and in vivo in artificially infected *Nicotiana tabacum* model plants, providing a first evidence of both the lipidome of *X. fastidiosa* and the lipids present/absent in healthy model plants compared to infected ones.	S.Loreti, CREA-DC	**European Commission** and others[1]		

[1] Centre International De Hautes Etudes Agronomiques Mediterraneennes C.I.H.E.A.M. France; Inra France; Agencia Estatal Consejo Superior Deinvestigaciones CientificasCsic Spain; Instituto Valenciano De Investigaciones Agrarias Ivia Spain; Benaki Phytopathological Institute Bpi Greece; Julius Kuhn-Institut Jki Germany; Vlaams Gewest Vl O Belgium; The Regents Of The University OfCalifornia Uc United States; Agencia Paulista De Tecnologia Dos Agronegocios Iac / Ccsm Brazil; National Taiwan University Ntu Taiwan; Universidad De Costa Rica Ucr Costa Rica; Natural Environment Research Council Nerc United Kingdom; Nvwa Netherlands Instituto Politécnico De Bragança Ipb Portugal; The University Of Salford Usal United Kingdom; Jrc Belgium; Nederlandse Voedsel En Warenautoriteit Nvwa Netherlands Nederlandse Voedsel En Warenautoriteit Nvwa Netherlands Nederlandse Voedsel EnWarenautoriteit Nvwa Netherlands; Instituto Andaluz De Investigaciony Formacion Agraria Pesquera Alimentaria Y De La Produccion Ecologica Ifapa Spain; Instituto Andaluz De Investigaciony Formacion Agraria Pesquera Alimentaria Y De La Produccion Ecologica Ifapa Spain; Instituto Andaluz De Investigaciony Formacion Agraria Pesquera Alimentaria Y De La Produccion Ecologica Ifapa Spain; International Federation Of Organic Agriculture Movements European Union Regional Group Ifoam Eu Group Sweden; Eppo France; Russell Ipm Ltd Russell Ipm Ltd United Kingdom; Ainia Ainia Spain; Sustainable Communication Aisbl S-Com Belgium; Stichting Nederlandse Algemene Kwaliteitsdienst Tuinbouw Naktuinbou Netherlands/ **European Commission**.

PLANT PROTECTION / *Xylella* etc	**CO.XI.BO** Funds for the control of phytosanitary emergencies caused by *Xylosandrus compactus, Xylella fastidiosa, Botrytis cinerea.*	Control of phytosanitary emergencies caused by the pests, *Xylosandrus compactus*, *Xylella fastidiosa*, *Botrytis cinerea.*	V. Francardi CREA-DC	MIPAAF		
ACTIVE PROTECTION / forests and timber crops	**DAFCOL** Active protection of forests and timber crops..	Produce dissemination material for forestry personnel with the aim of improving active and preventive protection from fungal pathogens in both forest ecosystems and nurseries.	S.Vitale, CREA-DC	MIPAAF		
ECOSUSTAINABLE PROTECTION / aromatic and subtropical leguminosae	**PR.E.VA.N.I.A** High nutritional value and low environmental impact products..	Implementation and sharing of cultivation and eco-sustainable plant protection protocols of species (aromatic and subtropical leguminosae) suitable to develop a supply chain of nutraceutical products. Among the studied species, a particular focus will be placed on Moringa oleifera Lam.. and on Salvia officinalis L.	M. M. Mammano e G. Fascella, CREA-DC	Sicilian Region		
LOW-ENVIRONMENTAL IMPACT INTEGRATED PEST/ *Popilia J.*	**IPM POPILLIA** Integrated Pest Management of the invasive *Japanese Beetle, Popillia japonica.*	Investigations on low-environmental-impact integrated pest management strategies for the monitoring and control of Popillia japonica .	L.Marianelli , CREA DC	**European Commission** and Others[1]	Torrini, G., Paoli, F., Mazza, G., Simoncini, S., Benvenuti, C., Strangi, A., & Marianelli, L. (2020). Evaluation of Indigenous Entomopathogenic Nematodes as Potential Biocontrol Agents against Popillia japonica (Coleoptera: Scarabaeidae) in Northern Italy. Insects, 11(11), 804.	
DISEASE/ industrial hemp	**UNIHEMP** Use of biomasses deriving from industrial hemp for the production of energy and new biochemicals	Valorisation of industrial hemp for the relaunch of its cultivation. CREA-DC is involved in the study of major diseases.	L. Riccioni, **CREA-DC** CREA-CI CREA-AA	MUR		
MOLECULAR DATA/DUS TESTING/ durum weat	**DURDUS**	Integration of Molecular data into dus testing in durum wheat: use of a standardized method for the efficient management of reference collections**.**	P.G. Bianchi/ A. Giulini - CREA DC	EU-CPVO (Community Plant Variety Office)		
PHYTOSANITARY MONITORING	**DIA.ON.CAL** service delivery of diagnostics, identifications, and scientific/specialistic activities aimed at the identification of organisms noxious to plants.	Physoanitary analysis of quarantine noxious organisms during monitoring activities in regione Calabria.	F. Faggioli, CREA-DC	Calabria Region		
PHYTOSANITARY MONITORING / smart surveillance tools	**EFSA**.	Pilot application of smart surveillance tools for citrus black spot pathogen in Italy.	L. Riccioni, CREA DC	NIB (Slovenia), IVIA (Spagna), Fera (UK)/ EFSA		1 Scholarship
PHYTOSANITARY MONITORING	**MONITORAGGIO 2020-** Monitoring activities of noxious microorganisms - phytosanitary sector.	Coordination and implementation of phytosanitary programs for the co-funded european program.	L. Tomassoli, CREA-DC	MIPAAF		2 Reports; 7 technical data sheets.

[1] Eidgenössisches Departement für Wirtschaft, Bildung und Forschung - Agroscope; E-nema Gesellschaft für Biotechnologie und Biologischen Pflanzenschutz mbH; Pessl Instruments GmbH; SPOTTERON GmbH; Institut national de la recherche agronomique; Technische Universität München; Fundação Gaspar Frutuoso; Jardin Suisse Ticino/**European Commission**

PHYTOSANITARY MONITORING	**MONITOSC 2020**	Phytosanitary monitoring for the Tuscany Region.	L. Marianelli, E. Gargani, CREA-DC	Toscana Region	1)Torrini, G., Paoli, F., Mazza, G., Simoncini, S., Strangi, A., Guidotti, A., . & Marianelli, L. (2020). First detection of Bursaphelenchus abietinus and B. áandrassyi in Italy. Forest Pathology, 50(5), e12627. 2) Gargani et al., A FIVE-YEAR Survey in Tuscany (Italy) and detection of Xylella fastidiosa Sub. Multiplex in potential insect vectors, collected in Monte Argentario.	
ENVIRONMENTAL RESOURCES/ agricultural districts	**AGRICULTURA**	Designing a research model aimed at defining an "AgriCultural district" by promoting the unique and peculiar cultural as well as environmnetal resources of the Sicilian territory. Increase the employability in the R&S system and the activation of research "Spin off" cooperations in Sicily..	M. M. Mammano, CREA- DC	Sicilian Region	Agronomy MDPI, Agronomy 2021, 11, 98. https://doi.org/10.3390/agronomy11010098 – Agronomy MDPI, 7 August 2020, 10, 1158; https://doi.org/10.3390/agronomy10081158 8) Capitolo di libro Patrimonio Culturale identità territoriale e sviluppo locale CNR IBAM Stampa marzo 2020.	"spin off". 5 Scholarships.

3.2.2 Patents and Services

Services

Collections

Products /main topics	*Description*	*Person in charge*	*CREA Centres*
genomic DNA collection of phytoparasitic nematodes	Genomic DNA of morphologically and molecularly identified organisms preserved at -30°C	T. Irdani	CREA- DC
collection of certified drupaceae germplasm	Collection of 130 certified stone fruit ecotypes, pre-basic material in screen house	F. Faggioli, E. Marinelli, L. Ferretti	CREA- DC
collection of certified olive germplasm	Collection of 32 certified olive tree ecotypes, pre-basic material in screen house and pre-multiplication material in open field.	F. Faggioli, E. Marinelli, L. Ferretti	CREA- DC
collection of certified grapevine germplasm	Collection of 84 grapevine clones, pre-basic material stored in screen house.	F. Faggioli, A. Gentili	CREA- DC
phytopathogenic microorganisms	Collections of phytopathogenic microorganisms, fungi, bacteria, viruses, viroids and phytoplasmas of agricultural interest characterised by phenotypic and molecular analysis.	L. Luongo	CREA- DC
collections of phytopathogenic and endophytic microorganisms of tree species	Collection of fungal mcroorganisms and pathogenic microorganisms of tree species characterised phenotypically and molecularly.	M. Pilotti	CREA- DC
horticultural species and vetch	Reference collection for agricultural and horticultural species and vetch	M.Mele, M. Faina, F. Cuciniello, M.C. Napoli	CREA- DC
tomato, melon, artichoke and thistle	Patent collection of tomato, melon, artichoke and thistle	M.Mele, M. Faina, F. Cuciniello, M.C. Napoli	CREA- DC
collection of phytoparasitic galls and forest nematode populations	In vivo maintenance of phytoparasitic galls and forest nematode populations.	T. Irdani, G. Torrini	CREA- DC
cryogenic collection of phytoparasitic nematodes and other genera.	Storage in LN2 (-196°C) of quarantine and non-quarantine populations of phytoparasitic nematodes.	T. Irdani, P. Roversi.	CREA- DC
rice	Rice variety seed bank 800 varieties of Italian and foreign rice	L. Tamborini - G. Mongiano	CREA- DC
seed	ISTA Reference Collection ISTA Universal List of Species seed collection (130 accessions)	P. Mazzola	CREA- DC
cultivated and weed plants	Seed reference collection. Seed collection of cultivated and weed plants for identification purposes for seed testing laboratory (1800 accessions)	P. Mazzola	CREA- DC

plant species	In vitro collection of over 50 Mediterranean and exotic plant species (herbaceous, shrub and tree species) of agro-food, nutraceutical, ecological and environmental interest	G. Fascella, M. Mammano	CREA- DC
plant species	Seed and DNA bank; 60 Mediterranean and exotic plant species (herbaceous, shrub and tree species) of agro-food, nutraceutical, ecological and environmental interest.	M.Fiore, A.Giovino	CREA- DC
plant species	Fields ex situ collection of 200 Mediterranean and exotic plant species (herbaceous, shrubby and tree species) of ornamental, agro-food, nutraceutical, ecological and environmental interest	S. Aprile, G. Fascella, A. Giovino, G. Gugliuzza, S. Lazzara, M. Mammano	CREA- DC
Trifolium alessandrino	Trifogli alessandrino Collection of varieties registered in the national and community registers of Trifolium alessandrino.	C.Miceli, L.Raimondo, B.Frangipane	CREA- DC
Pannonian vetch	Collection of varieties registered in the national and community registers of Pannonian vetch	C. Miceli, L. Raimondo, M. Vaccarella	CREA- DC

Certifications –

Main topics/products	*Description*	*Person in charge*	*CREA Centres*
rice	**Rice variety description: 7 technical examinations and 3 take-overs on rice varieties on behalf of CPVO Vercelli**	L. Tamborini	CREA-DC
seed	**Seed certification of analysed samples** **Entry in the new varieties register: (n. 1702)" "Varietal laboratory analyses Register.**	CREA-DC	CREA-DC
seed	**Official control of areas for seed production in Italy (208124,18 ha) hectares of seed crops of all varieties controlled during the seed year 2019-2020.**	L. Tamborini A. Sommovigo, C. Miceli, E. Frusciante	CREA-DC
various	**Phytosanitary activities Inspections and sampling on behalf of SFR**	L. Tamborini	CREA-DC
various	**Descriptive plot tests, agronomic and use tests, complementary analysis tests (e.g. herbicide resistance, pathogen resistance and technological tests such as bread-making or biometrics for rice type classification).** About 1600 varieties.	A. Sommovigo G. Corsi L. Tamborini P. Titone A. Giulini	CREA-DC
various	Disclosure of certification data to operators in the sector Vercelli.	L. Tamborini	CREA-DC

Other services

Main topics/products	*Description*	*Person in charge*	*CREA Centres*
Acarology	**National Reference Laboratory for Acarology, designated by MiPAAF (Italian NPPO) for the coordination of the National Laboratory Network according to the EU Reg. 2017/625**	S. Simoni	CREA-DC
Bacteriology	**National Reference Laboratory for Bacteriology, designated by MiPAAF (Italian NPPO) for the coordination of the National Laboratory Network according to the EU Reg. 2017/625.**	S. Loreti	CREA-DC
Animal and Microbial Cryopreservation.	**Laboratory of Animal and Microbial Cryopreservation. Conservation and research on phytoparasitic and free-living nematode populations.**	T. Irdani, P. Roversi	CREA-DC
Phytosanitary emergencies in Sicily	**Scientific dissemination, Phytosanitary emergencies in Sicily. Research and scientific dissemination at the heart of good agricultural practice.**	R. Rizzo	CREA-DC
Entomology	**National Reference Laboratory for Entomology, designated by MiPAAF (ItalianNPPO) for the coordination of the National Laboratory Network according to the EU Reg. 2017/625.**	L. Marianelli	CREA-DC
Phytopatology	**DIALAB Laboratory .Laboratory of phytopathological analysis for customers of public or private institutions accredited to ISO 17025**	F. Faggioli/L. Ferretti	CREA-DC
Mycology	**National Reference Laboratory for Mycology, designated by MiPAAF (Italian NPPO) for the coordination of the National Laboratory Network according to the EU Reg. 2017/627.**	L. Riccioni	CREA-DC
Nematology	**National Reference Laboratory for Nematology, designated by MiPAAF (Italian NPPO) for the coordination of the National Laboratory Network according to the EU Reg. 2017/625.**	G. Torrini	CREA-DC
Planet tree- cancer	**Laboratory and arboreal plants for evaluation of resistance of plane tree to canker.** Selection for resistance of plant tree to canker (*Ceratocystis platani*).	M. Pilotti	CREA-DC
Virus resistance	**Laboratory carrying out resistance tests to viral pathogens of new lines of varieties and/or species for seed companies, breeders and other public and private institutions.**	L.Tomassoli, A. Tiberini	CREA-DC
Virology	**National Reference Laboratory for Virology, designated by MiPAAF (Italian NPPO) for the coordination of the National Laboratory Network according to the EU Reg. 2017/625.**	F.Faggioli, L. Ferretti	CREA-DC

Working tables / working groups / institutional partnerships/Centre journals / Editorial Board of Journals

Main topics/products	*Description*	*Person in charge*	*CREA Centres*
plant protection	MPAAF-EPPO 'Ad hoc Panel on harmonization of data on plant protection products on EPPO codes.	L. Donnarumma	CREA DC
plant protection	MiPAAF-EPPO 'EU Commodity Expert Group minor uses fruits and vegetables.	L. Donnarumma	CREA DC
plant protection	MIPAAF Technical and Scientific Committee for *Xylella fastidiosa* supporting the National Phytosanitary Committee.	S. Loreti	CREA DC
plant protection	Ministry of Health Technical Committee for Nutrition and Animal Health - Advisory Section for Plant Health.	L. Donnarumma	CREA DC
plant protection	Ministry of Health Technical Committee for Health, Section for the evaluation of biotechnology (full member).	M. Aragona	CREA DC
plant protection	MIPAAF Technical Committee "Products used as corroborants, enhancers of natural plant defenses".	C. La Torre, L. Donnarumma	CREA DC
plant protection	MIPAAF Member of the "Permanent Working Group for the protection of plants" CREA Full member in the Plant Health Barriers Section.	S. Simoni	CREA DC
plant protection	MIPAAF Member of the Working Group "Export Controls".	S. Simoni	CREA DC
plant protection	MIPAAF Component of Technical-Scientific Table New CAP (Decreto Dir. Gen. CREA n. 288 del 08/03/2018), to support Mipaaf, Department of European and International Policies and Rural Development, in the drafting of the new CAP programming, beyond 2020, for Italy. Designated expert component for Thematic Area 6 'Organic Agriculture'.	S. Simoni	CREA-DC
plant protection	Extraordinary member of the Italian National Academy of Entomology.	S. Simoni	CREA DC
plant protection	CREA Member of the Technical and Scientific Table of the New CAP - Subgroup Organic Agriculture.	A.La Torre	CREA DC
plant protection	ACOVIT Board of Directors (Vine Growers Association) Elected member).	F. Faggioli	CREA DC
plant protection	SIPAV Board of Directors.	S. Loreti	CREA DC
plant protection	MIPAAF-Coordinator of GdL "Difesa e certificazione" Hop Table ".	E. Gargani	CREA DC
plant protection	MiPAAF-EPPO (European and Mediterranean Plant Protection Organization https://www.eppo.int/) panel "Diagnostics and Quality Assurance".	L. Ferretti	CREA DC
plant protection	MIPAAF-EPPO 'Phytosanitary Measures for Potatoes (P POTATO MEAS).	S. Loreti	CREA DC
plant protection	Ministry of Health. Expert for phytosanitary aspects of the advisory section for the phytosanitary of the Technical Committee for Nutrition and Animal Health.	A.La Torre	CREA DC
plant protection	MiPAAF/EPPO Expert for EPPO PRA and DP for vegetable viruses.	L. Tomassoli	CREA DC
plant protection	MIPAAF- GdL Pest Survey.	L. Tomassoli	CREA DC
plant protection	MIPAAF Working Group on "Mobile seed selectors".	A. Infantino	CREA DC
plant protection	MIPAAF - GdL "Thousand Canker Disease".	S. Vitale	CREA DC
plant protection	MIPAAF - GdL "Bactrocera dorsalis".	L. Marianelli	CREA DC
plant protection	MIPAAF- Organic Agriculture Working Group, Plant Protection Sector.	L. Riccioni	CREA DC
plant protection	MIPAAF Permanent Working Group for "Plant Protection" - Phytosanitary Products.	C. Morgia L.Marianelli, P. Roversi	CREA DC
plant protection	MIPAAF Permanent Working Group for "Plant Protection" of Mipaaf for the section "Certification of fruit, vegetable and ornamental plants".	F.Faggioli	CREA DC
plant protection	MiPAAF Permanent Working Group for the "Plant Protection" of Mipaaf for the section "Grapevine propagation materials".	A.Gentili, F.Faggioli	CREA DC
plant protection	MiPAAF Permanent Working Group for "Plant Protection". Fruit, Vegetable and Ornamental Reproduction Materials Section".	L.Ferretti	CREA DC
plant protection	Mipaaf Plant Protection Working Group, Phytosanitary Barriers Section.	L. Donnarumma S. Simoni, L. Riccioni	CREA DC
plant protection	MIPAAF Technical-scientific working group "Kiwifruit dieback".	M. Pilotti	CREA DC
plant protection	Latium Region- Regional technical-scientific working group "Kiwi fruit dieback".	L. Riccioni, M. Pilotti, S. Vitale	CREA DC
plant protection	SOI Dried fruit group.	M. Pilotti	CREA DC
plant protection	EU Italian leader EWG Plant Health Survey.	L.Tomassoli	CREA DC
plant protection	EPPO Member of Panel for diagnostics (Entomology).	E. Gargani	CREA DC
plant protection	AAB -Association of Applied Biologists – UK Virology Group.	S. Bertin	CREA DC
plant protection	Mipaaf Member of the permanent working group for the quarantine pathogen Pantoea stewartii .	V. Scala	CREA DC
plant protection	MiPAAF Member of the National Technical Table "Emergency measures to prevent the spread of Popillia japonica Newman in the Italian territory " established by the National Phytosanitary Committee.	L.Marianelli	CREA DC
plant protection	MIPAAF Coordination of the technical table for the control of the BMSB.	P.F. Roversi , Sabatini	CREA DC
plant protection	MIPAAF -EPPO National Contact Point per EUPHRESCO I e II (Era-Net Project).	S. Simoni	CREA DC

plant protection	MIPAAF-New CAP, Plant protection sector - sustainable use of plant protection products	L. Riccioni	CREA DC
plant protection	MIPAAF-EPPO Panel of EPPO experts for the drafting of the Diagnostic Protocol of Xylella fastidiosa.	S. Loreti	CREA DC
plant protection	MIPAAF -EPPO Panel diagnostics in virology and phytoplasmology.	F.Faggioli	CREA DC
plant protection	MiPAAF-EPPO Panel EPPO for Fungal Diagnostics.	L. Riccioni	CREA DC
plant protection	MIPAAF - Ministerial table for the drafting of the national emergency plan Xylella fastidiosa.	E. Gargani	CREA DC
plant protection	CREA-MATTM Cartagena Protocol (http://bch.cbd.int/protocol/) on safety in the exchange of living modified organisms (LMOs), biosafety expert (http://bch.cbd.int/protocol/cpb_roster.shtml) for the assessment and management of GMO risk.	V.Ilardi	CREA DC
plant protection	Italian Iris Society SIDI Scientific responsible for the executive protocol of monitoring and mass trapping of *Oxytherea funesta.*	V.Francardi	CREA DC
plant protection	MIPAAF Subgroup "Registration and labeling of phytosanitary products" within the Permanent Working Group for plant protection of MiPAAF .	C.Morgia	CREA DC
plant protection	MiPAAF Subgroup "Minor Uses within the Permanent Working Group for the Protection of Plants of MiPAAF- Coordination.	L.Donnarumma, C.Morgia	CREA DC
plant protection	MiPAAFSQNPI National Quality System of Integrated Production - Integrated Defense Group (GDI).	L.Donnarumma, C.Morgia	CREA DC
plant protection	CREA SQNPI National quality system of integrated production - Technical Scientific Body (OTS).	L. Donnarumma	CREA DC
plant protection	Sicilian Region- Scientific technical support in the field of phytosanitary protection and ecology in reference to the D.A. n. 69 of 3/7/2019 of the Assessore Regionale all'Agricoltura of Sicily Region.	R. Rizzo	CREA DC
plant protection	MIPAAF Fruit in Shell supply chain table.	S. Vitale	CREA DC
plant protection	MIPAAF Hop sector table - Certification, quality and phytosanitary aspects (permanent member).	L. Ferretti	CREA DC
plant protection	MIPAAF- Dried fruit technical table.	M. Pilotti	CREA DC
plant protection	MIPAAF Medicinal plants technical table.	L. Donnarumma	CREA DC
plant protection	MIPAAF -EPPO- Working group EPPO Regulated non Quarantine Pests (RNQP).	F. Faggioli	CREA DC
plant protection	AISSA (Italian Association of Agricultural Scientific Societies). Delegate of the Italian Society of Nematology.	P.F. Roversi	CREA DC
plant protection	(FISNA) Italian Federation of Nature and Environment Sciences. Delegate of the Italian Society of Nematology.	P.F. Roversi	CREA DC
plant protection	MIPAAF Technical Table on Toumeyella parvicornis Members.	L. Marianelli, S. Bertin, P. F. Roversi	CREA DC
certification	ISTA 2020 Working Group 1st Comparative test for introduction into ISTA standards of a new protocol for varietal identification in pea using microsatellite markers (SSR).	C. Delogu L. Andreani A. Venturini	CREA DC
certification	WG Biobanche ACCREDIA Accreditation for "UNI/ISO 20387 Biotechnology - Biobanking - General requirements for biobanking" inspections of agricultural plant biobanks Tavazzano.	C. Delogu	CREA DC
certification	ISTA Germination committee Activities.	R. Zecchinelli	CREA DC
certification	ISTA Flower seed testing committee Activities.	R. Zecchinelli	CREA DC
certification	Component "Working Group Criteria and technical procedures for the registration to the voluntary National Register of varieties of Triticum turgidum subsp. Turanicum").	C. Miceli	CREA DC
certification	Technical Table" of the cereal supply chain including processing.	C. Miceli	CREA DC
certification	Committee for the evaluation and approval of control plans proposed by the Control Bodies to carry out the activity of control and certification of products with the Mark "Sicilian Region Guaranteed Safe Quality".	C. Miceli	CREA DC
certification	Sicialian Region - Local Steering Committee of LIFE ADAPT2CLIMA Project.	C.Miceli	CREA DC
certification	Sicilian Region-Examination Committee for the acquisition of the requirement of expertise in the seeding activity according to art. 19 of the legislative decree 214/05 and D.M. 12/11/2009.	C.Miceli	CREA DC
certification	Working group revision of the criteria for the inclusion of soybean. Introduction of new procedures for the determination of the character "Peroxidase".	C. Delogu , L.Andreani R.Cremona, B.Seminari, A.Musetti A.Venturini G. Co	CREA DC
certification	Sicilian Region -Technical and Scientific Committee for the evaluation of applications for registration in the National Seed Register, conservation varieties section (Law 6 April 2000, n° 46 art. 2-bis and following Ministerial Decree 17 December 2010 implementing the Legislative Decree 29 December 2009 n°149).	C. Miceli	CREA DC
certification	Piedmont Region-Committee for conservation varieties.	L. Tamborni P. Titone	CREA DC
certification	Working group on post-control for seed certification.	V. Battaglia	CREA DC
certification	ISTA- variety committee DNA working group.	C. Delogu	CREA DC
certification	ENGL wg DNA extraction European Network of Gmo Laboratories Working group on DNA extraction.	D. Villa	CREA DC
certification	ENGL WG Multiplex Real Time PCR Methods European Network of Gmo Laboratories Working group on Multiplex Real Time PCR Methods.	E. Perri A.Barbante	CREA DC
certification	Executive committee ISTA.	R. Zecchinelli	CREA DC

certification	MIPAAF - Officinal Plants Technical Table. Working group "Research and experimentation".	L. Andreani	CREA DC
certification	Working group post Control of agricultural species for the implementation of the program for the registration of samples.	CREA-DC	CREA DC
certification	Technical group UNI/CT 003/GL 23 "Authenticity of foodstuffs".	L. Andreani	CREA DC
certification	Roma Tre University Scientific responsible for the executive protocol of collaboration within the agreement Roma Tre - CREA.	V.Scala	CREA DC
certification	Working group: Technical and applicative provisions in agreement with the seed law Revision of the technical and applicative provisions in agreement with the seed law.	A.Arioli P.Mazzola E.Perri P.G. Bianchi	CREA DC
certification	CPVO Accredited unit for plant variety descriptive tests Vercelli.	L. Tamborni	CREA DC
certification	Lombardy Region Surveys on behalf of SFR Vercelli.	L. Tamborni P.Titone	CREA DC
certification	ISTA- Tetraziolium committee.	Arioli	CREA DC
certification	ISTA- GMO committee.	E.Perri	CREA DC
certification	ISTA- Proficiency test committee.	R. Zecchinelli	CREA DC
certification	ISTA- Rules committee.	R. Zecchinelli	CREA DC
certification	CPVO Accreditation Quality Manual Working Group.	CREA-DC	CREA-DC
certification	MIPAAF-Seeds Group.	CREA-DC	CREA-DC
certification	MiPAAF Evaluation Group of applications for registration of new accessions to the National Voluntary Certification Service.	L.Ferretti, F. Faggioli	CREA-DC

Editorial board			
editorial board	"MDPI" Reviewer Bord Microorganisms.		
editorial board	"Frontiers" Editorial Board Special Issue Frontiers in Microbiology.	V.Scala	CREA-DC
editorial board	"Insight Medical Publishing" Editorial Board for journal "Research Journal of Plant Pathology".	V.Ilardi	CREA-DC
editorial board	"OMICS Publishing group" Editorial Board for journal "Medical Safety & Global Health".	V.Ilardi	CREA-DC
editorial board	"Taylor & Francis" Editorial Board for journal "GM Crops & Food: Biotechnology in Agriculture and the Food Chain".	V.Ilardi	CREA-DC
editorial board	"MDPI" Editorial Board for journal "Plants".	V.Ilardi	CREA-DC
editorial board	"MDPI" Topic Editor.	Mazza, Sabbatini,F. Faggioli	CREA-DC
editorial board	"MDPI" Topic Editor for journal INSECTS.	F.Paoli	CREA-DC
editorial board	Redia Editor/Editorial Board.	P.F. Roversi, S.Simoni, F. Paoli	CREA-DC
editorial board	Science Publishing Group. Editorial Board Member for "Journal of Plant Sciences".	M. Pagano	CREA-DC
editorial board	"Elite" Editorial Board Special Issue Frontiers in Bioscience.	V.Scala	CREA-DC
editorial board	"MDPI" Editorial member per ANTIBIOTICS, section PLANT'S DEFENCE AGAINST PATHOGENS.	V.Scala	CREA-DC
editorial board	"MDPI" Journal Topic Board Member for the journal Biology (I.F. 3.796)	M. Pagano	CREA-DC
editorial board	"MDPI" Special Issue Editor.	Sabbatini	CREA-DC
editorial board	"Bulletin of Insectology" Editorial Board.	P.F. Roversi	CREA-DC
editorial board	Editorial Board Editor of "Annals of Warsaw University of Life Sciences".	S.Sauro	CREA-DC

3.3 SUSTAINIBILITY (ECOSYSTEMS, CLIMATE, WATER, LAND)

In a national territory where the majority of farmland is concentrated in an area which in 2002 was classified by the EU as being at risk of desertification, monitoring the level of degradation and resilience is useful for developing sustainable management strategies.
Conservation aspects must be assessed from both physical and biological viewpoints; land use sustainability must also be assessed in relation to climate change. Today, the analysis of the response by production systems to climatic change has become fundamental in evaluating its vulnerability and strengthening adaptation and mitigation abilities.
This is the frame within which the world's scientific community is called to develop new agronomical processes, forecasting systems for cultures and relative parasites and endemic and alien pathogens. Monitoring and assessing the mitigation potential of direct (CO_2, N_2O and CH_4) greenhouse gas emissions and those which are indirect such as NH_3 (a precursor of greenhouse gas and involved in the formation of atmospheric particulate matter) by means of sustainable land management, including the use of zootechnical manure and organic soil improvers is extremely important for environmental sustainability. Hence the importance of biological indicators (bees, microorganisms, mesofauna) in monitoring the impact of climatic change on agro-ecosystems to preserve production and quality of agricultural production.

The summary of different types of information concerning climatic risk to agriculture, in terms of use of resources, environmental impacts or upgrading ecosystem services is fundamental in the development of methods for analysis and agrotechnical itineraries for different supply chains and production methods (conventional, organic and others). This challenge can only be won with innovative strategies orientated towards the use of products pertaining to the *Earth Observation* system within IoT technologies in the food chain, with a view to *Space Economy*.
Against this backdrop of sustainable digital agriculture, the rationalisation of water use for agricultural production is becoming increasingly important. To this end, hydrological models are becoming fundamental tools in analysing the reciprocity of effects on different scales, for a dynamic connection between the farmwater balance and the district water works. Equally important is the assessment of resilience of organic production systems to climatic change, where restrictions surrounding the use of technical methods may slow down their adaptation to adverse climatic conditions differently compared to the climatic trend of decades ago.

The ability to map agricultural land, to gather data on the dynamics of productions and the potential to provide estimates on intra-field nutritional and stress variability represent useful sources of information when giving direct support to farmers, as well as responding to national and regional territorial planning and production demands.
An innovative portfolio of agricultural analysis and monitoring services must be developed, which integrates data from different scales. Synergy with new data sources, from sensors and remote sensing, such as those employed in the Copernicus programme, permit approaching these complex issues with better spatial cover and time resolution that can capture the dynamics of the processes under observation.
Still now, digital technologies are an underexploited resource in finding solutions to deepening problems concerning agricultural production and environmental impact. Interest in access to data based on agro-environmental analysis is already high and continues to increase, as is interest in readily available modelling solutions for the world of production, from producer associations to large production chain businesses.
Metadata standards and the FAIR paradigm of *Open Data* access are mandatory methods for public authorities, but continue to be used only sporadically. In the distributed context of a national and transnational research infrastructure, it is important to overcome a notion of data and models as static artefacts and offer access to them to both scientists and other stakeholders, as a form of service. In terms of efficiency, the benefits of accessing these services and their interoperability, and of building new digital services enable alignment with the growing *Open Data* market.
CREA develops and maintains cloud services for accessing data and simulation models for estimating environmental and productions dynamics. We also develop *image recognition* services with AI applications: current technologies of artificial vision permit equalling, or in some cases surpassing, the reliability of visual assessment carried out by a human expert. Services are distributed through the CREA cloud infrastructure, thus making their access possible to large numbers of researchers and other stakeholders.

3.3.1 Research and research products – Sustainibility (ecosystems, climate, water, land)

Main topics/ products	Acronym and Research Title	Aims	Person in charge and CREA Centres	Partnership/ Financing Body	Scientific Publications	Other Research products [1]
WATER RESOURCES	**WATER4AGRIFOOD** Improvement of Mediterranean agri-food production in conditions of lack of water resources.	Develop knowledge and innovative solutions for the management and distribution of water resources to Mediterranean agro-productive systems, to make them more resilient to climate change, efficient from an economic and technical point of view, sustainable, and able to contribute to economic growth and to the development of the agricultural sector of the southern region.	M. Mastrorilli, **CREA-AA** CREA-GB CREA-PB	MUR		6 Research grants.
WATER RESOURCES	**TRASIRRIMA** Transfer of mature irrigation management technologies and protocols for irrigation optimization.	Transfer of innovative techniques and technologies to improve the use of water resources in agriculture.	M. Mastrorilli , CREA-AA	Basilicata Region		
SILKWORM	**SILK PLUS**	Obtaining feed and food from silkworm pupae.	S.Cappellozza, CREA-AA	Veneto Region		
SILKWORM	**SILK** Innovation in Tradition: Re-launch of steak farming through new production and processing system.	Contribute to the relaunch of the sericulture sector through the application of innovative techniques and the testing of prototypes.	S. Cappellozza, CREA-AA	Friuli Venezia Giulia Region		
BIODIVERSITY, ECOSYSTEM SERVICES, LANDSCAPE	**POSHBEE** Pan-European Assessment, Monitoring, and Mitigation of Stressors on the Health of Bees.	Monitoring program for evaluating the impact of agricultural / environmental practices on the well-being of Apoidea (bees, Bumblebees and other solitary bees).	C. Costa, CREA-AA	40 partners/European Commission	Vanderplanck et al. Monitoring bee health in European agro-ecosystems using wing morphology and fat bodies, in press, ONE ECOSYSTEM.	
BIODIVERSITY, ECOSYSTEM SERVICES, LANDSCAPE	**SUREVEG** Strip-cropping recycling of waste for biodiverse and resource-efficient intensive vegetable production.	Costruire modelli orticoli biologici diversificati, gestiti attraverso l'uso della terminazione conservativa delle colture per servizio agroecologico.	A. Trinchera, **CREA-AA** CREA-ORA	AuFood (Danimarka); ILVO (Belgio); WUR (Olanda); LUKE (Finlandia); LatHort (Lettonia)	Submission to to Organic e-Print: Trinchera A., Willekens K., Barbry J., Lepse L., Rossing W., Migliore M., Himanen S., Debode J., Shanmugam S., Dane S., Salo T., Kivijärvi P., van Apeldoorn D., Campanelli G., Lakkenborg Kristensen H. "SureVeg – Belowground biodiversity in strip cropping systems" to Organic e-Print	
BIODIVERSITY, ECOSYSTEM SERVICES, LANDSCAPE	**FERDI 2** Valutazione della fertilità biologica e della diversità microbica di suoli coltivati a mais ed analisi delle comunità microbiche metabolicamente attive nel suolo coltivato a riso.	Valutare l'effetto di differenti gestioni agronomiche sulla fertilità biologica e sulla diversità microbica di suoli coltivati a mais. Valutare l'effetto di differenti gestioni agronomiche sulle comunità microbiche metabolicamente attive nel suolo coltivato a riso.	L. Canfora, **CREA-AA** CREA-OFA	Convenzione Acqua & Sole SRL		

[1] *prototypes; dissemination activities (conferences, seminars, reports, sites and videos, etc.); training activities (scholarships, research grants and PhD scholarships prototipi.*

BIODIVERSITY, ECOSYSTEM SERVICES, LANDSCAPE	**RGV-FAO** Conservation, characterization, enhancement and documentation of the biodiversity of plant genetic resources present at the IRSA and the Germplasm Institute: mulberry + almond.	Enhancement the CREA-AA mulberry and almond collections.	S. Cappellozza, L.Gaeta, CREA-AA	MIPAAF		
BIODIVERSITY, ECOSYSTEM SERVICES, LANDSCAPE	**LIFE 4 POLLINATORS** Involving people to protect Involving people to protect wild bees and other pollinators in the Mediterranean.	The main objective of the project is to raise public awareness on the main environmental problems of pollinator decline and to involve citizens and farmers to adopt "pollinator-friendly" attitudes and behaviors.	L. Bortolotti, CREA-AA	[1]) / **European Commiss**		
BIODIVERSITY, ECOSYSTEM SERVICES, LANDSCAPE	**BEENET** BeeNet: bees and biodiversity in environmental monitoring.	Development of a beekeeping monitoring network, consisting of 300 stations (apiaries) located on the Italian territory and representative of various agricultural realities for the assessment of the health of the Italian agro-environment through bees and wild apoidea.	L. Bortolotti - CREA-AA	MIPAAF		
CLIMATE CHANGE	**AGROMETEORE** RRN 2019-2020.	Agro-meteoclimatic and phenological monitoring for the strengthening and operational management of the system developed for the meteo-climatic analysis and forecasting of the phenological development of crops.	A.Monteleone**, CREA-PB** CREA-AA CREA-FL CREA-ZA CREA-VE CREA-AN	MIPAAF	Parisse, B., Pontrandolfi, A., Epifani, C., Alilla, R., & De Natale, F. (2020). An agrometeorological analysis of weather extremes supporting decisions for the agricultural policies in Italy. Italian Journal of Agrometeorology, (1), 15-30. https://doi.org/10.13128/ijam-790; Policy Brief e Analisi Swot per PAC post 2020 https://www.reterurale.it/PACpost2020/percorsonazionale. Sito web Fenologia https://www.reterurale.it/fenologia.	https://www.reterurale.it/incontritematicitavolo.
DIGITALIZATION	**AGRIDIGIT- Digital Agriculture**	Development of digital tools and methodologies for different stakeholders in agricultural production.	M. Donatelli, **CREA-AA** IT - ZA –FL- VE	MIPAAF		
DIGITALIZATION	**AGRIDIGIT-AGRIINFO** Digital Agriculture - Subproject	IT infrastructure for data and model management through cloud, artificial intelligence applications, blockchain applications.	M.Donatelli, CREA-AA	MIPAAF		
DIGITALIZATION	**AGRIDIGIT-AGROMODELLI** Digital Agriculture - Subproject Agromodelli	Digital platforms for modeling production systems through cloud services. Modeling tools for seasonal services and scenario analysis.	M. Donatelli, CREA-AA	MIPAAF	R.M. Ferrara, N. Martinelli, G. Rana (2020) CO2 and H2O fluxes due to green manuring under Mediterranean conditions. Italian Journal of Agrometeorology (2): 45-53. doi: 10.13128/ijam- 972 Fila G., Cappelli G., Ginaldi F. 2020. Simulating oilseed fatty acid composition through a stochastic modelling approach, Industrial Crops and Products 150,112381 DOI:10.1016/j.indcrop.2020.112381.	

[1] University of Vigo, Department of Plant Biology and Soil Sciences (ES) 2) UAEGEAN University of the Aegean, Department of Geography (Mytilene, GR) 3) IMEDEA Mediterranean Institute for Advanced Studies (Balearic Islands, ES) 4) E-zavod, zavod za projektno svetovanje, raziskovanje in razvoj celovitih rešitev

DIGITALIZATION	**AGROTECH** Transfer Of Agrotech Innovations To The Basilicata Agricultural System.	Monitoring of both the soil with multisensory platform and the plant by means of optical sensors used in kinematics; Development of decision support systems based on short and medium term weather forecasts; Applications of digital agriculture to the "organic" sector.	M. Mastrorilli, CREA-AA	Basilicata Region		Report
DIGITALIZATION	**MATHIL DE** Models for HazeLnut DisEases.	Development of simulation modeling for the estimation of risk and damage associated with fungal diseases and harmful insects of the cor.	S. Bregaglio, CREA-AA	Ferrero Trading Lux/Luxembourg National Research Fund		Research grant - Development of predictive modelling.
DIGITALIZATION	**PROMENADE** PROcess-based Machine lEarninNg for hAzelnut yielD prEdiction.	The planned activities aim to apply the simulation model based on HAZEL processes in the Chilean and Turkish areas, and the subsequent use of model-based indicators as input for machine learning algorithms in order to provide an anticipated production forecast	S. Bregaglio, CREA-AA	Convenzione con Ferrero Trading Lux S.A.		
ENERGY USE/ bioenergies	**SUSCACE** Scientific support towards agricultural conversion to energy crops.	Dissemination of scientific knowledge useful for the dissemination of biomass crops for energy use.	L. Pari, **CREA-IT** CREA-FL CREA-CI CREA-AA	MIPAAF	-Ceotto E, Vasmara C, Marchetti, R. Cianchetta S., Galletti, S, 2021. Biomass and methane yield of giant reed (Arundo donax L.) as affected by single and double annual harvest, GCB Bionergy,13, 3, 393-407.	
ENERGY USE / bioenergies	**AGROENER-** WP 2 task 2.2 - task 2.6 - - task 2.5 - task 2.6 - task 2.6; WP3 task3.4 - task 3.5; WP4 task 4.1. Energy from agriculture: sustainable innovations for the bioeconomy.	Development of innovative techniques and strategies for the lignocellulosic biomass supply chain for energy use.	P. Menesatti**, CREA-IT** CREA-AA CREA-DC CREA-CI CREA-FL CREA-ZA CREA-OF	MIPAAF	WP 2 task 2.2, pubblicazioni: Ceotto E, Vasmara C, Marchetti, R. Cianchetta S., Galletti, S, 2021. Biomass and methane yield of giant reed (Arundo donax L.) as affected by single and double annual harvest, GCB Bionergy,13, 3, 393-407. WP 2 task 2.4 . Recupero di residui ligno-cellulosici da gestione del verde urbano. Aromolo r., Gallo P., Imperi G., Biocca M., Evaluation of qualitative parameters in Quercus ilex woody residual in corso di valutazione. WP2 task 2.6: Cappelli, G.A., Ginaldi, F., Corinzia, S.A., Cosentino, S.L., Fanchini, D., Ceotto, E. (2020). Assessment of Giant Reed Biomass Potential (Arundo Donax L.) in Marginal Areas of Italy via the Application of Arungro Simulation Model. Proceedings of the 28th European Biomass Conference and Exhibition. Pages 15 – 21. WP 2 task 2.6: banca dati delle tipologie di suolo e caratteristiche chimico/fisiche derivate, su griglia a 500 m per tutto il territorio italiano, per la quale è in corso di pubblicazione un articolo su rivista scientifica. WP 3 task 3.5: Manfredini A., Chiariotti A., Santangelo E., Renzi G., Rossi E., Dell'Abate M. T.* (2020). Assessing the biological value of soluble organic fractions from tomato pomace digestates. Journal of Soil Science and Plant Nutrition, 16 October 2020, https://doi.org/10.1007/s42729-020-00361-4; G. Rossi, U. Neri, B. Felici, A. Benedetti - Effects Of Different Zootechnical Digestates On Fertilization And Nitrogen Leaching. Agrochimica, Vol. LXIV - N. 3 July-September	

					2020, 239-251. WP4 task 4.1: Vasmara, C., Cianchetta, S., Marchetti, R., Ceotto, E., & Galletti, S. (2021). Potassium Hydroxyde Pre-Treatment Enhances Methane Yield from Giant Reed (Arundo donax L.). Energies, 14(3), 630. WP4 task 4.1: Vasmara, C., Marchetti, R., Cianchetta, S., Galletti, S. Ceotto, E. Enhancing methane yield from giant reed (Arundo donax L.) through thermoalkaline pre-treatment and co-digestion with pig slurry (2020). European Biomass Conference and Exhibition Proceedings, Pages 481-483. ISSN: 22825819.	
SUSTAINABLE MANAGEMENT/ precision feeding	**EVOLAT** Precision feeding with pomace from extra virgin olive oil: modulation of the metabolism of dairy cows for the development of new products.	Rumen microbiota analysis.	R. Pastorelli, CREA-AA	MIPAAF		
SUSTAINABLE MANAGEMENT/ kiwi	**JINGOLD S.P.A.** Determination need in cold for the exit from dormancy and need in heat useful to budding of kiwi cultivars Jintao, Jinyan, Dong Hong.	Determination of the cold requirement for the exit from dormancy and the hot requirement useful for the budding of the kiwi cultivars Jintao, Jinyan, Donghon.	L. Gaeta, CREA-AA	Agreement with INGOLD S.P.A..		
SUSTAINABILITY MODELS	**DIVERFARMING** Crop diversification and low-input farming across Europe: from practitioners engagement and ecosystems services to increased revenues and chain organisation**.**	Increase the long-term sustainability, resilience and economic convenience of European agriculture, by evaluating the real advantages and limitations, barriers and obstacles to the use of diversified agricultural systems.	R. Farina, **CREA-AA** CREA-BG CREA-CI	[1] / **European Commissi**	1)Diversified Arable Cropping Systems and Management Schemes in Selected European Regions Have Positive Effects on Soil Organic Carbon Content. Rosa Francaviglia, Jorge Álvaro-Fuentes, Claudia Di Bene, Lingtong Gai, Kristiina Regina & Eila Turtola. https://doi.org/10.3390/agriculture9120261; 2) Deficit drip irrigation in processing tomato production in the Mediterranean Basin. A data analysis for Italy. Rosa Francaviglia & Claudia Di Bene. https://doi.org/10.3390/agriculture9040079; 3) Diversification and Management Practices in Selected European Regions. A Data Analysis of Arable Crops Production. Rosa Francaviglia, Jorge Álvaro-Fuentes, Claudia Di Bene, Lingtong Gai, Kristiina Regina, Eila Turtola. https://doi.org/10.3390/agronomy10020297 4) Assessing the influence of diversified cropping systems on land productivity and the soil-plant system at different scales. A case study from Southern Italy A Marchetti, C Piccini, C Di Bene, R Farina, 2019. European Conference on Crop Diversificationproceedings, 2019 1, 356-357; 5) Enhancing diversification of cropping systems to minimize agri-environmental problems: Results of	

[1] UPCT: Universidad Politécnica de Cartagena (coordinatore) CSIC: Agencia Estatal Consejo Superior de Investigaciones Científicas UTu: ASAJ: Asociación Regional de Empresas Agrícolas y Ganaderas de la Comunidad Autónoma de Murcia CCP: Consorzio Casalasco del Pomodoro Società Agricola cooperativa GA: Arento Grupo Cooperativo Agroalimentario de Aragón Bar: Barilla G.E.R. Fratelli SPA DML: Disfrimur Logistica SL UCO: Universidad de Córdoba WU: Wageningen University NBT: Firma Nieuw Bromo van Tilburg InDa: Industrias David S.L.U UPO: University of Portsmouth Higher Education Corporation UT: Universität Trier ETH: Eidgenössische Technische Hochschule Zürich WDF: Weingut Dr. Frey DLR: Dienstleistungszentrum ländlicher Raum Rheinhessen - Nahe – Hunsrück UP: Pecsi Tudomanyegyetem NMT: Nedel-Market Kft Luke: Luonnonvarakeskus PK: Paavolan kotijuustola PJ: Polven juustola Exe: University of Exeter EL: Ekoboerderij de Lingehof/EC

					stakeholders' consultation in Italy, C Di Bene, V Baratella, A Trinchera, R Farina, R Francaviglia, European Conference on Crop Diversification proceedings, 2019 1 (1), 32-33, 6)Building diversification and inputs reduction in inten sive arable farms in Italy: main concepts and experimental co-design, R Farina, B Pennelli, E Blasi, D Rocca, European Conference on Crop Diversification proceedings, 2019 1 (1), 14-15; 7)Effects of diversification on agricultural soil fungal biodiversity and community structures under Mediterranean conditions, L Canfora, L Orrù, R Farina, B Felici, M Migliore, B Pennelli, F Pinzari, First European Conference on Crop Diversification proceedings, 94.	
SUSTAINABILITY MODELS	**DiverIMPACTS** DIVErsification through Rotation, Intercropping, Multiple Cropping, Promoted by Actors and value Chains Towards Sustainability.	Design, implement and demonstrate the feasibility of sustainable crop systems through crop diversification, their excellent rotation, intercropping and multicropping.	S.Canali, **CREA-AA** CREA-CI CREA-OF CREA-PB	**European Commission** [1]	Iocola, I.; Angevin, F.; Bockstaller, C.; Catarino, R.; Curran, M.; Messéan, A.; Schader, C.; Stilmant, D.; Van Stappen, F.; Vanhove, P.; Ahnemann, H.; Berthomier, J.; Colombo, L.; Dara Guccione, G.; Mérot, E.; Palumbo, M.; Virzì, N.; Canali, S. An actor-oriented multi-criteria assessment framework to support a transition towards sustainable agricultural systems based on crop diversification. Sustainability 2020, 12, 5434; doi:10.3390/su12135434.	
SUSTAINABILITY MODELS	**EURBEST** Pilot project: Restructuring of the honey bee chain and Varroa resistance breeding & selection programme.	Development and validation of a method for the selection and production of varroa resistant bees.	C. Costa, CREA-AA	*1.Landesbetrieb Landwirtschaft Bieneninstitut 2. INRA-Centre de Provence-Alpes-Côted'Azur; 3. Co GmbH* / **European Commi**	Pubblicazione: Le Conte Y, Meixner MD, Brandt A, Carreck NL, Costa C, Mondet F, Büchler R. Geographical Distribution and Selection of European Honey Bees Resistant to Varroa destructor. Insects. 2020; 11(12):873. https://doi.org/10.3390/insects11120873.	
SUSTAINABILITY MODELS	**BIOLOGICO A+++** Pilot management system of the low-entropy organic farm, through the interpretation of the environmental factor, the prevalent use of natural preparations and the use of precision farming techniques..	Implementation of a pilot management system for organic farms, through the interpretation of the environmental factor, and use of natural preparations in order to obtain functional foods.	M. Amenta, **CREA-OFA** CREA-CI	Sicilian Region		1 Scholarship
SUSTAINABILITY MODELS / agroecology	**AE4EU** Agroecology for Europe.	Contribute to agroecological research and the development of innovation through the development of a European network of agroecological life laboratories (LL) and research	S. Canali, **CREA-AA** CREA-IT	**European Commission**		

[1] 1. Institut National De La Recherche Agronomique (Inra), 2. Asociatia Aider Agricultura Integrata Durabil Economic Rentabil (Aider), 3. Assemblee Permanente Des Chambres D'agriculture (Apca), 4. Association De Coordination Technique Agricole (Acta), 5. Ass Groupe Ecole S9. Obszanski Tomasz (Bz), uperieure Agriculture (Groupe Esa), 6. Associazione Sviluppo Rurale (Asr), 7. B.V. Exploitatie Reservegronden Flevoland (Erf), 8. Baertschi Agrartecnic Ag (Ba), 10. Bioforum Vlaanderen (Bioforum), 11. Centre Wallon De Recherches Agronomiques (Cra-W), 13. Forschungsinstitut Fur Biologischenlandbau Stiftung (Fibl), 14. Hushallningssallskapet Skane (Hs), 15. Inagro, Provinciaal Extern Verzelfstandigd Agentschap In Privaatrechtelijke Vorm Vzw (Inagro), 16. Inra Transfert S.A. (It), 17. Instytut Uprawy Nawozenia I Gleboznawstwa, Panstwowy Instytut Badawczy (Iung-Pib), 18. Agrosolutions (Agr22. Okologiai Mezogazdasagi Kutatointezet Kozhasznu Nonprofitosolutions), 19. Landwirtschaftskammer Niedersachsen (Cals), 20. Linking Environment And Farming Lbg (Leaf), 21. Muhle Rytz Ag (Mühle Rytz Ag), Kft (Omki), 23. Progressive Farming Trust Ltd Lbg (Orc), 24. Quality Responsible R Srl (Nsf Romania), 25. Services Operationnels Du College Des Producteurs (Socopro), 26. Stichting Bionext (Bionext), 27. Stichting Wageningen Research (Dlo), 28. Sveriges Lantbruksuniversitet (Slu), 29. Johann Heinrich Von Thuenen-Institut, Bundesforschungsinstitut Fuer Laendliche Raeume, Wald Und Fischerei (Ti-Bd), 30. Universite Catholique De Louvain (Ucl), 31. Universiteit Van Amsterdam (Uva), 32. Wageningen University (Wu), 33. Walagri Sa (Wal.Agri Sa)/EC

		infrastructures (RI) and other relevant actors.				
SUSTAINABILITY MODELS / Mediterranean Area	**CAMA** Research-based participatory approaches for adopting Conservation Agriculture in the Mediterranean Area.	The objective of CAMA is to identify the main barriers that limit the adoption of Conservative Agriculture by small farmers in Mediterranean countries and to overcome them with a participatory research approach, based on the use of field experiments and pilot case studies in different conditions, and the development of an extensive dissemination and training program.	M. Rinaldi, **CREA-CI** CREA-ZA CREA-PB CREA-AA	*APOSOLO (Portugal), INIAV (Portugal), ARVALIS (France), Univ. di Lleida (Spain), IAMZ-CIHEAM (Spain), CSIC (Spain) Agrommia (Italy), HAO-Demeter (Greece), INRAT (Tunisie), APAD (Tunisie), INRA (Morocco), ENSA (Algerie) MUR*/ **European Commission**	1)Castellini M., Di Prima S., D.Moret-Fernández, L Lassabatere. Rapid and accurate measurement methods for determining soil hydraulic properties: A review. J. Hydrol. Hydromech., 69, 2021, 2, X–X. DOI: 10.2478/johh-2021-0002 2)Castellini M, Giglio L., Modugno F. Sampled Soil Volume Effect on Soil Physical Quality Determination: A Case Study on Conventional Tillage and No-Tillage of the Soil under Winter Wheat. Soil Syst., 2020, 4, 72. 3)Castellini M., Stellacci A.M., Di Prima S, Iovino M, Bagarello V. Improved Beerkan run methodology to assess water impact effects on infiltration and hydraulic properties of a loam soil under conventional- and no-tillage. Soil Sci Soc Am J. https://doi.org/10.1002/saj2.20191 4)M. Castellini, A.Vittorio Vonella, D. Ventrella M. Rinaldi G. Baiamonte. 2020. Determining Soil Hydraulic Properties Using Infiltrometer Techniques: An Assessment of Temporal Variability in a Long-Term Experiment under Minimum- and No-Tillage Soil Management. Sustainability 2020, 12, 5019; doi:10.3390/su12125019.	Deliverable 1.1 Deliverable 1.2 Realizzazione del sito Web http://www.camamed.eu/en/index.
SUSTAINABILITY MODELS / SSD	**FAST** Study for the development of a common framework for the quantitative advice of crop nutrient requirements and greenhouse gas emissions and removal assessment at farm level.	Develop a decision support tool for the assessment of crop nutrient needs and emissions and the removal of greenhouse gases at farm level.	S. Fabiani, **CREA-PB** CREA-AA	*Agrisat Iberia sl [Ente Coordinatore]*/**European Commission**		
AIR POLLUTION	**SUSCROP** Developing resilience and tolerance of crop resource use efficiency to climate change and air pollution.	Application of crop models to evaluate the limitations caused by the interaction between air pollution and extreme weather events on the productivity of agricultural systems and on the efficiency in using resources in current and future climate scenarios.	G. Cappelli CREA-AA	**European Commission** [1]	Dentener, F., Emberson, L., Galmarini, S., Cappelli, G., Irimescu, A., Mihailescu, D., ... & van den Berg, M. (2020). Lower air pollution during COVID-19 lock-down: improving models and methods estimating ozone impacts on crops. Philosophical Transactions of the Royal Society A, 378(2183), 20200188.	
CLIMATIC PARAMETERS	**CASPOR 2018**	Monitoring network of climatic parameters and implementation of data in the research and management area of the Tenuta Presidenziale di Catelporziano. "Monitoring of depositions and atmospheric particulate matter.	S. Fares, **CREA-FL** CREA-AA	Accademia dei Quaranta-	1) Impact of pollutants in Castelporziano following a chemical accident. 2) Evaluation of qualitative parameters in Quercus ilex woody residuals: first results. 3) L'andamento climatico di Castelporziano: indagine esplorativa.	

[1] 1. University of York- Environment, SEI York, UK; 2. Centre for International Climate and Environmental Research (CICERO), Oslo, Norway; 3."Henri Coandă" Air Force Academy, Braşov, Romania;4. MeteoRomania,Bucharest, Romania; 5. EU, JRC, MARS unit; 6. University of Bonn - Institute of Crop Science and Resource Conservation (INRES) · Crop Science,Bonn, Germany; 7. CIEMAT–Centro de investigaciones energeticas, medioambientales y tecnologicas, Madrid, SpainMUR

SUSTAINABILITY OF PRODUCTION SYSTEMS	**SERYCINE**	Larvae production on diet and artificial diet supply.	S. Cappellozza, CREA-AA	SERICYNE		
SUSTAINABILITY OF PRODUCTION SYSTEMS	**MAR E TIARIS**	a) Increase local agri-food production, diversifying it and enhancing its typical features; b) Enhance environmental and landscape resources, improving social inclusion in the area.	S. Cappellozza, CREA-AA	Friuli Venezia Giulia Region		
SUSTAINABILITY OF PRODUCTION SYSTEMS / bees	**Mipaaf 1308- 2020 F1.** National Three-year Program 2020-22 in favor of the beekeeping sector, for the improvement of the production and marketing of beekeeping products - Ministerial sub-program - year 2020.	Quality improvement of beekeeping products through physico-chemical and microbiological analyzes, typing studies based on botanical and geographical origin.	G. L. Marcazzan, CREA-AA	MIPAAF		"I MIELI ITALIANI: un patrimonio unico di qualità e tipicità" www.informamiele.it
SUSTAINABILITY OF PRODUCTION SYSTEMS / bees	**INNOVAPE** Innovative tools to support the beekeeping sector for the enhancement of ligustica bees	Establishment of an Operating Group, partnership aimed at creating a plan for the development of a process to develop an innovative process / service for the beekeeping sector, in the field of honey selection and product.	E. Carpana, CREA-AA	Emilia Romagna Region		
SUSTAINABILITY OF PRODUCTION SYSTEMS / bees	**Mipaaf 1308 - 2020 F2.** National Three-year Program 2020-22 in favor of the beekeeping sector, for the improvement of the production and marketing of beekeeping products - Ministerial sub-program - year 2020	Research aimed at combating diseases and hive attackers.	E.Carpana, CREA-AA	MIPAAF		
SUSTAINABILITY OF PRODUCTION SYSTEMS / bees	**LG.Libro Genealogico Api** Tenuta del Libro genealogico e miglioramento genetico delle api.	Monitoring and coordination of the selection and breeding of queen bees of Italian autochthonous bee subspecies; management of the 3 National Registers (Italian Beekeepers, Experts in Sensory Analysis, Experts in geographical origin of honey).	C. Costa, CREA-AA	MIPAAF		
SUSTAINABILITY OF PRODUCTION SYSTEMS/ technical input register and databases	**METinBIO** Address and technical support for the management of the "registers / databases" of the Technical Means of the Ministry of Agricultural, Food, Forest and Tourism Policies.	Support to the Italian Ministry of agricultural, food and forestry policies for technical inputs registers and databases allowed in organic production.	A.Trinchera, **CREA-AA** CREA-OFA CREA-DC	MIPAAF	Trinchera A. "Progetto METinBIO eprospettive per i mezzi tecnici in agricoltura biologica".	1 Internship activities within the convention CREA AA -Scuola Sant'Anna di Pisa (May-October 2020))
SUSTAINABILITY OF PRODUCTION SYSTEMS	**UNIHEMP** Use of industrial hemp biomass for energy	Selection and characterization of new hemp varieties.	R. Paris, **CREA-CI** CREA-AA	MUR		

industrial hemp	production and new biochemicals.					
SUSTAINABILITY OF PRODUCTION SYSTEMS Lucanian cereal production	**LUCAN CEREALS** Sustainable crop management for the standardization of the Lucanian cereal production techniques.	Introduction of tecniques and technologies of proximal sensing for crop-livestock systems.	R Rossi, **CREA-ZA** CREA-AA	Basilicata Region		
SUSTAINABILITY OF PRODUCTION SYSTEMS / cherry growing and organic viticulture	**OLTRE BIO** Innovative management of cherry growing and organic viticulture.	It promotes an integrated, endogenous and sustainable development of the table grape and cherry cultivation chain in organic management.	L. Tarricone, **CREA-VE** CREA-AA	Puglia Region		
SUSTAINABILITY OF PRODUCTION SYSTEMS/ organic farming	**DIBIO** Subproj. BIOPRIME	Natural compounds and microorganisms for the defense and the PRIming of Mediterranean BIOlogical crops.	V. Terzi **CREA-GB** CREA-VE, CREA-ZA, CREA-AA	MIPAAF		
SUSTAINABILITY OF PRODUCTION SYSTEMS/ olive orchards ecosystems in Latium	**Mon.Oli.Tec.** Hi-Tech monitoring for the sustainable management of the Lazio olive grove ecosystem.	Establishment of the Operational Group on the topics of technologically advanced monitoring in olive growing.	M. Biocca,**CREA-IT** CREA-AA CREA-DC	Lazio Region		
SUSTAINABILITY OF PRODUCTION SYSTEMS forest wood supply chian	**FOR.CIRCULAR**	Circular Economy Forest-Wood Supply Chain: Decision Support System.	A.Paletto, **CREA-FL** CREA-AA	Ministero dell'Ambiente della tutela del territorio e del mare	1) Biancolillo I., Becagli C., Bianchetto E., De Meo I., Paletto A., 2020. Il ruolo del settore forestale nella strategia nazionale per lo sviluppo sostenibile (SNSVS). Dendronatura N. 2: 8-22 2) Becagli C., Bianchetto E., Sacchelli S., De Meo I. (Submitted). Measuring and assessing forest-based circular bioeconomy to implement the National Sustainable Development Strategy in Italy. Austrian Journal of Forest Sience.	1 Scholarship
SUSTAINABILITY OF PRODUCTION SYSTEMS minor supply chain	**CINCHRON**	Chronobiology study in insects.	S. Cappellozza, CREA-AA	*University of Leicester, University of University of Muenster, Jagellonian U Krakow, University of Groningen, U Wuerzburg, BCAS Czech Republic, Jerusalem, of Haifaic/* **Europ Commission**	1) Brady D., Saviane A., Cappellozza S., Sandrelli F. (2020) An Efficient Workflow for Screening and Stabilizing CRISPR/Cas9-Mediated Mutant Lines in Bombyx mori. Methods Prot.4(1):4.doi: 10.3390/mps4010004. 2) Brady D., Saviane A, Romoli O., Tettamanti G., Cappellozza S., Sandrelli F. (2020) Oral Infection in a Germ-Free Bombyx mori model. January 2020 DOI: 10.1007/978-1-0716-0259-1_14 In book: Immunity in Insects (pp.217-231	1PhD Scholarship
SUSTAINABILITY OF PRODUCTION SYSTEMS / organic durum wheat	**BIODURUM** Reinforcement of the production systems of Italian organic durum wheat.	Evaluate how the strategies for strengthening the durum wheat production system based on both diversification and implementation of agro-ecological criteria are going to impact on the overall sustainability of the systems themselves.	M. Palumbo **CREA-CI** CREA-AA CREA-DC CREA-IT	MIPAAF		Software BIODURUM_MCA: strumento di supporto alle decisioni basato sull'analisi multicriteriale per la valutazione della sostenibilità delle aziende biologiche. del sud Italia che coltivano frumento

						duro.http://www.sinab.it/sites/default/files/share/BioDurum_MCA.pdf
SUSTAINABILITY OF PRODUCTION SYSTEMS/ wheat and rice	**DIBIO** **Sub pro. CONCIABIO**	Control of the main pathogens transmitted by seed in Triticum spp. and Oryza sativa: tanning agents and defense strategies for agriculture.	L.Tamborini **CREA-DC** CREA-AA, CREA-CI	MIPAAF		1 Research grant
SUSTAINABILITY OF PRODUCTION SYSTEMS/ organic orchard	**BIOPAC** Innovation and sustainability in the organic orchard management: Peach, Apricot and Cherry.	Identify varieties suitable for organic farming; Study of management methods of the main entomological adversities; Biodiversity and biotechnological potential of saline soils with different pedoclimatic characteristics.	D. Ceccarelli **CREA-OFA** CREA-AA	MIPAAF	Ciaccia, C., Ceccarelli, D., Antichi D., Canali, S. 2020. Long-term experiments on agroecology and organic farming: the Italian long-term experiment network. In "Long Term Farming Systems Research. Ensuring Food Security in Changing Scenarios". G.S. Bhullar and A. Riar (Eds.). Academic Press (UK). ISBN: 978-0-12-818186-7. 183- 196. Ceccarelli, D., Ciaccia, C., Canali, S. 2020. I dispositivi sperimentali di lungo periodo per l'agricoltura biologica. In: BIOREPORT 2019. L'agricoltura biologica in Italia. Abitabile C. Marras F. Viganò L. (Eds). Rete Rurale Nazionale 2014-2020, pp. 161-179. Tabilio M.R.,Colacci M., Ceccaroli C., Assennato M.,Ceccarelli D. Andamento delle popolazioni di D. Suzukii in differenti condizioni: confronto tra ciliegeto biologico e convenzionale. Atti Giornate Fitopatologiche, 2020, 1, 211-216; Chiesa S.G., Angeli G., Fiaschetti M.,Tabilio M.R., Cristofaro M., Ipla Mora I., Ioriatti C. 2020 .Validazione della tecnica dell'insetto sterile per la gestione della mosca della frutta Ceratitis capitata in meleto. Atti Giornate Fitopatologiche 1, 141-146; Ciaccia, C., Ceglie, F. G., Burgio, G., Madžarić, S., Testani, E., Muzzi, E., Mimiola, G. & Tittarelli, F_Participatory Research towards Food System Redesign: Italian Case Study and Perspectives. Sustainability, 11(24)pp12https://www.mdpi.com/2071-1050/11/24/7138 Ciaccia, C., Ceglie, F. G., Burgio, G., Madžarić, S., Testani, E., Muzzi, E., Mimiola, G. & Tittarelli, F_Participatory Research towards Food System Redesign: Italian Case Study and Perspectives. Sustainability, 11(24)pp12 https://www.mdpi.com/2071-1050/11/24/7138	
SUSTAINABILITY OF PRODUCTION SYSTEMS / Apulian table grape cultivation	**INNOFRUIT** Sustainability and innovation in table grape cultivation.	Promote the recovery of competitiveness and profitability of Apulian table grape producers compared to the main competitors, working organically on the improvement of the product offered and on the efficiency and sustainability of the entire production process.	A. R. Caputo **CREA-VE** CREA-AA	Puglia Region		

SUSTAINABILITY OF PRODUCTION SYSTEMS / mulberry	**SERINNOVATION** Operational group on innovation, quality, traceability in mulberry growing for the development of supplementary sources of income for farms.	Re-launch the gelsibachicola business, demonstrating that some innovations can decrease the incidence of labor costs and increase the added value of the final product (cocoon)	S. Cappellozza, **CREA-AA** CREA-IT	Veneto Region	1)Cappellozza S., Saviane A., Cappellozza L. (2020) La coltivazione del gelseto: dalla potatura alla raccolta. Vita in Campagna, 1: 33-38; 2) Dalle Zotte A., Singh Y., Squartini A., Stevanato P.G., Cappellozza S., Kovitvadhary inclusion of full-fat or defatted silkworm (Bombyx mori L.) pupa meal on the nutrient digestibility and faecal microbiome of fattening quails. Animal, 10.1016/j.animal.2020.100112	
SUSTAINABILITY OF PRODUCTION SYSTEMS / mulberry	**CONVENZIONE RATTI**	Agreement includes several research contracts for mulberry growing: 1) genetic analysis of Tunisian mulberries 2) formation of a polyhybrid resistant to high temperatures 3) high quality silk production test starting from Italian polyhybrid eggs 4) remote training of Tunisian farmers of set	S. Cappellozza, **CREA-AA** CREA-OFA	Ratti srl (Marzotto Group)		
SUSTAINABILITY OF PRODUCTION SYSTEMS / olive and oil	**COBRAF** COproducts for BioRAFfinerie.	Create a logistic platform for oil crops with the aim of obtaining the enhancement of the different components of the biomass of innovative crops.	L. D'Avino, **CREA-AA** CREA-CI	Toscana Region		Webinar 25.06. 2020: "La valutazione di sostenibilità e la comunicazione".ttps://www.cobraf.it/wp-content/uploads/2020/07/Media-5.pdf
SUSTAINABILITY OF PRODUCTION SYSTEMS / olive and oil	**INNO_OLIVO&OLIO** Innovation And Transfer Along The Olive-Oil Supply Chain For Sustainability And Quality Of Processes And Products - Olive & Oil Operating Group.	Identification of innovation and transfer along the olive-oil supply chain for sustainability and quality of processes and products.	M. Mastrorilli, CREA-AA	Basilicata Region		
SUSTAINABILITY OF PRODUCTION SYSTEMS / olive orchards	**MOLTI** Improvement of production in traditional and intensive olive groves	1.study of the water management mechanisms of high-density plants in full production, monitoring of soil moisture and physiological performance of the plant. 2. study the single or combined effect of pruning and soil management treatments with the aim of rapidly recovering the functionality of the canopy and fruit production, monitoring soil fertility conditions	E. M. Lodolini, **CREA-OFA** CREA-IT, CREA-AA	MIPAAF		
SUSTAINABILITY OF PRODUCTION SYSTEMS / olive and oil	**O.R.G.OLI.O. LUCANO** Optimization of Profitability and Management of OLIVE OIL and LUCANO oil production processes.	Identification of innovation and transfer along the olive-oil supply chain for sustainability and quality of processes and products.	A.F. Modugno, **CREA-AA** CREA-OFA	Basilicata Region		
SUSTAINABILITY OF PRODUCTION SYSTEMS / olive	**SALVAOLIVI** Safeguarding And Enhancing The Italian Olive Heritage With Research	Defense of national olive growing against emerging and harmful organisms and microorganisms.	F. Faggioli, **CREA-DC** CREA-AA CREA-OFA	MIPAAF		1 Research grant.

	Actions In The Phytosanitary Defense Sector.					
SUSTAINABILITY OF PRODUCTION SYSTEMS / precision forming in poplar	**PRECISIONPOP**	Development of a multi-scale monitoring system to support precision poplar cultivation in the Lombardy region.	F. Chianucci, **CREA-FL** CREA-AA CREA-IT	Lombardia Region	Chianucci, F., Puletti, N., Grotti, M., Bisaglia, C., Giannetti, F., Romano, E., Brambilla, M., Mattioli, W., Cabassi, G., Bajocco, S., Li, L., Chirici, G., Corona, P., & Tattoni, C. (2020). Influence of image pixel resolution on canopy cover estimation in poplar plantations from field, aerial and satellite optical imagery. Annals of Silvicultural Research, 46(1). doi:http://dx.doi.org/10.12899/asr-2074	
SUSTAINABILITY OF PRODUCTION SYSTEMS / Industrial tomato	**ITALIA ORTOFRUTTA** Innovative agronomic techniques to raise the dry matter content and the brix degree of industrial tomatoes.	Improvement of the quality of the raw material sent for industrial transformation in terms of ° Bx and content in total solids (dry residue) through the adoption of agronomic techniques (modulation of irrigation), the use of innovative commercial preparations (antiperspirants, potassium-based fertilizers, biostimulants based on active molecules or useful microorganisms).	P. Campi, **CREA-AA** CREA-OF	Italia Ortofrutta		
SUSTAINABILITY OF PRODUCTION SYSTEMS / organic greenhouse producton	**GREENRESILIENT** Organic and biodynamic vegetable production in low-energy GREENhouse-sustainable RESILIENT and innovative food production systems**.**	Agroecological approach to organic greenhouse production, in different European regions, for the creation of solid agroecosystems, adapted to different climatic conditions, productive and sustainable from an economic and environmental point of view.	F. Tittarelli, **CREA-AA**, CREA-CI	MUR	1)Tittarelli F. (2020) Organic Greenhouse Production: Towards an Agroecological Approach in the Framework of the New European Regulation—A Review. Agronomy, 10, 72; doi:10.3390/agronomy10010072 2)Tittarelli F., Alsanius B.W., Kemper L., Koefoed Petersen K., Willekens K. (2020) GREENRESILIENT – applying agroecology to organic greenhouse production. Acta Hortic. 1296. ISHS 2020 DOI 10.17660/ActaHortic.2020.1296.139. Proc.Int.Symp. On Advanced Technologies and Management for Innovative Greenhouses – GreenSys 2019. Eds: P.E. Bournet et al.: 1099 - 1105	
SUSTAINABILITY OF PRODUCTION SYSTEMS / organic vegetables	**PERILBIO** Promotion and strengthening of long-term devices in biological agriculture**.**	Enhancement of the network of long-term experimental devices – DSLP.	D. Ceccarelli, **CREA-OFA** CREA-PB, CREA-AA CREA-OF CREA-ZA	MIPAAF	1)Ciaccia C., Diacono M., Testani E., Fiore A., Farina R., Montemurro F., Canali S., Mele G., Ceccarelli. D. 2020. Participatory Action Research for the Co-design of a Long-Term Experiment: the Basilicata Case Study. XLIX Convegno Nazionale della Società Italiana di Agronomia, 16-18 settembre; 2) Ciaccia C., Mele G., Testani E., Fiore A., Montemurro F., Diacono M. La Ricerca al servizio del territorio: il caso studio Lucano di ricerca partecipativa. Agrifoglio (sottomesso uscirà quest'anno) 3) Ciaccia C., Diacono M., Canali S., Testani T., Montemurro F., Ferlito F., Roccuzzo G., Campanelli G., Di Pierro M., Mele G., Ranuzzi M., Grasselli O., Ceccarelli D. 2020. Long-term experiments as a tool for governing the transition towards new food systems: an Italian	Techincal days "La coltivazione del fico in Basilicata: valutazione delle cultivar locali per l'introduzione nel nuovo DSLP Perilbio".

					trajectory. Organic World Congress, Rennes 21-27 September, SCI-381	
SUSTAINABILITY OF PRODUCTION SYSTEMS / organic horticultural products	**INNOVABIO** Application of innovative methods for the traceability of organic farming products.	Improve understanding of the factors affecting the food quality of organic horticultural products.	S. Fabroni **CREA-OFA,** CREA-OF CREA-AA	MIPAAF		
SUSTAINABILITY OF PRODUCTION SYSTEMS/ horticultural products	**EXCALIBUR** Exploiting the multifunctional potential of belowground biodiversity in horticultural farming**.**	Improving the resistance of crops (tomato, apple, strawberry) to biotic / abiotic stresses by means of multifunctional microbial bioinoculi made according to the native biodiversity of the soil.	S. Mocali**, CREA-AA** CREA-IT CREA-PB	16 international research centresi[1]	1.http://doi.org/10.3389/fmicb.2020.01904; 2.http://doi.org/10.3389/fpls.2020.535005; 3.https://zenodo.org/record/4262470#.YBQZIOhKiUk;4.http://doi.org/10.3390/microorganisms8111655;5.http://doi.org/10.3389/fpls.2020.01068 6.http://doi.org/10.3390/microorganisms8101506;7.http://doi.org/10.1186/s40793-020-00364-9; 8.http://doi.org/10.3389/fpls.2020.00270;9.https://doi.org/10.1534/g3.119.400716;10.DOI 10.36959/718/60311.https://doi.org/10.1093/femsec/fiaa119	
SUSTAINABILITY OF PRODUCTION SYSTEMS/ biological rice	**Risobiosystems** Research and experimentation of national organic rice production systems.	Project aimed at carrying out technical-scientific studies and insights to support and protect the national organic rice production systems and carried out by Universities and Research bodies with excellent skills on the subject, with the involvement and participation of stakeholders and operators in the sector.	N. Pecchioni, S. Monaco, **CREA-CI** CREA-DC CREA-PB	MIPAAF		https://www.risoitaliano.eu/crea-ecco-le-rese-di-risobiosystem/; http://sinab.it/bionovita/risobiosystems-video-da-una-giornata
SUSTAINABILITY OF PRODUCTION SYSTEMS / fruit species	**AMICA FRAGOLA** 3° year Friendly FRUIT Project-Climate-Kic, research and development on strawberry.	1.Selection of strawberry genotypes best suited to protected strawberry cultivation in southern Italy and good yield and quality performance. 2. Evaluation of eco-friendly practices to disinfest soil pre-planting in strawberry.	D. Giovannini e G. Baruzzi, CREA-OFA	INRAE (Francia); DANONE		Alternatives to soil chemical disinfection in strawberry' TRAINING DAY DANONE FOR HORTICULTURAL AGRONOMISTS, Trento, 8 ottobre 2020
SUSTAINABILITY OF PRODUCTION SYSTEMS / viticultural terroirs	**PROSIT** Digital platform for the sustainable management and enhancement of viticultural terroirs**.**	Online platform development, aimed at companies and wine consortia, for the soil optimal management and design of new viticultural systems.	P. Storchi, **CREA-VE,** CREA-AA	Toscana Region	D'Avino L., 2020. Perché l'agricoltura potrebbe salvarci dai cambiamenti climatici, Ecquologia visibile al sito https://ecquologia.com/category/ efficienza/chimica-verde/ (accertato il 10/11/2020). Webinar 26 11 2020 relazione su La mappatura digitale dei suoli toscani di Lorenzo D'Avino disponibile a https://www.goprosit.it/wp-content/uploads/2020/12/Lorenzo_DAvino.pdf	

[1] 1) Research Institute of Horticulture (PL) 2) Research Centro ricerche produzioni vegetali soc. Coop. (IT) 4) Advisor Natural History Museum (UK) 5) Research NIAB East Malling Research (UK) 6) Research Kmetijski Institut Slovenije - Agricultural Institute of Slovenia (SI) 7) Research Università degli Studi di Torino (IT) 8) Research Koninklijke Nederlandse Akademie Van Wetenschappen (KNAW) (NL) 9) Research Kobenhavns Universitet (DK) 10) Research Technische Universitaet Graz 11) Research Inoculumplus (F) 12) SME Universidad de Granada (ES) 13) Research Intermag sp. z o.o. (PL) 14) SME NSF Euro Consultants (B) 15) SME Kompetenzzentrum Obstbau Bodensee (DE) 16) Extension service Fördergemeinschaft Ökologischer Obstbau e.V. (DE)/ EC

SUSTAINABILITY OF PRODUCTION SYSTEMS / organic grapes and wines	**BIOFOSF-WINE** Tools for resolving the "phosphite" emergency in organic grapes and wines**.**	Identification of the causes of phosphonic acid (phosphite) and ethyl-phosphonic acid contamination in organic grapes and wines and study of soil-plant phosphite dynamics.	A. Trinchera, CREA-AA	MIPAAF	Trinchera A., Parisi N., Baratella V. Roccuzzo G., Soave I, Bazzocchi C. Fichera D., Finotti M. Riva F., Mocciaro G., Brigliadori M., Lazzeri L. (2020). Assessing the Origin of Phosphonic Acid Residues in Organic Vegetable and Fruit Crops: The Biofosf Project Multi-Actor Approach", Agronomy 2020, 10(3), 421. Trinchera A., Bazzocchi C., Fichera D. (2020). Fosfito, il fantasma del biologico. Terra e Vita 3: 64-66	Workshopinternazionale:" Why phosphonic acid residues in organic wine? The Italian BIOFOSF-WINE project", BIOFACH 2020, Norimberga 15 feb 2020. Trinchera A. "Il progetto BIOFOSF-WINE: individuazione delle cause di contaminazione da fosfiti nei vini biologici" webinar ad invito ad evento tematico: "LMR fosfiti nel vino biologico: i passi avanti del nuovo decreto", webinar ad invito (Unione Italiana vini e Federbio), 3 ago 2020. Trinchera A. "Il progetto BIOFOSF-WINE: attività e contributo al nuovo decreto sugli LMR nei prodotti biologici", webinar ad invito FEM, 10 ago 2020.
SUSTAINABILITY OF PRODUCTION SYSTEMS / horticultural crop rotations	**FERTORT** Fertilizers in long-term rotations**.**	Evaluation of the potential agronomic efficacy of biostimulant and / or soil improver products of the Tersan company in the soil and climatic conditions of the Metapontine Ionian arc, in horticultural crop rotations, and active involvement of Tersan company among the stakeholders of the PERILBIO project.	D. Ceccarelli, **CREA-OFA** CREA-PB CREA-AA CREA-OF CREA-ZA	TersanPuglia S.p.A.		
SUSTAINABILITY OF PRODUCTION SYSTEMS / horticultural and aromatic plants	**BIO4FOOD** High quality and nutrient rich food through crop waste-derived biostimulant and biopesticide	Enhancement of waste biomass / residues of horticultural and aromatic plants through the production of biostimulants, biopesticides and biofertilizers to be used in organic farming.	M. Diacono, CREA-AA	[1]/EC		
SUSTAINABILITY OF PRODUCTION SYSTEMS / organic horticultural products	**DIBIO-INSOBTEC**	Bio-based technologies to support the production and quality of organic vegetable seeds.	M.L. Manici **CREA-AA** CREA-IT	MIPAAF		

[1] Ghent University/Fac of Bioscience Engineering/Horticell lab; Faculty of Bioscience engineering / Department of Plants and Crops - Belgium (Coordinatore ILU - Institute for Food and Environmental Research - Germany Abdelmalek Essaadi University, Faculty of Sciences and Techniques of Tangier (FSTT) Department of Biology- Morocco CICERO Center for International Climate Research - Norway/

SUSTAINABILITY OF PRODUCTION SYSTEMS/ sustainable viticulture	**LIFE GREEN GRAPES** New approaches for protection in a modern sustainable viticulture: from nursery to harvesting.	Reduction the contribution of pesticides to the entire wine production chain, from the nursery to the production of wine and table grapes.	**CREA-VE** CREA-AA CREA-DC	**European Commission**		3 webinars (https://www.lifegreengrapes.eu/news/), 2 conferences,1 training course
SOIL	**GRASCIARI RIUNITI** Circular economy in agriculture: proper management of organic waste and corporate self-production of biomass to increase the fertility of agricultural land in the Marche region	Application of new strategies for the virtuous management of company organic waste, residues, as matrices to be reused in agriculture, energy and other sectors.	L. D'Avino	Marche Region	D'Avino L., 2020. Perché l'agricoltura potrebbe salvarci dai cambiamenti climatici, Ecquologia visibile al sito https://ecquologia.com/category/ efficienza/chimica-verde/ (accertato il 10/11/2020)	
SOIL	**CANALETTO**	Microbial biodiversity and biotechnological potential of saline soils with various pedoclimatic characteristics.	R. Napoli ,CREA-AA	Institute of Fermentation Technology and Microbiology (ITFiM), 3) Lodz University of Technology (LUT); Institute Technical Biochemistry (IBT), LUT (Polonia)/Ministero affari Esteri (MAE)	Otlewska, A., Migliore, M., Dybka-Stępień, K., Manfredini, A., Struszczyk-Świta, K., Napoli, R., Białkowska, A., Canfora, L., & Pinzari, F. (2020). When Salt Meddles Between Plant, Soil, and Microorganisms. Frontiers in Plant Science, 11. https://doi.org/10.3389/fpls.2020.553087	
SOIL	**ARESVA**	Delimitation of Italian disadvantaged agricultural areas due to natural constraints. Application of biophysical criteria (Reg. (EU) No. 1305/2013).	A. Monteleone, **CREA-PB** CREA-AA CREA-FL CREA-ZA CREA-VE CREA-AN	MIPAAF	Report tecnici: https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/19589; https://mediageo.it/ojs/index.php/GEOmedia/article/view/1698 "Delimitazione delle zone agricole soggette a vincoli naturali: Applicazione dei criteri biofisici in Italia (Reg. (UE) n. 1305/2013)". ISBN 9788833850672, autori: E. Costantini, M. Fantappiè, L. Fraschetti, A. Libertà, F. Lupia, D. Storti. "Il fine-tuning delle zone agricole soggette a vincoli naturali (art. 32.3, Reg. (UE) n. 1305/2013)". ISBN 9788833850696; a cura di D. Storti e L. Fraschetti; autori: C. Cardillo, M. Fantappiè, L. Fraschetti, F. Lupia, D. Storti.Poster AISRE 2020 – "The Italian agricultural areas with significant natural constraints: the fine-tuning approach with economic and structural factors" autori: L. Fraschetti, D. Storti, F. Lupia, C. Cardillo e M. Fantappiè	
SOIL	**FERT-NEC**	Evaluation of emissions related to the use of nitrogen fertilizers, with particular attention to urea and the impact of possible measures to reduce their use for each significant crop.	C. Di Bene, CREA-AA	ISPRA		
SOIL	**SOIL4LIFE**	The project applies the Voluntary Guidelines for Sustainable Soil Management promoted by FAO for sustainable and efficient use of soil in Italy and Europe in order to maximize ecosystem services and improve the chemical, physical and biological properties of the soil in the long term.	F. Altobelli **CREA-PB** CREA-AA	1- Coordinating Committee for International Voluntary Service (France); 2- Udruga Zelena Istra - Green Istria (Croatia)/EC		

SOIL	**Soil_HUB** Creation of an Italian HUB to support Italy's participation in the Global Soil Partnership and the European network of excellence on soil research.	Establishment of a network of excellence that can interface with the European Joint Program (EJP) and the Global Soil Partnership (GSP) in order to enhance knowledge to stem and mitigate the impact of climate change on agricultural systems and ecosystem functions of the soil related to agriculture.	R. Farina, CREA-AA CREA-PB	MIPAAF		
SOIL	**SOSFERA** Guidelines to support organic substance, biological fertility and the quality of Emilia-Romagna waters and soils.	Reduction of pollutant releases and improvement of water and soil quality; Control of adversity with low impact methods; Verification and adaptation of agricultural crop systems to climate change.	M. L. Manici, CREA-AA	Emilia Romagna Region		
SOIL	**RONSAS** Recovery of Organics and Nutrients from Sludge on Apulian Soils.	Analyze and evaluate the technical-economic feasibility of an innovative treatment system, by means of hydrolysis, of the biological sludge of the line (in aqueous suspension) that have not yet completed the purification process.	R. Leogrande, CREA-AA	Puglia Region		
SOIL	**EJPSOIL** European Joint Programme - Towards climate-smart sustainable management of agricultural soils.	To form a European network of excellence on soil study, in order to contribute to the challenges of adaptation and mitigation to climate change and to support EU agricultural policies.	R. Napoli, **CREA-AA** CREA-PB CREA-VE	**European Commission** [1]		
SOIL	**NCONTROL** Reduction of greenhouse gas and ammonia emissions in the livestock sector.	Control of nitrogen (N) losses in the livestock sector by monitoring greenhouse gas emissions, ammonia from the soil and N losses due to smoothing.	C. E.L. Scotti, **CREA-ZA** CREA-AA	Lombardia Region		
INNOVATIVE TECHINOLOGIES	**SOFTOIL** SOFTware-assisted optimization of the quality and quantity of microbial oils produced for energy purposes	Development of software for the qualitative and quantitative optimization of the production of bio-fermented oils for energy purposes.	G. Fila, CREA-AA	MIPAAF		

[1] 1. Inra, Institut National De La Recherche Agronomique, Francia, Coordinamento del progetto 2. Stichting Wagening Research, The Netherlands, Co-leader di progetto 3. BIOS Science Austria (Association for the Advancement of Life Sciences), Austria, partner 4. EV-ILVO, Eigen Vermogen van het Instituut voor Landbouw en Visserij Onderzoek, Belgium, partner 5. CRAW, Walloon Agricultural Research Centre, Belgium, partner 6. CULS, Czech University of Life Sciences Prague, Czech Republic, partner7. Aarhus University, Denmark, partner 8. Estonian University of Life Sciences, partner 9. LUKE, Natural Resources Institute, Finland, partner 10. Johann Heinrich von Thünen Institut Bundesforschungsinstitut für Ländliche Räume, Wald und Fischerei (Thuenen), Germany, partner 11. Research Centre Jülich, Germany, partner 12. Magyar Tudományos Akadémia, Agrártudományi Kutatóközpont (MTA ATK), Hungary, partner13. Teagasc, Agriculture and Food Development Authority , Ireland, partner 14. University of Latvia, Faculty of Geography and Earth Sciences, partner 15. Lithuanian Research Centre for Agriculture and Forestry, partner 16. NIBIO-Norwegian Institute of Bioeconomy Research, partner 17. IUNG-Institute of Soil Science and Plant Cultivation, Poland, partner18. Instituto Nacional de Investigação Agrária e Veterinária, I.P. (INIAV), Portugal, partner 19. National Agricultural and Food Centre (NPPC), Slovakia, partner 20. University of Ljubljana, Biotechnical faculty, Slovenia, partner 21. Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA), Spain, partner22. Swedish University of Agricultural Sciences (SLU), Sweden, partner 23. Eidgenössisches Departement für Wirtschaft, Bildung und Forschung WBF (Agroscope), Switzerland, partner 24. Ministry of Agriculture and Forestry/General Directorate of Agricultural Research and Policies (TAGEM), Turkey, partner25. Agri-Food and BioSciences Institute (AFBI), Northern Ireland, partner/ EC

INNOVATIVE TECHNOLOGIES	**ENVRI-FAIR** ENVironmental Research Infrastructures building Fair services Accessible for Society, Innovation and Research.	Integration and interoperability of the cluster of environmental Research Infrastructures (RI) (atmosphere, sea, land, biodiversity and ecosystems) in the EOSC (European Open Science Cloud)	F. De Natale, CREA-AA	**European Commissio**		WP11.3 - ENVRI-FAIR Project Meeting. 27-28 gennaio 2020 - CREA Agricoltura e Ambiente. Roma [organizzato dal CREA] - ENVRI-WEEK, 3-7 febbraio 2020 Dresda - ENVRI FAIR - WP5 Task Forces - Workshop 25-26 novembre 2020 (virtual meeting)

3.3.2 Patents and Services

Patents INDUSTRIAL PATENTS

Main topics/ products	*Denomination/Description*	*Autthors/Inventors*	*CREA Centres*
biodiversity, ecosystem services landscape	Agricultural tool for the preparation of transplant beds. (IT).	S. Canali F. Tittarelli F. Montemurro G. Campanelli S. Fabrizi	CREA-AA
	Device and procedure for reducing the dispersion in the environment of dust from abrasion of tanned seeds by pneumatic precision seeders (IT + EPO *[FR + DE]*).	D. Pochi M. Fedrizzi	CREA-IT
sustainability models	Plant protection product and method for obtaining that plant protection product (IT).	D. Rongai	CREA-DC
	Digestate-based fertilizer enriched with biostimulating micro-organisms and method to produce it (IT)	V. Terzi	CREA-GB
	New antimicrobial peptides (IT).	L. Orrù A. Lamontanara	CREA-GB

Services

Collections and experimental fields

Main topics/ products	*Denomination/Description*	*Person in charge*	*CREA Centre*
wild bees	**National reference collection of the Apoidei (*Hymenoptera Apoidea*)** Collection of about 50 entomological cases, bearing one male and one female specimen of each of about 1000 Italian species of "wild bees" (*Hymenoptera Apoidea*). Italy hosts about half of all European species. The collection is in formation. The material is obtained through donations, field collections within projects and loans from European museums. Currently, the collection hosts about 60% of the species	M. Quaranta	CREA-AA

[1] 1. Forschungszentrum Jülich GmbH 2. Centre National de la Recherche Scientifique (CNRS) FR 3. Integrated Carbon Observation System - European Research Infrastructure Consortium FI 4. Lunds Universitet SE 5. Université de Versailles Saint-Quentin-en-Yvelines. FR 6. Fondazione Centro euro-Mediterraneo sui Cambiamenti Climatici (CMCC) IT 7. Universitetet i Bergen NO 8. Euro-Argo European Research Infrastructure Consortium (Euro-Argo ERIC) FR 9. Institut Francais de Recherche pour l'Exploitation de la MER (IFREMER) FR10. European Multidisciplinary Seafloorand water column Observatory -European Research 21. Institutul National De Cercetare-Dezvoltare Pentru Geologie Si Geoecologie Marina-GEOECOMAR RO 22. Institutul National De Cercertare Dezvoltare Pentru Stiinte Biologice RA RO 23. The University of Stirling UK 24.Institut national de la rechèrche agronomique FR 25. Svaldbard integrated Arctic earth observing system (SIOS Svalbard)AS NO 26. Universiteit van Amsterdam NL 27. Technische informationsbibliothek (TIB) DE 28. Mariene Informatie Service Maris BV NL 29. Institut Royal des Sciences Naturelles de Belgique (RBINS) BE 30. Istituto nazionale di oceanografia e di geofisica sperimentale (OGS) IT 31. Agencia estatal consejo superior de investigaciones cientificas (CSIC) ESInfrastructure Consortium (EMSO ERIC) IT 11. E-Science European Infrastructure for Biodiversity and Ecosystem Research (LifeWatch ERIC) ES 12. Norsk Institutt for Luftforskning stiftelse. NILU NO 13. Consiglio Nazionale delle Ricerche IT 14. Ilmatieteen laitos (FMI) FI 15. Helsingin yliopisto (UHEL) FI 16. Istituto Nazionale di Geofisica e Vulcanologia (INGV) IT 17. Natural environment research council UK 18. Bureau de recherches geologiques et minieres FR 19. Koninklijk Nederlands Meteorologisch Instituut-KNMI NL 20. EISCAT Scientific Association SE32. mweltbundesamt gesellschaft mit beschrankter haftung (UBA GMBH) AT 33. Biosense Institute - Research and Development Institute for Information Technologies in Biosystems RS 34. Consortium of European taxonomic facilities (CETAF) BE 35. Stichting naturalis biodiversity Center NL 36. Surfsara BV NL/EC

	with at least one of the two sexes, for a total of about 1200 specimens out of the 2000 expected at completion. The activity is not currently funded by a specific dedicated project, but proceeds over time through several projects to which it provides support. For the period 2020-2023 the collection offers support to the Beenet project		
breeds silkworm, mulberry	**Silkworm germoplasm collection and varietal collection about 200 breeds silkworm and 2.5 h mulberry with 60 varieties in collection.**	S. Cappellozza	CREA-AA
recovery of fertility	**Farm "S. Anna" ca. 11 ha - several experimental devices have been carried out which have involved the recovery of fertility of land under intensive cultivation in Monteroni di Lecce (Le)**	C. Fina	CREA-AA
almond germplasm	Farm "La Piantata" ca. 6 ha - Preservation of almond germplasm and almond systems in dry in Bitetto (BA)	F. Fornaro	CREA-AA
rotational tests	**Fagna experimental center ca. 42 ha - carried out five-year rotational tests and long-term tests (over 40 years) in Scarperia e San Piero (FI)**	G. Moretti	CREA-AA
relationships water - cultivation systems	**Farm "M. Elisa Venezian Scarascia" ca. 25 ha in irrigation - oriented to study the relationships "water - cultivation systems" in Rutigliano (BA**	N. Sanitate	CREA-AA
extensive Mediterranean cultivation systems.	Farm "Podere 124" ca. 20 ha - studies are being carried out on extensive Mediterranean cultivation systems. We study production techniques that are the basis of organic farming, conservation and precision in Foggia	A. V. Vonella	CREA-AA
sustainable production systems	**Farm "Campo 7" ca. 7 ha -** studies and trials, including long-term studies, are developed on the management of cultivation systems, both arboreal and herbaceous, with particular regard to the efficient use of agri-environmental resources, the planning of eco-friendly production systems and techniques, integrated and organic farming methods **in Metaponto, Bernalda (MT)**	A. Fiore	CREA-AA

Certifications

Main topics/products	*Denomination/Description*	*Person in charge*	*CREA Centre*
apis mellifera	**certification of the subspecies of Apis mellifera by morphometric characterization.**	C.Costa	CREA-AA
Hymenoptera Apoidei	**Species identification service of Hymenoptera Apoidei.**	M. Quaranta	CREA-AA
honey and wax	**ACCREDIA analysis service on honey and wax**	G. Serra	CREA-AA

Other services

Main topics/products	*Denomination/Description*	*Person in charge*	*CREA Centre*
Agrometeorological trends	**Technical and scientific support to PIUE III-Direct payments and PAC monitoring -Directorate-General for International and European Union Policies- Mipaaf on request of 13 February 2020 on the need to request the EU Commission for the derogation on advances of CAP aid.** Technical report on "Agrometeorological trends in the current agricultural year" (2 March 2020)	B.Parisse, R.Alilla, F. De Natale, A. G. Pepe, A. Pontrandolfi	CREA-AA
Agrometeorological trends- fodder sector	**Technical and scientific support to the PIUE III-Office -Direct payments and CAP monitoring- Directorate-General for International and European Union Policies- Mipaaf on request of 15 June 2020 to request the EU Commission to derogate from greening obligations.** Technical report on "Agrometeorological trends and implications in the fodder sector" (June 2020)	R. Alilla, F. De Natale, B. Parisse, A. Pepe, A.Pontrandolfi	CREA-AA
plant protection products in organic farming	**Technical-scientific support for the PQAI I Mipaaf Office in the definition of the new Decree n. 7264 of 10 July 2020 of the Minister of Agricultural Food and Forestry Policies 13 January 2011, n. 309, bearing "Adventitious and technically unavoidable contamination of plant protection products in organic farming.**	A. Trinchera	CREA-AA

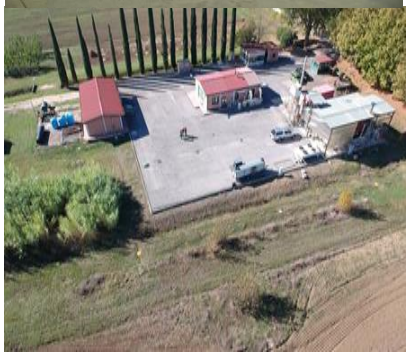
Working tables / working groups / institutional partnerships / Centre journals / Editorial Board of Journals

Main topics/products	*Denomination/Description*	*Person in charge*	*CREA Centre*
agriculture and environment	Joint Working Party on Agriculture and the Environment-OECD	S. Vanino	CREA-AA

organic agriculture	Board of Directors- RIRAB (Rete Italiana Agricoltura Biologica)	A. Trinchera M Diacono	CREA-AA
organic agriculture	Technical-Scientific Table new PAC - Thematic area: Organic Agriculture	S. Canali, C.Ciaccia	CREA-AA
organic agriculture	Technical table shared in Organic Agriculture Mipaaf	A. Trinchera	CREA-AA
organic agriculture	RIRAB (Italian network for Organic Agriculture)	S. Canali	CREA-AA
organic agriculture	Control body in RIRAB (Italian Network for Organic Agriculture)	C. Ciaccia	CREA-AA
agroecology	SCAR Working Group on Agroecology (SCAR-AE)	S. Canali	CREA-AA
agrometeorology	Board of Directors of the Italian Association of AgroMeteorology (AIAM)	C. Epifani	CREA-AA
agrometeorology	National coordination table in the field of agrometeorology	C. Epifani	CREA-AA
agrometeorology	Board of Directors of the Italian Association of Agrometeorology (AIAM)	D. Ventrella	CREA-AA
agronomy	Board of Directors of the Italian Society of Agronomy (SIA)	M. Donatelli, D. Ventrella	CREA-AA
AIRP (Italian Association of Radioprotection)	Collegial Board member of the Italian Association of Radioprotection (AIRP)	C. Fontana	CREA-AA
Honey	International Honey Commission (IHC), coordinator of Working Group "Sensory analysis of honey"	G.Luigi Marcazzan	CREA-AA
Honey	Managing Committee of the National Register of Experts on "Sensory analysis of honey"	G.Luigi Marcazzan	CREA-AA
italian bees, honey	Central technical Commission of the National Register of Italian Beekeepers, Managing Committees of the National Register of Experts on "Sensory analysis of honey" and of the National Register of Experts in Melissopalinology (D.M. 20984/1997)	M. Donatelli	CREA-AA
italian bees	Central technical Commission of the National Register of Italian Beekeepers	C. Costa E. Carpana	CREA-AA
protection of ligustica bee	Emilia-Romagna Region: L.R. n. 2/2019 "Apiculture" restricted working group, art. 7 comma 2 ligustica protection.	C. Costa	CREA-AA
Inland and Less Favoured Areas	CAP table - Group of Inland and Less Favoured Areas at Mipaaf	S. Pellegrini	CREA-AA
BACSA (Black Caspian Seas and Central Asia Silk Association)	BACSA (Black Caspian Seas and Central Asia Silk Association)	S. Cappellozza	CREA-AA
cultural heritage	Scientific Council of ASAS (Academy of Health Art History) nominated by the Ministry of Cultural Heritage	C. Fontana	CREA-AA
biodiversity	Technical-Scientific Table new PAC - Thematic area: Biodiversity	S. Mocali, M. Quaranta, L. Bortolotti	CREA-AA
biodiversity	Group of experts to support the contact person of CREA within the National Observatory for the National Strategy of Biodiversity	M.L. Manici, S. Mocali	CREA-AA
evolutionary biology and ecology	MSc in Evolutionary Biology and Ecology, University of Florence (research agreement with Universities of Ferrara and Parma) https://www.bio.unifi.it/vp-198-collegio-docenti.html	S. Mocali	CREA-AA
biometeorology	Phenology Commission (International Society of Biometeorology – ISB)	S. Bajocco	CREA-AA
biosafety, risk assessment and management	Forum of the Biosafety Clearing House (BCH) on the Risk Assessment and on the Risk Management of LMOs (Living Modified Organisms	S. Mocali	CREA-AA
chemical Pesticide-free Agriculture	Member of the group of CREA Contact points for the European Research Alliance Towards a Chemical Pesticide-free Agriculture	M. Diacono	CREA-AA
chemical green	CS Focus chemical green (national rural network)	L. D'Avino	CREA-AA
quality environment and territory	Circle of quality Environment and Territory of ISTAT	A. Pontrandolfi, B. Parisse, S.Vanino	CREA-AA
EURATOM	Group member EURATOM "Qualified Experts" related to ionizing radiations and radioactive waste- Legislative Decree 17 march 1995 n. 230	C. Fontana	CREA-AA
Copernicus	Contact point CREA in the National User Forum of the Copernicus Programme	S. Bajocco	CREA-AA
fortifyers	Technical Commission "Fortifyers" (DM 10 March 2020, n. 2587 (Mipaaf n.9152632 del 21/09/2020)	M. T. Dell'Abate	CREA-AA
fortifyers	Technical Commission "Fortifyers" (Mipaaft), D.M. 4416/2013	A.Trinchera	CREA-AA
defense, sustainable use of pesticides	Technical-Scientific Table new PAC - Thematic area: Defense, sustainable use of pesticides (Decree CREA n. 1026 of 14/09/18)	A. Trinchera	CREA-AA
earth sciences and cultural heritage	Working Group Earth Sciences and Cultural Heritage - US-Italy Science and Technology Joint Commission	S. Bajocco	CREA-AA
economia circolare	Italian Circular Economy Stakeholders Platform (ICESP)	A.Trinchera	CREA-AA
renewable energy	Technical-Scientific Table new PAC - Thematic area 11: Renewable energy	M. T. Dell'Abate	CREA-AA
fertilizers	Permanent Working Group for Plant Protection - Section "Fertilizers - referred to in DM 30 June 2016 n. 17713 -Section Fertilizers (D.M. DISR 5 n. 27272 of 24/09/18 and note CREA n. 73632 of 08/10/2020)	M.T. Dell'Abate, L. Manici, B. Pennelli	CREA-AA
fertilizers	Permanent Working Group for Plant Protection - Section "Fertilizers - DM 30 giugno 2016 n. 17713 -Section Fertilizers	A. Trinchera	CREA-AA

fertilizers	Italian Scientific Center for Fertilizers (CIEC)	M. Mastrorilli	CREA-AA
fertilizers	Steering Committee of the Italian Scientific Center for Fertilizers (CIEC)	F. Montemurro A Trinchera	CREA-AA
food, bioeconomy, natural resources, agriculture and environment"	Agency for the Promotion of European Research (APRE): Working Group Cluster 6 "Food, Bioeconomy, Natural Resources, Agriculture and Environment"	S. Mocali	CREA-AA
forest dss	Working Committe of the CoP ForestDSS - Community of Practice Forest Management Decision Support Systems (Forest DSS)	I. De Meo	CREA-AA
global Ssil	Global Soil Partnership FAO, Pillar 4.	M.Fantappiè	CREA-AA
forest fires	Working Group for the Management of Forest Fires (Italian Society of Silviculture and Forest Ecology – SISEF)	S. Bajocco	CREA-AA
irrigation and draining	Steering Committee of the Italian Committee for Irrigation and Draining (Ital ICID)	M. Mastrorilli	CREA-AA
meteorology	Technical-Scientific Group for monthly and seasonal weather forecasts at national level and for climatological analyses (Civil Protection Department)	F.De Natale, B. Parisse, R. Alilla	CREA-AA
microbial ecology	Italian Young Ambassador of the International Society of Microbial Ecology (ISME) https://www.isme-microbes.org/ambassadors	S. Mocali	CREA-AA
organic agriculture research	Member of the World Board dell'ISOFAR (International Society for Organic Agriculture Research)	S. Canale	CREA-AA
organic Production	Committee on Organic Production (COP – Commissione Europea)	A. Trinchera	CREA-AA
horticulture	International Society for Horticultural Science (ISHS)	F. Tittarelli	CREA-AA
PAN	Working Group n. 4 "Information and Education" of the Technical-Scientific Council of PAN (Mipaaf)	A. Trinchera	CREA-AA
bee pathology	BeePath – Italian Society of Bee Pathology	A. Nanetti	CREA-AA
pest and disease models	PEDIMIP Pest and Disease Models intercomparison and Improvement initiative	S.Bregaglio	CREA-AA
technical Professional Pool (Agri-Polo)	Territorial Technical-Scientific Committee Comitato of the Technical Professional Pool Agri-Polo	M. Mastrorilli	CREA-AA
sustainable use of hytosanitary products	Working Group on Indicatord for the National Action Plan for Sustainable Use of Phytosanitary Products (ISPRA)	A.Trinchera	CREA-AA
bee-related programmes	Monitoring Committee for bee-related programmes	L. Bortolotti	CREA-AA
risk assessment e risk management	Frum of the Biosafety Clearing House (BCH) on Risk Assessment and Risk Management of LMOs (Living Modified Organisms)	S. Mocali	CREA-AA
water quality-effluent management	Technical-Scientific Table new PAC - Thematic area: Water quality-effluent management	S. Vanino	CREA-AA
greenhouse gas emissions, etc.	Technical-Scientific Table new PAC - Thematic area: Air quality - greenhouse gas emissions, etc.	R. Farina, R. M. Ferrara, A. Lagomarsino	CREA-AA
sustainable management, organic carbon, fertilizers, etc	Technical-Scientific Table new PAC - Thematic area: Soil quality - sustainable management, organic carbon, fertilizers, etc	R. Francaviglia G. Rossi, M. T Dell'Abate	CREA-AA
space economy	Copernicus Technical-Scientific Table - Space Economy (MIPAAF-DIPEISR) Thematic area: Agriculture	S. Bajocco	CREA-AA
Soil	SISS newsLetter – Italian Society for Soil Science (SISS)	M. Mastrorilli	CREA-AA
Soil	Steering Committee of the Italian Society for Soil Science Division II	L.Canfora	CREA-AA
Soil	Working Group QBS- SISS (Italian Society for Soil Science)	L. D'Avino	CREA-AA
Soil	Global Soil Partnership (GSP) – Italian Soil Partneship Italian Society for Soil Science - SISS Pillar 1 and Pillar 3	G.Rossi	CREA-AA
sustainable bee breeding	"COLOSS - Research Network for Sustainable Bee Breeding"	C. Costa	CREA-AA
sustainable land use	National table for sustainable land use of the Ministry of the Environment and Protection of the Territory and the Sea	M. Fantappiè	CREA-AA

3.4 TECHNOLOGICAL INNOVATIONS



The strategic and unifying factor of research activities, proposed in the present chapter, is the application of mechanical and engineering technologies, including digital ones, from agricultural production to agro-food processing. This is in full compliance with the European "Farm to Fork" strategy (one of the pillars of the European "Green Deal") which aims to ensure quality, safe and sustainable food production. Farmers will have to transform their production methods more quickly, also using solutions based on innovations in traditional mechanics (mechatronics), which increasingly integrate digital (sensors, ICT, etc.) and aerospace technologies (Sentinel, Galileo) to continue guaranteeing, also with the changed climatic scenarios, safety and quality of primary productions, adequate economic profitability and improving environmental protection through the reduction and efficiency of the inputs use (eg pesticides, fertilizers). These *green technologies* must also aim at supporting farms and traditional productions, even on a small scale and under biologic farming sytems, by developing innovations and experimenting ad hoc applications, both for field activities and for post-harvest and first transformations.

The innovations for primary "field" activities mainly concern the study and testing of new machines or components, innovative mechanization processes, automation (including robotics) and technological systems, especially the digital ones. This innovation is driven by the concept of "precision" and operationally developed in technologies for precision and digital agriculture (agriculture 4.0). It can extend to the entire agro-food sector (precision transformations, logistics, etc.), to make production activity more efficient and contextually more sustainable (environmentally, economically and socially) through the conscious use (consequential or predictive) of the site/specific time of all production factors.

Digitization is a driving and transforming element for the whole economy and for society. In particular, the digital transition is important for the agro-food sector, characterized by great fragmentation and poor integration of and between supply chains and operators, especially the smaller and less organized ones. This transition is based on a multiplicity of technological tools made available by the strong innovation of the sector increasingly advanced, integrated, effective and economical solutions. The main technological innovations to be evaluated and tested in the multiplicity and variability of agricultural applications (even very sectorial and specific) and agro-food transformations (*smart agrifood*), are related to: advanced sensors, new communication protocols, *big/thick data, cloud computing, digital security, advanced photonics, artificial intelligence, digital twin.*

Digital integration can make process data available, from individual activities to internal systems, to develop coherent information for the support and the efficiency of decision-making skills, especially predictive ones, guiding directions and actions for producers and the entire supply chain/system with retroactive mechanisms of dynamic adaptive development, capable of acting on multifactorial productivity as a lever for sustainable growth

The transition towards more sustainable production and consumption systems requires the adoption of innovative technologies for the realization of a circular economy to be extended to the agro-food system, which increasingly acquires a pivotal role as a source of recovery matrices. In addition to the supply of raw materials for bioeconomy, it is important to intensify *mining* studies on secondary materials and on waste for development of biomaterials and bioproducts, for agricultural production (e.g. competitively priced bioplastics for crop protection, environmentally friendly packaging, etc.), in a virtuous productive and economic circle in which the actors play roles of both supplier and user.

In the perspective of achieving a "Carbon neutral" Europe by 2050 and in the light of the deterioration of environmental factors in agriculture (land salinization, water scarcity, rising temperatures, alteration of seasonal cycles, etc.) induced by climate changes, the objective focuses on the study of remote-driven approaches for the targeted application of farming practices and agro-ecological irrigations. The energy impact reduction of agro-food productions with the same expected productions, is positioned within the "farm-to-fork" strategy, for the aspects relating to the identification of the most efficient food production systems and the conscious and reasoned use of fertilizers.

The set of technological and process innovations, including digital transition and advanced sensoristics, in the agro-food processing sector, inclusive of cereals, fruits, vegetables and olive groves, can significantly contribute to raising the product quality level, operating synergistically on various aspects, including typicality, guarantee and safety, to improve production, environmental, economic and social sustainability.

3.4.1 Research and research products -Technological innovations

Main topics/products	Acronym and Research Title	Aims	Person in charge and CREA Centres	Partnership/ Financing Body	Scientific Publications	Other Research products [1]
AGRIMECHANICAL INNOVATIONS/ mulberry	**SERINOVATION** Innovation, Quality; Traceability in mulberry growing for the development of supplementary economic sources for farms .	Development of mechanization lines for the harvesting of Pratogelso / developing cocoons sorting machine for various enhancements.	A. Assirelli, **CREA-IT** CREA-AA	Veneto Region		1 Phd scholarship .
AGRIMECHANICAL INNOVATIONS / Hemp	**Multicanapa** Multi-purpose applications to relaunch the hemp supply chain .	Create the technical, economic and market conditions to support the development of a supply chain for the production of multipurpose hemp in Emilia Romagna. Mechanization of the collection of the different fiber-seed-by-product fractions.	A. Assirelli, CREA-IT	Emilia-romagna Region		
AGRIMECHANICAL INNOVATIONS / Grain legume	**PROLEGU** Re-launch program of grain legumes for human nutrition .	Sustainable increase in productivity, profitability and resource efficiency in agro-ecosystems.	E. Romano, **CREA-IT** CREA-CI CREA-OF CREA-AN	MIPAAF		
AGRIMECHANICAL INNOVATIONS / Agricultural machinery	**MOBI.RU.D** Design, development, and testing of an electrically propelled vehicle for disabled operators **.**	To promote the employment of disabled workers in agriculture by enabling the use of rural areas	M. Pagano, CREA-IT	INAIL		
AGRIMECHANICAL INNOVATIONS / Agricultural machinery	**La.St.** Survey on the methods for ascertaining the 38° lateral stability provided in OECD Code 6 .	The project will ascertain the possible difference in maximum static lateral stability angles adopting alternative methods.	M. Cutini, CREA-IT	OECD		
AGRIMECHANICAL INNOVATIONS / Agricultural machinery	**Pr.Us.A.** Experimental analysis of the influence of wear of solid tires for forklifts on some performance parameters.	The purpose of the research is the evaluation of the influence of the tread wear of the forklift solid tires on some performance parameters such as braking, traction, stability and comfort of forklifts.	M. Cutini, CREA-IT	TWS, Trelleborg Wheel System		
AGRIMECHANICAL INNOVATIONS / Agricultural machinery	**Spe.C.Tr.Al.** Experimental analysis of the elastic	The aim of the research is to elastically characterize the elastic supports of the cabs of high-power agricultural tractors	M. Cutini, CREA-IT	SAME DEUTZ FAHR Italia spa		

[1] *prototypes; dissemination activities (conferences, seminars, reports, sites and videos, etc.); training activities (scholarships, research grants and PhD scholarships .*

	characteristics of the suspension of the cabs of high-power tractors	by means of stress cycles on an electro-hydraulic bench.				
AGRIMECHANICAL INNOVATIONS / Agricultural machinery	**BKT P.RO.File** Experimental analysis of some performance aspects of agricultural trailer tires with highly flexible sidewalls.	The aim of the research is to evaluate the influence of low-pressure tires for agricultural trailers on some performance and geometric parameters such as rolling resistance in the field and on the track, and the relief of footprints on yielding material.	M. Cutini, CREA-IT	BKT EUROPE		
AGRIMECHANICAL INNOVATIONS / Agricultural machinery	**CAFTA** Experimental analysis of the front axle's influence on agricultural tractor operator's comfort.	Aim of the research is to determine the effects of two different front axles on the agricultural tractor operator's comfort.	M. Cutini, CREA-IT	Convenzione CAFTA - DANA ITALIA		
AGRIMECHANICAL INNOVATIONS / Agricultural machinery	**T.A.S.So** Experimental analysis of the elastic characteristics of the suspensions of specialized wide track tractors .	The aim of the research is to elastically characterize the elastic supports of the cabs and of the independent front suspension of specialized agricultural tractors, eg. for orchards, with wide track through stress cycles on an electro-hydraulic bench.	M. Cutini, CREA-IT	SAME DEUTZ FAHR Italia spa		
AGRIMECHANICAL INNOVATIONS / Agricultural machinery	**Vi.S.Ta.** Experimental analysis of the vibrational dynamics of an agricultural tractor in operating conditions.	The aim of the research is to characterize the vibrational dynamics of six agricultural tractors by surveying with accelerometers in operating conditions, such as transport and working situations in the field, and in the engine testing room.	M. Cutini, CREA-IT	SAME DEUTZ FAHR Italia spa		
AGRIMECHANICAL INNOVATIONS / Agricultural machinery	**AGRIDATA** Acquisition of experimental data on agricultural machinery under controlled conditions.	Define experimental methodologies focused on the study of the operating dynamics of agricultural machinery under controlled conditions and perform the related tests on vehicles characterized by innovative elements concerning: i) electronic control, ii) braking capacity, iii) capacity of traction and iv) general performance (e.g. comfort, noise, stability, visibility, instrumental checks aimed at homologation, etc.).	C. Bisaglia CREA-IT	SAME Deutz-Fahr Italia SpA	Dati sensibili non pubblicabili	
AGRIMECHANICAL INNOVATIONS / agricultural machinery /quinoa	**Quinoapuglia** Quinoapuglia	Development of mechanization lines for Quinoa seed harvesting.	A.Assirelli, CREA-IT CREA-CI	Regione Puglia		
TECHNOLOGICAL INNOVATIONS / Table olive and oil supply chain	**Mon.Oli.Tech** Mon.Oli.Tech Hi-Tech monitoring for the sustainable management of the	Creation of an Operating Group, actor animation and design of innovative systems for the Hi-Tech mounting of crop adversities in Olviculture.	M. Biocca, **CREA-IT** CREA-AA CREA-DC	Regione Lazio		Dissemination (website, depliant), 2 eventi div

	olive grove ecosystem in Latium region.					
TECHNOLOGICAL INNOVATIONS / Table olive and oil supply chain	**INNOLITEC**Technological innovations in the olive oil and table production chain.	Implementing technologically advanced and sustainable models for extra virgin olive oil and table olives aimed at technological renewal, product quality and traceability in the post-harvest phase, as well as the implementation and testing of new processing technologies, allowing the overcoming of the critical points that companies today face every day.	F.V. Romeo, **CREA-OFA** CREA-IT CREA-OF	MIPAAF		prototiype. 1phd scholarship. 2 sholarships. 2 research grants.
TECHNOLOGICAL INNOVATIONS / Cattle	**AUTOFEED** Feeding automation for cattle farms in Lombardy .	Aims at improving the dairy and beef cattle's welfare that result in an improved quality and sustainability of their production thanks to the adoption of mechanized and automatic devices for feeding administering.	C.Bisaglia, CREA-IT	Regione Lombardia		dissemination (website) https://autofeed.crea.gov.it/
TECHNOLOGICAL INNOVATIONS / Fruit orchard protection	**SIMODROFILA** Innovative monitoring systems for sustainable controll of Drosophila suzukii and other pests.	Creation of an Operational Group, actor animation and design of innovative traps and systems for the control of the main pests harmful to fruti orchards in Latium region.	M. Biocca, F. Pallottino, **CREA-IT** CREA-OFA	Regione Lazio		Dissemination (website, depliant), 2 events.
TECHNOLOGICAL INNOVATIONS / hazelnut ochard protection	**DERINOCCIO** Research and production experimentation on the reduction of the drift of phytosanitary treatments in hazelnut groves.	Reduction of pesticide inputs through the use of anti-drift nozzles and by adjusting the sprayer.	M. Biocca, CREA-IT			
TECHNOLOGICAL INNOVATIONS / sprayers	**IRRO CAMPANIA** Inspections of plant protection equipment in Campania.	Collaboration and scientific technical support to the activities of control and calibration of sprayers in Campania, according to Legislative Decree 150/2012.	M. Biocca, CREA-IT	Campania Region		
TECHNOLOGICAL INNOVATIONS / **organic agriculture**/ soil	**AB COMPOST** Organic matter for organic agriculture.	Demonstration actions to overcome barriers to the development of compost value chain for organic agriculture.	S. Bergonzoli, CREA-IT	Lombardia Region	ABCompost-Sostanza organica di valore in Agricoltura Biologica. Manuale per l'impiego. S. Bergonzoli, A. Confalonieri, E. Lopez, R. Missale, D. Ponzini, E. Alfonsi. 2020	Dissemination (sito web), 2 eventsi.

TECHNOLOGICAL INNOVATIONS / bioeconomy	**AGROENER** Energy from agriculture: sustainable innovations for the bioeconomy .	1. Increase the energy efficiency of agricultural machines and systems. 2. Use solid biomass, mainly obtained from agroforestry by-products.3. Recover agro-industrial by-products for the development of the biogas supply chain. 4. Use dedicated crops as a matrix for the extraction of biofuels and / or biolubricants in the production cycles of integrated biorefineries. 5. Implement demonstration actions and knowledge transfer regarding the development of microgeneration plants with analysis of sustainability and the main critical issues. .	P. Menesatti, **CREA-IT** CREA-OFA CREA-AA CREA-CI CREA-ZA	MIPAAF	1)Civitarese V., Acampora A., Sperandio G., Caracciolo G., Assirelli A. 2020. Pellet from 9–year–old poplar. characterization of the raw material and the pellets produced. 28th European Biomass Conference and Exhibition: 360-363. 6 – 9 July 2020, Virtual; 2)Acampora A., Civitarese V., Sperandio G., Caracciolo G., Assirelli A. 2020. Pellets from hazel and olive groves pruning residues. Characterization of the product obtained. 28th European Biomass Conference and Exhibition: 364-367. 6 – 9 July 2020, Virtual; 3) Coppa E., Astolfi S., Beni C., Carnevale M., Colarossi D., Gallucci F., Santangelo E., 2020. "Evaluating the potential use of Cu-contaminated soils for giant reed (Arundo donax, L.) cultivation as a biomass crop" - Environmental Science and Pollution Research; 4)Dono G., Enea Picarella M., Pons C., Santangelo E., Monforte A., Granell A., Mazzucato A., 2020. "Characterization of a repertoire of tomato fruit genetic variants in the San marzano genetic background" - Scientia Horticulturae; 5)Cecchini F., Serra M.C., Bevilacqua N., Costa C., Valori R., Pallottino F., Casadei G., Menesatti P., Antonucci F., 2020. "Advanced Modeling for the Identification of Different Pathogen Tolerant Vines to Reduce Fungicides and Energy Consumption". Sustainability, 12 (5): 1900; 6) Rossi G., Neri U., Felici B. And Benedetti A., 2020 "Effects Of Different Zootechnical Digestates On Fertilization And Nitrogen Leaching". AGROCHIMICA Vol. 64, No. 3 (July - September issue, 2020). ISSN 0002-1857 (IF 20018=0.750); 7)Santangelo E., Carnevale M., Migliori C.A., Picarella M.E., Dono G., A. Mazzucato A. - 2020 "Evaluation of tomato introgression lines diversified for peel color as a source of functional biocompounds and biomass for energy recovery". Biomass and Bioenergy 141 pag 1-9; 8) Manfredini A., Chiariotti A., Santangelo E., Rossi E., Renzi G. & Dell'Abate M.T.* (2020) "Assessing the Biological Value of Soluble Organic Fractions from Tomato Pomace Digestates." - Journal of Soil Science and Plant Nutrition pag 1-14 0718-9508; 9)Ceotto E., Vasmara C., Marchetti R., Cianchetta S., Galletti S., 10 Dicembre 2020 "Biomass and methane yield of giant reed (Arundo donax L.) as affected by single and double annual harvest" - GCB- Bioenergy Bioproducts for Sustainable Bio Pag 1-39	"Produzione di inoculi per digestori anaerobici da liquami suinicoli" con Regione Emilia Romagna
TECHNOLOGICAL INNOVATIONS / bioenergy	**STIMA** Environmental sustainability of bioenergy: Development of innovative analytical technologies for monitoring and abatement of pollutants from the	Main focus is the validation of an innovative method for the sampling of Levoglucosan and its isomers, markers of cellulose combustion. L'impiego di tale metodica porterà all'identificazione di pattern caratteristici per il riconoscimento di PM10 e PM2.5 generato dalla combustione di biomasse e permetterà quindi di distinguere se il particolato atmosferico di aree urbane, suburbane o	F. Gallucci CREA-IT	MIPAAF		

	energy conversion of agroforestry biomass.	rurali, sia generato dall'impiego di combustibili fossili o da biomasse.				
TECHNOLOGICAL INNOVATIONS / biomass, emissions	**BBT** Study of the influence of the nature of biomass on atmospheric emissions and effects on health and plants.	To characterize the gaseous effluents and the pollutants present in them through an experimental activity of monitoring and chemical-physical characterization of the waste effluents.	F. Gallucci, CREA-IT	MIPAAF		
TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY / biomethane	**BIOMASS HUB** Biomethane for a sustainable society: development of an Italian Laboratory of Circular Economy from biomethane.	The project aims to promote the creation of a model for the enhancement of organic waste through the efficient production and management of electricity, biomethane and fertilizers with a view to circular economy and the closure of waste recycling (zero waste).	C. Bisaglia, T. M. P. Cattaneo, **CREA-IT** CREA-ZA	Regione Lombardia		4 research grants
TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY/ cactus pear/water resouces	**MediOpuntiA** Introducing cactus plantations (Opuntia spp.) and smart water management systems in marginal lands of Egypt and Morocco to drive rural renaissance in the Mediterranean Region.	The Project wants to develop a suitable cultural system for Cactus in desert areas and marginal lands, CREA deals with the development of a prototype for the application of SWRT (Subsurface water retention technology) in order to retain rainwater in land in the process of desertification.	L. Pari CREA-IT	Universidade Nova de Lisboa, Faculdade de Ciências e Tecnologia/Departamento de Ciências e Tecnologia da Biomassa, Caparica, Portugal, City of Scientific Research and Technological Applications (SRTA- City), Arid Lands Cultivation Research Institute (ALCRI), Alessandria Egitto, Université Cadi Ayyad, Faculty of Science Semlalia/ Physics Department,Marrakesh, Marocco/**European Commission**		1 prototype
TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY / camelina/conservation agriculture	**4CE-MED Camelina** A Cash Cover Crop Enhancing water and soil conservation in MEDiterranean dry-farming systems.	1.Development of innovative techniques for conservation agriculture, also in North African countries.2. Fine-tuning of the production chain focused on *Camelina*, development of mechanical systems for the collection and reduction of losses of the Camelina.	L. Pari CREA-IT	**European Commission** [1]	1. Stefanoni, W., Latterini, F., Ruiz, J. P., Bergonzoli, S., Attolico, C., & Pari, L. (2020). Mechanical Harvesting of Camelina: Work Productivity, Costs and Seed Loss Evaluation. Energies, 13(20), 5329. 2.Stefanoni, W., Latterini, F., Ruiz, J. P., Bergonzoli, S., Palmieri, N., & Pari, L. (2021). Assessing the Camelina (Camelina sativa (L.) Crantz) Seed Harvesting Using a Combine Harvester: A Case-Study on the Assessment of Work Performance and Seed Loss. Sustainability, 13(1), 195.	

[1] Institut National de la Recherche Agronomique d'Algérie (INRAA)Francia, Cooperativas Agro-alimentarias de España (SPANISH CO-OPS) Spagna, Iniciativas Innovadoras S.A.L (INI) Spagna , Camelina Company Espana (CCE) Spagna, ARVALIS – Institut du Végétal Francia, Centre for Renewable Energy Sources and Saving (CRES) Grecia, BIOS AGROSYSTEMS S.A. (BIOS) Grecia, International Center for Agricultural Research in the Dry Areas (ICARDA) Marocco, Institut National de la Recherche Agronomique de Tunisie (INRAT), Tunisia/**European Commission**

TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY / hemp	**CCF** Hemp Campana in Fiber.	Development of mechanization lines for the harvesting of hemp for textile use .	A. Assirelli, CREA-IT	Campania Region		
TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY / hemp	**CANAPRO** Valorization of hemp supply chain through product and process innovation.	Composition in hemp seeds and derivatives, to be used as feed integration on cattle.	R. Lo Scalzo **CREA-IT** CREA-ZA	Lombardia Region		Kick-off meeting, due incontri tecnici per discussione metodiche e risultati preliminari.
TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY / green chemistry technologies	**COMETA** Native Mediterranean crops and their enhancement with advanced green chemistry technologies .	Studying and validating innovative non-food cultivation systems with low inputs and suitable for cultivation in marginal areas, at risk of erosion / desertification, under-used, polluted and / or badly used Obtain fractions (seeds, hypogeal and epigeal biomass) suitable for be converted through advanced low-impact green chemistry technologies into bioproducts of interest for the agricultural and industrial sector: animal feed, biodegradable bioplastics, biolubricants, products for cosmetics, biostimulants and compost for agriculture, bio-insecticides, extracts for nutraceuticals and health, panels for green building.	L. Pari **CREA-IT** CREA CI	MUR	"S. Sebastiano, G.M. Baldi, F. Latterini, W. Stefanoni, L. Pari" 2020 Valorizzare terreni marginali con la coiltivazione del cardo l'informatore agrario 42/2020 ISSN 0020-06889.	
TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY / energy crops	**SUSCACE** Scientific support for agricultural conversion to energy crops .	Develop the necessary scientific innovations (agronomic and mechanical) essential to make the agro-energy supply chains economically viable.	L. Pari**, CREA-IT** CREA FL CREA AA	MIPAAF	L. Pari, Editor of the Specia Issue: Renewable Energy Production from Energy Crops and Agricultural Residues, published online in the open access journal Energies (ISSN 1996-1073) Francesco Latterini, Walter Stefanoni, Alessandro Suardi , Vincenzo Alfano , Simone Bergonzoli , Nadia Palmieri and Luigi Pari 2020 A GIS Approach to Locate a Small Size Biomass Plant Powered by Olive Pruning and to Estimate Supply Chain Costs Energies 13, 3385 ISSN: 1996-1073; Picchio, R., Pari, L., Venanzi, R., Latterini, F., Suardi, A., Alfano, V., Bergonzoli, S. 2020 Analysis of Woody Biomass Obtainable from Abruzzo Forests Proceedings of the 28th European Biomass Conference and Exhibition (e-EUBCE Virtual), 6 July – 6 September 2020 pp. 71-73 ISSN 2282-5819 Rezaie, N., D'Andrea, E., Pari, L., Matteucci, G. 2020 How Did Different Forest Management Options Affect Woody Assortments? Proceedings of the 28th European Biomass Conference and Exhibition (e-EUBCE Virtual), 6 July – 6 September 2020 pp.209-211 ISSN 2282-5819 Picchio, R., Pari, L., Venanzi, R., Latterini, F., Suardi, A., Alfano, V., Bergonzoli, S. 2020 " Italian Coppices and their Economic Income" Proceedings of the 28th European Biomass Conference and Exhibition (e-EUBCE Virtual), 6 July – 6 September 2020 pp. 74-76 ISSN	

					2282-5819 Cetera, P., Moretti, N., D'Auria, M., Faraone, I., Russo, D., Bruno, M.R., Fioravanti, M., Pari, L., Milella, L. 2020 From Biomass of Poplar Utilizations to Byproducts Proceedings of the 28th European Biomass Conference and Exhibition (e-EUBCE Virtual), 6 July – 6 September 2020 pp. 163-168 ISSN 2282-5819 Picchio, R., Pari, L., Venanzi, R., Latterini, F., Suardi, A., Alfano, V., Bergonzoli, S. 2020 A New Mobile Kiln Prototype for Charcoal Production Proceedings of the 28th European Biomass Conference and Exhibition (e-EUBCE Virtual), 6 July – 6 September 2020 pp.686 - 689 ISSN 2282-5819 Todaro, L., Cetera, P., Lo Giudice, V., Moretti, N., Pari, L., Bochicchio, G." 2020 High Calorific Value of Lignin Derived from Turkey Oak Wood: Combined Effect of Steaming and Thermal Treatment Proceedings of the 28th European Biomass Conference and Exhibition (e-EUBCE Virtual), 6 July – 6 September 2020 pp. 616-617 ISSN 2282-5819	
TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY / Green chemistry technologies	**BECOOL** Brazil-EU Cooperation for Development of Advanced Lignocellulosic Biofuels .	Twinning Project EU/BRASIL - Sustainable development in terms of resource efficiency and cost-effectiveness of the cultivation of energy crops both in Europe and in Brazil for the production of biofuels - Brazilian Project: BIOVALUE .	L. Pari CREA-IT	BTG Biomass Technology Group BV (BTG), Olanda, Centro de Investigaciones Energeticas, Medioambientales y tecnologicas (CIEMAT), Spagna, Centre for Renewable Energy Sources and Saving (CRES), Grecia, Deutsches Biomasseforschungzentrum (DBFZ), Germania Stichting Energieonderzoek Centrum Nederland (ECN), Olanda, International Institute for Applied Systems Analysis (IIASA), Austria, Stichting Wageningen research (WR), Olanda Technical Research centre of Finland Ltd. (VTT), Finlandia/ **European Commission**	1)L. Pari, Editor of the Specia Issue: Renewable Energy Production from Energy Crops and Agricultural Residues, published online in the open access journal Energies (ISSN 1996-1073); 2) Francesco Latterini , Walter Stefanoni , Alessandro Suardi , Vincenzo Alfano , Simone Bergonzoli , Nadia Palmieri and Luigi Pari 2020 A GIS Approach to Locate a Small Size Biomass Plant Powered by Olive Pruning and to Estimate Supply Chain Costs Energies 13, 3385 ISSN: 1996-1073 3)Picchio, R., Pari, L., Venanzi, R., Latterini, F., Suardi, A., Alfano, V., Bergonzoli, S. 2020 Analysis of Woody Biomass Obtainable from Abruzzo Forests Proceedings of the 28th European Biomass Conference and Exhibition (e-EUBCE Virtual), 6 July – 6 September 2020 pp. 71-73 ISSN 2282-5819 4) Rezaie, N., D'Andrea, E., Pari, L., Matteucci, G. 2020 How Did Different Forest Management Options Affect Woody Assortments? Proceedings of the 28th European Biomass Conference and Exhibition (e-EUBCE Virtual), 6 July – 6 September 2020 pp.209-211 ISSN 2282-5819 5) Picchio, R., Pari, L., Venanzi, R., Latterini, F., Suardi, A., Alfano, V., Bergonzoli, S.2020 "Italian Coppices and their Economic Income" Proceedings of the 28th European Biomass Conference and Exhibition (e-EUBCE Virtual), 6 July – 6 September 2020 pp. 74-76 ISSN 2282-5819 6)Cetera, P., Moretti, N., D'Auria, M., Faraone, I., Russo, D., Bruno, M.R., Fioravanti, M., Pari, L., Milella, L. 2020 From Biomass of Poplar Utilizations to Byproducts Proceedings of the 28th European Biomass Conference and Exhibition (e-EUBCE Virtual), 6 July – 6 September 2020 pp. 163-168 ISSN 2282-5819 7)Picchio, R., Pari, L., Venanzi, R., Latterini, F., Suardi, A., Alfano, V., Bergonzoli, S. 2020 A New Mobile Kiln Prototype for Charcoal Production Proceedings of the 28th European	

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TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY/ industrial crops	**MAGIC** Marginal lands for Growing Industrial Crops: Turning a burden into an opportunity .	Sustainable development in terms of resource efficiency and cost-effectiveness of the cultivation of industrial crops on land with low (marginal) productivity in order to favor, in the long term, the development of a bio-economy, contributing to the achievement of energy and environmental objectives .	L. Pari CREA-IT	**European Commission** [1]	1) Pari, L.; Suardi, A.; Stefanoni, W.; Latterini, F.; Palmieri, N. 2020 Environmental and Economic Assessment of Castor Oil Supply Chain: A Case Study, Sustainability 2020, 12, 6339.; 2. Pari, L.; Latterini, F.; 2)Stefanoni,W 2020 Herbaceous Oil Crops, a Review on Mechanical Harvesting State of the Art Agriculture 2020, 10, 309.; 3) Latterini, Francesco; Stefanoni, Walter; Sebastiano, Simone; Baldi, Gian M.; Pari, Luigi. 2020. Evaluating the Suitability of a Combine Harvester Equipped with the Sunflower Header to Harvest Cardoon Seeds: A Case Study in Central Italy, Agronomy 10, no. 12: 1981. https://doi.org/10.3390/agronomy10121981; 4) Luigi Pari, Vincenzo Alfano, Giammaria Magagnini, Gianpaolo Grassi., 2020 Seed Losses Evaluation During Hemp Harvesting With A Modified Combine Header , . Proceedings of the 28th European Biomass Conference and Exhibition (e-EUBCE Virtual), 6 July – 6 September 2020.; 5) Luigi Pari, Walter Stefanoni, Alessandro Suardi, Nadia Palmieri, Simone Bergonzoli, Vincenzo Alfano, Sandu Lazar, 2020 Cultivation of castor in Romania: a case of study,Proceedings of the 28th European Biomass Conference and Exhibition (e-EUBCE Virtual), 6 July – 6 September 2020.	
TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY/ industrial crops	**PANACEA** A thematic network to design the penetration Path of Non-Food Agricultural Crops into European Agriculture.	The project aims to create a network of relationships and exchanges between research, industry and the agricultural world aimed at the dissemination of knowledge and experience in the field of cultivation and use of non-food crops (NFC) already subject of study and research activities in many areas of Europe (rapeseed, sunflower, willow, miscanthus, thistle, common reed) in order to increase their diffusion and encourage the development of	L. Pari CREA-IT	**European Commission** [2]	1) Latterini, F.; Stefanoni, W.; Sebastiano, S.; Baldi, G.M.; Pari, L. Evaluating the Suitability of a Combine Harvester Equipped with the Sunflower Header to Harvest Cardoon Seeds: A Case Study in Central Italy. Agronomy 2020, 10, 1981. https://doi.org/10.3390/agronomy10121981; 2) Stefanoni, W.; Latterini, F.; Ruiz, J.P.; Bergonzoli, S.; Palmieri, N.; Pari, L. Assessing the Camelina (Camelina sativa (L.) Crantz) Seed Harvesting Using a Combine Harvester: A Case-Study on the Assessment of Work Performance and Seed Loss. Sustainability 2021, 13, 195. https://doi.org/10.3390/su13010195	

[1] Centre for Renewable Energy Sources and Saving Fondation, Greece; Stichting Dienst Landbouwkundig Onderzoek, Netherlands; Wageningen University, Netherlands; Universitaet Hohenheim, Germany; Institut National de la Recherce Agronomique; IFEU – Institut fur Energie und Umweltforschung Heidelberg GMBH, Germany; Imperial College of Science Technology and Medicine, United Kingdom; Nova-Institu fur Politische und Okologiche Innovation GMBH, Germany; Faculdade de Ciencias e Tecnologiada Universidade Nova de Lisboa, Portugal; Arkema France SA, France, Partner; Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas-CIEMAT, Spain; Cooperativea agro-alimentarias de Espana u de Coop sociedad Cooperativa, Spain; BioWarmia Bioenergia i Biosurowce Michal Krzyzaniak, Poland; Intytut Wlokien Naturalnych i Roslin Zielarskich, Poland; B.T.G. Biomass Technology Group BV, Netherlands; Agricultural University of Athens, Greece; Institute of Bioenergie Crops and sugar beet National Academy of agrarian Sciences of Ukraine, Ukraine; Latvijas valsts mezzinatnes Institus Silava, Latvia; Internationales Institut fuer Angewandte Systemanalyse, Austria; NovaBiom, France; Vandinter Semo BV (VDS), Olanda; Bios Agrosystems SA (bios), Greece/ **European Commission**

[2] Centre for Renewable Energy Source and Saving Fondation, Grecia, Stichting Wageningen Research, Olanda, Imperial College of Science Technology and Medicine, Regno Unito, Agricultural University of Athens, Grecia, Faculdade de Ciencias e Tecnologiada Universidade Nova de Lisboa, Portogallo, Iniciativas Innovadoras SAL, Spagna, Assocaition de Coordination techniquw Agricole, Francia, Instituto Navarro de Tecnologias e Infrastructuras Agroalimentaires SA, Spagna, Asociata Clusterul Agro-Food-Ind Napoca, Romania, Bios Agrosystems SA, Grecia, Cooperativas Agro-alimentarias de Espana u de Coop Sociedad Cooperativa, Spagna, Lietuvos Agrariniu ir misku Mokkslucentras, Lituania, Krzyzaniak Michal, Polonia, Arkema France, Francia/**European Commission**

		sustainable supply chains of bioproducts and materials for the "EU's Circular Economy"				
TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY/ guayule		Setting up of a system for the collection, storage and pre-treatment of Guayule.	L. Pari CREA-IT	ENI VERSALIS		
TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY/ hop	**INNOVALUPPOLO** Sustinable innovation for hop cultivation.	Introduction of sustainable innovations for the development of the hops supply chain.	K. Carbone **CREA-OFA** CREA-VE- DC - IT - VE- PB	MIPAAF		Internal report on the results.
TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY/ pomace olive oil	**ASSITOL-INNOHUB** Use of pomace olive oil as technical fluid for the operations in olive orchard .	Evaluation of the pomace olive oil as lubricant andhydraulic fluid for the operation of hydraulic plants and machines in the olive oil production chain, with the aimo of reducing the environmental impact and food contamination (e.v.o. oil) as a consequence of the dispersion of conventional lubricants and hydraulic fluids .	D. Pochi, CREA-IT	INNOVHUB		
TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY/ pomace olive oil	**ASSITOL INNOVHUB 2-** Use of rough and refined pomace olive oil as technical fluid for the operations of agricultural machinery - Phase 2	Evaluation of the pomace olive oil as "disposable"lubricant in chainsaws for the lubrication of the chain, with the aim of reducing impact on the agro-forestry environment consequent to the dispersion of the conventional lubricants commonly used .	D. Pochi CREA-IT	INNOVHUB		
TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY / PGI pear	**ESPERA** Circular Economy and sustainability of the "PGI Mantovana" pear supply chain .	The aim of the ESPERA project is the overall improvement of the management of the "PGI Mantovana" pear supply chain, combining technological innovations with the reconfiguration of production, storage and distribution processes, within the paradigms of circular economy and sustainability	M. Vanoli, CREA-IT	Lombardia Region		kick-off meeting
TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY / organic waste	**COMPOSTEAM** Reuse and enhancement of organic waste in agro-food companies to be used for heat production .	Development of innovative technologies related to the Green Economy and applied to biomass plants for the production of energy at the service of agro-industry. The technological solutions of the Project aim to increase energy efficiency, improving the current thermal conversion processes, rationalizing the consumption of	F. Gallucci, CREA-IT	Lazio Region		

		resources and reducing the environmental impact .				
TECHNOLOGICAL INNOVATIONS CIRCULAR ECONOMY / *Solanaceae* and *Brassicaceae* waste	**SUS.IN.CER** Sustainable use of bioactive compounds from brassicaceae and solanaceae wastes for cereal crop protection	Characterization and use of extracts of potato peels as inhibitor of maize molds .	R. Lo Scalzo, **CREA-IT** CREA-CI	Cariplo Foundation	Pane et al., doi:10.3390/biology9090270; Vanoli et al., doi: 10.13128/ahsc-7666	kick-off meeting. 1 phd scholarship
DIGITAL TRANSITION, ADVANCED SENSORS / forest and environment sector	**LIFE FOLIAGE** Forest planning and earth observation for a well-grounded governance	The project purpose is to improve PAs governance in the forest and environment sector to comply to the EU legislation. It will provide a real-time picture of the forests status and their ecosystem goods and services, enabling the forest management practises and the conservation status monitoring of forest habitats, inside and outside Natura 2000. Specifically the project will develop a software framework of three components: 1. the Forest Management Platform (FMP), targeted at PAs, forestry professionals, enforcement agencies, and citizens; 2. the Earth Observation Platform (EOP), specifically addressed to PAs and designed to be a complementary instrument of the FMP; 3. Information Exchange Platform (IEP), to support with a mobile app the field surveys and the information exchange between citizens, NGOs, law enforcement and PAs.	M. Bascietto, **CREA-IT** CREA-FL CREA-FL	**European Commission**		1 Research grant.
DIGITAL TRANSITION,ADVANCED SENSORS / bovines for milk production/ animal feed	**INNOVALAT** INNOVative technologies for feeding dairy cattle in order to guarantee animal welfare and production quality .	The objectives of the study are to evaluate the effect of using innovative technologies in an IoT (Internet of Things) context, aimed at optimizing the (precision) feeding of the high-production dairy cow to improve animal welfare and the dairy characteristics of the milk produced.	F. Pallottino, CREA-IT	Università la Tuscia - DAFNE		2 prototype: 1 spectrophotometer IoT Vis-Nir; 1 cavalletto. 1 event - Università degli Studi della Tuscia di Viterbo.

DIGITAL TRANSITION,ADVANCED SENSORS / climatic parameter monitoring	**AGROMETEORE**	Monitoraggio agro-meteoclimatico e fenologico per il potenziamento e la gestione operativa del sistema messo a punto per le analisi meteo-climatiche e di previsione dello sviluppo fenologico delle colture.	A Monteleone, **CREA-PB** CREA-AA CREA-FL CREA-ZA CREA-VE CREA-AN	MIPAAF	I Parisse, B., Pontrandolfi, A., Epifani, C., Alilla, R., & De Natale, F. (2020). An agrometeorological analysis of weather extremes supporting decisions for the agricultural policies in Italy. Italian Journal of Agrometeorology, (1), 15-30. https://doi.org/10.13128/ijam-790; Policy Brief e Analisi Swot per PAC post 2020	https://www.reterurale.it/incontritematicitavolo. https://www.reterurale.it/PACpost2020/percorsonazionale; https://www.reterurale.it/fenologia
DIGITAL TRANSITION,ADVANCED SENSORS / resource optimization	**AGRI 4.0** A new integrated approach to optimizing agricultural resources and preserving the environment.	Realization of a new integrated system for the optimization of water, energy, agronomic-cultural resources, the preservation of the environment and the increase of resilience to climate change, in agriculture.	C.Costa, CREA-IT	Provincia Autonoma di Trento		Dissemination (website), 2 events 1 publication, 1 software.
DIGITAL TRANSITION,ADVANCED SENSORS / Poplar	**PRECISIONPOP**Multi-scale monitoring system to support precision poplar cultivation in the Lombardy Region .	The project aims to create an innovative high-resolution spatial and temporal multi-scale monitoring system of poplar surfaces in the Lombardy Region. .	F. Chianucci, **CREA-FL** CREA-AACREA-IT	Regione Lombardia		https:// precisionpop.net/
DIGITAL TRANSITION,ADVANCED SENSORS / Vineyard	**Ro.Vi.TIS** Operating group for the dissemination of autonomous robot connected to DSS for the sustainable and efficient management of the vineyard .	Creation of an Operating Group, development, implementation, evaluation in the field and dissemination of an autonomous robot connected to DSS for carrying out phytosanitary treatments in the vineyard .	F. Pallottino, M. Biocca, **CREA-IT** CREA-VE	Veneto Region		Dissemination (website 2 events 2 prototypes
INNOVATIVE TRANFORMATIONS/ Cereals	**FILIGRANO** Innovations in the Campania cereal supply chain: from high quality sustainable production to differentiated storage .	Promote the use of new technologies (agronomic, genetic, IT) to make agricultural practices more efficient, improve the quality of durum wheat production also through a better organization of storage .	L. Gazza CREA-IT E. Romano CREA-IT	Campania Region		
INNOVATIVE TRANFORMATIONS / Cereals	**METROFOOD-PP METROFOOD-RI** Preparatory Phase Project	1. Organization of the technical aspects of the research infrastructure, as a service-oriented organization, and to define its operational standards. 2. Definition of the long-term activities (on a strategic basis) of the future research infrastructure. 3. Drawing up the service charter and access procedures.	A. Turrini, **CREA-AN** CREA-CI CREA-GB CREA-IT	**European Commission** [1]		
INNOVATIVE TRANFORMATIONS /Wheat/tolerance	**RGV FAO** Maintenance and renewal of collections of Triticum dicoccum, Triticum spelta,	The general objective of the program is the maintenance, multiplication and eventual renewal of the collections of hulled wheats (T. dicoccum and T. spelta), of the "ancient Triticum", of	F. Quaranta, CREA-IT	MIPAAF		

[1] PREMOTEC GmbH - PMT Switzerland; CZU/CULS Czech Republic; UCT Czech Republic; TUM Germany; EUT Spain; EVIRA Finland; UPPA France; AUTH Greece; USZ Hungary; DAS Moldova; IJZRMFYROM (Now Republic of North Macedonia); RIVM Netherlands; WR Netherlands; NTNU Norway; INSA Portugal;National Research & Development Institute for Food Bioresources - IBA Romania; JSI Slovenia; TUBITAK Turkey/European Commission

	Triticum caucasians and of differential lines of wheat (NILs) carrying genes for resistance to rust and powdery mildew. Identification of resistant or tolerant genotypes to the main fungal pathogens. Development of perennial wheats. .	perennial wheat and of the NILs differential lines. For hulled wheats (T. dicoccum and T. spelta), preservation in purity is also checked by electrophoretic analysis of the reserve proteins; as part of the maintenance of the collection, any accessions with characteristics of interest, resulting from the characterization of the starch, not carried out in previous years, may be identified. Conservation of gene resources for resistance or tolerance to the main fungal pathogens, an activity of great importance also considering the recent epidemics that have affected our territory with a consequent global alert launched by the FAO. "Ancient triticum": create opportunities for the breeding of wheat species with superior health and nutritional potential and promote the cultivation of ancient wheat species as a new source of biodiversity and for a more sustainable agriculture. Maintenance of differential lines of wheat (NILs) carrying genes of resistance to rust and powdery mildew of wheat, also for the purpose of their use in breeding programs to increase resistance. Maintenance of perennial wheats for their possible use in mixtures of durum and soft wheat with the prospect of increasing the health properties of the products.				
INNOVATIVE TRANFORMATIONS / wheat	**AsFrum** Arsenic and mycotoxins in durum wheat supply chain of region Lazio: on-line optospectral control and use of innovative processing technologies to contain their presence in processed products .	The main objective of the research is to develop in a synergistic way innovative technologies of screening effective in controlling the durum wheat raw matter and processing aimed to contain the concentration of total arsenic and mycotoxins in the transformed products of semi-integral type.	G. Aureli, CREA-IT	Lazio Region		website, webinar
INNOVATIVE TRANFORMATIONS wheat	**GOMM HaMMurabi** Development of einkorn supply chain from farm to fork.	Identify the most appropriate agriculture management, milling and pastamaking process of einkorn wheat.	L. Gazza, CREA-IT	Marche Region	1)S Picascia, A Camarca, M Malamisura, R Mandile, M Galatola, D Cielo, L Gazza, G Mamone, S Auricchio, R Troncone, L Greco, R Auricchio, C Gianfrani. (2020). In celiac disease patients the in vivo challenge with the diploid Triticum monococcum elicits a reduced immune response compared to hexaploid wheat. Molecular Nutrition and Food Research. 64(11), e:1901032. doi: 10.1002/mnfr.201901032	

					2)L Di Stasio, S Picascia, R Auricchio, S Vitale, L Gazza, G Picariello, C Gianfrani, G Mamone. (2020). Comparative analysis of in vitro digestibility and immunogenicity of gliadins proteins from durum and einkorn wheat. Frontiers in Nutrition, 7: 56. doi: 10.3389/fnut.2020.00056	
INNOVATIVE TRANFORMATIONS / durum wheat	**BIODURUM** Strengthening of the production systems of Italian organic durum wheat .	Define innovative processes for organic cereal farming according to the "National Strategic Plan for the development of the organic system", in order to promote adequate income for producers, product quality, environmental protection and sustainable resource management.	E. Romano, **CREA-IT** CREA-CI CREA-AA CREA-PB	MIPAAF		-
INNOVATIVE TRANFO RMATIONS/ *Sorghum*	**SOUL** Innovation in food grade sorghum chain in the Latium Region: Sustainability, cropping, transformation and functional recovery of co-products coming from the transformation. process.	The project aim is to introduce the chain of sorghum 'food grade' in Latium, Italy (from seed to processed product and recovery of by-products) in order to improve the competitiveness of farms by better integrating them into the agri-food chain. .	F. Taddei, **CREA-IT** CREA-OFA	Lazio Region	Galassi, E., Taddei, F., Ciccoritti, R., Nocente, F., & Gazza, L. (2020). Biochemical and technological characterization of two C4 gluten-free cereals: Sorghum bicolor and Eragrostis tef. Cereal Chemistry, 97(1), 65-73. doi.org/10.1002/cche.10217	3 Events
INNOVATIVE TRANFORMATIONS / oil and table olive supply chain	**DEAOLIVA** Quality, sustainability and operational safety improvement in table olives debittering through innovative pilot scale processes**.**	Innovative technological implementations Quality control of fermented products through microbiological and chemical analysis of olives and fermentation brines Textural, sensory and chemical / nutritional control of products .	B. Lanza, **CREA-IT** CREA-OFA, CREA-AN	MIPAAF	1) Lanza B., Zago M., Di Marco S., Di Loreto G., Cellini M., Tidona F., Bonvini B., Bacceli M., Simone N., 2020. Single and Multiple inoculum of Lactiplantibacillus plantarum strains in table olive lab-scale fermentations. Fermentation, 6 (4), 126; https://doi.org/10.3390/fermentation6040126; 2) Lanza B., Cellini M., Di Marco S., D'Amico E., Simone N., Giansante L., Pompilio A., Di Loreto G., Bacceli M., Del Re P., Di Bonaventura G., Di Giacinto L., Aceto G. M., 2020. Olive pâté by multi-phase decanter as potential source of bioactive compounds of both nutraceutical and anticancer effects. Molecules, 25(24), 5967; https://doi.org/10.3390/molecules25245967. 3 posters al 9th EUROPEAN CONFERENCE ON SENSORY AND CONSUMER RESEARCH (EUROSENSE 2020): 1) "Factors that affect Italian consumers' table olive consumption behaviour", Autori: N. Simone, M. Bacceli, B. Lanza;2) "Social communication: Brief investigation about social media use by some typical food industries in Abruzzo region (Italy)", Autori: M. Bacceli, N. Simone, B. Lanza ; 3) "Rheological and sensory approaches to characterize table olive texture", Autori: B. Lanza, M. Bacceli, N. Simone.	kick-off meeting .https://deaoliva.crea.gov.it/ 1 research grant
INNOVATIVE TRANFORMATIONS / oil and table olive supply chain	**INFOLIVA** Informative traceability, process and product innovations in the olive supply chain .	Development of advanced systems of quality and traceability information of olive oil. Process innovation for oil extraction Valorization of co-products of mechanical extraction	C. Costa, **CREA-IT** CREA-OFA	MIPAAF	1) Violino, S., Ortenzi, L., Antonucci, F., Pallottino, F., Benincasa, C., Figorilli, S., Costa, C. (2020). An Artificial Intelligence Approach for Italian EVOO Origin Traceability through an Open Source IoT Spectrometer. Foods, 9(6), 834;2) Violino, S., Pallottino, F., Sperandio, G., Figorilli, S., Ortenzi, L., Tocci, F., Vasta, S., Imperi, G., Costa, C. (2020).	prototype. WEBINAR...1 Ph.D..1 research grant. 1 scholarship

		Production of probiotic olives and olive creams made from them and evaluation of "unconventional" probiotic activities			A Full Technological Traceability System for Extra Virgin Olive Oil. Foods, 9(5), 624.	
INNOVATIVE TRANFORMATIONS / Oil and table olive supply chain	**M.O.L.T.I** Improvement of production in traditional and intensive olive groves.	Mechanization of pruning for vegetative-productive control, inter-row control for weed management, economic analysis of the technologies examined.	E. M. Lodolini, **CREA-OFA, CREA-IT,** CREA-AA	MIPAAF		
INNOVATIVE TRANFORMATIONS/ Fruit productions	**FRUFUN** Low environmental impact production of innovative functional foods with fruit produced by agricultural enterprises in the Sabine area.	Carry out all the animation activities useful for organizing the cooperation around the initial project idea up to the establishment of the Operating Group.	T. M. P. Cattaneo, CREA-IT	Lazio Region		https://nutrifrutta.com/; poster: https://www.crea.gov.it/web/ingegneria-e-trasformazioni-agroalimentari/-/giornata-divulgativa-g.o.-frufun; 2 events: https://youtu.be/vvZZDL-YZWk;https://digital.makerfairerome.eu/#/mfr/108/event; stand Maker Faire, Rome https://digital.makerfairerome.eu/#/mfr/107/brand
INNOVATIVE TRANFORMATIONS / Fruit productions	**KIMOR_KIRIS** La moria del kiwi – Approfondimento sull'eziologia e strumenti di prevenzione e difesa.	Insights on physiological aspects involved in the onset of kiwifruit early decline syndrome as a consequence of environmental, agronomical and phytopatological factors, in order to prevent the onset of this disorder in new plantations and to propose possible remedies for existing orchards .	L.Bardi, CREA IT	AGRION Fondazione per la ricerca l'innovazione e lo sviluppo tecnologico dell'agricoltura piemontese - Regione Piemonte.	1. Bardi, L. (2020) Early Kiwifruit Decline: A Soil-**Borne** Disease Syndrome or a Climate Change Effect on Plant–Soil Relations? Front. Agron., May 2020, Volume 2, Article 3 doi.org/10.3389/fagro.2020.00003; 2. Bardi Laura, Nari Luca, Morone Chiara, Faga Maria Giulia, Malusà Eligio (2020) Possible Role of High Temperature and Soil Biological Fertility on Kiwifruit Early Decline Syndrome. Frontiers in Agronomy, 2, pag.13, DOI=10.3389/fagro.2020.580659; 3. Tacconi G., Giacopini A.,Vittone G., Nari L,Spadaro D., Savian F., Ermacora P., Saro S.,Morone C., Bardi L., Tosi L. "Moria del Kiwi" situazione disastrosa al Nord, preoccupante nel resto d'Italia. Kiwiinforma 2020, 4-6.	https://www.theguardian.com/world/2020/oct/08/mystery-disease-killing-italys-kiwi-fruit-trees-baffles-scientists; Comunicati stampa CREA: https://www.crea.gov.it/-/il-crea-su-gente-la-moria-del-kiwi-favorita-dagli-effetti-dei-cambiamenti-climatici; https://www.crea.gov.it/-/moria-del-kiwi-gestione-del-suolo-e-alte-temperature-fra-i-possibili-fattori-scatenanti2: https://www.raiplayradio.it/programmi/glisbandatidiradio2/archivio/puntate
INNOVATIVE TRANFORMATIONS/ vegetable productions, *Brassicaceae*	**BRESOV** Breeding for Resilient, Efficient and Sustainable Organic Vegetable production	Finding the genotypes of Brassica vegetables more resilient and adapted to organic conditions and physiological stresses.	R. Lo Scalzo, **CREA-IT** CREA-OF	see BRESOV consortium (https://bresov.eu)/ **European Commission**	Picchi V. et al., doi: 10.3390/molecules25153495; Lo Scalzo et al., doi: 10.1007/s00217-020-03492-1; Di Bella et al., doi:10.3390/agronomy10060782	3 meetings
INNOVATIVE TRANFORMATIONS/ vegetable productions, tomato	**POMOFONDI** Certified quality of mini San Marzano tomatoes from the Plain of Fondi (LT) in relation to environmental sustainability and nutritional value .	Promoting sustainability and productivity of the mini San Marzano tomato crop in the Piana di Fondi (LT) through the use of engineered irrigation systems.	M. Pagano, **CREA-IT** CREA-AN	Latium Region		

INNOVATIVE TRANFORMATIONS / Vegetable productions / soil	**EXCALIBUR** Exploiting the multifunctional potential of belowground biodiversity in horticultural farming .	Proposes to deepen the knowledge of soil biodiversity dynamics and its synergistic effects with prebiotic and probiotic approaches in horticulture, using a multi-actor cooperation approach.	S. Mocali, **CREA-AA,** CREA-IT		https://www.excaliburproject.eu/it/partners/EC	

3.3.2 Patents and Services

Patents INDUSTRIAL PATENTS

Main topics/products	*Denomination/Description*	*Authors/Inventors*	*CREA Centres*
feed silkworms	Method to feed silkworms (IT).	S. Cappellozza	CREA-AA
animal wax	Method and installation for the purification of animal wax from unwanted chemicals (IT + EPO).	R. Colombo, M. Boi	CREA-AA
automatic insect sorting	Procedure and apparatus for automatic insect sorting (IT).	A. Assirelli, G. Cabassi, S. Cappellozza, C. Costa, S. Figorilli L. Marinoni. F. Pallottino, A. Saviane	CREA-AA
crop condidioning apparatus	Conditioning apparatus of a crop and agricultural machinery using such apparatus (IT).	L. Pari, A.Assirelli	CREA-IT
silkworm larvae	Method for raising silkworm larvae and their derived uses (IT).	S. Cappellozza, A. Saviane	CREA-AA
Yeasts	Yeast strain that can be used to reduce the amount of acrylamide in heat-treated food (IT)	L. Ugolini	CREA-CI
animal feeding	Leaf cutting machine for animal feeding, especially silkworms (IT).	A. Assirelli, S. Cappellozza	CREA-IT
macchina estrattrice	Machine to extract material contained in horizontal plastic silos (IT + EPO).	A. Assirelli	CREA-IT
antioxidant capacity	Method for measuring antioxidant capacity (IT).	E. Finotti, F. Nobili	CREA-AN
durum wheat pasta	Process for the production of a high nutritional potential durum wheat pasta and high nutritional potential durum wheat pasta (IT)	A. Arcangeli, ,A. Cammerata,E. Gosparini,R. Mortaro, D. Sgrulletta, S. Bellato R. Ciccoriti V. Del Frate G. Terracciano	CREA-IT
silkworm cocoons	Tools for cleaning silkworm cocoons, comb with several tools and machine incorporating comb (IT).	F. Motto, A. Saviane	CREA-AA
vegetable fractions	Apparatus for the separate collection of vegetable fractions from a crop and agricultural machinery using such apparatus (IT).	L. Pari, A.Assirelli	CREA-IT
Pappi	Group for the separation of pappi and agricultural machinery using such a group (IT)	L. Pari, A.Assirelli	CREA-IT
incoherent material	Agricultural equipment for storing incoherent material (IT)	D. Pochi M.Fedrizzi, R. Fanigliulo,M. Biocca	CREA-IT

Services

Collections

Products/main topics	*Description*	*Person in charge*	*Centri CREA*
table olive	**Collection of microorganisms of olive-oil interest** Collection of lactic bacteria and yeasts to be used in the guided debittering processes of table olives	B. Lanza	CREA-IT

Certifications

Products/main topics	Description	Person in charge	Centri CREA
agricultural machinery and tires	**ENAMA and ENTAM certification of the functional and safety characteristics of agricultural machinery and equipment - Soil processing machines - Sowing and transplanting machines - Agricultural tires.** The CPMA Laboratory (agricultural machinery testing center), accredited by ACRREDIA from 2010 to 2014 carries out test activities aimed at the certification of the machines apart from ENAMA. The Certificates are recognized in Europe by the ENTAM (European network for testing of agricultural machinery)	D. Pochi	CREA-IT

Other services

Main topics/ products	Description	Person in charge	Centri CREA
cereals and derivates	**Transformation and qualitative characterization of cereals and derivatives .**Qualitative analysis and characterization of cereals and derived products, according to official methods. First and second transformation processes through the technological platform supplied to the Center	P. Menesatti	CREA-IT
chlorophyll and carotenoid	**CLOCARD - Chlorophyll and carotenoid determination in different plant species.** Leaf cholophyll and carotenoid extraction and quantification through spectrophotometric determination .	V. Picchi	CREA-IT
durum and emmer wheat	**Quality tests for registration in the National Register of durum wheat and emmer wheat varieties.** Qualitative characterization and pasta making tests on samples of durum wheat and spelled sent for registration in the National Register of cereal varieties according to D.M. 10 october 2011 (MiPAAF).	P. Menesatti	CREA-IT
innovative agricultural machines, equipment and tires	**Testing activities for third parties aimed at research and experimentation on innovative agricultural machines, equipment and tires.** The CPMA Laboratory (agricultural machinery testing center), accredited by ACRREDIA from 2010 to 2014, has facilities, equipment and instruments for the study and evaluation of the performance of agricultural machinery and equipment and agricultural tires, at the direct request of manufacturers.	D. Pochi	CREA-IT
Vegetable oil and fats	**Contract/third party analysis to verify the authenticity of vegetable oils and fats**-Qualitative and authenticity analysis of vegetable oils and fats, according to the official methods set out in Reg. no. 2568/91/EEC as amended and in the Trade Standard of the Madrid International Olive Oil Council (IOC)	L. Di Giacinto	CREA-IT
DA products	**Third party analysis for the characterization of DA products.** Qualitative-quantitative characterization of inorganic and digestate fractions from the AD process	F. Gallucci	CREA-IT
recovered products	**Quality control activities of recovered products transformed by solar energy.** Collaboration in the development of issues concerning the "Quality of recovered products and/or food surplus, transformed by solar energy	T.M.P. Cattaneo	CREA-IT
volatile substances, semi-finished basil	**Third party analysis for the quality evaluation of processed products -** Contract for the assignment of the analysis service of the volatile substances profile of basil raw materials and semi-finished products .	G. Bianchi	CREA-IT

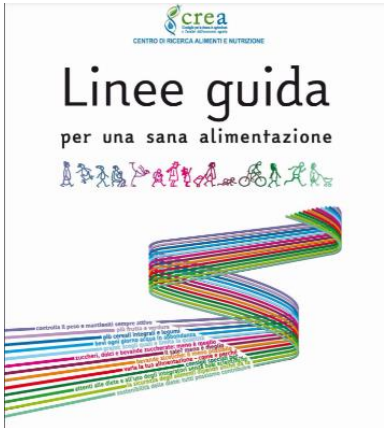
Working tables / working groups / institutional partnerships

Main topics/products	Description	Person in charge	CREA Centres
virgin olive oils	**Commission referred to in art. 9 of Ministerial Decree no. 18/06/2014. Departmental Decree no. 3028 of 29/05/2017 -** Procedure for the revocation of tasting committees for virgin olive oils recognised by MiPAAF	L. Di Giacinto	CREA-IT
honey sensory analysis	**Management Committee of the National Register of Experts in Honey Sensory Analysis as per Ministerial Decree no. 21547 of 28 May 1999 as amended, renewal of Prot. no. 28737 of 7/07/2017.** Management Committee of the National Register of Experts in Honey Sensory Analysis	L. Di Giacinto	CREA-IT
virgin olive oil	**Ministerial Group on oil quality strategy.** Formulation of guidelines for the improvement of virgin olive oil quality	L. Di Giacinto,	CREA-IT
vegetable oil	**CODEX Alimentarius Ministerial Group - Vegetable oils.** Verification of CODEX Alimentarius methods and parameters - Vegetable oils	L. Di Giacinto	CREA-IT
virgin olive oils	**IOC Commission for the management of the Mario Solinas International Competition on the quality of virgin olive oils -**Management of the Mario Solinas International Competition on the quality of virgin olive oils	L. Di Giacinto	CREA-IT
table olive	**IOC Table Olive Standard Expert Group -** Verification of the methods and parameters present in the "Trade standard applying to table olives" referred to COI/OT/NC No 1 and CODEX ALIMENTARIUS CODEX STAN 66-1981	B. Lanza	CREA-IT
tractor	**OECD Tractor Standard Codes**. CREA-IT is accredited as a test station to participate in regulatory and technological harmonization activities within the OECD, preparing or acquiring technical-scientific documents which are then shared, through ad hoc technical working groups, with other institutions.	M. Cutini	CREA-IT
kiwi	**National Phytosanitary Commettee. Working.** group "Kiwifruit early decline syndrome"	L. Bardi	CREA-IT

integrated production	**GTQ (technical group of quality**)- National System of Certification of Integrated Production (SQNPI)	R. LoScalzo	CREA-IT
table olive	**IOC Table Olive Organoleptic Expert Group -** Verification of the methods and parameters present in the "Method for the sensory analysis of table olives" referred to COI/OT/MO No 1	B. Lanza	CREA-IT
virgin olive oil	**IOC Organoleptic Expert Group-** Verification of the method "SENSORY ANALYSIS OF OLIVE OIL - METHOD FOR THE ORGANOLEPTIC EVALUATION OF VIRGIN OLIVE OIL" referred to in IOC/T.20/Doc. no.15/	L. Di Giacinto	CREA-IT

4. CREA RESEARCH LINES - Food, Nutrition and Food waste

In line with the priorities set out in the Agenda 2030, CREA develops research, activities, competencies and initiatives aimed at safeguarding human health within the development of models of healthy, nutritious and sustainable diets, innovation in food quality and safety, also introducing tools and methodologies of waste bio-refinery, and food waste reduction. This latter area of research is aimed at lowering the environmental footprint of biomass wastes derived from the main food chain agricultural production systems (e.g. olive oil, wine, fish industry etc.), enhanching the global chain value by means of bioactive molecules recovery and green extractive procedures. FOOD 2030 represents a European research and innovation platform in the agricultural and agrifood sector focused on the development of production systems meeting the international policies and directives of COP21 on climate change, the Sustainable Development Goals (SDGs) of the Agenda 2030, and the UN Decade of Action on Nutrition. Assuring food and human nutrition security on the long term, requires a deep transition of our current unsustainable production systems towards the unique goal of the "One Health" paradigm, which includes human nutrition and health, food security and sustainability.



FOOD QUALITY. The research activity aims at evaluating and improving the nutritional and organoleptic quality of food, as well as its safety. All steps of the food supply chain are analyzed in a farm-to-fork approach. Traditional food and foodstuffs with quality labels (e.g., PDO, PGI, TSG, etc.) are characterized in order to valorize and promote the excellence of the national agro-food production, with a special focus on organic farming. Quality markers for the identification of farming systems, breeding, processing and storage are investigated. Food chain by-products and food wastes are also studied as source of functional molecules and bioactive compounds (microalgae, molluscs).

RESEARCH TARGETS: • Bringing new knowledge to nutritional and organoleptic quality (molecular and sensory), safety and health-promoting aspects of food, so as to provide consumers with tools enabling informed choices in line with nutritional recommendations; • Providing stakeholders and SMEs in the optimization of production processes and in the choice of processing and preservation technologies for improvement of food products and process sustainability, also through the recovery and use of by-products and food wastes. • Contributing to the development of new agro-food systems to safeguard crop biodiversity, and to the promotion of food and sustainable diets. • Supporting policy makers and stakeholders in the development and valorization of national food production systems

EFFECT OF FOOD INTAKE AND DIET ON HUMAN HEALTH. Research on human nutrition studies the interaction between life style, physical activity and human health, in order to understand the complex association between dietary patterns and risks for non-communicable diseases. Special attention is paid to the physiological aspects and the molecular mechanisms related to the prevention of non-communicable diseases and to the maintenance of the health status. Population and intervention studies are targeted at the population of all ages (e.g., children, adults, elderly people). Studies on animal and cellular models are also performed, with experimental methodologies that combine biochemical, microbiological, metagenomics and molecular techniques.

RESEARCH TARGETS: • Understanding the relationship between nutrition, nutritional status and health. • Identifying molecular biomarkers (metabolic, molecular, microbiological, metagenomics, genomic, genetic, epigenetic and clinical) associated with diet, health status and life style. • Identifying the physiological, biochemical, metabolic and molecular mechanisms by which the different components of the diet act at level of cells, tissue and organism; • Preventing the increase of physio-pathological conditions associated with wrong food choices and lifestyles, and providing recommendations on the nutritional adequacy of the diet, in terms of energy and nutrient requirements, according to the SDG2, SDG3 and SDG10 of the Agenda 2030.

POPULATION STUDIES. Population studies include national food consumption surveys aimed at collecting data about the adequacy of diets in terms of energy and nutrient intake, exposure to chemical substances and environmental foot print. These studies allow to focus on aspects of food consumption which may also explain consumers' food choices. Population-based data are used as a basis for formulating food policy guidelines for healthier lifestyles, and the set up of consensus documents, e.g. dietary guidelines, also in the frame of chronic disease prevention.

RESEARCH TARGETS: • Evaluating population-based food consumption data, with a focus on children, adolescents, pregnant women, etc., so that the nutritional risk assessment can produce accurate and reliable results, as well as food consumption impact and food waste. • Investigating the drivers for consumers' food choices also through the development of new methodologies for the analysis of sensory perceptions. • Developing food education campaigns targeted specifically at children, adults and elderly people. • Management of national food databanks (Food Composition Database have been regularly updated since 1939; Food Consumption Surveys; Observatory for Food Waste). The research approach is multidisciplinary in adherence with the EU Farm to Fork Strategy within the SDG 12 responsible consumption and production.

4.1 Research and research products - Food Nutrition and Food waste

Main topics/ products	*Acronym and Research Title*	*Aims*	*Person in charge and CREA Centres*	*Partnership/ Financing Body*	*Scientific Publications*	*Other Research products* [1]
FOOD/ QUALITY AND FUNCTIONALITY	**Pasta-cous** Process and product innovation in the production of highly environmentally sustainable food from durum wheat (pasta, cous cous).	The Sub-unit 1 task was to identify quality parameters for the definition of a wheat wholegrain flour. These parameters can be used to draft a new product classification to be introduced in the Italian or international legislation.	M. Carcea, CREA-AN	International Association for Cereal Science and Technology (ICC)/ MUR	*(see publications various)*	
FOOD/ QUALITY AND FUNCTIONALITY	**Naturally Pinsa** Characterization of flour blends for the production of Pinsa Romana.	Characterization of optimal blends of cereal-based flours (soft wheat, spelt, rice) and legumes (soy, chickpeas and / or peas) for the production of Pinsa Romana.	T.Amoriello ,CREA- AN	Naturally Made of Italy srls	*(see publications various)*	
FOOD/ QUALITY AND FUNCTIONALITY	**EXCornsEED** Separation, fractionation and isolation of biologically active natural substances from corn oil.	Increase the value of industrial co-streams by developing eco-efficient processing solutions for enriching intermediate fractions with bioactive compounds and proteins. Develop technologies to recover proteins and bioactive components from industry side streams into ingredients for high value products. Application in food, feed, cosmetics , nutraceutics).	G. Di Lena, CREA-AN	ENVIRAL (Slovacchia), Celabor (Belgio), Nutricia (Paesi Bassi), BIOZOON GmbH (Germania), Tecnalia (Spagna), HighChem (Slovacchia), ICECHIM (Romania), FCTA (Spagna), Procter & Gamble (Belgio)/ **European Commission**	*(see publications various)*	

[1] *prototypes; dissemination activities (conferences, seminars, reports, sites and videos, etc.); training activities (scholarships, research grants and PhD scholarships).*

FOOD/ QUALITY AND FUNCTIONALITY	**DIPRIMAO** Productive diversification of aquaculture: integration of mollusc culture plants with Holoturia spp.	Develop an innovative protocol of integrated multi-trophic aquaculture. Quality and sustainability in aquaculture.	G. Di Lena, CREA-AN	Puglia Region		
FOOD/ QUALITY AND FUNCTIONALITY	**PROBIS** Development of environmentally friendly protocols to be applied to the recovery of molecules of interest as ingredient for innovative value chain of markatable products	Develop eco-friendly extraction of omega-3 and Vit.E from fish waste and by-products for their application as ingredient in new sustainable new supply chains (food, nutraceutic, cosmetic) of merkatable products to enhance the local economy.	G. Lombardi-Boccia CREA- AN	Lazio Region	(see publications various)	
FOOD/ QUALITY AND FUNCTIONALITY	**COST ACTION EUROCAROTEN** European networkto advance carotenoid research and application in agro-food and health.	Advancement of Carotenoid research in agro-food and health context and study on novel and sustainable sources of Carotenoids and application in food, nutraceutic and cosmetic sectors.	G. Lombardi-Boccia CREA- AN	35 partecipanti Europei/ **European Commission**	(see publications various)	
FOOD/ QUALITY AND FUNCTIONALITY	Sviluppo di processi sostenibili e innovativi per l'estrazione di Vitamina D, utile nella riduzione del rischio di influenze e Covid-19, da scarti della lavorazione di funghi edibili e prodotti ittici Anno 2020 (durata 2 anni).	Applicare la tecnica di analisi FTIR-ATR per lo studio dei livelli di vitamina D da scarti di funghi edibili e prodotti ittici.	A. Durazzo e M. Lucarini CREA-AN	Marche Region	(see publications various)	
FOOD/ QUALITY AND FUNCTIONALITY	**TEMPRO** Effects of the storage temperature of raw milk on the safety and quality characteristics of Provolone Valpadana PDO.	Support to the request of an amendment to the product specification of PDO Provolone Valpadana, by the evaluation of the effects of changing the storage temperature of raw milk on the chemical, microbiological, technological and nutritional quality of the Provolone Valpadana PDO cheese.	D. Carminati, **CREA -ZA** CREA-AN	MIPAAF	1)Ritota M., Di Costanzo M.G., Manzi P. Modification in cheese making of Provolone Valpadana PDO: Nutritional assessment. Online 34th EFFoST International Conference - Bridging high-tech, food-tech and health: Consumer-oriented innovations. Israel Institute of Technology, 10-12/11/2020; 2) Ritota M., Di Costanzo M.G., Barzaghi S., Manzi P. Latte crudo per la caseificazione "Influenza della temperatura di stoccaggio sulle caratteristiche chimico-nutrizionali" (articolo in press su Scienza e Tecnica Lattiero Casearia Journal)	Conference 10/9/2020 "Effetti del temperatura di stoccaggio del lat crudo sulle caratteristiche di sicurez e qualità del Provolone Valpadar DOP: risultati relativi ai parametri interesse nutrizionale (latte formaggio)".
FOOD/ QUALITY AND FUNCTIONALITY	**VEGGIE-MED-CHEESE** Valorisation of thistle curdled CHEESES in MEDiterranean marginal areas.	Studying and optimizing the existing processing technologies in cheese making in order to: (i) valorise traditional and typical local cheeses by meeting the world-wide increase demand of cheeses made by non-animal rennet; (ii) assess the technological and socio-economic	P. Manzi, CREA AN	Spagna (UCAM); Grecia(DEMETER) e Tunisia ISA-CM)Programma PRIMA 2018/ MUR		https://veggiemedcheeses.com/ https://www.crea.gov.it/-/crea-per l-innovazione-2020-il-centro-alimenti-e-nutrizione-per-un-sistema-alimentare-sempre-piu-sostenibile-e-sano; "Valorisation of thistle-curdle CHEESEs in MEDiterranea

		viability of the utilization and valorisation of the Mediterranean thistles as traditional alternatives to the animal rennet; (iii) build upon traditional knowledge and culinary heritage while establishing the conditions for sustainability, food safety and better control of the quality of these traditional cheeses; (iv) improve the traditional cheese-making value chain				marginal areas" 1° meeting 8.-6-2020 (event on line).
FOOD/ QUALITY AND FUNCTIONALITY	**GB-TAF-8230-** Enhancement of botanical collections by recovering fungal spores from the (myco-)rhizosphere of whole plant specimens Horizon 2020 UE G.A. n. 823827 SYNTHESYS +.	To enhance botanical collections by capturing the diversity of their associated mycorrhizal fungi from the whole plant specimens.	M. Bragaloni CREA AN	Host Staff Member Silvia Pressel, PhD. Natural History Museum, di Londra infrastruttura della DiSSCo (Distributed System of Scientific Collections), Museo di Storia Naturale di Londra / **European Commission**		
FOOD/ QUALITY AND FUNCTIONALITY	**METROFOOD PP**Infrastrutture di ricerca Preparatory Phase Project.	Develop the organisational, operational and strategic frame of METROFOOD-RI, which is a new distributed research infrastructure aimed at providing high-quality services in support to the agrifood sector with specific reference to food quality and safety. The Consortium involves 48 Institutes from 18 European Countries.	A. Turrini e M. Masci, **CREA-AN** CREA-CI, CREA-GB, CREA-IT	Belgio, Svizzera, Repubblica Ceca, Germania, Spagna, Finlandia, Francia, Grecia, Ungheria, Moldavia, Macedonia, Olanda, Norvegia, Portogallo, Romania, Slovenia, Turchia/ **European Commission**		Conference "5th IMEKOFOODS": Metrology for sustainable food production. www.metrofood.eu.
FOOD/ QUALITY AND FUNCTIONALITY	**ProOrg** Code of Practice for organic food processing.	Develop guidelines addressed to organic food processors and labelling organizations with the aim to provide a set of strategies and tools that can help them for making the best choice for careful processing methods.	F. Paoletti, CREA AN	University of Copenhagen, University of Wageningen, University of Kassel, University of Warsaw, Muenster University, Thuenen Institut, The French Network of Food Technology Institutes, Institut Technique de l'Agriculture Biologique, Forschungsinstitut fu biologischen Landbau, Institut National de Recherche en Agriculture Alimentation et Environment, Assoziation Ökologischer Lebensmittelhersteller/ MiPAAF	Paoletti F., Raffo A. "Organic fruit and vegetables processing: development and innovation in compliance with the organic principles." 3rd Fruit and Vegetable Processing Symposium. 24-25 Novembre 2020 "Impact of different temperature abuse scenarios on sensory quality and off-odour formation in ready-to-eat salad leaves" A. Raffo, M. Senatore, E. Moneta, F. Paoletti, M. Peparaio, E. Saggia Civitelli First published: 17 October 2020 https://doi.org/10.1111/ijfs.14858 International Journal of Food Science and Technology.	

FOOD/ QUALITY AND FUNCTIONALITY	**SysOrg** Organic agro-food systems as models for sustainable food systems in Europe and North Africa.	SysOrg aims to identify intervention and entry points to enable a transformation process to resilient, sustainable food systems, and to identify how pathways to increase sustainable consumption and food production could be successfully designed.	F. Paoletti, CREA AN	Università di Kassel (Germania), Università di Varsavia (Polonia), Università di Muenster (Germania), Università di Copenaghen (Danimarca), Università Ibn Tofail (Marocco))/MiPAAF		
FOOD/ QUALITY AND FUNCTIONALITY	**ESPAS** Valorisation des espèces végétales autochtones siciliennes et tunisiennes avec un intérêt nutritif et bon pour la santé.	The project aims at promoting cooperation between research institutes and farms in Sicily and Tunisia. Esploitation of autochthonous vegetable crop landraces of the cooperation areas, characterised by remarkable nutritional value and health-related properties. Knowledge transfer and dissemination to growers.	**CREA-DC** CREA AN	Institut National de Recherches en Génie Rural Eaux et Forêts (Tunisie), Agence de Vulgarisation et de Formation Agricole (Tunisie), Banque Nationale de Gènes de Tunisie (Tunisie)/ **European Commission**		
FOOD/ QUALITY AND FUNCTIONALITY	**DEAOLIVA** Quality, sustainability and operational safety improvement in table olives debittering through innovative pilot scale processes.	Set up processing protocols able to improve the organoleptic and nutritional quality, and the safety of use of table olives.	B. Lanza CREA-IT **CREA-AN** CREA OFA	MIPAAF		
FOOD/ QUALITY AND FUNCTIONALITY	**CORYNE** Corylinnova Nebrodi: characterization, conservation and valorisation of the hazelnut germplasm; genetic-sanitary certification in plant nurseries; quality improvement of the hazelnuts produced.	Define and enhance the genotypic, organoleptic and nutritional characteristics of the main hazelnut cultivars grown in Italy.	G. Pastore, **CREA-AN** CREA- DC	Sicilian Region		
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**PROLEGU** Plan to relaunch grain legumes for human feeding.	Improvement of nutritional and technological quality of grain legumes (common bean, chickpea, etc:): characterization of novel varieties obtained through classic genetic selection (breeding)	A. Carboni ,**CREA-CI** CREA-AN, CREA-OF CREA-IT	MIPAAF		
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**BELINDA** Plant versus animal based diet from adolescence into young adulthood: determinants and associations with cardiovascular and cognitive health.	The project will update the relationship among diets, cardiovascular health, and cognitive status, as a follow-up of the HELENA "EVALUATION OF BODY COMPOSITION AND PHYSICAL ACTIVITY IN ADOLESCENTS 13-16-YEAR-OLD".	A. Polito ,CREA-AN	Alpro Foundation/Università di Ghent, Ghent University, Department of Public Health, Belgio; Lille University, Francia; Ruhr University Bochum, Germania; University of Zaragoza, Spagna/ **European Commission**	(see publications various)	

NUTRITION AND NUTRITIONAL SUSTAINABILITY	**SYSTEMIC EoI 1058** NutriSUSfood An integrated approach to the challenge of sustainable food systems: adaptive and mitigatory strategies to address climate change and malnutrition.	To determine the health effects related to the consumption of sustainable and balanced diets (in relation with nutrient/ bioactive bioavailability and content, i.e. WP2, as well as in relation with WP4 and WP5).	M. Ferrari, **CREA-AN** CREA-CI, CREA-GB CREA-PB	MIPAAF	(see publications various)	Kick-off meeting.
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**TERRAVITA** Biodiversità, Territorio e Nutrizione: la sostenibilità dell'agro-alimentare italiano.	Enhance the Italian agro-food sector, with particular reference to local productions present in areas of particular environmental sensitivity such as national parks, regional parks, natural areas, mountain areas.	A. Polito , **CREA-AN** CREA- PB CREA- CI	MIPAAF	(see publications various)	
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**AMAMP** Muscle Fatigue in Paralympic Military Athletes, Relationship with Microbiome, Salivary Markers and Eating Habits.	Evaluation of the nutritional status and identification of nutritional biomarkers as a tool to define the quality of the diet and formulate indications aimed at preventing incorrect food choices. Specific objectives: Assessment of salivary antioxidant capacity and evaluation of healthy and sustainable dietary behaviors in Paralympic athletes.	I. Peluso, CREA-AN	Università Sapienza Roma	(see publications various)	
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**HI-IT** Physical Fitness and performance improvements through High Intensity Interval Training (HI-IT) in Wheelchair basketball players.	Evaluation of the nutritional status and identification of nutritional biomarkers as a tool to define the quality of the diet and formulate indications aimed at preventing incorrect food choices. Specific objective: Evaluate eating habits and adherence to the Mediterranean diet in the National WB Athletes.	I. Peluso, CREA AN	FIPIC (Federazione Italiana Pallacanestro In Carrozzina)		
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**ABASA** "Green" technologies for sustainable agriculture: protection from phytopathogens and fertilizers of agri-food crops by means of biomolecules obtained from oil.	The pourpose of ABASA project is recycling and commercial enhancement of oil waste products using innovative, "green" and "solvent free" processes.	E. Finotti, **CREA-AN** CREA-AA	LAZIOINNOVA	Pubblicazioni (si rinvia a pubblicazioni varie)	
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**HAM2016-01** Evaluation of Hamamelis extract bioavailability and its effects on gene expression.	Valorization of a medicinal plant through the study of the bioavailability of the phenolic compounds and of the effects of metabolites on the molecular pathways involved in skin regeneration processes.	R. Canali, CREA AN	Horphag Research Ltd		

NUTRITION AND NUTRITIONAL SUSTAINABILITY	**MICROFLUX** Analysis of microbial fluxes involved in the interplay among environmental, foodborne and gut microbiomes.	Critical analysis and literature search of microbial flows connecting environment, food and gut; Collection, harmonization and standardization of existing data related to foodborne microbiomes.	C. Devirgiliis, CREA-AN	52 european partnersrs MiPAAF		Elaboration of an updated catalogue of traditional fermented dairy, meat, fish and vegetable foods containing live microorganisms, accompanied by a description and collection of available data relating to the associated fermentatiive microbiomes, aimed at highlighting any critical issues concerning harmonization and standardization in terms of applied protocols, sequencing strategies, metadata associated with the studies. Literature analysis aimed at drafting a Systematic Review focused on the potential of colonization and impact on the intestinal microbiota by foodborne microorganisms associated with fermented foods, through consumption Development and expansion of an ontology that formalizes the concepts in the ingredients axis -> biological transformation -> fermented food.). 1 Fellowship.
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**NATCASEI** Production and valorization of natural and added microbial starters to be employed in the production of Italian cheeses from Trentino and Puglia regions.	Evaluation of antibiotic resistance profile of lactic acid bacteria isolated from cheese to be employed as starters.	C. Devirgiliis, CREA-AN	MiPAAF		
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**PROLAT2** Functional characterization of milks with two different beta-casein profiles.	To evaluate whether the consumption of milk with a different beta-casein profile could improve gut health, in an animal model of ageing mice.	M.Roselli, **CREA-AN** CREA-IT	Centrale Latte Italia	(see publications various)	
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**LPS-MG** Binding activity of Mastersorb gold clay to lipopolysaccharide (LPS) in intestinal cells.	Study of protective and anti-inflammatory activity of a clay through binding with E. coli LPS, in an in vitro model of porcine intestinal cells.	M.Roselli, CREA-AN	EW Nutrition GmbH		
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**MYO-INOSITOLO** Evaluation of the aromatase activity of D-chiro-Inositol and Myo-Inositol in different in vitro cell models.	Study of the effects of D-chiro-Inositol and Myo-Inositol on mRNA modulation and enzymatic activity of aromatase in different cell models	R. Comitato, CREA-AN	Lo.Li.Pharma		

		(breast, ovarian and adipocytes cell lines).				
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**CHIRO-TRAS** Evaluation of trans-epithelial transport of D-chiro-inositol on in vitro intestinal models.	Characterization of intestinal passage of D-chiro-inositol on in vitro differentiated intestinal human cell line (Caco-2). Effects of peptides derived from simulated digestion of the protein alpha-lactalbumin on D-chiro-inositol intestinal absorption.	G.Ranaldi, CREA-AN	Lo.Li.Pharma		
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**ALIMA** Multicultural eating in adolescents.	Agreement with Municipality of Rome I Center in order to evaluate food habits, lifestyle and nutritional status of adolescents of different cultures and geographical origins.	F. Intorre, CREA-AN	Municipio Roma I Centro		
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**QUANUBE** NUtritional QUAlity of fermented Beverages.	Assessment of nutritional quality of fermented beverages for bioactive compounds content and antioxidant activity.	M. Nardini, CREA-AN		(see publications various)	
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**MINDIET** A qualitative study investigating the barriers and facilitators towards the uptake of a diet to promote brain health (MIND diet), in a sample of men and women aged 40-55 years in a Northern Irish and Italian population	To assess the obstacles and factors favoring the consumption of the MIND Diet (Mediterranean-DASH Diet Intervention for Neurodegenerative Delay) in order to reduce the risk of cognitive decline in old age.	A. Polito, CREA-AN	Ulster University (UK); Institute of Technology Sligo (ITS), Ireland	(see publications various)	
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**STEAL** PhySical acTivity, diEt And heaLth.	Evaluation of physical activity and sedentary lifestyle in relationship with the determinants of eating behavior. Guidelines aimed at preventing incorrect food choices.	A. Polito, CREA-AN	Research groups from 12 countries (Austria, Belgium, Finland, France, Germany, Italy, Ireland, Norway, Poland, Spain, The Netherlands and The United Kingdom)	(see publications various)	
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**LEARN** Lifestyle and physical activity for the prevention and control of breast cancer.	To evaluate the relationship between diet, lifestyle, and physical activity in women at risk of breast cancer in association with predisposing genomic profiles.	A. Polito, CREA-AN			
NUTRITION AND NUTRITIONAL SUSTAINABILITY	Definition by HPLC of the differences (quantitative and qualitative) in carotenoids in thyroid tissues with and without neoplasms.		B. Guantario, G.Pastore e R. Ambra, CREA-AN			

NUTRITION AND NUTRITIONAL SUSTAINABILITY	Use of the nematode Caenorhabditis elegans as a simplified model system to evaluate probiotic activity of foodborne bacterial strains.		C.a Devirgiliis, CREA-AN			
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**ASA** Study of a new molecular mechanism for acetyl salycilic acid activity.		R. Canali, CREA-AN			
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**GOOGLING** Systematic analysis of the information available on internet related to diet during Covid-19 pandemic.	Study of the scientific quality of the information, provided to the Italian population from internet, relating to diet in Covid-19 time	F. Natella, CREA-AN			
NUTRITION AND NUTRITIONAL SUSTAINABILITY	Effects of biopetides derived from simulated digestion plant food matrix: bioavailability metabolism and biological effects (hypocholesterolemic, hypoglycemic, hypotensive).	Evaluation of intestinal transport and metabolism of lupin peptides in human intestinal differentiated cell line (Caco-2). Effects of peptides and their metabolites on cholesterol synthesis and on angiotensin convertig enzyme (ACE) activity.	G. Ranaldi e S. Ferruzza, CREA-AN			
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**STANIS** Lifestyle, Self-medication and Use of Nutraceuticals in a Population of Italian and Spanish Students.	Comparing: Lifestyle, Self-medication and Use of Nutraceuticals in a Population of Italian and Spanish Students.	I. Peluso, CREA-AN			
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**IDEAS** Environmental impact of Diet Athletes and overweightOVERWEIGHT /OBESE PEOPLE.	Environmental impact assessment of the diet in relation to body composition.	I. Peluso, CREA-AN			
NUTRITION AND NUTRITIONAL SUSTAINABILITY	**CISAFAL** Celiac disease, Locomotor Impairment and hematomological indices of inflammation and platelet activation: the role of sedentary lifestyle, physical activity and eating habits.	Comparison of hematological indices of inflammation and platelet activation of individuals at risk of osteoporosis compared to healthy volunteers.	I. Peluso, CREA-AN			
CONSUMER, FOOD EDUCATION, CONSULTANCY	**CLIMAQUALITEC EoI 967 SYSTEMIC-** Agricultural biotechnology for nutrition quality of food crops in different agro-climate scenario. Challenges and perspectives in potato and cereal crops.	Explore transversal solutions, identify knowledge gaps and develop pathways towards a food system that is resilient and able to meet societal challenges.	G. Mandolino, **CREA-CI** CREA-AN CREA-IT	39 public research institutions of 8 different Europen countries /MIPAAF-- **European Commission**		Kick-off meeting.
CONSUMER, FOOD EDUCATION, CONSULTANCY	**SYSTEMIC-NutriSUSFood** Consumption models	Characterize and manage the impact of climate change on the nutritional properties of food, propose and evaluate adaptive strategies in order	M. Ferrari, **CREA-AN** CREA-CI, CREA-GB CREA-PB	16 international partners /MIPAAF		Kick-off meeting.

		to promote new balanced and low environmental impact food consumption models, guaranteeing the nutritional security of populations, for a more inclusive, sustainable future, safe and healthy for everyone.				
CONSUMER, FOOD EDUCATION, CONSULTANCY	**IV SCAI** food consumption patterns	Survey of individual food consumption at national level.	A. Turrini, CREA-AN	EFSA		Data base
CONSUMER, FOOD EDUCATION, CONSULTANCY	**CAOBISCO** food consumption patterns.	Review of the Contribution of Portion Sizes of the EU Confectionery Sector to the Diet - Portion sizes, in calories and in grams, of chocolate and biscuits to the diets of Italian adults.	A. Turrini, CREA-AN			
CONSUMER, FOOD EDUCATION, CONSULTANCY	**FNH-RI**	Food, Nutrition and Health - Research Infrastructure.	CREA-AN			https://fnhri.eu/
CONSUMER, FOOD EDUCATION, CONSULTANCY	**AGROBRIDGES**.	Create a bridge between producers and consumers to support the system of short food supply chains through a toolbox based on a holistic, systemic and multi-actor approach.	F. Giaré, **CREA-PB** CREA-AN	**European Commission**		kick-off meeting.
CONSUMER, FOOD EDUCATION, CONSULTANCY	**IV SCAI** Individual food consumption	Detection of national food consumption with harmonized methods according to the guidelines of the European Food Safety Authority (EFSA): theoretical and practical aspects, activities in the field and significance in public health.	L.Mistura CREA-AN			
CONSUMER, FOOD EDUCATION, CONSULTANCY	**TRAIN-DIE** Higher Training Survey on Individual Food Consumption.	Training in Dietary Assessment and Sharing Platforms for Monitoring Population Food Consumption Habits in a Long-term Perspective (Surveillance and Continuous Training).	L.Mistura CREA-AN			https://train-die.crea.gov.it
CONSUMER, FOOD EDUCATION, CONSULTANCY	**PROORG** WP6- Consumer acceptance, preferences and communication; T6.3. Analysis of the role of cognition and emotions in decision making for careful processed organic food.	Assess the importance attached by consumers to different careful processed products and the related attributes and the magnitude of consumer cognitive consonance and emotions produced by additional information on product processing related to organic products.	F. Paoletti (CREA-AN)	TI, UNIVPM, FiBL, FH MU/- MiPAAF- **European Commission**	(see publications various))	
CONSUMER, FOOD EDUCATION, CONSULTANCY	**PREBREASP** Asparagus breeding	Experimental protocol for the sensory characterization of asparagus genotypes.	F. Sinesio, **CREA-AN** CREA-GB	Azienda sementiera Rijk-Zwaan	Report	

CONSUMER, FOOD EDUCATION, CONSULTANCY	**GREENWASHING** Laboratori di aprendimento sociale con l'uso del gioco per aumentare la consapevolezza dei cittadini consumatori e produttoi cirva il greenwashing.	Esplorare l'uso di laboratori esperienziali collettivi basati sul gioco per aumentare la motivazione da parte dei cittadini produttori per mettere sul mercato prodotti alimentari con basso impatto ambientale e aumentare lo spirito critico dei consumatori nei confronti dei prodotti promossi come "green".	F. Sinesio, C. Leclercq, CREA-AN	INRAE/RISE/Sensory Dimension/European Sensory Network (ESN)		
CONSUMER, FOOD EDUCATION, CONSULTANCY	**VEGGE-MED-CHEESE** Valorisation of thistle-curdled CHEESEs in MEDiterranean marginal areas.	Carry out cheese-making trials to attain the full (physico-chemical, chemical, microbiological, textural, colorimetric and sensory) characterization of local ewes' and goats' milk cheeses coagulated with thistle rennets.	P. Manzi CREA-AN	Universidad Católica San Antonio De Murcia (UCAM); Department of Food Hygiene and Technology, Veterinary Research Institute, Hellenic Agricultural Organization (DEMETER); High Institute of Agronomy of ChottMariem, Sousse University (ISA-CM) /MUR		
CONSUMER, FOOD EDUCATION, CONSULTANCY	**WINE-TASTING-CONTEXT** Influence of the context on the evaluation of Chianti wine	Explore how the evaluation context (sensory laboratory, evoked consumption situation, consumption situation at home in natural conditions) and the intrinsic properties of Chianti wine influence the liking, the intention to consume, the emotions evoked by the wine and the perceived flavor .	F. Sinesio, CREA-AN	ADACTA International	(see publications various)	
CONSUMER, FOOD EDUCATION, CONSULTANCY	**FAOWASTE** Sustainability of food models: Food waste in Italy: food policies and measurements.	1) Acquire and deepen knowledge on food waste (from definitions to data, from methods of analysis to intervention tools). 2) Measuring the degree of approach to the targets defined by international legislation 3) Structuring, on the basis of in-house data and data that will be collected with ad hoc surveys, international actions with the USA and with FAO to position Italy in the implementation of best practices on food waste.	L. Rossi, CREA-AN	FAO/MATTM		2 research grants .
CONSUMER, FOOD EDUCATION, CONSULTANCY	**FOODWASTE2** Sustainability of food models: Annual program against waste 2 years - The OERSA observatory - activities and development.	1) Full implementation of the Observatory passing from the design phase to that of systematic detection and production of the data collected throughout the supply chain 2) Identify the phases of the supply chain that require a reinforcement of	L. Rossi, CREA-AN	MIPAAF	M. Luisa Scalvedi, Federica Grant, Umberto Scognamiglio, Laura Rossi (2020). L' osservatorio sulle eccedenze, sui recuperi e sugli sprechi alimentari. Le potenzialità del primario e del consumatore nella gestione delle eccedenze. A cura del Ministero delle politiche agricole, agroalimentari, forestali e	(https://www.crea.gov.it/web/alim nti-e-nutrizione/-/osservatorio-sugli-sprechi-alimentari)

		monitoring to deepen specific points as emerged from the results of the first year of activity.			del turismo e Crea-Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria. ISBN 978883385101 Scalvedi, M.L.; Rossi, L. Comprehensive Measurement of Italian Domestic FoodWaste in a European Framework. Sustainability 2021, 13, 1492. https://doi.org/ 10.3390/su13031492	
CONSUMER, FOOD EDUCATION, CONSULTANCY	Development of specific methodologies for the evaluation of diet quality indices and adherence to the Mediterranean diet.	Develop questionnaires for the impact assessment of nutritional intervention programs and food education through the development of the Nutrition knowledge tool and other questionnaires developed ad hoc Adaptation of the questionnaires to the Italian context, comparison with eating habits, creation of indexes of adherence to recommendations , evaluation of nutrition literacy in the general population and in selected groups.	L. Rossi CREA AN	Università La Sapienza	F.Grant, M. Luisa Scalvedi, U. Scognamiglio, Laura Rossi (2020) L'impatto dell'emergenza Covid-19 sulle abitudini alimentari degli italiani nel periodo della quarantena di marzo-aprile 2020. A cura di Crea-Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria, Centro di ricerca Alimenti e Nutrizione. ISBN 9788833850962	
CONSUMER, FOOD EDUCATION, CONSULTANCY	Study, analysis and development of FOP labeling in Italy (NutrInform Battery).	Experiment with consumers with the national proposal for additional labeling of the nutrition declaration pursuant to Article 35 of Regulation (EU) no. 1169/2011.	A. Ghiselli e L. Rossi CREA AN	Istituto Superiore di Sanità, MIPAAF, MISE, Ministero Salute	Report Silano M, Ghiselli A, Rossi L (2020). Front-of-Pack nutrition labeling in Europe - The Italian system proposal: the NUTRINFORM battery ISBN 9788833850566.	
CONSUMER, FOOD EDUCATION, CONSULTANCY	**Better Life By Nutrition During Adulthood – BELINDA** Diet based on plant products compared with a diet based on animal products from adolescence to adulthood: determinants and associations with cardiovascular and cognitive diseases.	Examine the relationship between plant-based and animal-based diets with cardiovascular health and cognitive status. The study is a follow-up of the HELENA project "Healthy Lifestyle in Europe by Nutrition in Adolescence", conducted in the years 2006-2007 in 10 European cities.	A.Polito, L.Censi, M.Ferrari CREA-AN	Università di Ghent, Dipartimento di salute pubblica,Belgio; Università di Lille, Francia ;Università della Ruhr a Bochum, Germania ;Università di Zaragoza, Spagna/Università di Ghent	1) Seral-Cortes M, Sabroso-Lasa S, De Miguel-Etayo P, Gonzalez-Gross M, Gesteiro E, Molina-Hidalgo C, De Henauw S, Erhardt É, Censi L, et al. Interaction Effect of the Mediterranean Diet and an Obesity Genetic Risk Score on Adiposity and Metabolic Syndrome in Adolescents: The HELENA Study. Nutrients. 2020. 12(12):3841. doi: 10.3390/nu12123841. 2) Salazar-Tortosa DF, Pascual-Gamarra JM, Labayen I, Rupérez AI, Censi L, et al. Association between lipoprotein lipase gene polymorphisms and cardiovascular disease risk factors in European adolescents: The Healthy Lifestyle in Europe by Nutrition in Adolescence study. Pediatr Diabetes. 2020. 21(5):747-757. doi: 10.1111/pedi.13035. 3) Pascual-Gamarra JM, Salazar-Tortosa DF, Labayen I, Rupérez AI, Censi L, et al. Association between CNTF Polymorphisms and Adiposity Markers in European Adolescents. J Pediatr. 2020. 219:23-30.e1. doi: 10.1016/j.jpeds.2019.12.036. Epub 2020 Feb 6.	

					4) Salazar-Tortosa DF, Pascual-Gamarra JM, Labayen I, Rupérez AI, Censi L, et al.. Single nucleotide polymorphisms of ADIPOQ gene associated with cardiovascular disease risk factors in European adolescents: the Healthy Lifestyle in Europe by Nutrition in Adolescence study. J Hypertens. 2020. 38(10):1971-1979. doi: 10.1097/HJH.0000000000002502.	
CONSUMER, FOOD EDUCATION, CONSULTANCY	**SUPRE** International Survey on Food Supplements: Consumption, attitudes and understanding of the health effects by pregnant women.	Survey of pregnant women to study the consumption of food supplements, knowledge and attitudes towards the use of food supplements during pregnancy and compare the responses between four geographically and socio-economically diverse European countries.	S. Ruggeri, CREA-AN	Institute of Biomedicine, University of Turku, Turku, Finland; University of Surrey, Guildford, UK; - Medical University of Warsaw, Warsaw, Poland		Indagine conclusa su un campione 1819 donne in gravidanza (557 donn italiane).
CONSUMER, FOOD EDUCATION, CONSULTANCY	**NEUROLIFE**	Improve eating habits and lifestyle to reduce the risk of obesity and congenital diseases and to prevent chronic degenerative diseases.	M. Galfo, CREA-AN		Galfo M, Morocutti A, D'Addezio L, Melini F. Characteristics and Cluster of Lifestyle Factors in Neurological Outpatients. J Health Sci Med Res 2020 Available from https://www.jhsmr.org/index.php/jhsmr/article/download/763/812	
CONSUMER, FOOD EDUCATION, CONSULTANCY	**CHINUT** Evaluation of nutritional adequacy in critically ill pediatric patients.	International review of the nutritional status of critically ill pediatric patients.	M.Galfo, CREA-AN		Galfo M, De Bellis A, Melini F. The effect of obesity on outcomes in burned pediatric patients. Pediatr Med 2020;3:4.	
CONSUMER, FOOD EDUCATION, CONSULTANCY	**EPABAL** Eating Behaviour, Physical Activity and Lifestyle of Italian Children and Adolescents during Lockdown for COVID-19.	Evaluate eating habits, adherence to the Mediterranean Diet and lifestyles in Italian children and adolescents during the COVID-19 pandemic.	L.Censi, S.Ruggeri CREA- AN			Survey conclusa su un campione 1027 bambini.
CONSUMER, FOOD EDUCATION, CONSULTANCY	**POMOFONDI** Certified quality of a Mini San Marzano tomato of the Piana di Fondi in relation to environmental sustainability and nutritional value.	Improving the production of mini San Marzano with a view to sustainability and healthiness.	S. Ruggeri, CREA-AN	Latium Region		"Ritratto di un produttore"; Attivi di motivazione dei produttori del piana di Fondi (Video).
CONSUMER, FOOD EDUCATION, CONSULTANCY	**VITAMINA D** Development of sustainable and innovative processes for the extraction of Vitamin D, useful in reducing the risk of influenza and Covid-19, from waste from the processing of edible mushrooms and fish products.	Apply the FTIR-ATR analysis technique for the study of vitamin D levels from edible mushroom and seafood waste.	A. Durazzo, M.Lucarini CREA-AN	Marche Region	Pubblicazioni (si rinvia a pubblicazioni varie)	
NUTRITIONAL SAFETY AND HEALTHY CONSUMPTION	**NutriSUSFood EoI1058-** SYSTEMIC - Nutritional security for healthy and	Explore transversal solutions, identify knowledge gaps and develop pathways for a transformation of the	M. Ferrari, CREA-AN	39 public research instituionse of 8 different European		

	sustainable food consumption.	food system that is resilient and able to meet societal challenges.		countries/MIPAAF-**European Commission**		

4.2 Patents and Services

Patents (INDUSTRIAL PATENTS)

Main topics/products	*Denomination/Description*	*Authors/Inventors*	*CREA Centres*
Food composition	**Method for measuring antioxidant capacity (IT)**	E. Finotti , F.Nobili	

Services

Services- *FOOD/QUALITY AND FUNCTIONALITY*

Data bases and collections	*Description*	*Person in charge*	*CREA Centre*
Database Composition and Nutritive Value of italian deli meats	Chemical and nutritional profile of italian deli meats	M. Lucarini	CREA AN
Database Composition and Nutritive Value of Meat-based Italian Traditional Recipes	Chemical and nutritional profile of meat based recipes	G.Lombardi-Boccia	CREA AN
Collection of arbuscular mycorrhizal fungi and raw inocula (Pre-commercial biostimulants)	The collection begins in 2019, partly self-financed by the referent, to reconstitute arbuscular mycorrhizal fungal strains, actually no longer available, as those that had been isolated between 1994-1999 that were part of the "COLMIA" collection at CREA Agricolture and Environment Center of Rome . The fungal strains of this type of collection are obligate symbionts and must necessarily be grown with their host plant. The current collection consists of several strains of 3 different species and 4 "pre-commercial" biostimulating raw inocula at the II generation stage of multiplication and selection on clover and zucchini. The collection is a tool for study and applied research in organic farming and for obtaining sustainable food and products.	M. Bragaloni, L. Riccioni	CREA AN, CREA-DC

Communication services	*Description*	*Person in charge*	*CREA Centre*
Support activity for the italian trade agency (ICE)	Support activity for the promotion of the Made-in-Italy agro-food products in USA in collaboration with the italian trade agency (ICE)	vari	CREA AN
Event organized by CREA-AN and CNA (Italian Confederation of Craft Trades and Small- and Medium-Sized Enterprises) Title: Agenda 2030 - Sustainability of the Mediterranean Diet and case studies of circular economy	Webinar on UN 2030 Agenda topics, Sustainable Development Goals, sustainability and waste reduction.	G. Di Lena; M. Lucarini	CREA AN CREA PB
FrascatiScienza – European Researchers' Night. Webinar: Agenda 2030: Sustainable Development Goals - The scientific research for agri-food sustainability and waste reduction	Webinar on topics related to the UN 2030 Agenda and SDG, sustainability, waste reduction	G. Di Lena; M. Lucarini	CREA AN CREA PB
Divulgation activity - Maker Faire 2020: Sustainability and green transition: research proposals	Webinar on topics related to agri-food productions, circular economy, sustainable use of resources	G. Di Lena; M. Lucarini	CREA AN
dissemination activity: biosaccovalley in collaboration with PIN-Università di Firenze; Università della Tuscia; università di Tor Vergata	End of Project report webinar "site-remediation case study: the biosaccovalley (FR, Lazio region, Italy)"	M. Lucarini; A. Durazzo	CREA AN
Result sheets	Evaluation of the technological processes of dairy products through the Degree of Retinol Isomerization	P. Manzi	CREA AN
Frascati Science #ContagiousScience	Webinar on "Cereals: are they fattening only?"	M. Carcea	CREA_AN
Television networks RAI, TV2000, Radio Cusano TV Italia	Collaboration in the drafting of texts and interviews in TV programmes of RAI3 (All Health, Elisir), TV2000 (My doctor), Radio Cusano TV Italia (An apple a day)	M. Carcea	CREA-AN

Ongoing: activation of Services pursuant to the Decree of the Ministry of Health n. 686/1996	In order to be able to carry out the activities and functions envisaged and in accordance with the Ministry of Health Decree n. 686/1996 the referent in 2020 followed the professional course for the certification of Mycologist. The two-year course will end in 2021 with the final exam and will allow enrollment in the National Register of Mycologists of the Ministry of Health, allowing the activity of services in the context of training and information activities as well as consulting and appraisals at public or private facilities.	M. Bragaloni	CREA-AN

Activities for schools	***Description***	***Person in charge***	***CREA Centre***
support activity for training and employment programme	webinar "Polyphenolic characterization of some wines of the Comino Valley (Lazio region, Italy)"	M. Lucarini	CREA AN
Launch of the "on the job trainings for the high school" - PCTO project, also known in Italy as "Alternanza Scuola Lavoro"	PCTO project, entitled "Instruction manual to build a healthy and sustainable food model among students", carried out by CREA Research Centre for Food and Nutrition and targeted to the Scientific high School "S. Cannizzaro" in Rome during the school year 2019/2020.	M. Mattera	CREA AN
	PCTO project entitled "Tenth Anniversary of the Mediterranean Diet in UNESCO: a training and knowledge path" carried out by CREA Research Centre for Food and Nutrition for the Agricultural Technical Institute "G.Garibaldi" in Rome during the school year 2019/2020 (half of its lessons were taken during the pandemic emergency).	M. Mattera	CREA AN
	Distance learning was carried out from November to December 2020 for the students and teachers of Classical - Linguistic - Scientific high school "Lucio Anneo Seneca" on the occasion of events organized by CREA Research Centre for Food and Nutrition for the "Tenth Anniversary of the Mediterranean Diet in UNESCO: a training and knowledge path"	M. Mattera	CREA AN
	3 PCTO projects entitled "Instruction manual to build a healthy and sustainable food model among students" were proposed by CREA Research Centre for Food and Nutrition to teachers and their students during the school year 2020/2021. They will be carried out from January to May 2021 in three different high schools in Rome. In progress	M. Mattera	CREA AN
Video lecture on the INDIRE website of the Italian Ministry of Education, University and Research	Video lecture on "environmental contaminants, food safety and sustainability", in accordance with the distance learning initiative activated by the Italian council of public research bodies	M. Masci	CREA-AN
Lectures	***Description***	***Person in charge***	***CREA Centre***
Lessons at the Specialization School in Food Science "La Sapienza" University of Rome, (annually agreement activity)	Composition and structural and "functional" properties of foods. Food items, food categories, servings	P. Manzi	CREA AN
Supervisor for Master's degree in Biotechnology for food, University of Padua (non-empirical dissertation)	Reviewing the nutritional and compositional characteristics of the by-products of the olive oil supply chain while evaluating the main traditional and innovative technologies for their valorization	M. Ritota	CREA AN
Scientific partnership between CREA and Università degli Studi di Roma "La Sapienza"	Academic course on "Chemical and sensory characterisation of food quality", master's degree in Food Science and Technology 2019/2020/2021	A. Raffo	CREA AN
Tutoring for master's degree thesis: academic course in Food Science and Technology 2020/2021	Thesis "Instrumental and sensory assessment of fresh-cut salad quality and off-odour formation during shelf-life".	A. Raffo	CREA AN

Working tables / working groups / institutional partnerships	***Description***	***Person in charge***	***CREA Centre***
Working group 5 "Economic Observatory and Statistical Data" of the technical committee on Botanicals - MiPAAF	Participation in the Working group 5 "Economic Observatory and Statistical Data" of the technical committee on Botanicals (DG PQAI - PQAI 02, Prot. n. 73436 del 19/10/2018).	T. Amoriello, P. Borsotto	CREA AN, CREA PB
Working group 3 "Research and experiments" of the Table of Chain on hop (*Humulus lupulus* L.) – MiPAAF	Participation in the Working group 3 "Research and experiments" of the Table of Chain on hop (*Humulus lupulus* L.) (DG PQAI - PQAI 02, Prot. n. 34580 del 15/05/2019).	T. Amoriello, A. Assirelli, G. Bianchi, F. Bonello, K. Carbone, M. C. Cravero, M.Pagano, M. Savino	CREA AN, CI, DC, IT, OFA, PB, VE
Working group 4 "Economic and statistical Observatory" of the Table of Chain on hop (*Humulus lupulus* L.) – MiPAAF	Participation in the Working group 4 "Economic and statistical Observatory" of the Table of Chain on hop (*Humulus lupulus* L.) (DG PQAI - PQAI 02, Prot. n. 34580 del 15/05/2019).	T. Amoriello, K. Carbone	CREA AN OFA
Working group	Participating in the drafting of the contribution of the CREA Research Centre for Food and Nutrition to the three-year CREA Research Plan for 2021-2023 (Determina n. 172 del 13/10/2020).	M. Carcea	CREA-AN

CREA Technology Transfer Network	Member of the CREA Technology Transfer Network, CREA Director General's Decree n. 1295, 12/20/2019.	V. Narducci	CREA-AN
Participation in the international working group "Whole grain initiative"	Drafting of documents shared at the international level to be submitted to national authorities on topics concerning the commercialization and consumption of wholegrain products.	V. Melini	CREA-AN, SINU
Co-Technical Director of the International Association for Cereal Science and Technology (ICC)	To provide expertise in the process of standardisation and publication of standard analytical methods on cereals and cereal foods issued by the ICC.	V. Melini	CREA-AN, SINU
Working Group "Bioactive Compounds/Polyphenols" within the Italian Society of Human Nutrition (SINU)	Member of the working group "Bioactive Compounds/Polyphenols" within the Italian Society of Human Nutrition (SINU) - research activity on food bioactive compounds and their dietary intake.	M. Carcea, R. Redaelli	CREA-AN, CI
Working Group "FIGC Project" within the Italian Society of Human Nutrition (SINU)	Member of the working group "FIGC Project" within the Italian Society of Human Nutrition (SINU) - Nutrition education for young athletes.	M. Lucarini	CREA- AN
Governing Committee of the Italian Association for Cereal Science and Technology (AISTEC)	To take part in the activities of the decision-making body of the association.	G. Lombardi-Boccia	CREA AN
CREA AN working goup for the "public consultation EFSA on the draft scientific opinion on dietary reference values for sodium"	Redazione del documento scientifico finalizzato alla "public consultation EFSA on the draft scientific opinion on dietary reference values for sodium"	G. Lombardi-Boccia	CREA AN
Codex Group	Meat and meat hygiene	M. Masci	CREA-PB, IT, CI, AN
Codex Group	Soups	M. Masci	Vari Centri CREA
Hemp production chain working group	Hemp production chain working group set up by the Italian Ministry of Agricultural, Food and Forestry Policies (Ministerial Decree n. 9385830, December the 17th 2020)	M. Masci	Vari Centri CREA

Editorial Activities	***References***	***Personi in charge***	***CREA Centre***
Editorial Board member	Journal of Spectroscopy -https://www.hindawi.com/journals/jspec/editors/	A.Durazzo	CREA - AN
Editorial Board member	Beverages -https://www.mdpi.com/journal/beverages/editors	A.Durazzo	CREA - AN
Editorial Board member	Sustainability -https://www.mdpi.com/journal/sustainability/editors	A.Durazzo	CREA - AN
Section Board member	Applied Sciences -https://www.mdpi.com/journal/applsci/sectioneditors/food_science_and_technology	A.Durazzo	CREA - AN
Section Board member	IJERPH -https://www.mdpi.com/journal/ijerph/sectioneditors/Toxicology_and_Public_Health_1	A.Durazzo	CREA - AN
Section Board member	Agriculture-https://www.mdpi.com/journal/agriculture/sectioneditors/Agricultural_product_quality_safety	A.Durazzo	CREA - AN
Editorial Board member e Section Board member	Biology -https://www.mdpi.com/journal/biology/sectioneditors/Pharma	A.Durazzo	CREA - AN
Editorial Board member e Section Board member	Encyclopedia -https://www.mdpi.com/journal/encyclopedia/sectioneditors/medicine_pharmacol	A.Durazzo	CREA - AN
Advisory Board Member	Piattaforma Encyclopedia, MDPI https://encyclopedia.pub/advisory_board	A.Durazzo	CREA - AN
Advisory Board Member	Challenges- https://www.mdpi.com/journal/challenges/editors	A.Durazzo	CREA - AN
Topic Board Member	Nutrients - https://www.mdpi.com/journal/nutrients/topic_editors	A.Durazzo	CREA - AN
Topic Board Member	Molecules - https://www.mdpi.com/journal/molecules/topic_editors	A.Durazzo	CREA - AN
Guest Associate Editor	Frontiers in Nutrition, sezione Nutrition and Food Science Technology https://www.frontiersin.org/journals/nutrition/sections/nutrition-and-food-science-technology#editorial-board	A.Durazzo	CREA - AN
Guest Associate Editor	Frontiers in Nutrition, sezione Nutrition Methodology https://www.frontiersin.org/journals/nutrition/sections/nutrition-methodology#editorial-board	A.Durazzo	CREA - AN
Guest Editor	Special Issue "Forest, Food and Nutrition" in Forest https://www.mdpi.com/journal/forests/special_issues/Forest_Foods	A. Durazzo, M.Lucarini Massimo	CREA - AN
Guest Editor	Special Issue "Sodium Intake and Related Diseases "in International Journal of Molecular Sciences, IJMS https://www.mdpi.com/journal/ijms/special_issues/sodium_intake_diseases	M.Lucarini, Al.Durazzo, G. Lombardi-Boccia, S. Sette	CREA - AN
Guest Editor	Special Issue "Plant and Diabetes: Description, Role, Comprehension and Exploitation" in International Journal of Molecular Sciences, IJMS https://www.mdpi.com/journal/ijms/special_issues/Plants_Diabetes	M. Lucarini, A. Durazzo	CREA - AN
Guest Editor	Special Issue "New Traits of Agriculture/Food Quality Interface" in Agriculture https://www.mdpi.com/journal/agriculture/special_issues/Agriculture_Food_Quality_Interface	A.Durazzo	CREA - AN

Guest Editor	Special Issue "Recent Advances in Plant Metabolomics: From Metabolic Pathways to Health Impact" in Biology https://www.mdpi.com/journal/biology/special_issues/RAIPMFMPTHI	A.Durazzo	CREA - AN
Guest Editor	Special Issue "Tocols and Food Quality " in Journal of Food Quality https://www.hindawi.com/journals/jfq/si/210201/	A.Durazzo	CREA - AN
Guest Editor	Research Topic "Cold Pressed Oils: A Green Source of Specialty Oils " in Frontiers in Nutrition https://www.frontiersin.org/research-topics/17185/cold-pressed-oils-a-green-source-of-specialty-oils	M. Lucarini, A. Durazzo	CREA - AN
Guest Editor	Research Topic "Database and Nutrition" in Frontiers in Nutrition https://www.frontiersin.org/research-topics/18084/databases-and-nutrition	M. Lucarini, A. Durazzo	CREA - AN
Guest Editor	Research Topic "Dietary Supplements, Botanicals and Herbs at The Interface of Food and Medicine" in Frontiers in Pharmacology https://www.frontiersin.org/research-topics/18013/dietary-supplements-botanicals-and-herbs-at-the-interface-of-food-and-medicine	M. Lucarini, A. Durazzo	CREA - AN
Guest Editor	Special Issue "Environmental, Ecological and Food Resources in the Biodiversity Overview: Health Benefits" in Life https://www.mdpi.com/journal/life/special_issues/Environmental_Ecological_Food_Resources	M. Lucarini, A. Durazzo	CREA - AN

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Services - *NUTRITION AND NUTRITIONAL SUSTAINABILITY*

Data bases and collections	*Description*	*Person in charge*	*CREA Centre*
Cell line	Caco-2 (intestinal epithelial cell line derived from human adenocarcinoma)	S. Ferruzza	CREA-AN
Cell line	RIN-38 (pancreatic beta cell lne derived from rat insulinoma)	G. Ranaldi	CREA-AN
Cell line	HepaRG (hepatic cell line derived from human hepatoma)	S. Ferruzza	CREA-AN
Cell line	HT29_MTX (goblet intestinal cell subcloned in Methotraxate from the parental human coloncarcinoma HT29 cell line)	G. Ranaldi	CREA-AN
Cell line	HT29-18 C1 Clone (differentiated epithelial intestinal cells sucloned from the parental human adenocarcinoma HT29 cell line)	G. Ranaldi	CREA-AN
Cell line	HT29 18 N2 clone (goblet intestinal cells sucloned from the parental human colon carcinoma HT29 cell line)	G. Ranaldi	CREA-AN
Cell line	MDCK (epithelial kidney cell derived from dog)	G. Ranaldi	CREA-AN
Cell line	MDCK-TRE (MDCK cell stably tranfected with TRE,tetracycline responsive element, plasmid)	G. Ranaldi	CREA-AN
Cell line	MDCK TET-OFF (MDCK cell stably transfected with tet-off plasmid)	G. Ranaldi	CREA-AN
Cell line	MDCK-ZnT4 (MDCK cell stably transfected with TET-OFF+ ZnT4 zinc trasnporter plasmid)	G. Ranaldi	CREA-AN
Cell line	IPEC-J2 (intestinal porcine epithelial cell line isolated from neonatal piglet mid-jejunum)	M. Roselli	CREA-AN
Cell line	3T3-L1 (mouse fibroblast cell line of embrionic origin)	M. Roselli	CREA-AN
Cell line	K562 (human erythroleukemic cell line)	M. Roselli/A. Finamore	CREA-AN
Cell line	FRTL-5 (rat thyroid cell line)	B. Guantario	CREA-AN
Cell line	Hep-G2 (human hepatocyte carcinoma)	B. Guantario	CREA-AN
Cell line	HUVEC (human umbilical vein endothelial cells)	R. Canali	CREA-AN
Cell line	U937 (human pro-monocytic from myeloid leukaemia)	R. Canali	CREA-AN
Cell line	HaCaT (human epidermal keratinocyte)	R. Canali	CREA-AN
Cell line	HDF (human primary dermal fibroblast)	R. Canali	CREA-AN
Cell line	HeLa (human epitheloid cervix carcinoma)	R. Comitato	CREA-AN
Cell line	MCF-7 (human breast cancer cell. Estrogen dependent)	R. Comitato	CREA-AN
Cell line	MDA-MD-231 (human breast cancer cell. Estrogen independent)	R. Comitato	CREA-AN
Cell line	LiSa-2 (human liposarcoma)	R. Comitato	CREA-AN
Cell line	SGBS (human preadipocyte cell strain)	R. Comitato	CREA-AN
Cell line	COV 434 (human ovarian granulosa tumour cell line)	R. Comitato	CREA-AN
Cell line	NHDF (Normal Human Dermal Fibroblasts) Lonza	A. Finamore	CREA-AN
Cell line	IEC6 (Rat intestinal epithelial cell-6)	A. Finamore	CREA-AN
Microbial isolates	26 bacterial strains isolated from vegetable fermented foods (table olives)	C. Devirgiliis, P. Zinno	CREA-AN
Microbial isolates	4 bacterial strains isolated from dairy fermented foods (mozzarella di bufala campana)	C. Devirgiliis, P. Zinno	CREA-AN

Technology transfer and know-how	*Description*	*Person in charge*	*CREA Centre*

Result sheet 2020 objective IOP 2.3.1	Instruments for assessment of nutritional quality of cereal based fermented beverages	M. Nardini	CREA-AN
Result sheet 2020 IOP 2.3	The nutraceutical value of Italian agri-food products	E. Azzini	CREA-AN
Result sheet 2020 IOP 2.3	Markers of nutritional and technological quality of local ecotypes of legumes	M. Carbonaro	CREA-AN

Editorial activities	***References***	***Person in charge***	***CREA Centre***
Guest Editor in the Editorial Board	Molecules - www.mdpi.com/journal/molecules	M.Nardini	CREA-AN
Guest Editor in the Editorial Board	IJM-Swww.mdpi.com/journal/ijms/special_issues/b_vitamins_metabolities	E.Azzini., S.Ruggeri A.Polit	CREA-AN
Guest Editor in the Editorial Board	IJMS www.mdpi.com/journal/ijms/special_issues/b_vitamins	E. Azzini I Peluso, A Polito	CREA-AN
Editorial board member	https://www.hindawi.com/journals/omcl/editors/	I. Peluso, E. Azzini	CREA-AN
Editorial board member	https://www.wignet.com/2307-8960/MemberDetail/17796	I. Peluso	CREA-AN
Editorial board member	www.graphyonline.com/journal/journal_home.php?journalid=IJCND	A. Polito	CREA-AN
Section Board Member	Molecular Sciences -https://www.mdpi.com/journal/ijms/sectioneditors/bioactives	I. Peluso	CREA-AN
Guest Associate Editor	Frontiers in Pharmacology (Inflammation Pharmacology)- https://www.frontiersin.org/research-topics/8685/therapeutic-index-for-nutraceuticals-in-inflammation-related-diseases-efficacy-bioavailability-metab	I. Peluso, E. Azzini, A. Polito	CREA-AN
Guest Associate Editor	Frontiers in Pharmacology (Ethnopharmacology)- https://www.frontiersin.org/research-topics/16489/biomolecules-against-coronaviruses-molecular-aspects-multi-omics-and-systems-pharmacology	I. Peluso	CREA-AN
Guest Editors -Special issue	https://www.mdpi.com/journal/nutrients	R. Canali, F. Natella	CREA-AN
Editorial board member	https://www.frontiersin.org/journals/immunology	A. Finamore	CREA-AN
Founder and Editor in chief	https://genesandnutrition.biomedcentral.com/	F.Virgili	CREA-AN
Editorial board	https://www.journals.elsevier.com/free-radical-biology-and-medicine	F. Virgili	CREA-AN
Editorial board	https://www.mdpi.com/journal/ijms	F. Virgili	CREA-AN

Activities for schools	***Description***	***Person in charge***	***CREA Centre***
Istituto Professionale di Stato per i Servizi "Graziella Fumagalli" Casatenovo (LC)	Webinar: Quality of food products (30/11/2020); seminar on: Nutritional needs of adolescents (2/12/2020)	A. Polito/ S. Ruggeri	CREA-AN

Working tables / working groups / institutional partnerships	***Description***	***Person in charge***	***CREA Centre***
Working group "Nutrition day"	Working group for the organization of the annual conference "Giornata della Nutrizione" (Nutrition day)	F. Natella/ L. Rossi	CREA-AN
Institutional Partnership between CREA-AN and Roma Tre University, Dept. of Sciences	The agreements are aimed at establishing collaboration in terms of research and teaching activities within Bachelor degree "Enogastronomic Sciences and Cultures" and Master degree "Biology for molecular, cellular and physiopathological research"	C. Devirgiliis/ E. Moneta	CREA-AN
Society for Free Radical Research - Europe (SFRR-E)	Elected member of "council of experts"	F. Virgili	CREA-AN
Designated component of working group on animal testing regulation of the italian Health Ministry	Investigating the correct application of animal testing regulations and promoting the implementation of the 3Rs (Refinement, Reduction, and Replacement) principles in the use of animals in research.	Y. Sambuy	CREA-AN
Contact person for CREA-AN for the activities of the Coordination between the Protection of Animals National Committee (CNPA) used for scientific purposes and responsible for animal welfare (OPBA) art 38 del D.L. vo 26/2014	CREA-AN delegate for participation in the organizational meetings of the Organisms for Animal Welfare	A. Finamore	CREA-AN
Responsible member of the Organism for Animal Welfare of the CREA-AN Center	Contact person with ASL and the Ministry of Health for the management of projects involving the use of animals for scientific purposes	A. Finamore	CREA-AN

Network of Programme on Sustainable Food Systems (SFSP) of the 10-Year Framework of Programmes on Sustainable Consumption and Production (10YFP)	Collaboration with international institutions for the definition of the sustainability of the diet in particular to the Mediterranean Diet	A. Polito	CREA AN
Technical-scientific support activities for which EFSA makes use of CREA pursuant to art. 36 of Regulation (EC) no. 178/2002.	Expert for hematic"4.10 Human nutrition, dietetic products, allergens and/or novel foods"	A. Polito	CREA AN
Working group for the recommended levels of energy and nutrient intake for the Italian population (LARN)	Revision of enregy requirements	A. Polito	CREA AN
Scientific Committee of the Italian Society of Human Nutrition	Support activities for the Society directive Board	A. Polito	CREA AN
GdL. 4 - Revision of big consensus documents of transnational organizations	Working groupof CREA-AN in the frame of scientific contact for revision of consensus documents	M. Nardini, M.Carbonaro	CREA-AN
EFSA 2019: Public consultation on the protocol for the assessment of hazard identification and characterization of the sweeteners	Public consultation for assessment and identification of hazards due to sweeteners consumption	M. Nardini	CREA-AN

Lectures	***Description***	***Person in charge***	***CREA Centre***
Appointed teacher	Sapienza University of Rome, Faculty of Matematical, Physical and Natural Sciences. Bachelor: Agro-Industrial Biotechnology. Course title: Food microbiology (academic years 2017/18; 2018/19; 2019/20)	C. Devirgiliis	CREA-AN
Appointed teacher	Roma Tre University, Dept. of Sciences, Bachelor: Enogastronomic Sciences and Cultures. Course title: Molecular methods for food microbiological safety (academic years 2019/20; 2020/21)	C. Devirgiliis	CREA-AN
Appointed teacher	Sapienza University of Rome, Faculty of Medicine and Dentistry. Bachelor: Dietistic Science. Course title: "Food science and tecnology" (academic years 2018/19; 2019/20; 2020/21)	F. Natella	CREA-AN
Appointed teacher	Sapienza University of Rome, Faculty of Medicine and Dentistry. Bachelor: Dietistic Science. Course title: "Nutritional biochemistry". (academic years 2016/17; 2017/18; 2018/19; 2019/20; 2020/21)	R. Canali	CREA-AN
Appointed teacher	Course of Nutrigenomics, master (1st level) in Biological Sciences. Faculty of Sciences, University Roma TRE (a.a. 2018/19; 2019/20; 2020/21)	F. Virgili	CREA-AN
Appointed teacher	Course of Nutrigenomics, master (1st level) in Bio-technology. Faculty of Sciences, University Tor Vergata, Roma (a.a. 2018/19; 2019/20; 2020/21)	F. Virgili	CREA-AN
Appointed teacher	Course of "Nutrients, genes and omics technologies" school of specialization in Nutritional Sciences, Faculty of Medicine and Surgery, University La Sapienza, Roma (a.a. 2016/17; 2017/18; 2018/19; 2019/20; 2020/21)	F. Virgili	CREA-AN
Lecturer (Agreement Sapienza-CREA)	FOOD SCIENCE [1023236] (cfu: 8, ssd: BIO/09), (A.A. 2017-2021), Matricola 674245 . Degree: Pharmacy Single Cycle, Faculty: Farmacia e Medicina, Sapienza University of Rome.	I. Peluso	CREA-AN
Lecturer (Agreement Sapienza-CREA)	Nutrition physiology - Food chemistry (1 CFU), Healthcare postgraduate course: Hospital pharmacy, Faculty: Farmacia e Medicina, Sapienza University of Rome.	I.Peluso	CREA-AN

Publications- *NUTRITION AND NUTRITIONAL SUSTAINABILITY*

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***Services-** CONSUMER, FOOD EDUCATION, CONSULTANCY*

Databases	***Description***	***Person in charge***	***CREA Centre***
Adherence to the Mediterranean Diet, eatin habits and consumption, lifestyles an physical activity and anthropometri characteristics in national and regiona representative samples of Italian childre and adolescents.	Databases, individual and aggregated derived from the primary data collections carried out in population studies by the members of the research group 3.3 from 1999 onwards, in various areas in Italy, with validated and standardized methodologies, and related to anthropometric data (nutritional status and body composition; eating habits; adherence to the Mediterranean Diet, physical activity and sedentary lifestyle, blood pressure, socio-economic aspects and living environment, with regard to the developmental age.	L. Censi	CREA AN
Databases system to estimate foo consumption models.	The information system includes individual food consumption and databases that can be used for nutritional quality - home portions and measurement units, photographic atlas, standard recipes, linkage with food composition data, probabilistic linkage with contaminant occurrence data and other undesirable substances carried by food, deterministic linkage with databases of environmental indicators - the coding system and all processing procedures.	A. Turrini	CREA - AN
Database of Italian Food Composition	Development and management of a relational and structured database consists of 900 foods and 129 nutrients. Each food and nutrient value is accompanied by specific documentation of the method, the bibliographic reference, the descriptors of the data. In addition, for each recipe (≃ 55) the ingredients, the preparation protocol, the cooking method and the variation in weight have been stored.	L. Marletta, E. Camilli	CREA- AN
Dietary Supplement Label Database in Ital	Development of the Dietary Supplements Label Database in Italy: it currently contains 558 items and each product has been assigned a code, based on the standardized classification system FoodEx2, Revision 2, developed by EFSA. Published and Available as supplementary file: https://www.mdpi.com/2072-6643/12/1/89/s1 to the publication Durazzo A, Camilli E, D'Addezio L, Piccinelli R, Mantur-Vierendeel A, Marletta L, Finglas P, Turrini A, Sette S. Development of Dietary Supplement Label Database in Italy: Focus of FoodEx2 Coding. Nutrients 2020, 12 (1), 89; https://doi.org/10.3390/nu12010089	A. Durazzo	CREA- AN

Database linking food nutritiona composition and GHG.	A duly designed database was developed, linking food nutritional composition and GHGE based on 921 food items consumed in Italy according to the last national food consumption survey (INRAN-SCAI 2005–2006). Available as supplementar materials: https://www.frontiersin.org/articles/10.3389/fnut.2020.00048/full for the publication; Ferrari M, Benvenuti L, Rossi L, De Santis A, Sette S, Martone M, Piccinelli R, Le Donne C, Leclercq C and Turrini A. Could dietary goals and climate change mitigation be achieved through optimized diet? The experience of modelling the national food consumption data in Italy. Frontiers in Nutrition (2020); 7, Article number 48. DOI:10.3389/fnut.2020.00048	M. Ferrari	CREA- AN

Services various	*Description*	*Person in charge*	*CREA Centre*
Processing on request of data on food consumption and methodological support	On request, specific processing of data on food consumption collected with the surveys carried out by CREA is carried out, with the aim of having estimates relating to categories of food products, analysis of the diet in energy and nutrients also for population subgroups, exposure analysis to harmful agents conveyed by the diet, analysis of the environmental impact of the diet, joint analysis of the reasons for food choices and behavior and analysis for other categories of in-depth analysis.	A.Turrini	CREA - AN
Professional preparation courses in the scientific sector of population studies on individual food consumption	Organization of blended courses that include e-learning, frontal, remote and on-the-job modules with a theoretical and experiential component with teaching on design, database system and software, design, collection, processing and analysis of data population studies on food consumption, with a theoretical and experiential component.	A.Turrini	CREA - AN
Licensing to use food data management software (FOODCONS)	Use of the software for estimating food consumption for operators in the education, health, prevention and environmental sustainability sectors (FOODCONS - Food Consumption Database) for schools, health companies and private citizens.	A.Turrini	CREA - AN
Development of the alimentinNUTrizione.it portal	Management and strengthening of the Food Consumption section of the alimentinutrizione.it web portal to communicate to the visitor how to carry out national surveys on food consumption which, in addition to nutritional implications, include effects such as those relating to risk exposure and environmental impact	A. Turrini	CREA - AN
Development of the AlimentinNUTrizione.it portal	Management and enhancement of the section "Perceiving Tradition", within the CREA website https://www.alimentinutrizione.it/, which provides the consumer with the key elements to understand and interpret the quality of Italian traditional agri-food products	F. JavierComendador, F. Melini	CREA - AN
Citynews s.r.l. consultancy 2019-2020 and 2020-2021	Scientific technical support to the PAC promotion activities within the Agrikids projects in the design of competitions for children, cartoons, TV appearances and interviews with Gambero Rosso, as provided for in European calls for communication companies	L. Gennaro	CREA-AN,OFA C
Enhance collaboration, among scientists of research organizations on complex cross-cutting issues scientific issues	Organization of video conferences through approaches that facilitate listening among research colleagues. Sharing of the format of those video-calls through video story-telling that facilitate replicability ("the art of questioning among research colleagues"	C. Leclercq,E. Toti/F. Natella	CREA-AN
Development of AlimentiNUTrizione Portal, Section: Food Composition Tables (https://www.alimentinutrizione.it/sezioni/tabelle-nutrizionali)	Managment and updating of the Food Composition Tables that can be freely consulted through an easy-to-use interface. Users access the composition data form using the search system by food, category, nutrient and alphabetical order. The form is divided into two areas: one descriptive of the characteristics of the food, the other shows the values of the analyzed nutrients expressed both per 100g of edible part and per portion, furthermore each data is provided with a descriptor and a bibliographic reference. The menus: introduction, presentation of data, symbols and abbreviations, complete the picture of the information that direct users to a correct and informed use of the data.	L. Marletta, E. Camilli	CREA-AN
EBASIS database compiler, EuroFIR AISBL	Value documentation and compilation of Input Forms for bioactive compounds (polyphenols, lignans, carotenoids) on a regular basis	A. Durazzo	CREA-AN
Nutritional labeling	Consultancy for the creation of nutritional labeling of processed products and food preparations (recipes) for operators in the agro-food sector	L. Marletta	CREA-AN

Professional training services	*Description*	*Person in charge*	*CREA Centre*
Italian Confederation of Craft Trades and Small- and Medium-Sized Enterprises (CNA)	1°E-Learning Course of food law and scenario analysis. Webinar: "Complex food matrices and recipes: standardized methods for calculating nutritional value and labeling"	S. Marconi, E. Camilli	CREA-AN
e-learning for health and nutrition professionals	The use of food composition databases for nutritional assessments: "Evolution of food composition databases" https://fad.biomedia.net	A.Turrini	CREA-AN
e-learning for health and nutrition professionals	The use of food composition data bases for nutritional assessments: "What challenges for the future: computerized applications AND on mobile devices" https://fad.biomedia.net	A. Turrini	CREA-AN

e-learning for health and nutrition professionals	The use of food composition data bases for nutritional assessments: "Harmonization of databases to facilitate their consultation: food classification and coding systems" https://fad.biomedia.net	L. D'Addezio	CREA-AN
e-learning for health and nutrition professionals	The use of food composition data bases for nutritional assessments: "Nutritional databases in national surveys on food consumption to improve quality and standardization" https://fad.biomedia.net	S. Sette	CREA-AN
FAD. Distance education for operators in the medical / nutritional sector	The use of food composition data bases for nutritional evaluations: "Food composition data in Italy, production and use: updates of the CREA Food and Nutrition Tables" https://fad.biomedia.net	L. Marletta	CREA-AN
FAD. Distance education for operators in the medical / nutritional sector	The use of food composition data bases for nutritional evaluations: "Data quality and methodological approach" https://fad.biomedia.net	S.Marconi	CREA-AN
FAD. Distance education for operators in the medical / nutritional sector	The use of food composition data bases for nutritional evaluations: "Classification and Coding for simple foods and recipes in the composition tables" https://fad.biomedia.net	A. Durazzo	CREA-AN
FAD. Distance education for operators in the medical / nutritional sector	The use of food composition data bases for nutritional evaluations: "eTCA: structure and contents" https://fad.biomedia.net	E. Camilli	CREA-AN
FAD. Distance education for operators in the medical / nutritional sector	The use of food composition databases for nutritional evaluations: "Dedicated databases" https://fad.biomedia.net	A. Durazzo	CREA-AN
FAD. Distance education for operators in the medical / nutritional sector	The use of food composition databases for nutritional evaluations: "Nutritional labels" https://fad.biomedia.net	S. Marconi, E. Camilli	CREA-AN
FAD for medical / nutritional workers	The Guidelines for healthy eating Revision 2018 in collaboration with SINU (Italian Society of Human Nutrition)	A. Giselli, L. Rossi, U. Scognamiglio	CREA AN
Italian Confederation of Craft Trades and Small and Medium Sized Enterprises (CNA)	"2nd E-Learning Course on food law and scenario and project analysis: "Perceiving the tradition: communicating the key elements to understand and interpret the quality of Italian traditional agri-food products"	F. Javier Comendador	CREA-AN
On-the-job training course "IV National Dietary Survey in Italy - Individual food consumption survet (10-74 years). Winter-Spring 2020.	Filedworkers traiining on dietary assessmen	G. Catasta [1];	CREA AN
Italian Confederation of Craft Trades and Small and Medium Sized Enterprises (CNA)	1°st E-Learning Course on food law and scenario analysis: "Observatory on food surplus, recovery and food waste: actions along the food chain, from agriculture to consumer"	L. Rossi, M.L.Scalvedi	CREA AN

Lectures	***Description***	***Person in charge***	***CREA Centre***
Teaching under MoU	Supervision of degree theses (> 10), specialization theses (> 5), internships (> 5), international fellows (> 5)	L.Rossi, U. Scognamiglio	CREA AN
Teaching under MoU	Teaching of "Food Science" of the Degree Course in Enogastronomic Sciences and Cultures at the Faculty of Science of the Roma Tre University SSD: MED / 49 CFU: 8	L. Rossi, U. Scognamiglio	CREA AN
Teaching under MoU	Teaching master "Master in Applied Nutrition, Food Safety and Quality" at the "Campus Bio-Medico" University of Rome	L.Rossi	CREA AN
Teaching under MoU	2nd level Master's teaching "Teaching Europe" by Unitelma Sapienza	L. Rossi	CREA AN
Teaching under MoU	Teaching of "Nutritional Epidemiology" of the Master's Degree Course in Food Sciences and Human Nutrition at the Department of Medicine and Surgery of the University "Campus Bio-Medico" of Rome SSD: MED / 01 CFU: 3	L. Rossi	CREA AN

[1] L. Censi; F. Javier Comendador Azcarraga; L.D'Addezio; A. Durazzo; M. Ferrari; C. Le Donne; D.Martone; L. Mistura; A. Pettinelli; R.a Piccinelli; A.Saba; S. Sette; A. Turrini

Teaching under MoU	Teaching of "Reference levels of energy and nutrient intake and Guidelines for healthy eating" Level I Master "Nutrition and Cosmetics" at the Department of Experimental Medicine and Surgery of the University "Tor Vergata" of Rome SSD: MED / 49 CFU : 1	L. Rossi	CREA AN
Teaching under MoU	Teaching of "Nutritional Surveillance Epidemiology of malnutrition excess / deficiency (incidence / prevalence and risk factors)" at the School of Food Science of the University "La Sapienza" of Rome SSD: MED / 49 CFU: 1	L. Rossi	CREA AN
Teaching under MoU	Teaching "Collective catering" Specialized Degree Course in Sciences of Human Nutrition, Faculty of Medicine and Surgery. University of Rome, Tor Vergata.	U. Scognamiglio	CREA AN
Teaching under MoU	Teaching Principles of Dietetics and Human Nutrition, CL of Sciences in Enogastronomic Tourism. Department of History, Heritage Cultural, Education and Society. Faculty of Arts, University of Rome, Tor Vergata.	U. Scognamiglio, L.Rossi	CREA AN
Teaching under MoU	President of the Commission for the final examinations of the course for Higher Technician responsible for agricultural production and transformation agri-food and agro-industrial sectors. Biocampus Latina Foundation Desiganzione Ministry of Education PROT.N: N. 12023 of 15.07.2020	U. Scognamiglio	CREA AN
Teaching under MoU	FAD Guidelines for healthy eating Revision 2018 UNITELMA Sapienza	A. Ghiselli, L.Rossi	CREA AN
Teaching under MoU - Faculty of Science, Roma Tre University	Teaching of "Sensory and Consumer Science" of the Degree Course in Enogastronomic Sciences and Cultures SSD: AGR/15 CFU: 6	E. Moneta	CREA AN
Lecturer under MoU. University "La Sapienza" Faculty of medicine.	Nutrition epidemiology	C. Leclercq	CREA AN
Erasmus Mundus Joint master's degree Food Innovation and Product Design (FIPDes). Master Course edition: 2020 Dublin- Cohort 9. Summer School Lectures FIPDes	Teaching in Sensory and Consumer Science	F. Sinesio	CREA AN
Lecturer (in agreement), Master's Degree in Human Nutrition Sciences, Faculty of Medicine-University of Rome Tor Vergata	Teaching "Food technologies" (AGRI 15)	S. Ruggeri	CREA AN
Lecturer (in agreement), Master's Degree in Human Nutrition Sciences, Faculty of Medicine-University of Rome Tor Vergata	Teaching "Communication in Nutrition " (MED 49)	S. Ruggeri	CREA AN
Lecturer (in agreement), Master's Degree in Human Nutrition Sciences, Faculty of Medicine-University of Rome Tor Vergata	Teaching "Healthy Food Design" (AGRI 15)	S. Ruggeri	CREA AN
Working tables / working groups / institutional partnerships	***Description***	***Person in charge***	***CREA Centre***
Food sources - LARN ed. 2022	Update of food sources for the new LARN 2022 edition	S. Sette, A.Turrini, M.Ferrari, L. Marletta, E. Camilli	CREA - AN
Working group «The network OPENS towards Horizon Europe» of cluster 1 Health	Working group to prepare a document for the Horizon Europe Shadow Committee	A. Turrini	CREA - AN
Italian Network for Data Collection	Coordinated Italian table of the Italian FOcal Pint of EFSA (Ministry of Health)	A. Turrini, S. Sette	CREA - AN
Network on Food Consumption Data	European table of Member States for the collection of data on food consumption within the EU-Menu program of the European Food Safty Authority (EFSA)	A. Turrini, S. Sette	CREA - AN
Standing Committee on Agricultura Research - Strategic Working Group on Food System	The SCAR is a respected source of advice on European agricultural and wider bioeconomy research.	A.Turrini, L.Rossi , F.Paoletti	CREA - AN
Joint Programming Initiative "Healthy Diet for a Healthy Life" - Scientific Advisory Board	The Joint Programming Initiative a Healthy Diet for a Healthy Life (JPI HDHL) brings together 26 countries that align research programming and fund new research to prevent or minimise diet-related chronic diseases.	A.Turrini	CREA - AN

EuroFIR AISBL	European system of databases of nutritional composition of foods	A. Durazzo, A. Turrini, S.Marconi, E. Camilli	CREA - AN
Member	EPHNA-European Public Health Nutrition Alliance	L. Mistura, L. Rossi	CREA - AN
Network NCD Risk Factor Collaboration Collaboration (NCD-RisC). http://ncdrisc.org/about-us.html	A network of scientists providing rigorous and timely data on major risk factors for non-communicable diseases for all countries of the world. N. 3 Publications in 2020: https://ncdrisc.org/publications.html#2020	M.Ferrari	CREA - AN
European Sensory Network (ESN)	Research in the field of sensory and consumer sciences	F. Sinesio	CREA - AN
Collaboration agreement between CREA-AN and the Department of Computer, Control and Management Engineering, Sapienza University of Rome	Definition, through methods of mathematical optimization, of dietary patterns for the improvement of the nutritional status, the reduction of greenhouse gases emissions and of diet cost.	C. Devirgiliis, E. Moneta	CREA - AN
Collaboration agreements between CREA-AN and the Faculty of Science of the Roma Tre University	Aimed at carrying out teaching and research activities in the context of the Degree Course in Enogastronomic Sciences and Cultures and of the Master's Degree Course in Biology for molecular, cellular and pathophysiological research	M.Ferrari, L. Rossi	CREA - AN
Ministry of Education scientific-technical committee "School and food"	The Committee coordinates and expresses opinions on the Ministry of Education food education initiatives , as a facilitating agent of the Guidelines for food education	A. Ghiselli, L. Gennaro	CREA - AN
OKkio alla Salute technical committe	National surveillance system, coordinated by the Istituto Superiore di Sanità, which has collected data, every two years since 2008, on the weight status, eating habits and lifestyles of Italian children.	L.Censi	CREA - AN
Network NCD Risk Factor Collaboration Collaboration (NCD-RisC). http://ncdrisc.org/about-us.html	A network of scientists providing rigorous and timely data on major risk factors for non-communicable diseases for all countries of the world. N. 5 Publications in 2020: https://ncdrisc.org/publications.html#2020	L. Censi, M.Galfo, R.Roccaldo	CREA - AN
Working group for teaching and tutoring activities participating in the course "IV National Dietary Survey in Italy -Detection of food consumption (10-74 years). Training in the field -research activities (FSC). Winter-Spring 2020.	The activity of the Research Group in the Group concerns in particular the detection of anthropometric measures for the evaluation of the nutritional status.	L. Censi	CREA - AN
Technical -scientific support activities for which EFSA avails itself of CREA pursuant to art. 36 of Regulation (EC) no. 178/2002.	Expert for the topic "human nutrition, dietetic products".	L. Censi	CREA - AN
Member of the Scientific Evaluation Committee of the JPI HDHL PREPHOBES call, within the ERA-NET HDHL INTIMIC.	The aim of the call is to support research projects focused on the development, implementation and evaluation of innovative strategies aimed at preventing or reducing overweight and obesity, in target populations defined on the basis of different stages of life.	L. Censi	CREA - AN
Working group Technical Roundtable "First 1000 days of life"- Ministry of Health	Definition of intervention strategies for risk reduction in the first 1000 days of life and improvement of eating habits and lifestyles.	S. Ruggeri	CREA - AN
Scientific Committee of the "Observatory on Crime in Agriculture and the Agri-Food System" chaired by the Prosecutor Gian Carlo Caselli.		S. Ruggeri	CREA - AN
Nutrition Day working group.	Organization of nutritional information events.	M. Galfo	CREA - AN
Working Group for the LARN Review	Review of energy needs and water-soluble vitamins	L. Censi e S. Ruggeri	CREA - AN
CREAILDUBBIO ("CREAting doubt")	Working group to develop game-based social learning workshops for food system satkeholders, towards the reduction of greenhouse gas emissions related to the food system while ensuring a nutritionally adequate diet	M. Ferrari ed altri [1]	CREA - AN
RE-INVENTING FOOD SYSTEMS	Working group for the co-creation of the project "Re-inventing food systems through transformative social learning and co-creation, with a focus on planet and people friendly food production and consumption baskets" with the following partners: FAO, WUR (The Netherlands), OXFAM Italy, ZALF (Germany), Rikolto (Germany)	C. Leclercq, F. Natella, M. Ferrari	CREA - AN

[1] C. Leclercq F. Natella, E.Moneta, N. Nardo, M. Peparaio, A.Saba, F. Sinesio, E. Toti

Working Group «The network APRE towards Horizon Europe» of cluster 6 Food, bioeconomy natural resources, agriculture and environment	Participation and contribution to the Working Group "The APRE network towards Horizon Europe" of cluster 6 Food, bioeconomy natural resources, agricultureP and environment by definition of research priorities, in the areas: 3 Agriculture, forestry and rural areas 5. Food Systems, 6 Bio based Innovation Systems, aimed at the elaboration of "Results of the OPEN MEMBERS Working Group - The OPEN network towards Horizon Europe"	A. Durazzo	CREA - AN
Research Working Group with Office of Dietary Supplements, National Institutes of Health and Agricultural Research Service, US Department of Agriculture (USDA) on Food Supplements	Harmonization of the database of food supplements, coding systems, and metrology. Participation in web meetings on "Dietary Supplement Label Databases" organized by USDA, NIH and NIST on a monthly basis.	A. Durazzo, A.Turrini	CREA - AN
Eurofir working group: Documentation data	Documentation working group (nutrients, methods, bibliography etc ..) for food composition data, including the use of EuroFIR and Thesauri standards and LanguaLTM and FoodEx2 in data software management.	A.Durazzo, E.Camilli, L.Marletta	CREA - AN
Eurofir working group: Aggregation data	Working group that studies the possible aggregation of composition data	A.Durazzo ed altri[1],	CREA - AN
Eurofir working group: Recipe calculation	Working group that studies the calculation methods for the recipes and the application of the different nutrient retention factors	A.Durazzo ed altri [2],	CREA - AN
Eurofir working group: FoodCASE	Working group collaborates for the identification of technical specifications for the creation of a software (foodcase) with which to store the composition data, calculate recipes, create nutritional labels, consumption	A.Durazzo, E.Camilli, A.Turrini	CREA - AN
Eurofir working group: Branded Foods	Working group for the evaluation of the identification of the Brands for the possible introduction in the composition databases	S. Marconi ed altri[3],	CREA - AN
Eurofir working group: Laboratory Analysis	Working group that collaborates in the standardization of laboratory analytical methods	S.Marconi	CREA - AN
LARN V Review Coordination		L. Rossi, A.Ghiselli, U. Scognamiglio	CREA - AN
Appointment, as CREA expert, to the Board of the Ministry of Health on the prevention and fight against overweight and obesity		A. Ghiselli/L. Rossi	CREA - AN
Appointment, as CREA expert, to the intersectoral board for the promotion of health in the workplace (PROMOSAL) of the Public Administrations of the Ministry of Health		L. Rossi	CREA - AN
Italian technical focal point at FAO for the preparation of ICN + 21 (International Conference on Nutrition 21 years later) on official assignment of the Ministry of Agriculture, Food and Forestry		L. Rossi	CREA - AN
High Level Expert of Committee of Nutrition Security (CSA) at FAO on an official mandate from the Ministry of Foreign Affairs		L.Rossi	CREA - AN
Working group for drafting the Report to Parliament on interventions carried out for application of the Law 125/2001 "Framework law on alcohol and related alcohol problems" of the Ministry of Health		L.Rossi	CREA - AN
Appointment, on official assignment by CREA, as effective representative of the national platform "Guadagnare salute" of the Ministry of Health		L. Rossi	CREA - AN

[1] E.Camilli, L.Marletta , S.Marconi, L. D' Addezio

[2] E.Camilli, L.Marletta, S.Marconi , S.Sette, R.Piccinelli, C.Le Donne

[3] A.Durazzo, C. Le Donne, S. Sette, R. Piccinelli

Appointment, on official assignment by CREA, of the Technical Panel on Nutritional Safety with the function of TASIN observatory		L.Rossi, S.Sette	CREA - AN
Designation, as CREA expert, to the Italian Board for the Decade of Action on Nutrition		L.Rossi	CREA - AN
Appointment, as CREA member, by decree of the Director General for International and European Union Policies of the Ministry in the Steering Committee, composed of CREA and Ministry members, as an instrument of collaboration between the parties, with the aim of harmonizing the different needs and address the activities on Food Waste		L.Rossi	CREA - AN
Head of the UNESCO task force on behalf of the Ministry of Agriculture, Food and Forestry "Implementation of special information and communication programs for the enhancement of production, consumer health protection and food education"		L.Rossi	CREA - AN
Editorial activities	***References***	***Person in charge***	***CREA Centre***
Scientific Journal	"Ecologia della Salute"- http://www.aiems.eu/ecologia_della_salute.html.	A.Turrini	CREA - AN
Scientific Journal Research Topic	https://www.frontiersin.org/research-topics/5094/emerging-topics-in-dietary-assessment	A.Turrini ed altri ,[1]	CREA - AN
Guest Editor - Special Issue	https://www.mdpi.com/journal/nutrients/special_issues/Assessment_Human	A.Turrini	CREA - AN
Guest Editor - Special Issue	https://www.mdpi.com/journal/nutrients/special_issues/Malnutrition_Unsustainability	M.Ferrari	CREA - AN
Guest Editor - Special Issue	https://www.mdpi.com/journal/sustainability/special_issues/health_food_consumption	L.Mistura	CREA - AN
Editorial Board	https://www.osservatoriosullasalute.it/	A. Turrini	CREA - AN
Editorial Board	https://www.hindawi.com/journals/tswj/	A.Turrini	CREA - AN
Reviewer Board	https://www.mdpi.com/journal/nutrients/submission_reviewers	L. Mistura	CREA - AN
Reviewer Board	https://www.cambridge.org/core/journals/british-journal-of-nutrition/article/list-of-reviewers-the-editorial-board-of-the-british-journal-of-nutrition-would-like-to-thank-the-following-for-their-contribution-as-peer-reviewers-in-2020/E331AACC45A6959AE149FCB182DD623C	L. Censi	CREA - AN
Activities for schools	***Description***	***Person in charge***	***CREA Centre***
Nutrition education for all school levels.	Organization of single or articulated meetings, in presence or virtual activities, on issues related to nutrition, aimed at pupils, their families and teachers. Setting up of webinar and production of paper and digital tools. Creation of educational workshops, based on playing, for the promotion of a healthy lifestyle, as already organized at the Genoa science festival or at Explora, the Children's Museum of Rome.	L. Gennaro	CREA AN
Teachers' training	Organization of structured training modules, frontal or in e-learning, with methodologies approved by the Ministry of Education. The training provides credits to teachers on the MIUR S.O.F.I.A platform	L.Gennaro	CREA AN

Publications - *CONSUMER, FOOD EDUCATION, CONSULTANCY*

Arouca AB, Meirhaeghe A, Dallongeville J, Moreno LA, Lourenço GJ, Marcos AM, Huybrechts I, Manios Y, Lambrinou CP, Gottrand F, Kafatos A, Kersting M, Sjöström M, Widhalm K, Ferrari M, Molnár D, González-Gross M, Forsner M, De Henauw S, Michels N, HELENA Study Group. Interplay between the Mediterranean diet and C-reactive protein genetic polymorphisms towards inflammation in adolescents. Clin Nutr 2020 Jun;39(6):1919-1926.

[1] G. Catasta , L. D'Addezio,E. Dhurandhar, M. Ferrari, C. Le Donne, D. Martone, L. Mistura, R. Piccinelli, M. L. Scalvedi, S. Sette

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Quaderni didattici
Manuale didattico per insegnanti "Scopri le meraviglie di Frutta e verdura. CREA, gioca e impara" (Benincasa C.; Berni Canani S.; Buonocore P.; Caracciolo G.; Cervelli C.; De Benedetti L.; Fabroni S.; Francese G.; Gabrielli P.; Gennaro L.; Guantario B.; Maccati F.; Nesi B.; Peñalosa Barbero A.; Simoncini S.; Virdis M.V.; Zinno P. ISBN 9788833850726
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5. CREA RESEARCH LINES– Bioeconomy and Agricultural policies

Research activities on bioeconomy and agricultural policies developed by the Research Centre for Agricultural Policies and Bioeconomy follow the five main topics: *a) Development of methodological tools and databases for the monitoring and evaluation of policies' impact, the analysis of the economic, social and environmental dynamics of the agri-food system; b) Impact assessment of the national and European agricultural policy on both Italian agri-food and local systems to improve the effectiveness of policy tools; (c) Analysis and tools for ecological transitions in the agricultural and forestry sectors; d) Analysis of the Italian agri-food system competitiveness; (e) Economic and social needs and impact assessment of innovations*.

Research objectives have been defined on the base of the strategic importance of the national agri-food and forestry systems compared to the economy as a whole, and considering their characteristics. In fact, agricultural and forestry production in Italy is highly differentiated and articulated at local level and is the result of extremely heterogeneous production units, which find specific support measures in the European, national, and regional agricultural policies, specific and articulated to sustain, according to the principle of the multifunctionality enhancement. At the same time, the Italian agro-forestry-food economy is strongly integrated into the global system, so the analysis of the factors of competitiveness and the set of international rules in which the system operates is fundamental to optimize the Italian performance in the world scenario.
Among the most recent activities: drafting of preliminary and useful studies for the European Common Agricultural Policy (C**AP**) **Strategic Plan 2021-27**; evaluation of the impact of the current CAP Reform on the Italian agri-food system; sustainability analysis with particular attention to the indicators and certification issues; ecological transition and digital technology applied to agriculture; need assessment under the new **National Recovery and Resilience Plan** within the **Next Generation EU** programme. Another current issue explores the **impact of Covid-19** on the agricultural and agri-food sector. Some studies address issues which are becoming increasingly relevant to face the challenges of the European **Green Deal** and **Farm to Fork Strategies**: environmental ones (water, agricultural and natural biodiversity, climate and emissions, soil, landscape, sustainable forest management); those related to social inclusion (work, migrants, social agriculture, vitality of rural areas); those related to ecological transition (bioeconomy, circular economy, sustainable use of inputs, animal welfare and antibiotic resistance, food waste, organic farming financial support policies; (f) rural development models for local socio-economic balance; (g) contributions to the water management plans 2021-27, water and water resources use.

Publications and other research products are mainly concerned with: (a) quantitative models to monitor and evaluate the effects of the CAP on Italian agriculture, the analysis of the performance of the Italian agri-food system and the effects of the EU trade agreements on Made in Italy products; (b) database on irrigation investments for effective planning of infrastructure investments

(prevention and mitigation of hydrogeological instability); c) analysis of organic farming and of environmental and economic benefits of sustainability; (d) mapping of underutilized, contaminated and marginal lands to be dedicated to sustainable cultivation of energy purposes biomass; (e) contribution to the 2021-27 CAP National Strategic Plan by analyzing new actions impact and their integration in the historical structure of financial support policies; (f) rural development models for local socio-economic balance; (g) contributions to the water management plans 2021-27, water and water resources use.

Dissemination activities this topic mainly concerns: 1) stimulating the institutional and scientific debate through workshops, seminars and other events; 2) attending international, national and regional conferences presenting research work in a fruitful confrontation with the scientific community.

About institutional activities, results of the long-term agricultural system analyses (structural characteristics and economic performance) provide useful information. The relationships between agriculture and other sectors, environment and society are also analyzed. Some publications present data and ready to use information about main economic and environmental trends, both at national and regional level; some others investigate the dynamics of import and export of different sectors and products with a particular focus on "Made in Italy" production, while some others analyze public spending in agriculture.

Regarding advisory and technical assistance services and institutional working tables, researchers are mainly involved in supporting the Italian Ministry of Agriculture Food and Forestry Policies and the Regions, with activities related to the common agricultural and rural development policies. CREA is indeed "the core" of the **Rural National Network**, the operational tool to improve the implementing and management of Rural Development Plans – RDP. The outward opening is enhanced by the discussions with experts belonging to academic and productive sectors. Finally, the Research Centre for Policy and Bioeconomy (CREA-PB) hosts the **Statistical Office (UDS)**, which has the task of coordinating all the statistical activities carried out in the CREA centers, as well as ensuring relations with the SISTAN and other statistical public bodies and institutions.

5.1 Research and research products - Bioeconomy and Agricultural policies

Main topics/ products	*Acronym and Research Title*	*Aims*	*Person in charge and CREA Centres*	*Partnership/ Financing Body*	*Scientific Publications*	*Other research products* [1]
AQUACULTURE	**FEAMP Aquacolture**-	Improving the design and management capacity of lucanian fish companies.	M.A. D'Oronzio, CREA PB	Basilicata Region		Perspectives 2020 "Knowledge Agriculture Systems in Basilicata, Southern Italy" 25-28 maggio 2020- Reggio Calabria. "Le neo- comunità di pescatori nelle due coste lucane" in Collana "Rcerche e studi territorialisti"SDT" - Atti del convegno. "Quaderno di mare": Banca dati della pesca in Basilicata.
AQUACULTURE	**VALUE-SHELL** Economy, environmental externalities and policies of the shellfish sector in Italy -	The project pursues the following objectives: to provide an updated knowledge framework of the shellfish production chain in the national and community context; to assess the environmental impacts associated with farms; to identify the main policies directly and/or indirectly supporting the sector; to identify	L. Tudini, **CREA- PB** CREA-ZA	MIPAAF		

[1] *prototypes; dissemination activities (conferences, seminars, reports, sites and videos, etc.); training activities (scholarships, research grants and PhD scholarships).*

		future intervention strategies with stakeholders and sector operators..				
ORGANIC AGRICULTURE	**SBEVAL**	Analysing the control system for organic farming.	A.Zezza, CREA PB all	MIPAAF		Supervising third-party control bodies for certification: the case of organic farming in Italy, JAFE 2020
AGRO-FOOD	**ESAD IT**	Platform European Sustainable Agricultural Dialogue..	M. Lai, CREA-PB	IEEP (Institute for European Environmental Policy), Bill and Melinda Gates Foundation		.
CITRUS, GRAPES	**TROPICSAFE** Tropicsafe Insect-borne prokaryote-associated diseases in tropical and subtropical perennial crops.	TROPICSAFE aims to address three economically important insect-borne prokaryote-associated diseases of perennial crops (palm Lethal yellowing, citrus greening and grapevine yellows) grown in tropical and subtropical areas. The General objective of TROPICSAFE is to provide innovative tools and solutions to manage and reduce the impact of these harmful perennial crop diseases. WP5, coordinated by CREA-PB is adressed to evaluate the economic sustainability the different approaches for Lethal Yellowing (LY), Citrus Greening (HLB) and Grapevine yellows (GY) – mainly at farm level and to evaluate the social impact of proposed management solutions at area level, regional level or national level. Moreover WP5 will evaluate the sectorial relevance of the innovation and scaling up of demonstration activities (effects on internal production, trade, pricies, etc).	L. Cesaro, **CREA PB** CREA-VE	[1] **European Commission**	http://www.tropicsafe.eu/ito https://ecas.ec.europa.eu/ TROPICSAVE - D5_2 - _Report on methodology and bases of the adaptation of CBA methods;D.2.) TROPICSAVE - D5.4 - Report on market analysis; D.3.) TROPICSAVE - D5_5_Report on operational manual of Simplified Balance Sheet on Line.	
AKIS	**I2CONNECT** Connecting advisors to boost interactive innovation in agriculture and forestry.	The project aims to fuel the competencies of advisors who will support and facilitate interactive innovation processes responding to multiple challenges in European agriculture and forestry. In particular, i2connect project's main objectives are: 1) To strengthen the skills, competencies and attitudes of advisors to support interactive innovation, by identifying and sharing best practices, developing tools and methods, training, and organizing peer to peer learning & networking; 2) To enhance and profile the role of advisors in interactive innovation processes, at different scales: by a better understanding of the Agriculture and Forestry Knowledge and Innovation System (AFKIS) at country level, by identifying providers of	P. Proietti, CREA PB	APCA, ACTA, IDELE (FR), AUA (GR), ILVO (BE), NAAS (BG), FIBL-EU, EUFRAS, IALB (EU), FIBL-CH, AGRIDEA (CH), FuAk, UHOH (DE), LKÖ (AT), SEASN, CAFAS (HR), KGZS (SI), ProAgria (FI), NAK, SZE (HU), CIRCA, TEAGASC (IR), LLKC (LV) LAAS (LT), CDR (PL), CONSULAI (PT) MAPAMA, INTIA, DARP (ES), ZLTO, WR (NL)/ **European Commission**		2 Reports AKIS in Italy and Malta (https://i2connect-h2020.eu/resources/akis-country-reports/).

[1] University of Nottingham,United Kingdom Coconut Industry Board, Jamaica University of Pretoria, South Africa Cooperativa Agricola y Vitivinicola Loncomilla Ltda, Chile Centro de Investigación Científica de Yucatán A.C., Mexico Council for Scientific and Industrial Research, Ghana Colegio de Postgraduados,Mexico Stellenbosch University ,South Africa Aarhus University, Denmark National Institute of Biology, Slovenia Universidad de Chile, Chile Instituto de Investigaciones en Fruticultura Tropical, Cuba Fundacion Empresa Universidad Gallega, Spain CIRAD (Reunion & Guadeloupe),France Istituto Valenciano de Investigaciones Agrarias Spain Ecoproductores del Tropico Humedo, A.C., Mexico ASSOFWI, France (Guadeloupe) VinPro Consultation Services, South Africa Patho Solutions ltd, South Africa.

		advisory services across Europe, by creating an enabling environment within advisory services, by better connecting and embedding advisory services within the AFKIS and by appropriate public policies; 3) To create a social support network and a networking culture among advisors facilitating innovative innovation processes..				
AKIS	**AKIS fishing and aquaculture Campania/** Implementation of a knowledge system according to an AKIS model on the fisheries and aquaculture sector.	The project aims to support small fisheries, fish farming and shellfish farming enterprises, which form the basis of the sector, through the structuring of knowledge networks, according to the AKIS model, in order to develop shared knowledge among the various actors and also start activities of Innovation brokers through the dissemination of innovations.	C. Menna, CREA PB	Istituto zooprofilattico del Mezzogiorno		
BIODIVERSITY	**National registry of biodiversity**.	.	A. Trisorio CREA PB	MIPAAF		
BIOTECNOLOGIES	**BIOTECH** Sustainable biotechnologies for Italian agriculture.	Valutazione economica delle nuove biotecnologie.	A.Zezza, CREA PB	MIPAAF		Exploring Attitude Towards Genetically Modified Foods and new breeding techniques: bad or positive view of the Millennials, Comunicazione al Convegno dell'AIEAA, 2020.
CLIMATE CHANGE	**ADA** ADaptation to climate change in Agriculture.	Implement a public-private partnership to increase the resilience of the agricultural sector, through the development of knowledge and planning tools that individual farmers and producer organizations can use to adapt to climate change.	S. De Leo, CREA PB	**European Commission**		
CLIMATE CHANGE	**SYSTEMIC** NutriSUSfood_Eol 1058 -An integrated approach to the challenge of sustainable food systems: adaptive and mitigatory strategies to address climate change and	Develop adaptation strategies for sustainable food production and consumption, addressing the different impact of climate change on nutritional quality and food composition and setting standards for food and nutrition security.	F. Altobelli, **CREA- PB** CREA AN, CREA CI, CREA GB	MIPAAF[1]		

[1] Ghent University;National Institute for Agricultural Research - Safety and Quality of Plant Products; National Institute for Agricultural Research - Science and technology of milk and eggs; National Institute for Agricultural Research - Plant and cropping System in Horticulture; National Institute for Agricultural Research - Tropical and Mediterranean Cropping System Functioning and Management; National Institute for Agricultural Research - Nutrition Physiology and Ingestive Behavior; National Institute for Agricultural Research - Center for Cardiovascular and Nutrition research / Aix-Marseille University; National Institute for Agricultural Research - Food and Digestive Microbiology to serve Health; National Institute for Agricultural Research - Food Process Engineering and Microbiology; Technical University of Munich, ZIEL Institute for Food and Health Else Kröner-Fresenius - Center of Nutritional Medicine; Kiel Ocean Assessment and Solution Centre at Kiel University Leibniz Centre for Tropical Marine Research ; University of Florence- Department of Agriculture, Food, Environment and Forestry; University of Palermo - Department of Engineering; University of Milan, Department of Food, Environmental and Nutritional Sciences; University of Sassari/Centre for Conservation and Evaluation of Plant Biodiversity; Ente Nazionale di Ricerca e promozione per la standardizzazione Libera UniversitÃ di Bolzano; Alta Scuola in Management ed Economia Agro-alimentare/ Università Cattolica del Sacro Cuore; University of Florence - Department of Agriculture, Food, Environment and Forestry; Polytechnic University of Marche - Dep. Life and Environmental Sciences Department of Computer, Control and Management Engineering, Sapienza University of Rome; University of Bari Aldo Moro; University of Bologna, Department of Physics and Astronomy; Riga Stradins University- Dpt of Internal Diseases / Nutritionist division; Nodibinajums Baltic Studies Centre; Norwegian Institute of Bioeconomy Research; Institute of Marine Research; Institute of Marine Research,Centre of Marine Sciences Rede de Química e Tecnologia - Laboratório Associado para a Química Verde; Rede de Química e Tecnologia - Laboratório Associado para a Química Verde; Rede de Química e Tecnologia - Laboratório Associado para a Química Verde; University of Porto, Institute of Public Health; University of Porto, Faculty of Pharmacy; Institute of Mediterranean Agricultural and Environmental Sciences - University of Evora; Universidade Católica Portuguesa - Escola Superior de Biotecnologia; University of Vigo; University of Valencia/MIPAAF[1]

	malnutrition_ Nutritional Security for healthy and sustainable food consumption.					
HEMP	**CCF Canapa Campana in Fibra**	The project identified 3 supply chains to be economically enhanced: -Separation and exploitation of the long fiber contained in the bark of particular varieties of hemp, using innovative maceration systems and specific machines/equipment to separate the fiber from the hemp. -Use of sheathing for the production of packaging material and mulching sheets. -Production of spray paints obtained using the scraps of the hemp fiber combing. However, the CCF project has the objective of encouraging the use of long hemp fiber for the production of high quality yarns	R. Pergamo, **CREA- PB** CREA IT	Campania Region		
FORESTRY COOPERATION	**AFAI** Azienda Forestale Alta Irpinia.	1.Cooperare per il supporto alla competitività delle filiere forestali attraverso la sperimentazione di una gestione attiva del patrimonio forestale dell'Alta Irpinia. 2.Effettuare studi tecnici e analisi del contesto ambientale e socioeconomico dell'Area Interna dell'alta Irpinia, anche attraverso mappatura, delle funzioni eco-sistemiche presenti o da incrementare sul territorio al fine di dare attuazione ad un Piano strategico di valorizzazione del patrimonio forestale dell'Area Interna.	R.Romano, CREA PB	Campania Region		
DIGITALIZATION	**NIVA** A New IACS Vision in Action.	Modernize the management and control systems of the Common Agricultural Policy through the development of innovative digital solutions, in order to reduce, on the one hand, the bureaucratic burdens for both the competent administrations and farmers and, on the other hand, to ensure at the same time sustainable agricultural production by improving policy monitoring capabilities.	F. Pierangeli, CREA PB	23 partner esteri / **European Commission**		1 Research grant.
AGROFOOD SUPPLY CHAIN	**JRC/SVQ/2019/MVP/**	**2614** SStudy on drivers and constraints of intergenerational change in EU agriculture and on the role of farmers' participation in food supply chains.	R. Sardone, CREA-PB	Institute of Agricultural and Food Economics – National Research Institute (IAFE-NRI)- Warszawa, Poland/ **European Commission**		
SOCIAL GOVERNANCE	**BRIGHT** Building RIGHTs.	To improve the social inclusion and democratic participation of 800 Romanian and Bulgarian mobile women employed in agriculture in Southern Italy. To enhance the capacity of local institutions and encouraging European countries to adopt participatory	G. Valentino, CREA PB	FUNDATIA CENTRUL PARTENERIAT PENTRU EGALITATE (RO); FOUNDATION GENDER PROJECT FOR BULGARIA (BG); ASSOCIATION DES AGENCES DE LA DEMOCRATIE LOCALE (FR)/**European Commission**		Baseline report

		governance systems (PuPs) that enable the participation of EU mobile citizens in decision-making processes.				
SOCIAL GOVERNANCE	**FAS Cipro Nord**	Technical Assistance for the implementation of Farm Advisory Services..	S. Cristiano, CREA PB	National Agriculture Advisory Service (Bulgaria)/NIRAS IC Sp. z o.o		
FRUIT PRODUCTION	**FRUTTIJOB** On-the-job training for fruit growers in Cuneo.	The project intends to support the growth of human capital within the Cuneo fruit companies with specific training actions in order to increase their competitiveness and provide them with adequate knowledge on innovative tools to obtain quality production in compliance with more sustainable and green techniques.	P. Borsotto, CREA PB	Fondazione Cassa di Risparmio di Cuneo	1)P. Borsotto, I. Borri, R.Cagliero, P.Chiosso, S. Facciuoli Celea, S. Trione, A.Vagnozzi.Il progetto Fruttijob: Rapporto di valutazione on going (2019-2020); 2)P. Borsotto, I. Borri, R.Cagliero, P.Chiosso, S. Facciuoli Celea, S.Trione, A.Vagnozzi. POLICY BRIEF - Il progetto Frutti-job. La lettura valutativa delle attività del primo anno di attuazione; 3)P. Borsotto R. Cagliero S. Trione, Il progetto di formazione on-the-job Fruttijob: una valutazione di processo e della utilità percepita PianetaPSR numero 96 novembre 2020.http://www.pianetapsr.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/2466	
INNOVATION/ AQUACULTURE	**AQUACULTURE 2020** Institutional and technical/scientific support for the implementation of the Strategic Plan for aquaculture in Italy (2014-2020)	The project is aimed at carrying out actions in support of organizational coordination, innovation and research for companies and for the improvement of knowledge and technology transfer in the mussel farming sector.	L.Buttazzoni,. **CREA-ZA** CREA-PB	MIPAAF		1 Research grant. Piattaforma Itaqua, partecipazione Aquafarm 2020, pubblication GCFM-FAO "Allocated Zones for Aquaculture: a guide for the establishment of coastal zones dedicated to aquaculture in the Mediterranean and Black Sea", partecipazione alla Piattaforma tecnologica europea dedicata all'acquacoltura (EATIP).
GRAIN LEGUMES	**LEGUBIOCER**	The general objective of the project is to promote the spread of the cultivation of grain legumes - in particular chickpea and lentils - in Campania cereal areas, both by favoring the transfer of innovations in the cultivation technique and in the defense of legumes and wheat (use of a new seeder called Seminbio, minimum tillage, false sowing, tanning of the seed with useful microorganisms, use of new environmentally friendly molecules for disease	R. Pergamo, **CREA- PB** CREA- OFA CREA- IT	Campania Region		Report

		control) and favoring the development of supply chains at a regional level - from producer to processor - focused on the enhancement of productions of quality, especially organi.				
INNOVATIVE FEEDS	**SUNSYNUTRIFEED** Production of feed with nutraceutical value through the use of by-products of the oil industry and study of their effects on the well-being and functional quality of milk and cheese	The project aims to arise the production of new and competitive feeds with a "nutraceutical value". Trough OR7 is expected - Study of an evaluation model of the economic sustainability of the use of innovative feeds in the sheep farming.	**CREA- ZA** CREA-PB CREA-OFA	MISE		Evaluation model
LAND MARKET	**MERCFOND** Indagine sul mercato fondiario.	Annual survey on the land market from a qualitative point of view (market trends by type of land bought and sold and by types of buyers and sellers also at a sub-regional level) and quantitative (detection of the average price for up to 11 types of crops in 767 agricultural regions), based on interviews with privileged witnesses and comparison with other available information sources. The database of the Farm Accountancy Data Network (FADN) is used as a comparison. The Data Bank of Land Values provides information on the average prices of agricultural areas for 5 types of crops at the level of the provincial altitude area.	A. Povellato, CREA-PB	CREA-RICA	CREA-PB (2021) Cap. 3.2 - L'andamento del mercato fondiario e degli affitti, in "Annuario dell'agricoltura italiana 2019", vol. LXXI, CREA. Longhitano D. (2020) L'inflazione si mangia il valore della terra. Tutti i numeri del mercato fondiario, Terra e Vita n. 37; Longhitano D. (2020) Terreni agricoli, l'affitto piace sempre di più, canoni stabili, Terra e Vita n. 37; Povellato A. (2019) Nuova contrazione del prezzo della terra, L'Informatore Agrario n. 40; Povellato A. (2020) Canoni di affitto stabili e prospettive incerte, L'Informatore Agrario n. 41; Povellato A., Longhitano D. (2020) Indagine sul mercato fondiario in Italia. Rapporti regionali 2019, INEA, Roma; Povellato A., Longhitano D. (2020) Indagine sul mercato degli affitti in Italia. Rapporti regionali 2019, INEA, Roma.	
SUSTAINABLE MODELS	**SUSINCER** Sustainable use of bioactive compounds from Brassicaceae and Solanaceae wastes for cereal crop protection.	Using agro-industrial resources efficiently to enhance scraps and avoid waste, creating by-products with high added value that combine environmental and economic sustainability.	C. Balconi , **CREA- CI** CREA- IT, CREA-PB	Fondazione Cariplo		-KickOff ottobre 2020.
OLIVE GROWING MONITORING	**OLIVEMAP** Mapping of investment needs and	Provide the public decision-maker with a cognitive picture of the Italian olive Producer Organizations (POs) through the analysis of	N. Puletti, **CREA-FL** CREA-PB	MIPAAF	"Progetto OLIVEMAP" in OLIVE&OLIO, n. 6/2020, pp. I-VIII: M.R. Pupo	Webinar Le caratteristiche delle OP olivicole in Italia" (8 luglio 2020) nell'ambito del ciclo di seminari sul

	monitoring of Italian olive growing Task 1 "Investments in olive growing" (CREA Research Centre for Agricultural Policies and Bioeconomy)	the legislation and the CAP reform proposals and of the structural, economic and financial characteristics of the POs .			D'Andrea e E. Reda "Le politiche epr il settore e il ruolo delle OP" (pp. I-IV).	pogetto OLIVEMAP. 1. Analisi delle caratteristiche strutturali delle aziende olivicole aderenti a Organizzazioni di Produttori attraverso i dati ISTAT 2.Analisi strutturale e socio-economica aziende olivicole aderenti a OP sulla base dei dati RICA 3. L'analisi economico-finanziaria delle OP olivicolo-olearie attraverso i dati di bilancio.4.Analisi delle proposte di riforma della PAC 2021-2027 relative agli interventi per il settore olivicolo-oleario.5. PSR 2014-2020 e misure di interesse delle OP 6.Contributo alla revisione dei programmi di attività triennali per il periodo transitorio 2021-2022 - M. R. Pupo D'Andrea e C. Cardillo "Aziende associate a OP: l'identikit strutturale" (pp. V-VI); - O. Cimino "Performance economiche delle aziende aderenti a OP" (pp. VII-VIII)2- Articoli ripubblicati in forma sintetica in Terra e Vita, n. 37-2020, pp. 62-65.
OPEN DATA	**Open IACS** Open LOD platform based on HPC capabilities for Integrated Administration of Common Agriculture Policy.	To harmonise and publish as public open data data from paying agencies to improve accessibility and uses by using the Linked Open Data paradigm. To create agri-environmental indicators for monitoring the CAP.	F. Lupia, CREA PB	Spagna, Grecia, Polonia e Lituania/Innovation and Networks Executive Agency (INEA).		
CAP	**AGRI-2019-0258**	Evaluation of the CAPs impact on knowledge and advisory activities.	F. Mantino, CREA- PB	ADE (Aid a la decision Economique); Università di Gloucerstershire (UK); OIR (AT)/ **European Commission**	Final report (website DG AGRI)	
QUALITY	**STRENGHT2FOOD**.	Strenghtening European Food Chain Sustainability by Quality and Procurement Policy.	L. Cesaro, CREA- PB	Newcastle University (UNEW) - UK; University of Edinburgh -UK;Wageningen University- Netherlands; Aristotle University of Thessaloniki - Greece; AgroSup Dijon - France;Ekonomski fakultet Univerziteta u - Serbia;Universität Bonn - Germany;Statens Institutt for Forbruksforskning-Norway;Sveučilišta u Zagrebu - Croatia;CREDA-UPC-IRTA - Spain;Szkola Glowna Gospodarstwa Wiejskiego - Poland; Kasetsart University -Thailand/ **European Commission**	www.strength2food.eu D.4) STRENGHT2FOOD – Impact of farmers engagement in FQS and SFSC on farm performance; D.5) STRENGHT2FOOD - Determinants of Farmers Engagement in Food Quality Schemes	

SHEEP AND GOAT SPECIES	**COLAUTOC** Collection of a seed bank of native sheep and goat breeds and strategies for their maintenance and increase in numbers	The project aims to maintain the biodiversity of sheep and goat species reared in Basilicata at risk of extinction: ovine-Gentile di Puglia, Leccese, Caprine - Capra di Potenza, Garganica, Jonica, Rossa Mediterranea, (Altamurana and Trimeticcio di Segezia)	M.A. D'Oronzio, **CREA- PB** CREA- ZA	Regione Basilicata		Biodiversity laboratory. 1 scholarship
FARM ACCOUNTANCY	**RICA 2020**	(Farm accountancy data network).	A. Scardera, CREA PB	**European Commission** - MEF		
GENERATIONAL RENEWAL	**Generational renewal**	Impact of the Common Agricultural Policy upon Generational Renewal, local development and jobs in rural areas.	F. Mantino, CREA-PB	ADE (Aid a la decision Economique); Università di Gloucerstershire (UK); OIR (AT)/ **European Commission**	Finalreport (sito web DG AGRI)	
WATER RESOURCES	**Analisi Economica Po**	Performance of technical and scientific activities necessary for the economic analysis for the update of the Po River Basin District Management Plan and support for the Water Balance Plan of the River Basin District through: supporting the socio-economic analysis of irrigated agricultural and livestock use - non-irrigated agricultural activity; supporting the validation phase of the analysis of pressures and significant impacts; supporting the determination of the program of measures and related costs; supporting the assessment of ecosystem services; supporting the identification of levers for cost recovery: coverage and internalization.	R. Zucaro, **CREA-PB** CREA ZA	Autorità di Bacino Distrettuale del Fiume Po		6 meetingcon il Comitato tecncico di coordinamento. 3 incontri con il Comitato tecnico scientifico. 2 Borse di studio.Banche dati: database dei dati utili all'analisi socio eocnomica per il settore agricolo, per gli usi agricoli e zootecnici provenienti da banche dati CREA e di altri enti vigilati dal Mipaaf (SIGRIAN, RICA, SIAN) o da altre fonti nazionali (BDN zootecnica). nota metodologica per elaborazione integrata di dati delle diverse fonti e metodi di stima alternativi in carenza del dato.
WATER RESOURCES	**WATER4FOOD2030** - Improvement of Mediterranean agri-food production in conditions of water scarcity	Develop knowledge and innovative solutions for the management and distribution of water resources to Mediterranean agro-productive systems, to make them more resilient to climate change, efficient from an economic and technical point of view, sustainable, and able to contribute to economic growth and development of the agricultural sector in southern regions	R. Zucaro, **CREA- PB** CREA- GB	MUR		Kick-off meeting (11.11.2020). CREA Break innovation 2020. 1
WATER RESOURCES	**RESERVAQUA** INTERREG V-A Italia – Svizzera 2014/2020 .	Determination of the environmental cost and the cost of water resource for the performance of the activities referred to WP4 Optimization of the use of water resources in the agricultural sector in the framework of the Interreg V-A Italy - Switzerland 2014/2020 cooperation project called "RESERVAQUA "	P. Borsotto, CREA PB	Fondazione Institut Agricole Régional		"Il progetto Reservaqua: relazione annuale (2019-2020)", P.Borsotto, F. Altobelli, S.Trione, C.Pilan, R.Cagliero

SUSTAINABILITY	**DIVERIMPACTS**.	Diversification through Rotation, Intercropping, Multiple Cropping, Promoted with Actors and value-Chains towards Sustainability	P. Nino, **CREA-PB** CREA- AA CREA- CI CREA- OF	**European Commission**		
AGROECOLOGICAL STRATEGIES	**UNISECO**	Understanding and Improving the Sustainability of Agro-ecological Farming Systems in the EU.	A. Povellato, **CREA-PB**	/ **European Commission**	283.Landert J. et al. (2020) Assessing agro-ecological practices using a combination of three sustainability assessment tools, Landbauforsch - Journal of Sustainable and Organic Agricultural Systems·70(2): 129–144.	
SOIL	**EJP SOIL** Towards climate-smart sustainable management of agricultural soils.	Towards climate-smart sustainable management of agricultural soils..	G.Bonati, **CREA-PB** CREA AA	Stichting Wagening Research (Netherlands), BIOS Science Austria,EV-ILVO (Belgium), CRAW (Belgio), CULS (Czeck Rep.), Aarhus University (Denmark) ,Estonia University (Estonia), LUKE, Natural Resources Inst. (Finland),Johann Heinrich von Thunen Institut (Germany), Research Centre Julich (Germany)/ **European Commission**		
SOIL	**CAMA** Conservation Agriculture in the Mediterranean Area.	Conservation Agriculture in the Mediterranean Area.	M. Rinaldi **CREA- CI** CREA- PB CREA- ZA CREA- AA	**European Commission**		
SOIL	**SOIL4LIFE**	Promoting sustainable use of Mediterranean soil resources	F. Altobelli, **CREA- PB** CREA- AA	Green Istria/ **European Commission**		
LOCAL DEVELOPMENT	**LEADER BTD evaluation**	Evaluation of the impact of LEADER on territorial development.	F. Mantino, CREA- PB	ADE (Aid a la decision Economique); Università di Gloucerstershire (UK); OIR (AT)/ **European Commission**		
RURAL DEVELOPMENT	**AT 2017/2023 PSRN** Cooperation agreement between Mipaaf and CREA for the National Rural Development Plan 2014-2020 (NRDP)	Support the achievement of the objectives set by the National Rural Development Plan (NRDP), in particular in relation to the management of water resources and irrigation investments (sub-measure 4.3) and the development of cooperation to preserve biodiversity in the livestock sector (sub-measures 10.2 and 16.2). In relation to the irrigation resource, the technical-scientific support is accompanied by analysis activities on issues related to water resource policies and their impact on the agricultural seex ante conditionality for water resources under EAFRD;integration and synergy between agriculture and environment policies (in particular Water Framework Directive and	R. Zucaro, **CREA- PB** CREA- ZA	MIPAAF a valere sul Fondo europeo agricolo per lo sviluppo rurale 2014-2020	1) Serra-Wittling, C.; Baralla, S.;Bravo,D; Drastig, K.; Ghinassi, G.; Guillot, S.; Nagy, A.; Nagy, V.; Popova, Z.; Topcu , S. Synthèse - Adaptation de l'irrigation au changement climatique dans l'Union européenne : les actions engagées par les États membres pour économiser l'eau Science Eaux & Territoires, Économies d'eau en irrigation, 34; p. 8-17 2020; 2) Baralla S., Ferrigno M., Zucaro R., Del Prete A., Zumpano C. Infrastrutture	Workshop "Festival della sostenibilità 2020- Infrastrutture irrigue e servizi alla popolazione: la politica agricola e di sviluppo rurale di fronte alle sfide dell'agenda 2030 per uno svilupposostenibile",6.10.2020. Digital workshop "Le Varianti in corso d'Opera", 3.12.2020; "Le misure di Semplificazione in materia di contratti pubblici a seguito del decreto-legge 76/2020 (Convertito in legge 120/2020), 18.12.2020. Banche dati: WebgisSIGRIAN https://sigrian.crea.gov.it/).

		Floods) and other national and regional policies (state aids) analysis of the irrigation context and phenomena of water scarcity, also through the quantification of appropriate indicators;irrigation reuse of purified wastewater; support for the new CAP 2021-2027; identification and promotion of actions for the saving and efficient use of water resources for irrigation, also in the international scientific context.			irrigue e servizi alla popolazione: la politica agricola e di sviluppo rurale di fronte alle sfide dell'agenda 2030 per uno sviluppo sostenibile. PianetaPSR, numero 95 ottobre 2020	
RURAL DEVELOPMENT	**ACOPOA** Accordo di cooperazione con MiPAAF per l'attuazione del POA.	Support the planning of irrigation investments towards innovative types of intervention, to favor the mitigation capacity and the adaptation of the agro-forestry system to the reduction of the environmental impact on soil and water resources and to identify and promote actions for the saving and efficient use of water resources, favoring the implementation of policies for knowledge and innovation also in the field of water resources and in relation to the Community agricultural policy.	R. Zucaro, CREA PB	MIPAAF	1) Zucaro, R., Ferrigno, M., Lorenzetti, R. A Decision Support System to finance irrigation investments: the Italian National Database of Investments for Irrigation and Environment (DANIA) Atti del seminario CEUR, 2020 Volume 2761 pagg. 205–212 2-s2.0-85097532757;2) V. Manganiello, R. Zucaro, N. Crisponi, L. Adolfo Folino, R. Lorenzetti, M. Scaglione, S. Baralla, M. Ferrigno. SIGRIAN e DANIA per la gestione della risorsa idrica in agricoltura: dalla programmazione al monitoraggio per uno sviluppo sostenibile. Presentazione orale evento Ecomondo 2020- 03.11.2020	
RURAL DEVELOPMENT	**RRN 2014-2020 National Rural Network** 2014-2020.	Improve the implementation of the rural development policy in Italy, favoring the growth of the capacity building of the institutions concerned, the creation of thematic networks among stakeholders, animation and information, as well as communication.	A. Monteleone, **CREA- PB** AA-FL-ZA -VE -AN	MIPAAF	Pubblicazioni -si rinvia a pubblicazioni RRN e ad articoli su riviste scientifiche.	(see RNN event and publiacations)
RURAL DEVELOPMENT	**CORASVE** Scientific coordination of the Regional Conference on Agriculture and Rural Development of the Veneto Region.	Scientific coordination of the Regional Conference on Agriculture and Rural Development of the Veneto Region.	A. Povellato, CREA-PB	Veneto Region		
RURAL DEVELOPMENT	**SAMoCA** Support for the monitoring of company accounting keeping by the beneficiaries of the	Support the activity of monitoring the keeping of company accounts, according to the FADN methodology, by the beneficiaries of Measures 112 (Establishment of young farmers) and 121 (Modernization of farms) of the PSR Lazio	C. Liberati, CREA- PB	Lazio eEgion		

	2007/2013 Lazio Rural Development Program.	2007/2013, of the companies benefiting from the aid of the Measure 121 financed by the CMO sugar and by the beneficiary companies that have obtained a concession provision under measure 411.121 of the LAG's PSL.				
RURAL DEVELOPMENT	**TWINNING ALGERIA**.	Ensure institutional support to the Ministry of Agriculture, Water Resources and Fisheries to strengthen its capacities for the development and implementation of inclusive, participatory and long-term agricultural and rural policies.	C. Zumpano, CREA-PB	MIPAAF		
RURAL DEVELOPMENT	**Balanced territorial development-CAP** Impact Evaluation of the CAP's impact on territorial development of rural areas: socio-economic aspects.	Impact of the CAP on the balanced development of the rural territory.	F. Mantino, CREA-PB	ADE (Aid a la decision Economique); Università di Gloucerstershire (UK); OIR (AT)/ **European Commission**	Publication Final Report (sito web DG AGRI)	
RURAL DEVELOPMENT	**Convenzione sul PSR Sicilia 2014-2020"** The investment needs of Sicilian farms through the reading of the business development plans.	Making the implementation of the 2014-2020 Sicily RDP more effective: the "PSAWeb Sicily" application was designed and developed for the treatment of Business Development Plans (PSA).	I. Agosta, CREA-PB	Sicilian Report		
RURAL DEVELOPMENT	**PPN** Gargano Plan of the Gargano National Park.	Drafting and Approval of the Gargano National Park Plan and SEA Report.	R.Romano, CREA PB	Parco Nazionale del Gargano		
RURAL DEVELOPMENT	**SIMDAZ** Simulation of the economic and environmental dynamics of the F.V. Giulia.	Simulation of micro-economic dynamics based on the use of econometric models to support rural development policies	F. Cisilino, CREA PB	ERSA		
RURAL DEVELOPMENT	**CAMPFVG** Statistical survey for the economic analysis of regional farms	CAMPFVG provides information, structural economic staistics concerning Friuli Venezia Region farms. The metodology is based on a direct collection of a sample of 200 farms included in livestock, organic and orticulture type of farming.	F. Cisilino, CREA PB	ERSA		Statistical survey for the economic analysis of Friuli Venezia Giulia farms CREA Ed.by Federica Cisilino, Gabriele Zanuttig, Greta Zilli
TRACEABILITY OF FOREST PRODUCTS	**AGRIDIGIT**Agricoltura digitale	To develop, test and transfer the following innovative methods, tools and technologies for the enhancement of the national forest heritage and the development of its production chains. CREA-PB participates in WP4, coordinating the Task of Analysis of the economic sustainability of the traceability systems of wood products	L. Cesaro, **CREA- PB** CTRA-IT, CREA-AA, CREA-FL	MIPAAF		

5.2 Services

Institutional Activities	Description	Person in charge	CREA Centre
Italian Agriculture Yearbook 2019, Volume LXXIII	The Yearbook, that has reached its 73rd year, analyzes the structural features of the agricultural sector, its trend and relations with the economy as a whole, offering a medium-long term view. Relationships between agriculture, environment and civil society are also analyzed.	R. Sardone	CREA-PB
Italian Agriculture in figures	Italian Agriculture in figures now in its 33nd edition, represents a well established and an easy informative tool. The thematic structure the available information, thus providing a clearer picture of the relationships between has been updated to make it easier to read and better assimilate the different components that define the role of the primary sector in an advanced economy	M. F. Marras	CREA-PB
Regional Agriculture in figures	The purpose of the regional information booklet, born in 2008 is to follow the same aim of the Italian agriculture in figures, but at regional level.	C.Liberati, R. Ugati, A. Sturla, S. Trione, I. Borri	CREA-PB
Italian foreign trade in agri-food products 2019	The Report, that has reached its 28th edition, analyzes the Italian agri-food trade. Import and export performance is analyzed by areas and main partner countries, by sectors and products, with a focus on Made in Italy.	R. Solazzo	CREA-PB
Public spending on agriculture	Analysis of the evolution and consistency of expenditure in agriculture: quantification and qualification of the items that make up, directly or indirectly, public support to the sector	L. Briamonte	CREA-PB

Advisory and technical assistance services	Description	Person in charge	CREA Centre
Support and consulting for the implementation of the National Rural Network	Drafting of execution reports, coordination of network activities, portal management and coordinated image	S.Angeli	CREA PB
Support and consulting for dissemination activities on the value of rural development policy	Magazine publication, Collection of rural excellence	M. Verrascina, B. Zanetti	CREA PB
Support to the Managing Authority of the NRN Program for coordination and implementation of EAFRD communication and implementation of information and knowledge exchange activities	Coordination of the communication table, pilot project with schools and universities	P. Lionetti	CREA PB
Support and consulting for the strategic monitoring of the CAP	Information collection and analysis for PAC results analysis	F. Pierangeli, S.Tarangioli	CREA PB
Support and consulting for the Programming of the CAP 2021-23 and the PNRR	Coordination of the technical table, preparation of analyses, methodological documents and guidelines	A. Monteleone, F.Pierangeli, S. Tarangioli	CREA PB
Support and consulting for the implementation of the evaluation system of the rural development policy	Coordination of technical table Mipaaf, IGRUE, Regions, paying agencies	M.Bolli, A. Amato	CREA PB
Support and consulting for the implementation of the national monitoring system of rural development policy	Coordination of the Regions-Evaluators technical table, participation on the European experts group, methodological and guiding documents	S.Cristiano	CREA PB
Support and consulting for the implementation of environmental measures of the rural development policy	Analysis of interventions implementation, drafting of documentation, animation of discussion with stakeholders (MATTM, OOPP, environmental organizations)	D. Marandola	CREA PB
Support and consulting for the drafting of the National Plan for the sustainable use of plant protection products	Participation in the Scientific Committee, drafting of documentation, animation of discussions with stakeholders	D. Marandola	CREA PB
Support and consulting for the implementation of the organic farming measure of the rural development policy	Analysis of interventions implementation, drafting of documentation, animation of discussion with stakeholders ("Organic" world organization)	L. Viganò	CREA PB
Support and consulting for the definition of the new classification of less favored areas	Definition of methodology, classification and discussion with Regions	D. Storti, L. Fraschetti	CREA PB
Support and consulting for the animation of territorial development strategies	Territorial support to define strategies based on territorial reading of data and information	D.Storti	CREA PB
Support and consulting for the implementation of the National Strategy for Internal Areas	Territorial support for defining pilot areas strategies and integration with EAFRD funds	F. Mantino	CREA PB

Support and consulting for the implementation of the territorial measures of the rural development policy	Support to regions for overcoming problems related to financing infrastructure interventions in the EAFRD	C. Zumpano	CREA PB
Support and consulting for the implementation of LEADERs	Animation of the LAG network, support to LAGs and regions on implementation issues	R.Di Napoli	CREA PB
Support and consulting for the implementation of measures on supply chain cooperation within the CAP	Support to the regions on problems related to the implementation of cooperation measures	S.Tarangioli	CREA PB
Support and consulting for the implementation of Social Agriculture measures within the rural development policy	National Observatory activities support, stakeholders animation, interventions implementation analysis	P.Borsotto, F.Giarè	CREA PB
Support and consulting for the implementation of the National Forest Strategy	Support to Mipaaf and Regions on the commitments undertaken in the context of the national forest law	R. Romano, L. Cesaro	CREA PB
Support and consulting for the implementation of animal welfare measures within the rural development policy	Participation in the ACCREDIA table for certification, stakeholders animation, interventions implementation analysis	M. C. Macrì, M. Scornaienghi	CREA PB
Support and consulting for the implementation of AKIS within the rural development policy	Network animation of GO PEI, support to GOs and Regions on implementation problems	A. Vagnozzi	CREA PB
Support and consulting for the implementation of the national strategy for ultrabroadband	Support to Mipaaf and the Regions in the implementation of the BUL	G. Bonati, N. D'Alicando	CREA PB
Regional network stations	Support to Regions on implementation issues related to RDPs	P.Piatto	CREA PB
Accounting survey of 400 farms in Piedmont (financial year 2017)	Piedmont Region supports the accounting survey; data is useful to monitoring and evaluation of agriculture and rural development policies at the regional and national levels	S. Trione, G. Peiretti	CREA PB
Accounting survey of 80 farms in Aosta Valley (financial year 2018)	Autonomous Region of the Aosta Valley supports the accounting survey; data is useful to monitoring and evaluation of agriculture and rural development policies at the regional and national levels	S. Trione, C. Pilan	CREA PB
Regional network stations	Support to Regions on implementation issues related to RDPs	R. Cagliero, F. Varia	CREA PB
Farm Advisory Services - FAS Cyprus -Technical assistance for the implementation of local agricultural advisory services in Northern Cyprus	The overall objective of the project is to support the economic development of the Turkish Cypriot community and to prepare it for the implementation of the acquis, helping, among other things, to establish agricultural advisory services, strengthen the technical skills of local consultants and define intervention measures in favour of the advisory system in Cyprus. CREA is contributing through the definition and implementation of training plans for local consultants on subjects such as: beekeeping, farm management and animal welfare, global business management and supply chain integration, plant production, pest management, production protection and quality, viticulture.	S.Cristiano	CREA - PB, AA, IT, ZA,- OFA,- DC,

Working tables/ working groups / institutional partnerships /	***Description***	***Person in charge***	***CREA Centre***
Expert Position for the Committee for Agriculture (COAG) - Working Party on Agricultural Policies and Markets (APM)	Support to Mipaaf on issues of the OECD APM table	S. Nicoli	CREA-PB
Collaboration on paper prepared by OECD "Building agricultural resilience to natural hazard-induced disasters: Italy case study"	Meeting with the OECD delegation	S. Nicoli	CREA-PB
Participation in working group within the National Fruit and Vegetable Table	Support to Mipaaf for definition of OP programs and sustainability	C. dell'Aquila	CREA-PB
Cooperation agreement	Initiate sustainable and supportive territorial development paths and social innovation practices, through the tool of social agriculture and system	G. Gaudio	CREA-PB
Cooperation agreement	Launch support actions to facilitate young people's access to the primary sector and to combat the abandonment and consumption of agricultural land (L.R. n. 31 of 5/7/2017)	G. Gaudio	CREA-PB
Cooperation agreement	Elaboration and implementation of research and development programs, aimed at intercepting the social and economic needs of the territory and proposing solutions	G. Gaudio	CREA-PB
Cooperation agreement	Develop and regulate collaborative relationships on topics of common interest aimed both at the mutual exchange of skills in training and teaching, in particular on the design and management of European funds for rural development and in institutional events for the promotion of scientific-technological culture	G. Gaudio	CREA-PB
FADN Community Committee	Body responsible for verifying the compliance of the selection plans drawn up by each Member State, monitoring, evaluating and analysing the accounting data in relation to other statistical sources and the Economic Accounts	A. Scardera	CREA-PB

FADN National Committee	Body in charge at national level of: approving the selection plan for each accounting year; approving the criteria for distributing companies by type and size class; approving the methods for selecting farms.	A. Scardera	CREA-PB
Table on the theme of equal access to land promoted by the Inequalities and Diversity Forum (letter from the Director of CREA PB prot. No. 00551613 of 11/27/2019)	On suggestion of the Inequalities and Diversity Forum, collaboration on a proposal for the improvement of working conditions in agriculture and for a more equitable access to land	L. Briamonte, M. C. Macrì, G. Valentino	CREA-PB
XVIII Technical Discussion Table/Round table discussion on Primary Sector, organized by Veneto Lavoro (Regione Veneto) - 2 October 2020	Presentation of the activities carried out by CREA PB as part of the intervention on "L'occupazione femminile in agricoltura: Progetto BRIGHT Programma Rights, Equality and Citizenship 2014-2020" (the whole presentation was shared with other project partners)	M. C. Macrì, G. Valentino	CREA-PB
Table on hop secotr	Participation in the sector table to provide opinions and addresses - Coordination 2 WG	S. Tarangioli, R. Sardone, F.Licciardo	CREA-PB
Table on fruit and vegetables sector	Participation in the logistic working group table	G. Petriccione, S. Tarangioli	CREA-PB
National bioeconomy steering group	National table for implememtation of bioeconomy national strategy	A. Zezza	CREA-PB
GBEP- Global Parnership for Sustainable Biofuel	Multilateral working table at FAO for the sustainability of bioenergy	A. Zezza	CREA-PB
OCSE	Agriculture and Trade Committee PB	A. Zezza	CREA-PB
SCAR BSW	Strategic Working group on bioeconomy- European Commission, SCAR Committee	A. Zezza	CREA-PB
OCSE	APM- Committee for Agricultural Policies and Markets	A. Zezza	CREA-PB
AGMEMOD	European econometric model working group for agriculture Outlook	A. Zezza	CREA-PB
Agricultural expert c/o national representative of United Nations	technical support to ONU ROMA on agricultural topics	F.Altobelli	CREA-PB
Discussion table on the theme of equal access to land - Inequality and Diversity forum	Technical-scientific support to the activities of the Table	L.Briamonte	CREA-PB
Working group "Territorial needs and value chains"	Technical-scientific support to the activities of the Undersecretary for Agricultural Policies concerning the political and programmatic lines to be implemented also in accordance with the planning of resources under the Recovery Plan	L.Briamonte	CREA-PB
Institutional tables of hemp, hazelnut and other nuts	Technical-scientific support for the activities of the Table	L.Briamonte	CREA-PB
Technical committee of the National Contact Point of the OECD guidelines on social responsibility at the MISE	Participates in the work of the NCP representing MIPAAF	L.Briamonte	CREA-PB
Interministerial Committee for Human Rights (CIDU) at the Ministry of Foreign Affairs	Participates in the work of the Committee	L.Briamonte	CREA-PB
Working Group 3 - Indicators under the Agreement entered into with the Italian Alliance for Sustainable Development (ASviS)	Technical-scientific support for the revision of the indicators used for ASVIS activities	Referenti postazioni regionali RRN(membri/uditori/stakeholder)	CREA-PB
Monitoring Committee for the 2014-2020 Rural Development Program	Partecipation to Monitoring Committee for the 2014-2020 Rural Development Program	R.Zucaro	CREA-PB
Partnership istituzionale. Study visit Turkey	In collaboration with the Central Apennine District Authority, to which the European Commission had made an explicit request in the framework of the TAIEX Project, CREA PB hosted a delegation of the Turkish Ministry of Agriculture. In addition to the description of CREA and its activities, the study visit included a specific presentation of the activities carried out by CREA and CREA PB, in particular on issues related to the sustainable use of water. On this occasion, the SIGRIAN and DANIA databases were illustrated.	R.Zucaro	CREA-PB
Table. Coordination table of the PRIMA initiative (Partnership for Research and Innovation in the Mediterranean Area)	Support to the PRIMA (Partnership for Research and Innovation in the Mediterranean Area) Program, the Euro-Mediterranean action ex Article 185 of the TFEU, approved by the European Parliament and the Council by Decision (EU) 2017/1324 of July 4, 2017, with the aim of consolidating a long-term structured partnership in research and innovation in the Mediterranean area, in accordance with the principles of co-ownership, mutual interest and benefit sharing.	R.Zucaro	CREA-PB
Institutional Partnership/Working Group. Focal point for the FAO Global Framework on Water Scarcity (WASAG).	In April 2017, the international platform WASAG - The Global Framework on Water Scarcity in Agriculture (http://www.fao.org/land-water/overview/wasag/en/) was launched, promoted by FAO and composed of government agencies, ministries, international organizations, research institutes, advocacy groups and membership organizations. To date, it consists of about 50 partners who are committed to working together with the common goal of identifying priority actions to be taken to combat global water scarcity and promote adaptation of the agricultural sector to climate change, including in compliance with the 2030 European Agenda and the United Nations Sustainable Development Goals. Within WASAG, CREA-PB has been identified as the Focal Point for Italy in support of MiPAAF (part of the Steering Committee). In this context, an Italian coordination group has been established in order to create synergies, cooperate and raise the level of political commitment towards more sustainable practices in the management of water resources for different uses, promoting a	R. Henke, C. Abitabile, R. Zucaro, C. Zumpano, A.Trisorio, S. Fabiani, G. Bonati, R. Sardone, F. Giarè, L. Viganò, F. Mantino, M. Verrascina, I. Namdariam, L. Briamonte, S. Luzzi Conti, S.Baralla, G. Crisponi.	CREA-PB

	conscious and rational use. To date, the working group has started the drafting of the Technical Guidelines for the appropriate "Design and Management of pressurized irrigation distribution system", a support tool useful in providing a methodology for planning and design of investments in the irrigation field to increase the productivity of water resources for irrigation purposes, especially in arid areas, also through the involvement of the private sector.		
Working Group. Adherent ASVIS - Italian Alliance for Sustainable Development	CREA PB, in coherence with its general scientific competences in the field of agriculture, agribusiness, agroindustry, fisheries, forestry, human nutrition of food, rural development and agricultural economics, carries out relevant activities aimed at promoting the sustainable and efficient use of natural resources, with particular regard to water and soil, with a view to the overall sustainability of the production system in the light of environmental, economic and social constraints. With particular reference to water resources in agriculture and their sustainable management, ensuring sustainable and resilient agriculture will enable the achievement of the goals stated in the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) adopted by the United Nations in 2015. Based on these considerations, CREA's membership in ASVIS was initiated during 2019 and then made official in 2020. The membership provides that the Research Centre for Agricultural Policies and Bioeconomy supports the various activities conducted by the Alliance, including those carried out by the Thematic and Transversal Working Groups, as well as the organization of the ASVIS Festival of Sustainability and the drafting of the ASVIS Report "Italy and the Sustainable Development Goals" and the report "The Budget Law and Sustainable Development" drafted annually.	S.Fabiani e R.Romano	CREA-PB
CLUSTER SPRING Italian Cluster on Green Chemistry - Working table “Biomass” and Working table "Law"	Development of strategies for the enhancement of biomasses of agricultural and forestry origin with a particular focus on marginal, disadvantaged, abandoned industrial areas. Activities aimed at creating value chains based on the enhancement of agricultural biomass. Analysis and regulatory planning activities aimed at the development of the bioeconomy and integration with other sectoral policies.	S. Fabiani	CREA-PB
ENRD Thematic Group - Bioeconomy and Climate Action in Rural Areas	Thematic group within the European Network for Rural Development. ENRD serves as a hub for exchange of information on how Rural Development policy, programmes, projects and other initiatives are working in practice and how they can be improved to achieve more	R. Zucaro	CREA-PB
Table. Permanent Table as per art. 3 of the Ministerial Decree MIPAAF of 31 July 2015	CREA PB, within this table, supported the drafting of the MiPAAF Guidelines of MD 31/07/2015. These guidelines define the minimum cases in which the regions and autonomous provinces must establish obligations to measure the volumes of water used in agriculture, with regard to withdrawals, returns and uses, both for collective and autonomous irrigation, indicate the elements to be monitored (withdrawals, uses, returns), the subjects responsible for the acquisition and transmission of monitoring data (irrigation agencies or regions), the methods of quantification (measurement or estimation) and the timing of monitoring and data transmission to SIGRIAN. In fact, they identify SIGRIAN as the reference database for the collection of data for the quantification of irrigation volumes. With their own measures, all regions and autonomous provinces have subsequently implemented and adopted the MiPAAF guidelines.	R. Zucaro	CREA-PB
Table. Technical Committee for the Coordination of the Observatories	CREA participates in the Technical Committee for the Coordination of the Observatories, whose purpose is to define - minimum and common contents of the Bulletins of the Observatories (a basic information tool where the current, historical and statistical values of the magnitudes of cause and effect of water crises are reported, so that the members of the Observatory have a suitable cognitive basis for the identification of the most appropriate actions to be taken to contrast the critical situation); - national guidelines for water availability and water severity to be adopted at the level of the individual District Observatory.	R. Zucaro	CREA-PB
Table. Permanent observatory on the water uses in the seven Hydrographic Districts	CREA is a member of the Permanent Observatories for Water Uses, established in July 2016 by MATTM for each of the seven Hydrographic Districts and in which participate as subjects, in addition to the District Authorities, , the Ministry of Agriculture, Food and Forestry (MiPAAF) and the Ministry of Infrastructure and Transport (MIT), the DPC, ISPRA, ISTAT, the National Research Council (CNR), the Regions, ANBI, lake regulation consortia, energy and environmental water companies and electricity companies. The activation of the Observatories is a specific measure of the District Water Management Plans.	R. Zucaro	CREA-PB
Table. Technical Coordination Committee for the "Design of the Operational Plans of the Permanent Observatories on Water Uses set up in the various Italian Districts".	CREA's activity includes participation in the Technical Coordination Committee and in particular in the working group aimed at: -preparation of a technical manual for Water Availability and Water Severity Indicators; - to the WEI+ working group to coordinate at national level the calculation and evaluation methods of the indicator; - to the Ecological Runoffs Working Group.	R. Zucaro	CREA-PB
Working Group. Evaluation Steering Group of the NRDP 2014-2020.	The activity of CREA has provided support in the evaluation activities of the National Rural Development Program 2014-2020, with particular reference to the proposals for updating the Evaluation Plan, the identification of evaluation needs throughout the programming period 2014-2020 and the verification of the functionality of the links between the monitoring system and the evaluation process. The Evaluation Steering Group was also responsible for liaising with the Independent Evaluator and providing him with data and information relevant to the evaluation activities.	R. Zucaro	CREA-PB

Working Group. Participation in the Terrevolute 2022 Project promoted by the National ANBI	CREA provides support within the project Terrevolute 2022 promoted by ANBI. In particular, the purpose of the project is to outline the operational and institutional guidelines that will inspire the action of the Consorzi di bonifica in the coming years, in an era now strongly affected by climate change. To this end, four Technical Tables have been set up, corresponding to four distinct thematic areas, each of which will focus on the analysis of some of the Goals for Sustainable Development of the 2030 Agenda, goals that are particularly linked to the activities and responsibilities of the Land Reclamation Consortia: A. Goals 8-9-12 (8. Decent work and economic growth; 9. Goals 3-6 (3. Health; 6. Clean Water - Water Quality) D. Goal 15 (15. Life on Earth - Biodiversity). In particular, CREA is providing support to Table C. Goals 3-6, focused on the analysis of Health, Clean Water and Water Quality, among the Goals for Sustainable Development of the 2030 Agenda particularly related to the activities and prevailing responsibilities of the Reclamation Consortia.	R. Zucaro	CREA-PB
Agreement between CREA PB and the University for Foreigners of Perugia, Department of Human and Social Sciences, WARREDOC Center	The agreement between CREA PB and Warredoc foresees the joint collaboration of the two institutes in order to carry out technical-scientific activities necessary: 1. to the implementation and development of policies and programs for the sustainable use of water to address water scarcity in agriculture and to adapt agricultural systems to these limiting conditions and climate change; 2. to the study and development of technologies for the sustainable use of water in agriculture; 3. to promote the conscious and rational use of water resources, through an active participation in WASAG; 4. to promote technology transfer activities and best practices for the sustainable use of water resources also through research and experimental communication projects that actively involve citizens and students with a focus on the exploitation of the potential offered by new technologies for observation, modeling and monitoring through remote sensors and mobile devices (e.g. open data, big data, citizen science).	Direttore di Centro	CREA-PB
Memorandum of Understanding	Memorandum of Understanding with Campania Region, Department of Agriculture, on agriculture and rural development	M. A. D'Oronzio, G. Costantini	CREA-PB
Lucanian Bioeconomy Cluster	The Cluster aims at 1) promoting the bioeconomy in the regional territory, 2) promoting the development and competitiveness of enterprises on the regional strategic lines on the bioeconomy; 3)encouraging specialist training.	C. De Vivo	CREA-PB
Partnership agreement between CREA PB and Basilicata University	Agreement aimed to: 1) Collaboration in the definition of research and training projects for young graduates and undergraduates, 2) Definition, development, participation and implementation of scientific projects in sectors of common interest; 3) Development of improvement situations to enhance the results of the changes and their transfers; 4) Sharing of instrumental and human resources aimed at the realization of programs and projects	M. A. D'Oronzio, M. C. Suanno	CREA-PB
Institutional Tables of FEAMP 2014-2020 OP, Monitoring Committees, State-Region Conference linked to the fishing sector under the EMFF OP, National Network of FLAGs.	To favor the planning, control and management of the EMFF 2014-2020 National Operative Program	L. Tudini	CREA-PB
Regional Conference of Research and Innovation (Tuscany)	Permanent body of the Tuscany Region with consultative functions, made up of representatives of universities, research centers, science and technology parks, companies and trade unions.	L. Tudini	CREA-PB
Management body for transparent goby fishing in GSA 9 (Ministry of Agricultural, Food and Forestry Policies)	Management and socio-economic monitoring of the National management plan for derogation to Regulation (EC) n. 1967/2006, regarding the use of boat seines for transparent goby fishing in GSA 9	L. Tudini	CREA-PB
Working Group CREA-NISEA (Fisheries and Aquaculture Economic Research)	Analysis of the Covid-19 emergency effects on the Italian fisheries and aquaculture sectors (results published on the CREA website)	P. Proietti	CREA-PB
Steering Commitee of the International Farming System Association (IFSA)	Scientific exchange on issues concerning farming systems, organization of biennial European conferences, convenors' activities and organization of thematic sessions within the conferences	P. Proietti	CREA-PB
International Scientific Steering Committee of the European Seminar on Extension Education (ESEE)	Scientific exchange on issues concerning education and extension in agriculture, organization of biennial European conferences, convenors' activities and organization of thematic sessions within the conferences	P. Proietti	CREA-PB
Editorial board of The International Journal of Agricultural Extension (ISSN: 2311-8547, 2311-6110). https://esciencepress.net/journals/IJAE/about/editorialTeam	Editorial activity	P. Proietti	CREA-PB
Cultural Association Laboratorio di Studi Rurali Sismondi	Scientific exchange on issues concerning rural development, organization of conferences and seminars	M. Lai	CREA-PB
Monitoring Committee of the RDP EAFRD 2014-2020 of the Tuscany Region	Stakeholder	F. Pierangeli	CREA-PB

Italian ESAD platform	The project is funded (€ 33,000) by IEEP (Institute for European Environmental Policy). The goal is the creation of a national platform of research stakeholders who discuss the agro-food research needs to be promoted through Horizon Europe. These contributions feed a European ESAD platform, in constant contact with the EC and with a group of relevant stakeholders for the agro-food sector.	M. C. Macrì	CREA-PB
CAP National Strategi Plan (2023-2027)	National contact point with the services of the European Commission regarding the National Strategic Plan of the Common Agricultural Policy from 2023 to 2027	S. Baiocco, F. Pierangeli, M.Bascietto	CREA-PB
Analysis of the impact of the COVID 19 emergency measures on foreign labor in agriculture	Carrying out a qualitative survey on shortages of foreign seasonal labor during the lockdown	F.Pierangeli	CREA-PB
National User Forum for Space Economy (Copernicus)	The Space Economy consists of a national program parallel to the EU program relating to Copernicus and aims to develop downstream services of the space supply chain in the context of the country for the use and application of technologies enabled by satellite earth observation	P. Lionetti	CREA-PB
Agriculture table for the Space Economy	The group aims at identifying the needs of the agricultural world and defining the technical requirements indispensable for the application of remote monitoring through the use of Earth Observation satellite data.	P. Lionetti	CREA-PB
Rete Comunicatori Fondi Sie	Tavolo degli esperti sulla comunicazione nell'ambito dell'Accordo di partenariato	M. Bolli, S. Cristiano, V. Carta, P. Proietti, P. Lionetti, F. Varia, A. Trisorio, F. Licciardo	CREA-PB
Comitato Comunicazione della RRN	Tavolo degli esperti sulla comunicazione nell'ambito della Rete Rurale Nazionale	R. Cagliero, B. Camaioni, S. Cristiano	CREA-PB
Steering group for the implementation of the Evaluation Plan of the 2014/2020 Rural Development Program of Lazio, Sardinia, Tuscany, Emilia Romagna, Sicily, RDN	Coordination of methodologies and use of evaluation results	R. Di Napoli	CREA-PB
GREXE	Gruppo esperti sulla valutazione PAC costituito dalla DG AGRI	A. Trisorio	CREA-PB
Leader sub-committe	Gruppo esperti sulLEADER costituito dalla Rete rurale europea	F. Altobelli	CREA-PB
European Innovation Partnership (EIP-AGRI) Focus Group on High Nature Value (HNV) - Farming profitability	Network Esperti europei HNV	D.Marandola	CREA-PB
Rappresentanza Permanente d'Italia presso le Organizzazioni delle Nazioni Unite in Roma Scientific Attaché	Attività di supporto alla Rappresentanza su temi strategici agricoltura e sviluppo rurale	A. Trisorio	CREA-PB
Comitato scientifico del Piano di azione nazionale sull'uso sostenibile dei prodotti fitosanitari (PAN)	Comitato esperti per indirizzo e redazione del PAN	F. Pierangeli	CREA-PB
Gruppo di Lavoro UNESCO	Gruppo esperti presso Mipaaf per selezione aree UNESCO	F. Mantino, D. Storti	CREA-PB
GeoHUB Italia su PAC 2021-27	Gruppo coordinamento elaborazione PSN 2021-27 e raccordo con CE	G.Bonati, S.Cristiano, F. Giarè, D.Storti, R. Di Napoli, D. Marandola, S. Tarangioli	CREA-PB
Comitato Tecnico Aree interne (CTAI)	Tavolo coordinamento attuazione SNAI	Serena Tarangioli	CREA-PB
Gruppi tecnici Accordo di Partenariato 2021-2027	Confronto su temi strategici Accordo di partenariato in via di elaborazione	F. Giarè	CREA-PB
Gruppo tecnico Attuazione Accordo di Partenariato 2014-2020	Confronto periodico su Monitoraggio AP	R. Pergamo	CREA-PB
Ossarvatorio Nazionale Agricoltura Sociale	Tavolo tecnico presso Mipaaf con Regioni e OOPP su attuazione legge AS	R. Romano	CREA-PB
Scientific Advisory Board	Journal of Food Economy	M. Scornaienghi	CREA-PB
Strategia Forestale Nazionale	Tavolo tecnico Mipaaf, Regioni su attuazione legge forestale nazionale	A. Vagnozzi	CREA-PB
Tavolo Tecnico ACCREDIA per certificazione benessere animale filiera suinicola	Definizione percorso per "standard" nazionale su certificazione benessere animale	A. Scardera, R. Sardone	CREA-PB
Rete dei Servizi e della Ricerca in Agricoltura	Tavolo di coordinamento delle regioni sui temi AKIS	G. Bonati	CREA-PB
Tavolo tecnico certificazione sostenibile filiera vitivinicola	Tavolo coordinamento con Mipaaf/regioni/altri enti certificatori	D. Storti	CREA-PB
Tavolo tecnico BUL	Tavolo coordinamento con Mise/Infratel/regioni su attuazione BUL	D.Storti	CREA-PB
OCSE, Working Party on Rural Policy	Rural develoment policies working group	F. Cisilino, G. Zanuttig	CREA-PB
Acrion group 5 Eusalp - EU Strategy for the Alpin Region	Rural develoment policies working group for apline regions	S. Cristiano	CREA-PB

Events - National Rural Network

Event titles	References	Person in charge	CREA Centre
LEADER: Stato dell'arte e nuova programmazione	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21446	R. Di Napoli	CREA-PB
I servizi eco-sistemici forestali: stato dell'arte e strategie di sviluppo dei mercati volontari e misure forestali dei PSR	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/20396	R. Romano, S. Maluccio	CREA-PB
Una nuova alleanza per una Val di Sole sostenibile	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/20467	M. Verrascina	CREA-PB
Strategia Forestale Nazionale - Presentazione Proposta della Strategia Forestale Nazionale	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21092	R. Romano	CREA-PB
Leader in azione per sostenere le Comunità locali	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21446	R. Di Napoli	CREA-PB
Agricoltura digitale: soluzioni e opportunità	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21268	G.Bonati	CREA-PB
L'agricoltura di precisione e digitale (Focus group con esperti)	_	A.Monteleone	CREA-PB
Leader in azione per sostenere le Comunità locali	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21224	R. Di Napoli	CREA-PB
E-commerce dei prodotti agricoli ed agroalimentari	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21286	G. Bonati	CREA-PB
Agricoltura digitale: dati rilevati da remoto per l'azienda agricola e le amministrazioni	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21343	F. Lupia	CREA-PB
Budget di salute: opportunità per l'agricoltura sociale	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21301	M.Ascani, C. De Vivo	CREA-PB
L'innovazione al servizio dell'agricoltura: le esperienze dei GO	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21319	P. Borsotto	CREA-PB
Blockchain e dati in agricoltura	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21385	R. Pergamo	CREA-PB
La connettività a banda ultra larga nelle aree rurali	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21404	N. D'Alicandro	CREA-PB
L'agricoltura di precisione e digitale (focus group con OOPP e altre rappresentanze)	_	A.Monteleone	CREA-PB
Il quadro teorico e regolamentare della valutazione dell'innovazione nei PSR	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21409	S. Cristiano	CREA-PB
Telemedicina per le aree rurali	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21487	G. Bonati	CREA-PB
"Semplificare Leader" (1° incontro)	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21452	R. Di Napoli	CREA-PB
Esperienze di valutazione dell'innovazione in agricoltura: approcci, metodi e strumenti	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21409	S. Cristiano	CREA-PB
Prospettive di valutazione dei sistemi d'innovazione in agricoltura	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21409	S.Cristiano	CREA-PB
RURAL4HACK - PSR. Motore per la sostenibilità e l'innovazione	https://www.reterurale.it/rural4learning	P. Lionetti	CREA-PB
Infrastrutture e sviluppo sostenibile: la politica agricola e di sviluppo rurale di fronte alle sfide dell'Agenda 2030	https://www.crea.gov.it/web/guest/-/agenda-2030-le-politiche-agricole-alla-prova-della-sostenibilita-	C. Zumpano	CREA-PB
Costruire le competenze dell'operatore forestale	www.reterurale.it/foritaly	R. Romano	CREA-PB
"Semplificare Leader" (2° incontro)	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21420	R. Di Napoli	CREA-PB
Una nuova alleanza per una Val di Sole sostenibile	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21692	M.Verrascina	CREA-PB
L'approccio interattivo per l'innovazione: l'esperienza dei GO	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21888	F. Giarè, P. Borsotto	CREA-PB
Semplificare Leader (3° incontro) "Uso dei costi semplificati nell'ambito di Leader"	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/22003	R. Di Napoli, F. Muscas	CREA-PB
Bio distretto Terre degli Elimi - Focus group	_	G. Dara Guccione	CREA-PB
Bio distretto Valle Camonica - Focus Group	_	A.Sturla	CREA-PB
EvaluationWORKS! "Improving evidence-based RDP evaluations in view of the ex-post"	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21846	S. Cristiano, M.Bolli	CREA-PB
Semplificare Leader (3° incontro) "Tassonomia degli interventi di Leader: definizioni e iter procedurali"	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/22003	R. Di Napoli	CREA-PB
Healthy Soil "La nuova strategia UE per il suolo: Sfide e implicazioni per la PAC	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/22040	D. Marandola	CREA-PB
Semplificare Leader (3° incontro) "Ruolo, attività delegate e inquadramento giuridico del GAL"	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/22003	R.Di Napoli	CREA-PB

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RRN MAGAZINE. Bee cool! Api, sentinelle dello stato di salute ambientale. ISBN/ISSN 2532-8115	**http://www.pianetapsr.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/2347**	M. Verrascina (a cura di) e AAVV	PSRHUB n° 7 - Strumenti finanziari e sviluppo rurale: stato dell'arte e prime riflessioni per il futuro 'ISBN/ISSN 9788833850771	**https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21714**	F. Licciardo e F. Cisilino
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Policy brief: "L'Italia e la PAC post 2020. Favorire lo sviluppo sostenibile e un'efficiente gestione delle risorse naturali"	https://www.reterurale.it/PACpost2020/percorsonazionale	AA.VV.	Policy brief: "L'Italia e la PAC post 2020. Contribuire alla mitigazione dei cambiementi climatici e all'adattamento a essi, come pure allo svliluppo dell'energia sostenibile"	https://www.reterurale.it/PACpost2020/percorsonazionale	AAVV
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Misure preventive e precauzionali delle AdG dei PSR in risposta all'emergenza epidemiologica da Covid-19	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21416	F. Varia	Expo' rurale per promuovere il turismo lento in Sicilia	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21218	AAVV
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La misura 14 Benessere animale in Campania	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21185	C. Salerno	Esperienze di cooperazione istituzionale e integrazione tra fondi e politiche adottate in italia in fasi emergenziali	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21162	C. Zumpano, D. Storti, F. Mantino, R. Romano, I. Borri
Progetti di comunità per promuovere lo sviluppo delle aree Leader in Toscana	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21174	AAVV	Covid-19. Leader in azione per sostenere le comunità locali	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21120	AAVV
Lo stato di avanzamento delle sottomisure 16.1 e 16.2 dei PSR 2014-2020	https://www.innovarurale.it/it/pei-agri/documenti/lo-stato-di-avanzamento-delle-sottomisure-161-e-162-dei-psr-2014-2020-febbraio	E. Ascione, R. Ugati	Semplificare per una attuazione efficiente e efficace: l'utilizzo dei costi semplificati nel Leader	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/20973	F. Muscas, E. Reda, G. Ricciardi
Il Leader durante l'emergenza epidemiologica da Covid-19, una panoramica delle iniziative e disposizioni adottate dalle UE, dalle Reti europee e regioni italiane	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/20983	G. Ricciardi	Benessere animale e sostenibilità ambientale della produzione zootecnica	https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/20644	G. Pirlo, M. Speroni

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L'attuazione dell'agricoltura sociale nella programmazione 2014-2020 della politica di sviluppo rurale - situazione al 31 dicembre 2020	**https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/22229**	C. De Vivo e M. Ascani	Leader in azione per sostenere le comunità locali: Report di sintesi ReteLeader questionario GAL - Aprile 2020	**https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/21123**	R. Di Napoli, R. Ciaravino, F.Muscas, G. Ricciardi, E. Reda
Il fine tuning delle zone soggette a vicoli naturali	**https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/19589**	AAVV	Towards an evaluation plan: an on-the-job training experience in Piedmont Region	**Proceedings of the 24th European Seminar on Extension (and) Education**	P.Borsotto, I. Borri, R. Cagliero, S. Trione A.Vagnozzi
Migrants workers and processes of social inclusion in Italy: the possibilities offered by social farming	**Sustainability, 2020**	P. Borsotto, F. Giarè, G. Ricciard	La normativa italiana sull'agricoltura sociale e il ruolo dell'impresa agricola.	**Italian Review of Agricultural Economics 75(2)**	F. Giarè, G. Ricciardi, M. Ascani
Designing Rural Policies for Sustainable Innovations through a Participatory Approach	**Sustainability, 2020**	F. Cisilino, A. Monteleone	Social innovation and rural development in the documents on the future of EU policies	**Proceedings of the LV Conference of SIDEA studies.**	M. Ascani, C. De Vivo
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The Agricultural Knowledge and Innovation System (AKIS) in Campania Region: the challenges facing the first implementation of experimental model	**Journal of Agricultural Policy ISSSN 2520-1223 (Online) Vol.3, Issue No.2, pp 35 – 44**	C. Menna et Al.	Quali politiche per quali spazi e attori	**Urban@it - 2/2020 ISSN 2465-2059**	P. Borsotto, R. Cagliero
Actor-Oriented Multi-Criteria Assessment Framework to Support a Transition Towards Sustainable Agricultural Systems Based on Crop Diversification	**Sustainability 2020, 12(13), 5434**	G.Dara Guggione et al.	Le politiche per il settore e il ruolo delle OP	**Olivo e Olio•n. 6/2020**	M. R. Pupo D'Andrea, E.Reda
An action-research exploration of value chain development from field to consumer based on organic hempseed oil in Sicily	**OCL - Oilseeds and fats, Crops and Lipids**	G. Dara Guggione, S. Canali et A	The role of rurality in determining the economy-wide impacts of a natural disaster	**Economic Systems Research**	A. Bonfiglio, S. Coderoni, R. Esposti, Baldoni E.
Neo-Endogenous Rural Development in Favor of Organic Farming: Two Case Studies from Italian Fragile Areas	**European Countryside, Volume 12 2020 No 1 p. 1-29 - Issue 1**	A. Belliggiano, A. Sturla, M. Vass L. Viganò	Spatial distribution of organic farms and territorial context: An application to an Italian rural region	**Bio-based and Applied Economics**	Bonfiglio A., Arzeni A.
Organic Food Consumption: The Relevance of the Health Attribute	**Sustainability 2020, 12, 595**	Rizzo G., Borrello M., Dara Gucc G., Schifani G., Cembalo L.	Urban Agriculture and Water Use in the Search for Sustainability Options	**Handbook of Environmental Materials Management - Springer**	Pulighe G., Carta V., Lupia F.
The Sicilian cooperative system of wine production The strategic choices and performance analyses of a case study	**International Journal of Wine**	Borsellino V., Varia F. et al.	Farm advisory services and knowledge growth in Italy: comparison among three regional intervention models	**Italian Review of Agricultural Economics Vol. 75 No. 1 (2020)**	Menna C., Gandolfi F., Cannellini M., Trentin G., Del Giudice T., Cavallo C., Cigliano I., Passari M.
Do differential payments for agri-environment schemes affect the environmental benefits? A case study in the North-Eastern Italy.	Land Use Policy	Bartolini, F., Vergamini D., Longhitano, D., Povellato, A.			

6. CREA ORGANIZATION

CREA - Council for agricultural research and economics- is the leading Italian research organization with scientific competences in the fields of agriculture, agri-food supply chains, food-science and nutrition, fishery, silviculture, and socio-economics issues.

Having inherited a hundred-year history of experimental institutes, CREA was profoundly reformed in 2015, with an organization based on a Directorate-General, 12 research centres, 6 of them focused on supply chains and 6 on transversal fields.

CREA carries out research and develops technological solutions to enhance the protection and conservation of natural resources and of agricultural, forestry and fisheries ecosystems biodiversity, as well as the profitability and competitiveness of agriculture, agri-food and forestry activities, in a context of sustainability and health of production; it promotes the objectives of competition between agro-food and industrial systems for "Made in Italy" products; it promotes and develops relations with public research institutes, private, national and international; it promotes the debate on scientific topics of interest to Italian and European agriculture; it carries out certification, testing and accreditation activities in the relevant fields.

CREA is a legal entity under public law, supervised by the Ministry of Agricultural, Food, Forestry Policies (Mipaaf). Its organization chart is made up of:

- **The President,** Prof. Carlo GAUDIO, appointed by Decree of the President of the Italian Republic, upon the appointment of the Minister of Agricultural, Food and Forestry Policies, after consultation with the Parliamentary Committees on Agriculture.
- **The Board of Directors**, which, in addition to the Chairman, is composed of 4 members: two members upon appointment by the Minister, one member upon appointment by the Regions-State Conference and one member elected by the staff of CREA; the new Board of Directors, appointed on February 15th, 2021, in addition to President Gaudio, is composed as follows: Prof. Alberto Basset; Prof.ssa Stefania De Pascale, Dr. Enrica Onorati e Dr. Domenico Perrone.
- **The Scientific Council**, composed as follows: Prof. Michele Morgante; Prof. Dario G. Frisio; Prof. Andrea Segrè; Dr. Gabriella Morini; Prof. Felice Adinolfi; Prof. Angelo Frascarelli; Prof.ssa Laura De Gara; Dr. Marina Carcea; Dr. Domenico Ventrella; Dr. Ignazio Verde; Dr. Ernesto Lahoz; Prof. Giorgio Calabrese.
- **The Board of Auditors,** composed as follows: Dr. Laura Belmonte – President; Dr. Luca Fazio; Dr. Carlo Regoliosi.

The Board of Directors

President, Prof. Carlo GAUDIO	*Vice President, Member* *Prof.ssa Stefania De PASCALE*	*Member* *Prof. Alberto BASSET*	*Member* *Dr.ssa Enrica ONORATI*	*Member* *Dr. Domenico PERRONE*
				

The Director-General, responsible for the overall management of CREA, oversees the activities of all offices and takes care of the organization and management, ensuring both the operational coordination of all the departments and the operational and administrative units present on the whole territory. Since November 2020, the CREA DG is Dr. Stefano Vaccari.

Control over the financial management of the institution is also ensured by a Magistrate of the Italoian Court of Audit, who attends the meetings of the Board of Directors and the Board of Auditors. Currently, the delegated Magistrate is Cons. Donato LUCIANO.

CREA has scientific, statutory, organizational, administrative and financial autonomy, in order to enable the Institution to achieve its aims as defined within the objectives and guidelines laid down by the Minister of Agriculture, Food and Forestry Policies.

CREA's budget revenue is largely secured by the Ministry of Agricultural, Food and Forestry Policies, through a specific annual allocation, but they are complemented by the hundreds of projects financed by other State Administrations, Regions and European Union in which CREA participates.

CREA staff is mostly employed by permanent contracts, enjoying therefore a significant proportion of stability in contracts. As of December 31, 2020, 2,213 staff units worked for CREA, 81% of whom in research and technical roles. The rate of women employed is 51.4%. About 7% of the staff works in the Central Administration. CREA staff is located in 80 operative branches.

The ***Central Aministration*** supports the research centres in technical and administrative activities and provides the common institutional services.

The following table provides a summary of the different Offices and their Heads of the Central Administration:

CENTRAL ADMINISTRATION (31 december 2020)	**Executive**	**CENTRAL ADMINISTRATION**	**Executive**
UDG1 - Programming and Management control	Speranza De Chiara	UDG8 - Information Systems	Speranza De Chiara (*ad interim)*
UDG2 - Transparency and anti-corruption	Fiorella Pitocchi	USC1 - Recruitment, training and labour	Silvia Incoronato
UDG3 – Project management	Laura Proietti	USC2 - Financial resources	Carla Berti
UDG4 - Institutional Affairs and International relations	Paola Fiore	USC3 - Human Resource Management	Mara Peronti
UDG5 - Technology Transfer	Corrado Lamoglie	USC4 – Property and real estate valorisation	Fidalma D'Andrea
UDG6 - Certification activites management	Antonio Di Monte	USC5 – Contracts Office	Emilia Troccoli
UDG7 - General and Legal Affairs	Ginevra Albano	*Press Office*	*Cristina Giannetta*

CREA, as said, is structured in 12 research centers (6 interdisciplinary and 6 focused on supply chain) distributed all over the national territory and collaborating with a central administration, local and regional institutions, companies and various commercial and industrial sectors and associations. From a structural point of view, CREA can boast a large number of structures.

In the publication "I Centri di ricerca del CREA", available at https://www.crea.gov.it/-/presentation-del-volume-centri-di-ricerca-del-crea- further details and insights on the single CREA Research Centers are available

RESEARCH CENTRES	STRUCTURES	REAL ESTATE	MAIN LABORATORIES	HECTARES
Agriculture and Environment (CREA-AA)	4	34	6	111
Food and Nutrition (CREA-AN)	1	1	1	
Cereals and Industrial Crops (CREA-CI)	8	80	3	939
Plant Protection and Certification (CREA-DC)	10	31	4	239
Forestry and Wood (CREA-FL)	3	19	2	480
Genomics and Bioinformatics (CREA-GB)	3	12	2	30
Engineering and Agro-Food Processing CREA-IT	6	75	4	295
Olive Fruit and Citrus Crops (CREA-OFA)	6	38	4	194
Vegetables and Ornamental Crops (CREA-OF)	4	27	5	31
Agricultural Policies and Bioeconomy (CREA-PB)	18	-		-
Viticulture and Enology (CREA-VE)	6	22	5	38
Animal Production and Aquaculture (CREA-ZA)	5	257	5	2.567
Central Administration (CREA-AC)	1	-		-
TOTAL	**75**	**596**	**41**	**4.924**

Staff working at CREA (situation at 31 December 2020)

Position PROFILE	Agriculture and Environment (CREA-AA)	Food and Nutrition (CREA– AN)	Cereals and Industrial Crops (CREA-CI)	Plant Protection and Certification (CREA-DC)	Forestry and Wood (CREA-FL)	Genomics and Bioinformatics (CREA-GB)	Engineering and Agro-Food Processing CREA-IT	Vegetable and Ornamental Crops	Olive Fruit and Citrus Crops (CREA-OFA)	Agricultural Policies and Bioeconomy (CREA-PB)	Viticulture and Enology (CREA-VE)	Animal Production and Aquaculture (CREA-ZA)	Central Administration (AC)	TOTAL
Research Director													1	**1**
Research Manager 1st grade													12	**12**
Research Manager 2nd grade	7	2	2	5	2	3	3	5	3	6	-	8	-	**46**
Technical Manager	1	2	-	-	-	1	3	-	-	4	2	-	-	**13**
Chief Researchers	6	9	11	7	1	1	6	3	6	17	5	10	-	**82**
Chief Technicians	2	-	2	7	-	-	2	1	1	10	1	1	-	**27**
Researchers	55	50	31	45	27	35	47	31	41	52	38	37	-	**489**
Technicians	14	4	7	21	7	-	3	2	3	104	19	11	27	**222**
Administrative Officers	1	4	2	2	3	-	-	2	2	1	2	1	16	**36**
Technical collaborators	43	32	27	95	24	5	31	17	35	70	26	18	24	**447**
Administrative collaborators	15	15	8	22	4	2	8	5	21	46	10	12	55	**223**
Administrative operators	15	6	6	21	9	4	11	12	19	6	13	14	11	**147**
Technical operators	28	5	39	67	14	11	27	26	24	4	21	50	3	**319**
Other		1		1										**2**
PhD Students	1	3	9	1	-	-	7	9	20	-	11	15	-	**76**
Research grant holders	-	1	1	5	-	3	2	-	7	11	8	4	-	**42**
Agricultural Operators				9				3				17		**29**
Total	**188**	**134**	**145**	**308**	**91**	**65**	**150**	**116**	**182**	**331**	**156**	**198**	**149**	**2.213**

THE CREA RESEARCH CENTRES and THEIR DIRECTORS

Agriculture and Environment (CREA-AA)
Structures in: Bologna Saliceto, Bari, Bologna, Florence, Rome
Director: Marcello Donatelli
marcello.donatelli@crea.gov.it
https://www.researchgate.net/profile/Marcello_Donatelli

Food and Nutrition (CREA– AN)
Structures in: Rome
Director: Elisabetta Lupotto
elisabetta.lupotto@crea.gov.it

Cereal and Industrial Crops (CREA-CI)
Structures in: Rovigo, Bergamo, Bologna, Foggia, Vercelli, Acireale, Caserta
Director: Nicola Pecchioni
nicola.pecchioni@crea.gov.it
https://www.researchgate.net/profile/Nicola_Pecchioni

Plant Protection and Certification (CREA-DC)
Structures in: Milan, Palermo, Lonigo (VI) - Bagheria (PA), Battipagnia (SA), Florence, Rome, Tavazzano (LO), Vercelli
Director: Pio Federico Roversi
piofederico.roversi@crea.gov.it

Forestry and Wood (CREA-FL)
Structures in: Rende (CS), Rome, Arezzo, Casale Monferrato, Trento
Director i.t.: Giuseppe Nervo
giuseppe.nervo@crea.gov.it

Director until September 2020: Pier Maria Corona

Genomics and Bioinformatics (CREA-GB)
Structures in: Fiorenzuola d'Arda (PC),Montanaso Lombardo (LO), Rome
Director: Luigi Cattivelli
luigi.cattivelli@crea.gov.it
https://www.researchgate.net/profile/Luigi_Cattivelli

Engineering and Agro-Food Processing (CREA-IT)
Structures in: Rome, Forlì, Pescara, Turin, Milan, Monterotondo (RM) Treviglio (BG)
Director: Paolo Menesatti
paolo.menesatti@crea.gov.it

Olive Fruit and Citrus Crops (CREA-OFA)
Structures in: Rende (CS), Spoleto (PG), Acireale (CT), Caserta, Forlì, Rome Ciampino
Director i.t. Enzo Perri
enzo.perri@crea.gov.it

Director until 2020: Paolo Rapisarda

Vegetable and Ornamental Crops (CREA-OF)
Structures in : Monsampolo del Tronto (AP), Pescia (PT), Pontecagnano (SA), Sanremo
Director: Teodoro Cardi
teodoro.cardi@crea.gov.it
https://www.researchgate.net/profile/Teodoro_Cardi

Agricultural Policies and Bioeconomy (CREA-PB)
Structures in: Rome, Bari, Bologna, Cagliari, Campobasso, Florence, Genova, Legnaro, Milan, Osimo, Palermo, Potenza, Reggio Calabria, Rende, Turin, Udine, Naples, Pescara, Perugia
Director: Roberto Henke
roberto.henke@crea.gov.it

Viticulture and Enology (CREA-VE)
Structures in: Conegliano (TV), Asti, Arezzo, Velletri (RM), Gorizia, Turi (BA)
Director: Riccardo Velasco
riccardo.velasco@crea.gov.it
https://www.researchgate.net/profile/Riccardo_Velasco

Animal Production and Aquaculture (CREA-ZA)
Structures in: Monterotondo (RM), Lodi, Modena, Bella Muro (PZ)
Director: Luca Buttazzoni
luca.buttazzoni@crea.gov.it
https://www.researchgate.net/profile/Luca_Buttazzoni

Consiglio per la ricerca in agricoltura
e l'analisi dell'economia agraria

Council for Agricultural Research and Economics

CONTACTS

HEADQUARTER
Via Po, 14 - 00198 - Roma
Ph +39 06 478361
C.F. 97231970589 P.I. 08183101008
MAIL segreteria.direttoregenerale@crea.gov.it
PEC crea@pec.crea.gov.it