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Oral presentations

Insights into preferences of organic consumers for pasta made with ancient wheat

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Pasta is one of the most popular and representative foods of the Mediterranean diet. In Italy, the world's biggest pasta producer and consumer, pasta is part of the culinary tradition and culture. Different pasta typologies are commercially available. Among those, dried pasta made with durum wheat is considered as staple food for Italians because of its sensory characteristics, versatility and cheapness. Despite the pasta consumption increase in 2020 due to the COVID-19 pandemic, the sector has been experiencing a decrease in demand since 2011. The main reasons for this negative trend may be health reasons, preference for diets with a lower intake of carbohydrates, and integration with novel foods from other cultures, among others. The need of high-quality and healthier foods is particularly evident among organic consumers. Specifically, the growing awareness of organic consumers for sustainable agriculture and biodiversity increased the demand for local products made with high-quality raw materials. Specific claims such as natural, local or healthy positively impact consumers' preference and choice. Nevertheless, the consumption of wholegrain pasta or pasta made with ancient grains is very limited compared to the conventional one. Nevertheless, only one study has investigated organic consumers' preferences in relation to pasta made with ancient grains. The present study aims to explore Italian organic consumers' preferences towards dried pasta made with ancient wheat varieties and the relevant claims for improving the communication strategy of this food product. Focus groups and conjoint analysis were used to obtain a holistic view. A total of seventeen organic consumers (regular or occasional) participated in the focus group discussions, and seventy-three respondents answered the conjoint analysis experiment. The conjoint analysis was performed via the 1000Minds online software platform using the "PAPRIKA" method. Results indicated that most participants have limited knowledge about "ancient" grain varieties. However, the perception of pasta made with "ancient grains" was positive, confirming previous studies focusing on ancient wheat food products. In fact, the conjoint analysis results showed that the "Ancient grains" attribute was preferred over the more generic "Durum wheat". Although good taste is the first driver to purchase, the origin, quality of the raw material and certification are relevant drivers too. Moreover, results from the conjoint analysis indicated that consumers prefer a highly specified "local" claim over a generalized one. Regarding the price, FG participants perceived it too high. However, most of FG participants declared to be more willing to pay a price premium for high-quality products with the desired characteristics. Finally, the low importance of pasta brand for organic consumers indicated how organic pasta market is still growing and can be considered highly fragmented. Results may be used to suggest more efficient marketing strategies for pasta producers.

Fostering biodiversity through innovative cattle farming: Consumers' views on virtual fencing and insights regarding a multi-level biodiversity labelling scheme for pasture-raised beef

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Cattle grazing supports ecosystem services and biodiversity and provides valuable pasture-raised beef and dairy products. While the share of cattle grazing on grassland is decreasing in Europe, innovative grazing management systems applying virtual fencing can optimize and promote grassland use. To stimulate consumer demand, communicating the benefits of grazing-based production, e.g. through labelling, is vital. Yet, we know little about consumer perceptions of virtual fencing and of labels designed to certify the biodiversity benefits of cattle products. Thus, we aimed to explore consumer perceptions, understanding, and acceptance of virtual fencing in cattle pasturing and of a multi-level labelling system for beef from biodiverse grazing systems. We investigated several research questions: How do consumers understand grazing, biodiversity, and pasture-raised products? What do consumers think about virtual fencing? How do consumers perceive a multi-level biodiversity labelling system? We conducted two qualitative studies with a total of 60 German consumers. In the first study, consumer responses to information brochures with different argumentation lines were tested using 20 in-person think-aloud protocols. The second study consisted of six audio-only online focus groups with 40 respondents to examine perceptions of a multi-level labelling scheme that differentiates between biodiversity conservation measures. Think-aloud protocols demonstrated the participants' support of pasturing to promote animal welfare and foster biodiversity. However, respondents struggled to see the advantages from a specific grazing management practice; many of them were skeptical about virtual fencing. Online focus groups revealed significant challenges to the implementation of biodiversity labelling, including low levels of understanding of biodiversity among consumers, many of whom currently place little value on the biodiversity benefits of products. Our findings, however, highlight consumers' appreciation for biodiversity conservation at local level and, thus, the opportunities for selling local pasture-raised beef. Policy action is needed to encourage livestock practitioners to conserve and promote biodiversity.

Sustainability impact of rural SFSCs organized by consumers: evidence from a case study

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When rural development and multifunctionality in agriculture are considered, it refers to a series of strategies and purposes that aim to keep resources, people, knowledge, know-how, and socio-economic-cultural factors essential to maintain alive rural areas. From this point of view, a short food supply chain (SFSC) is one of the character of rural development and agricultural multifunctionality, which aims to incentivize the economic growth of the reference territory and develop social ties at the local level, thus consolidating the permanence of the population and of activities in the countryside. This study explores the role of the SFSC when it is organized by consumers and citizens with the specific aim to ampere the level of social sustainability of the territory and the consequent local economic impact. The purpose of this work is twofold: to measure the ability of SFSC to contribute to the rural economy, therefore socio-economic sustainability, and to understand which tools can be systematically introduced to increase capacity to stay on the market. The evaluation of relationships between SFSC and Rural Development is made on the case study of the farmers' market "Mercatiamo", which is a direct-distribution channel made up of small organic farmers, adhering to the Participatory Guarantee System. The case study will provide an overview of the socio-economic impact that the short food supply chain has on the local community and of the strategies that producers implement with respect to their competitors. The Local Multiplier 3 methodology will be used as an indicator of economic sustainability, and the study, through a questionnaire, of the marketing mix strategies implemented to measure the capacity of competing in the market.

Innovation and segmentation of the EU cheese market: a discrete choice experiment

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The dairy sector in Europe is expected to grow by 2030, increasing the already intensive competition, especially in the highly industrialized cow's milk cheese industry. In such a framework, the key to future growth is innovation. Nevertheless, as cheese is a product that is highly linked to the local identity and food culture, it is difficult to introduce significant changes or radical innovations in the product. In this context, consumers are more prone to accept novelties that reinforce the authentic and traditional character of the product itself. Given the rising interest of European consumers in products with societal benefits, innovation through more sustainable processes and labelling (ethical and health-related) might allow the cheese industry to modify existing products according to the needs of new specific marketing demands. Consumer preferences and purchase intentions are heterogeneous between and within different countries and cultures. Moreover, although consumers might have a real interest on sustainable and health related labels, they might show restrictions on their willingness to pay for such benefits. These differences are market segment dependent. Therefore, studying consumers' preferences, their choices and willingness to pay is imperative to identify those segments in different choice contexts. This research aims to identify European consumers' preferences for innovations when choosing and buying cheese to provide recommendations for identifying new market segments. Data were collected through a web survey with a hypothetical discrete choice experiment about cheese. The attributes included: price (average, +/- 30%), origin (national/EU), Protected Designation of Origin label (present/none), Organic Euro-leaf label (present/none), milk source (cow, goat, ewe, mix), pasteurization/raw milk, type of rennet (animal/vegetal origin) and low salt content (present/none). The respondents were selected using a quota representative online panel in seven countries: Finland, France, Greece, Italy, Spain, Turkey and the United Kingdom. A total of 2,900 responses were collected. Mixed Multinomial Logit and Latent Class Multinomial Logit models were estimated at the country level to identify the willingness to pay for each consumer segment. All segments were described in terms of sociodemographic, behavioural, knowledge and psychographic variables. Results show that most of the countries investigated highly value organic labels and Protected Designations of Origin (PDO). Nevertheless, there are also differences between countries. Finland and the United Kingdom are more interested in cheese made from cow's milk and are the only countries willing to pay for vegetable rennet. Moreover, France is the only country with a positive willingness to pay for goat's milk cheese and raw milk. Although some segments appear cross-country, there are also substantial differences between the preferred attributes among diverse segments in different countries.

Storytelling for biodiversity: Examining the effects of different comic formats on consumers' attitudes and sustainable food choices

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Our current food systems substantially contribute to biodiversity loss, which in turn jeopardises food security. A promising way towards transforming current food systems is to shift towards more sustainable and biodiverse-friendly diets. However, consumers are often not aware of what constitutes a sustainable food choice and its impact on biodiversity, as one of the dimensions of sustainability. Therefore, it is crucial to effectively communicate this information to consumers. As stories – and especially comics – are engaging, persuasive and accessible to a large audience, they are a particularly effective tool for scientific communication. They allow readers to mentally construct and “immerse” themselves in the plot (i.e. narrative transportation) which reduces counter arguing and induces increased emotional responses. Given that biodiversity is a complex topic that can be difficult to communicate and understand, we developed three comic concepts that all aim to raise awareness of the link between food choices and biodiversity within a story format. This study explores the persuasive effects of these three comic concepts. In an online mixed design study, participants are randomly assigned to either one of three comic conditions or a control condition. Before and after reading the comic, participants rate their attitudes towards biodiversity in the food-domain, intention to eat biodiverse dishes and reveal their food choice. Furthermore, participants report their experienced narrative transportation and understanding upon reading the comic. We expect all three comics to lead to higher attitudes, intention and behaviour for biodiversity compared to the control condition. Exploratorily, we investigate which comic is most persuasive in influencing attitudes, intentions and behaviour. Having identified the most persuasive comic, we aim to implement this narrative in a real-world laboratory.

Are differentiation strategies backed by certification schemes a lever of sustainability for actors in agri-food value chains? – A study of the organic farming market in France and Europe according to Lancaster’s theory

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Faced with new environmental and societal challenges, but also economic pressures from the market, farmers are forced to adapt their farming practices and marketing strategies. In a context of globalization where “green washing” and food health crises have already taken their toll, it can be difficult for farmers to gain recognition for their products’ quality and trust of increasingly demanding consumers. This article aims to understand how producers, involved in sustainable value chains, can develop new value-adding strategies, while taking into account the evolution of regulations and demand in the end market. To do so, we first extend a previous empirical study on the evolution of the French organic farming market between 1920 and 1995, using the convention theory (Sylvander, 1997). It allows us to pursue the previous analysis, on the link between practices, regulations, and strategies, in the organic farming sector beyond 1995 till today. Then, we mobilize the new consumer theory (Lancaster, 1966) to explain how the practices, regulation and strategic levers are interconnected in value chains to meet sustainability criteria and market accessibility conditions. This theoretical framework allows us to graphically explain differentiation strategies that rely on labelling but also on the promotion of ethical and environmentally-friendly attributes of products. It also allows us to highlight the role of coordination between actors, perception of products’ attributes and price variations in the organic farming market. By doing so, our approach differs from more classical economic approaches, which focus essentially on the analysis of market mechanisms and price determination between producers and consumers. Besides, by using the Lancaster’s theory to studying a labelled market, we illustrate how different strategies can enable producers to build more environmentally and socially sustainable value chains, while maintaining their economic profitability.

Factors influencing farmers' decisions on crop diversity: literature review and implications for industrialized and high- income countries

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Maintaining on-farm crop diversity is seen by academic discourse and by various policies as an important strategy to improve economic and environmental sustainability and to attain resilience under changing climatic conditions. At the same time, crop diversity in Europe declined over the last decades. Crops that can significantly enrich biodiversity are scarcely present in the agri-food value chain and in consumers' food diets. In such a situation understanding of key factors influencing the decision of farmers to adopt additional and/or new varieties of crops is highly important to find the pathways towards increased crop diversity. Generally, the discussion of factors impacting the farmers' decisions on crop diversity are quite popular in scientific literature. At the same time, this discussion usually focuses on developing countries with prevailing numbers of smallholder farms characterized by high subsistence level (Tacconi et al. 2022; Viira 2022). The objective of the current article is to use the available literature to perform an in-depth study of the factors that play a role specifically for industrialized and high-income countries and summarize the implications of various farming contexts for crop diversity. The key research question is: which factors have particularly strong influence on farmers' decisions related to diversification of crops and particularly to adopting new and/or underutilized crops? The methodology of this study uses the literature review approach in four steps: (1) We use the available reviews (Tacconi et al. 2022; Viira 2022) to pre-select the factors and constraints that might play a particular role for industrialized and high-income countries. (2) The next iteration of literature review uses key words indicating the selected factors together with "crop diversity" and associated terms like "crop diversification". (3) After the search, those articles are selected that focus on industrialized and high-income countries as basis for empirical analysis. (4) The presentation of the results is structured around the pre-selected factors and focuses on implications and development directions for crop diversity. We expect that the following factors will have particularly significant impact on crop diversity decisions of farmers within the context of industrialized and high-income countries: management, income and further characteristics of a particular farm and farmer; environmental conditions and agroecological context; marketing options and interactions within the value chain; involvement into various networks and associations and access to information; institutions and policies governing the farming sector and interactions within the value chain.

Scale efficiency in EU milk production: what are the consequences of milk quota abolition?

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The abolition of European milk quotas has significantly changed the milk sector environment and accelerated structural adjustments with implications for regional development. This paper examines the EU milk sector dynamics through the scale efficiency in the context of the abolition of milk quotas. The regional analysis is conducted for 24 European countries in period 2004-2017. To control for potential endogeneity system GMM estimator of input-distance functions is used on farm-level data. The main goal of the paper is to provide regional-level evidence on the value and dynamics of scale efficiency in EU milk production in relation to milk quota abolishment. The study will answer a series of research questions: Firstly, what are the differences in scale efficiency among the EU regions? Secondly, what are the factors determining scale efficiency dynamics in EU regions? Thirdly, can we observe the effects of milk quota abolishment on scale efficiency dynamics? The study extends the current literature by the regional analysis of dairy sector competitiveness driver – scale efficiency. Since quota regime restrained the comparative advantages of European regions, the paper presents empirical evidence of the positive effects of milk quotas abolishment on scale of operations and restructuring of the dairy sector after quota removal with consequences for regional development and rural employment. In contrast to most previous studies on structural changes following the abolition of milk quotas, which focused only on few countries/regions (e.g. Olvera-Porcel et al., 2022; Cele et al., 2022; Lappe et al., 2022; Salou et al., 2017), the paper analyses farm-level data from 24 EU countries. Moreover, to the best of our knowledge, this is the first study of the milk production scale efficiency dynamics in relation to quota abolition. However, our research not only fills a scientific gap by providing regional-level evidence of scale efficiency and its dynamics in the context of quota abolishment, but also helps to better understand changes in milk production in order to strengthen its governance in new green policy environment.

Do we like the look of agriculture? A discrete choice experiment to evaluate preferences for aesthetic value of agricultural landscapes

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While regulating and maintaining ESs are highly studied in the literature, provisioning and particularly cultural ESs receive much less attention. We supplement the cultural ESs literature by analyzing the aesthetic value of agricultural landscapes using a discrete choice experiment (DCE). We compare results between three case study areas: Flanders, Belgium, Hungary and the United Kingdom. Our objective is to identify the aesthetic value of agricultural landscapes under ecological transition, and to see how this value differs across different European contexts. Specifically we aim to answer following research questions: i) How do people value aesthetic services in an agrarian landscape? and ii) How much are people willing to pay for these services? A DCE was carried out in the spring of 2022. A total sample of 2537 respondents was collected (*N*Flanders=1037,*N*Hungary=500,*N*UK=1000). Seven attributes were included in the DCE: 1. land coverage, 2. landscape diversity, 3. crop separation, 4. Mechanization degree, 5. agricultural infrastructure, 6. energy generating infrastructure, and 7. a payment vehicle which was presented as an increase in monthly food expenditure (€). Mixed logit models, generalized-multinomial logit model and latent class models are used to evaluate (differences in) preferences and willingness to pay. Preliminary results indicate that respondents have a positive value the aesthetic services associated with agricultural landscapes. Respondents show a positive preference for covered land, increasing levels of landscape diversity, and for wild, unmanaged crop separations. Preferences for anthropogenic attributes are more varied, with respondents only demonstrating a positive preference for medium mechanization levels, and medium infrastructure. Comparing between different European contexts we find that respondents in Flanders, Belgium and the United Kingdom similarly value the aesthetic features of a landscape under ecological transition, while the same landscape in Hungary elicits different preferences.

CAP start-up aid for young farmers does reflect EU's biodiversity policies?

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Agricultural intensification continues to threaten habitat and biological diversity in farmland. EU's Common Agricultural Policy (CAP) is targeting to enhance biodiversity in agriculture by promoting sustainability on farming that ensures that farmers can produce food and earn a living and at the same time that agricultural ecosystems are protected. This objective is also echoed in the European Green Deal and Farm to Fork strategy. Although several measures to support biodiversity have been established or proposed, their effectiveness is often put under question. In this context, the present study attempts to assess whether the Sub-measure 6.1 "Start-up aid for young farmers" of the Rural Development Program 2014-2020 is motivational enough to enhance the biodiversity of beneficiaries' agricultural holdings as expressed through crop diversification. For this reason, a questionnaire was developed and distributed among young farmers, with the scope to explore their attitudes and their practices in the field. Additionally, the current assignment attempts to detect potential differences in biodiversity levels between the beneficiaries and the non-beneficiaries of the measure.

Cooperative Member Preferences: A Best-Worst Scale Approach

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Cooperatives are member-oriented organizations and their sustainable performance is highly influenced by the level of commitment of their members. Commitment is driven by member preferences (i.e., utility) for several cooperative attributes. The main objective of this paper is to study empirically the relative importance that members attach to selected cooperative attributes (i.e., economic benefits; additional services; market access; corporate governance; communication, ideology). To address this research objective, a questionnaire-based survey was carried out in Zagora, Magnesia, Greece in the “ZAGORIN” multi-purpose agricultural cooperative in Fall 2021. The Best-Worst scale method was applied to analyze the data (n=106) and, further, a Latent Class Analysis (LCA) was employed in order to identify the diversity in members’ preferences. The findings indicate that the economic benefits is the most important attribute. Furthermore, the results of the LCA revealed two distinct sub-groups among the total sample of participants: the “Business-oriented” (larger in size segment, n=74) and the “Ideology-seekers” sub-groups (much smaller in size segment, n=32). Knowledge of the existence of member segments and an understanding of their preferences may be useful to co-operative policy makers and managers to better evaluate the extent of member commitment and make more informed decisions of how a cooperative can servicing its membership needs.

Climate crisis, biodiversity, and the value chain of carob flour in Rethymno, Crete

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The carob tree (*Ceratonia siliqua*) is a species of flowering evergreen tree in the pea family that has been cultivated for centuries in Crete and in the Mediterranean basin (Tous, Romero, & Batlle, 2013). Carob trees are part of the long-established agro-silvo-pastoral systems of farming on the island. They have limited soil requirements and they thrive on the rocky, dry, sloping soils in rural areas. Sheep and goat herding along with carob tree cultivation are complementary activities that improve the environment by remediating pollution, preventing fires and naturally enhancing soil fertility (Papanastasis et al., 2009). Being multi-functional and biodiverse, agro-silvo-pastoral systems are resilient and mitigate the effects of climate change (Chebli et al., 2021). The economic and cultural value of carob has more recently resurged, as more and more people recognize that it can be used in pharmaceuticals, nutraceutical industries, cosmetics etc., Carob has traditionally been processed into flour used for human consumption during WWII is currently considered a “superfood” and it used as ingredient in a range of food products such as baked goods, pasta, dairy drinks, health bars, and dietary supplements (Papaefstathiou, et al., 2018). In this presentation, using a variety of archival sources, statistical, interview and workshop data, we discuss the results of our work as partners in the HORIZON 2020 MOVING project. The presentation explores how the carob flour value chain can play a role in mitigating the effects of climate crisis in the region. The focus is on the contribution of the value chain to the development of the ecological and socio-economic factors of territorial sustainability and to the biodiversity of the region of Rethymno, Crete.

Evaluation of the effects of climate on the parameters of quality control analyses in wines

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According to the National and European Community legislation and the Quality Control regulations of wines, a series of analyses are carried out on all locally produced wines, by the government agencies. The present research examines the results of the analyses carried out on white wines produced in Epirus and the Ionian Islands (GR), and correlates them with the climatic conditions of each region. The purpose of this correlation is to evaluate the effect of the local climate not on the wine as a whole, but specifically on its individual characteristics which are identified by the analyses. The next goal of this research is the evaluation of the effects caused by the continual climate change on these characteristics, as determined by the analyses carried out. Climate change is already affecting most of the food production processes, including global wine production. For this reason, it becomes imperative to try to ensure sustainable characteristics of wine production, utilizing concepts such as biodiversity and agri-food value chains, and attempting to implement production practices based on them. Towards this effort, it is of particular importance the evaluation of the climatic effects on the individual characteristics of wines, as they outcome in the context of quality control, by the applied analyses.

Consumption patterns for healthy and environmentally friendly food choices: An overview of contemporary issues

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Understanding factors driving sustainable food consumption patterns is a crucial issue for the future wellbeing of humans, food systems sustainability and the environmental protection. Household food consumption patterns are influenced by numerous factors such as nutritional aspects, economic restrictions, cultural taste and customs, lifestyle, and consumer preferences. On the other hand, dietary patterns are associated with various impacts, both social and environmental, and constitute sources of Greenhouse Gas Emissions (GHG). However, reinforcing sustainable diets, that based on environmentally friendly foods, changing food consumption habits and increasing demand for organic food, can reduce the food-related carbon footprint, mitigate the negative impacts of climate change, improve the quality of human life, promote changes in the retail, distribution and marketing functions of business. Through a systematic literature review, scientific publications were selected and evaluated by the sight of a descriptive analysis. The reviewed articles examined to answer the following two questions: 1) How consumer needs on healthy and environmentally friendly products can shape the consumption patterns? 2) Are consumers willing to change their food choices in a more environmentally friendly direction? In addition, this article tries to demonstrate the existing policy recommendations that reinforce public awareness and encourage environmentally friendly food consumption patterns. The study highlights that a pathway towards sustainable food systems is consumer demand for healthier food and the persistence in environmentally friendly food selection. Findings from previous surveys suggest also that established attitudes toward climate change and preferences for healthier food products seem to be the key factor to increase social awareness towards environmentally friendly products and to change purchase and consumption behavior.

Agri-Food Trade Competitiveness in the Latin America and the Caribbean Region

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Latin America and the Caribbean (LAC) countries are among the global leaders in terms of the production and export of agricultural commodities, accounting for 15% of the world's average agri-food export from 1995 to 2019. LAC's abundance of natural resources plays an important role in global agricultural production and trade. With the rising global market competitiveness, considering the agri-food sector, it is important to assess if the region can compete with other global rivals, and in what products. The paper analyses the Latin America and the Caribbean region's agricultural trade patterns and competitiveness and identifies the product-level competitiveness to encourage the development of appropriate policies aimed at the growth and development of the sector. The study applies the Revealed Comparative Advantage (RCA) index (Balassa 1965), and its variations (Vollrath 1991, Dalum et al. 1998) as SRCA (Symmetric Revealed Comparative Advantage), RTA (Relative Trade Advantage), and RC (Revealed Competitiveness) at the Harmonized System 2-digit level along with the Kaplan-Meier survival rates in the agricultural sector from 1995 to 2019. The data is derived from the World Bank World Integrated Trade Solution (WITS) database. The results indicate that Brazil, Argentina, and Mexico were among the TOP agri-food exporters in LAC. The highest RCA, SRCA, and RTA indices were found in Guatemala, whereas the highest RC index was observed in Argentina. Of the 24 agricultural products, oil seeds and oleaginous fruits, miscellaneous grains, seeds and fruit, industrial or medicinal plants, and straw and fodder were the most exported items at the product level. Fruit and nuts, edible; peel of citrus fruit or melons had the most competitiveness in the worldwide market, with the highest SRCA and RC indices, whereas coffee, tea, mate, and spices had the highest BRCA and RTA values for LAC. The evidence suggests that among the TOP 10 LAC exporters, all indices in the global agri-food trade are relatively stable, whereas the survival rate was not persistent over time. The results demonstrate that all indices of agri-food trade were persistent for the TOP 10 countries in LAC, suggesting stable agri-food competitiveness. According to Kaplan-Meier survival rates, 98 per cent at the beginning of the period fell to 9 per cent by the end of the period, implying that global agricultural trade is highly competitive

Environmental risk acceptance criteria and optimal correction measures

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Environmental pollution related for example to hazardous wastes and chemicals is widely accepted as one of the main drivers of biodiversity loss and is highly influenced by global megatrends such as population and consumption increase. Types of environmental pollution include air pollution, soil pollution, water pollution but also light and noise pollution and have a major impact on agriculture and consequently on the overall economy, the environmental sustainability and the social wellbeing. Criteria for acceptance of environmental risk in terms of i) probability of accidental events vs. consequences (represented by affected area or/and recovery time) curves and ii) risk matrices are presented first (see /1/, /2/) and are critically discussed. Environmental consequences are divided into pollution of water, soil and air and are monetized by defining unit costs to recover the damaged area. By applying such as procedure it is possible to combine the various contributors to environmental damage and to include the associated parameters. A cost-benefit approach is the applied by evaluating the costs and benefits of each possible investment into environmental protection. In the first step, all costs are related to the decision point using the net present value method. Annuity factors are derived based on a defined interest rate and an inflation rate. Then the evaluation of the cost-benefit information for each individual mitigation or remediation measure can be made based on its utility. Characteristic case studies are shown. One can expect an increased use of the aforementioned approaches as policy makers become more convinced of their usefulness for decision making related to the preservation of the environment and biodiversity.

Improving the operational efficiency and reducing transport related carbon emissions of food distribution hubs

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Small-scale food producers typically suffer from low margins and weak bargaining power. Food hubs, which aggregate products and deliver to final consumers, may improve producers' economic fortunes and contribute to local economic development. However, food hubs often involve small volume journeys, increasing logistics costs, with carbon emissions potentially exceeding those of supermarket-based supply chains. This research seeks to improve the food hub's operational and environmental efficiency in logistics by minimizing transport costs and carbon emissions. The study addresses the 'producer-to-hub-to-customer' distribution problem where products are shipped on the following links – producer groups to hub, producer groups to customer zones and hubs to customer zones. A mathematical model is developed to address the problem while seeking to minimize total costs comprising of transportation and fuel costs while aiming to fulfill customer demand. The model mitigates carbon emissions and fuel consumption on shipment links and reduces the vehicle trips and unused volume of vehicles, thereby enhancing operational efficiency. An application of the model draws on real-world data for a local food hub serving over 150 producers in the North East of England. Experiments consider the extent to which co-operation between producers in delivering to the hub alters transport and fuel costs as well as carbon emissions. In addition, the study examines the impact of fuel price variations and demand fluctuations on cost components and carbon emissions. Useful insights are obtained after investigating the effects of shipment delays and disruptions on shipment links. The analysis also considers the effect on costs and carbon emissions of switching to electric vehicles.

Using the Triple-Layered Business Model Canvas to strengthening sustainability transition in agri-food value chains

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A major challenge for the agri-food system is feeding the global population in an economically feasible way while protecting communities and the environment. Public opinion reveals growing propensity to reward agri-food companies that act in a socio-responsible manner toward environmental impacts, including climate change adaptation and biodiversity conservation. In this context, sustainable value creation systems should be adopted swiftly and on a large scale within agri-food value chains to face this great challenge. Firms in agri-food value chains should move from traditional, linear business models focused solely on economic performance towards new, more creative business models explicitly integrating environmental and social sustainability concerns. There are very few studies providing conceptual frameworks to analyze the three pillars of sustainability together with their impacts on the development of sustainable business models in the agri-food value chains. Therefore, this contribution aims to address this research gap using the Triple Layered Business Model Canvas (TLBMC) which is a novel framework for enhancing sustainable value creation. The study intends to contribute an adaptation of the generic TLBMC model to agri-food contexts to support sustainability-oriented business model innovation, where in addition to the traditional (economic) business model canvas two more layers are supplemented: the environmental layer based on a lifecycle perspective and the social layer based on a stakeholder approach. Based on concrete examples, findings reveal that business model transition toward sustainability is crucial to agri-food companies, as the integration of sustainability objectives may lead to increasing sustainable performance as well as the development of sustainable operations, which can improve companies' market positioning. Companies focused on sustainable value creation integrating socio-environmental standards, tend to operate in value chains based on trust, safety, transparency, and close stakeholder relationships which, in turn, are key assets for competitive advantage.

Farmers in German Nature Protected Areas: Hesitation and Aspiration for the Commitment to Halt the Loss of Biodiversity – an assessment within the project “Diversity of Insects in Nature protected Areas (DINA)” –

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Pursuant to Sustainable Development Goal (SDG) 15 of the 2030 Agenda for Sustainable Development of the United Nations, one pivotal target is to “[...] halt the biodiversity loss“. In this paper, we aim to understand why and how German farmers hesitate to implement more than the required measures concerning cross compliance and direct payments under the common agricultural policy (CAP) and what their expectations for possible incentives are. By focusing on German nature protected areas, especially arable land within, we uncover reasons for their hesitant behavior and investigate their aspirations to increase operational readiness for enhancing biodiversity. With newly implemented regulations, farmers in Germany feel trapped in the so called “trilemma” (WBGU 2021). Farmers are not only obligated to counteract climate change and provide for food security, but legislation also requires farmers to enhance biodiversity of their farmed land. To examine this nexus, we apply a mixed method approach: Firstly, we investigate the subjective experience of individual farmers by means of a qualitative approach, using a semi-structured questionnaire. In the next step, we conduct a quantitative study by computer assisted telephone interviews (CATI). The analysis of this study sheds light on how farmers perceive indirect influencing factors and framework conditions, as they play a non-negligible role for their commitment. Factors such as economy (i.e. market conditions), policy and society are intertwined and need to be considered from a multi-faceted perspective. Finally, an in-depth analysis follows, using online focus group discussions to determine whether farmers accept financial support, focusing on both, action- and success-oriented payments. Our results highlight the importance of paying attention to the heterogeneity of farmers, their locations and, consequently, farmers’ different views on indirect drivers, showing the complexity of the problem. Farmers’ expectations are not only met by financial allocations, other aspects must also be taken into account.

Economic and environmental determinants of farm succession. Does sustainability matter?

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The farm succession is currently considered as one of the most important problems for agriculture in the European Union countries. Lack of young people in rural areas willing to work in this sector is a key reason. It seems to be a challenge especially in countries with land fragmentation such as Poland. On the other hand, farms' succession, viability and resilience are necessary for sustainable development of the entire agricultural sector and rural areas in long term. On the microeconomic level the farm to be inherited should be sustainable in various aspects, including satisfactory income as well as maintaining biodiversity and ensuring environmental durability. Therefore, the aim of this presentation is to discover the impact of environmental and economic performance on decisions concerning succession in Polish farms. We used the results of own surveys carried out in the Wielkopolska region (Poland) and applied structural equation modelling in econometric strategy. We contribute threefold through: defining the relationships between environmental performance and farm succession; empirically proving the importance of economic factors influencing the succession; estimating a well-fitted multiple-factor measurement model for microeconomic data collected from 78 family farms in the Wielkopolska region. The theoretical framework for our study are sustainable development concept and environmental economics as we analysed both environmental and economic aspects of farm succession at the same time. For the economic performance crucial factors are: farmer's income, agricultural output and land value. Among environmental determinants we identified some elements concerning biodiversity as important factors, namely winter cover crops, catch crops and taking care of the environment as a farm's function. As our results indicate, economic viability matters for farm succession to a slightly greater extent, and the economic determinants currently are more important for succession than environmental ones. Moreover, we discovered that the latent environmental variable negatively influenced the farms succession. There are some differences related to economic and environmental features between farms with and without successor. Farms from the first group were economically stronger, had larger utilised agricultural area and lower total liabilities. Concerning environmental field – farms with designated successor achieved higher energy and fertilizer efficiency, received higher greening payments and took more pro-environmental actions but were worse at environmental pressure index. Thus, there is a potential for improvement between economic and environmental sustainability. Our research indicates the need to create incentives for taking over farms, especially in the case of smaller ones. This involves broader support at the EU common agricultural policy (CAP) and national level as part of The European Green Deal. Solutions should move towards targeted funds for farms transfers, consolidation programs, or even stronger incentives for young farmers. As for the environmental issues, it would be advisable to prolong the time horizon for environmental programs within CAP. Moreover, further research on the impact of economic and environmental factors on farm succession should be carried out using individual focus studies. The farms succession is important and interesting both as research problem and in terms of managerial implications. Research financed by the National Science Centre in Poland (grant 2018/29/B/HS4/01844).

Changes in Food Consumption and Food Security During the Covid-19: Turkey Case

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The spread of coronavirus worldwide has affected consumer behavior in many ways. This study tries to investigate the impact of the SARS-CoV2 (COVID-19) on food consumption behavior of consumers. Food consumption motivation data were assessed and compared before, during, and after the quarantine. An online survey was conducted among about 900 people from 54 different cities in Turkey, between April and May 2020, trying to understand consumers' changing behavior in their food choices, preferences, and habits during the pandemic period. The aim of this paper is (i) to examine how consumer preferences were influenced by the COVID-19 quarantine period, using an ordered probit analysis, and (ii) to identify differences in the preferences for the food itself, food disinfection and cooking, and shopping preferences before and during the quarantine. Finally, as per the consumers' body mass index (BMI), correlation with their mood and eating frequencies was observed. The findings indicate that, under stress conditions, like the quarantine period, food preferences and eating behavior changed, and consumers put all those emotions and information into their consumption process. At the end, food consumption behaviour and shift will be explained with food security situation after pandemic and Russia -Ukraine.

Analysis of the economic and environmental efficiency of eco-schemes in olive-grove

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The Common Agricultural Policy (CAP) reform for the forthcoming period 2023-2027 introduces a new green architecture that aims to improve the climate and environmental execution of this policy. In this respect, a new instrument called eco-scheme has been proposed to provide farmers with an annual payment against the implementation of specific recommended management practices. Eco-schemes are designed by each member state to be better tailored to the specific needs of each country and are fully financed by pillar 1 funds. Although this architecture is expected to improve the climate and environmental performance of the new CAP and open the door for designing payments for environmental services, an effective policy implementation requires to define more concretely the greater overall contribution in terms of targets instead of actions. Furthermore, it is necessary to account for the additionality of the policy by evaluating its performance against clear baselines levels baseline levels. In summary, the new framework provides spaces for increased environmental ambition, but more accountability is necessary to guarantee the achievement of it. The aim of this paper is to evaluate the potential for climate change mitigation through soil carbon sequestration of growing cover crops and pruning residues retention, as two eco-schemes proposed for permanent crops, to provide policy makers with information about the cost-effectiveness of the new green architecture of the forthcoming policy. The study case focuses on soil organic carbon (SOC) sequestration in olive groves in the Andalusian region. Results indicate that the adoption and diffusion of eco-schemes lead to a significant increment of SOC by favouring, at the same time, the provision of a wide spectrum of environmental services. Finally, it indicates that the implementation of the eco-scheme increases the cost-efficiency of the CAP and Its social legitimacy.

Impact of plant-based diets on health care costs in developed countries: A Systematic Review

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The past years have seen a wide range of high-quality reviews on sustainable diets centred around predominantly plant-based items. Research is often conducted for topics such as barriers or motives of adapting such a diet and their corresponding impacts on natural resources, human health, or climate related goals. While there exists a range of interesting publications regarding predominantly plant-based diets and their impact on health care costs and medical expenditures, a current systematic review is still missing to this date. This paper aims to fill this research gap. Given the problems arising from reporting medical expenditures and dietary choices in general in developing and emerging countries, the focus will be set on developed countries in Europe, North America and Oceania. The objective of this review is to summarize the findings distinguishing plant-based diets to standard westernised diets, which are conceptualized through a high intake of animal-based and processed foods. These will be reflected upon medical expenditures in the last 10 years (from 2012-now). The paper will thereby not only take the health care costs itself into account, but more importantly compare the costs and benefits at various stages of time during a lifecycle, i.e., relating the potential saved costs in health care at a later stage with potential larger expenses for healthier, plant-centred food items earlier. The focus should be set on empirical studies that estimate the costs and establish a causal relationship. Hence, this systematic review aims at answering the following research questions: 1. What are the associated overall health care cost savings of adherence to a sustainable, predominantly plant-based diet 2. Are there any extra burdens of a lower share of plant-based diets in the population of westernized countries? If so, what are they in monetary terms? 3. Are there any quantifiable savings from an incremental change in the share of plants in one's diet. 4. Are there higher expenses for these healthy food choices? If so, do they outweigh the load in terms of saved healthcare costs later in life? To answer the research questions, a systematic literature review of published economic evaluations of spending on food products and health care costs was conducted with the focus on publications from the past 10 years. An electronic literature search in the database Web of Science was performed. After title and abstract screening for relevant articles, a CHEERS checklist was used to assess the quality of reporting. It is expected that high-quality studies are in the minority. However, for the limited amount of high-quality studies, a clear consent can be found in a positive effect of an increasing share of plant-based products in the diet by larger health care cost savings throughout life. Further, quality adjusted life years (QALYs) tend to increase with a lower share of animal-based foods in people's diet. The impact of the consumption of dairy products is ambiguous and in general more high-quality research needs to be conducted.

Behavioural factors driving farmers' intention toward intercropping adoption

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The intercropping of two or more crop species on the same piece of land at a given time has been acknowledged as a sustainable farming practice, but in Europe its adoption is limited. This paper for the first time investigated the influence of, and interrelations between subjective norm, perceived behavioural of control, attitude, intercropping's attributes, farmers' innovativeness, and knowledge on intention toward intercropping adoption. The empirical application is made to Sweden's agriculture. Theory of Planned Behaviour was merged with Diffusion of Innovation to explain farmers' intention, using structural equation modelling. Data was collected via a farmer survey with 378 usable replies. The paper highlights the important role that knowledge played in intercropping uptake. The result shows that knowledge was linked to innovativeness and influenced farmers' confidence in implementing intercropping, their view on the attributes of intercropping, and their attitude toward this farming practice. Knowledge also determined adoption intention directly and indirectly via perceived behaviour of control. Given the investigated farmers' insufficient knowledge of intercropping and the role of knowledge in shaping adoption behaviour, policy instruments to enhance farmers' knowledge are required to scale up intercropping uptake. The relationship among farmers' innovativeness, knowledge, and intercropping adoption implies the necessity of supports provided to farmer innovators to encourage their engagement in intercropping diffusion.

Sustainability adjusted analysis of agricultural performance – a systematic literature review

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The aim of the study is to identify the extent to which environmental aspects of agricultural production are taken into account in studies of its performance. There are two most common ways to assess farm performance – data envelopment analysis (DEA) and stochastic frontier analysis (SFA). In this review, we concentrate on studies implementing those methods. The factual, spatial and methodological scope of the works is analysed. Based on the Scopus database resources from the years 2015-2022, we identified a collection of 226 works, of which 135 were qualified for content analysis. Others were eliminated mostly due to lack of connection with agricultural production (37), language other than English (17) or inaccessibility (10). Research scope was divided relatively evenly between agriculture in developed (60 papers) and developing (74) countries, with the domination of works regarding Asia (61) and Europe (51) and underrepresentation of works regarding Africa (6). Studies were conducted in a majority on a farm level (79). Regional (29) and country (21) level was less common. A dominating methodological approach was DEA (109). General efficiency analysis was scarcely enriched by total factor productivity (TFP) indices (21), however, the factors of the agricultural production performance were assessed rather often (61), mostly with a two-step Tobit regression or Simar & Wilson bootstrap procedure. The most often analysed factors were farm size and farmer's age, education, experience and chances of succession, as well as participation in agri-environmental schemes or certification. When it comes to the methods of integrating sustainable development into performance research, a dominating strategy was taking into account some additional variables such as undesirable outputs (45) or undesirable inputs (31). Another common approach was eco-efficiency analysis where only undesirable inputs are taken into account (15), which was often combined with life-cycle assessment (LCA) of pressures generated by agriculture (20). Three other practices were: 1) application of the physical material-balance principle (5); 2) by production approach – modelling production of desirable and undesirable outputs on different production functions (6); 3) mathematical transformation of undesirable outputs into inputs (7). DEA models were most often estimated using slack based method (SBM, 32) or directional distance function (DDF, 18), while for SFA models the approach proposed by Reinhard (12) was the most common. Sustainability of agricultural production was the most often evaluated by including into model greenhouse gases emission or, less often, nitrogen surplus. These values were used as both undesirable input and output. Based on the abovementioned results it is possible to identify some research gaps. In particular, lack the works: 1) investigating African agriculture; 2) conducted under the SFA framework, with more advanced methods than including into the production function undesirable inputs; 3) including more variables representing farmers' attitudes (e.g. toward regulation and environment) as explanatory variables; 4) including environmental services provided by the agriculture as a desirable output (e.g. pasture and forest area), not only concentrating on negative externalities; 5) implementing by production methodology which seems the less biased among all the identified approaches.

From social capital to territorial resilience: a conceptual approach for managing ecosystem services in the dehesa

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Rural areas are facing enormous paradoxes and uncertainties, in the midst of which complex territorial dynamics are taking shape. One of the main factors underlying the current change in rural realities is the sustainable management of biodiversity and, based on this, the promotion of economic, social, and environmental development in the territories. Thus, the conceptual meaning of territorial resilience, understood not only as the capacity of the territory to resist external pressures while maintaining its structural and functional attributes, but also as its capacity to respond positively to external changes, is appropriate for the analysis of the management of biodiversity as an ecosystem service (ES) that contributes to territorial development. The aim of this communication is to present a conceptual model for the sustainable management of ecosystem services in the dehesa of southern Spain; a traditional agro-ecosystem of high natural value with a strong multifunctional character and a strong potential to provide ES for the benefit of society. To this end, a conceptual model is defined that links the elements of social capital, governance and territorial resilience. The results indicate that the characterization of the social relations that flow in the management of the ES in the dehesa allows the identification of the type of social capital, the coordination mechanisms of the actors, and the collective action that is configured in the territory. The above elements make it possible to incorporate the economic, social, cultural and natural dimensions of the changes produced in the territories and the possibility of analysing both the processes of adaptation of these in the long term and the conditioning factors that make this possible, which leads to the analysis of territorial resilience. Finally, based on the model, some recommendations are proposed for the management of the ES provided by the dehesa, which promote not only economic growth but also the resilience of the territory.

Stakeholder views on policy priorities for healthy and sustainable beekeeping in the EU

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Pollinators including honeybees occupy a crucial place in agri-food production systems. Yet, their pivotal role in ensuring food security is threatened by environmental degradation, biodiversity loss and climate change. Socio-economic research within the EU-funded project B-GOOD aims at identifying stakeholder views on policy priorities for fostering healthy and sustainable beekeeping in the EU. This contribution presents mixed methods research with stakeholders involved in the EU beekeeping sector following the Analytical Hierarchy Process (AHP) methodology (Saaty, 1980) as a supporting tool for multi-criteria decision-making. First, 19 possible policy actions for fostering healthy and sustainable beekeeping were identified through a series of in-depth stakeholder interviews (n=41). Each of the identified policy actions referred in a hierarchical structure to either an improved ecological, social or economic status of the beekeeping environment. Second, a quantitative stakeholder survey (n=504) was conducted with the aim of prioritising the identified policy actions. Eight types of stakeholders were represented in the sample including beekeepers, beekeeping service providers, quality inspectors, agri- and horticultural actors, commercial and industry actors, scientists, non-governmental organisation representatives, and policy makers. Survey participants were exposed to a series of pairwise comparisons of policy actions with 9-point ratio scales to determine their preferences (i.e. personal importance attached to one policy action relative to the other). Analyses were performed using the AHP-OS software. Among the three overarching sustainability objectives, stakeholders gave clear priority to an improved ecological status (58%) followed by an improved social status and improved economic status (both equally scoring 21%). Within the ecological dimension of sustainability, priority went to increased agricultural crop diversification (28%) followed by stricter regulation on pesticide use (20%) and increased use of alternatives to pesticides (19%). Within the social dimension, priority was given to improved transfer of scientific knowledge to beekeeping practice (25%) and improved communication/cooperation between farmers and beekeepers (23%). Finally, improved quality control of apiary products (e.g. testing for adulteration) and increased promotion of beekeeping as a valuable ecological and economic service topped the priority ranking (both 20%) within the economic dimension of sustainability. This contribution also assesses differences between stakeholder groups and EU regions in terms of policy action prioritisation. For example, beekeepers reported the strongest preference (as compared to other stakeholder groups) for policy actions aiming at reduced impacts of pesticides. Meanwhile, preferences for the overall sustainability objectives did neither differ significantly between stakeholder types nor between stakeholders from Northern, Western, Central and Southern European regions. The study findings tie in with the European Commission's (2022) recently proposed new rules to reduce the risk and use of pesticides in the EU to protect health, build sustainable agri-food systems and ensure lasting food security as part of the European Farm-to-Fork strategy and the European Green Deal.

PUBLIC POLICIES AND THEIR CONTRIBUTION TO THE PROVISION OF ECOSYSTEM SERVICES: THE CASE OF THE DEHESA IN ANDALUSIA

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The dehesa in Andalusia constitutes a mixed agroecosystem of the agrosilvopastoral type with a marked multifunctional character and a high potential to provide Ecosystem Services (ES) for the benefit of society. This allows it to provide high quality food and at the same time to respond to the new social demands towards farms. However, despite this, the future of dehesa agroecosystems is currently compromised by different factors, which determines the need to articulate effective public policy instruments that ensure the viability of this agroecosystem while promoting the provision of its ES. In order to contribute to the construction of a framework of scientific knowledge that supports the correct design of these instruments, the main objective of this research is to analyse, from the point of view of different interest groups, the capacity of various Common Agricultural Policy (CAP) instruments currently in force to contribute to the provision of ES by Andalusian dehesas. To carry out this analysis a conceptual, theoretical, and institutional framework is developed in which the dehesa agroecosystem is briefly described and the ES and main policy instruments under study are identified. Furthermore, in order to achieve the proposed objective, the Analytical Network Process (ANP) technique is employed, a specific methodology of empirical contrast defined by its holistic and integrative character and its capacity to consider the perspectives of diverse stakeholders. In this way, the present research makes it possible to assess in relative terms the capacity of a total of 6 public policy alternatives to influence the provision of 16 ES of the dehesa, grouped together (provisioning, regulating and socio-cultural services) and individually, and to determine the level of provision of each of these ES as a consequence of the potential impact of the alternatives studied.

How can cocoa production become more sustainable? The role of certification schemes and farmer cooperatives

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Many small-scale cocoa producers in Côte d'Ivoire and Ghana grow cocoa unshaded or low-shaded cocoa plantations (Ruf, 2011). This has dire consequences for farm biodiversity as studies show that completely unshaded production systems have significantly lower species richness (Schulze et al. 2004). At the same time, sector-specific research is lacking about how marketing and organizational structures can support cocoa producers to adopt more sustainable agricultural practices (SAP). To address this gap, we aim to define sustainable agricultural practices in cocoa production and assess whether farmer participation in certification schemes and/ farmer cooperatives can support their adoption. We construct a sustainability scale as an outcome variable, which includes altogether ten indicators incorporating agroforestry, soil conservation, pest management and farm sanitation. Then we test our hypothesis that farmer participation in certification schemes and/or farmer cooperatives leads to the use of more sustainable practices. While a number of studies have focused on identifying mostly economic and social benefits of private sustainability schemes such as Fairtrade in the cocoa sector (Meemken et al., 2019; Dompok et al., 2021; Iddrisu et al., 2020; Knöbelsdorfer et al., 2021), the environmental dimension has hardly been taken into account. For our analysis, we use a representative survey data set of cocoa producers. It encompasses the information of 1.745 cocoa producing households, 1.219 households in Côte d'Ivoire and 527 in Ghana. We apply a multinomial endogenous switching regression model, which consists of two stages. First, the farmer decision to participate in a certification scheme and/ or a farmer cooperative is modelled through a multinomial probit selection regression. Here, we include exclusion restriction, consisting of distance measures to the closest cooperative and the closest buyer of certified cocoa. Second, the effect of the farmer participation in such organizational and marketing structures is estimated through an ordinary least squares regression with selectivity correction terms (Manda et al., 2021). We can derive both the average treatment effect of the treated (ATT) and the untreated (ATU) for three participation options: 1) certification scheme only, 2) farmer cooperative only and 3) both in a scheme and cooperative. This econometric approach, which is considered more efficient than instrumental variables techniques (Tefaye and Tirivayi, 2018), takes into account the interrelatedness of participation options as well as possible selection bias as the farmer's decision to participate in a cooperative and/ or certification scheme is non-random. Interim results in Ghana confirm that cocoa producers that participate in organizational and marketing structures apply more SAP than those not participating in such structures, with cooperative membership showing the largest effect. The interim results in Côte d'Ivoire are more mixed. Only when producers are both certified and a member of a farmer cooperative, do we see that they apply more SAP. We will further analyse and interpret these initial results.

Young Farmers Schemes: An exploratory study of farmers attitudes, beliefs and perceptions

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Young farmers are the persons who affected directly by the young farmers' related policies as key stakeholders, and therefore their opinions should be taken into consideration on the future formulations of the relevant measures. However, after three decades of young farmers' schemes implementation, there is still limited information regarding farmers' attitudes, beliefs and perceptions towards the form of the scheme and its implementation procedures and requirements. To address this gap, the present study based on a survey covering 433 participants from the total of 13 regions (NUTS II) of Greek territory, attempts to identify young farmers' attitudes and beliefs towards the current measure of the Greek Rural Development Program, and to assess whether these attitudes and beliefs are differentiated according to farmers' socioeconomic profile as well as their agricultural holdings' features, with the view to indicate factors that could lead to the improvement of the overall measure's performance. Our findings "underplay" the significance of socio-economic aspects and underscore the farms' features as factors which could form farmers' attitudes and perceptions towards young farmers schemes. Furthermore, results indicate the need for more intense policy interventions since the Sub-measure 6.1 "Start-up aid for young farmers" does not prove to be sufficient by itself to create actual inflows of new entrants in agricultural sector.

Green Deal and CAP reform: a sustainable approach for the future of European livestock systems

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The integration of agricultural and environmental policies has characterized the reform path of the Common Agricultural Policy (CAP) from the mid-1980s to the present. Many scholars (i.e Feindt, 2010; Alons, 2017) over time have tried to study this phenomenon and the possible influences affecting the future environmental agricultural policy in the European Union. The CAP reform for the period 2023-2027 has integrated the challenge of the climate crisis, the improvement of animal welfare, the protection of the environment, the enhancement of the landscape, the sustainable development of rural areas and the competitiveness of agri-food systems. This reform aims to decisively raise the bar for the socio-environmental performance of the European agricultural sector. This new course of action comes under the impetus of the communication “From Farm to Fork” which, as part of the broader European Green Deal initiative, sets ambitious targets for the contribution of European agriculture to combating the climate crisis. Driving the ecological transition of agriculture is a logic of offsetting the production of public goods and services by agriculture, with a particular and significant focus on livestock systems. Indeed, livestock farms are called upon to rethink their technical and organizational formulas to reduce their contribution to greenhouse gas emissions, to meet the growing expectations of European society with respect to animal welfare and more generally, to the broader concept of “One health” (Erklavec et al., 2021). This approach requires attention at all levels where “energy” exchanges are directly or indirectly generated between production and consumption, on the one hand, and stocks of natural resources, on the other. In the case of livestock systems, three levels of analysis can be highlighted: micro, meso, macro (De Rosa et al. 2021). At all three levels, the contribution of policies can only be decisive in promoting neutral balances between consumption and regeneration of natural resources. The combination of the CAP and the contents of the “From Farm to Fork” strategy acts at the micro level, in particular through support for breeding programmes and access to specific animal welfare measures and advisory services, including veterinary services. At the intermediate level, it can have an impact through rural development measures for investment, including supply chain approaches, cooperation in research and innovation and support for extensive methods. At the macro level, “From farm to fork” strategy formally opens the way for a new European labelling initiative. Indeed, it is the Union’s intention to radically redefine the regulatory contents governing nutritional and geographical indications.

A cross-country comparison of pig production systems performance: Evidence from EU countries

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This study aims at assessing the productive efficiency of pig farms across five EU countries (Denmark, Germany, Spain, France and Poland) which together represent 70% of the total production. The empirical analysis relies on the Generalized True Random-effects (GTRE) that allows estimating the persistent and transient efficiency levels of farms. The separation between both types of efficiency permits examining whether efficiency differences between countries are associated with the individual management performance of farms or the pig sector structure in each country. The empirical application is based on Farm-level data obtained from the Farm Accountancy Data Network (FADN) for the period 2010-2015. The final sample is composed of an unbalanced panel that contains 8,212 observations representing 1,966 farms. Empirical results revealed that Spanish farms display the highest overall technical efficiency scores of 0.96, while other EU countries show more margin to improve the pig productive system in Poland (0.93), Germany (0.92), Denmark (0.87) and France (0.77), either through reducing persistent or transitory inefficiencies. Our empirical findings could provide important implications for pig farm management decisions and policy measures in European countries. Improving long-term efficiency of farms may need new policies driven by country-specific factors, while enhancing short-term conditions of pig production (managerial skills and farming practices) could reduce transient inefficiency levels of farms.

A Review of Guiding Tools on Agri-Food Value Chain Modelling

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Value chain based approaches have been appropriate for development in agricultural and food systems. While the value chain has an important effect for the farmers, processors, wholesalers, retailers and consumers as well as for the external organizations that provides the development process. Moreover, value chain highlights the multiple ways in which producers and consumers are linked through a variety of processes, interactions and stakeholders. Thus, a well-selected value chain will be connected to an expanding and profitable market. The study, aimed to examine guides for agri-food value chain. 14 guidelines such as ILO, VCA4D, UNIDO and GTZ/GIS are investigated through the area of interest which concentrate on topics according to the analytical framework of the value chain analysis. Selected guides were based on four dimensional approach; Institutional/Functional, Economic/Financial, Social and Environmental evaluation. Institutional/Functional analysis provides a detailed profile of the industry structure through the identification, description and quantification in physical terms of the sequence of operations concerning commodity production, processing, marketing and final consumption. Tools of Institutional/Functional are Mapping, Governance Analysis, Demand & Supply Conditions, SWOT analysis and End Market analysis. Economic approach of a value chain assesses in quantitative terms the creation of “Value Added” and its distribution to the various agents involved. Another tool is Policy Analysis Matrix with financial ratio analysis. Social approach consists of the tools of Employment Creation, Gender analysis and gender equality and decent work deficit evaluation. The evaluation of the environmental approach of the VC is made by Hot Spot Analysis, Environmental Assessment and Life Cycle Assessment which has directly effects decreasing or increasing the biodiversity.

Boosting short food supply chains as a tool to build more sustainable food systems: a stakeholder research with focus groups

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In recent years, short food supply chains are receiving more consumer interest due to an increased awareness of more sustainable agri-food systems that generate economic, social and environmental benefits at local and regional level. This type of distribution channel, in which the agri-food producer decides to take his products to the final consumer using a very small number of operators or intermediaries, implies an increase in the added value retained by the producer, as he takes care of almost all the tasks related to the marketing process and which in traditional channels are absorbed by other figures such as wholesalers, stockists, logistics companies, etc. In a general context of falling food prices at origin, with the consequent dissatisfaction of producers that has been reflected in continuous mobilisations and acts of protest, the development of short channels can become a sustainable tool that improves the profitability of agri-food producers, as it will allow them to maintain their activity and remain in rural areas. However, new patterns of work and consumption, as well as consumers' purchasing habits and lifestyles, can make it difficult to accept these new forms of food purchasing. For this reason, focus groups with Spanish consumers and agri-food producers (8 sessions with consumers and 4 with agri-food producers) have been used in this research to try to identify the main advantages and disadvantages related to the use and implementation of short food supply chains. The results show that, from the point of view of consumers they are willing to use this form of food purchasing, although they demand adaptation to current lifestyles and more information from producers. Trust and origin have also appeared repeatedly in the research, which can reflect a search for local/regional or zero-kilometer foods. However, consumers have also stated that, although they consider short food supply chains to be more profitable for producers, they don't see an economic benefit, with food purchased through these channels being perceived as more expensive than that of traditional retailers. Agri-food producers have identified the main drawbacks they encounter when implementing short marketing channels (lack of support, bureaucratic barriers, lack of funding) as well as the aspects that contribute to the success of this type of initiative, such as the type of products marketed or the different types of sales applicable (online or offline, home delivery or collection point, etc.). The results obtained can make these channels more accessible to the end consumer, making them more competitive and positioning them as an alternative to traditional channels, thus generating new and more sustainable opportunities for Spanish agri-food producers.

Globalization and Changing Food Consumption Patterns

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The obesity epidemic is a global burden that has tripled over the last 40 years, with serious consequences on the global economy. This phenomenon has been called “globesity”. However, it is especially relevant in low and middle income countries (LMIC). The concept of nutrition transition has been theorized by Popkin (1993) to explain the shifts in the composition of diets. In LMIC the supply of animal protein, fat, and sugar increased significantly over the last decades. Simultaneously, there has been also a period of increasing economic and social interdependence among countries, the globalization. This process has had implications on the nature of food supply chains, which are influenced by higher incomes, greater urbanization, market liberalization, and foreign direct investment. The aim of the study is to analyse whether the last waves of globalization have affected food consumption patterns. More specifically, we test whether there exists a link between the extent to which countries have been exposed to globalization and a change in consumption of specific food categories. Food consumption data was obtained from the Global Dietary Database, which provides consumption data for 55 dietary factors for 185 countries from 1990 to 2018. We aggregate food consumption data in the following product categories: animal-based; plant-based; “healthy”; “unhealthy” products. To measure the extent to which countries have been exposed to globalization over time, we used the revised KOF Globalization Index, which considers the economic, social, and political dimensions of globalization. From a methodological perspective, we run a fixed effects panel data approach, where we regress the consumption of different food categories on the globalization index. Our empirical approach also controls for other potential socio-political-economic determinants of food consumption, such as the level of income, political regime, level of education, and trade exposure. We further test whether the effect of globalization on food consumption may change according to countries’ level of development. Countries have been clustered according to two criteria: initial level of GDP (high, medium, and low-income countries); upgrade in the economic development status (transition and non-transition countries). Considering the preliminary results of this study, it emerges that globalization is significantly associated with changes in food consumption and that this association varies according to the food category considered, the level of income, and the stage of economic development of the examined country. Overall, an increase in the level of globalization corresponds to an increase in the consumption of “unhealthy” and animal-based products. These correlations are stronger in transition countries, and even more so those with high-middle income. This suggests that the effect of globalization on the increase in consumption is particularly intense in countries that are in an intermediate phase of the economic development process. In high income countries, consumption of “healthy” products results to be negatively correlated to globalization. If the preliminary results are confirmed by further analysis, they highlight the importance of public health intervention to direct food consumption, of all countries, towards a healthier and more sustainable path.

Modelling crop diversity in Italian lentils' value chain: exploring the potential of the Agent-based model approach

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Since the beginning of the Green Revolution in the late 1960s, agricultural industrialization of major uniform crop varieties increased productivity but led to a deep decline in agricultural biodiversity and to global unsustainable food production systems. Detrimental effects on the environment and biodiversity as well as resilience and sustainability of cropping systems are issues of growing concern. However, a shared understanding of crop diversity decisions and implications within the agri-food value chain including approaches towards a multi-actor research is lacking. Previous research in this field focused mainly on the role of farmers' decision-making largely disregarding the role other actors may have on supply chain dynamics. In this research we propose to design a comprehensive multi-actor approach applied to the lentils value chain in Italy with the aim of embedding and fostering crop diversity in terms of minor underutilized varieties. There are at least 10 different lentils varieties in Italy which differentiate in color, shape and taste. The lentils value chain is suitable for being studied not only in terms of crop diversity but also of multi-actor approach given the large numbers of market actors involved along the chain. We introduce an agent-based model that allows each agent – from producers to retailers – to be modelled as an autonomous entity with capacity to interact with their environment and other agents, and to evolve according to its decisions and context dynamics. Our main findings will show factors affecting crop diversity decisions along the chain: (i) at individual agents' decision-making level, (ii) in the interactions among the agents through supply-demand effects and (iii) in the interactions between the agents and their environment considering influences coming from the governance and policy framework. Research findings will provide advanced knowledge of the Italian lentils value chain and crop diversity related decisions. This will help formulate future policy recommendations aimed at enhancing crop diversity along the chain and achieving sustainable and diversified food systems.

Milk alternatives from an environmental and nutritional point of view

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Milk consumption in humans lasts longer than in other mammal species. Today consumers' awareness of the environmental burden that some products carry keeps growing. Thus, they look for alternatives that are more environmentally friendly and nutritionally similar. This work explores data available in the literature, comparing the nutritional profile of several milk alternatives and milk from different mammals, as well as their environmental impact. For this, the Google Scholar search engine was used, and the search was structured into two phases using two sets of keywords. The first was aimed at LCA and the second was for the nutritional properties of the beverages. The research was limited to studies published in scientific journals from the last 10 years and available in English. The initial search yielded more than 239 articles. Further analysis of the articles and data available narrowed down the articles used in this review to 74. The values for the analysed macronutrients (proteins, fat, fibres and carbohydrates) and most micronutrients – Fe, Mg, P, K, Na, vit. B1, vit. B3, vit. B6, vit. B6, vit. B9, vit. B12, vit. E and vit. D – are higher (in g / 100g of product) in plant-based products. Mammals' milk had higher values of calcium, zinc, vit. C and vit. A. On the environmental footprint of these products, dairy has a higher impact on the categories of Global Warming Potential, Ozone Depletion Potential, Marine Eutrophication and Freshwater Eutrophication; while the alternative beverages have a higher energy and water consumption. Overall plant-based beverages appear to be nutritionally richer than animal milk: their profile shows a possible fortification in some nutrients, which is standard practice during processing. Overall, the environmental impact of plant-based milk is lower than milk, with exceptions in some categories. However, a lot of data is missing, making it impossible to make a full comparison across environmental categories. This study has many limitations since data for the different products is limited, for both nutritional profile and environmental impact.

Organic agricultural production and the promotion of social sustainability of farmers and agri-food workers: A systematic literature review on the European Union context

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Since the establishment of the Millennium Development Goals in 2000 under the United Nations framework, the concept of sustainability – considering its three dimensions of social, environmental, and economic sustainability – represented the reference framework for the implementation of public and national policies all over the world. The following Sustainable Development Goals set in 2015, were then considered in all the EU policies, with the aim of encouraging member states to follow this path towards a sustainable growth. Under this framework, considering agricultural policies, organic production became a central element, and it is currently recognized as the sustainable alternative to conventional agriculture as it implies lower costs in terms of inputs and is more able to meet food and caloric needs and to regenerate soil and water. Currently, organic production represents one of the pillars of the 2019 EU Green Deal and of its Farm to Fork Strategy which sets the objective of reaching at least 25% of the EU's agricultural land under organic farming by 2030. Beside economic and environmental sustainability, according to the International Federation of Organic Agriculture Movements, definitions of organic agriculture also incorporate a commitment to social justice. Hence, the Farm to Fork Strategy aims also at supporting the cooperation among primary producers, at mitigating the socio-economic consequences that impact food chain and that might affect seasonal, precarious, and undeclared workers and therefore at promoting the “protection of health and safety will play a major role in building fair, strong and sustainable food system”. In this work, we ask the question: considering the role played by private and public actors, is the organic sector able to fully embrace every dimension of sustainability and ensure fair working conditions to farmworkers and seasonal workers compared to conventional agriculture? Can we consider the organic agri-food industry a driver of good practices in terms of employment and working conditions? The work consists in a systematic literature review that will follow the “Preferred Reporting Items for Systematic Reviews and Meta-Analysis” (PRISMA) protocol and it will also consider contributions that focused on conventional agriculture to assess whether there are any differences. To this extent, the aim of this research is to present the current state of art on how social sustainability – with a particular attention to labour conditions – is related to organic agriculture in the framework of EU agri-food policies. As the literature on labour conditions within the agri-food sector mostly focused on developing countries, by focusing mostly on the EU legislative framework, the project will attempt to fill this gap.

Consumers willingness to pay (WTP) more for more sustainable wines

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The present study assessed the effect of information and taste on consumers' willingness to pay for different typologies of red wine and sparkling wine (Cava). In particular, it assessed the impact of providing the bottle label, European Union organic logo (without explaining what it means), and information about the production system on the willingness to pay for wine, and Cava. It tested whether elicited bids for organic and selected vintage organic wine (or Cava) were higher than those for conventional wine (or Cava). We conducted two fifth-price multi-product auctions (simultaneous) in May 2019 in the region of Catalonia (Spain), in the town of Barcelona. The first auction was performed among 160 Catalans' red wine drinkers'. The auction had a total of five rounds of bidding and in each round subjects were required to simultaneously bid for three different typologies of market red wine, including conventional, organic, and selected vintage organic wine. During the whole auction, the brand was not revealed to subjects to avoid the effect of the brand. In each round, subjects were presented with three bottles of red wine and they were asked to bid privately for each of the three wines to buy for a special occasion. To make the experiment more realistic and to reduce hypothetical bias, subjects were endowed with €10 prior to bidding and they were informed that at the end of the five rounds a winning round and wine will be randomly selected and the winners of the auction will be the 4 subjects with the highest bids for the wine drawn in the selected round. The winners would have to pay the fifth-highest price and take the selected wine home. From one round to another, subjects received progressively more information about each of the three wines. The second auction is a replica of the previous experiment using sparkling wine (Cava). It was performed among 140 Catalans' Cava drinkers'. The market red wines and sparkling wines used in these auctions were from a wine-producing cooperative. Results showed that the provision of the EU organic farming logo and the explanation of the wine production system reduced significantly consumers' bids for the conventional wine. The WTP for the organic wine increased with each of the information provided, while it decreased after wine tasting. The changes in the WTP for the selected vintage organic wine are very similar to those of the organic wine, although the drop in the WTP after wine tasting is much more important. Providing information about the variety of the grapes positively stimulated the bids for the conventional sparkling wine while revealing the system of production and tasting the wine decreased significantly participants' bids. There was a negative effect of the grape varieties and taste on the bids for organic sparkling wine, and a positive effect of the production system. The information provided (grape varieties, logo, and production system) influenced positively participants' bids for the selected vintage organic sparkling wine, while taste affected them negatively.

How important is land tenure security in state-facilitated reforms? Insights from a choice experiment with farmers in Uzbekistan

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Land property rights shall be properly defined and protected within the existing institutional framework of a country to aim for the efficient resource allocation and sustainable use, as well as to induce productive investment activities. However, transition countries, such as Uzbekistan with state land property, still do experiment with the agricultural land governance seeking to find an optimal farmland size and tenure system. The problem is topical since farmers in Uzbekistan have hardly enjoyed secure land tenure from the start. Our theoretical framework is grounded on the tripartite concept of the land tenure security, which can be decomposed into three components: legal, de-facto, and perceived. For the full tenure security to be hold all these components should match in practice: that is, legal rights are fully enforced, and farmers feel confident about the rights in the future. However, the state in Uzbekistan is the dominant actor and ongoing and unpredictable policy interventions present a primary threat to land tenure security. For instance, state-initiated land reallocations (coined as land optimization) within 2008-2019 have undermined both legal and de-facto dimensions of the land tenure security by premature termination of then effective farmers' land rental contracts, which were concluded for at least 30 years. In our study we have investigated the problem of how farmers perceive tenure security under the condition of continuous threat of land expropriation by the state. Our main research question is aimed to understand whether farmers in Uzbekistan have become indifferent to having secure land tenure due to frequent land reallocations or not. To answer our research question we conducted the survey of farmers (n = 153) in Uzbekistan (2021) with the choice experiment to reveal their preference pattern with regard to land contract attributes, including contract duration, contract security, crop choice rights and payment for contract. Our preliminary findings indicate that state-facilitated land redistributions accompanied by the termination of existing land contracts undermine all three aspects of the land tenure security: legal, de-facto and perceived. Nearly the third of surveyed farmers (32%) perceive the risk of losing land in the next five years as serious, while 40% were worried about losing land in the same period. At the same time, the results of our study suggest that farmers proved to be more sensitive to and are willing to pay a relatively higher price for the contract security compared to other contract attributes, even if being exposed to frequent land reallocation process. To conclude, our findings suggest that land policy in transition countries like Uzbekistan should be based on the parity between demand and supply of tenure security. We can see that there is a considerable demand for tenure security on the part of farmers. The supply side, that is the state, should ensure legal and de-facto security of the land tenure to meet the demand of agricultural producers.

A Key Study Review on Agrifood Value Chain Analysis

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Value chain is a full range of activities that are required to bring together a product or service through the different phases of process in order to deliver to the final consumers. Value chains can be mapped and analyzed using the methodology of value chain analysis (VCA) which can include qualitative and/or quantitative tools. There are two approaches which are narrow and broad in the value chain analysis. According to broader approach, there are four different dimensions which are Institutional/Functional, Economic/Financial, Social and Environmental. Each dimension has many tools and outcomes. In order to generalize these tools and outcomes, it is essential to review both theoretical background of value chain and the case studies done on the base of product and tools used. The aim of this study is to present the results of a review of more than 200 research studies on the value chain in four different dimensions, up to the examination of the product and the most common tools used. To achieve the goal, case studies were reviewed by different researchers, considering the structured questionnaire to explore VC tools and related indicators. The results showed that the researchers have mainly studied on Institutional/Functional analysis which is the first step of Value Chain analysis. This stage focuses the core process and agents for Mapping of the value chain which produce data on product delivery channels, up-mid-down streams, quality standards and controls, sanctions and rewards, taxation and governance of value chains, etc. The other most studied area of interest is Economic/Financial analysis of Value Chain. This is mainly done for the value added creations, price transmission and investment planning to be foreseen, etc. The Social and Environmental side of the Value Chain have been neglected sides of the analysis with the least of attention. Social side of the analysis can find out the degree of social inclusiveness in the community, women and young participations into the economy or sector. Environmental analysis can produce data on related value chain that augments or not augments the biodiversity. The review results also show that Cereals, Vegetables and Fruits are the product groups which are mostly selected in the studies. Legumes, tubers and oily crops comes behind of them. In addition, Cases were studied generally on activity and agent based approach together in the same cases. But, agent based approach is most preferable one.

An end-to-end mapping of the Greek vegetables supply chain: in the quest for interventions towards sustainability

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Agri-food supply chains involve numerous stakeholders, complicated processes, and flows of goods/materials/information. Even though sustainability's triple bottom line is referred among the top priorities of the agri-food industry, the contradictory objectives and business mentalities of the key supply chain actors often result in poor sustainability performance. Therefore, analysing the entire supply chain is a vital first step towards a thorough research framework that could contribute to improving this situation. This work provides an end-to-end mapping of the Greek vegetables supply chain. The objective is to gain a comprehensive understanding of this particular sector and offer clear directions for further adaptation of sustainable practices. The analysis is implemented utilising data from the Greek vegetables supply chain. Key findings provide an end-to-end mapping of the supply chain, highlighting certain blockages of information flows and conflicting interactions among stakeholders. The analysis offers valuable insights and recommendations for future research and targeted solutions.

Is there room for agroecological transition? The case of Cretan vineyards

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A growing body of literature identifies agroecology as the answer to many problems of the current industrialized food sector. Threats to the environment and to agricultural production resulting from biodiversity loss and monoculture cultivation, and subsequent poor nutrition, poverty and other socioeconomic issues arising from corporate-controlled production inputs, together with cultural heritage and local knowledge loss, can all be modulated by agroecological transition. As a concept, agroecology remains somewhat vague, but the consensus is that it aims for social, economic and environmental sustainability of agroecosystems. The identification of appropriate methodologies to measure and monitor agroecological transition and the adoption potential of agroecological practices in specific sectors and areas is of immediate concern. In the case of viticulture, current research aims to investigate sustainability across alternative systems of grape production and throughout the wine chain to pinpoint the main factors affecting the adoption of agroecological practices, and to identify appropriate indicators of economic, social and environmental sustainability (Santiago – Brown et al., 2015; Lamastra et al., 2016; Borsato et al., 2020; Litskas et al., 2020; Baiano, 2021). For this study the Main Agroecological Structure (MAS) index introduced by León-Sicard et al. (2018) along with the analysis of the perception of the degree of favourability of the Territorial and Environmental Context (TEC) are used to assess the level of agroecological maturation of Cretan viticulture farms, and their potential to maintain or improve their status. The methodology combines ten indicators, examining the connectivity of the vineyards with the main ecological landscape structure, the extent and diversity of external and internal connectors, soil conservation, as well as weed and other management practices. The degree of awareness of the concept of agroecology, the availability of means enabling the adoption of sustainable farming practices, as well as potential obstacles to agroecological transition along with socio-economic indicators of the perception of the farmers concerning the performance of viticulture in the specific territory, are assessed. The analysis utilizes data gathered in the context of the ECOVINEGOALS Interreg–Adriatic project through face-to-face interviews with vine growers using a structured questionnaire in two case-study areas, the Municipalities of Platánias in Chania, and Archanes-Asterousia in Heraklion. The data from the original sample of 10 farms is currently being supplemented with that from additional farms in the same areas. The results of the preliminary analysis indicate that the MAS of Cretan vineyards is not strongly developed yet, but there is a favorable context for agroecological transition. The main obstacles to the adoption of agroecological practices are the increased workload that these practices often require and the misconception that agroecological management will reduce profitability. Encouragement of the participation of farmers in meetings and associations, and the provision of means and services fostering the horizontal exchange of agroecological management practices are key actions to be taken to promote the agroecological transition of Cretan vineyards.

Sustainable fresh vegetables supply chain: the case of Crete

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Sustainability in food supply chains is a vital issue, given the emerging global importance of the agri-food industry. In particular, fresh vegetables consist of an important food sector with significant room for improvement in its socioeconomic performance, but also in its environmental footprint. The Cretan vegetables supply chain is a perfect case for further investigation, given its unique characteristics (e.g., vulnerable, high-valued and quality products, ideal climatic conditions for the production of vegetables). The current research provides a comprehensive study of the Cretan vegetable supply chain utilising local knowledge provided by the stakeholders' engagement as well as secondary data. The analysis covers all three pillars of sustainability, with a special focus on economy and social ones, due to the recent global trading issues and the importance of this sector in the local development and social cohesion. The findings suggest that the utilisation of digital tools towards more effective trading can enhance competition within and across actor groups in the supply chain, thus resulting in financial gains for all stakeholders and eventually benefits for the local society. The study concludes with managerial and policy implications as well as targeted recommendation for future research.

A recursive dynamic linear programming farm-level model to simulate the structural change in the arable production system of a Greek region

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Structural change is integral to evolving economies (Goddard et al., 1993). Although increased agricultural productivity has allowed the release of resources needed by other sectors of the economy, structural change in agriculture usually has a negative connotation in public debate (Balman and Valentinov, 2016). There are mainly two types of public concern about structural change in agriculture, with the former expressed as “dying peasants” and the latter as “factory farming” (Balman and Valentinov, 2016). In this context, detailed and up-to-date information on structural change in agriculture is valuable for policymakers and stakeholders as it forms the basis for policy analysis (Espinosa et al., 2016). Moreover, modeling exercises can support the formulation of structural policies to obtain the “desired farm structure” or “optimal farm structure”, considering the constraints that societal demand places based on equity goals (Goddard et al., 1993; Finger and Benni, 2021). Simulation models such as recursive dynamic programming models and more sophisticated agent-based models allow for endogenous structural change, and they are considered appropriate for analyzing the structural effects of policy reforms on a region’s agricultural structure (Happe et al., 2008; Espinosa et al., 2016). Based on the above, in this study, we present the structure of a recursive dynamic linear programming farm-level model coupled to the ARIMA stochastic process to simulate the impact of a policy regime reform on structural change. Determination of farm viability is not just based on traditional monetary criteria, but also on an innovative criterion, comparing the profitability of the farm with the standard of living of the reference group (neighboring farms) according to the concept of “pecuniary emulation” (Veblen, 1899). An additional innovative structural element of the proposed modeling approach corresponds to how resources are reallocated/allocated between viable neighboring farms following the theoretical model of efficient allocation (Ayerst et al., 2020). A representative sample of arable farms of the region of Karditsa (NUTS 3 level) is utilized for the empirical application of the suggested model. The model is validated for its ability to simulate the allocation of actual activities and the farm size distribution of the reference period. Then we perform simulations for two policy scenarios: i) the business as usual (BAU) scenario and ii) the alternative policy scenario referred to as the CAP Post-2020 reform scenario based on the Greek Strategic Plan proposal for the CAP 2023-2027. Increasing average farm size and decreasing number of viable farms indicate that the characteristics of structural change are expressed in all policy scenarios. Nevertheless, the results of the simulation for the CAP Post-2020 reform scenario against the BAU scenario, prove a further reduction of the percentage of farms with a size of fewer than 30 hectares. Funding: This research is co-financed by Greece and the European Union (European Social Fund-ESF) through the Operational Programme “Human Resources Development, Education and Lifelong Learning” in the context of the project “Strengthening Human Resources Research Potential via Doctorate Research” (MIS-5000432), implemented by the State Scholarships Foundation (IKY)

Crop diversity and value chains: a systematic literature review

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For decades, modern agri-food value chains have been seeking for economies of scale in more and more globalized word and interconnected markets. This has led to high level standardization, and loss of diversity in crop varieties, inputs, production methods and food products all around the world. While economically justified in short and medium term, these trends undermine biodiversity, food security and resilience of food systems in longer term. This necessitates deeper understanding of the ways how value chains can support cultivation and consumption of more diverse crops and thereby contribute to biodiversity conservation and improvements. Academic literature includes numerous studies on initiatives to bring older and sometimes neglected varieties and landraces to modern agri-food supply chains and therefore contribute to biodiversity and food security. Often such studies do not pay equal attention to all segments of the value chains and their interrelations. Thereby this study, by utilizing the approach of systematic literature review, aims to provide a more complete understanding of the roles of all segments in the value chains – input suppliers, farmers, logistics and infrastructure, processing industry, distribution, food services, consumers – as well as institutions that support cultivation of older and neglected varieties and landraces. Our initial literature search in Web of Science and Scopus databases resulted with 1192 records of publications. After applying relevance and selection criteria, the final selection of publications included 52 papers. Each paper was scrutinized by two researchers who searched for quotes related to decision making logic of value chain segments in cultivating, trading, processing or consuming such crops and products, and the interrelations of the value chain segments. All the excerpts were thematically coded and analysed. The initial results, among others, highlight the importance of availability of sufficient quantity of the relevant seeds; collaborative activities of farmers and their community members; collaboration between farmers, processing industry and distributors; stability of quality and supply of products to satisfy the requirements of processing industry and retailers; increasing diversity of distribution channels, especially in short supply chains; and cultural relevance of the varieties and products for both farmers and consumers. The existing examples of value chain development often involve facilitation and promotion activities of NGOs and/or research and knowledge organizations, stressing the importance of institutional support.

The impact of plant-based dairy alternatives on the German agricultural sector: a descriptive and modelling study

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The popularity of plant-based alternative products to animal foods is growing. Drivers of this development is a critical attitude toward today's animal husbandry, particularly with respect to its environmental and health consequences. Currently data on per capita consumption of plant-based alternatives is rare, but surveys indicate that alternative products to milk are particularly popular among plant-based foods. While increasing consumption of plant-based dairy alternatives can, on the one hand, supplement and diversify the human diet and have a positive impact on the environment, it can also transform agriculture and livestock production. In Germany, approximately one in four farms produces milk, generating 19 % of the total agricultural production value. Besides, milk and dairy products also play an important role in foreign trade and, at 9.8 billion euros, generate the highest agricultural export revenues next to meat products. Therefore, possible impacts of a substitution of dairy products by plant-based alternatives are of great importance for German dairy producers and agriculture as a whole. This paper contributes to the existing literature by providing, to our knowledge, the first empirical data on the purchase volumes, prices, and repurchase rates of animal products and their plant-based alternatives in Germany. Based on a representative household panel of the German Society for Consumer Research (GfK), which includes scanner data of 13,000 households from 2017 to 2021, a descriptive analysis is conducted to examine how demand for plant-based dairy alternatives has developed. In the second part of the paper the obtained results from the household panel are used to perform a model-based analysis. Using the general equilibrium model MAGNET, the impact of a reduced demand for dairy products and simultaneous substitution by plant-based alternatives on the German agricultural production, prices, trade and income are be estimated. First results indicate that although the annual growth rate of plant-based alternatives is relatively high, the purchase volumes of plant-based dairy alternatives in the overall market are still low. However, if growth rates are continued, this will result in a significant share of plant-based dairy alternatives in the total dairy market by 2030. The model-based analysis shows that a transition to a more plant-based diet with lower milk consumption would be associated with changes for the entire agri-food system. While dairy farmers and dairies may face price and production declines if demand for dairy products decreases as a result of increasing consumption of plant-based dairy alternatives, the environment could benefit from more plant-based diets.

Demand for sustainable agrifood systems and the land ownership dilemma: bottom-up solutions from civil society in Germany

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Use of land is at the heart of shaping sustainable food production, mitigating and adapting to climate change and conserving biodiversity, among other land system functions. Sustainable land management is, however, challenged by inadequate property rights' considerations of the soils complexities and ecosystem functions (Bartkowski et al., 2018). The private property rights to land (private or in for-profit firms) lead to the prevalence of land management outcomes expressing private incentives and objectives, the underdelivery of land functions exhibiting public-good character (such as biodiversity) (Bartkowski et al., 2018) or their costly delivery due to land title holders' presumptive entitlements (Bromley and Hodge, 1990). In our study, we explore solutions to the land ownership dilemma that go beyond the more common interventionist/regulatory approach to land use. Informed by non-profit economics, there, where dichotomous market versus state solutions fail to satisfy societal demands, third sector organizations and governance systems can be expected to form to fill in the gap and deliver missing (ecosystem) services. We, therefore, investigate new forms of (bottom-up) civil society organizations that have furnished common and multi-stakeholder property right regimes to land, and analyze whether such initiatives represent responses to unsatisfied demands for more sustainable agrifood systems' development. More specifically, we look into the objectives and missions of such civil society organizations identified within the project "New Organizational Forms of Land Ownership" commissioned by the German Federal Ministry of Food and Agriculture, and analyze whether they target the functions of land exhibiting public-good character (including biodiversity). In the second part of the study, we analyze citizens' subjective valuations of the importance of sustainability of land use and agricultural production in relation to their willingness to participate in such collective land purchases and governance. This analysis is based on survey data collected with residents of rural and suburban areas in Germany and a discrete choice model. The analysis of the identified organizations' objectives shows that all of them acquire and manage farmland for organic farming, many furthermore specifically target improvement of biodiversity, regenerative agriculture, local short supply chains, and/or social service delivery. The survey results (i) reveal relatively high citizens' (consumers') claimed willingness to participate in common land ownership (ca. 30% of respondents) and (ii) suggest that participation in such organizations is mainly motivated by the organizations' capacity to counteract speculative investments in farmland and to support local food security. A comparison of different participation models demonstrates that the related property rights designs attract systematically different stakeholders. Publically beneficial initiatives promising no prospects of financial returns on invested capital are more likely to attract stakeholders with sentiment of solidarity with farmers (sense of collective responsibility). The study elucidates that issues of private property rights (individual and in for-profit firms) for securing sustainable land use and agrifood systems are being increasingly internalized by civil society. Policy makers need to adjust to this new societal reality and design legal framework and conditions reflecting the needs of these new common land governance models.

SPANISH CONSUMERS' COMMITMENT AND BEHAVIOUR TOWARDS SUSTAINABILITY IN FOOD CONSUMPTION

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Sustainability is a complex concept, although it is increasingly present in our society, where it is used in a generalized and almost indiscriminate manner. Food consumption is one of the areas that most influences sustainability – especially environmental sustainability – although many consumers are not fully aware of the association between their consumption and the environmental impact of food production. On the other hand, growing social concern about the environmental impacts caused by the need to produce food to meet global demand has led to increasing consumer interest in the way their food is produced and the production methods used. However, consumers' unfamiliarity with the concept of sustainability makes it difficult to evaluate and compare the different products on offer. This makes food companies interested in analyzing the influence that the concept of sustainability has on the consumers, affecting not only their knowledge, but also how it is reflected in their purchasing and consumption behavior. The objective of this study is to analyze the level of commitment to sustainability of consumers in Spain, and their perception and preference towards more sustainable foods, production systems and consumption practices. The data analyzed in this article were obtained from a survey of 324 Spanish consumers. Data collection was carried out by means of a questionnaire designed in Google Forms that was distributed between October 2020 and April 2021. Participants were contacted by email using databases created by the research team in previous works, so it should be considered as a convenience sampling. The designed questionnaire included an initial part in which consumers had to self-assess their awareness of sustainability, their knowledge of sustainable food production, their willingness to modify their consumption habits towards more sustainable ways and finally their food consumption. The results obtained show the high level of awareness that almost all the consumers surveyed have about the impact that their food consumption has on the environment. On the other hand, their knowledge of products considered sustainable and their willingness to change their purchasing habits are lower. The analysis of consumers' self-assessment of their consumption habits, and the importance they therefore give to certain practices or products that would make their consumption more sustainable, leads to a high level of perceived commitment in areas such as: recycling, avoiding waste or the attention they pay to the origin when buying food, giving priority to local or national products. The price of food, on the other hand, is not in aggregate terms a particularly relevant variable in the final purchase decision of food consumers, neither at the global level nor in any of the groups identified.

Towards a modular and coherent approach to sustainability assessment of food value chains

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Globalized supply chains are the core of current food systems. They present a key entry point for management towards sustainability and resilience, but also a major challenge for food companies operating internationally. In a transdisciplinary research project, we aimed to understand how companies can develop and implement interventions to improve the sustainability performance and resilience of their supply chains. We studied two cocoa supply chains managed by two different chocolate companies. We evaluated their actual sustainability performance at the farm level and the impacts of interventions that the companies implemented. We used different sustainability assessment approaches and looked at buyer-supplier relationships based on 420 interviews, mostly with farmers but also with intermediaries, traders and chocolate companies. This paper focuses on how sustainability and resilience assessments can support companies in managing their supply chains. Our results show a great demand for a consistent framework to assess the sustainability of food supply chains, encompassing all relevant social, economic, and environmental aspects and their governance. Existing frameworks do not satisfy this demand entirely due to methodological challenges. For example, the scope of environmental life cycle assessments (LCA) is too narrow to cover relevant aspects such as biodiversity and soil fertility as well as important social, economic and governance aspects. Approaches with a wider scope, like the SAFA Guidelines, in this project operationalized by the SMART-Farm Tool, are operator-specific and fail to address the interrelationships between supply chain operators. Finally, data requirements for both approaches are immense, and data standards are incoherent with secondary data. Therefore, both frameworks are costly to implement in a business context. Hence, we argue for a modular approach to sustainability assessments that can be targeted towards the relevant specific issues. This approach needs to be based on a harmonized common data standard for farm and food systems data.

Members' Choice for Marketing Cooperatives' Financial Structure: Evidence from the Netherlands

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Besides their contributions to the sustainable development of the value chains in the primary sector, agricultural cooperatives (co-ops) have long been criticized for their capital constraints because they have traditionally adhered to exclusive members' ownership in the form of direct investments or retained patronage refunds. However, many marketing co-ops, in order to successfully adapt to the industrialization of agricultural and food markets, have relaxed their traditional finance principle. The extent to which co-ops relax this definitional principle influences the formation of their ownership financing structure. That is, co-ops range from traditional (e.g., general reserves) to a more individualized, IOF-like (investor-owned firm) ownership model. Numerous co-ops in the US and EU allow for individualized equity shares, invite non-member parties to partially finance their operations, and publicly list parts of their equity stock. A question that arises is what actually drives the decision of member-patrons to invest in a marketing co-op's equity structure, which is formed either using traditional funding sources (e.g., general reserves) or more individualized ones (e.g., individual certificates and loans). The objectives of this paper is to examine what drives members' choice for cooperative ownership financing and the impact of heterogeneity on their choice, attitudes, and perceptions. To address our objectives, we conducted field studies with 225 members of two marketing co-operatives: one involved in horticulture and the other in dairy production. To the best of our knowledge, this is the first empirical study that examines the drivers (attitudes and perceptions) of members' choice for different sources of marketing co-ops' equity. Our results indicate the diversity in members' choices, risk behavior, perceptions, and attitudes. Knowledge of the existence of member-segments and an understanding of their preferences may be useful to co-op policy makers to better evaluate efforts by member-subgroups who may strive to influence the make-up and implementation of co-op equity policies.

Definition of an analytical framework for the analysis of Bio-districts social sustainability: A literature review

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The general objective of the paper is to present an analytical framework for the analysis of the impacts of Bio-Districts on social sustainability, a less studied dimension of sustainability when compared to the environmental and economic ones. The Bio-Districts are territories where farmers, citizens, public authorities, and other local actors accomplish the sustainable management of local resources, based on the principles and model of organic farming and on agroecology, to boost the economic and socio-cultural development of their community. The study focuses on the most vulnerable stakeholders of a Bio-district such as small farmers and their employees. The analysis will allow to evaluate the positive outcomes from this alternative food system, assessing the aspects of economic resilience as well that are achieved by stakeholders involved in such production chain. The research question addresses the possibility to define an analytical framework and related indicators, capable to assess the social sustainability of Bio-Districts. The theoretical framework is built using an extensive literature review on the existing social sustainability tools and their key indicators, applied to an agricultural context and/or in food production systems. By comparing studies related to sustainable food systems to more conventional ones, hypothesis, and consequent sets of variables, will be defined to assess the benefits that farmers can earn from maintaining biodiversity and promoting Important Agricultural Heritage Systems, like the Bio-districts. The main expected results are to find key indicators and a suitable analytical method, that can be adopted for understanding how Bio-districts can influence the socially sustainable development of food systems and rural areas. Moreover, this is the first approach to the analysis of the social dimension of Bio-districts, providing the opportunity to compare different Bio-Districts around the world and retrieve information that can be shared to achieve better solutions in terms of sustainability and economic resilience, not only for the stakeholder directly involved in the production, but also for the local communities and inhabitants of the nearby areas.

Household livelihood strategies and forest dependence in Tunisia

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In Tunisia, rural households pursue a wide range of livelihood strategies. Some households diversify their livelihood strategies, while others rely on one or few activities. Forest products are providing substantial contribution to the wellbeing of local population. However, the level of forest use and the degree of dependence on forest resources differ across households. The factors that affect a household's reliance on forest products, depending on their socio-economic characteristics. In this context, understanding-determining factors in a household's activity choice and particularly its dependence on forest products is essential for both conservation and development-targeted policies. The aim of this paper is to identify the factors that influence a household's choice of livelihood strategy, with a particular focus on the dependence on forest products. Our guiding premise in exploring the determinants of household livelihood strategies relies upon the 'rationality' assumption of economic agents and the fundamental proposition of the livelihood approach. The latter states that the type of activity undertaken and the amount of income earned by a household could be defined as a function of the assets at its disposal (Barrett et al., 2005; Brown et al., 2006). Based on this proposition and the behavioral responses of a rational economic unit, we hypothesize that the less a household has access to livelihood assets, the more it relies on forest products. To test our hypothesis, we carried out an econometric analysis using data from a random sample of 330 households in the northern Tunisia. Based on the share of forest income in total household income, sample households are clustered into four mutually exclusive clusters. A multinomial logit (MNL) regression is implemented to examine the main factors determining the household's livelihood strategy and its reliance on forest products. Using the share of forest environmental income in total household income, the sample households were categorized into four classes, as noted above. This helps obtain a mutually exclusive choice of livelihood strategies of households. In the first group, about 60% of the share of an average household's total income comes from crop and livestock sources together. Thus, this strategy is called as 'less dependent' on forest products. With an average forest income share of 25%, households in the second group are generating nearly a quarter of their livelihood from forest collection. Given the high contribution of non-forest sources to the total income, households in this strategy type may be considered as only 'moderately dependent' on forest income. Both the last two groups derive the lion's share of their income from forest products about 50% and 65%, respectively. Consequently, these categories could be classified as 'highly dependent' and 'very highly dependent' strategies on forest income. The MNL model results indicate the effect of explanatory variables on the relative likelihood that the household chooses, compared with choosing the forest-dominated strategy as the base strategy. We found gender of the household head and land size significantly and consistently explained the choice of forest activity. Women are more likely to engage in the collection of forest products compared to the rest of livelihoods clusters. In addition, our findings show that households with large farm size are less likely to engage in forest extraction as the dominant strategy. Furthermore, men and better education and access to markets and credit are vital for local population to be 'less dependent' on forest products and have the opportunity to be engaged in more remunerative activities. On the other hand, households with livestock production are more likely to adopt a forest-dominated strategy. This could be explained by the valorization of forest by-products (glands, grazing, etc..) as animal feed for the livestock activity in forests areas in Tunisia, which in turn helps households reduce the animal feeding costs (Babulo et al., 2008). Finally, our empirical findings suggest that larger household boosts the likelihood of higher dependence on forest products. A first possible explanation for this observed pattern is that a larger family means more children that would be engaged in various family activities, mainly cattle herding and fodder and firewood collection (Taghouti et al., 2021).

Ecosystem services and dis-services related to endemic species cultivation in Crete

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The main objective of agroecosystems management is to meet human needs, such as providing quality and sufficient food and biomass and income security. Based on the Millennium Ecosystem Assessment, these ecosystem services are classified as provisioning services. However, sustainability in provisioning services is directly dependent on a set of ecosystem services, whether they are supporting (such as pollination, soil fertility, nutrient cycling, and water supply) or regulating (such as climate regulation, biological pest control, and beneficial insects), which are linked to agroecosystems functions. Finally, agroecosystems provide a set of cultural services, such as recreational or spiritual activities. However, agriculture can potentially be responsible for ecosystem dis-services that can affect production costs and agricultural productivity. Such dis-services could be the introduction of invasive pests, the competition for water and nutrients, and habitat degradation. The flows of these services and dis-services are directly dependent on the cultivation methods implemented on the agroecosystems and the crop selection of adapted species. In order to provide adequate ecosystem services, this management approach is a critical factor in agricultural production today and requires extensive interdisciplinary research. The link between the sustainable provision of ecosystem services and sustainable agricultural production is also confirmed by the long-term policies of the European Union, such as the Farm to Fork Strategy, the New CAP 2023-27, and the Biodiversity Strategy for 2030. Based on this approach, Crete's highly diverse and heterogeneous natural landscape is recognized as biodiversity hotspot, with extensive human activities related in managing agricultural environments. Agroecosystems of Crete, could supply multiple ecosystem services and social and environmental benefits. This presentation focuses on how the cultivation of endemic species could enhance ecosystem services provided by Cretan agriculture while reducing ecosystem dis-services. Based on a targeted review, we first describe the main physiological aspects, quality characteristics with emphasis on the content in biologically active phytochemicals as well as cultivation practices of *Sonchus oleraceus* L., *Crithmum maritimum* L., *Scolymus hispanicus* L., *Portulaca oleracea* L., *Pastinaca sativa* L., *Amaranthus blitum* L., *Lactuca serriola* L., *Urtica dioica* L., *Reichardia picroides* L., *Plantago lanceolata* L.. We then present the most important ecosystem services, which are associated with these plants. Finally, we explore if their cultivation is capable of reversing some of the ecosystem dis-services concerning agriculture.

CONSUMER PREFERENCES FOR QUALITY LABELS OF SAFFRON IN THE SPANISH REGION OF ARAGON

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Aragon, in the northeast of Spain, has a traditional production of saffron (*Crocus sativus* L.). Nowadays, after a long-term decrease in the cultivation, there is a renewed interest in saffron as a sustainable high value agricultural product. Unlike the Spanish saffron from La Mancha that counts on the Protected Designation of Origin (PDO) Azafrán de La Mancha, the Aragonese saffron has not any quality labelling that guarantees the quality of the product to consumers. The aim of this work was to study which of the available labels to ensure and communicate the quality, origin, and/or production system of saffron were the most and the least preferred by consumers in Aragon. Five different labels: the EU organic label, Protected Designation of Origin (PDO), Slow Food, “C’ALIAL”, and “Artesanía Alimentaria Aragón” were assessed by consumers. The two first labels are regulated by the European Union, Slow Food is promoted by the Slow Food international movement, whereas the last two labels are regulated at regional level. A direct ranking preference method was used and a rank-ordered mixed logit model was estimated with the data from an experiment conducted with food shoppers in Aragon. A total of 202 volunteers stratified by age, gender, level of education, and province of residence participated in the experiment. Consumer preferences for the different labels were heterogeneous. Results indicated that the most preferred label was the EU organic logo, followed by the PDO one, indicating that consumers clearly valued the quality labels that are regulated by the EU. On the contrary, the least preferred was the Slow Food label. Moreover, consumer preferences for food labeling were heterogeneous and four segments of consumers of similar sizes were obtained from the cluster analysis: organic lovers little interested in C’ALIAL; organic lovers little interested in PDO; PDO lovers; and C’ALIAL lovers. This work contributes to the understanding of consumer behaviour regarding quality differentiation of saffron.

Biodiversity in Agri-Food Value Chains: comparative studies in three countries

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Although the benefits of increased biodiversity have long been recognized, it largely remains underutilized and restricted from commercial agri-food value chains. In this article we employ a mixed methods approach, combining quantitative data analysis with qualitative interviews with industry insiders and experts, to uncover the structure and conduct in selected agri-food value chains in Europe. We specifically explore the cases of cereals, legumes, fruity vegetables, and leafy vegetables and our focus is on four countries: France, Italy, Norway, and Germany. Our work will give insights and intuition on the drivers and hindrances for increased biodiversity in modern agri-food value chains in European markets. The article is part of the H2020 BIOVALUE project.

Agricultural Holding Groups and Technical Efficiency: An Analysis Accounting for Unobserved Heterogeneity

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Recent farm structural changes in countries of Central and Eastern Europe have been accompanied by vast ownership as well as size dynamics, in which formation of holding structures through merger and acquisition is no more a unique form of farm growth (Curtiss, et al., 2018). The farm groups with capital integration ('agroholdings') became an integral part of business structures accounting for more than 40% of country's utilized agricultural land and simultaneously even higher share of agricultural employees. Holdings' performance and thriving economic results raises concerns how sustain is the justification of equal public fund distribution among agroholdings and individual family-based farms. This paper examines the technical efficiency of farms that are members of agroholdings in comparisons to those operating as individual businesses. The empirical analysis uses accounting data, i.e. balance sheet and profit and loss account for 200 farms (legal entities) in the period of 2010 to 2020 (imbalanced data panel). We evaluate the true fixed effect and random fixed-effect model developed by Greene (2005) that addresses time-varying and unobserved heterogeneity from the inefficiency component. Dependent variable is revenue in CZK Krona, explanatory variables include land, nr. Of employees, operating costs, overheads and capital. We estimate the technical inefficiency models as pooled for both groups and, separately for agroholding members and individual firms (non-members). The empirical results show that farms that belong to agroholdings are more technically efficient than those that do not belong to agroholdings. In particular, agroholding farms achieved on average about 95% efficiency scores compared to 84% of non-agroholdings. Some of the explanation is that firms within agroholdings more often benefit from the operational and managerial advantages; they often pool some resources inside the agroholding making the cash-flow more available for the agricultural members. Besides, their fixed costs are reduced by sharing capacities of several specialists, e.g. lawyers, accountants, risk-assessment managers, etc. Regarding the factors of technical efficiency, we observe that the number of employees and total agricultural land played an essential role in the technical efficiency of firms (positive scale effect). Indeed, data confirm that additional land contributes to productivity growth on farms as well as inefficiency reduction for both observed groups which may suggest capping the part of direct or investment payments with farm size.

Agronomic performance of broomrape resistant and susceptible pea and faba bean breeding lines: the value of genetic resistance

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Pea (*Pisum sativum*) and faba bean (*Vicia faba*) are temperate grain legumes. A peculiarity of Mediterranean pea and faba bean production is that “spring types” not requiring winter hardiness are typically winter sown, profiting from winter rains and to escape drought and heat at late spring. However, early sowings are more prone to broomrape (*Orobanche crenata*) infection that is a major constraint for legume cultivation in the Mediterranean basin. Strategies for broomrape control have been developed, including cultural practices and chemical control, however, all have met with limited success (1). No complete resistance is available, but classical breeding has succeeded in accumulating valuable levels of resistance in a number of cultivars that are becoming available to farmers (2,3). Here we describe a series of agronomic trials comparing performance and yield of pea and faba bean elite breeding lines and cultivars differing in the level of broomrape resistance in multi-environment field testing. Results in both crops showed how grain yield was strongly affected by broomrape infection, with lower influence of other diseases. The level of broomrape infection varied among environments, being strongly dependent on parasitic seedbank density and on environmental factors, with mild temperatures before crop flowering enhancing broomrape seed germination and establishment, and rain and fresh temperatures at spring rain favouring broomrape development and emergence. Grain yield was highly correlated (negatively) with broomrape infection in both crops, with broomrape resistant accessions clearly over yielding in environments with high broomrape infection. Results will be presented and critically discussed.

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Hydroponic cultivation as a tool for the protection of biodiversity and sustainable development

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According to FAO, by 2050 the global population will reach 9.1 billion, and food production will have to increase by 70 %. While the need for food production is rising rapidly, in the last 40 years 1/3 of the planet's arable land has become unproductive because of poor management. Meanwhile, biodiversity is at risk mainly due to unsustainable natural resource use, agricultural expansion, deforestation, climate change and pollution. Hydroponics is a technology where plants grow in nutrient solutions with or without the use of an artificial medium. In closed hydroponic systems, the excess nutrient solution is re-used after the irrigation. Nowadays, the use of hydroponics is growing thanks to innovative cultivation systems such as vertical farming, floating systems, and plant factories with artificial lighting. Advantages of hydroponics include the ability to cultivate plants in territories with degraded or unsuitable for plant-growing soils, the absence of pesticides in the production and the rational use of water and energy. Thus, hydroponics could indirectly benefit biodiversity conservation, as resource use is more efficient, achieve the production of vegetables with a lower carbon footprint and the system is more sustainable than traditional agriculture. It can also help limit biodiversity loss through the reversion of farmlands into natural environments. In conclusion, it seems that hydroponic cultivation could be potentially used as a tool for the protection of biodiversity and sustainable development.

How resilient are Czech farmers to climate change related risks?

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Governmental compensations for losses caused by weather and other production risks became an integral part of risk management agricultural policy in the Czech Republic. However, the model of frequent ad hoc compensations, where farmers are regularly paid by the state for production damages, are no longer sustainable. It leads to undesirable consequences, that weaken farmers' preparedness to the risk threats and other implications while ad hoc aid represents a significant increasing financial burden on public funds. The aim of the research was to investigate the actors' perception of farm specific external (e.g. governmental support for insurance) and internal incentives (cost effectiveness, motivations) that distinguish their choice of various risk management strategies. The investigated strategies involve producers' participation in state-subsidized insurance schemes and the mutual risk funds. One of these conditions is maximum insurability and the establishment of a mutual fund for those types of risks, for which private insurance is not offered. In this way, insurance and mutual funds can be seen as complementary strategies. The results of the research will indicate, for example, how publicly supported measures have potential to build sustainable agricultural risk strategies on different farm types and implicitly to what extent farmers are capable to absorb production losses. The analysis explores data from a farm survey organized among Czech family and corporate farms in 2021. The (binary) logistic regression models showed that there is an effect of farmland acreage on what (dis)trust in insurance companies, the probability of realizing a loss above 20 % of production, the price of insurance premiums and risk management according to the developed formal strategy on taking out agricultural insurance. The research results in a model with high reliability of predicting the negotiation of agricultural insurance. The positive relationship between farm size and extent of insurance on a farm supports the argument for a degressive principle of state subsidy with a size of the applicants. Findings that (past) relationship between the farmer and the insurance company promotes farmer trust and thus a greater participation in insurance contracts should encourage companies to invest in the trust of their customers and promote long-term relationships. This indirectly helps in greater insurability and thus hedging against the impact of risk among farmers. Approximately one-third of respondents assess a certain probability that there will be at least one weather-related loss of more than 20 % in crop production on their farm in the next 5 years. It will be interesting to explore in the next part of the research whether this assessment is based on past experience of similar damage or whether other factors on the farm predict such an assessment. The relationship between 'likely' expected damage and willingness to insure is to some extent expected. Indeed, it is important to further understand what types of risks the respondents in question have in mind in their assessment. The results suggest indirectly that drought risk also contributes significantly to the above assessment but is not yet offered by insurers.

Food systems governance and agroecological transitions: a perspective study of Senegal

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With the European Green Deal, the EU has committed to promote sustainable development both internally and at the international level. Indeed, addressing global environmental problems, from climate change to biodiversity loss, requires internationally coordinated responses. In this respect, a special attention is devoted to Africa, Europe's closest neighbour. Here, the eradication of poverty and malnutrition remains a priority, while the effects of climate change are predicted to be particularly dire. The Covid-19 crisis and the conflict in Ukraine further deteriorate the situation. The promotion of sustainable agriculture and rural development is key to addressing these challenges. The adequacy of the conventional agricultural model for Africa is being questioned. First, it is not clear whether a Green Revolution approach, relying on a few high-yield varieties and high external inputs applications, can ensure food security and adaptation to climate change. Second, focusing on input-intensive agriculture in a context dominated by resource-poor farmers is likely to produce at best mixed results. It is against this backdrop that a call for food systems (FS) transformation in Africa has emerged, with several authors pointing to an agroecological transition (AET). An agroecological approach, which aims to achieve high productivity with minimum amounts of external inputs, is particularly suited to resource-poor farmers in the Global South, while fostering climate change adaptation. The proposed research addresses the following important gap: FS are complex socio-ecological systems. The effects of policy interventions are difficult to predict since they will depend on other contextual factors. Without considering the context within which change can occur, any discourse on transformation remains abstract. Existing research points to the crucial role of grassroots organizations and FS stakeholders. It also posits that AETs should reflect the aspirations of the various actors within a FS. Yet, these aspects are often addressed separately. A full understanding of the role of contexts in AETs requires the joint study of the constraints associated to the existing governance regimes of the FS and the possibilities reflected in the visions of the different stakeholders. We will focus on Senegal to tackle these questions. Agriculture in Senegal accounts for 37% of GDP, while providing occupation to over 50% of the active population. Yet, undernourishment in Senegal still affects over 9% of the population, while at the same time the pressures on agricultural resources (land, water in particular) are increasing at an unsustainable rate also due to climate change. Addressing this research gap, represents a preliminary step to assembling the needed scientific evidence to guide the EU initiatives for AET in Africa. This in turn is crucial to promoting sustainable nutrition at the international level, as highlighted in the EU-African Union Summit, alongside recent EU strategic documents.

Exploring the behavioral intentions of food tourists who visit Crete

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Food tourism is growing globally in the last years. Food tourism is considered as an alternative form of tourism, attracting highly interested tourists. Tourists spend a significant percentage of their budget on the purchase of local food products and related food activities, also contributing to the sustainable development of the touristic destination. The survey took place at the Airport of Chania, Crete throughout the touristic period of 2021 and almost 4000 valid questionnaires were completed by tourists. For the data analysis, advanced statistical analysis and the Theory of Planned Behavior, based on subjective norms, attitudes and perceived behavioural control, were used to better understand the consumers' intentions to buy local agricultural products, visit food establishments and revisit the Region of Crete. Moreover, in this paper, the importance of motives and food experiences in the final decision for tourists to choose Crete is highlighted, the degree of satisfaction regarding characteristics of the products is pinpointed, their participation in food activities is being explored, their willingness to recommend those products is mentioned and the percentage of their budget spent on those products during their stay in the Region of Crete is estimated.

A cluster analysis study based on financial indicators, as a competitiveness strategy of the brewery industry in Greece

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Greek brewery is one of the most important industries, not only in terms of the domestic beverage market but also for promoting Greek products abroad. There is no doubt that the brewery is one of the most profitable industries not only in Greece but also in Europe, as it employs a large number of employees and also contributes to strengthening state revenues. To ensure the sustainability of the industry and understand the economic situation of brewery enterprises, financial analysis is crucial. By analyzing financial ratios, a company can gain insight into factors affecting economic utility, such as increasing profitability, reducing risk, and enhancing liquidity. As a result, it will be able to create a competitive advantage and follow a successful strategy. This paper examines and analyzes the financial situation of the brewery industry. As a result, it will be possible to evaluate how well the company adapts to the changing market environment. In terms of financial analysis, this paper discusses the most relevant financial ratios in each category and their results with the aim of drawing specific conclusions regarding the creation of competitive advantage for the firm. In order to determine their level of competition, a cluster analysis would be conducted according to the size of the firms. Results showed that large companies were able to pay their current liabilities, fixed costs, interest, and dividends, and better handle current losses. Solvency levels and stock circulation rates of large companies were high. There were difficulties in meeting current obligations and coping with losses for small and medium-sized businesses.

Posters

Be RADIANT: help ReAlising DynamIc vAlue NeTworks for underutilised crops

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In the last century, 75% of the genetic diversity of crops has been lost, and very few crops account for the largest percentage of cultivated farmland. The most recent EU Agricultural Outlook Report concluded that consumer, environmental, and animal health concerns will drive EU farmers to promote crop diversity. There is a hitherto unparalleled urgency for alternative production systems based on underutilised crops (UCs), as they can offer elevated levels of agrobiodiversity, and empower stronger local, or bioregionalised, short value chains, especially for smallholder farmers. The Food and Agriculture Organization of the United Nations (FAO) have stated that UCs have a pivotal role to play in the fight against hunger, malnutrition, inequality, and the avoidance of environmental and economic degradation, and biodiversity loss. While such farmers most commonly produce a variety of landraces and crop species, they usually lack well-established producer-consumer links, and a resilient commercial infrastructure. The European Commission funded project, RADIANT (ReAlising DynamIc vAlue ChaiNs for underuTilised crops; www.RADIANTproject.eu; Grant Agreement number 101000622), aims to address this. RADIANT is a Research & Innovation action structured around an array of strategic work-packages and workshops to accommodate the widest possible range of multi-stakeholders via inter- and trans-disciplinary engagement methods. RADIANTs approach will focus on a core collection of 15 UCs, and an extended collection of many other UCs, which are important species for a network of 20 ‘AURORA’ farms as key pilot studies across a range of cropped system types, and biogeographical zones. RADIANT activities are centred on implementation of the ‘Theory of Change’ approach, which recognises the need for cross-stakeholder engagement for identification, and implementation of simultaneous transformative actions system-wide. These include for example, support which enables multilateral learning opportunities among farmers, breeders, chefs, food retailers, scientists, representatives of food/non-food industry, and civil society - where dialogues generate appropriate questions, and transformation avenues. Also, these narratives and strategies should strengthen the evidence-base with respect to multiple ecosystem-function, indicators - and with respect to high-level dimensions, specifically: environmental-, economic-, human-, and societal-capitals. RADIANT has a strong focus on the impact if UCs on cropped system functions, including biodiversity, plus nutritional and health provisions, and adoption of UC benefits into new marketing schemes. This will be achieved by also identifying and clarifying the necessary governance and policy frameworks required to ensure preservation of UC diversity and their multifunctional benefits - and especially where UC are developed for commercial profit in a variety of food-, feed-, and/or industrial-value chains. RADIANT therefore welcome engagement with all stakeholders wishing to safeguard UCs, to discern and assemble the best approaches to achieve truly sustainable UC-based approaches that foster agrobiodiversity, and downstream societal benefits. Towards this end, a dedicated platform for agrobiodiversity will be established to offer new digital communication routes, and UC-dedicated tools engage and enable UC-producers and -processors. Furthermore, RADIANT welcomes engagement farms from outside the project and is offering support-funding for UC-focused commercial ventures.

Delignitization era in Western Macedonia: citizens attitudes towards the effects on local agrofood sector and employment

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Western Macedonia region is located in North-western Greece with the higher level of unemployment among all EU regions. Its economy largely depends on lignite mining, lignite-fired power plants and district heating systems. In 2019, the Greek Government set the goal of withdrawing all lignite plants by 2028. This decision will have significant impacts on the region in terms of local economy, employment, environment and the agro food sector. In this context, this paper aims to identify residents' attitudes towards the effects of delignitization in all the above mentioned sectors. A survey was conducted in the region of Western Macedonia, Greece, where 384 residents were participated via a questionnaire survey. Statistical analysis was applied and potential differences among residents' attitudes according to socioeconomic data were derived. Results indicated that respondents believe the delignification will reinforce the agricultural development of the region and that the eventual upgrading of the natural environment will contribute to the production of higher quality agricultural products and consequently increase their preference and consumption. Finally, as far as employment is concerned, respondents believe that the withdrawal of the lignite plants will increase unemployment in the region and reduce family income. However, the agro food sector seems to be the most promising economic activity against unemployment.

Preliminary study for the identification of aphid resistance in grass pea

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Lathyrus sativus (grass pea) is a temperate grain legume crop with a great potential for expansion in dry areas or zones that are becoming more drought-prone (1). Currently, given the increasing need for resilient food crops, improvement of grass pea and other economically important species grown commercially for food or forage are still considered a priority by national and international research centers (2). Grass pea can be severely affected by pea aphid (*Acyrtosiphon pisum*). This is a polyphagous species of major importance on pea, but also on related species, to which little resistance is available (3). Preliminary screenings showed some variation in resistance in grass pea germplasm. Here we describe the verification screenings performed on nine breeding lines of *L. sativus* and 1 of *L. cicera* performed under semi-controlled conditions in field at Córdoba (Spain) during two seasons (2020-21 and 2021-22), as well as under growing chamber conditions. Aphids used in the experiment derived from a natural population collected on grass pea in field in 2020 and multiplied on susceptible pea plants under controlled conditions. At mid-March (prior to plant flowering), aphid infestation was performed by gently placing on the apical part of the plant approximately 3 nymphs per plant, using a paint brush. After 3 weeks (early-April) and coinciding with the flowering stage, aphid response was estimated evaluating the % of canopy covered by insects. This was periodically repeated at the pod formation and pod maturing stages (between end-April and end-May). In addition to this, screenings were performed in seedlings under controlled conditions where aphid infestation was estimated at 3 days interval until 25 days after infection by counting the number of aphids, adults and nymphs per plant. Also, total number of aphids in the apical part was evaluated. Host damage was estimated by assessing 1) percentage of the plant with chlorosis (Chlor), 2) percentage of the plant damaged by aphid attack (Dam), 3) percentage of the tip with damage (TipDam), 4) percentage of the plant that presents wilting (Wilt). This allowed the calculation for each trait of the area under the disease progress curve (AUDPC). Significant differences in aphid infestation were found identified, with Almerana, Almora and Chicharito outstanding both under field and controlled conditions.

Farm Planning in rural areas of the region of Central Macedonia using Linear Programming

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Linear Programming (LP) is one of the main methodologies used for farm planning in literature. Linear Programming is the optimal allocation of limited resources, between competing activities, according to a set of constraints imposed by the nature of the problem which is under study. These constraints could reflect the financial, technological, organizational, or other techno-economic resources of the farm. In this study a reorganization of the farm plan of the region of Central Macedonia in Greece was made using the Linear Programming methodology. The farm plan of the region was emerged from a sample of 219 agricultural holdings. These farms have participated as beneficiaries of measure 121 “Modernization of agricultural holdings” of the Rural Development Program 2007-2013 in the Region of Central Macedonia. For these reason a Linear Programming model was developed under three different conflicting goals. The goals were the maximization of gross margin the minimizations of fertilizers use and the minimization of labor use. The implementation of the Linear Programming model achieved a new optimal farm plan for the region. The results of the optimal farm plan showed that there is an increase in the farms’ gross margin, but also an increase in fertilizers use and in labor use. In conclusion, the use of the Linear Programming method is suggested in cases where we are interested for optimizing one single goal in farm planning. Since the Linear Programming model is a static model its use is also suggested for a specific period of time (e.g. one growing season).

Assessing the impact of food safety issues and COVID-19 pandemic on consumer purchase habits

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There is strong evidence that there is a growing concern about food safety and quality of agricultural products. Hence, consumers have been faced with different food safety problems having major consequences on their behavior, attitudes and preferences towards particular food products (Liu et al., 2021). Due to various food safety failures (such as Salmonella, Listeria, E.coli, Dioxins in animal feed, etc.) and the impact of COVID-19 pandemic, consumers have become more demanding regarding food safety issues (Meixner and Kalt, 2020). Quality management in the food industry is quite a complex process, due to factors such as the short lifespan of agricultural products, as well as the big and diversified number of stakeholders involved in the production, processing and trading process. These challenges have forced the food industries, in the context of competition, to diversify food supply chain management in order to define and meet consumer concerns and ever-increasing demands. This survey aims to assess and evaluate consumer perceptions regarding food safety issues with the application of Factor Analysis, in order to identify the main factors affecting consumers and whether legal, operational and social context influences consumers' decision-making process. Factor analysis results feature that people are more concerned about technological risks of food production but also risks associated with their lifestyle. Consumers state, to a large extent, the difficulty of finding and purchasing healthy/safe food. In addition, COVID-19 pandemic has raised consumer concern about food safety issues affecting the way food is prepared. Demographic differences were observed in terms of gender, age, educational level and monthly individual income. Education level of respondents is significantly interrelated with the importance of food safety, while more educated individuals are more aware of food safety and hygiene issues. Finally, it is evident that women emphasize more to the aforementioned issues compared to male consumers. Indeed, some individuals, especially men, seemed to underestimate risks associated with food management and domestic food hygiene, suggesting that they feel they have under control their hygiene and safety practices regarding food preparation and storage.

Blockchain based traceability system in short food supply chains

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Food supply chains are dealing with increasing food fraud challenges and consumer trust and their interest in knowing more about the food they eat. Traceability can ensure a product's follow-up through each stage of its life cycle and provides consumers more visibility and guarantees on the items they buy. Blockchain (BC) is a digital distributed ledger where data is saved into blocks linked together with cryptographic technologies. In BC technology, transactions can be written to BC to create permanent and immutable records, protected against subsequent manipulations. Each supply chain actor writes relevant data about the products in the chain of blocks. The producer receives a digital identity and enters the farm and field production data. Processing actors provide information about their entity, equipment, processing methods, and batch number. The distribution actor provides shipping details, storage conditions, and time in transit. As the producer or processing actor prepares the digital delivery docs, the retailer accepts the product by scanning the QR code, which signs the transaction and directly transfers the data to the store business management system. At the final stage, the mobile device enables the consumer to scan the product QR code and review the food traceability record on a screen. The User interface is designed with a focus on end-users (farmers) and consumers who all mainly use mobile phones, but there is also a management part mainly used on desktop devices by store employees. Blockchain can provide an efficient solution to the urgent need for improved food traceability and increase safety and transparency.

Creating novel food dishes and innovative food products using promising neglected and underutilized crops

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Introduction: The double burden of malnutrition, the coexistence of both over- and under-nutrition, is nowadays seen in both developing and developed countries. Novel food approaches, with the capacity to simultaneously counteract food insecurity and malnutrition, improve biodiversity, increase sustainability, and prevent the outgrowth of overweight and obesity in humans, are required. Objective: The objective of the current work was to develop a methodology for creating recipes for novel dishes and innovative food products, considering different cultural and traditional practices in numerous countries across Europe. An assessment of consumers' acceptance and preferences for new foods and food dishes, as well as the interest of food producers to utilize nutritionally rich underutilized cultivars for the creation and promotion of novel food products, will be taken into consideration. Methods: Comprehensive overview of the literature to assess the demand for novel foods and food products and the capacity to develop sustainable novel foods applicable to all populations across Europe. A methodology for the development of novel food recipes includes the following: comprehensive grey literature search (collection of the traditional recipes and existing food products containing cultivars of different endemic plants and vegetables across Europe), creation of qualitative questionnaires for assessment of consumers' preferences and expectations (paper format, focus groups), online surveys (international consumer preferences of dishes and food products containing studied plants) and tailor-made interviews (examine food producers' readiness to enhance food processing and marketing practices). Results: Locally available, nutrient-dense, climate adjusted, and affordable plant species are crucial for ensuring dietary diversity and healthy diets worldwide. Novel foods and food dishes, based on promising neglected and underutilized species, can help in overcoming several different nutritional challenges and should become available to all. The application and promotion of underutilized traditional foods provide nutritional, economic, and cultural benefits and, at the same time, address sustainability and food security concerns. Recipe design and food product collection will include an overview of online recipe databases, cookbooks, and commercial food databases across Europe. Consumers' focus groups, sensory tests, will be organized in four countries: two focus groups per country - in Serbia, France, Greece, and Hungary. Quantitative online consumer surveys will be run in eleven European countries and interviews with food producers will be performed in Germany, Greece, Hungary, Turkey, Spain, and Serbia (15 companies per country). Conclusion: Novel foods and new food technologies, based on underutilized crops, have the potential to contribute to healthy and sustainable diets. The creation, application, testing, and improved availability of these foods should be strongly supported in all European countries. A carefully planned, well-designed, multidisciplinary method is required to link nutritional, cultural, and environmental aspects of food production with the food industry's willingness to produce and promote novel food products and improve consumers' awareness to accept and utilize novel foods in everyday life.

Why have certain crops become neglected and underutilized species?

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Underutilized crops (UC), also known as neglected, orphan, promising, minor, and little-used species, are mostly wild or semi-domesticated species, typically native to the environments in which they are grown. Due to their lack of economic importance, most of these plants have been neglected by the international scientific community and industry when compared to commodities such as rice, wheat, and maize. When more productive crops became available in farming systems, many UC, that were used for centuries prior to it, became increasingly abandoned, marginalized, or entirely forgotten by breeders, farmers, researchers, and policymakers. Recently, more, and more attention is devoted to underutilized and neglected crops/plants due to their high nutritional value (rich in macro/micronutrients and bioactive compounds), recognized potential to reduce risk in agricultural production systems, improve human nutrition and health, be used as medicine, strengthen ecosystem health, support cultural diversity, and generate income. Research question: What were the main causes and conditions that contributed to reduced consumption and cultivation of numerous crops? Objective: To identify the main reasons for altered and/or eliminated consumption and cultivation of certain crops of interest. Methods: A comprehensive literature search was performed using two databases (Scopus and Web of Science) and Google Scholar. Seven UC were selected for a thorough evaluation: buckwheat, cucumber, dandelion, grass pea, eggplant, lentils, and green leafy vegetables. Main findings: The main causes for the modified and/or eradicated consumption and cultivation of UC can be classified into several categories: agronomic, social, technological, economic, and political. The most important identified factors for selected UC are the following: Buckwheat: Bitter taste, tightly adhering hull, only two species used for human consumption, expansion of other cereals, i.e., wheat, rice, and maize; the presence of allergenic compounds, self-incompatibility, vulnerability to both spring and fall frosts, insufficiently characterized agronomic evaluation of buckwheat plants Dandelion: Limited information on agronomic practices and cultivation characteristics, lack of awareness of beneficial aspects of these plants, and lack of culinary skills for the preparation of products based on these plants Grass pea: 'food of the poorest of the poor', neurolethyrism, absent genome sequence information Eggplant: increased exposure to plant diseases and insects; absence of genome sequence Cucumber: threatened by severe genetic erosion, short shelf life, pest diseases, fungal diseases, biotic and abiotic stressful conditions Lentils: relegation to marginal lands, abiotic and biotic stresses, water limitation, diseases, pests, low yield, low productivity, production constraints, complex cultivation, technical challenges, superiority of other crops Leafy vegetables: increased cultivation of exotic varieties, bitterness, unpleasant taste and/or smell, misconceptions about 'poor man's diet', short shelf life Conclusion: Recognized benefits of underutilized plants in reducing the risks in agricultural production systems and potential benefits to human nutrition and health should be the main drivers that will motivate farmers, researchers, breeders, nutritionists, agronomists, and policymakers to bring neglected species back to cultivation.

Heat waves are major limiting factors for legume production even in winter sowings: the need to select for tolerance to high temperatures at flowering and grain filling stage

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Heat waves are major limiting factors for legume production even in winter sowings: the need to select for tolerance to high temperatures at flowering and grain filling stage. Diego Rubiales¹, Angel M. Villegas¹, María J. Cobos¹ and Eleonora Barilli^{1,2}, Fernando Flores³ 1 Instituto de Agricultura Sostenible – CSIC, Córdoba, Spain 2 Solintagro SL, Córdoba, Spain 3 Universidad de Huelva, Spain Keywords: heat, *Pisum sativum*, *Vicia faba*, *Cicer arietinum*, *Lens culinaris*, genetic resistance Abstract There is potential for expanding grain legume cultivation to dry and warm Mediterranean rain-fed environments where early sowings are recommended to profit from winter rains and to escape from drought. Attention has been paid in most breeding programs on resistance to pests and diseases (1), and on tolerance to drought, salinity and cold (2). However, less attention has been paid to tolerance to high temperatures. Our results from multi-location field trials in southern Spain on chickpea, lentil, faba bean, pea show how even in winter sowings, high temperature at grain-filling stage is a major detrimental on grain yield. Our results from multilocation trials in which 15 to 20 accessions each of lentil, chickpea, faba bean and pea, tested in 10 to 15 environments under winter sowings, showed how, contrary to common understanding, high temperature at flowering and early grain filling stage is by far the major abiotic stress in the region, that could be paired with a biotic one, depending on the crop. Like this, chickpea trials showed how the two major constraint to yield were as blight infection, paired with number of days with temperatures higher than 30°C after flowering (NDTmax>30), with little effect of cold temperatures or of other abiotic or biotic stresses. Faba bean, pea and lentil trials showed how broomrape paired with NDTmax>30 were the most detrimental factor on yield on the three crops, followed by drought, with low temperatures and other diseases having lower effects. Jointly, results presented reinforce the need to included tolerance to heat at flowering and grain filling as a priority trait in breeding.

Sustainable water resources management in East and West African countries: the EWA -BELT project case studies

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Water is a vital natural resource for humans, plants, and animals to survive. Although it covers 71% of the earth's surface, the total amount of fresh water that humanity can use to meet its demands constitutes a very small percentage of the total water amount on earth. In recent years there has been global concern about water availability. Water demands are increasing due to global population growth, human well-being and development, and intensification of economic activities. Climate change projections predict that drought periods will be prolonged, and floods will occur more frequently. Water supply will be threatened along with food and health security. In this context, the EWA-BELT project, funded by the European Union's Horizon 2020 program, examines the human and ecological factors affecting water quality and quantity in case studies from West and East African countries (Ghana, Burkina Faso, Kenya, and Tanzania). It aims to analyze the impacts of water resources degradation on the environment and society, to propose strategies to address the problems, and to improve water resources management. For achieving these goals, the Driving Forces–Pressures–State–Impacts–Responses (DPSIR) framework, promoted by the European Environmental Agency, was implemented. DPSIR methodology has been used in literature for the development of indicators, for organizing the information contained in management plans, and for stakeholder communication. Some preliminary findings indicate that the main issues concerning water resources shortage in the surveyed areas are caused by population growth, intensive agriculture production, expansion of agriculture along with climate change, lack of infrastructure, and inadequate water management practices. Farmers' income is reduced, and health issues arise over the years. Training programs to educate stakeholders, funding for equipment, establishment of a monitoring network, wastewater treatment, improvement/building of infrastructures, and implementation of integrated water resources management were identified as the most appropriate responses.