4th INTERNATIONAL CONFERENCE ON ORGANIC AGRICULTURE IN MEDITERRANEAN CLIMATES: THREATS AND SOLUTIONS

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Proceedings of the 4th International Conference on Organic Agriculture in Mediterranean Climates: Threats and Solutions

May 27-29, 2022 linked to the 11th Ecology Izmir Fair

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Introduction

Because of the pandemic Coronavirus (COVID-19) cases, 4th IFOAM AgriBioMediterraneo (IFOAM ABM) Conference on Organic Agriculture and 11th Ecology İzmir Fair activities were postponed in 2020 to a later date. After 2 years, the Ecology fair organized on 26-29 May 2022 in Gaziemir İzmir Türkiye. The **4th International Conference on Organic Agriculture in Mediterranean Climates: Threats and Solutions** organized together with Ecological Agricultural Organization Association (ETO), IFOAM AgriBioMediterraneo (IFOAM ABM), International Society of Organic Farming Research (ISOFAR), Ege University Agriculture Faculty, the Aegean Exporters' Associations, İzmir Fair Services Culture and Art Works Trade. Inc. (IZFAŞ) and Mediterranean Agronomic Institute of Bari (CIHEAM Bari). The Conference was a three-day meeting consisting of oral and poster presentations and panel discussions. The Conference was organized at the İzmir Fair (Gaziemir) Conference Hall, which also hosts two fairs as Ekoloji for organic products and services, OLIVTECH Olive, Olive Oil, Dairy Products, Wine & Technologies Fair during the same period. This created an opportunity to visit stands and meet the exhibitors.

The **4th International Conference on Organic Agriculture in Mediterranean Climates: Threats and Solutions** aimed to bring together academia and practice in the Mediterranean as well as in regions where Mediterranean climate prevails. The participants could be able to discuss different facets of the threats of today and future posed on organic agriculture and deliver applicable solutions during the conferance. The climate change issue was a major threat with high probability and high impact on land, water biodiversity and human resources, which in turn affects the system designs, production patterns, pest, disease, and weed prevalence, human resources, and the marketing channels of organic goods and services. The Mediterranean Sea is already a tragic symbol of migration. Migration whether domestic from rural towards urban or to other countries, or from one continent to the other will be triggered with the climate change and others as economic or political instability. Aging of the population especially in rural requires innovative solutions not only in agriculture but also in related fields. Organic agriculture with basic principles that favor health of the soil, plant, animal, human and planet as indivisible can bring solutions for agroecosystem management to overcome challenges of climate change and deliver healthy and nutritious produce. Services brought by can be better preserved, managed and/or diversified. The Mediterranean diversity embeds healthy diets, culture, and tourism as regional values. Sharing research results, experiences and best practices could contribute to identify the problems and threats, to discuss sustainability point of view, to derive applicable solutions and to establish cooperation for future networking. This very rich and diverse programme was only possible thanks to a strong engagement of the organizing committee (Alexis Giannarakis, Alev Kır, Barbaros Çetinel, Constantinos Machairas, Ebru Pınar Saygan Ayaydın, Emre Bilen, Gökçem Delibacak, Muazzez Cömert Acar, Nebahat Kılıç, Nurhayat Bayturan, Oğuz Aşçıoğlu, Osman Çetin, Uygun Aksoy, Ülfet ERDAL) and the support of the with ETO, IFOAM ABM, ISOFAR, Ege University Agriculture Faculty, The Aegean Exporters' Associations, IZFAŞ. CIHEAM-Bari and TÜBİTAK. We very much acknowledge the support by members of the Scientific Advisory Board, which helped to review the papers. A special thanks go to Prof. Dr. Uygun AKSOY and Özge ÇİÇEKLİ from ETO for their support and Prof. Dr. Gerold RAHMANN from ISOFAR for backup-help with the proceedings. A big thank you to all the presenters for providing interesting papers.

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SESSION 1 Organic Agriculture in Mediterranean Climate: Current state of art and threats

Cross border alliances and partnerships to tackle challenges of organic value-chains through innovative solutions in the Mediterranean countries

Mara Semeraro[1]

Key words: value chain, organic, Mediterranean

Abstract

In the context of the Mediterranean region, different Countries face common challenges related to climate change, youth and women unemployment, environmental degradation.

The ORGANIC ECOSYSTEM project "Boosting cross border organic ecosystem through enhancing agro-food alliances", within the ENI-CBC-MED Programme, aims at fostering the development and scaling up of organic farming, renowned to represent one of the best sustainable agricultural methods, in partner Countries (Greece, Italy, Jordan, Lebanon and Tunisia). In the described scenario, the present contribution focuses on relevant issues of the same project, with particular reference to the analysis of the cited common challenges intended to the drafting of a sound document encompassing the perspective of a broad range of stakeholders (both public and private). The final aim is to create a solid basis for future discussion and to strengthen the role of the ecosystem created, at project level.

Furthermore, the mentioned scaling up of sustainable farming in partner Countries will be pursued by means of a tailored innovation path devoted to MSMEs (Micro-Small and Medium Enterprises) in the organic agriculture sector. The same path will be based on fruitful exchanges between MSMEs involved and actors in the innovation sector (start-ups, spin-offs, researchers and so on), to enhance innovation capabilities of MSMEs and create a fertile environment for future business alliances, both at project level and Mediterranean region level"

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The Tunisian Organic Agriculture

Samia Maamer[1]

Key words: olive, organic, agri-tourism

Abstract

The Tunisian Organic agriculture Tunisia is the first in the world in certified organic olives areas, is the first in Africa and 28rd in the world in certified area, the implementation of the first organic Farm Field School in the world the first African and Arab country to have implemented a regulation for organic farming, is the only African and Arab country recognized as equivalent to the EU and Switzerland and the United Kingdoms. Our vision to 2030 is to build a Tunisian model of organic agriculture supported by a better governance of the sector by doing our missions like Consolidate the synergy between the different actors, integrate the notion of Organic "Culture" in the society, consolidate the control system, to guarantee the credibility of the organic sector, to boost the development of territories through organic agriculture with the "Bio territories", To develop a fair and sustainable organic agri-tourism sector for the benefit of Tunisian territories and their population.

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Reflections of "Good Manufacturıng Practise (GMP)" Applications in Bee Products

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Key words: Bee products, quality, good manufacturing practises, standardization, sustainability.

Abstract

Bee products (honey, beeswax, pollen, bee bread, royal jelly, propolis, bee venom, apilarnil, bee hive air etc.) getting from beekeeping practices are ancient recipe of nature used as food, food supplier, medicine and cosmetic directly used without adding any additive or components inside. Protection of natural, effective and healthy structure of bee products possible only if with quality production. Quality production could be feasible with "Good Manufacturing Practises"; though protect or reduce technical application of possible pollution from internal and external weldings from production to consumption in every single case. Bee products face many risk factors affect quality from getting from hive to till consumers. Good manufacturing practises (GMP) sustain quality and standardization in persistance and assurance of bee products from hive, environmental conditions, hive managements, equipments and materials, quality of package, delivery to consumers. Thus, assurance utilization of bee products could be sustained with high food security, standardization and health declaration.

Introduction

The importance of bee products in human, animal and plant life is a doubtless truth. Protecting the natural, healthy and efficient structure of nature's ancient recipe bee products that is used as food dietary supplement, medicine and cosmetics and directly edible without adding any other additives, is only possible with quality production (Sunay, 2011).

In recent years, food safety emphasis in agriculture become more important by the raising consciousness of natural and healthy nutrition. Bee products qualified as important nutritional source with its natural contents and healthy features, are being faced with many risks from hive to table because of beekeeping activities are made in field conditions. In other words, many important factors that are effecting on bee products quality are appearing on production stages at field conditions. Nowadays, bee products are under threat of heavy metal, antibiotics, pesticides and microbiological contamination directly or indirectly. Can 'Good Manufacturing Practices' be the solution for this serious problems on quality of bee product productions?

Good Manufacturing Practices (GMP) in Beekeeping

'Practical beekeeping' is defined as beekeeping practices that using all potential of modern technology and as a result of this, gaining profit above its economical yield level.

First of all, for having a good manufacturing in beekeeping, it is very important that beekeeper is educated and have enough knowledge and experience on beekeeping. Beekeeper must be innovative, self-developer and visionary to collate information that learnt with developing technologies. Besides, the beekeeper needs to determine his/her aim of production well. That is to say, which bee product or products the beekeeper targets to produce, the beekeeper needs to plan an accordingly colony management system.

It must be studied on the bee colonies that are compatible ecotypes to the region. Working with improper bee races and ecotypes to the region is an important factor that can reduce the success of production. Attention should be paid to keep young queen bees in colonies, to change queen bee after two production season and after one winter period, to avoid breeding queen bees from swarm colonies. Queen bees should be bred subjected to productivity based selection in the way beekeeper wants. Queen bees should not be given to the production colonies without controlled by progeny tasting (Doğaroğlu, 2012).

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Because of colony productivity depends on the convenience of pollen and nectar resources, success in beekeeping related majorly on these factors. Beekeeping is a production line that natural resources turn into products by honey bees and quantity and activity of production is only depends on sufficient nectar and pollen amount in nature. It is necessary to have plenty of water resources close to colonies, to consider number of colonies in significant area according to environmental flora and to transmit colonies to water resources at the beginning of flowering. Also, on the purpose of benefiting from surrounding sources at flowering period in maximum levels, attention should be paid to keep foragers in maximum population by colony arrangement. The area where the apiary situated must have clean environment and air conditions, there shouldn't be plant production areas which are using conventional agriculture pesticides around apiary. The distances between apiaries are important for spreading and controlling of diseases and pests. Generally, areas that are windless, far from human and animal activities, noise free, contains clean water resources must be selected. It must pay attention to feeding of bees and not using anything except syrup, honey-powdered sugar cake or fresh pollen while feeding (Doğaroğlu, 2012).

Beekeeper should attach importance to hygiene and cleanliness of the hands before practices and mask that is using at the apiary. Regular cleaning of used hives, other tools-equipment and specially disinfection of hive tool by sodium hypochlorite and caustic soda mixture after every use can prevent infection of diseases pretty well. It is very important that beekeepers use materials and methods that is convenient for good manufacturing practices at fighting with disease and pests for preventing medicine and pesticide residues in bee productions. Strategy for fight against Varroa must be using of regionally simultaneous, ordinate, alternate and non-residual practices. Correct diagnosis at diseases prevents unnecessary usage of medicines at beehives and provides the manufacture of non-residue products. Antibiotics shouldn't be used for American foul brood and remove the possible disease causing factors for Nosema. Using good beekeeping techniques develops the efficiency and health of the colony. Hygienic apiculture practices has long lasting protective effects for continuity of colony health. Bee welfare is under pressure of viruses, microorganisms and parasites. Sanitation and hygiene helps honey bees to be healthy and to prevent the transmission of diseases like Nosema, American foul brood and European foul brood. (GTHB, 2008).

Bee products can easily effect from heat and light, that is why there can be variations on nutrition facts and microbiological reproduction. Features that peculiar to every product must be known from producers and proper storage conditions must provide by having necessary precautions.

Significant principal points can be summarized for consideration of bee products in 'Good Manufacturing Practices':

- Standardization; is the most important criterion that increases marketability, continuity and value of the product and providing convenience of finding mouth-pleasing product for consumers.

- Additive, residue and hygiene: It should be avoided from every practice that can left residues for consumer welfare. Besides, to follow the rules of hygiene would make this products preferably and improve food safety.

- Colony population levels: It is important to keep colony population in optimal levels for manufacturing good quality bee products.

- Harvest time: It must be known in when, how often and which conditions honey harvest will be made and during this practice, product quality needs to be protected in maximum level (GTHB, 2008).

Food Safety Applications for GMP of Bee Products

Monitoring after sales in bee products makes the component part of 'Good Manufacturing Practices' and have an important place in food safety. If product preserves under improper conditions at sales point, product structure and feature can deteriorate and this situation can reflect to consumers. In that case, it needs to specially pay attention to protect the product guarantee line at the sales point to prevent from negative results, it needs to be specified the conservation, handling and storage conditions at product labels, it must not be forgotten that sales point is also responsible for product safety. All information, document and samples for that lot needs to be kept till the end of product expire date (Çukur et al., 2017).

Conclusion

'Good manufacturing practices', in other words; environmental conditions of bee products that importance for health is unquestionable, colony maintenance management and production applications, materials and equipment at production, storage conditions, packaging quality, bee products, reliable and continuous distribution to consumer brings standardization and quality to bee products. In attempt to provide standardization and quality; it needs to increase the frequency of bee products food controls, conduct effective inspections and controls, conduct disincentive penal sanctions to plants that are improper to regulations and rules, in Türkiye. Consumers needs to be informed by public service announcements, awareness needs to provide by social consciousness about the subject, EU harmonization studies and programs needs to accelerate, researches about bee products at universities and research institutions must be supported.

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The Future of the Organic Livestock Industry in Türkiye: Problems and Opportunities

Gürsel Dellal[1], Erkan Pehlivan[1], Hülya Hanoğlu[2], Ali Şenok[1]

Key words: Türkiye, organic livestock industry, food security, food safety

Abstract

While organic plant production activities in Türkiye started in the 1980s, organic livestock activities started after 2003. In the last 20 years, depending on the effect of many factors, the organic livestock sector has not been able to develop as much as organic plant production. However, it can be accepted that the developments in the poultry and beekeeping sector in recent years are promising. However, in recent years, there have been positive developments at the global and national level that can accelerate the development of organic animal livestock in Türkiye. At the same time, it can be said that factors such as the increase in consumer perception of healthy nutrition and researching export opportunities in the livestock sector in our country in recent years will contribute to the development of the organic livestock sector. There are many negative factors that hinder the development of the organic livestock sector in Türkiye. However, there are also opportunities that will positively affect the development of this sector in different regions, providing employment for women producers and providing organic animal products to consumers at cheap prices. From this point of view, in this paper; the changes that may occur in the organic livestock in Türkiye in the near future (at least until 2030) will be discussed within the framework of current problems and opportunities.

Introduction

According to the Codex Alimentarius Commission, organic agriculture is a holistic production system that aims to preserve and enrich the health of the agro-system, biodiversity, biological cycles and biological activity of the soil. In this way; it is accepted that important contributions are made to the healthier nutrition of animals and people, the protection of the ecosystem, the creation of employment and the development of rural development (Chander et al. 2011).

Despite the low percentage of organic livestock products in the global organic agriculture market, this production line continues to develop gradually. In Türkiye, the contribution of organic livestock farming to the agricultural and general economy is also at very low levels. However, there are many opportunities for the development of this field. A good use of these opportunities will positively affect the development of this production line.

Organic Livestock Sector in the World, EU and Türkiye

In the world, data on organic animal production can be obtained from very few countries, except the vast majority of EU countries, and the main reason for this is that organic animal production does not have an important place in organic agriculture in most countries (Willer and Lernoud 2019).

In the world, organic animal production is primarily concentrated in Europe and North America. 70%, 80% and 77% of organic cattle, sheep and swine assets are in Europe, respectively, while 53% of poultry assets are in North America and 44% in Europe. The first three countries in the world with the highest number of organic certified cattle, sheep, pigs and poultry are respectively; China, USA, France; Argentina, England, Italy; China, France, Germany and USA, France, Germany (Willer et al. 2014).

Considering the situation of organic animal husbandry in Türkiye; It can be said that while the number of chickens and hives increased in the presence of organic certified animals between 2005 and 2020, the number of cattle and sheep and goats tended to decrease. When looking at the number of organic certified animals on a regional basis; it is seen that Marmara and Aegean regions lead in the number of cattle, Marmara in the number of ovines, Marmara and Black Sea in the number of poultry, and Eastern Anatolia and Black Sea regions in the number of hives. On the other hand, it is noteworthy that

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the Southeastern Anatolia region is behind in terms of the number of organic animals in areas other than beekeeping (bovine, ovine and poultry) (Anonymous 2022a).

Problems of the organic livestock sector in Türkiye

Environmental, structural and economic factors that negatively affect the traditional livestock sector also affect the organic livestock sector in general. In this section, mainly the factors specific to the organic livestock sector are emphasized.

Problems of the certification process: One of the problems of this process is the decrease in the quality of the control processes and, accordingly, the certification process, due to the fact that the controllers and certificaters working in the control and certification institutions (CCI) carry out control and certification outside of their areas of expertise. For this reason, legal legislation should be established to ensure that the controllers working in control and certification institutions control their areas of expertise and that the controllers are employed full-time and long-term, and that they are assigned according to their areas of expertise.

Problems with standards: There are some deficiencies and problems in the Organic Agriculture/Animal Production standards applied in our country. There are no concrete criteria required for water management, distance to pollution sources, shelter indoor-outdoor air quality criteria. Again, the non-uniformity of the control forms applied by the CCIs in the field reduces the quality of the controls (Anonymous 2004, Anonymous 2010, Anonymous 2012).

Agricultural Supports: Organic animal product consumption is at low levels in Türkiye due to reasons such as insufficient purchasing power and consumer awareness. In addition, the high cost of organic livestock inputs (feed, etc.) is one of the factors limiting organic livestock production. Today, only organic beekeeping (15 TL/hive) is supported. However, in order to develop this production line, the purchasing power of consumers, especially children, patients and the elderly, should be included in the scope of support, together with the organic livestock sector.

Transition process: Contrary to organic plant production, organic livestock transition products are not allowed to be considered as organic transition products. Correcting this situation will make a positive contribution to the economic safety of the farmers who want to switch to organic animal production, especially those who apply for individual certification.

Product marketing process: The domestic market for organic animal products is not developed enough in Türkiye and the export of organic animal products is also very low (Anonymous 2022b). Therefore, focusing on increasing the consumer perception towards the consumption of organic animal products and ensuring effective control of the organic animal products market will contribute to the development of this sector.

Feed: As in traditional animal husbandry, feed expenses are the most important cost factor in organic livestock breeding. For this reason, especially organic livestock producers should be supported to produce their own feed.

Opportunities and strategies for the development of the organic livestock sector in Türkiye

In recent years, there have been significant changes that have positively affected the development of organic agriculture/animal production at the global level, and it can be said that the policies to combat climate change and the positive changes in consumer perception towards organic products are very important among them. It can be accepted that the effects of these changes will be seen in Türkiye in the near future, and therefore, the future of organic agriculture/livestock should be planned in advance. From this point of view, the existing opportunities and strategies for the development of organic livestock breeding in Türkiye are discussed below.

Opportunities

Developments related to climate change policies: Organic farming standards have a very positive effect on climate change mitigation and adaptation studies. For this reason, the vision of developing the organic agriculture sector in the EU constitutes a very important part of the "sustainable agriculture from farm to fork" strategy of the European Green Deal published on 11 December 2019, and by 2030, 25% of all agricultural lands will be allocated to organic agriculture (currently. 7.5%) and at least 10% is expected to provide high diversity (European Commission Report 2021). Considering that Türkiye is a party to the Paris Climate Agreement, it should be expected that the plans and studies for the development of the organic agriculture/livestock sector in our country will accelerate.

Consumer perception: There have been important developments in consumer knowledge and perception about healthy nutrition in Türkiye in recent years. This is an important opportunity for the development of organic animal production, especially organic bee products.

Presence of uncontaminated regions: The presence of uncontaminated regions in Türkiye such as Eastern Anatolia and the Black Sea Region due to non-intensive industrial and agricultural production can be considered as an important advantage in terms of organic animal production in these regions.

Rangeland existence: One of the most important inputs for organic animal production is rangeland availability and capacity (Scialabba and Hattam 2002). In many regions of Türkiye, especially in the Eastern Anatolia Region, there are pastures around the village and highland in sufficient width and capacity to be allocated to organic livestock breeding.

Existence of extensive animal production systems: Conversion of traditional extensive animal production systems to organic intensive and/or extensive systems is easier, more effective and cost-effective than intensive systems (Scialabba and Hattam 2002). In all geographical regions in Türkiye, intensive animal production depending on roughage sources, especially pasture and stubble, can be seen as an opportunity. Again, the presence of plateau and meadow areas in many regions creates an opportunity for organic livestock breeding (Dellal 2000).

Presence of alternative regions: In addition to disadvantaged regions (such as high mountainous and forested areas) in terms of agricultural production in Türkiye, there are inland water resources such as many rivers and lakes and islands. These areas, which are not suitable for plant production, are suitable for organic animal production, especially sheep, goat and beekeeping, and the producers here have the capacity to be converted into organic production more easily. As a matter of fact, important studies are carried out in the world to benefit from disadvantaged regions (for example, very sloping lands and pastures) for plant production through organic goat and sheep production. The islands in Türkiye should also be seen as an opportunity for the development of organic animal production and importance should be given to the development of organic animal husbandry in these areas.

Strategies

Regional planning: Planning for the development of organic livestock should be made at the regional level and structural, technical, economic (especially market) and socio-cultural data that will form the basis of the planning should be collected and analyzed accordingly.

Planning to increase consumer perception and preference: Before making region-based plans, planning and studies should be carried out to determine consumer perception towards organic animal products and to increase current perception levels.

Planning for the target audience: It can be said that there have been important developments in Türkiye in recent years, such as nature and agricultural tourism, nutrition for children, the elderly and the sick, and the production of textiles and geographically indicated products (special products). For this reason, these areas should also be included in the plans to be made for organic animal production.

Planning for the evaluation of natural production resources: There are regions and resources suitable for natural production such as mountains, forests, plateaus, streams, lakes and islands that are protected from environmental pollution in many geographical regions in Türkiye, and more efficient production can be made with domestic animal breeds in most of these regions. Plans should be made to benefit from these areas in organic animal production.

Planning for the development of exports: Türkiye's traditional animal product exports are quite low, and in this case, the fact that the animal products to be exported cannot meet the EU and international standards required in terms of food safety has a significant impact. When it is accepted that organic certified animal products produced in Türkiye are capable of ensuring food safety, strategies should be developed to increase the export of these products and/or to overcome other existing obstacles. While developing these strategies, the efforts to benefit from the knowledge and experience of the countries exporting organic products in the world should definitely be taken into consideration.

Rural development and women's employment: One of the important aims of organic agriculture is to contribute to rural development. Again, the role of women in rural family businesses is very important and a significant part of them (78%) are willing to engage in organic farming (Karaturhan et al. 2018). For this reason, supporting women's employment in this field together with organic livestock breeding in rural areas will make a significant contribution to rural development and more effective use of women's workforce.

Planning for scientific studies: Universities and the Ministry of Agriculture and Forestry will contribute to the development of organic animal husbandry on a country basis if they develop strategies and cooperate in the planning and realization of scientific studies for the development of organic animal production. However, the organic livestock training included in organic agriculture education is quite insufficient and the training in this field must be planned at the regional level and according to the sector's demand.

Non-Governmental Organizations (NGOs) and Organizing: The importance of NGOs in the development of organic agriculture is very high. There are approximately 65 NGOs operating in the fields of organic agriculture and ecological life in Türkiye (respectively Marmara (24.6%), Central Anatolia (20%), Black Sea (18.5%), Aegean (15.4%), Mediterranean (12.3%), Southeast Anatolia (6.2%), East Anatolia (3.1%) (Anonymous 2022c). However, considering the organic agriculture/livestock husbandry capacities of the regions, it can be said that there is an inconsistency in the number of NGOs in the regions (eg Aegean and Eastern Anatolia regions). For this reason, it should be ensured that the number of NGOs that will operate in organic livestock farming in the regions and their fields of activity should be planned in accordance with the capacities of the regions in this production branch.

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SESSION 2 Sustainability in Organic Livestock Production

Research and Development priorities for sustainable organic livestock production

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Key words: climate change, production, feeding, animals, management

Abstract

Organic food and fiber production is rapidly expanding globally in terms of area, production, number of producers and consumers of organic foods and fiber leading to the annual global organic food market of approximately US$167.85 billion in 2020. But, the share of organic animal products is still very small on global scale. India has just begun making some progress in organic animal production, with limited quantity (2125,6 Kilogram) of clarified butter exported to the UAE during 2019-20, in addition to the slowly growing domestic market. Whereas, animal sourced foods (ASF) play pivotal role in healthier human life as it ensures many vital nutrients, vitamins, minerals etc. But animals are also seen as threat to environment and have been blamed for climate change. Against this scenario, the challenges are how to raise animals sustainably, while ensuring animal welfare requirements. To ensure progress in organic animal production, technologies compatible to organic production standards and requirements are required, which are currently inadequate in many countries. The research priorities need to be established, research budget enhanced and policy support for organic animal production research and development is needed to see organic animal production coming up at par with research and development on organic cereals, fruits, pulses, nuts etc. Most of the research in organic animal husbandry is currently confined to temperate countries, while it needs to be expanded to other regions as well. There is a lot of room to improve organic farming practices, which is why more research is crucial, in context of well defined Principles of organic farming, viz. Health, care, fairness and ecology.

Introduction

The human population has been estimated to be 9.6 billion by the year 2050, which will require tremendous efforts to feed them nutritive diets. The food required for such a huge population will have to be produced in such a way that the environment and the natural resources such as air, water and forests are not adversly affected, while also protecting the ecosystem and biodiversity of the planet. It is also hard to imagine meeting 2050-projected demand by raising twice as many poultry, 78% more small ruminants, 58% more cattle and 37% more pigs, without further damaging natural resources (Rivera and Lopez 2012). Animal sourced foods (ASF) play pivotal role in healthier human life as it ensures many vital nutrients, like vitamins, minerals etc. But at the same time, animals are seen as threat to environment and have been blamed for climate change. Raising livestock generates 14.5 per cent of global greenhouse gas emissions that are very bad for the environment. Deforestation due to expansion of pasturelands and croplands for livestock production contributes 9.2% of total livestock GHG emissions (Gerber et al. 2013). About 92 per cent of the fresh water is used for farming purposes, and 1/3rd of it is used for rearing livestock and manufacturing animal products. Livestock farming creates a huge carbon footprint and has a very high global warming potential. If livestock numbers continue to increase and feeding practices are not changed, global emissions due to livestock production will continue to increase. The livestock sector in particular is considered to be the major contributor for climate change by emission of green house gases but can also deliver a significant share of the necessary mitigation effort (Gerber, et al., 2013). Do we see an opportunity to reduce carbon foot print of livestock production by switching over to organic animal production practices? We will have to ensure that animal production in terms of breeding, feeding, disease control and management positvely contribute to protecting the ecosystem, bidiversity & environment.

Results

Breeding: Organic standards emphasize selecting Breeds which do well under organic management-well adapted to local conditions. This suggests that rather than introducing exotic breeds, or crossing them with native breeds, efforts should be directed to promote local breeds by improving theirproductivity. This will also help conserve the biodiversity. In India, currently big push is being given

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to indigenous breeds by introducing several measures to promote local breeds including enhancing their productivity. The research efforts are needed to improve productivity of local well adapted breeds so that carbon foot prints of animal production could be reduced. Breeding for improved feed conversion efficiency (lower net feed intake) should be compatible and is likely to reduce methane emissions and the greenhouse gas intensity of animal products.

Feeding: Livestock that are produced under organic management must have their total ration that is comprised of agricultural products including pasture, forage, and crops that are organically produced and handled organically. The low input low output systems often put less pressure on resources like quantity of feed and fodder requiring more inputs in producing these. Improved forage quality with lower fibre and higher soluble carbohydrates can reduce methane production in livestock. The local breeds in India, for instance, are well adapted to local situations doing well under limited feed and fodder availability, sustain well on crop residues, grazing on harvested field etc. But, these native breeds must produce more, for which research is required along different dimensions of animal production including nutritive feed and fodder. Dietary supplements and feed alternatives can be evalauted to assess whether they can reduce methane emissions from livestock. There are approved methodologies for using dietary supplements to reduce greenhouse gas emissions from dairy cows and cattle.

Disease control: Prevention is better than cure applies well to organic systems. Managing health issues with minimum allopathic drugs, antibiotics are the key. Practical methods yet non chemical ways of controlling internal and external parasites in livestock are required to be explored. Huge database of plant based alternative remedies needs experimental validation for making recommendations for organic animal production.

Housing: Organic Animal production is welfare oriented-designing comfortable housing for animals is important. Low cost loose housing systems are being promoted in India, which provide maximum comfort to animals resulting in possible yield increase.

Management: Organic animal production is a matter of efficient management of resources in context of organic principles, practices, guidelines, regulations etc. These are evolving with changing times, so research is needed to see if suitable changes are required to make organic farming more practical. Climate change adaptation, mitigation practices, and policy frameworks are critical to protect livestock production. Reducing the number of unproductive animals on a farm can potentially improve profitability and reduce greenhouse gas emissions. Manure management that ensures recovery and recycling of nutrients and energy, besides the use of energy saving devices is helpful too.

Additionally, better management of grazing lands could improve productivity and create carbon sinks with the potential to help offset livestock sector emissions.

Conclusions

To minimize the environmental impact of raising animals, following steps taken would be helpful:

- Evidence based organic package of practices for milk, meat & egg production with reduced methane production.

- Enhanced budgetary allocations for research on prioritized researchable issues on organic animal production targeted to reduction in methane production & carbon footprint of animal production.

- Proven technologies developed after research based validation to be recommended to farmers.

- Right technologies available to organic farmers at right time to boost productivity of organic production systems.

- Livestock greenhouse gas emissions can be reduced by following 4 approached, viz. husbandry (animal breeding, feed supplements, improved pastures), management systems (stocking rates, biological control), numbers of livestock and manure management. Research and Development is required for increasing the supply of new and improved mitigation technologies/practices.

- More Coordinated research efforts like- Organic Plus Horizon 2020, The European Network for Scientific Research Coordination in Organic Farming, ISOFAR & IFOAM Sector Platforms like TIPI, IAHA and country specific organic agriculture research networks like National Project on Organic farming in India need to include organic animal production component in the research agenda.

Discussion

Organic farming involves complex, diverse systems with varied crop rotations and other soil-building practices, animal integration, and ecosystem preservation etc. There is a lot of room to improve organic farming practices, which is why more research is crucial. Possible interventions to reduce emissions from animals are to a large extent based on technologies and practices that improve production efficiency at animal and herd levels.The experiences of research outcomes, therefore, need to be shared from mega coordinated research projects like the European Network for Scientific Research Coordination in Organic Farming, Organic Plus Horizon 2020 as also the country specific organic research networks like Indian National Project on Organic Farming etc. There is a lot of room to improve organic farming practices, which is why more research is crucial, in context of well defined Principles of organic farming, viz. health, care, fairness and ecology.

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Sustainability of Organic Dairy Cattle Farms in Türkiye

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Key words: Organic cattle breeding, organic milk, livestock sustainability

Abstract

This proceeding contains the results of the project carried out within the scope of the EU Core Organic Co-found project to determine the general structural status, breeding systems, feed and milk quality, production problems and solution propositions of organic dairy cattle farms in Türkiye. Within the framework of the project, all 11 organic dairy farms in Türkiye were visited to conduct a survey. The general situation of the farms, production methods, capacities and problems were tried to be determined with the survey study. In addition, within the scope of the project, 5 dairy cattle farms in different regions of the country were selected and feed and milk samples were taken in 4 different seasons of the year, and feed and milk quality were tried to be determined. It has been observed that farms in different regions of the country have significant differences in terms of capacity, animal breed, pasture use, animal feeding, shelter, milk yield and quality. As a result of the project; the number of organic dairy cattle farms is decreasing day by day due to insufficient support for organic livestock, insufficient demand and marketing problems. It has been determined that its sustainability is not possible under current conditions. For this reason, in order to increase organic milk production and consumption in the country, organic dairy cattle farms should be supported more and young people should be encouraged for sustainability in animal production in rural areas. It is recommended to support organic livestock on a basin basis, especially in the Eastern Anatolia region, and to use the organic milk produced for the purpose of healthy nutrition of students in schools with the school milk project in order to solve the market problem.

Introduction

Organic production in Türkiye was first started in 1984 with the export of raisins and dried figs, which are traditional export products, due to the demand from abroad (Aksoy, 1999). In Türkiye, organic agriculture first showed intensive development in crop production, while organic livestock farming has not developed much due to export-related problems seen in animal production (Ak, 2015, Turhan et al., 2017). The first organic livestock production in Türkiye began in 2006. In the following years, the number of breeders, animals and the number of products increased slightly. However, the share of organic animal products in total animal production was very low. Organic animal husbandry is carried out in a total of 108 farms in Türkiye. These farms organically produced 21.801 tons milk, 756 tons meat, 183 million eggs and 1.028 tons honey. Almost all of the products are consumed in the domestic market. Approximately 1% of the total egg production in the country, 1% of the total honey production and 0.1% of the total meat (red or white meat) production consist of organic products (GTHB, 2021). For this reason, organic animal production and consumption levels in Türkiye are very low compared to plant production.

Material and methods

Within the scope of the project, 11 different dairy farms were visited all over Türkiye. A face-to-face survey was conducted to determine the general situation of organic dairy cattle farms. In addition, feed, milk and faces samples were taken from 5 different organic dairy farms in different regions of Türkiye within 4 different seasons of the year. Nutrient analyses of feed samples, silage quality properties, dry matter, fat, protein, lactose, ash, total bacterial count (TBC), somatic cell count (SCC), and Vitamin E, Omega-3 and conjugated linoleic acid (CLA) analyses in milk samples were performed. Internal parasite analysis was performed in faces samples. As a result of the feed, milk and faces analyses carried out in 4 different periods of the year, data were obtained on the feed quality characteristics, milk quality characteristics and internal parasite status in organic dairy cattle farms.

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Results

The survey data regarding the organic dairy cattle farms in Türkiye was given in Table 1. According to the survey, land and pasture areas of organic dairy farms are on average 353 ha and 1.835 ha, respectively. The average number of dairy cattle is 212 per farm. Daily milk production is 19.5 l/head. The insemination number per pregnancy is 1.7. The number of lactations is 3.3. Fat and protein contents of milk are 3.8 and 3.2%, respectively. The death ratio of calves up to weaning is 4.4%. The ratio of mastitis is 9.52%. The artificial insemination ratio is 60%. The silage usage ratio is 50%. The grazing period is 5.8 months. The first insemination age and service period are 18.5 months and 62 days, respectively. The lactation period is 288 days.

Table 1: Survey data of the organic dairy cattle farms

Data regarding farms and production	Number of farms	Min.	Max.	Mean
Land area (decars)	10	98	20.000	3.528
Pasture area (decars)	7	40	10.000	18.348
Pasture period (months)	5	3	8	5.8
Arable land per dairy cattle (decars)	10	4.0	93	20.7
Silage usage rate (%)	5	-	-	50.0
Ratio of farms that milk control (%)	5	-	-	50.0
Number of milking cow (head)	9	10	867	212.3
First insemination age (months)	10	13	36	18.5
Artificial insemination rate (%)	6	-	-	60.0
Insemination number per pregnancy	6	1	2.5	1.71
First calving age (month)	10	22	48	24.35
Service period (days)	9	45	90	62.22
Lactation period (days)	9	200	390	288.33
Gestation interval (days)	9	365	450	412.22
Lactation number	9	2	5	3.28
Daily milk yield (kg/head)	9	12.5	28	19.5
Fat percent (%)	7	3.6	4.0	3.84
Protein percent (%)	5	3.0	3.5	3.24
Somatic cell count	4	25.000	200.000	145.500
Total bacteria count	2	5.000	7.000	6.000
Calf mortality rate (From birth until weaning) (%)	9	1	10	4.36
Clinical mastitis rate (%)	9	0	30	9.52

The nutrient analysis results of the feed used in the farms are given in Table 2. Due to the fact that the farms are located in different geographical and ecological regions, different roughage sources are used in the feeding of dairy cows. While alfalfa hay and silage are used as roughage in the farms in the central and western regions of the country, pasture grazing and straw are used in the farms in the east.

While concentrate feed mixture and total mix ration are used in the feeding of dairy cows in the Central and Western Anatolia regions, grain feed is used in the eastern farms. Milk yields are taken into account in the feeding of dairy cows in Central and Western Anatolia. In this study, no significant quality problem was found in the feed used in the farms. However, the amount of yield is not taken into account in the feeding of animals in Eastern Anatolia. Except for the low dry matter content of Lenox silage, it was determined that the silage samples were generally of good quality.

Table 2: Nutrient content of feed used in farms (feed basis, %)

Feeds	Dry Matter	Crude Protein	Crude Fat	Crude Fiber	ADF	ADL	NDF	Crude Ash
Corn silage	30.60	2.42	0.67	6.25	8.61	0.94	13.74	1.80
Sunflower silage	23.33	1.75	1.05	1.65	7.15	1.59	8.14	2.39
Lenox silage	18.50	1.48	4.45	7.75	9.10	1.40	9.91	2.26
Alfalfa hay	92.75	16.62	1.35	21.12	30.58	6.53	38.43	9.87
Pea hay	93.60	9.40	0.94	27.97	39.63	4.35	59.96	10.07
Oat hay	92.17	7.54	2.35	27.04	36.74	4.88	53.39	6.78
Meadow hay	91.88	8.30	1.92	26.78	35.55	4.78	49.80	8.43
Triticale and pea hay	93.03	9.96	1.17	25.10	38.61	5.20	50.68	12.79
Grass hay	93.21	8.04	1.64	26.68	38.77	6.80	51.77	8.24
Straw	92.73	4.04	0.97	32.20	46.93	5.96	64.05	9.75
Corn	90.08	6.95	2.40	3.74	3.01	0.70	9.86	1.30
Wheat	90.36	11.66	1.73	3.48	5.48	1.10	21.38	2.74
Barley	88.89	9.96	1.90	6.02	7.77	1.10	36.95	2.33
Total Mix Ration	44.85	4.20	0.99	13.38	16.50	2.66	23.74	4.43

NDF: Neutral detergent fibre, ADF: Acid detergent fibre, ADL: Acid detergent lignin

The results of raw milk analyses obtained from farms in 4 different seasons of the year are given in Table 3. As seen in Table 3, there are significant differences between the nutrient content, total bacteria count (TBN) and somatic cell count (SCC) content of milk obtained from different farms. The nutrient content of milk varies depending on feeds and animal feeding. The CLA, Omega-3 and Vitamin E content of milk change depending on pasture grazing. On the other hand, TBN and SCC in milk vary significantly depending on the health and milking hygiene of animals in the different farms.

Table 3: The data of raw milk analyses

Items	Dairy Farm-1	Dairy Farm-2	Dairy Farm-3	Dairy Farm-4	Dairy Farm-5	Mean	SD	SE
Dry Matter (%)	12.43	11.62	11.61	11.81	12.05	11.90	0.34	0.15
Protein (%)	3.99	3.60	2.98	3.28	3.25	3.42	0.39	0.17
Fat (%)	4.04	3.56	3.38	3.28	3.58	3.57	0.29	0.13
Lactose (%)	4.72	3.68	4.62	4.68	4.55	4.45	0.44	0.19
CLA (%)	0.33	0.16	0.18	0.14	0.21	0.20	0.08	0.03
Omega-3 (%)	0.30	0.34	0.20	0.34	0.21	0.28	0.07	0.03
Vit E (mg)	1.09	1.12	0.37	0.32	0.43	0.67	0.40	0.18
TBC (kob/ml)	1.420.450	106.000	307.025	278.550	822.750	586.955	537.379	240.323
SCC (adet/ml)	196.750	488.625	250.750	196.750	229.750	272.525	122.970	54.994

TBN: Total bacteria count, SCC: Somatic cell count, CSD: Standard deviation, SH: Standard error

The analysis results of the fresh feces samples collected from the farms are given in Table 4. The presence of pathogenic microorganisms in feces varies depending on the region and season of the farms. Due to the different flora and fauna in the regions where the research was carried out, the pathogen microorganism content of the faces samples differs. In addition, it is thought that the use of organic or conventional drugs against internal parasites in different farms is responsible from this difference.

Table 4: The data regarding the fecal analyses in the dairy farms

Internal parasite	Dairy Farm-1	Dairy Farm-2	Dairy Farm-3	Dairy Farm-4	Dairy Farm-5
Eimeria Oocyst	+	+	+	+	+
Trichuris spp.	+	-	+	+	-
Dicrocoelium spp.	+	+	+	+	+
Fasciolosis spp.	-	-	-	+	-

Discussion

Regionally, significant differences have been determined among the farms relating to production and feeding conditions, animal capacities, production technologies, milk yield and quality. The number of organic livestock farms has been decreasing due to insufficient support. According to the results of this research, more support is needed to develop organic animal production, organic dairy cattle breeding and increase the consumption of organic milk and dairy products in Türkiye.

It is necessary to sufficiently inform producers to increase milk yield and quality and raise consumer awareness to increase consumption. Since approximately 1/3 of the total pasture areas in the country are located in the Eastern Anatolia region, it is recommended to primarily support organic animal husbandry in this region and basin basis.

In order to protect local animal gene resources, more support should be given to local animal gene resources in organic livestock. For sustainability in organic animal husbandry, training of young people in animal husbandry should be encouraged and organic farm tourism should be supported.

Production of organic milk with dairy products and organic egg should be primarily supported, especially in terms of healthy and balanced nutrition of babies, children and pregnant women. For sustainability in organic livestock farming, small family-type food processing facilities where animal products can be processed should be legally supported. Unfair competition should be prevented through legal inspections and controls, and the consumer's confidence to organic products should not be broken. Due to the problems related to the export of organic animal products, there should be established a target market in organic animal husbandry in Türkiye.

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The role of small ruminant organic farms in Mediterranean countries to strengthen the sustainability

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Key words: Mediterranean, organic, goat, sheep, sustainability

Abstract

The intensification of agricultural production in order to meet the nutrient needs of the society has brought about environmental and food safety problems and this has caused the concept of organic and/or sustainable agriculture. Organic farming is good sample of integrated livestock and plant production. In the last 30 years, when in rural populations and in traditional farming systems decline, small ruminant farming systems need to be changed to improve animal welfare, and to increase the animal productive efficiency, and food quality with particular regard to food safety. The enhanced animal health and the increase of biological efficiency in terms of quantity and quality of milk and meat production related to the reduction of veterinary costs can be thought as the strategies to improve the economic profits of a sustainable goat and sheep products. Total approximately 5 million 838 thousand organic small ruminants (890 thousand organic live goats and 4 million 948 thousand organic live sheep) have been reported in 28 EU countries according to the Eurostat data in 2017 and total organic small ruminants presence increased by 13% between 2013-2017. The 5 major countries were Greece, Italy, France, Spain and Austria for total goat presence, United Kingdom, Italy, Greece, Spain and France for organic sheep presence. According to these data, it can be said that the countries of the Mediterranean are the **major** *small ruminant organic producers. For this reason, the objective of the study is to review the role of small ruminant organic farms to strengthen the sustainability in Mediterranean Countries. In addition to the European Union countries that have a Mediterranean coast, the action plan of organic livestock, the current position of small ruminant organic farms in other Mediterranean countries, including Türkiye will try to be shown. Sustainability will be examined the importance of efficient use of resources, protection of the environment and socio-cultural benefits to produce economically viable small ruminant organic products.*

Introduction

Integrating livestock into a farm system can increase its economic and environmental health and diversity, thereby making important contributions to the farm's sustainability (Coffey et al. 2004). A detailed analysis of the distribution of sheep and goats shows that sheep have been adapted to a variety of agroclimatic conditions where there are large and extensively managed pasture lands. Goats, by contrast, are more concentrated in dry tropical and subtropical areas of poor agricultural potential and even on marginal lands. Integrating livestock into a farm system can increase its economic and environmental health and diversity, thereby making important contributions to the farm's sustainability (Coffey et al. 2004). In the last 30 years, the decrease in rural populations and in traditional farming systems, small ruminant systems need to be changed to improve animal welfare, and to increase the animal productive efficiency, and food quality with particular regard to food safety. The reduction of veterinary costs linked to the enhanced animal health and the increase of biological efficiency in terms of quantity and quality of milk and meat production can be considered as the strategies to improve the economic profits of a sustainable livestock production.

The regulation on organic sheep and goat farming

1. All sheep and goats have to be raised on organic conditions
2. The sheep and goats should be provided with organic nutrition possibilities.
3. The main purpose should be healthy animal products from healthy animals.
4. For breed and production, the breeds or strains, that can adapt to local conditions and are resistant to climate conditions and diseases should be selected.

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5. For forming an organic flock in a newly established enterprise, the animals can be transferred from other organic enterprises or from conventional enterprises on condition that the animal is under a certain age limit. The age of conventional animals to be brought from conventional livestock farm to organic livestock farm is maximum 2 months old for lambs and kids. Table 1 shows the conversion periods of small ruminant pastures and products.

Table 1. The conversion periods for small ruminant pastures and products.

Production type	Conversion periods
Pastures for ruminants	24 months (like plant production)
Meat	6 months
Milk	6 months

Source: European Union Commission Regulation EC No: 889 (2008)

Hausing conditions

Indoors area (m^2/animal)	Outdoors area (m^2/animal)
1.50 per sheep and goat	2.50 per sheep and goat
0.35 per lambs and kids	0.50 per lambs and kids

Transport of small ruminants: Transport and slaughter of animals must be carried out so as not to stress the animals. This application is necessary for animal's ethics (Aerts, et. al 2006)

1. Minimum stress on the sheep and goats, the shortest period of time and without using allopathic tranquillizers.

2. Organic sheep and goats if possible, must be slaughtered in different, slaughterhouses from the conventional animals, if not, the organic goats must be slaughtered in the same slaughterhouse but at different times.

3. The sheep and goats should be slaughtered in such a way not to stress the animal, using appropriate slaughtering methods by qualified personel.

The Strengthen and Weakness of organic regulation

Strengthen

1. Adopted breeds to climatic conditions and to diseases,
2. Conversion periods,
3. The sheep and goat manure is dry, their farms don't need an important, equipment to recycle the slurry,
4. No hormone scandals.

Weakness

1. Organic feed availability,
2. Animal welfare,
3. Alternative veterinary treatments.

In this article, sustainability will be examined the importance of efficient use of resources, protection of the environment and socio-cultural benefits criteria to produce economically viable organic small ruminant's products.

The importance of efficient use of resources Biodiversity

Native sheep and goat breeds with special emphasis on their role as a tool of sustainability. Recently, indigenous breeds have started to become an object of interest, thanks to increasing awareness of the risk of biodiversity loss. The indigenous breeds studied revealed higher values in quality parameters such as monounsaturated and polyunsaturated fatty acids and oligosaccharides, which are beneficial for human nutrition, and higher total acceptability of their cheeses. This result reinforces the assumption that local breeds can provide high-quality milk products in spite of their lower milk yield (Danieli and Ronchi, 2018). Therefore, every effort to add value to local breeds is important, especially as a contribution to the prospects of their conservation through sustainable use. Organic livestock is good sample of biodiversity, because organic agriculture protects biodiversity and natural landscape by increasing the heterogeneity of products and agricultural production. A meta-analysis of the study show that (Tuck et al., 2014), the diversity of species in organic agriculture has been 34% higher than conventional production. Protection of soil and surface and groundwater: Protection of soil quality and fertility has an important place in sustaining ecological balance and improving the sustainability. Many people, including politicians, civil servants and biologists, consider goats to be responsible for environmental degradation (D'Alexis et al., 2014):

The protection of the environment

Climate change may modify both the availability and the types of feed for ruminants. Increasing levels of production can be achieved by increasing the percentage of concentrate feed in the diet. Intensification of feeding systems might modify feeding behavior and have impacts on intake and rumen metabolism, increasing negative outputs of nitrogen or methane. All these aspects have to been taken into account when proposing new sustainable sheep and goat feeding systems. The role that organic sheep and goat farming are about to play is achieved in a fully sustainable way; It must aim to find feeding strategies and management practices for reducing emissions from farming, to identify dimensional and physical parameters, and management practices for sustaining flock welfare, and to raise the profitability of goat farming by reducing the impact of veterinary costs and increasing the commercial value of goat products. In addition, Feldt (2015) stressed how goats, which primarily feed on grasses, are generally less affected by regional droughts and climatic stress than other livestock. Hence, it is argued, there is increasing importance of goats, small ruminants, and more generally of livestock portfolio diversification as a coping strategy for drought.

The socio-cultural benefits

Most Central, Eastern and Southeastern European countries need strong organizations of sheep and goat breeders and farmers to help individual farmers survive. Frequent regional meetings should be organized in this part of the world to discuss the latest results and develop useful cooperation. Serious government support is needed in these countries to preserve and protect and to improve local indigenous breeds. Without adequate support, exotic breeds dominate sheep and goat farming and the old genetic values will slowly disappear. Small rumínant farmers need basic and further education to benefit from new information and developments that they can apply to their everyday management in order to build a sustainable and prosperous future. However, in some areas with limited and seasonal sources of nutrients, it is possible for farmers to manage dairy sheep and goats. In these situations, technicians and farmers often make the mistake of introducing high-yielding breeds (Anglo Nubian, Saanen, etc.) without modifying them to local environmental conditions.

Public authorities would need to be involved; their awareness of the need to transition to agro-ecological practices and the role of sheep and goats has to be enhanced so that they can define appropriate public policies. For the past 40 years, the number of jobs in agriculture and livestock has dramatically decreased as a consequence of constantly increasing productivity. Social and environmental problems lead societies to change their paradigms. In many countries, underemployment is still a severe problem. In contrast, goat farming produces positive environmental externalities for preserving biodiversity, natural ecosystems and land-scapes. So far, remuneration for these externalities has not been fully debated, but such innovations could also be particularly relevant for goat farming.

Conclusion and Suggestions

Organic small ruminants can be a valuable part of a sustainable farming system. For sustainability, it must aim to find feeding strategies and management practices for reducing emissions from sheep and goat, to identify dimensional and physical parameters, and management practices for sustaining flock welfare, and to raise the profitability of sheep and goat farming by reducing the impact of veterinary costs and increasing the commercial value of these animal products. Also, the important attention must be paid on the marketing strategies of organic sheep and goat products because this is the main constraint of the sector, and it is the point where there are more possibilities for improvement for both farm profitability and overall sustainability of the food system. The implementation of some regenerative practices to improve the sustainability of small ruminants systems:

1. Assessment of energy footprint of sheep and goats
2. The reduction of farming dependency on fossil fuels
3. The integration of renewable energy sources in farm scale
4. The usage of locally available resources such as biogas energy from manure and solar energy

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A Qualitative Study on the Reception of New Organic Feed Production Techniques in Menemen, Aegean Region

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Key words: Organic feed, qualitative study, new techniques, ProRefine

Abstract

This study aims to provide an in-depth understanding of the opinions of Turkish forage legumes and animal farmers, researchers and marketing staff in ProRefine Project Pilot area on the new developments in organic animal husbandry regarding sustainability and their approaches towards these new experimental steps. The farmers are in Menemen, İzmir, Aegean Region where ProRefine Project, which focused on Lucerne cultivation methods in order to enhance sustainability in organic farming took place. Within the Project there were two meetings with these stakeholders, inquiring their ideas and opinions on the new horizon the Project brings. These meetings were cam recorded and transcribed. Critical questions supplied by the Project itself incited the stakeholders to explain their views in detail which calls for a qualitative study to bring forth a better grasp of mind-set of the future users of such technologies. By dissecting and realigning the answers of the sample group, the habits, attitudes and notions of the stakeholders are thoroughly comprehended to see the possible difficulties that new technologies and scientific approaches may face in Türkiye, and if there is also a tendency to try new ways for the sake of profitability and sustainability.

Introduction

According to Food and Agricultural Organization (FAO) estimations by 2050, we will need to produce 60% more to feed 9.3 billion people, compared to what we do today. One approach toward such a future image is organic farming. Organic products have a higher price range, which can be speculated that it attracts farmers promising a higher income. Regardless, it can be seen that organic farming has been increasingly spreading. For example, annual growth rates of certified organic product sales in the U.S. had exceeded 20% since 1992 (NBJ 1999; USDA 2000d). There is no doubt that organic products are also trending in Türkiye (Oztürk, 2014). It is estimated that within a few years organic animal products will be one of the most demanded organic products in Türkiye. With the well adapted local breeds, natural pastures and meadows, increasing forage crop areas and sufficient workforce, Türkiye has a great potential in organic animal husbandry (Bayram, 2007).

As it is known that organic farming is an agricultural activity encouraging balanced improvement of social, economic and ecological factors in a specific cultural setting. In such a setting for organic animal husbandry, as a part of organic farming, being able to benefit from organic forage crops is an important point along with many other elements such as healthy husbandry, proper barn conditions or suitable brood and breeding race selection. (Kurtar, 2004)

One of the main problems in animal husbandry in Türkiye is the inability to produce sufficient quality roughage. The grazing of meadows and pastures, where the production potential of quality roughage has been greatly reduced due to the misuse that has been going on for years, or the supply of cereal straw and straw with very low nutritional value, are among the main reasons for the low yield in animal products (Açıkgöz, 2005) it is known that one of the main reasons behind ProRefine project was the difficulties faced in protein rich feed acquirement in order to create a balanced diet of protein and energy rich feed in organic animal husbandry. Thus, ProRefine Project aimed to improve local production of protein feed in organic production, in particular for monogastrics, in different regions in Europe and Türkiye, through improved forage processing.

Considering the fact that above-mentioned information is on conventional forage crops, it is not surprising to think that the situation is far critical for organic feed systems. Under such conditions, ProRefine Project was conducted to solve the problem of organic feed in organic animal husbandry by

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recommending different value chains in accordance with the project results. The information and the experience gained in this Project brought an opportunity to evaluate the mindset of organic farming stakeholders of the region, to provide an insight on the steps which can be taken into consideration in the future decision making processes.

Material and methods

In this qualitative study, case study pattern was used. Case study is an empirical research method that studies a current phenomenon in its real-life context and examines situations in a multifaceted, systematic and in-depth manner. (Yıldırım and Şimşek, 2005; Patton, 1990; Cohen and Manion, 1997). The case study includes the stages of limiting the situation, determining the research case, searching the data set, creating the findings, making comments and writing the results (Denzin and Lincoln, 1996; Bassey, 1999). Since this study aims to explain the experiences of the potential stakeholders of ProRefine Project in the study group (Yin, 2003), the explanatory case study design was preferred. The empirical data was collected through focus group interviews. Within social science, this method is well-known as a method for collected empirical data within qualitative studies (Wilkinson, 1998).

Results

Study Population

The population of study is actors in the value chains of organic food production, and more specific the value chains of feed, meat and diary products, in Türkiye, which consists of potential stakeholders of the ProRefine Project. ProRefine Project is a project within the scope of Core Organic Call, conducted with 26 participants from 19 countries.

Study Group

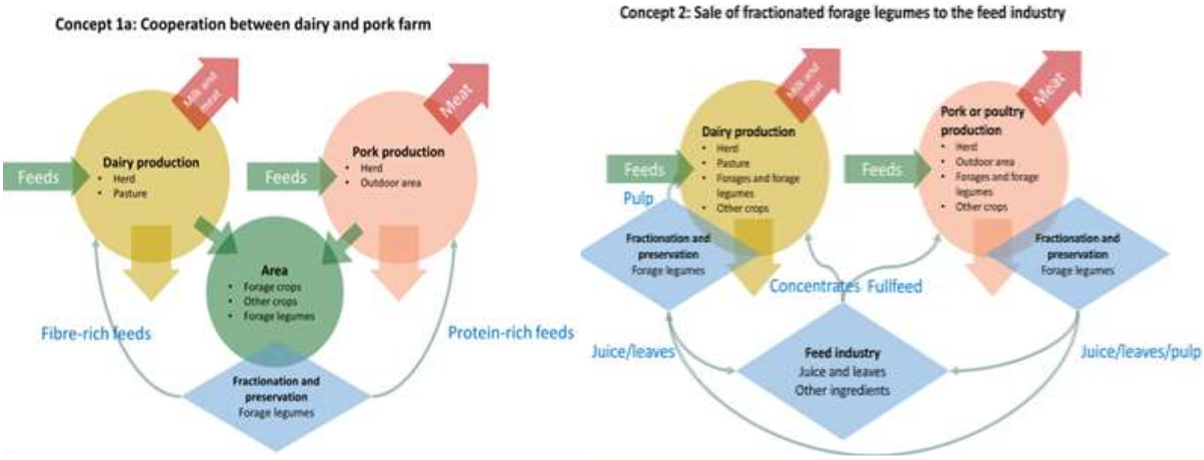
Representatives of actors in the organic farming sector in Izmir, Menemen Province, were invited for a study presentation and focus group interview in order to have an insight about the status of animal husbandry in organic farming in Aegean Region of Türkiye. The representatives included farmers, agricultural engineers and representatives from animal feed companies. While the farmers are closely engaged in organic farming, agricultural engineers and private sector representatives focus on both organic and conventional agriculture. The presentation and focus group interview took place in one of the meeting halls of International Agricultural Research and Training Center, which was a partner of the main Project. The meeting hall can host up to 50 people, it is equipped with audio-visual systems.

The study group was determined within the scope of purposeful sampling with variation in regard to role in the value chains and in the organic agricultural sector in general. Therefore, one person from each group attending the interview, farmers, entrepreneurs, engineers and private feed production sector representatives, was selected for a focus group interview.

Participant 1: Hasan FARUN, Farmer
Participant 2: Bayram TÜRKSOY, Entrepreneur
Participant 3: Sevinç KOCAERMİŞ, Agricultural Engineer
Participant 4: Deniz AKKOÇ, Tradesman

Study Group Questions

Within ProRefine Project workpackages, there are two which is directly related to dissemination and farmer attitudes. Therefore, the Project Team already assembled a focus group consisting of farmers, engineers and representatives from the private sector. During the focus group meeting, they were presented two value chain concepts. The concepts are as follows;



After these concepts were presented, the interviewees were asked the open-ended question of;

1. What are the potential positive aspects of such local value chain of organic feed production?
2. What are the potential challenges barriers within this kind of value chain?

Applying to both concepts.

The acquired data is analyzed through Critical Theory with positivism paradigm in order to understand the approach of the stakeholders towards innovation and new norms. It is seen in the all of the participants' answers; there is a highly skeptical approach towards a new understanding in animal husbandry.

Discussion

Analysing the responses of the participants, it is seen that in the Concept 1, although there is a slight tendency to try a new technology due to possible profits, the general approach to the concept is skeptical. Farmers do consider the possible financial gains and losses as priority. The private feed production sector representatives also have a similar take on the subject, which channel judgement to a point where even previous possible positive effects of the projects are disregarded. The lack of drive for profits and the altruistic work understanding of agricultural engineers working for the public sector encourage them to take on new techniques. However, all the participants agreed on the interspecies contamination risk.

Moving on to Concept 2, it is understood that participants focus mostly on the quality of the feed. High quality of the feed is appealing to all the participants. However, the inevitable correlation between high quality and high price again lead participants, who especially have economical concerns such as feed producers or farmers, to reconsider their decisions. Moreover, all the participants would prefer to see concrete positive effects of the feed, if possible by directly using and experiencing the feeds performance.

Conclusion

ProRefine project has aimed to bring a new approach to lucerne cultivation with leaf stripping and juicing technologies resulting in protein-rich and fibre-rich feed options through novel harvesting and biorefining techniques. Thus, forage legumes can be converted into protein- and fiber-rich fractions

Consequently, from this study, a part of ProRefine project, which aims to fulfil self-sufficiency in feed sector in organic farming, it can be concurred that Türkiye has a potential to increase its self-sufficiency level, however, a new approach can be met with skepticism. The stakeholders of the organic farming sector mostly have concerns about economical issues, they are interested in the high quality products, they require to see further evidence of a new system and they heed to the importance of hygiene in animal production, which again can be linked with economical issues due to the possibility of losses for sanitary reasons. It is understood that these new concepts require further studies to be accepted by the majority of the stakeholders.

Furthermore with the focus group interviews, it is seen that new techs and approaches may find a foothold in the target audience with quality and profit aspects. New projects combining these with environment-friendly understanding may provide the necessary further evidence for a better foundation in the agricultural sector.

Acknowledgements

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Organic Aquaculture in Türkiye: Current Position and Problems

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Key words: Current status of organic aquaculture, Problems of organic aquaculture, Legal Rules and Regulations, Good farming practices

Abstract

Organic farming practices include all kinds of entirely natural farming practices that do not cause any harm to the person who is the end consumer and the organism being cultivated. However, the growing population has changed the agricultural methods and policies applied in the world over time. As a result, the description of agriculture in a broad sense has evolved into "practices of obtaining maximum products from unit area/volume". Nevertheless, over the years, not only the suitability of using chemical fertilizers but also all kinds of agricultural pesticides as well as biotechnological applications within the framework of modern agricultural practices have been discussed in terms of human health. Furthermore, environmental contamination has an indisputable impact on all agricultural goods. Years of research have shown that modern agricultural practices have negative effects on human health, so organic farming practices have been put on the agenda, and its principles and framework have been revealed.

Introduction

Farmers and agricultural associations began organic farming activities at the end of the 1960s, which produced better results for the environment and people. As a result, studies have begun to ensure that agricultural production in European countries is sustainable, environmentally friendly, and safe for human health. Thus the concept of "organic agriculture" has been introduced.

However, organic aquaculture started in the 1990s, after other organic farming practices, with the "organic" certification of farm-raised carp by Bio-Ernte, a certification body in Austria. This initiative was followed by the introduction of salmon and rainbow trout into the market. The first organic trout was put up for sale in England in 1998, but organic aquaculture production has rapidly developed (Franze 2004) and spread among other European countries (Figure 1).

Organic aquaculture is a holistic approach to farm management and food production that combines the best environmental aspects. It provides and implements the most ideal growing conditions and preserves biological diversity without harming the environment (Bilgüven 2013).

Development of Organic Aquaculture in Türkiye

When it comes to organic aquaculture in our country, no other species than various fish species come to mind in practice. However, a small amount of organic mussel cultivation was carried out under partially human control, and the production reached 4168 tons in 2019 (Anonymous 2020).

However, when aquaculture is mentioned around the world, various crustacean species (shrimp, crayfish, lobster, crab, mussel and oyster) and some aquatic plant species and mollusks are also included in addition to fisheries. But today, salmon farming (Salmo salar) is the most crucial organic fish species globally.

However, it cannot be said that we have too many varieties in fish farming. So, trout farming has been the primary farming type in our country for many years. In addition, other inland fish (catfish, tilapia, etc.) have not been sufficiently successful in aquaculture or adaptation studies.

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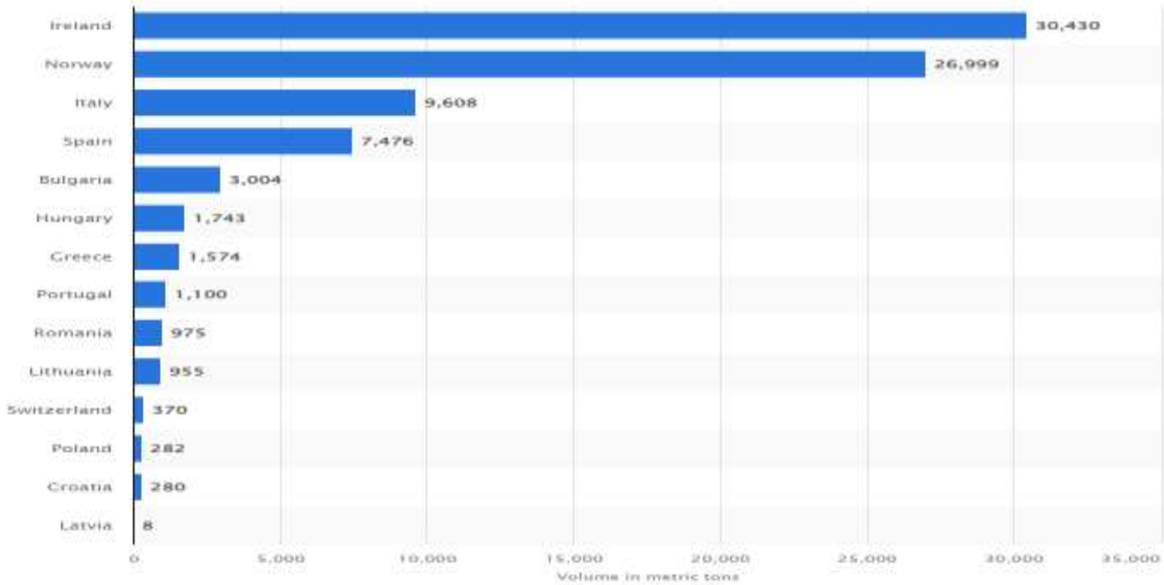

Figure 1. Volume of organic aquaculture production in Europe in 2020, by country (Anonymous 2021).

It is seen that the studies on sea bream and sea bass farming started in the first half of the 1980s. In the inland waters of our country, trout, carp, and eel are grown; in the seas, primarily sea bream (Sparus aurata) and sea bass (Dicentrarchus labrax) along with alternative species such as tuna (Thunnus thynnus), turbot (Scophthalmus Maximus), sinagrite (Dentex dentex), white grouper (Epinephelus aeneus), red porgy (Pagrus pagrus), white seabream (Diplodus sargus), and common bream (Diplodus Vulgaris) are also grown (Özden et al. 2005).

Although trout was the main species cultivated until 2004, after this year, marine fish (mainly sea bream and sea bass species) became the dominant species in aquaculture in our country.

The first studies in Türkiye on the production of organic fishery products started in Rize in 2003. As a result, a project for organic fish production was started in the autumn of 2006 under the Rize Provincial Directorate of Food, Agriculture, and Livestock. In 2009, six enterprises in Rize received organic fisheries entrepreneurship certificates, but this number decreased to three in 2013 (Anonymous 2010a; Çavdar & Aydın 2013).

However, while no production was made until 2015, it was reported that 161 tons/year of organic trout were produced after this date.

The initiatives, which started with the organic farming plan of rainbow trout (Oncorhynchus mykiss) and black sea trout (Salmo trutta labrax) in Rize province, emerged with organic sea bream production projects in Muğla province. With the projects that started with juvenile fish production in this region in 2014, 559 tons of fish were produced in 2015, including 317.2 tons of organic sea bream and 241.8 tons of organic sea bass (Anonymous 2016; Çördük 2016)..

According to the results of the examinations and surveys made in many provinces such as Isparta, Hatay, Rize, Muğla, and Sinop, it has been determined that most of the water resources and enterprises are suitable for organic fish farming. However, these studies have also revealed that although most producers are aware of the "organic agriculture" concept, they do not know or have not heard of the "organic aquaculture" concept. Again, the results of these studies show that the producers can switch to organic farming if there is a market guarantee, the sales price is high, and the state support is provided, and it is imperative that they receive a good education on the subject (Hasbek 2011; Kayhan 2015; Doğan et al. 2015).

Overall, it is seen that although some of the fish producers are interested in the subject and are eager to start organic farming if the conditions mentioned above are met, some of the producers continuing organic production give up on this after a while and stop organic production. If these deterrent reasons are considered, and thus a generalization is to be made, the main problems of organic aquaculture in Türkiye can be listed as follows:

1-The increase in cost per unit of production due to keeping the stock density low is an important issue. The requirement that fish producers reduce stocking rates to a maximum of 10 kg/m³ when switching to organic trout farming causes concern, especially among fish producers who are unable to expand their production capacities due to land and water constraints. This situation is discouraging for producers that rely only on this income.

2- It is also critical to emphasise the market's uncertainties and the manufacturer's sales predictions. Because of the increased interest and demand for organic fish production, organic fish prices will be higher than present fish prices, preventing the loss that will occur from reduced production capabilities. However, the enterprising producer must be able to clearly see this market.

3- Organic feed is more expensive than conventional feed, and its availability is not certain. This issue is the primary reason why organic aquaculture production is no longer being cultivated in our country. Organic aquaculture necessitates the use of feed manufactured from organic feed materials. That is, a GMO-containing substance cannot be utilised in fish feed. At the same time, fishmeal from sustainable fisheries must be used in this sort of diet (Anonymous 2010b). Soybean and fishmeal are the main ingredients used almost continuously in fish feeds. Non-GMO soybeans and this sort of fish meal are difficult to get in our country, where most of our soy and fish meal demands are satisfied by imports.

4-Certification fees.

5- Pollution issues arise as a result of installing many facilities on the same source. A similar issue exists for organic marine fish producers who operate in the same bay or gulf using floating net cages. Farming in floating net cages is costly today, and due to tourism development in these bays, undesirable competition occurs. In addition, environmental and visual pollution problems arise for both sectors. Since this is not a sustainable position, transferring these production cages to the open sea in the near future will increase production costs and complexity.

6-Obligation to keep regular records: The studies showed that most fish breeders (91%) engaged in organic production did not keep records and could not adapt to the organic production model.

7- Fish producers are unable to keep up with treatment or disease prevention practises or approaches, and they are unable to fully comply with hygiene rules throughout the enterprise due to their insufficient training.

8- Drought and Climate Change: Drought and sudden changes in weather conditions have begun to threaten aquaculture enterprises in Türkiye. Only good and rational water management and policies can mitigate the effects of the drought.

Conclusion

It can be concluded that the organic aquaculture conditions outlined so far do not match the realities of countries like Türkiye. Although there are many reasons behind this, it is seen that the main reasons are feed, health, and regular record keeping and training problems of employers and employees.

Due to the aforementioned explanations, all aquaculture companies producing organic fisheries products have ceased their operations in this field. As stated by the accredited authorized certification organizations, which have decreased to 2 today, there is no organic aquaculture production in Türkiye as of 2022.

This agricultural activity differs from organic farming practices in that good farming practices allow the use of commercial feed and antibiotics as long as they are registered. Apart from this, fish producers that want to produce in line with good agricultural practices should work with an authorized certification body. A production scheme and program should be developed; powers and responsibilities of persons operating in this system should be defined; Regular records should be kept and some factors such as pesticides, antibiotics, heavy metals should be analyzed annually. Fish producers who meet these conditions can sell their products by using the "good agricultural product" logo.

In summary, it is extremely difficult to produce organic aquaculture products in Türkiye and in the world, unless the serious feed restrictions in organic aquaculture are changed. Even if production takes place in nations where consumer awareness of organic agricultural products is low, producer will face marketing challenges because organic agricultural products are more expensive than regular agricultural products.

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SESSION 3 Solutions and Opportunities in Organic Agriculture

Organic agriculture in Republic of North Macedonia- major weaknesses and possible solutions for further development

Rukie Agic[1]

Key words: organic agriculture, North Macedonia, farmer, marketing

Abstract

The aim of this contribution is to provide an overview of the organic production in North Macedonia and detect the major weaknesses and possible solutions for further development. Macedonian organic agriculture is still a small sector, with the total area under organic farming of 4277 ha in 2021, comprising only 0.52% of the total arable area, with total of 929 registered operators. In contrast to our country, the increase of areas for organic production is significantly faster, with an increase of 3.4% in Europe and 9.2% in the EU (FIBL & IFOAM Organics International, 2022.

A several weaknesses have been detected as reasons behind this worrisome trend in our country, such as: emigration of young people and low interest of younger generations in agricultural occupations; lack of information for new technologies for organic production, limited info inputs supplier in the domestic market that are allowed for organic plant production; lack of organic seeds; inadequate transportation; shortage of warehouses and lack of adequate packaging and processing; there are no purchasing centres for organic food; producers sell individually instead of jointly; insufficient and inadequate offer for organic products in the Macedonian supermarkets – especially of fresh vegetables and fruits; relatively limited farmer experience, education and skills for the collecting and preparing the necessary documents for obtaining financial support; lack of joint marketing strategy for collective approach towards the supermarkets, green markets, catering and tourism establishments; failure to meet market and consumer requirements in terms of the quality, quantity and continuous supply of organic plan products.

Possible solutions and future steps for successful and further development should be aimed at: overcoming all previous limitations through their support, connecting the farmers is associations and cooperatives in order to obtain more benefits such as lower input prices, group certification, support of education and trainings, increasing the number of advisors for continuous education and information flow among the farmers, information on technologies etc.

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Trends in Organic Cotton and Textile Sector

Aydın Ünsal[1]

Key words: organic cotton, textile

Abstract

Companies that can anticipate future organic cotton needs, they projected an average 10% increase in purchases per year through 2025 and a 15% increase between 2025 and 2030. Overall, the findings of Textile Exchange represent an 84% increase in estimated organic cotton demand by 2030, based on 2019/20 data. The current price of organic cotton and the absence of «in-conversion» cotton in the pipeline to meet future organic cotton needs were recognized as major barriers to companies meeting their organic cotton sourcing targets.

This may indicate that some companies do not have detailed plans for how they intend to meet their future organic cotton needs or do not understand the important role that «in-conversion» cotton plays in the organic cotton journey. Companies overcome these challenges mainly by establishing long-term relationships with suppliers or by incorporating «in-conversion» cotton into their purchasing strategy

Introduction

Importance of Environmental Awareness

Environmental awareness is one of the most important agenda in the world.

As time progresses, more and more people realize that we must change the way we live and consume from which we are accustomed to until now.

In case we do not change, we will leave behind a world that cannot repair itself and life will be very difficult for future generations.

Sustainable Development Goals

Realizing the seriousness of global environmental change which is pressing issue due to rise of extreme weather conditions in many parts of the world, threatening the survival of living creatures and habitats, member countries announced 17 sustainable development goals in 2015 at the United Nations for this issue, it is a universal call to action that includes the goals aimed to be achieved by the member states of United Nations by the end of 2030.

Organic cotton production and environmentally friendly textile processes embrace all these 17 targets and contribute to their realization in every way.

Usage of Chemicals

Although cotton is cultivated in a rather small percentage of all cultivated area in the world, a significant part of all chemicals are used in cotton agriculture.

Additionally, all textile products go through many chemical processes until they reach the consumers.

[1] Egedeniz Tekstil

Organic Production

From the fields to ginning, during the production of yarn, fabrics and apparel, all possible damages to the environment must be minimized throughout all these stages. As it is described in GOTS website, Organic production is based on a system of farming that maintains and replenishes soil fertility without the use of toxic, persistent pesticides or synthetic fertilizers. In addition, it includes welfare standards for animal husbandry and prohibits genetically modified organisms.

GOTS (Global Organic Textile Standards)

GOTS (Global Organic Textile Standards) is a globally accepted standard by developing social criteria as well as Textile processes and making necessary improvements since 2002. This standard stipulates requirements throughout the supply chain for both ecological and labour conditions in textile and apparel manufacturing using organically produced raw materials.

GOTS standards, which are in force with more than 12,000 member companies in 40 countries around the world, are implemented without compromise by control and certification companies for sustainable textiles.

Why Consumers Demand Organic?

- For better quality.
- Healthier.
- Better for families and children.
- It contributes to sustainable environment.
- Creates more biodiversity.
- For looking good, feeling good and also believing they are doing something good.

The Reasons for Brands and Retailers choosing Organic products

- Huge new market.
- Changes visions in the Company.
- Fulfilling promised values by the brands.
- Additional reputation to the brands.
- Improving brand loyalty from customers and workers.
- Increasing trust and respect to the brand.

Choosing Organics

To achieve all these goals, countries, non-governmental organizations, Professional associations organize many meetings, trainings and shows to keep both producers and consumers informed and educated with latest developments.

An international organization called Textile Exchange which has more than 600 members who gathers the largest known brands and manufacturers in the world, offers its members new ways and informs them in order to accelerate the use of preferred materials in transparent and applicable ways.

Textile Exchange brings the textile industry together to achieve the goals of reducing the harm they will cause to the environment and climate and to achieve holistic positive effects in the productions of fiber and raw materials.

Textile Exchange's goal by 2030 is to guide the textile industry to achieve a 45% reduction in greenhouse gas emissions in fiber and raw material production.

Figure 1. Textile Exchange Organic Cotton Market Report

Figure 2. Textile Exchange Organic Cotton Production

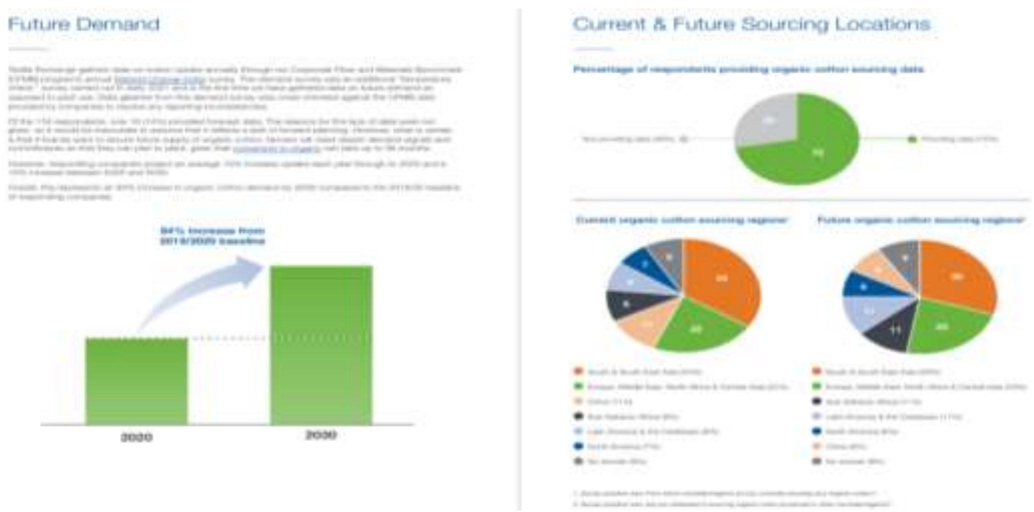

Figure 3. OCA (Organic Cotton Accelarator)

Regenerative Agriculture

In the recent years a new method of agricultural practice has become quite popular with responsible brands and companies which are supporting the global ecosystem.

Regenerative agriculture is a holistic philosophy that takes a whole systems approach. Combination of methods that support resilience as well as build and nourish our ecosystem.

Beginning practices include using cover crops, reducing tilling, rotating crops, spreading compost, and moving away from synthetic fertilizers, pesticides, herbicides, and factory farming.

Over time, regenerative practices can increase production and naturally reduce the need for external inputs. When these regenerative practices are implemented successfully, the health of the agricultural ecosystem and farmer's economic stability can be improved

In the light of all the above information, considering how valuable organic cotton is and the minimum damage it will cause to the environment, it is very important that demand for organic cotton will continue to grow over the years and all kinds of support must be provided by the countries and NGOs to increase its production.

Evaluating Organic Cotton Production in Türkiye

Ülfet Erdal[1], Zerrin Celik[1], Aynur Gürel[2]

Key words: Cotton, organic, SWOT analysis, Türkiye

Abstract

Cotton is crucial for Türkiye in terms of its extensive production and added value and employment opportunities. Especially, it is the leading country in the world with regards to yield and fibre quality. Rising awareness about environment conservation as well as health hazards caused by agrochemicals has brought a great alteration in consumer preference towards organic production particularly in developed countries. Textile products made of organic cotton which have contributed to the environment, economy and social development in particular, are started to be preferred. In this study, Türkiye's organic cotton production and its processes were evaluated by SWOT analysis method and solution proposals were presented within the scope of the achieved results. The strength as a result of the SWOT analysis is to have the appropriate geography and climate characteristics both in terms of production and market access. Subsidies and support policies for organic cotton production remained small scaled when the costs are compared to conventional production The most important opportunities are as follows; firstly, cultivation of GMO seeds is banned in the country and secondly, organic cotton regarding quality and fibre length has high demand in market. Higher prices of competing products (such as corn) are defined as the important threats. Türkiye has a good knowledge on organic farming, may enhance its potential of utilization in organic seed-cotton production. It is necessary to support organic cotton production that contribute to environment, economy and development, its cost should be reduced, along with carrying out long term researches to disseminate to farmers.

Introduction

Due to the Covid-19 outbreak in the 2019/2020 production year, organic cotton production decreased, as in many other products. Both the interruption in the production of cotton and cotton products and the uncertainties in the supply chain resulted in decrease in production. On the other hand, increasing input and energy costs have adversely affected the cotton cultivation. As can be seen Figure 1. the amount of organic seed-cotton production in 2020 decreased by 66.33% compared to 2010.

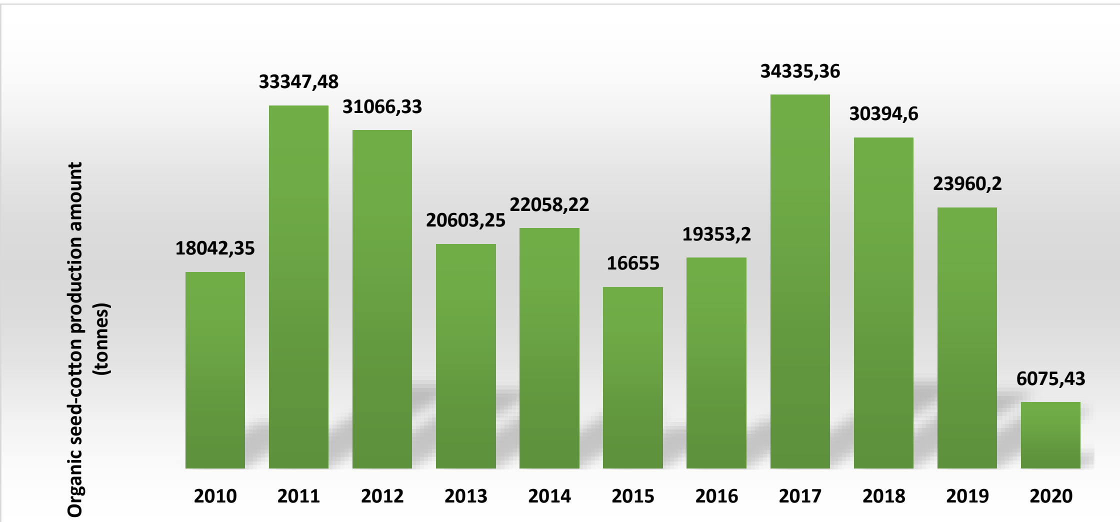

Figure 1. Türkiye organic seed-cotton production amount (tonnes), 2010-2020
Source: TOB, Organic Agriculture Statistics

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The total amount of organic production between 2010-2020 in Türkiye is similar to the amount of organic cotton production. To evaluate organic cotton production amount for the last decade that organic cotton production took the least share was production season of 2019/2020 with (0.37%) (Figure 2).

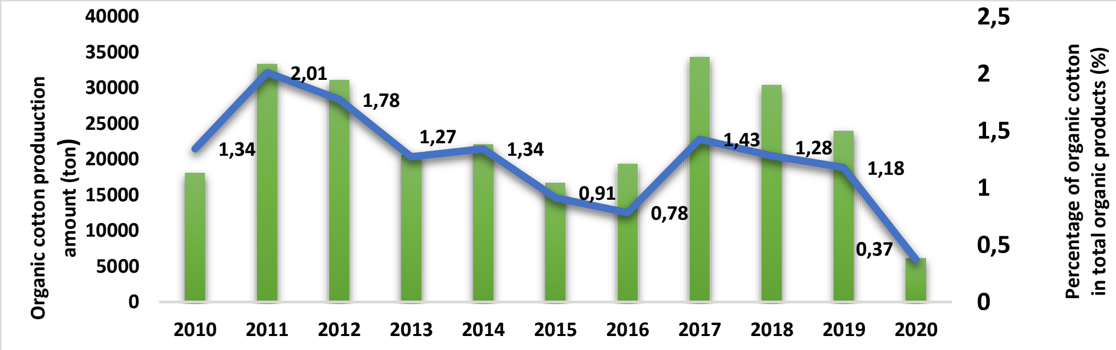

Figure 2. Türkiye organic seed-cotton production amount (tons) and the share of organic cotton in total organic production amount (%).

Source: TOB, Organic Agriculture Statistics

The SWOT analysis acquired from research data and reports on organic cotton production and production enterprises in Türkiye.

Organic Cotton SWOT Analysis

Strength	Weakness
• The climate and soil are suitable for organic cotton cultivation. • Farmers have know-how on organic cotton cultivation • Organic cotton has premium and a higher price than conventional cotton • Since the use of biotechnological (GMO) seeds is banned by official regulations, there is no risk of (GMO) contamination in organic cotton. • Better quality of organic cotton than conventional cotton thanks to hand-picking • Possibility to utilize the seed, oil and hull of cotton, • Cooperation between public, private sector and NGOs to meet the increasing demand for organic cotton • Experienced Enterprises with suitable infrastructure for the production of organic cotton, fiber and products (yarn, fabric, etc.) made from organic cotton. • Studies are carried out on Cotton Varieties for adaptability to extreme climate conditions (drought, water scarcity etc.) • Türkiye has Cotton Gene Bank	• In the beginning organic cotton yield is relatively lower than conventional cotton yield • Inputs in organic cotton are relatively more expensive than conventional cotton • High labor cost of organic cotton cultivation due to hand-picking • Domestic market remains underdeveloped due to the high prices of organic cotton • Farmers ended organic cotton cultivation during the periods of Payment support withdrawal. • Lack of inter-agency cooperation and coordination in organic cotton practices and policies. • Organic cotton producers don't have any organization • Agriculture sales cooperative unions such as (Tariş, Çukobirlik, Antbirlik) having around 120,000 members don't have any role in purchasing organic cotton. • Subsidies and support policies remained small scaled for organic cotton production

Opportunity	Threats
• Prioritize production methods and products that do not harm nature and human health. It can be supportive for Paris Agreement requirements • Market for organic cotton products has a promising future • Currently, Infrastructure, investment, research and dissemination studies are carried out in order to use alternative inputs, practices and techniques. • Cooperation, clustering activities, encouraging practices by government • Raising awareness on social responsibility, ethical values, brand effectiveness • Interest of market actors for ready-made clothing brands in Türkiye is growing	• Loss of fiber quality and yield, changing product patterns such as sunflower or corn due to climate change consequences as extreme weather conditions, drought and water scarcity • Energy and input prices are increasing so cost of organic cotton production becomes higher. • Interruption of product cultivation due to extraordinary conditions such as epidemics, pandemics causes fragility in the supply chain. • The rural population moved away from countryside. • Certain countries which cultivate organic cotton enhanced their organic cotton production so immensely that Türkiye faced the risk of losing its superiority in competitiveness

Results

The strength as a result of the SWOT analysis is to have the appropriate geography and climate characteristics both in terms of production and reaching the market. Subsidies and support policies for organic cotton production remained small scaled when the costs are compared to conventional production The most important opportunities are as follows; firstly, cultivation of GMO seeds is banned in the country and secondly, organic cotton regarding quality and fibre length has high demand in market. Higher prices of competing products (such as corn) are defined as the important threats. Türkiye has a good knowledge on organic farming, may enhance its potential of utilization in organic seed-cotton production. It is necessary to support organic cotton production that contribute to environment, economy and development, its cost should be reduced, along with carrying out long term researches to disseminate to farmers.

Discussion

Marketing strategies and support payments, grands may facilitate the transition to organic cotton production and make it attractive for farmers. Thus, assure sustainability of organic cotton production in order to maintain its competitive power like the other countries that enhanced their organic cotton production capacity. It is worth considering advantageous position of Türkiye in fiber quality and GMO-free cotton which is promising for a better future in organic cotton production.

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National and international organic farming research carried out by General Directorate of Agriculture Research and Policies (TAGEM) in Türkiye

Ayşen Alay Vural[1]

Key words: research, organic, Türkiye

Abstract

The history of organic farming dates back to 1985-1986 in Türkiye in parallel with the development of organic farming activities in the world and demand by foreign countries and has developed in accordance with the Organic Farming Act of 2004 and shifts in the global dietary habits on the consumption of healthy food. In year 2020, while number of farmers involved in organic farming reached 53.000, a number of 235 different products were organically produced/cultivated with an average production level peaked up to 1,6 Million tons per annum. National organic farming research in Türkiye started intensely in 2001. By year 2021, 84 nationwide Research Projects on organic farming has been finalized. Under the coordination of General Directorate of Agricultural Research and Policies, 12 different Organic Farming Research Projects are carried out by 8 research institutes of several different provinces and still are ongoing. International projects carried out by TAGEM started in 2011 with participation in different projects as a partner. International projects are mostly funded by different EU funds. Organic agriculture projects on different subjects are still being carried out by our institutes located in different provinces. In this regard, main objective is to conduct R&D studies within the existing conditions and gather scientific data on organic farming activities in order to ensure the continuity and economic sustainability of organic farming practices in our country.

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Actual Evaluation of Agricultural Aspect of Paris Agreement through Regenerative and Organic Practices in Türkiye

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Key words: climate uncertainty, organic farming, Paris Agreement, regenerative agriculture, GHG emissions

Abstract

Recently, climate change effects become more apparent and hazardous in world scale. Some measures are taken to offer new possibilities in European Green Deal and Paris Agreement to enable climate mitigation. As a candidate country and a key partner for the EU Türkiye signed Paris Agreement. Apart from its pledges in various topics this signature can be translated as a commitment for a transformative movement in agricultural practices. It is widely known that agricultural practices which are direct consequences of climatic conditions are one of the negative impact sources for climate change and cause considerable amount of GHGs. Therefore, Türkiye focuses on reducing GHG emissions and enhancing its capacity of adaptability to climate change within the context of agreement targets as other country parties. According to EU 2021 Report within the framework of EU alignment Türkiye has made some solid progress in Organic farming. In this respect, in addition to organic farming practices a more comprehensive ecosystem-based regenerative farming which is predicted to contribute in an integrative way to correspond an urgency in reduction of GHG emissions. Regenerative practices improve natural sources of a farm that include cover crops, rotation no till, etc. This approach can enhance nutrient levels of soil and also help sequester carbon. Thus, regenerative practices can be considered as a way to boost achieving net zero carbon emission target of Türkiye. In this regard, up-scaling trainings of farmers and young professionals also dissemination activities, the stuff to be harmonized with the regenerative practices may facilitate a smooth green transition.

Introduction

Recently climate change impacts has accelerated and its consequences become visible and tangible in every climate zone in the world. It is vital to have an urgency agenda in struggling with threats of climate change to ensure ecological sustainability on which human being heavily depends to survive. To handle the indispensable climate uncertainty some measures are taken to offer new possibilities such as European Green Deal under Common Agricultural Policy (CAP) of EU, 17 Sustainable Development Goals (SDGs)-2030 and Paris Agreement. Türkiye readily planning to cooperate with the EU on the European Green Deal objectives. As a candidate country and a key partner of EU ratified the Paris Agreement on October 06, 2021.

This review reveals the urgency of green transition, possibility to enrich our local experiences and sources by Regenerative Practices, the chance offered by Paris Agreement to adapt to climate change impacts.

Agricultural Aspect of Paris Agreement

‘‘A Green Transition’ is foreseen within the scope of CAP by EU, aiming to extend sustainable agricultural systems to sustain Good Agricultural and Environmental Condition (GAEC). European Green Deal is developed under the CAP by EU targeting to be climate neutral by 2050. Greener, Newer and Higher ambitions are on the way within the context of the new CAP (2023-2027) to support European Green Deal.

The Paris Agreement was adopted by 196 Parties at COP 21 in Paris, on 12 December 2015 and entered into force on 4 November 2016. It aims to limit global warming to well below 2, preferably to 1.5 degrees Celsius.

In world scale % 13,5 of total GHGS emissions originates from agricultural practices and in Türkiye this rate is % 14. Considering the fact that about half of Türkiye’s total land area is devoted to agriculture, which is slightly above the EU average. This can be translated as an opportunity for Türkiye to achieve

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carbon sequestration with the potential of its agricultural soils. In this regards, further intentions on agricultural practices in compliance with agreement targets can be prioritized. According to Country Report of EU 2021 Türkiye, Türkiye is well advanced regarding the requirements of EU acquis in organic Agriculture (Anonymous Türkiye Report 2021 https://ec.europa.eu/neighbourhood-enlargement/Türkiye-report-2021_en (date accessed 3.04.2022)). This progress can be addressed to provide necessary infrastructure, background, and experience in elaborating enhanced Nationally Determined Contributions (NDCs). The Paris Agreement which works on 5 years of cycle applies each party to elaborate their (NDCs). It requires each party to present their pledges for reducing national GHGs emissions and intentions to accelerate its adaptability to the impacts of climate change. Thus, accomplishments in organic farming may facilitate an immediate transition to a more comprehensive Regenerative Agricultural System. It may be an advantage for Türkiye to adopt an ecosystem-based approach as Regenerative Agriculture which elicits carbon sequestration, biodiversity increase, no-till. Regenerative practices allow improving natural sources of a farm applying cover crops, rotation etc. This will enable Türkiye to have healthier soils. Naturally, healthier soils provide an increase in carbon sequestration.

Agreement embodies the adaptability to climate change scenarios by owning authentic values, traditional and local knowledge. It offers the possibility to build a more equitable and prosperous agricultural system upon experiences and acquirements. Encouraging to design its intended contributions domestically. Türkiye is in an advantageous position with its considerable amount of farmer population familiar with organic farming practices. In Organic and Regenerative Practices farmers' behaviour may have a key role. Therefore, during a period of transition to a more ecosystem-based agricultural design skill-gaps may remain as a challenge. In addition to the contribution of actions on voluntary basis more solid actions would be required to be taken to scale-up the impact area of green transition agenda. Thus it is crucial to identify needs and urgencies then elaborate education programs oriented to farmers. According to Country Report 2021 of Türkiye by EC Türkiye needs to define its cross-compliance standards and align its agricultural support policy with CAP EU (Anonymous Türkiye Report 2021 https://ec.europa.eu/neighbourhood-enlargement/Türkiye-report-2021_en (date accessed 3.04.2022)).Launching locally adapted Farming Advisory Systems (FAS) like every country in Europe also organizing up to date training programs for farmers to integrate them to the new approaches on agricultural practices may be facilitating . In this sense, it would enable farmers to be aligned with Regenerative practices in a more efficient way. Dissemination and extension activities may contribute for a swift adoption of regenerative practices and finally infuse the young farmers with this innovative and comprehensive perspective and transfer to next generations which may contribute at transnational level.

According to many authorities from science and business world Türkiye is in a road of no return, upon its ratification the Paris Agreement. Therefore, it immediately needs to focus on the requirements of the agreement such as self-sufficiency, adaptability to climate-induce events, new technology adoption in order to reduce its GHG emissions and finally attain net zero carbon emission by 2050. In this regard, Türkiye in its new ecological agenda may adopt more holistic agricultural practices such as organic and regenerative practices which empower self-sufficiency, resilience and Good Agricultural and Environmental Condition (GAEC),

To conclude, from many perspectives Paris Agreement, embraces 'firsts' besides a milestone for a path towards a healthier soil and environment. It is a real unifying agreement that gather all the nations around the same concern: climate change and unite them for the same goal: get equipped with various tools for threats of climate change.

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SESSION 5 Climate Change

A model approach to explore agroecological practices for climate mitigation and adaptation in organic vegetable systems

Claudia Di Bene*[1], Alessandro Persiani[2], Francesco Montemurro[2], Elena Testani[1], Roberta Farina[1], Angelo Fiore[2], Mariangela Diacono[2]

Key words: Climate change-resilient strategies, crop diversification, nitrogen loss, soil-crop model

Abstract

The intensity and the frequency of extreme climate events (e.g., heat waves, long drought or flood periods) have increased and affect the horticultural sector, particularly in Mediterranean area. We used EPIC model to evaluate the performance of agroecological practices in a long-term organic vegetable system to cope with climate change in Southern Italy. These practices were a soil hydraulic arrangement combined with agroecological practices in crop rotations, including cover crops and organic fertilization. Cover crops were used as living mulch or break crops, which were terminated conventionally as green manure, or no tilled and flattened by roller crimper. Seven treatments were selected for the simulation procedure. EPIC was calibrated and validated using measured crop yield and soil organic carbon stock values. Then, it was run under baseline current climate (1985–2014) and climate change (2015–2044) scenarios. Climate change increased both microbial respiration and nitrate leaching compared to the baseline, while soil organic carbon stock change and nitrous oxide emissions were mainly influenced by agroecological practices. Cover crop management could be an effective solution to limit negative climate effects because it reduced nitrogen losses and increased summer cash crop yield and soil organic carbon stock, compared to the no-cover-crop system. In climate change scenario, green manure increased microbial respiration and reduced nitrogen losses, compared to roller crimper flattening. The main findings indicated that the tested practices may be effective adaptation and mitigation measures to limit the negative impacts of climate change, contributing to re-design more sustainable climate change-resilient vegetable crop systems.

Introduction

The Mediterranean Basin is one of the most vulnerable areas (with Southern Italy as hot spot) in which climate change (CC) can cause negative impacts (IPCC 2013), such as sustainability and production reduction of cropping systems. Vegetable crops are the most sensitive to extreme events and CC. According to the principles of agro-ecology, the promotion of diversified crop rotation by introducing agro-ecological service crops (ASCs) in crop sequence, organic matter inputs, such as on-farm compost, can be suggested as promising measure to increase crop yield and soil organic carbon (SOC) stock to face greenhouse gas (GHG) emissions impacts. Coupling experimental data and soil-crop models can allow to assess the long-term consequences of agro-ecological practices on crop yield and soil C and N dynamics (Autret et al. 2020). The hypothesis of this research is that the adoption of combined agro-ecological practices may increase the resilience of organic vegetable systems to near-future CC compared to the no-cover-crop system. This study aims at evaluating the ability of the EPIC model to predict the performance of such practices, as adaptation and mitigation measures to cope with CC effects in a Mediterranean organic vegetable system.

Material and methods

Site description

The modeling study was performed on the MITIORG field experiment carried out at the experimental farm “Azienda Sperimentale Metaponto” of the Research Centre for Agriculture and Environment, Council for Agricultural Research and Economics (CREA-AA), in Metaponto (MT) - Southern Italy. The soil is clayey, poorly drained with a superficial water table, and it is classified as Typic Epiaquerts. Climate is classified as accentuated thermo-Mediterranean. Generally, in the study site the winter temperatures can fall below 0 °C mainly in December-February, while the summer temperatures can rise above 40 °C, in June-August.

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Field experiment setup and management

The MITIORG field experiment (about 1300 m2) was established in 2014 to adapt local organic horticultural systems to extreme winter rainfall events, often observed in the last decade. These extreme events, with consequent waterlogging or flooding, represent a major threat to the productivity and potential profitability of farming enterprises in the area. The field experiment was designed combining different agro-ecological practices: i) Soil surface shaping: a ridge-furrow system in which vegetable crops are cultivated both on convex-shaped ridges and in flat strips between them, eliminating the risk of water stagnation and making easier the lateral water outflow; ii) Crop rotations: on the ridges, both winter and summer cash crops, whereas in the flat strips only summer cash crops; iii) Introduction of ASCs: on the ridges, a leguminous crop is intercropped with a winter cash crop and terminated before the summer cash crop. On the flat strips, ASCs are cultivated in the winter-rainy period as break crops; iv) ASCs management: on the ridges, managed as living mulch (LM), whereas on the flat strips chopped and ploughed into the soil as green manure (GM) or flattened by no-tillage roller crimper (RC), before summer cash crop transplanting; v) Organic fertilization: commercial organic fertilizers and amendments. Additional information and details on the long-term field experiment are reported in Diacono et al. (2016, 2017) and Di Bene et al. (2022).

EPIC model

In this study, EPIC v.0810 model was used to assess the effects of different agro-ecological practices. The model was set up using site-specific physico-chemical soil parameters, long-term daily weather data, and field operations. We used an initialization procedure of 20 years (1995–2014), following the procedure described by Le et al. 2018a. After the initialization, the model was run for calibration and validation, using MITIORG data collected. Calibration and validation were based on annual crop yield and SOC stock values, splitting the available data in different dataset. The calibration was performed by considering RC, while the validation procedure was performed on crop yield and SOC stock values observed in GM and no-ASC plots. For calibration, adjustments of parameters related to crop growth, SOC, and N cycles were made within the range of default values, following the procedure of other studies (Arunrat et al., 2018; Di Bene et al., 2022). Further details are reported in Di Bene et al. (2022).

Baseline and near-future climate change scenarios

Climate projection included 30-year of simulated weather data for both baseline (BL) and near-future climate change (CC) scenarios, which were extracted from the Joint Research Centre MARS-AGRI4CAST archive (http://agri4cast.jrc.ec.europa.eu/DataPortal/Index.aspx?o=d). The BL was focused on the current climate conditions of the year 2000 (time horizon 1985–2014), with a CO2 concentration of 400 ppmv in the atmosphere. Since a greater impact of CC around the 2030–2040 period is expected (IPCC 2014), the CC scenario referred to the near-future CC conditions focused on the year 2030 (time horizon 2015–2044), considering a CO2 concentration of 450 ppmv. More information is reported in Di Bene et al. (2022).

Impact assessment of agro-ecological practices under climate change

The EPIC model was run with the BL and CC scenarios. For CC we assumed the same initial soil parameters and model parameterization as set for calibration and validation, for the ridges and flat strips (R1-3 and FS1-4, respectively). Moreover, field operations and agricultural management practices under CC were the same as under BL. The impacts of CC were assessed by estimating the percentage of variation (%) between the selected EPIC outputs (i.e., cash crops yield, SOC stock change, and N2O emissions) predicted under the CC scenario and the corresponding BL values (as control). The percentage of variation was also used to assess the impacts of agro-ecological practices applied in the field experiment to select the most promising combination practices for both adaptations to and mitigation of CC. Thus, in the CC context, the selected EPIC outputs were compared to the values predicted in the fertilized plots without ASCs, used as control (R2 and FS2). Also, in the flat strips, the selected EPIC outputs in FS4 were compared to those obtained in the FS3 strips.

Statistical evaluation of model performance

Model performance was assessed using the model evaluation statistical routines (MODEVAL). The errors of the models were quantified by comparing mean annual crop yield and SOC stock measured data (expressed in Mg ha-1) with the simulated ones (Smith and Smith 2007), using: the Pearson correlation coefficient (r), the relative root mean square error (RRMSE) expressed as a percentage, the relative error (E), the mean difference (M), and the Nash–Sutcliffe model efficiency (NSE). Further details of such metrics can be found in Di Bene et al. (2022).

Results

Model performance

The simulated mean crop yield showed a significant positive correlation ($p < 0.05$) with the measured data, while the RRMSE ranged from 17 to 18% in the ridges and flat strips, respectively. An underestimation was observed in the simulated crop yield in the ridges (E = 6.6%), while a systematic overestimation was observed in the simulated crop yield in the flat strips (E = -1.4%). The M showed that there was no significant bias and the NSE value indicated a positive efficiency. The EPIC model adequately explained the variability of the SOC stock across all values, as affected by field management during the 2014-2017 simulation period.

Influence of climate change and agro-ecological practices on crop yield and on SOC stock change and N2O emissions

In the ridges (R1-3), the predicted crop yield under CC was generally higher compared to BL. The yield variation of the winter cash crops (cauliflower and fennel) was generally positive, negative, or null under CC compared to BL. The yield variation of the summer cash crops (tomato, zucchini, and lettuce) was generally positive or null under CC compared to BL. The percentage of SOC stock variation under CC compared to the BL showed a similar trend, ranging from -0.6 to 2.6%. The predictions of N2O emissions showed different behaviour (neutral, depletion or increase) both in the ridges and flat strips.

Agro-ecological practices as adaptation and mitigation measures to cope with climate change

In the ridges, the introduction of ASCs managed as LM revealed positive or negative variations compared to no-living mulch (R2). In the flat strips, the introduction of ASCs terminated as GM (FS3), or RC (FS4) revealed positive or negative variations compared to FS2. The ASCs management showed slight SOC stock increases (up to 2%) in R3 (LM) and FS3-4 (GM and RC) compared to the control (R2 and FS2). In the ridges, N2O emissions raised in R3 compared to R2 (11%), showing the highest values with METO GCM (12%). Conversely, in the flat strips, the predictions of N2O emissions were positive only for FS4 vs. FS3 comparison. In the flat strips, RC and GM showed similar behaviour for the soil C dynamics (SOC stock change), due to the amount of C input derived from ASCs biomass into the soil during the rotation.

Discussion

The findings from the 30-year CC simulations compared to BL indicated that future crop yield variations are influenced by changes in both temperature and precipitation patterns. The results indicate that the ASCs introduction and termination, in combination with organic fertilization may be effectively limit the negative impacts of CC on crop yield in organic vegetable systems. This is more evident on the summer crops yield compared to the yield predicted in the no-ASCs plots. The mitigation potential of agro-ecological practices to cope CC were observed in both the ridges and flat strips, confirming to increase the agro-environmental sustainability of the organic vegetable production systems. In the flat strips GM and RC increased SOC stock and reduced N2O emissions, compared to the control. Under CC, the RC termination increased N2O emissions, allowing to maximize the ASCs termination effectiveness in Mediterranean environment. Findings from this study could be used to promote recommendations on the adoption of agro-ecological practices to re-design vegetable systems, by highlighting their potential adaptation to and mitigation of CC in terms of C sequestration, crop yield stability, and reduction in N loss.

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Organic Production and Water Footprint of Grape in Gediz River Basin

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Key words: organic production, grape, water footprint

Abstract

CREATE Project is funded by H2020 ERANET FOSC program (TUBITAK 220N242) and it investigates cross-border climate vulnerability of Turkish, European and African food systems. Four significant key traded crops were identified: figs, grapes, hazelnuts and apricots. This study is focused on grapes. In 2020, organic grape production was 115.758 tonnes; 93% of it belongs to Manisa, Gediz river basin. Total water footprint of organic grape is 62 hm3/year, corresponding to 3% of the basin's water potential. Projection models estimate that temperature will increase and precipitation will decrease in the basin by 2050. Considering the drought risk, water footprint can be a useful tool to assess agricultural water efficiency. Organic farming practices should be increased for sustainability.

Introduction

Agriculture sector contributes to climate change through greenhouse gas emissions due to the use of fertilizers and pesticides and consumption of fossil fuels for transportation and distribution of those products. Climate change and water is also directly linked and affects agricultural productivity. Total annual water potential of Türkiye is 112 billion m3. 77% of water is used for agriculture. Per capita water potential is 1347 m3 per year which corresponds to a water stressed country. In 2030, it is expected to become a water poor country.

The water footprint concept has been used in literature since 2000s to assess the pressures on water resources due to consumptive use (Hoekstra, 2003). It measures the amount of water used to produce each of the goods and services we use. There are three components of water footprint. Green water footprint refers to precipitation, blue water footprint is freshwater resources and grey water footprint is the amount of fresh water required to assimilate pollutants to meet specific water quality standards (WFN, 2022).

Organic farming helps sustainable agricultural production and combat with negative impacts of climate change. The benefits of organic agriculture for adaptation to climate change are as follows: increased biodiversity and resistance to disease and pests, conservation of soil, reduction of eutrophication and water pollution, benefits for human health, profitability (IFOAM, 2016) However, organic production represents only 3% of the total production in Türkiye (MoAF, 2020; FAOSTAT, 2020).

This study represents part of CREATE Project (TUBITAK 220N242), which is funded by H2020 ERANET FOSC program and it investigates the cross-border climate vulnerability of Turkish, European and African food trade systems. In this manner, four key traded crops that has high contribution to Turkish economy were selected: figs, grapes, hazelnuts and apricots.

This abstract is focused on grape production and its water footprint as it is one of the most significant agricultural products in Mediterranean region, where water scarcity is a common problem. Production in Gediz river basin is considered, where climate projection models estimate that temperature will increase and precipitation will decrease by 2050 (ClimaHydro Project, 2016). So, there is an urgent need to improve water use efficiency in agricultural production.

Material and methods

Literature is reviewed on topics such as grape production, organic farming, climate change, water resources, Gediz river basin and water footprint. The data on organic production is provided by the Ministry of Agriculture and Forestry. Regarding water requirement of grape production, the global water footprint data produced by Mekonnen and Hoekstra (2011) are considered. The total grape production

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is provided by FAOSTAT and water footprint of total and organic grape production is calculated. The information on the impacts of climate change and future projections on Gediz river basin (ClimaHydro Project, 2016) are evaluated.

Results and Discussion

Around 1.12 million tonnes of organic crops were produced in Türkiye in 2020. Organic grapes constituted 115.758 tonnes of the total production (10%), of which 93% belongs to Manisa province (MoAF, 2020). Since Gediz river basin covers 82% of Manisa province (Gediz River Basin Management Plan, 2018), the data is accepted to represent organic grape production in Gediz basin. Table 1 presents water footprint data.

Table 1: Global average water footprint of grape production

Global average water footprint (m^3 /ton)				
	Green	Blue	Grey	Total
Grapes	425	97	87	608
Grapes, Dried	1700	386	347	2433

As seen (Table 1), producing one ton of grapes requires 608 m3 of water, of which 425 m3 (70%) is green water footprint and provided from rainwater. On the other hand, 97 m3 (16%) is blue water footprint and provided by irrigation. Total water footprint of grape production in Türkiye is 2553 hm3/year.

When multiplied by total annual production amount, the total water footprint of organic grape is found as 62 hm3/year, which corresponds to almost 3% of the water potential of Gediz river basin (2270 hm3/year).

As a result of these evaluations, it is seen that the green water footprint which refers to precipitation, is quite important for grape production in the Gediz basin. At the same time, the blue water footprint is also important for irrigation in agricultural production in the region.

Future climate models related to this region predict that there will be decreases in the total amount of precipitation caused by high temperature increases. A decrease in the amount of precipitation in the region is expected to have negative affect on water resources.

Conclusion

Considering the drought risks and dominant wild irrigation practices, it is urgently required to achieve water efficiency in agricultural production by applying pressurized irrigation methods. Water footprint approach can be a useful tool to assess water efficiency in agricultural production and also a useful guide in water allocation plans. For sustainable agricultural production, organic farming practices should be increased in our country.

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Effects of Different Biochar Applications on Greenhouse Gase Emissions under Corn Plant Growth

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Key words: biochar, greenhouse gases, nitrogen, irrigation, corn plant

Abstract

The objective of this study is to evaluate the effect of biochar treatments on greenhouse gases emissions (GHG). The study was established with corn planting for two-year field trial. As application treatments three different biochar materials (Corn Cobs (CC), Pistachio Shells (PS) and Cotton Straws (CS)) were used with three different doses (0, 4 and 8 Mg ha-1). Two nitrogen doses (N0 and N1) and as %65 and %100 of field capacity two irrigation treatment were applied. Emissions of greenhouse gases (CO2, N2O ve CH4 (mg m-² day-1) from each treatment were determined on plot scale. According to the results; application of biochar significantly affected the GHG emissions from the soil. Emissions of CO2 and CH4 decreased significantly in biochar treatments compare to control, however emissions of N2O were increased. Within the biochar treatments only CC (with 4 Mg ha-1) decreased the N2O emission in N fertilized soils.

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The importance of genotype-nutrition interaction in organic dairy cow farming

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Key words: sustainability, feedstuff, ruminants, breed

Abstract

Today, the increasing world population and the escalating competition in food and feed production makes sustainability indispensable in animal production. In animal production, sustainability is defined as meeting the existing food needs of society without compromising the capability of future generations to meet their food needs. The main purpose of economic sustainable milk production is to convert feed into milk, dairy products, and meat as a by-product. In the dairy industry, feed cost per production unit represents the cost per litter of milk produced from a cow and is one of the most important factors for efficient milk production. In the dairy industry, nutrition is also an important factor influencing production performance, animal health and welfare. For this reason, especially in Mediterranean climates, the threats arising from climate change, especially organic and low-input animal production enterprises should be more concerned with this issue in order to optimize feed utilization and feeding level and providing all the nutrients needed by dairy cattle is gaining importance day by day. These needs vary according to the type, breed, live weight and feeding purpose of the animal. In studies on organic animal production, it is emphasized that priority should be given to local breeds in rearing. In this context, while there are no Turkish native breeds with sufficient performance that we can benefit from in production, feeding and health problems are frequently confronted in high-producing animals and foreign breeds that have adapted to our country. Approximately 84% of the cattle breeds reared in our country consist of culture breeds and crosses. The main goal in organic animal production is not primarily yield, but to make a sustainable production by protecting the animal, the environment, and the consumer as much as possible. The aim of the study was to show the importance and genotype and nutrition interaction on organic dairy farming and discuss the threats arising from climate change especially in Mediterranean climates.

Introduction

In intensive animal husbandry, which is included in conventional livestock, the fact that the breeding is done more intensively with a large number of animals, the aim of obtaining high yields per animal and the priority consideration of economic rules during production has generally pushed the ecological balance into the background. Organic animal husbandry is the certified and controlled production of quality animal products that are based on animal welfare and health protection, do not harm the environment, carry the least pesticides (Valle et al., 2007). Organic dairy cow, which is one of the important branches of organic livestock; It is a controlled and certified production method with environmentally friendly production techniques for consumers who demand high quality, healthy, risk-free milk and dairy products and is one of the most researched areas in organic ruminant breeding.

General principles of organic feeding and nutrition

1. In organic production, all animals should be fed with roughage and concentrate feeds produced completely organically.

2. The rations to be prepared should meet the nutritional needs of all animals in different physiological stages.

3. Force-feeding of animals is prohibited, and feeding programs should aim to increase the quality of the product, as well as increase production.

4. It should be aimed to supply the feeds in the same enterprises in organic farms in order to ensure mutual support by using the inputs of each other by making plant and animal production together.

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5. As in conventional farms, in order for the production to be economical in organic farms, there must be meadow and pasture areas belonging to the enterprise so that the cow can reach the pasture areas at different times of the year.

6. Having adequately sized meadows and pastures in organic production farms not only ensures that the cow are healthier, but also reduces the cost of the obtained product.

7. On average, 30% of the ration dry matter may contain feed in the transition period.

8. This rate can be increased to 60% if the feed materials in the transition period are obtained from the enterprises where the animals are raised.

9. The inadequacy of organic feeds and the high prices in parallel with this stand as the most important problem in the development of the ecological meat and milk production sector in our country.

10. In order for organic livestock breeding to develop in Türkiye, it is absolutely necessary to support concentrated feeding.

11. In organic animal nutrition, roughage, mechanical toughness, as well as protein-rich ones, which are mainly used as an energy source, should be preferred.

12. For this purpose, legumes and mixtures of legumes and grasses should be used to obtain hay and silage.

13. In organic farms, the short feeding times and the ordering of the feeds cause the strong animals to fight the weak ones because they want to consume first, causing unnecessary stress and injuries to both animals.

14. For this reason, an ad libitum feeding program should be applied to cattle, especially lactating cows, in organic feeding.

15. According to the current organic agriculture regulation in Türkiye, the rations in organic meat and dairy cattle enterprises should consist of 60% roughage and 40% concentrated feed in terms of dry matter.

16. However, under the control of the control institution, the concentrate feed rate can be increased to 50% for a maximum of 3 months in cows that have just given birth, due to their intense energy needs.

Effects of climate change on animal production and sustainability

Climate change is one of the most important factors affecting biodiversity and causing serious ecological damage (Guan et al., 2021). Several species have faced local extinctions due to the decrease in their habitat. Hence, genetic diversity is also decreasing in parallel to these extinctions. The effects of climate change can also be observed in agriculture, forestry, and fisheries. This, in turn, affects human life by causing a decrease in agricultural production.

Impacts on industrial and landless livestock systems

New climate scenarios may induce negative effects even on industrial livestock systems, acting on feed resources, because they are completely dependent on the market for animal feeding. Cost variations of grains, and their availability at the market, will strongly influence profitability and sustainability of enterprises. Together with economic components, not strictly related to agriculture production systems, climate changes will influence crop production and relative costs, influencing for example costs for irrigation, especially for corn production, and for pest treatment (A.Nardone et al., 2010). The increase of CO2 concentration will influence in some ways grain yield, such as maize and soybean, with different and contrasting foreseeable effects, also depending on agronomic management (planting date, fertilization, and irrigation). In the near future the availability of some grains for animal feeding could be reduced, due to an increasing demand for human consumption and to the perspective of agriculture fuels.

The problem of water

Under global warming, water will be the main common weak point in all livestock systems. The phenomenon of water salination is spreading in many areas of the World. Other than salination, water may contain chemical contaminants, either organic or inorganic, high concentrations of heavy metals and biological contaminants. Animals exposed to hot environments drinking an amount of water 2–3 times more than those in thermo-neutral conditions can run many risks. Indeed, altered water pH may affect metabolism, fertility and digestion; the excess of nitrite content can impair both cardiovascular and respiratory systems; excess of heavy metals can impair the hygienic and sanitary quality of production, and the excretory, skeletal and nervous systems of animals (A.Nardone et al., 2010). Likely, all global warming effects on water availability could force the livestock sector to establish a new priority in producing animal products that need less water.

Importance of genotype in organic farming

Changes in climatic conditions negatively affect farm animals and animal products in terms of quality and quantity. Some of the main factors affected can be classified as availability, quality and price of forage crops, pasture quality, animal health, growth and reproduction (Thornton and Gerber, 2010). Dairy cows are more sensitive to climatic changes than other ruminant animals due to their high metabolic rate, and low water-holding capacity in their ureteral systems (Bernabucci et al., 2010). The effects of climate change on dairy cows can be grouped as growth, milk production, reproduction, adaptation and disease formation. Organic dairy production differs from conventional dairy production in many aspects (eg. dietary regimens and medical treatments). However, breeding programs for the two production systems are the same in most countries. Breeding goals (BG) might be different for the two production systems and genotype (G) × environment (E) interaction may exist between organic and conventional dairy production, both of which have an effect on genetic gain in different breeding strategies. In order for organic farming to be sustainable, care should be taken to use appropriate genotypes and to keep the genetic structure stable. For breed selection, the animals' capacity to adapt to local conditions, their strength, and their resistance to disorders should be taken into account. The main hurdle for sustainable organic dairy farming is to breed the genotypes suitable for forage-based production systems (Peeters and Wezel, 2017).

In conventional dairy cow farming, American Holstein-Friesian is the dominating breed due to its high milk yield. However, its performance decreases in organic farm conditions (Horn et al., 2013). On the other hand, it has been suggested that local breeds are more suitable for organic production and are important for maintaining genetic diversity (Ahlman et al., 2011). The breeding program of high-yielding animals can be continued by using organic genetic merit indices in accordance with organic dairy farming. Or high yielding animals can be crossed with resistant local breeds to produce sufficiently productive and resistant animals. Therefore, there is not a single cow breed for organic dairy farming due to heterogeneous environmental conditions. Farmers might choose the best option from purebred cows or crossbreeds to get high profits (Rodríguez-Bermúdez et al., 2019). When rationing dairy cows we need to take account of their energy requirements for milk production, the energy required to maintain the cows' basal body activity ('maintenance'), energy required for pregnancy, and energy required (or released by) body weight change.

Table 1. Breed of cow has no effect on energy utilisation efficiency

	Holstein	Non-Holstein
Metabolisable energy required for maintenance ($ME_{m'}$ MJ/kg $LWT^{0.75}$)	0.69	0.68
Efficiency with which metabolisable energy is used for milk production (k_1)	0.64	0.64
Feed required to maintain a 600 kg cow (kg DM/day)	6.9	6.8
Feed required to produce 30 kg milk (kg DM/day)	12.1	12.1

Source: SOLID, 2016.

There were no significant differences between Holstein cows and non-Holstein cows in the metabolisable energy required to maintain the cows' basal body activities. This result demonstrates that there were no differences between Holstein cows and the 'adapted breeds' in terms of their energy requirements for maintenance or milk production. However, it should be remembered that some alternative breeds of cows are lighter than Holstein cows, and as such they will have a lower energy requirement for maintenance (MJ/day). In addition, some breeds (such as Jersey crossbred cows) produce milk with a higher fat content, and this will increase their energy requirement for milk production.

Conclusion and Suggestion

Unlike the conventional farming sector, organic dairy farming on both local and large scales is very heterogeneous, and no single type of cow will be suitable for all scenarios. Because of the legislation associated with organic farming (mainly involving nutrition and allopathic treatments) and the high dependence on the environment, organic farmers generally demand robust cows that are sufficiently productive to yield profits.

Analysis of the available information indicates that:

1. There is no single alternative breed (Holstein-Friesian, other breeds or crosses) as there are advantages and disadvantages associated with all, and

1. The strong genotype × environmental interactions demand different strategies to deal with very diverse situations. For example, farms producing milk for payment systems that recompense volume would obtain benefits from high milk yielding cows, i.e. Holstein-Friesian may be the best option.

Although most Holstein-Friesian cows are currently selected for use in conventional systems, this situation could be reversed by the implementation of an organic merit index that takes into account organic breeding goals. On the other hand, farms producing milk either for systems that recompense milk solids or for transformation into dairy products would benefit from using pure-bred cows other than Holstein-Friesian or cross-breeds. Finally, it should not be forgotten that the resilience of climate change on local breeds have priority. Because of that, organic farmers who focus on rural tourism, farm schools, or other businesses where marketing strategies must be taken into account, could benefit from using local breeds (when possible) or an other breed valued by customers for sustainability.

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PANEL 2 Climate change adaptation of the organic agricultural sector

Recarbonization of soils with compost and biochar: lessons from a long-term field study in an organic olive orchard in Spain

Miguel A. Sanchez-Monedero[1], Maria Sanchez-Garcia, Maria Luz Cayuela

Key words: olive tree, two-phase olive mill waste, soil C sequestration

Abstract

This study shows the results after 8 years of a long term experiment evaluating different C sequestration strategies based on the biennial application of i) compost, ii) biochar and iii) a 90/10 mixture of compost/biochar to an organically managed olive orchard in Southeast Spain. The plots amended with biochar showed the greatest increase in TOC content (4,85 ton C ha-1), followed by the plots amended with the compost/biochar mixture (3.09 ton C ha-1). The use of compost and compost/biochar mixture showed an enhancement of soil N cycling and availability than biochar, without a significant impact on crop yield and nutritional status and soil greenhouse gas emissions (N2O). The amendment consisting of the compost/biochar mixture seems to be more favourable from both environmental and agronomic perspectives thanks to thanks to a greater increase in stable C retained in the soil and a greater availability of nutrient.

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SESSION 6 Contentious Inputs

Organic-PLUS – research for a better organic farming

Judith Conroy[1] and Ulrich Schmutz[1]

Key words: Organic farming, organic regulation, copper, organic fertilisers, peat, plastic mulch, antibiotics, socio-economic modelling, LCA, RISE

Abstract

Organic-PLUS is an EU Horizon 2020 project which aims to phase-out contentious inputs from organic agriculture in Europe and beyond. The project has been investigating alternatives to i) Plant-related contentious inputs: copper fungicide, mineral oils, ii) Livestock-related contentious inputs: bedding with pesticide residues, antibiotics and anthelmintics, and iii) Soil-related contentious inputs: non-organic animal and plant fertilisers, peat growing media and fossil-fuel derived plastic mulch. In addition to this applied natural science research, social science on consumer and farmer perceptions and socio-economic modelling (LCA and RISE) of the alternatives have been examined. This leads to better decision support for policy makers when developing organic regulation further, both in Europe and worldwide in the international organic movements (IFOAM). Phasing-out contentious inputs applies to both organic and non-organic agriculture. The Organic-PLUS project has specific research focus on Mediterranean crops.

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Contentious inputs: peat, plastic and fertilisers; what we did in Organic-PLUS WP5 experiments

Anne-Kristin Løes[1]

Key words: inputs, peat, plastic, fertilisers, Organic-Plus

Abstract

Peat for growing media, plastic for covering agricultural land ("mulching") and fertilisers derived from animal husbandry not being certified organic (manure, horn meal etc.) are considered as contentious inputs in certified organic growing. The work package "SOIL" in Organic-PLUS worked during 2018-2022 to develop alternatives to peat, non-degradable plastic and non-organic animal-derived fertilisers. In Organic-PLUS we have especially tested composts from locally available materials to replace peat; completely degradable plastic derived from potato starch to replace non-degradable plastic foil; and various types of fertilisers typologied as Urban (digestate from food waste, industrial food waste etc.), Residual (residues of captured fish and seaweeds; waste from organic food industry) and Vegan (from legumes or other plant material) to replace conventional animal-derived fertilisers. Results will be presented from these studies, involving many colleagues across more than 20 countries

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Pathways to phase-out contentious inputs from organic agriculture in Europe: Evaluation of system solution scenarios in on field plant trials

Katsoulas N,[1*] Andrivon D,[2] Cirvilleri G,[3] de Cara M,[4] Hansen JG[5], Kir A[6] and Schmutz U[7]

Key words: contentious inputs, copper, essential oils, natural biocides, organic agriculture

Abstract

An ex set of field and greenhouse experiments were performed within the Organic PLUS to test and possibly validate promising alternatives to copper. The alternatives considered, ranged from copper substitution products (biocides such as essential oils, plant defense stimulators, biological control agents, biostimulants) and natural biocides used alone or in combination, to resistant cultivars, crop architecture (including some changes through pruning and de-leafing), to more complex systems involving, decision support systems and to target preventative or curative management actions. The experiments showed that, with few exceptions, substituting copper for an alternative product without any further action was generally less efficient than the copper control; in some cases, the promises of substitutes could not be transferred at all to field conditions. They also showed that cultivar resistance should serve as one of the pillars of IPM strategies devoid of copper.

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The Tested Alternatives of Organic Farming Contentious Inputs and Key Results of the Activities

Alev Kir[1*], Barbaros Çetinel[2], Ünal Kaya[1], Tevfik Turanlı[2]

Key words: alternative input, olive pruning, compost, copper, organic farming

Abstract

Ministry of Agriculture and Forestry (MAF) is one of the co-partners of the Organic Plus Project (https://organic-plus.net/). Our ministry contributed to Work Packages Plant and Soil (WP-Plant and WP-Soil) and conducted olive, pepper, cabbage and eggplant field trials under organic management between 2018-2022. In Türkiye, Ministry of Agriculture and Forestry has the responsibility for agricultural research and as the partner of the Mediterranean Research Network has the right to direct large number of organic producers. It has potentials for the development of the organic farming in the country both for export to the Mediterranean countries and to the widely growing domestic markets. In this regard, our country is in the first ten in Europe.

On behalf of MoAF our institutes cooperated as a partner organization in 4 work packages of the project and involved totally in 18 replicated trials to identify alternatives to conventional manure, peat, plastic mulches, and copper. Part of our work on peat-free growing media and plastic-free mulching was to explore the potential of wood waste materials such as "Chipped" and "Composted" olive tree pruning scraps. Several plant extracts were examined as a plant nutrition input for sustainable use and management. We focused on holistic system approach that based on a rotation programme for vegetables (pepper-cabbage). Some of the local aubergines (eggplants) displayed a comprehensive diversity, some were resistant to common aubergine fungal disease, early blight (Alternaria solani) and some were tolerant. The choice of varieties adapted to local conditions, the use of resistant varieties and other general measures which ensure a resilient agricultural system, strongly contribute to reduction of dependency on external inputs such as copper to control plant health. Olive yields are threatened by a variety of pathogens and pests, which limit productivity in the field. Phytopathogenic fungi causing olive leaf scab disease Venturia oleaginea (Syn. Spilocaea oleaginea and Fusicladium oleagineum) commonly found throughout the Mediterranean region and significantly affect olive production. In organic olive orchards, pathogens are mainly controlled by spraying copper-based products regularly. In this regard, 10 different alternative inputs were tested in the Organic Plus Project. At the end of the 36th month, our institute proposed the research findings to EU Commission which were accepted to be used in the organic sector as successful alternative inputs. One of the key result is "in the organic sector instead of using "peat" an innovative "compost" is created, in which the use of "animal waste" is reduced to 2% (v.v-1) of the total raw material compost pile mass". Moreover, in some trials conducted together with Germany (ATB), Spain (IRTA) and England (Coventry University), our institute sent the olive pruning wastes from Türkiye and which were converted into fibre form by the ATB Institution in Germany with its own patented machines. The capacity of the prunings as a soil conditioner and plant growth medium were examined through trials. Result showed that it is a very low cost material since energy consumption is very low when converting olive prune residues into fibre form compared to the other ten different plant residues tested in the studies in the partner countries. For organic olive cultivation, result of a 3-year trial indicated that silicon fertilization could replace and reduce copper use. Also 50% decrease in the diseases was obtained by spraying compost tea to the leaves. In addition, the use of olive prunings by chipping instead of using petroleum sourced plastic mulch is a strategy that can compete with plant covers both in terms of soil organic matter and allopathic aspects. In the Mediterranean countries where production of the olive and other fruit trees is high, pruned branches can be defibred and/or composted and/or chipped to use as substrate, mulching and soil conditioner and plant fertiliser. Unhealthy pruning residues can also be buried into deep soil layers. Thus, the incineration of the pruned tree branches could be phased out or avoided.

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SESSION 7 Developing Sustainable Farming Systems

Comparative analysis and benefit/cost assessment of organic treatments applied to vegetable crops

Elame Fouad[1], Azim Khalid[2]

Key words: organic, treatment, partial budgeting, dominance, marginal return rate

Abstract

Organic farming is an agricultural production system ensuring a sustainable development approach. It is an agricultural production management system that does not use chemical fertilizers, pesticides, synthetic industrial products or GMOs (Genetically Modified Organisms). The main objective of this study is to evaluate the impact of 4 different organic treatments (T1, T2, T3, T4) on the profitability of 4 vegetable crops. We used the partial budgeting to compare the benefits of the use of these treatments. It is a decision-making tool for any change in the production system and could be useful for economic planning process at the farm level. Dominance analysis shows that, for pepper and cucumber, both T3 and T4 treatments are dominated because they require higher production costs with lower net benefits than the other treatments. While the two treatments T2 and T4 were dominated for beans and courgette crops. The Marginal Return Rate of the Comparative Analysis shows that T1 treatment remains the best choice in terms of economic and marginal profitability, followed by T3 treatment. Thus, organic amendments without enrichment (T1, T3) are the most attractive for farmers because they generate less cost and more profit seen that the yield is higher for these two cases.

Introduction

The Souss-Massa region produces mainly vegetable crops, citrus fruits and banana in a very intensive way which leads to a significant production of organic waste. This Waste is generally poorly managed. To valorize this waste, composting seems to be the most suitable and competitive method. In order to assess the profitability of a compost based on organic matter, a comparative study of four different organic treatments, applied to several vegetable crops, was conducted as part of the AMABIO project.

Material and methods

The adoption of a technology must meet several conditions, particularly the agro-ecological and economic constraints. However, the financial component, including the implication of the proposed change in costs and income, remains most often the central link in the adoption of a given technology. Nevertheless, farmers do not have adequate tools to quantify the effects of changes in order to respond effectively (Allogni et al., 2004; Crawford and Kamuanga, 1991; JIRCAS, 2012).

In order to assess the impact of 4 different organic treatments (T1, T2, T3, T4) on the profitability of 4 vegetable crops (Cucumber, Pepper, Courgette, Green Beans), the partial budgeting method is used to compare the benefits of the use of these treatments. It is a decision-making tool for any change in the production system and could be useful for economic planning process at the farm level (Tigner R., 2006; CIMMYT,1989).

T1 (Plantamix); T2 (enriched plantamix (trychoderma)); T3 (Biocompost); T4 (enriched Biocompost); T5 (Witness without any organic amendment).

Pepper, cucumber, Courgette and greenhouse green beans are case studies used to illustrate the approach. The economic evaluation of the different treatments applied to crops, already mentioned, was followed by recording the cost of the various operations carried out throughout the crop cycle. They are then subjected to a comparison to extract points of similarity and difference between the different modes of conduct. Only additional costs and revenues and those that fall as a result of the use of new technology are taken into account.

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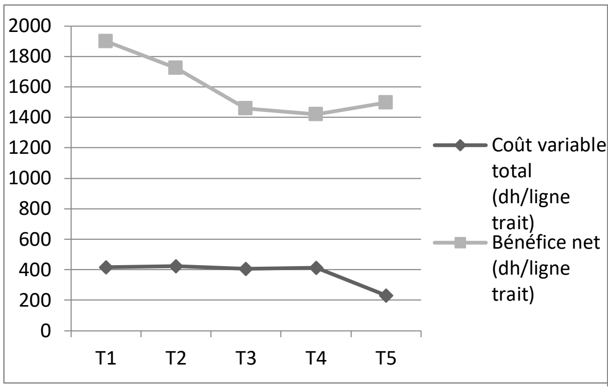
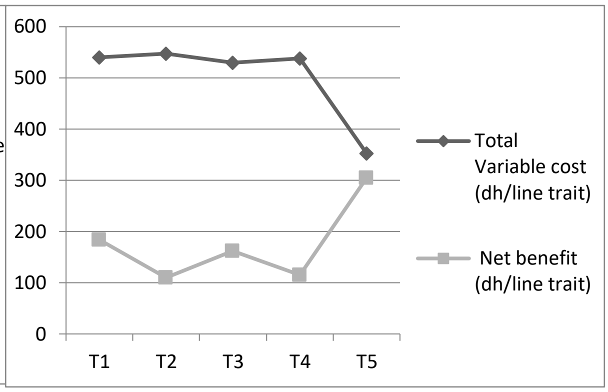
Results

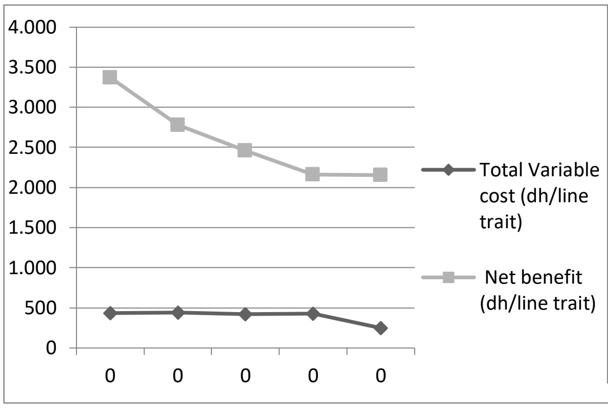
1. Analysis of the impact of new technologies applied to crop production: Dominance analysis

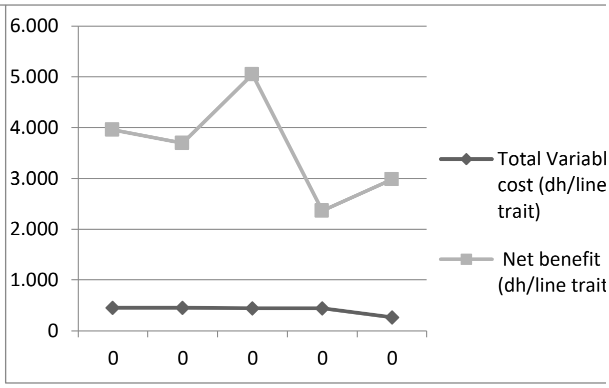




Pepper: Both T3 and T4 treatments are dominated because they incur higher production costs with lower net benefits than other treatments.

Green beans: Both T2 and T4 treatments are dominated as they incur higher production costs with lower net profits.

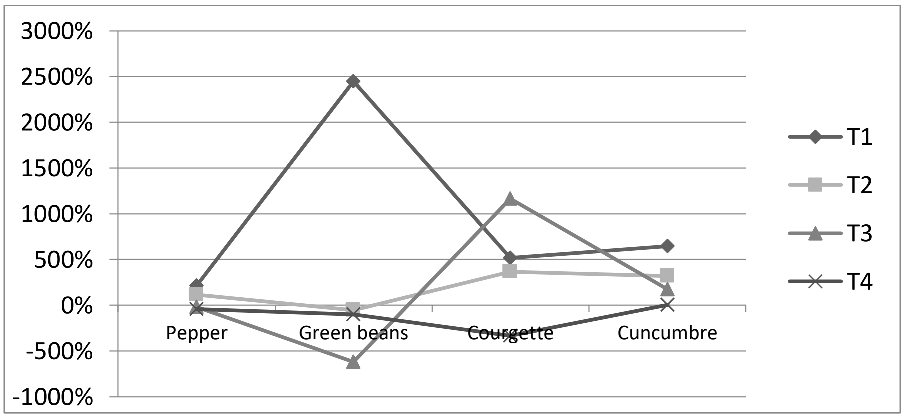




Cucumber: the two treatments T3 and T4 are dominated and are therefore eliminated from the marginal analysis

Courgette: T2, T4 and T5 treatments (control) have the lowest net benefits and are therefore to be eliminated from the analysis

2. Comparative analysis of Marginal return rates for 4 composts



T1 treatment remains the best choice in terms of economic and marginal profitability, followed by T3 treatment. So organic amendments without enrichment (T1, T3) are the most profitable since they incur less cost and more profit as the yield is higher. This conclusion holds for all crops except for green beans where the T3 treatment has the lowest Marginal return rate. Given this observation, this result must be verified by a second repetition of the test to confirm the results obtained for the T3 treatment.

Discussion

The results of this analysis show that T1 treatment remains the best choice in terms of economic and marginal profitability, followed by T3 treatment. Therefore, organic amendments (T1, T3) are the most profitable since they generate less cost and more profit as the yield is higher. This conclusion holds for all crops except for green beans where the T3 treatment has the lowest marginal return rate.

The partial budgeting is a tool that can provide an economic assessment of the technologies adopted. Nevertheless, an application at the farm scale is necessary to develop further and adapt this methodology to the Moroccan rural context, particularly, for organic crops, which could be a subject of a future research.

Acknowledgements

The author team acknowledges the financial contribution of AMABIO to this research project. They also recognise the effective contribution equally of every co-author to this work.

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Suppressive Effect of Root Knot Nematode Meloidogyne spp. During Composting of Tomato Residues

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Key words: Compost hygienization, Meloidogyne spp., C/N ratio, Mesophile phase, Crop damage

Abstract

The suppression of pathogens in general, as well as phytopathogenic agents, by the composting process is quite often attributed to the sanitation effect of the thermophile phase. This ensures hygienization and sanitation of compost against plant pathogens and phytoparasites to prevent their dissemination in horticultural production. The root knot nematode is one of the most economically damaging genera of plant-parasitic nematodes on horticultural crops. Composting horticultural wastes should ensure compost hygienization from root knot nematodes. Thus, the objectives of this work are to produce hygienic compost based on tomato residues and to study the suppression kinetic of Meloidogyne spp. during composting. Three levels of initial C/N ratio were tested (20, 30, and 40), combined with three levels of initial moisture (30, 50, and 80%). Several parameters were monitored such as temperature, oxygen, as well as the quality parameters of the composts produced. The results obtained showed that despite the thermophile phase at the start of the composting marked by a temperature reaching 60 °C, 10% of the root knot nematodes' larvae were not eliminated. This shows that temperature alone as a sanitizing factor does not allow the compost hygienization. However, at the end of the process, root knot larvae were completely suppressed. This is probably owed to the contribution of the mesophilic flora which colonizes the substrate after the thermophile phase.

Introduction

The suppressive effects on phytopathogenic diseases and Phyto parasitic nematodes are often observed during the composting process. Noble and Roberts (2004) have claimed that a sufficient exposure time of thermophile temperature is enough to eradicate nematodes during composting. Menke and Grossmann (1971) reported that for the sanitation of Meloidogyne incognita inoculated in the organic residues of pepper and tomato, it is necessary to go through a thermophile phase with an average temperature of 57 °C for at least 19 h in pile composting. On the other hand, for the sanitation of Meloidogyne incognita inoculated to green waste as egg masses required a maximum temperature of 74 °C for 4 days in dynamic free heap composting (Noble and Roberts 2004). However, it is only progressively that researchers begin to understand under what conditions root knot nematodes can resist during composting. Thus, the objective of this work is to produce a hygienic compost based on tomato residues and to study the suppression kinetic of root knot nematodes during composting with different initial C/N ratios and moisture.

Material and methods

Composting was carried out in Melk Zher experimental center (INRA-Agadir) 45 km south of Agadir city (coordinate: N30.0440758, W-9.548735). This study focused on composting green waste from tomatoes, sheep manure, and sawdust. During the biodegradation process, microorganisms use carbon as an energy source and nitrogen to produce proteins necessary for their development. For this reason, initial C/N ratios of the mixtures (20, 30 and 40) were calculated according to the method as suggested by Azim et al. (2018). The choice of tomato waste was motivated by the fact that horticultural producers consider it to be a source of inoculum for root knot nematodes (Meloidogyne spp.). Therefore, the composting of this high risky waste for vegetable crops requires rigorous monitoring throughout the process, while acting on two parameters: temperature and competition between microorganisms.

Composting was carried out in 220 L biocomposters ("Biolane" brand, Finland) with a patented natural ventilation system, equipped with a thermal probe and an evacuation hatch. Moistening is done in a

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way to start with three moisture levels (30, 50, and 80% v/v) for each level of C/N ratio. The factors studied are the initial C/N ratio with three levels (20, 30, and 40) and the initial moisture with three levels (30, 50, and 80% (v/v)). All the treatments were carried out in biocomposters in number of nine having received the combination of the two factors studied (three levels of C/N * three levels of RH% = 9 combinations). The method presented below allowed to carry out relatively balanced mixtures with respect to their C/N (Table 1). It is based, for each category of waste, on their total carbon and total nitrogen contents.

Treatments		C/N20			C/N30			C/N40	
Organic wastes	Sheep manure	Saw dust	Tomato waste	Sheep manure	Saw dust	Tomato waste	Sheep manure	Saw dust	Tomato waste
Ci (%)	35.41	59.4	42.2	35.41	59.4	42.2	35.41	59.4	42.2
Ni (%)	3.19	0.09	3.15	3.19	0.09	3.15	3.19	0.09	3.15
(C/N) i	11.1	660	13.39	11.1	660	13.39	11.1	660	13.39
% (p/p)	20	25	55	18	47	35	20	60	20
(C/N) Mean		19.3 ≈ 20			29.7 ≈ 30			40.60 ≈ 40	

All analyses were performed in triplicate for each sample taken from the center of the biocomposter through the 9 combinations throughout the duration of the experiment. Classical physic-chemical analysis was performed along with the microbial analysis that were carried out according to the method described by Saidi et al (2009) to follow the total mesophilic and thermophile flora. Manuel inoculation of nematodes Meloidogyne spp. was used to ensure a homogeneous level of inoculation for every combination. The inoculation density was set to 545 J2 / liter of biocompost with useful volume of 220 litre. Root knot nematode numbering was performed following Baermann (1917) modified method. A regular cress test was made at the end of the composting process for compost quality. All statistical analysis were performed using IBM SPSS Statistics 25 and the multiple comparisons of means were confirmed by the Tukey test at $p < 0.05$.

Results and Discussion

The results of this study indicate a good biodegradability of the raw materials, in particular the treatments C/N20 and C/N30 which have shown good results in terms of maturity and optimization. On the other hand. A slight resistance of the nematodes was observed after the thermophile phase, despite the thermophilic temperature up to 73 °C; where 90% of the J2 larvae have been eradicated. At the end of the process, the nematodes are probably eliminated by the antagonism of the mesophilic flora. Increasing initial C/N ratio increases the duration of composting and subsequently its production cost. C/N20 and C/N30 treatments appear to be the most suitable for direct soil amendment. At the same time, the sanitation of the compost vis-à-vis the nematodes cannot be carried out exclusively by thermophilic temperature (70 °C), the results have clearly shown that the combined action of thermophilic temperature (reduction of the population), with the action of the mesophilic flora (antagonistic action) was finally able to sanitize the compost of this hazardous Phyto parasites. It is recommended to carry out other validation tests to detect which groups of fungi have a nematicidal and antagonistic action against root knot nematodes during the mesophile phase.

Your suggestions for research and support policies to develop further step!

While increasing compost production and demand, attention must be paid to the compost quality and plant safety. As far as compost is amended on the agricultural soils, compost stakeholders should avoid making the compost as a potential dissemination agent of plant diseases and parasites. Therefore, plant and crop safety would be then at their higher standards in quality check in the plant diseases and parasites control and suppression during composting. There is a wide research area to determine the optimal condition to suppress phytopathogens and parasites during composting at multiscale level. According to the Sustainable Development Goals (SDG) of the United Nations, carbon sequestration is one of the main actions that could be taken int o consideration especially under the SGD N°13 (Climate

Action). Regrettably, carbon sequestration is less considered that carbon emission attenuation. Beside and since compost market is expensing, policy makers and stakeholders could take advantage of carbon trade and finance to boost compost production and tackle organic waste issue. This objective could be achieved through subsidizing circular economy (compost plant and machinery), regulation improvement, government institutions procurement of compost, community composting, funding R&D for startups creation, networking of compost stakeholders, education and extension for farmers and future generations.

Acknowledgements

The author team acknowledges the financial contribution of AMABIO to this research project. They also recognise the effective contribution of every co-author to this work. AK and SB made the trial conception, AK wrote the paper under the supervision of SB. CP, TAI and SR have read and improve the quality of the manuscript.

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SESSION 8 Scalling Up Organic Farm Management

Current Trends on Semiochemical-based Pest Control Strategies with special reference to Insect Pheromones

F. Ö. Altındişli[1], F. Özsemerci, T. Kılıç and S. Tanyolaç

Key words: Insect pest management, semiochemicals

Abstract

Semiochemicals are defined as informative molecules mainly used in integrated pest management as alternative or complementary treatments to chemicals. They manipulate insect behaviour by affecting their survival and/or reproduction to suppress the population densities and decrease infestations on crops, eventually. Semiochemicals carries much lower toxicity and reduced side effects on the environment, occupying an important place in organic agriculture. The article describes pheromones and allelochemicals utilized in insect management programs. Different semiochemical-based insect management strategies are highlighted focusing on mass trapping, mating disruption, attract & kill, and push & pull techniques. It overviews recent formulation types such as microencapsulation and nanoencapsulation for slower and more controlled release. The combination of semiochemicals-based techniques with other sustainable control methods are discussed.

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An investigation on impacts of regulations on boosting organic production: Iran

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Key words: organic production, regulations, legislation, law, Iran

Abstract

Boosting organic production is not only a value looking for its social agreements and requirements such as legislation, regulations and national, regional and international laws, but should also adapt to requirements of world trade and local fresh markets. The systems based on trust, efficient trade, risk analysis and organic 3.0 are growing organic market; For example, the European Union goal is a 25% market share for the organic products till 2030. In this study, the impact of the laws, regulations and standards, on biological control (BC), soil fertility, conservation agriculture (CA) and organic agriculture (OA) in the past two decades, have been investigated against the statistical trend of certified OA land in Iran. A decade long of capacity building and also research and development (R&D) on BC agents (BCAs), soil fertility and biological fertilizers (BFs) via the national project, Chemical Use Reduction Policy (CURP) based on a budget law, indicates some improving trend in organic production since 2001 too, while still showing a meaningful gap of regionally and nationally OA legislation and essential R&D structures to access future' and nowadays' OA world average (1.5%) and Participatory Guarantee System (PGS) indexes via a nexus approach.

Introduction

A SWOT analysis on CURP and its impact on biological control in paddy fields of Mazandaran province (Arjomandi et al. 2011) indicated that CURP adding to national budget law (since 1995 for a decade) was the main legislation with high positive impact on boosting of BCAs (Rezapanah & Jouzi 2011) and BFs production (as OA inputs) in Iran. It caused not only meaningful R&D boosting and national capacity building on BCAs (Rezapanah 2018) and BFs in Iran, but also expressed valuable organic inputs for future of OA regionally (Rezapanah 2011). It is difficult to evaluate the impact of CURP' organic sub-committee started since June 7, 1998, but it is timely synchronized with 57 hectares organic rosewater production in Kerman recorded in 2001 (Yussefi and Willer 2002). This is while, Kerman province is well-known for its organic production capacities rooted in more than ten millennia of animal domestication and a Qanat heritage extending more than thirty centuries back in Iran' history and for its production of cashmere from Raeini goats by nomad pastoralists (Ansari-Renani and Rezapanah 2017). Nawdays, the biodynamic and Demeter certification recorded as 67 ha in one farm in Kerman as well as the statistic trends of organic agriculture land of Iran (11916 ha) recorded since 2001 till 2020. The wild collection recorded as 50219 ha (for apiculture 39564 ha) that totally reach to 82135 ha (Willer et al. 2022). Iran's organic policies and regulations recognized as fully implemented 2012 till 2017, but it was changed since 2018 (Willer et al. 2020), The reasons of such changes should be investigated while continuous policy impact analysis of the legislation and regulations on OA in Iran and the regional trade for boosting OA nationally and regionally.

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Material and methods

The legislation, related laws, by laws, regulations and standards that may have impacts on BC, BCAs, BFs, soil fertility, CA and OA (Barzali & Rezapanah 2022) in the past two decades in Iran have been 1 Iranian Research Institute of Plant Protection (IRIPP), Agricultural Research Education and Extension Organization (AREEO), Tehran, Iran 2 Center of Excellence of Organic Agriculture (CEOA), Tehran, Iran 3 National Agriculture and Water Strategic Research Center (NAWSRC/ICCIMA), Tehran 1583643116, Iran 4 Golestan Agricultural and Natural Resources Research Center, AREEO, Gorgan, Iran 5 Volunteers of CEOA, Tehran, Iran 6 Horticulture Crops Research Department, Ardabil Agricultural and Natural Resources Research Center, AREEO, Ardabil, Iran 7 University of Jiroft 8 Iranian parliament 9 Seed & Plant Certification & Registration Institute (SPCRI/AREEO), Karaj, Iran 10 Nexus and HSE

Centre of AmirKabir University Foundation, Tehran, Iran collected by the volunteers of CEOA to boosting organic advocacy as well as looking for “organic” and “zisti” in the national legislation data banks. Their impacts have been investigated and discussed by elected professionals. The statistic trends of organic agriculture land and wild collection (since 2000 till 2022 of the world of organic books, as well as Willer and Yussefi 2000 and Willer et al. 2022) have been correlated to the related regulations to evaluate the impacts of the regulation on organic boosting and sustainable slope increasing of the statistic trends of organic agriculture land via policy impact analysis and Nexus approach (Stokey & Zeckhauser 1978, Arjomandi et al. 2011 and Rezapanah & Jouzi 2011).

Results

The statistic trends of organic agriculture land and wild collection expressed in Figure 1. The organic initiation year is 2001 with 57 hectares rose water production (Willer & Yousefi 2002), but Iran’s total agricultural land was overestimate (62,803,000 hectares in Willer & Yussefi 2001 and 62,959,000 hectares in Willer & Yussefi 2000), so the proportions are not acceptable. Also, the right data for 2009 is 8853 hectares, not 18353 (Willer et al. 2012). Iran’s organic policies and regulations recognized as fully implemented since 2012 till 2017, but it was changed in the books of the world of organic agriculture statistics and emerging trends since 2018 again (Willer et al. 2020). The reasons of such changes should be investigated in a risk analysis approach too. The data correlation with the related regulations to evaluate the impacts of the regulation on organic boosting expressed the gap of legislation for boosting OA, of course factors out of the studies such as sanctions should be considered in further investigations. The 2nd related law after the CURP adding to national budget law (as main legislation with high positive impact on boosting of BCAs, BFs and consequently on OA) was considered as seed and plant law legislated by the Iranian parliament in 2003 and establishing the Seed and Plant Certification and Registration Research Institute (SPCRI). The legal R&D capacity building were initiated registered sanitation of planting materials from infections such as vascular pathogens including viruses, viroids and phytoplasmas by SPCRI via private companies and somehow in research institutes including Horticultural Research Institute (HRI), Agricultural Biotechnology Research Institute (ABRI) and Iranian Research Institute of Plant Protection (IRIPP). These plants are used as pre-basics for developing mother blocks, and consequently, nurseries for multiplication of certified samplings for horticultural industry. Significant numbers of plant tissue culture companies within Iran are preparing virus-free planting materials for endemic or imported plant cultivars, particularly for horticultural industry. The impact of the law on organic seeds and plants preparation system need further investigation. It seems such legislation should be considered by law and by-law to avoid significant authentication in progressive national and regional markets in close future. It can be as a model for the legal R&D capacity building for OA and CA regionally.

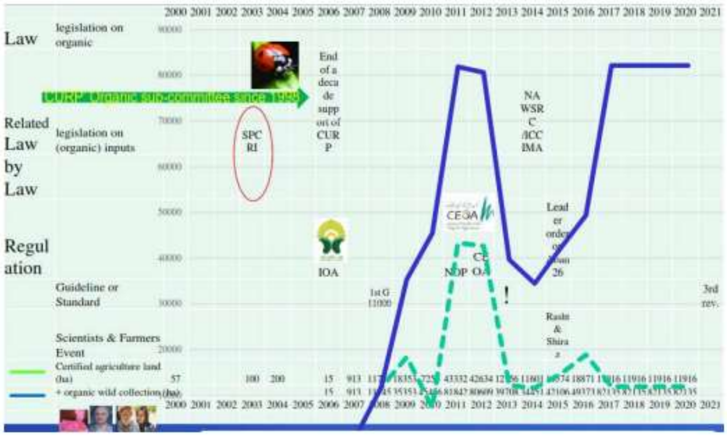

Figure 1. The statistic trends of organic agriculture land and wild collection in Iran correlated to the related laws and regulations

The 3rd related law should be considered as establishing of National Agriculture and Water Strategic Research Center (NAWSRC) in Iran Chamber of Commerce, Industries, Mines and Agriculture (ICCIMA) privately since 2011 (Figure 1). It has a legal potential to stablish a regional federation via scientific and professional structures such as CEOA/AIPPSS and IOA. The investigation did not express any related by-law with positive impact, of course there are a few with negative and neutral impacts on OA boosting. The organizations and programs in the name of organic that have been created regarding the national regulations considered as: CURP' organic sub-committee established on June 7, 1998 and later moved to Plant Protection Organization (PPO) and different deputies of different ministries till now. Iranian organic Association (IOA/ICCIMA) as member of IFOAM organics International since 2006. Assembly of the representatives of related Iranian organizations in 2008 approved 1st revision of Organic guideline as national guideline 11000 synchronized with the last revision of the guideline number 32 of Codex Alimentarius Commission (Anonymous 1999, CAC/GL 32) for the Production, Processing, Labelling and Marketing of Organically Produced Foods (Adopted 1999. Revisions 2001, 2003, 2004 and 2007. Amendments 2008, 2009, 2010, 2012 and 2013). Center of Excellence for OA (CEOA) as consortium of elected universities and research institutes since 2011 (Niglli et al. 2016) registered in Ministry of Science, Research and Technology and is active member of Technology, Innovation Platform of IFOAM Organics International (TIPI). National organic R&D program that approved by the minister of agriculture in 2012. The leader advice for promoting organic production on November 17, 2015, a day before 2nd national event of researcher and farmers on organic R&D in Shiraz-ICCIMA.

Discussion

In a resource limited world, where impacts of an action in one system immediately impacts another system, and we are approaching the tipping point of no return in the security of many resources, food being one of the most critically vital, we suggest that sector-wise actions and problem analysis is not only insufficient, but is definitely wrong. Providing sector-wise solutions can only provide temporary sector-wise relief to a sectoral symptom and not alleviating the real root-cause, hence, resulting in worsening of the overall situation. We suggest a robust nexus analysis approach to food sector problems with a starting focus on the positive nexus impacts of a robust organic food system. In the nexus analysis, where each system consists of its relevant subsystems, e.g., OA and food as a sub-system of the food system. We further suggest the nexus approach to be applied to problem analysis, to solution design and to policy, technology and methodology impact analysis, where combinatory complex indicators can emerge as better descriptors of real compound multi-dimensional progress rather than incorrect sector-wise misleading indicators. That is exactly, why institutionalization and its three pillars, namely, cognitive, normative and regulative phases come into the picture in the aforementioned order. That is, the regulative phase is rather the last step instead of the first. The proper understanding about vital importance of the need for considerable OA practice for achieving long-term food security and sustainability, supported by strong science and scientific evidence, should find its way to the cognition of policy makers, societal leaders and move forward into the normative phase, by creating a wide-spread societal value in the public domain for OA practice in the food sector and agriculture. It is then, that proper laws can be legislated and implemented with minimal bureaucratic regulations, optimized organizations and minimal societal and environmental external cost. By strong science and R&D, we emphasize on the very true nature of OA and its recognition of the interconnectedness of elements of environmental systems and subsystems and to the essence of sustainability and circularity with its three embedded layers (not pillars), of environment, society and economy, with the environment being the foundation of the other two layers for existence. We suggest the start of a program for a sustainability and circularity nexus approach for the organic food sub-system, where the relevant R&D, nexus indicators and nexus-based policy, technology, methodology and socioeconomic analysis can be developed and implemented. Finally, for boosting OA in Iran (Babajani et al. 2015), PGSs should be considered in data as gap of legislation and as well as new technologies to trace the information in food supply chain such as Blockchain under concept of Intelligent farming.

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Organic Farming Trends in Türkiye

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Key words: producers, production area, land-use, processing, market

Abstract

Organic *farming in Türkiye started with the demand from foreign countries. The number of organic producers, which was 313 in 1990, has increased exponentially over the years. While there was a decrease of 29.4% in 2020 compared to the previous year, the number of producers certified as organic according to the Turkish legislation reached 52,590 with an increase of 23.9% compared to ten years ago. Organic farming area, which was 89,827 hectares in 2002, increased 3 times in 2020 to 382,665 hectares. The amount of total agri-food produce certified as organic according to the Turkish legislation was 310,125 tons in 2002 and reached 1,631,943 tons in 2020 with an increase of 426%. In addition to these, there are organic products certified solely according to the standard of the importing market. Number of countries to which Türkiye exports organic agricultural and food products is 32, and the EU countries constitute the most important export markets.*

Introduction

Organic production in Türkiye started depending on the development of organic agriculture in the world and demand from foreign countries. The number of producers, which was 313 in 1990, showed an increase until 2001, although there were fluctuations in the number of producers in the 2001-2008 period, there was a general upward trend. There was a net increase in the number of producers in the period of 2009 – 2014, and according to 2014 data, when the producers in the transition period are included, the number of producers engaged in organic production was 71,472. While the number of producers engaged in organic production decreased by 29.4% in 2020 compared to the previous year, the number of producers engaged in organic production reached 52,590 with an increase of 23.9% compared to ten years ago (Figure 1).

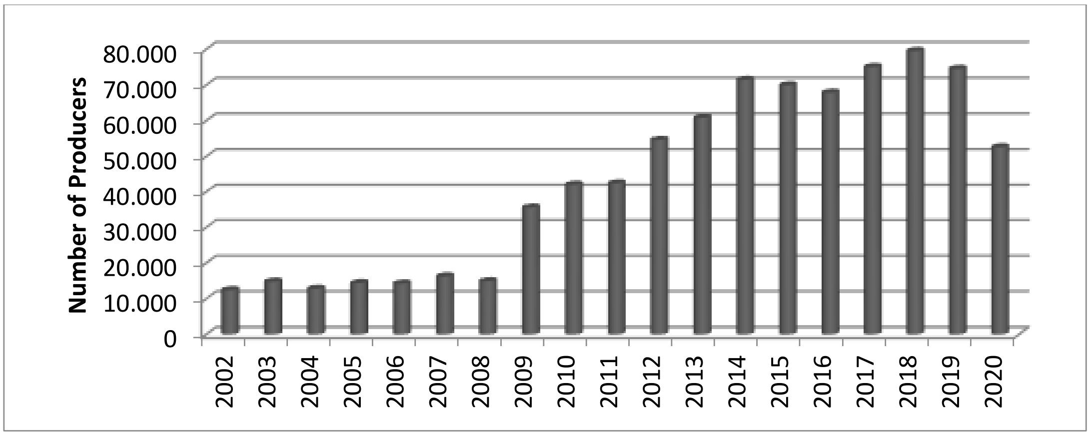

Figure 1. Organic Producers in Türkiye (including conversion areas) (2002-2020)
Source: (TOB, 2021)

Organic production area, which was 89,827 hectares including wild collection areas in 2002, increased by 6 times and reached 614,618 hectares in 2011, and reached 382,665 hectares in 2020 with an increase of 3 times. Due to the rapid increase in wild collection areas in some years, a decrease is observed in the total (wild collection and production together) area in the following years. This situation is related to the decrease in the certificates taken to the wild collection areas rather than the producers moving away from organic farming. The decrease in total organic production areas due to reduction in wild collection areas is evident in 2015. Although there are fluctuations for the organic production area for some years, in general an increasing trend is observed like for the number of producers (Figure 2).

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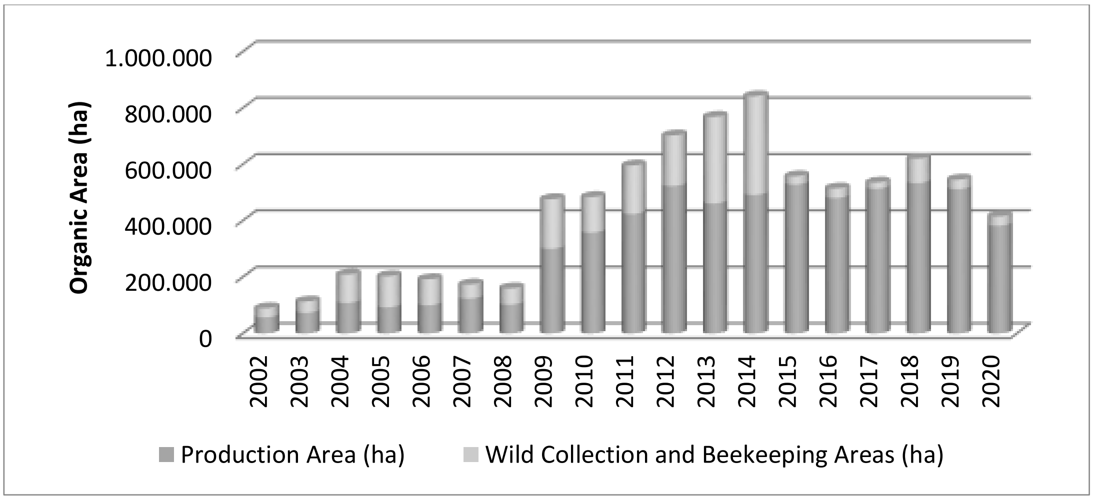


Figure 2. Organic Production and Wild Collection Areas in Türkiye (including conversion areas) (2002-2020)
Source: (TOB, 2021)

Organic production, which was 310,125 tons in 2002 in Türkiye, showed an increase until 2012. In the period of 2013 – 2020 there was fluctuations throughout the years, related to the fluctuations in the number of producers and organic production area. There is an increases for some years and a decrease for some other years. While there was a 20% decrease in the amount of production in 2020 compared to the previous year, the amount of organic production reached 1,631,943 tons with an increase of 426% compared to 2002 (Figure 3).

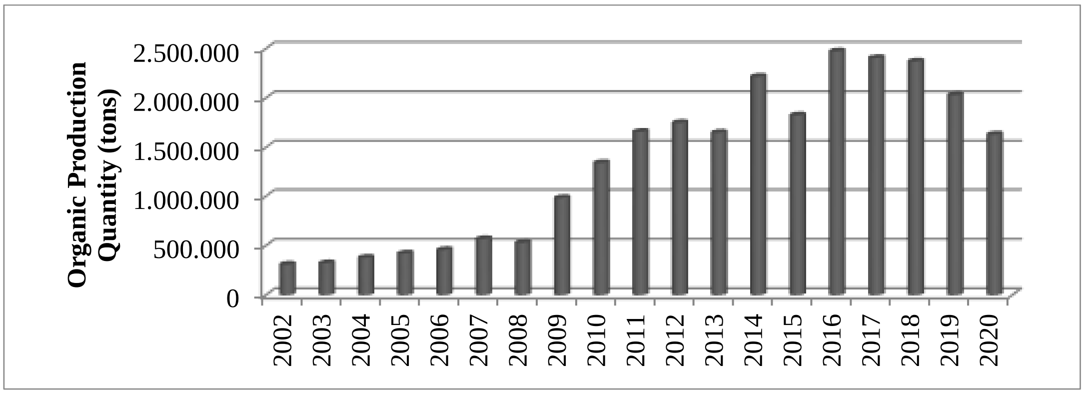
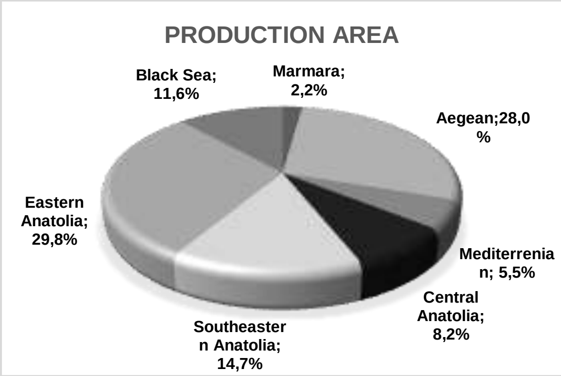


Figure 3. Organic Production Quantity in Türkiye (including conversion areas) (2002-2020)
Source: (TOB, 2021)

When we look at the production area, Eastern Anatolia ranks first with a share of 29.8%, and the Black Sea ranks first in terms of the number of producers. The Aegean region ranks second with a 28% share in terms of production area and second again in terms of the number of producers with a 32% share.



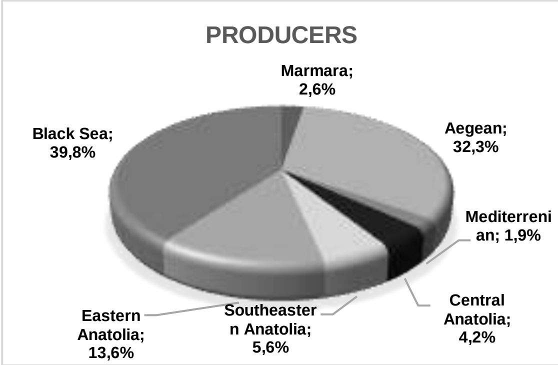


Figure 4. Production area and number of producers by region in Türkiye (including conversion areas) (2002-2020)
Source: (TOB, 2021)

There have been significant developments in organic animal production in the world and in Türkiye. However, the presence of organic animals and the number of enterprises in our country are not yet at a sufficient level. The most important reasons for this are the limited export opportunities of organic animal products and the lack of demand due to the low purchasing power of the consumer in the domestic market. Although the number of organic livestock producers increased between 2005 and 2020, this figure was limited to only 110 producers (Including transition period).

In the period between 2005 and 2020, the number of cattle increased by 304% to 7,888, the number of sheep and goats decreased by 76% to 2,454 and the number of poultry has reached 1,119,823 with an increase of approximately 126 thousand percent. Due to the increase in the demand for organic eggs, there has been a big increase in the number of organic poultry. (Table 1).

Table 1. Organic Animal Production in Türkiye (including conversion areas)

Years	Number of Producers	Cattle (animal)	Sheep and Goats (animal)	Poultry (animal)
2005	6	1.953	10.066	890
2020	110	7,888	2,454	1,119,823
Changen(2005 - 2020)	**1.733%**	**304%**	**-76%**	**125.723%**

Source: (TOB, 2021)

Between 2005 and 2020, the number of organic beekeepers increased by 34% to 494 people, the number of hives increased by 77% to 89,128, and the production amount increased by 79% to 1.028 tons (Table 2). After honey production most produced organic products are pollen, beeswax and propolis (TOB, 2021).

Table 2. Organic Beekeeping in Türkiye (including conversion areas)

Year	Producers	Beehives	Honey Production (Tons)
2005	370	50.486	573
2020	494	89.128	1.028
Change (2005 - 2020)	**%34**	**%77**	**%79**

Source: (TOB, 2021)

- The number of countries that Türkiye exports organic agricultural products to is 32 for 2019, and Türkiye is the 6th biggest country that exports the most products to European countries with 210,760 tons.

- EU countries constitute the most important export markets for Türkiye followed by Northern European countries, USA, Canada and Japan (BÜGEM, 2021).

Türkiye is still the leading country in the dried and dried fruits market, which initially helped the development of organic agriculture in Türkiye. Fruit and fruit products constitute 15% of the total exports with 37 million dollars.

Organic products are also imported to Türkiye in line with domestic demand. In particular, some raw materials required for the production of value-added organic products are tried to be obtained through imports. According to 2020 data, Türkiye imported more than 33 thousand tons of organic products from various countries: nearly 8000 tons of soy beans (Pulp, Oil and Sauce) from Ethiopia, China, and Netherlands; 7,200 tons of Canola from Kazakhstan, Russia and Ukraine; 4,500 tons of Sunflower (Seeds and Oil) from Russia, Ukraine and the Netherlands; more than 4,100 tons linen seed from Kazakhstan and Russia has been imported. Other than these organic products like Sesame seed, bean, baby food and dates imported (BÜGEM, 2021).

Since a significant portion (more than 85%) of organic products in Türkiye are produced on a contract and exported, production is shaped according to foreign demand. Since the 1990s, organic products in Türkiye have been sold in some supermarkets, specialized shops selling organic agricultural products and as “natural products” at the herbalist shops in big cities. Farmers' markets stand out as the most important marketing channels in Türkiye. The prevalence of e-commerce in the recent years also increases the accessibility of organic products (Doğan, 2020).

Thanks to the initiatives of some municipalities and NGOs such as “ETO” and “Buğday”, farmers' markets have been established in big cities and these continue their activities. Although their number in Türkiye changes from year to year, around 20 organic farmers' market are active in 11 provinces.

R&D studies related to organic agriculture are carried out by universities, NGOs and the public in Türkiye. Organic agriculture research started in 2001 by TAGEM, one of the most important institutions carrying out R&D activities in the public sector. A total of 84 research projects were carried out between 2005 and 2021. Currently, 12 research projects related to organic agriculture are continuing in 8 research institutes in different provinces under the coordination of TAGEM.

Conclusions

Domestic market consumption in Türkiye is still very low. One of the most important problems experienced in organic production is finding necessary inputs within a reasonable time and cost. R&D studies are very important in solving the problems experienced related to the inputs. Some work has already been done and continue to be done related to these issues however there is still a long way to go. Making progress on these issues will pave the way for the further development of organic agriculture in Türkiye.

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Economic Performance of Floor Management Methods for Organic Kiwifruit Orchard

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Key words: no-till, mulch, cover crop, tillage, cost

Abstract

Kiwifruit cultivation in Türkiye has increased rapidly in recent years. Orchard floor management methods have an effect on soil organic matter, soil mineral content and soil moisture which then affects the growth of the plants, yield and quality of the fruits. A field experiment was designed at a farmer's kiwifruit orchard in Giresun province of Türkiye between 2016-2019 in which 5 different floor management methods were implemented. The methods tested were traditional tillage, no-till management, organic mulch (hazelnut husk + straw), cover crops (vetch and rye) and geotextile cover as a mulch material. The trial aimed to find a sustainable kiwifruit orchard floor management system that could be recommended to the producers. Economically, the no-till floor management system stands out among the other tested floor management systems examined and can be recommended to the producers in Giresun, where the study was carried out.

Introduction

Kiwifruit is of the genus Actinidia with about 50 different species in the natural cultivation areas of the world. Kiwifruit is native to China, where wild kiwifruit populations are concentrated. In ancient China, kiwifruit was mostly used for therapeutic purposes. Kiwifruit gained popularity with the establishment of the first commercial orchards in the 1930s, after agronomists brought the kiwifruit to New Zealand due to its large growing area. World kiwi trade remained under the monopoly of this country until the 1970s. After the middle of the 20th century, it began to be cultivated in Europe. In Mediterranean countries, although its cultivation started 15-20 years ago, it has shown a very rapid development. Kiwi studies were first initiated in Türkiye in 1988 by Atatürk Horticultural Central Research Institute. As a result of the adaptation and demonstration studies carried out in 15 different ecological regions, the coastal regions of the Black Sea and Marmara Region were determined as suitable regions for kiwifruit cultivation. Kiwifruit is called a health fruit because it is rich in vitamins and minerals. Due to its nutritional value, wide adaptability, ease of storage and various evaluation methods, significant increases have occurred in the production and consumption of kiwi in recent years (Ordu Ticaret Borsası, 2019; Öztürk, 2010). In this study, economic analysis of different soil management systems that can be applied in organic kiwifruit production has been made, and the system that can be applied economically according to gross profit (gross margin) has been tried to be determined.

Material and methods

In the study, the data of the project, named The Effect of Cover Plant and Mulch Use on Yield, Quality and Weed Growth in Organic Kiwi Production, supported by BÜGEM, were used. Within the scope of the project, besides the weed density, fruit yield and quality of the applications, the economic aspect of each application is evaluated. In the project, each application was applied for 4 years in Giresun conditions, following the principles of organic farming, and compared with each other.

Floor management applications:

Application-1 (Geotextile cover): In this application, geotextile cover is used as a mulch material.
Application-2 (Traditional Soil Management): In this application, which is parallel to how the producers manage their orchards, the weeds were cut at certain times.
Application-3 (Hazelnut husk + straw): It is the application in which hazelnut husk and straw are mixed and laid on the garden floor for weed control as mulch material.
Application-4 (Cover crops): It is the application in which a mixture of vetch and rye is planted in the garden as a cover plant.
Application-5 (no-till): In this application, no intervention was made on the development of weeds.

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Gross profit analysis was used to compare the applications economically. Gross Profit (Gross Margin) = Gross production value - Variable costs formula is used in the gross profit analysis. Gross Production Value was calculated by multiplying the prices received by the farmer with the production amount. As variable costs, labor, mechanization and material costs are taken into account. Since there was no yield due to climatic reasons in the first year of the study, calculations were made according to the 3-year average yield.

Results

In application-1, in which geotextile cover is used as mulch material, the gross profit is calculated as ₺25458.30 per hectare. Organic fertilizer and irrigation costs are included in plowing. Plowing, fertilization, pruning, green pruning, irrigation, harvesting and material costs are calculated as labor and mechanization costs and are the same in all applications. The difference compared to other applications is the geotextile application. Labor and material costs arising from the application of geotextile in the total variable cost is 69.24%. Total variable costs are ₺14104.20 per hectare. Yield In this application was 10550 kg and the gross production value is ₺39563.80 per hectare (Table 1).

Table 1: Variable Costs, Gross Production Value and Gross Profit in Geotextile Application

COST UNITS	APPLICATION-1 (GEOTEXTILE COVER)			
A. Labor and mechanization	*Amount (hour/ha)*	*Cost (₺/hour)*	*Sum (₺/ha)*	*Share of Cost %*
1) Plowing	13.30	25.00	333.30	0.09
2) Fertilizer	25.00	12.50	312.50	2.21
3) Prunning	50.00	25.00	1250.00	8.86
4) Collection of pruning residues	25.00	6.25	156.30	1.11
5) Green pruning (tip pruning)	8.30	10.00	83.30	0.59
6) Irrigation	1.70	6.25	10.40	0.07
7) Mulching-1(Geotextile cover)	33.30	10.00	333.30	2.36
8) Harvest	16.70	15.63	26.40	1.85
B. Material Cost	*Amount (kg,lt,m²/ha)*	*Cost (₺/kg,lt,m²)*	*Sum (₺/ha)*	*Share of Cost %*
1) Organic Fertilizer	500.00	4.35	2175.00	15.41
2) Mulch material (geotextile cover)	6400.00	1.48	9440.00	66.88
3) Irrigation	96.00	0.05	80.00	0.57
Total Variable costs (₺/ha)			**14104.20**	100.00
Yield(kg/ha)			**10550.00**	
Sale Price (₺/kg)			**3.75**	
Gross Production Value (₺/ha)			**39563.80**	
Gross profit (₺/ha)			**25458.30**	

In application-2, Variable Costs are calculated as ₺8307.10, Gross Production Value was ₺38737.50 and the gross profit is calculated as ₺30430.40 per hectare (Table 2).

Table 2: Variable Costs, Gross Production Value and Gross Profit in Format Application

COST UNITS	APPLICATION-2 (TRADITIONAL SOIL MANAGMENT)			
A. Labor and mechanization	*Amount (hour/ha)*	*Cost (₺/hour)*	*Sum (₺/ha)*	*Share of Cost %*
1) Plowing	13.30	25,00	333.30	4.01
2) Mowing	145.80	25,00	3645.80	43.89
3) Fertilizer	25.00	12,50	312.50	3.76
4) Pruning	50.00	25,00	1250.00	15.05
5) Collection of pruning residues	25.00	6,25	156.30	1.88
6) Green pruning (tip pruning)	8.30	10,00	83.30	1.00
7) Irrigation	1.70	6,25	10.40	0.13
8) Harvest	16.70	15,63	260.40	3.13
B. Material Cost	*Amount (kg,lt,m²/ha)*	*Cost (₺/kg,lt,m²)*	*Sum (₺/ha)*	*Share of Cost %*
1) Organic Fertilizer	500.00	4.35	2175.00	26.18
3) Irrigation	96.00	0.05	80.00	0.96
Total Variable costs (₺/ha)			**8307.10**	100.00
Yield(kg/ha)			**10330.00**	
Sale Price (₺/kg)			**3.75**	
Gross Production Value (/ha)			**38737.50**	
Gross profit (₺/ha)			**30430.40**	

The total variable costs calculated for Application-3 are ₺6494.60 per hectare. The labor and material costs caused by the extra costs arising from the application are ₺183.33 per hectare and the share of this in the variable costs is calculated as 28.23%. The gross production value is ₺31012.50 per hectare and the yield is 8270 kg per hectare. Gross profit was found to be ₺24517.90 per hectare (Table 3).

Table 3: Variable Costs, Gross Production Value and Gross Profit in Husk and Straw Application

COST UNITS	APPLICATION-3 (HAZELNUT HUSK + STRAW)			
A. Labor and mechanization	*Amount (hour/ha)*	*Cost (₺/hour)*	*Sum (₺/ha)*	*Share of Cost %*
1) Plowing	13.30	25.00	333.30	5.13
2) Fertilizer	25.00	12.50	312.50	4.81
3) Pruning	50.00	25.00	1250.00	19.25
4) Collection of pruning residues	25.00	6.25	156.30	2.41
5) Green pruning (tip pruning)	8.30	10.00	83.30	1.28
6) Irrigation	1.70	6.25	10.40	0.16
7) Mulching-2 (Hazelnut husk+straw	33.30	10.00	333.30	5.13
8) Harvest	16.70	15.63	260.40	4.01
B. Material Cost	*Amount (kg,lt,m²/ha)*	*Cost (₺/kg,lt,m²)*	*Sum (₺/ha)*	*Share of Cost %*
1) Organic Fertilizer	500.00	4.35	2175.00	26.18
2) Mulch Material(Hazelnut husk + straw)	7500.00	0.20	1500.00	23.10
3) Irrigation	96.00	0.05	80.00	1.23
Total Variable costs (₺/ha)			**6494.60**	100.00
Yield(kg/ha)			**8270.00**	
Sale Price (₺/kg)			**3.75**	
Gross Production Value (₺/ha)			**31012.50**	
Gross profit (₺/ha)			**24517.90**	

In application-4, where a mixture of vetch and rye is used as a cover crop, the yield per hectare is 11030 kg and the gross production value is ₺41362.50. The variable cost is calculated as ₺5444.60 per hectare, and the share of the costs arising from the application is 14.39%. In this application, it has been seen that organic fertilizer was the biggest factor adding to the cost with a share of 39.95%. Another important expense is pruning and it has a share of 22.96% with ₺1250 per hectare. The gross profit per hectare was calculated as ₺35917.90 in the cover crop application (Table 4).

Table 4: Variable Costs, Gross Production Value and Gross Profit in Cover Crop Application

COST UNITS	**APPLICATION-4 (COVER CROP)**			
A. Labor and mechanization	*Amount (hour/ha)*	*Cost (₺/hour)*	*Sum (₺/ha)*	*Share of Cost %*
1) Plowing	13.30	25.00	333.30	6.12
2) Fertilizer	25.00	12.50	312.50	5.74
3) Pruning	50.00	25.00	1250.00	22.96
4) Collection of pruning residues	25.00	6.25	156.30	2.87
5) Green pruning (tip pruning)	8.30	10.00	83.30	1.53
6) Irrigation	1.70	6.25	10.40	0.19
7) Cover crop planting	3.30	10.00	16.70	0.61
8) Harvest	16.70	15.63	260.40	4.78
B. Material Cost	*Amount (kg,lt,m^2/ha)*	*Cost (₺/kg,lt,m^2)*	*Sum (₺/ha)*	*Share of Cost %*
1) Organic Fertilizer	500.0	4.35	2175.00	39.95
2) Cover Crop (Vetch)	50.0	7.00	350.00	6.43
2) Cover Crop (Rye)	80.0	5.00	400.00	7.35
3) Irrigation	96.0	0.05	80.00	1.47
Total Variable costs (₺/ha)			**5444.60**	100.00
Yield(kg/ha)			**11030.00**	
Sale Price (₺/kg)			**3.75**	
Gross Production Value (₺/ha)			**41362.50**	
Gross profit (₺/ha)			**35917.90**	

After the calculation of the Variable Costs, Gross Production Value and Gross Profit in Cover crop Application It has been found that organic fertilizer material cost and pruning labor have the highest share among variable costs in no-till management application, where no action is taken on weed control. The total variable costs of the application is ₺4650.80 per hectare. Gross production value is ₺48037.50 per hectare and yield is 12810 kg per hectare (Table 5).

COST UNITS	**APPLICATION-5 (NO-TILL)**			
A. Labor and mechanization	*Amount (hour/ha)*	*Cost (₺/hour)*	*Sum (₺/ha)*	*Share of Cost %*
1) Plowing	13.3	25.00	333.30	7.15
2) Fertilizer	25.0	12.50	312.50	6.70
3) Pruning	50.0	25.00	1250.00	26.82
4) Collection of pruning residues	25.0	6.25	156.30	3.35
5) Green pruning (tip pruning)	8.3	10.00	83.30	1.79
6) Irrigation	1.7	6.25	10.40	0.22
7) Harvest	16.7	15.63	260.40	5.59
B. Material Cost	*Amount (kg,lt,m^2/ha)*	*Cost (₺/kg,lt,m^2)*	*Sum (₺/ha)*	*Share of Cost %*
1) Organic Fertilizer	500.00	4.35	2175.00	46.66
3) Irrigation	96.00	0.05	80.00	1.72
Total Variable costs (₺/ha)			**4650.80**	100.00
Yield(kg/ha)			**12810.00**	
Sale Price (₺/kg)			**3.75**	
Gross Production Value (₺/ha)			**48037.50**	
Gross profit (₺/ha)			**43386.70**	

Discussion

Applied agronomic methods have been effective in controlling weeds. When the applications are evaluated in terms of efficiency, the highest amount of efficiency was realized in the no-till application. It was found that the geotextile and cover crop application also increased the yield compared to the traditional soil management application, which is similar to the method farmer's use, the gross production values of these applications were higher than it too. However, in the group where the geotextile cover was applied as a mulch application, the material and labor costs resulting from the application were higher than some applications. No-till management method were the best in terms of profitability as it has no extra costs as labor or material. Application-3 (hazelnut husk + straw) is seen as a low cost option compared to traditional soil management method in terms of costs. However, the fact that the gross production value and yield is low compared to other ground management methods, usage cases are limited. Application-3 was determined as the application with the lowest gross production value. As a result, it is seen that intensive tillage (mowing application) increases the cost and produces lower yields compared to other applications. The no-till soil management method stands out among other methods and can be recommended to the farmers in Giresun, the province where the study was carried out.

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SESSION 9: Improvement of Soil Fertility

Development of Composting Technique from Two-Phase Pomace Wastes and Its Evaluation in Organic Olive Cultivation in Türkiye

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Key words: Two phase olive pomace, composting, olive, olive oil

Abstract

In Türkiye, a large amount of olive mill waste water and olive pomace waste is generated every year during the olive oil production season. Discharge of olive mill waste water into water resources creates a high level of environmental pollution. For this reason, olive oil mills are converting their processing system to a two-phase system. Due to the 60% moisture content of the waste, it is very difficult to transport and dispose of it. It is seen that the most suitable solution for agricultural purposes is "Composting". Because these wastes contain high organic matter and plant nutrients, they can also decompose microbiologically. With the project, compost was made from two phase pomace wastes, which have harmful effects on the environment. Composts were applied for the nutrition of organic olive trees and positive effects on growth and yield were determined. We use low-cost inputs for the nutrition of organic olive orchards.

Introduction

Türkiye has an important place among the Mediterranean countries with olive production. However, with the increasing olive oil production, the amount of waste originating from olive mill waste water and olive pomace is a problem. It is recommended that olive oil mills be converted to environmentally friendly two-phase systems. By making compost from these wastes, it is possible to obtain organic raw materials beneficial to the soil and to protect the environment. It can also be used as a low-cost input in the nutrition of trees in organic olive cultivation. Two phases of pomace waste was composted with different materials (Paredes et al, 2002; Alburquerque et al, 2006; Cegarra et al, 2006; Zenjari et al, 2006; Sellami et al, 2008; Hachicha et al, 2009). The effects of compost applications on olive yield were also investigated (Garcia-Ruiz, R et al, 2012; Toscana et al, 2013; Fernández- Hernandez et al, 2014; Aranda et al, 2015, 2016; Proietti et al, 2015).

Material and methods

In the project, two-phase system pomace was used as the main compost material. Other materials used in the project; cattle manure, poultry manure and straw were obtained from enterprises with organic production certificate. Raw materials were used according to the most ideal mixing ratios previously determined in the compost reactors. The compost mixture was prepared on a dry basis with 60% 2PP (Two phase Pomace), 23% CM (Cattle manure), 10% PM (Poultry manure) and 7% straw, with a C/N ratio of 30.17 initially. A Compost Pilot Facility was established within the scope of the project at the Olive Research Institute. Compost piles were created with the Rutger's static pile method (2x3x1.5m) and active aeration was applied to shorten the composting time and increase the compost quality (Feinstein et al., 1992).

Figure 1. Aerated static pile composting system

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In the initial compost and matura compost materials; Temperature, humidity %, pH, total organic matter, macro and micro nutrient elements, C/N ratio, organic carbon, phenols and phytotoxicity evaluations and heavy metal analyzes were made. In addition, pH, EC, % humidity, total N analyzes were carried out on the samples taken at certain intervals. Cress seeds (Lepidium sativum) were used for phytotoxicity analysis of compost piles (Zucconi et al, 1981). After the compost piles mature, they are enriched with at least 25% organic matter, maximum 20% moisture, maximum 4 dS m-1 E.C (salinity), % total nitrogen, 3% total phosphorus, 3% total potassium. Cottonseed meal, rock phosphate and potassium salt were used as the main material for enrichment.

Field trials; It was carried out in the Organic Olive parcels of the Olive Research Institute in Kemalpaşa. In the experiments, 45-year-old trees of the "Memecik" olive variety were used. The experiment was carried out in the Random Blocks Trial Design, with 3 applications, three replications, and 5 trees in each replication, on a total of 45 trees.

The studies were carried out in 2 years according to the practices discussed below.

1. Application Green manure

2. Application Green manure+ Animal manure

3. Application Green manure+ E2PPC (Enriched two-phase pomace compost)

The amount of compost application per tree was 20 kg to meet the general need of 40-year-old olive trees. Green manure was applied in the parcels in the form of 8 kg vetch and 3 kg barley per decare. Vetch and barley seeds were sown at the beginning of November, and were mixed into the soil at the beginning of flowering at the beginning of April. The amount of animal manure was determined according to the nitrogen content of the manure. Compost applications were made when the green manure plant was mixed with the soil (Figure 2).

Figure 2. Scratching the canopy projection of the trees and applying compost

Before the applications, leaf and soil samples were taken from the field and soil fertility and plant nutrient status of the olive orchard were determined. In the second year after the application in olive trees, the shoot length of the trees, the amount of yields (kg/tree), the number of fruits per kg, the weight of 100 fruits, % flesh/kernel ratio, fruith width, fruit size, the maturity index of the fruits, the free fatty acid in olive oils, the peroxide value (meq02/kg oil), Determination of specific absorbent values (K232 and K270) chlorophyll in u.v, % moisture in olives, % oil in olives, fatty acid composition of olive oils, total phenol and sensory analyzes in olive oils were made.

Results

Table 1. Contents of main material and two-phase pomace compost at different stages

Parameters	2PP[1]	2PPCI[2]	2PPCM[3]	E2PPC[4]
Moisture (%)	45.02	72.27	43.81	30.42
pH	6.65	8.89	7.67	7.11
EC (dS m^{-1})	1.01	2.41	3.97	3.92
C/N	57.16	26.73	14.02	15.13
Humic acid (%)	46.41	63.62	15.49	24.79
Organic matter (%)	96.57	72.82	45.93	54.25
Watersolublephenol(%)	2.09	1.18	nd*	2.43
Total phenol (%)	2.46	1.97	nd	5.02
N (%)	0.98	1.58	1.90	3.03
C (%)	56.01	42.24	26.64	45.87
K (%)	1.56	3.48	2.90	3.05
P (%)	0.47	1.05	0.52	3.02
Ca (%)	0.77	9.35	6.19	6.80
Mg (%)	0.07	0.69	0.37	0.61
Fe (mg kg^{-1})	90.37	1185.65	5434.78	4889.72
B (mg kg^{-1})	6.52	10.19	44.41	46.01
Cu (mg kg^{-1})	4.77	8.05	39.63	33.75
Mn (mg kg^{-1})	3.22	47.61	205.04	162.34
Zn (mg kg^{-1})	3.48	28.05	147.62	142.34
Al (mg kg-1)	81.17	1113.96	4994.58	4063.11
Cd (mg kg^{-1})	nd	0.04	0.22	0.45
Co (mg kg^{-1})	0.13	0.60	2.63	2.40
Cr (mg kg^{-1})	2.46	19.47	25.34	52.57
Mo (mg kg^{-1})	nd	0.38	1.38	nd
Ni (mg kg^{-1})	1.31	2.86	14.39	16.21
Pb (mg kg^{-1})	nd	0.53	4.91	2.52
Se (mg kg^{-1})	0.82	0.37	nd	nd

*:not determined [1]2PP: Two-phase pomace [2]2PPCI: Initial two-phase pomace compost
[3] 2PPCM: Mature two-phase pomace compost [4]E2PPC: Enriched two-phase pomace compost

The contents of two phase pomace (2PP), initial two phase pomace compost (2PPCI), mature compost (2PPCM) and enriched two phase pomace compost (E2PPC) used in composting are given in (Table 1). It was found that mature compost has a high content of organic matter, humic acid, carbon, nitrogen and potassium, a sufficient content of phosphorus and magnesium, and high amounts of iron and aluminum. After enrichment, pH neutral, slightly salty, low phenol content, high organic matter, humic and carbon content, N, K and P content of about 3%, with a certain amount of Mg, B, Zn, Cu, Cd, Mo and Ni content, It was determined that it is rich in aluminum and iron The heavy metal amounts in the compost pile remained below the limits specified in the organic agriculture regulation.

Temperature, pH, EC, N and humidity changes

Temperature values were measured and recorded by sensors at three different points of the compost pile. The temperature changes of the compost pile from February 2014 to April 2015 are given in the graph below (Figure 3a). The compost temperature increased rapidly to 70°C after 4 days, then gradually decreased. After enrichment of the piles it rose to 60°C and then stabilized at 20°C. Changes in pH, EC, (%) Nitrogen and (%) Moisture in the compost pile are also given (Figure 3b).

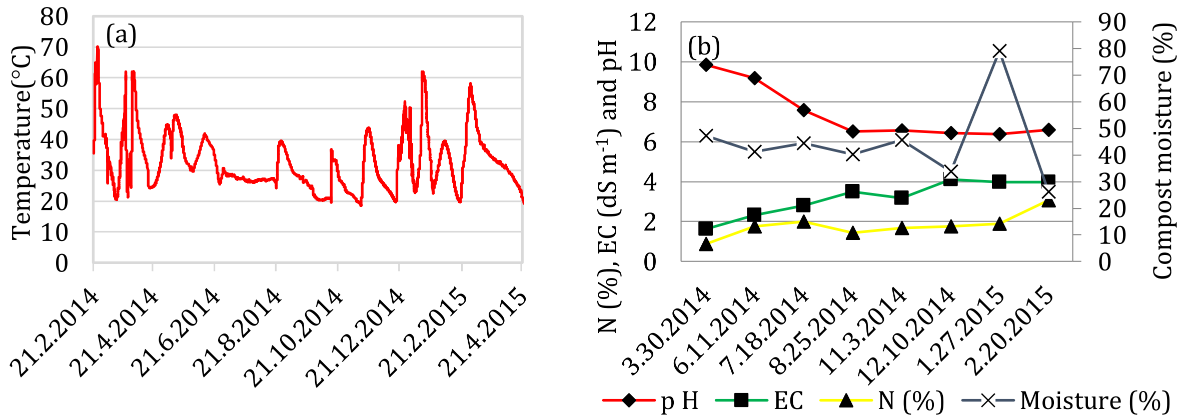

Figure 3. Changes of temperature (a) N, EC, pH, and moisture (b) in a two-phase pomace compost pile

At the start of composting, the pH was measured at 9.8, sulfur was applied and the pH decreased to 7.5-7.0 and then to 6.5-6.0. After enrichment, the pH increased to 7.5-7.0. In the pile, EC was initially measured between 1.5-2.0 dS m-1. A few months later, the EC had increased to 2.5-3.0 dS m-1. It increased in the following months and was determined as 3.5-4.0 dS m-1 after enrichment. At the beginning of composting, the (%) N value varied between 0.9 and 2.0. It increased to 2.5-3.0% after enrichment. Compost moisture was initially around 50-60%, then decreased to 30-40%. It increased to 60-70% after enrichment and decreased to 25-30% over time. Since the germination index of mature compost is 85% and above in all applications, it was determined that the phytotoxic effect on the compost piles disappeared.

In the organic olive parcels, shoot length and fruit set ratio in the trial trees were obtained at the most in two phase pomace compost applications. Positive effects of two phase pomace compost applications were found on the flesh/kernel ratio and 100 fruit weight in the fruit samples taken after the treatments. Two-phase pomace compost and green manuring applications gave positive results in terms of free acidity and total chlorophyll values in olive oils obtained from fruits. In sensory analyzes of olive oil samples obtained from organic olive parcels, good properties such as fruitiness, bitterness and pungency have come to the fore. It was determined that all of the olive oil samples obtained were in the natural extra virgin olive oil class and in the green maturity period. In addition, as a result of soil analysis conducted in the experimental area, it was found that the level of plant nutrient elements in the soil increased, especially in organic parcels where two-phase pomace compost applications were performed.

Discussion

With the project, composts containing a certain amount of plant nutrients and not having phytotoxic properties were obtained from olive oil production wastes that are harmful to the environment and cannot be adequately evaluated. Composts have been able to be used as plant nutrition, soil conditioner and organic matter source in organic agriculture. The positive effects of compost applications on shoot length, fruit yield and olive oil quality in organically grown olive trees were determined. Compost applications were made to the organic parcel for two years. It is thought that more positive effects will emerge after long-term applications due to the fact that composts take a long time to decomposition in the soil and become useful. It has been determined that two phase pomace compost applications provide sufficient plant nutrient levels in the soil and leaves for the nutrition of olive trees. The nutrition of olive orchards has been provided by using low-cost inputs in organic olive cultivation.

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Effect of organic nitrogen on the performance of potato in organic farming

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Key words: potato, organic farming, organic fertilizers, tuber yield, quality parameters.

Abstract

Crops grown under organic systems may suffer from insufficient nitrogen (N) due to the mismatch between the N bioavailability and its demand dynamics by the plant. This work investigates the response of three potato cultivars to a combination of organic fertilizers (compost and fishmeal). Field trials were conducted during two cropping seasons on two plots left fallow for several years. The results obtained show that the contribution of increasing N doses has a significant effect on tuber dry matter, total dry matter, tuber N uptake, total N uptake, tuber yield, and quality parameters. Tuber yield ranged from 34 t ha-1 (control) to 52 t ha-1. Moreover, the different cultivars have a significant effect on the most parameters studied. The N dose of 230-250 kg ha-1 (including N soil supply) is recommended to achieve satisfactory yield (about 50 t ha-1) and good tuber quality under similar conditions.

Introduction

An adequate N supply of culture is necessary for growth, development, and optimal yield (Kumar et al. 2007, Zelalem et al. 2009). The characterization of the N uptake period by potato makes to better synchronize the mineralization dynamics of organic fertilizers with N uptake dynamics. This synchronization is considered an essential strategy for maximizing yield and minimizing N losses (Waddell et al. 2000, Mortvedt et al. 2001). Compost is used increasingly in organic fertilization. However, its low nutrient content makes it a soil conditioner rather than a source of nutrients (Foley and Cooperband 2002). Thus, Organic fertilization turns to organic matter whose composition, especially in N, is high and whose mineralization dynamics are fast and follow almost the cultivation cycle. Thus, the present study investigates the effect of organic fertilizers on potato performance. The choice of fertilizers was based on compost (organic amendment) combined with fishmeal (organic fertilizer easily mineralizable).

Material and methods

Sites and years of testing

Two trials were conducted in two years on two adjacent plots (1660 and 2620 m2 with 54 and 63 elementary plots respectively) at the experimental farm of the National School of Agriculture of Meknes. These plots fallow for over 10 years and no chemical input. The soil of the test plot is calcixeroll, moderately deep, moderately calcareous, with a clay-silty texture and slightly alkaline pH. It has an average content of organic matter and total and mineral nitrogen. It is moderately rich in exchangeable potassium and assimilable phosphorus.

Experimental design

The experimental device adopted is a criss-cross on complete blocks where the distribution of treatments and cultivars is not totally random in the blocks. The number of factors used is two:

- Factor 1: "cultivars" located vertically and are Paramount, Spunta, and Desiree.
- Factor 2: "N treatments located horizontally", corresponding to the intake of increasing doses of fishmeal (T0, T1, T2, T3, T4, and T5). For the second year of the trial, T6 was introduced at the protocol level to verify the response trend found in the first year of the trial. Witness T0 no received any nitrogen input. T1 encompasses compost alone. From T2, each treatment includes the same amount of compost as T1 and the increasing nitrogen supply is provided by fishmeal which is rich in nitrogen (5.2%) and easily mineralized with a rate of about 80% referring to Robitaille (2003). As for the compost, the quantity brought is 5 t ha-1 since the soil is rich in organic matter (about 3%) and this quantity is considered the minimum dose of fertility maintenance (Bischoff 1987, Proshlyakov and Tikovy 1988, Stumpe et al. 1988). The compost mineralization rate is estimated to be 30% by referring to Hadas and

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Portnoy (1994) who found rates ranging from 10 to 29% and Robitaille (2003) who found rates of 5-25%.

Crop management

The planting was carried out in March. The seeding was done on ridges with an interline spacing of 80 cm and an intra-line of 30 cm. Irrigation was ensured by drip. Phosphorus and potassium fertilization were carried out in both trials based on soil analyses for the equivalent of 150 kg ha-1 of P2O5 and 300 kg ha-1 of K2O. The phosphorus was brought to the 1st hoeing and the potassium was fractionated in two intakes, at the first hoeing, and the beginning tuberization. Compost and fishmeal were brought just before planting.

Weeding, hoeing, and hilling were done manually throughout the cycle. The treatments against diseases and pests were carried out to the requirements of the management of organic crops. The harvest was carried out at the end of June and at the beginning of July respectively for the two tests.

Observations, measurements, and analyzes carried out during the cycle of potato

The dry matter and the distribution of the nitrogen uptake between the different parts of the potato were determined according to the method described by Sullivan et al. (2008). Five plant sampling periods were carried out at a time interval of 15 days from the beginning of tuberization to harvest. For each sample, three plants were selected randomly and each plant was subdivided into three parts (aerial part, tubers, and roots). The green material of each part was put in paper bags and dried at a temperature of 65 °C until a constant weight was obtained (for about 48 hours). The dry matter obtained for each part was ground and analyzed to determine its total N content by the Kjeldahl method (AOAC 1995). The analysis of the dry matter of the different parts of the plant was carried out for each sample.

The nitrogen uptake for each part of the plant was determined according to the following formula:

N Uptake (g plant-1) = (Dry matter, g plant-1) x (N total content, % of dry matter).

For each period of collection of the plant, three plants were taken at random from the different treatments. The tubers of each plant were washed and dried in air and the total volume of tubers was determined.

Analyzes of the reducing sugar content and nitrate content of potato tubers

At harvest, for each elementary plot, a representative tuber sample was taken from the harvested tubers. The samples were placed in a plastic bag and frozen at -20 °C. Just before their analysis, these samples were lyophilized at a temperature of -60 °C until a constant weight or a constant minimum pressure was obtained. Then, they were ground and stored at a low temperature.

The sugars were determined by HPLC on an ion-exclusion REZEX RHM column (300x7.8mm) operating at a flow rate of 0.5 mL min-1 with a pump of the model PU 2089, connected with a Refractive index detector (RI 2031 plus). The working refractive index detector temperature was 40 °C, while the mobile phase was the water of chromatographic purity. Chromatographic tests were carried out at a temperature of 30 °C of the mobile phase of the column.

At harvest, three plants were selected randomly, and for each plant, the green material of the tubers was put in paper bags and dried at a temperature of 65 °C until a constant weight was obtained (for about 48 hours). The resulting tuber dry matter was weighed, ground, and analyzed to determine its nitrate content by the ion-selective electrode method (Baker and Thompson 1992).

Results

Total N uptake

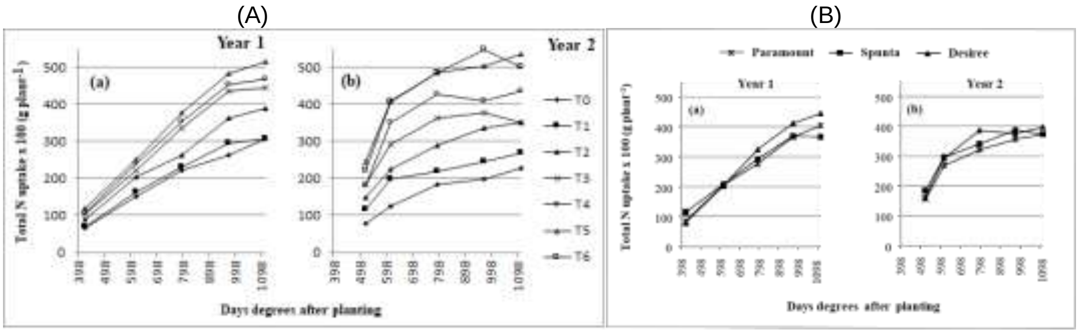

Figure 1. Evolution of total N uptake (A) for N treatments (T0= No intake of N; T1= Supply 5 tons of compost; T2= Supply 5 tons of compost + 1 ton of fishmeal; T3 =Supply 5 tons of compost + 1.5 ton of fishmeal; T4= Supply 5 tons of compost + 2 tons of fishmeal; T5 =Supply 5 tons of compost + 2.5 tons of fishmeal; T6 =Supply 5 tons of compost + 3.5 tons of fishmeal) and N uptake (B) for cultivars: Paramount, Spunta, and Desiree (n=27 for N treatment; n=18 in year 1 and n=21 in year 2 for cultivars) Tuber yield and tuber nitrate content

Tuber yield and tuber nitrate content

Table 1: Effect of treatments and cultivars on tuber nitrate content (for treatments: n= 9; for culivars: n= 18 in 2012 and n= 21 in 2013) and fresh tuber yield at harvest (for treatments: n= 27; for culivars: n= 54 in 2012 and n= 63 in 2013)

Factor	Tuber $N\text{-}NO_3^-$ content			Fresh tuber yield		
	Year 1	Year 2	Year average	Year 1	Year 2	Year average
Treatments						
T0	42.3 (b)	33.6 (b)	37.9 (c)	36.2 (c)	31 (e)	33.6 (e)
T1	44.4 (b)	40.9 (ab)	42.7 (bc)	40.4 (bc)	36.5 (d)	38.4 (d)
T2	44.2 (b)	45 (ab)	44.6 (bc)	42.9 (b)	40.6 (c)	41.7 (c)
T3	47 (b)	48.3 (ab)	47.7 (b)	48.3 (a)	43.6 (bc)	47.3 (b)
T4	47.4 (b)	50.8 (ab)	49.1 (b)	51.0 (a)	45.4 (b)	46.8 (b)
T5	58.1 (a)	54 (a)	56.1 (a)	51.2 (a)	52.7 (a)	52.0 (a)
T6***		54.6 (a)			51.0 (a)	
F	14.6 **	3.85 *	10.75 **	17.75 **	39.98 **	49.12 **
Cultivars						
Paramount	47.4	47.8	47.1	46.5	41.4	43.3
Spunta	48.1	46.9	46.8	43.1	44.1	42.8
Desiree	46.3	45.5	45.2	45.4	43.3	43.8
F	0.12 (NS)	0.08 (NS)	0.21 (NS)	4.18 (NS)	0.96 (NS)	0.35 (NS)

The different letters indicate significant differences according to the Newman–Keuls test at $p < 0.05$; NS Not significant effect; * Significant effect on a probability $P < 0.05$; ** Significant effect on a probability $P < 0.01$ and *** The values of the T6 treatment corresponding to the values of the trial-Year 2 ; Tuber $N\text{-}NO^{3-}$ content and Fresh tuber yield are expressed as mg kg^{-1} of tuber dry matter and t ha^{-1} respectively.

Tuber reducing sugar content

(A) (B)

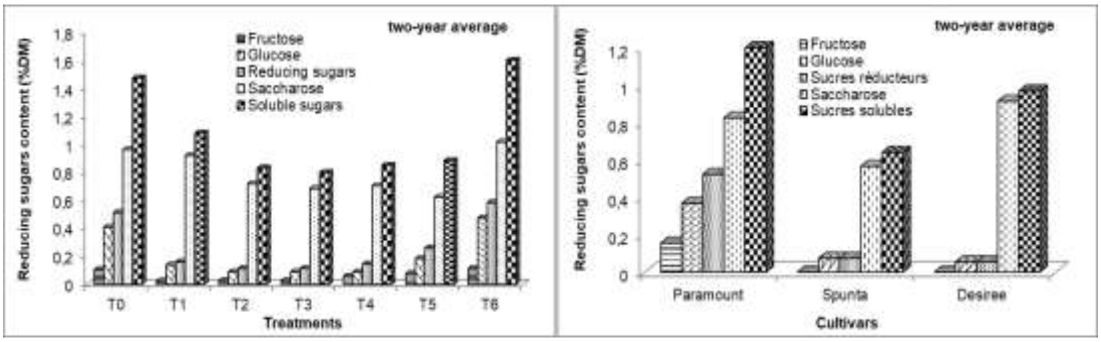

Figure 2. Reducing sugar content of potato tuber for N treatments (A) of the two trials at (T0= No intake of N; T1= Supply 5 tons of compost; T2= Supply 5 tons of compost + 1 ton of fishmeal; T3= Supply 5 tons of compost + 1.5 ton of fishmeal; T4= Supply 5 tons of compost + 2 tons of fishmeal; T5= Supply 5 tons of compost + 2.5 tons of fishmeal; T6= Supply 5 tons of compost + 3.5 tons of fishmeal and for cultivars (B): Paramount, Spunta, and Desiree (n=9 for N treatment; n=18 in year 1 and n=21 in year 2 for cultivars)

Tuber volume

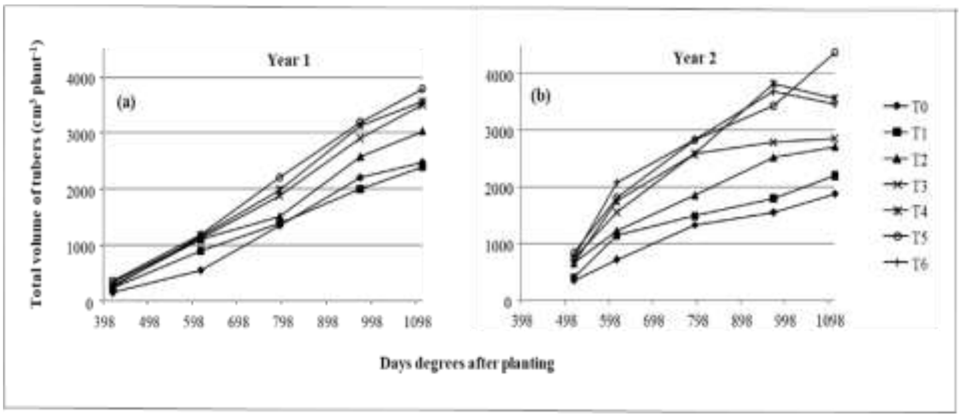

Figure 3. Evolution of the total volume of potato tuber in year 1 (a) and year 2 (b) for N treatments (T0= No intake of N; T1= Supply 5 tons of compost; T2= Supply 5 tons of compost + 1 ton of fishmeal; T3= Supply 5 tons of compost + 1.5 tons of fishmeal;T4= Supply 5 tons of compost + 2 tons of fishmeal; T5= Supply 5 tons of compost + 2.5 tons of fishmeal; T6= Supply 5 tons of compost + 3.5 tons of fishmeal) (n=27)

Discussion

Increased N inputs improved significantly the total dry matter, total N uptake, and total volume of tubers throughout the potato cycle. At harvest, increasing N doses increased significantly tuber yield, nitrate levels, and total volume of tubers, but decreased the levels of reducing sugars. The excess of N (T6) negatively affects this last parameter. N supply of 130 kg ha-1 with an N soil supply of 100 kg ha-1 allowed the highest total dry matter, total N uptake, total volume of tubers, and tuber yield.

The cultivars significantly affected total dry matter, total N uptake, and total volume of tubers.

All the chemical quality parameters of treatments and cultivars meet the quality standards. The comparison of the values of all the parameters studied with those of conventional and biological tests carried out on the world and national basis for N fertilization shows that our values are similar and sometimes better (Chambenoit et al. 2002, Elattir et al. 2002, Euvrard 2010, Arvalis 2013).

The combination of compost (5 t ha-1) with fishmeal (2.5 t ha-1) generating the N dose of 130 kg ha-1 (corresponding to 230 kg ha-1 which includes N soil supply) allowed the highest yield which is not significantly different from the N supply of 280 kg ha-1. The application of organic fertilizers providing an N supply of 230-250 kg ha-1 (5 tons of compost and 2.5 tons ha-1 of fishmeal) is recommended under similar conditions to those in our region, to achieve satisfactory yields (about 50 t ha-1) with good tubers quality.

Acknowledgments

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Pistachio shell biochar application effects on the biological properties of the soil

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Key words: Biochar, Pistachio shells, enzyme activities

Abstract

The objective of this study is to evaluate the effect of biochar treatments on calcareous clay soil. An incubation study was conducted with, 0- 0.2- 0.4- 0.6- 1.2 and 2.4% rates of pistachio shells biochar (PSB) material. Prepared mixed materials were incubated 180 days. Soil sampling was done during the 15., 30., 60., 90., 120 and 180 days and Urease, Catalase and Alkaline phosphatase enzyme activities and Microbial biomass were determined. According to the result; with regard to the effects of doses, Urease, Alkaline phosphatase and Microbial biomass were showed an increasing trend with increasing application rates. The 2.4% application rate and 180 day samples showed higher values. Catalase enzyme activities were determined a decreasing trend with increasing rates and incubation days. Overall, the results indicate a significant influence of PSB was evaluated using as an soil biological activity amendment to calcareous clay soils.

Introduction

Biochar is the agricultural residue of highly low oxygen deprivation or under low oxygen conditions. It is the name given to the carbonization or pyroysis process of the raw material and organic materials have a charred structure. The properties of biochar depend on the raw material used in the process of obtaining it, carbonization or pyrolysis processing. The chemical composition of biochar is highly heterogeneous and contains both stable and unstable components (Sohi et al., 2010). The response of enzyme activities to biochar application is associated with a wide variety of soil types and biochar properties (Singh et al. 2010; Gul et al. 2015).It has been determined that biochar applications may be effective in the biological properties of the soil (Cayuela et al., 2014). In the study conducted by examining 72 papers, biocharin significantly increased microbial biomass C (MBC) ve ürease, alkaline phosphatase and dehydrogenase activities by 21.7 %, 23.1 %, 25.4 % and 19.8 %, In this study, it was determined that enzyme analyzes had no negative effects (Pokharel et al., 2020). Studies have reported that soil obtained 350 °C increases the microbial biomass content (Lue et al., 2013). The microbial activity of the soil plays a very important role in the ecosystem.Studies have shown that when biochar is added to the soil, it directly affects enzymeactivity (Lehmann and Rondon., 2006; Warnock et al., 2007; Steiner et al., 2008; Kolb et al., 2009; Thies and Rillig, 2009). Using biochar as a soil conditioner can improve the quality of soils by increasing microbial growth and enzyme activity (Verheijen et al. 2010). Catalase activity is associated with the amount of organic matter and is stated to be an enzyme responsible for the breakdown of some organic materials in soils (Riozin and Egorov, 1972; Gür, 1987). In particular, the study using calcareous and clay soil in this regard has not been encountered.

Material and Methods

Pistachio shells were collected to be used in the study and biochar material was obtained by carbonization method (300 °C). In the study, pistachio shells (300 °C) were converted to biochar by carbonization method in an oxygen-free environment. The resulting biochar material was broken down and passed through a 2 mm sieve to make it ready for use in the incubation trial. For the incubation study, soil samples were taken from the Harran University Faculty of Agriculture Eyyübiye campus research area from a depth of 0-30 cm and passed through a 2 mm sieve. The results of the Electrical conductivity (EC), pH, total carbon (TC) (%), Total nitrogen (TN) (%), Field capacity (TK) (%), Lime (%), Texture class analysis of the soil sample taken are given in (Table 1).

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Table 1. Some analysis results of soil sample used in the incubation study are given.

Soil sample	pH	EC	TC	TN	Lime	Field Capacity	Texture class
		(dS m^{-1})	(%)				
0-30 cm	8.01	0.20	1.79	0.11	10.92	32.46	Clayey

Soil samples (350 g) are mixed homogeneously with 0%-0.2%- 0.4%- 0.6%- 1.2% and 2.4 % dose ratios of the pistachio shell biochar (PSB) on the basis of weight, 65% of the field capacity was humidified and moisture was protected by periodic measurements (on the basis of weight). Considering the microorganizma activity of the samples to be incubated, they were stored at 25 ± 2 °C and in a climate room (incubator) where the desired humidity rate would be provided. Within the scope of the incubation study, a total of 108 sample containers were used. The incubation study is designed according to the coincidence parcels trial pattern. In the incubation study,6 different sampling times were designed as sampling time 15th, 30th, 60th, 90th, 120th and 180th days. In the samples taken when the time came, the values of Urease (Hoffman and Teicher, 1957), Alkaline phosphatase (Hofmann and Hoffmann, 1966) and Microbial biomass (Anderson and Domsch, 1978) values were determined.In these prepared soil samples, statistical analysis of the obtained data was performed using SPSS 20 package program.

Results

The effect of biochar applications on alkaline phosphatase (mg phenol 100 g-1 soil) , microbial biomass (µg CO2-C 100 g-1 soil), urease (mg NH4+-N 100 g-1 soil) and catalase (mg O2 g-1) enzyme activities was determined. This study was conducted by taking into account sampling times (15th, 30th, 60th, 90th, 120th, and 180th day) and application doses (0, 0.2%, 0.4%, 0.6%, 1.2% and 2.4%). When the results of urease, alkaline phosphatase and microbial biomass enzyme activities are examined; control samples in terms of doses compared with biochar applications at increasing doses control (0%) samples. It was determined that the increase was increased due to the dose increase and the highest increase was in the 2.4% dose. There was a statistically significant difference between sampling time (on day 15, 30, 60, 90, 120, and 180) and doses ($p<0.05$). The 2,4% dose in 180 days is significantly higher than the 0% dose. When the enzyme activity of catalase is examined; The 2.4% dose at 15 days is significantly higher than the 0% dose (Figure 1).

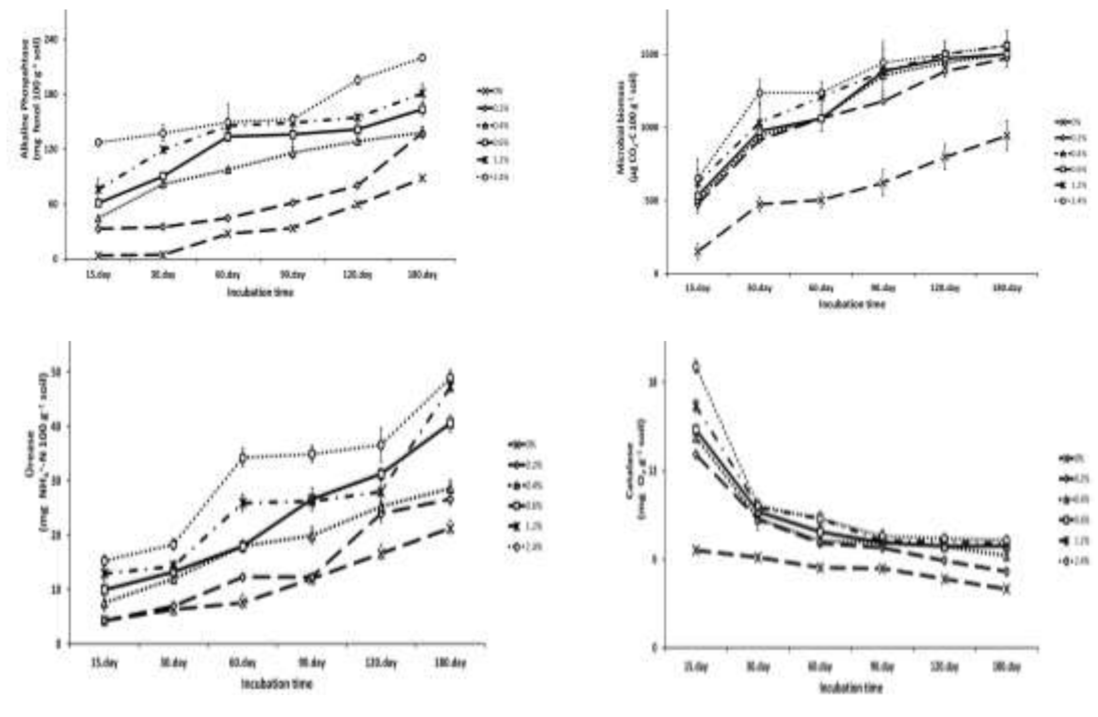

Figure 1. Results of alkaline phosphatase, microbial biomass, ürease and Catalase enzyme activities

Lehmann and Rondon., 2006; Kolb at al., 2009; IBI, 2008; Thies and Rillig, 2009; Warnock at al., 2007; Steiner at al., 2008; Cayuela et al., 2014 in their study that the biological activity of the soil increased significantly with the application of biochar. These results are similar to our study results. Zavalloni et al., 2011, In the 84-day incubation study, it was reported that the addition of 5% of wheat residues with biochar material had no effect on its microbial biomass activity. In our study, an increase in microbial biomass activity was observed. The material from which the biochar is obtained and the temperatures at which it is obtained greatly affect the working results. It was found that the results of the analysis increased due to the increase in the dose amount of biochar material and the enzyme activity increased. In this respect, Baligar et al., (1991) are simillar to the results of their studies. It has been determined that organic materials added to the soil increase catalase enzyme activity in the soil (Nannipieri et al., 1983; Zantuna and Bremner, 1976). In our study results, similar results were obtained in the results of alkaline phosphatase, microbial biomass, ürease activities. However, different results were obtained when compared with the results of urease enzyme activity (Pokharel et al., 2020). In our incubation study, the highest increase in catalase enzyme activity due to biochar application in seen at %2.4 dose. Based on the incubation times in catalase enzyme activity, it was determined that the catalaz enzyme activity of 15. days samples was higher than the 180.day samples. It has been found that catalase enzyme activity decreases due to increased sampling time. The reason for this reduction is that the biochar material applied at the beginof the incubation trial decreases over time due to decomposition.

Discussion

When the control sample was compared with biochar applications, it was determined that it caused improvement soil. These positive results increased linearly due to increase. When we look at the incubation times, it is detemined that the parameters tend to increase or decrease compared to the beginning. When the results of biological analysis of soil samples are examined; microbial biomas (180. day, PSB, 2.4%), Catalaz enyzme activity (15.day, PSB, 2.4 %) activities were found to have thee highest value at the specified sampling time and doses. In this study, as a result of obtaining biochar from the pistachio shell, these organic residues, which cannot be used in any other way economically, will contribute to the country's economy in terms of creating added value. It is also of great importance for sustainable agriculture as a soil improver.

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The State of Organic Ornamental Plants and Soil Management

Gülden Haspolat[1]

Key words: organic, ornamental, soil, growers, consumers

Abstract

Traditional agricultural production practices have the same environmental impact whether plants are cultivated for food or for ornamental purposes. Pesticides, herbicides, and chemical fertilizers can contaminate the air and groundwater, resulting in negative consequences for the environment, wildlife, and communities. Organic foods are becoming increasingly popular among consumers, who believe that they have a lower environmental impact than foods produced using conventional methods. These environmentally conscious customers are also interested in buying non-edible organically cultivated crops like ornamental bedding plants and cut flowers. Assuming this green trend continues, organic ornamental bedding plant production may soon be a new area for conventional bedding plant growers. Garden soils that are utilized year after year require regular applications of organic matter and full fertilizer. Incorporating appropriate organic matter is even more important for ornamental plants because there is only one chance to mix it into the soil before planting or seeding. Organic ornamental plants can be grown in composted or fermented home waste mixes, basic slag, and peat. Organic farming is more popular in Europe, the United States, Canada, Australia, Japan, China, and India, among other places, and organic ornamental nurseries and greenhouses may be found in the United States, the Netherlands, Switzerland, and Germany. In Türkiye, there is no organic flower cultivation, and customers are unaware of such a use. Edible flower herbs can be a good place to start. It is critical to speed up research on climate change adaptation and mitigation, sustainable production, and the prevention and restoration of land and soil degradation in ornamental plants.

Introduction

Ornamental plants are plants that are grown for decorative purposes and come in a variety of shapes, sizes, and colors to fit a variety of climates, landscapes, and gardening needs. Houseplants, bedding plants, cut flowers, and foliage plants are one of the classifications for ornamental plants. Trees, shrubs, aquatic plants, perennial and annual plants are among the ornamental plant types, from herbaceous to woody, lower to higher level, and aquatic to terrestrial plants (Liu et al. 2018).

Traditional agricultural production practices have the same environmental impact whether plants are cultivated for food or for decorative purposes. Pesticides, herbicides, and chemical fertilizers can contaminate the air and groundwater, resulting in negative consequences for the environment, wildlife, and communities (Burnett and Stack 2009). As in all areas of agriculture, it is necessary to accelerate studies on adaptation to climate change and reducing its effects, sustainable production, and prevention and restoration of land and soil degradation in ornamental plants.

Although organic ornamental plants are not widely used yet, it is one of the first steps to be taken for consumers to be aware of the fact that they will contribute to protecting the planet. Finding solutions to the problems of finding a market as well as growing problems will provide a good start. Consumers were unaware of the problems that conventional flower farming brings, despite increased awareness of environmental and social issues. On the other hand, the measures to be taken to improve the soil will lead to an increase in quality. Increasing the organic matter of the soil is a necessary condition in the cultivation of ornamental plants (Cacini et al. 2021; Fascella, 2015; Dela Cruz et al, 2014; Loffredo and Senesi 2009; Gaur and Adholeya 2005; Handreck et al. 2002). In addition, organic ornamental plants can be grown by increasing plant nutrients other than chemical fertilizers.

However, in recent years, consumer interest in certified organic products and plants has grown, consumers are uninformed of the issues that conventional production of ornamental plants cause. In developed countries such as Switzerland, Germany, Netherlands and United States, organic ornamental plant cultivation started to take off in the 90s. A start can be made with the organic cultivation of edible herbs in developing countries.

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Results

The first appearance of organic ornamentals was in Switzerland. The Swiss Research Institute of Organic Agriculture (FiBL) was the incentive for the first organic flower meeting, and realised that organic cultivation of cut flowers and ornamental plants was difficult because of the lack of information and experience. The first organic ornamental standards were published early in 1996 and the Swiss Association of Growers of Organic Ornamentals was founded. Fifty growers get together on a monthly basis to share their knowledge and experience. In addition, as a section of BIO SUISSE (VSBLO), the major Swiss organization for organic agriculture, an expert board on organic floriculture was established. Producers, specialized dealers, wholesale distributors, an environmental/consumer association, and FiBL consultants make up the board. The board meets twice or three times a year to examine plant standards, marketing, and appropriate plant assortments (Billmann, 1998).

In Netherlands a subsidiary of the flower auction in Aalsmeer, tried to improve the production and marketing of organic ornamental plants by further education of growers and a special marketing concept in 1993. Marketing proved far more difficult than the production of organic flowers. In 1997 a public advisor organised a research group, a study group for organic floriculture with about 70 growers, and an institution of experts in production, marketing and advising, comparable to the board of experts in Switzerland. Relying on self-organisation, producers who formerly were connected to them are now selling some of their plants to the private wholesaler called De Schoof. Another outlet is the flower auction Vleuten, run by the trading organisation Biosfeer (Billmann, 1998).

In Germany, mainly the growers' associations Bioland and Naturland took charge of organic ornamentals. Both organisations elaborated and published their floriculture standards, similar to those in Switzerland, just in time to the first seminary on organic ornamentals in Germany in September 1996. In the beginning of 1997, the main organisation on German organic agriculture (AGÖL), published a list of more than 100 growers of organic ornamentals. A producer cooperative (Bioland Pflanzenkontor) founded in 1996 by eight organic nurseries in northern Germany, all specialized in growing herbs, herbaceous plants, trees and shrubs. A group of some 20 organic tree nurseries, founded in 1997. Two study groups on organic cut flowers and pot and bedding plants in the Frankfurt and Munich areas, each with some 20 members. it has been proven that there was a demand for organic cut flowers and ornamentals (Billmann, 1998).

In the United States, floriculture, nursery, and bedding crops are grown under glass or other protection in 408 m2 on 551 farms and 322 open farms on 647.497 hectares. Organic propagative materials planted under glass or other protection areas in 590 m2 with 148 farms, 366 hectares of open lands take place in 84 farms. Certified organic cultivated Christmas trees, are grown on 24 farms with a total production area of 67 hectares (USDA, 2022).

In Hamburg 500 interviews were done at nine organic markets in 1997; 1000 interviews at 10 conventional markets, with the same questions in 1998. The major results were as follows: 54% of the buyers at the organic markets and 49% of those at conventional markets supported the idea of organic flowers and could imagine buying organic flowers (87% and 65%, respectively). They would theoretically pay 15% above the conventional prices for organic flowers (49% and 20%, respectively), the most important characteristics when buying flowers were freshness for conventional buyers and appearance for organic buyers. The medium importance was the absence of residues for organic buyers, and conventional buyers focused on floristic aspects. The quality, which was more important than residues or origin. Marketing prospects for organic ornamentals with the current unemployment situation and general economic conditions, environmental issues tend to be falling behind in consumers' thinking. So far success has been made by combining cut flowers and ornamentals with edible plants like herbs or small vegetable plants (Billmann, 1998).

Organic and conventional greenhouse growers in Maine were surveyed to determine the research needs of growers who may produce organic ornamental bedding plants. The greatest percentage (75%) of organic growers indicated that they choose to grow plants organically because of the thinking of right thing to do. The second greatest percentage (36%) of organic growers choose organic production techniques for ornamental plants because they grow food crops organically and consider it convenient to use only one production technique. A relatively small number of organic growers (7%) considered the market for organic ornamental plants to be a strong motivator for growing organically. Organic growers were asked to select production issues that pose the greatest challenge for them from a list of common production problems. They considered insect and disease management and organic fertility, substrate, and pH management to be their greatest problems. Conventional growers primarily avoid organic production techniques because they consider organic fertilization or organic insect management to be too big of a challenge. (Burnett and Stack 2009).

Another survey of participants at four locations in Maine to learn about the level of interest in organically, sustainably, and locally cultivated plants; and which demographic groups were most interested in them. Organic and sustainable vegetable/herb and decorative plants attracted respondents' awareness. Locally grown plants drew their interest less. Organic, sustainable, or locally grown plants would cost 15% more (vegetables/herbs) or 10% more (ornamentals) than conventionally grown plants, according to survey respondents. Younger participants were more interested in sustainable and organic plants than older participants, however they were not willing to pay extra for these plants. Similarly, women were more interested in non-traditional plants than men, but they were not likely to spend more on them. Organic and sustainable vegetable, herb, and ornamental plants have a strong market and growers may be able to charge 10% to 15% more for these plants than they would for conventionally grown plants. Individuals with higher incomes and education levels are likely to pay the biggest premium for organic and sustainable plants (Hawkins et al. 2012).

Plant growth was inhibited due to a lower nutrient concentration in the growing medium. To improve the chemical and physical qualities of soils, organic and inorganic amendments are frequently applied. The addition of expanded shale to the organic growth substrate lowered macro and micronutrient absorption in general. The organic materials that have been stabilized through past decomposition, such as compost or sphagnum peatmoss, are safe and dependable growing media, but that expanded shale, particularly in circumstances when more porosity is required, offers limited benefits as a container growing medium (Sloan et al. 2010).

Kilmas et al. (2022) determined the effect of chrysanthemum (Chrysanthemum sp.) on planting media made of soil, chicken manure and cow manure. There was a significant effect between the planting media treatment used and the observed variables in plant height, number of leaves, and stem diameter, where treatment mixture of manure and soil gave the highest number of leaves and plant stem diameter.

For the soil management regular applications of organic matter and complete fertilizer are essential for ornamentals and garden soils used each year. Organic materials used alone seldom supply a balanced source of plant nutrients. Most are low in phosphorus, and decaying straw, leaves, grass clippings, and sawdust can temporarily deplete the soil of available nitrogen. Reduced amounts of available nitrogen can damage some short-season vegetables and flowers (Burnett et al. 2016). Nitrogen can be supplied by plants that fix nitrogen to the soil in growing organic ornamental plants.

Organic additives are a valuable technique for controlling diseases in ornamental crops. Manure, agricultural and food leftovers, compost, and organic fertilizers are among them. Their usage in ornamental crops can help reduce soilborne diseases, especially when used in concert with other management strategies and a system approach. Compost and Brassica pellets are thought to be the most promising. The use of Brassica species as green manure is a form of biofumigation that results in the emission of volatile and poisonous chemicals. Compost has a variety of functions, which are mostly influenced by its microbial community and the presence of biological control agents (Pugliese et al. 2015).

The following items can be used for growing organic ornamental plants:

Composted or fermented household waste mixes, peat, basic slag, leonardite, aluminum silicate (kaolin), farm manure, dried farm manure and dehydrated poultry manure, composted animal droppings containing poultry manure and farm manure, liquid animal feces, calcium hydroxide, carbon dioxide, copper compounds in the form of copper hydroxide, copper oxychloride, tribasic copper sulfate, copper oxide, burgundy slurry, fatty acids, iron phosphate (iron (ııı) orthophosphate), kieselgur (diatomaceous earth, pure), lime sulfide (calcium polysulfide), paraffin oil, potassium hydrogen carbonate (aka potassium bicarbonate), quartz sand, sawdust and wood chips, bark compost, potassium sulfate with magnesium salt, magnesium and calcium carbonate, magnesium sulfate (kieserite), calcium chloride solution, trace elements, pheromones, plant oils, pyrethrins extracted from Chrysanthemum cinerariaefolium, sulfur, ethylene (Official newspaper 2022).

Discussion

Since ornamental plants are not consumed by eating, their organic cultivation is not yet at the desired level. However, the most important thing to keep in mind is that any production activity can be carried out in a sustainable way while protecting the environment and without damaging the soil.

On the other hand, there is a serious need for eco-friendly practices to reduce natural resource consumption and carbon emissions, we cannot keep ornamental plants apart. Although these kind of practices are not sufficient in growing ornamental plants, many organic materials are used in in terms of soil. However, with the start of certification processes without the use of chemical fertilizers and pesticides, the transition to organic ornamental plants can be achieved. Rotation, green fertilization and use of bio pesticides are among the must-haves in such an organic ornamental plants growing.

Customers, as well as experts, require that economic efforts be sustainable. Integrated and organic floriculture will be the most common production method. In the future, harmless will refer to more than only the beauty and durability of plants; it will also refer to good working conditions and environmentally sustainable production processes. Customers can contribute healthy planet with organic ornamentals, many of them are willing to pay greater fees if the reasons are adequately communicated. Organic ornamentals will take several years of effort to explain and organize production and marketing.

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Use of the Caesium-137 Re-sampling Approach to Assess Changes in Soil Erosion Rates in Some Mediterranean Agricultural Fields in North Morocco

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Key words: soil erosion, agricultural practices, climate change, the Caesium-137 technique, the re-sampling approach.

Abstract

Water erosion is the main threat of soil resources and water reservoirs in Northwest Morocco. The geomorphological, lithological and climatic conditions of the area make it vulnerable to erosion induced by water. This agro-environmental threat can be further aggravated by the impact of climate change, especially that the study area is submitted to Mediterranean climate, characterized by its fragility. This study aims to assess changes in soil erosion rates associated with two time-intervals: 1954-2001 (or 2002) and 1954-2017 (or 2018) in some upland agricultural fields located in three watersheds in Northwest Morocco based on the Caesium-137 technique and the re-sampling approach.

The results show that soil erosion rates had decreased from 26 to 20 t ha-1 yr-1 in the field of El Hachef watershed thanks to the beneficial agricultural practices based on fallows and the regional crop rotation. The rates of soil loss have also significantly decreased from 36 to 29 t ha-1 yr-1 during the period between the two sampling campaigns (2002–2017) in the field located in the Nakhla watershed due to more frequent fallow with natural vegetation and the planting of olive trees as part of the soil erosion control strategy that was implemented in the Nakhla basin. On the other hand, soil erosion rates had slightly increased from 4.5 to 5.7 t ha-1 yr-1 in the field of the Raouz watershed where agricultural practices were not changed. This variation could be due to climate change impact on soil erosion in this area.

Introduction

The Mediterranean basin has been considered for centuries as very sensitive to water erosion (Morgan 2005). To the South of the Mediterranean basin, there are environments at high risk of soil degradation due to climatic and topographical factors and due to population growth as well. Water erosion causes the loss of topsoil which is rich in mineral nutrients and organic material and leads to the reduction of soil fertility in consequence. The risk of water erosion is even expected to increase due to climate change (Mabit et al. 2014). Morocco, as a country with a contrasting climatic influence: Atlantic in the West, mediterranean in the North and arid in the South, is submitted to the combined impacts of climate change and water erosion (Damnati 2006). In 1990, a study conducted by the FAO showed that 40% of the land in Morocco is threatened by water erosion. The soil losses recorded in the country vary from 5 t ha-1 yr-1 in the Middle Atlas to more than 50 t ha-1 yr-1 in the Rif (HCEFLCD 2013). The Moroccan government has devoted efforts to protect soil and water reservoirs. Indeed, in 1996, the goverment launched a national program, entitled : “Plan National d’Aménagement des Bassins Versants (PNABV)” over a period of 20 years at the level of 22 priority watersheds and launched other programs like “Pérennité des Ressources en Eaux du Maroc (PREM)” to mitigate the in-site and off-site effects of soil erosion. Moreover, research teams working on “the vulnerability of soils to water erosion” were established via international projects to cover wider Mediterranean area.

Conventional techniques, have been generally used to quantify water-induced soil erosion in Northwest Morocco. Nevertheless, the use of fallout radionuclides (FRN) such as Caesium-137 (137Cs) is an excellent alternative for erosion studies (Benmansour et al. 2002, Damnati et al. 2013). Indeed, 137Cs with a half-life of 30.2 years, allows to estimate soil erosion over approximately 60 years. It is an anthropogenic isotope that was introduced into the environment by nuclear weapon tests, deposited on the soil surface by wet and dry fallout and rapidly adsorbed onto fine soil particles. The measurements of its stock in the soil give information on the sites of erosion and accumulation, compared to an inventory of a stable site, called a reference site, which represents the initial stock of 137Cs in the study

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area. This study is based on a previous study of soil erosion in some agrosystems belonging to three watersheds in Northwest Morocco based on the Caesium-137 technique (Ibrahimi 2005). The current study combined the Caesium-137 technique with the re-sampling approach to assess changes in soil redistribution in those agricultural fields in the light of the current natural and anthropic challenges.

Material and methods

The study sites were first sampled between 2001 and 2003 (Ibrahimi, 2005) and re-sampled in 2017 and 2018. Soil samples were collected using a stainless steel column cylinder auger of 9 cm in diameter driven into the ground by a motorized percussion corer. They were collected from the agricultural fields following the slope gradient and the runoff direction and according to systematic grids in the reference sites. One sectioned profile was collected from each agricultural field to inform about the tillage depth, whereas in the reference sites, sectioned profiles were collected to ensure that these sites were not disturbed between the two periods. Soil samples were transported into the laboratory. They were first oven dried at 60 °C, weighed before and after drying, disaggregated, manually and automatically ground, then sieved at 2 mm and homogenized (Moustakim et al. 2019, 2022). Sub-samples were analyzed using High Purity Germanium detectors (HPGe) of 50% and 30% efficiency. Then, the 137Cs inventory (areal activity) of each sample was calculated as follows:

$A = CMt / S$

Where:

A: areal activity (Bq m-2), C: Activity of 137Cs (Bq kg-1), Mt: the dry mass of the < 2 mm fraction (kg), S : sectional area of the sampling device (m2).

Then, the Mass Balance Model 2 (MBM2) (Walling et al., 2002) was used to convert the previous and the recent 137Cs inventories (t ha−1 yr−1) into erosion rates (t ha-1 yr-1). MBM2 can be used as follows:

$d(A)/dt=(1-\Gamma)I(t)-(\lambda+PR/d)A(t)$

Where A(t) is the 137Cs inventories (Bq m−2); t is the time since the onset of 137Cs fallout (yr) considered in 1954; R is the soil erosion rate (kg m−2 yr−1) which can be converted to t ha−1 yr−1; d is the cumulative mass depth representing the average plough depth (kg m−2); λ is the decay constant for 137Cs (yr−1); I(t) is the annual deposition flux at time t (Bq m−2 yr−1); Γ is the proportion of the recently deposited 137Cs removed by erosion before being mixed into the plough layer; P is the particle size factor.

The use of the same conversion model is required for comparison between the two datasets associated with the two periods (1954–2001, 2002 and 1954–2017, 2018) (Moustakim et al. 2019).

Results

The 137Cs distribution in the depth profiles collected from the reference sites of the three watersheds confirmed that these sites had not been disturbed during the periods elapsed between the two sampling campaigns (Moustakim et al. 2019, 2022). The sectioned profiles collected from the three fields of the three watersheds showed homogenization of the 137Cs activity in the plough layer which was about 12 cm in the Raouz field (Moustakim et al. 2022), 15 cm in the Nakhla field (Moustakim et al. 2019) and considered about 10cm in the El Hachef field (Moustakim et al. 2022).

Table 1 shows the mean 137Cs activities recorded in 2001, 2002 and in 2017, 2018 in the reference and agricultural sites of the three watersheds. The comparison permits to document changes that had occurred in the 137Cs content (Moustakim et al. 2019). As indicated in Table 1, except for the Nakhla field which shows a slight increase in 137Cs content, the recent mean 137Cs inventories of the other fields are lower than those recorded in the past years. This is consistent with the law of radioactive decay which suggests that the recent inventories should be lower than those recorded in previous years. Moreover, the mean 137Cs inventories recorded in the agricultural fields in the two periods are lower than their associated 137Cs reference inventories corresponding to each period, which suggests that the erosion processus is generally dominant in the fields.

Table 1: Previous and recent mean inventories in the agricultural and reference sites of the three watersheds (Moustakim et al. 2019, 2022)

Watershed	Agricultural / reference site	Previous mean ^{137}Cs inventories (Bq m^{-2})	Recent mean ^{137}Cs inventories (Bq m^{-2})
Raouz	Agricultural field	2283 ± 228	1541 ± 154
	Reference site	2651 ± 234	1793 ± 179
El Hachef	Agricultural field	1278 ± 128	886 ± 76
	Reference site	2466 ± 247	1707 ± 171
Nakhla	Agricultural field	652 ± 65	666 ± 71
	Reference site	2142 ± 254	1517 ± 223

Figure 1 illustrates the net erosion rates associated with the previous and the recent periods calculated for the three fields. The figure 1 clearly shows that soil erosion rates had decreased in the Nakhla (N_F) and El Hachef (H_F) fields and had slightly increased in the Raouz field (R_F) by almost 26.7%.

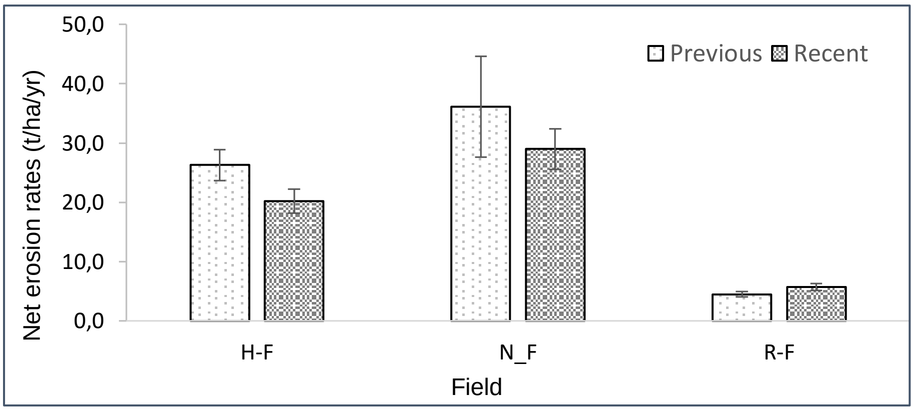

Figure 1. Previous and recent net erosion rates (t ha−1 year−1) within the three agricultural fields

Discussion

The positive impact of beneficial agricultural practices consisting of frequent fallow and the regional cultural tradition of crop rotation (cereals and legumes) had decreased soil erosion rates from 26.3 to 20.7 t ha-1 yr-1 in the El Hachef field (Moustakim et al. 2022). In the Nakhla field, the slight increase of the mean recent 137Cs inventories in comparison with those obtained in 2002 significates that during the period 2002-2017, there had been stabilization or no significant loss of 137Cs in the field. In the study reported by Porto et al. 2014 in southern Italy, the 137Cs inventories of the sampled 22 points in 2013 also exceeded those recorded in 1998 after correction by the law of radioactive decay. This was ascribed to the re-sampling precision since soil deposition was thought to be unlikely due to the lack of visual evidence of deposition on the slopes of the study catchment. Overall, the stabilization of the 137Cs content in the Nakhla field had led to a significant decrease in the mean soil erosion rates from 36.1 to 29.0 t ha-1 yr-1. This decrease could be explained by the positive impact of the recent agricultural practices consisting of more frequent fallow combined with natural vegetation and olive plantations in addition to the cultural tradition based on crop rotation (Moustakim et al. 2019). The appropriate agricultural practices were also recommended by the authorities to reduce soil erosion at the basin scale and sedimentation in the Nakhla dam, whereas in the Raouz field, the slight increase in soil loss could be due to the impact of climate change since there was no change in agricultural practices within this field. So, sustainable agricultural practices can provide significant protection to agricultural fields against the combined effects of erosion and climate change. There are only few studies on the use of the fallout radionuclide technique with the re-sampling approach to assess changes in soil redistribution in the world. At the scale of the Mediterranean, the main studies are those conducted by Porto et al. (2014, 2016) in Italy and Moustakim et al. (2018, 2019, 2021, 2022) in Morocco.

Your suggestions for research and support policies to develop further step!

•Adapting crops and agricultural practices to climate change must be always taken into consideration.
•Research efforts and exchange of expertise must be further increased in order to develop programs for the conservation of the natural resources, to protect their quality and allow their use by the future generations.

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SESSION 10 Organic products, Mediterranean diets and markets

Organic farming and markets in the World

Gülşah Mısır Bilen[1], Emre Bilen[1]

Key words: producers, production area, land-use, market

Abstract

Increasing demand for organic products continues to stimulate growth in the organic sector. The number of producers, which was approximately 200 thousand in 1999, increased 17 times and reached 3.4 million in 2020. Almost 91% of organic producers were located in Asia, Africa and Europe. The Asian Continent is home to more than half of the world's organic producers. The country with the highest number of producers is India, followed by Ethiopia and Tanzania. Organic farming area, which was 11 million hectares in 1999, increased more than six times and reached 74.9 million hectares in 2020 worldwide. Compared to 2019, there was an increase of around 3 million hectares in 2020. On the other hand, the share of organic farming land in the total agricultural land was 1.6% in 2020. International organic food sales reached 120 billion euro in 2020.

Production

The number of organic producers in the world is increasing over the years. The number of producers, which was 200 thousand in 1999, increased 17 times throughout the years until 2020 and approached 3.5 million (Figure 1). In general, the number of producers in developing countries is high and the organic production areas per enterprise are small. 3 countries with highest number of producers are India (1,599,010); Ethiopia (219,566); Tanzania (148,607).

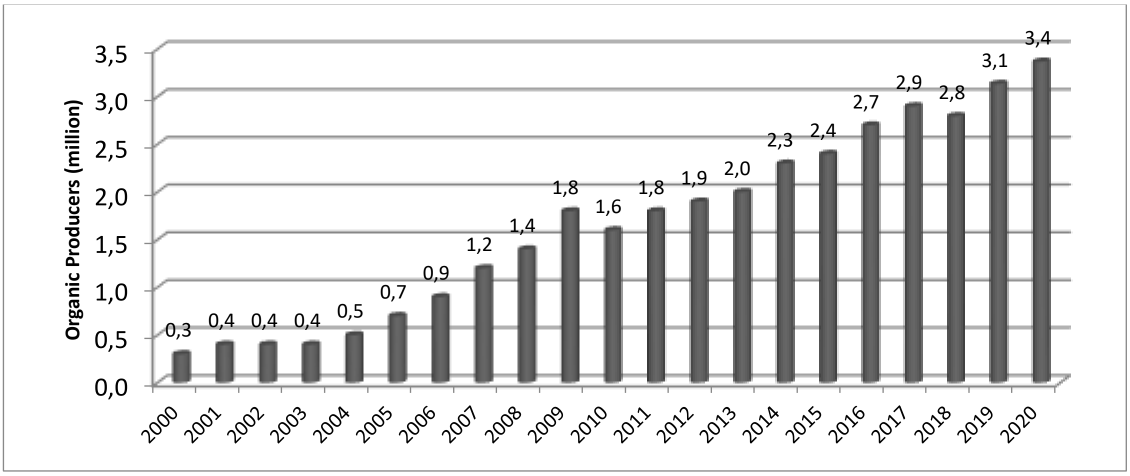

Figure 1. Number of Organic Producers in the World (1999-2020)
Source: (FiBL & IFOAM, 2022)

As seen in Figure 2, the organic production area, which was 15 million in 2000 in the world, increased 5 times in 2020 and reached 74.9 million hectares.

In the last year (from 2019 to 2020), for the organic farming areas there has been an increase of 4.1% with 3 million hectares (Figure 2). On the basis of countries, the highest increase happened in Argentina: 21% increase with 781.000 ha; Uruguay 28% increase with 589,000 ha and India 16% increase with 359,000 ha.

The share of organic agricultural areas in total agricultural areas is 1.6% according to 2020 data. According to the data from 2020, organic farming is actively done in 190 countries. The 3 countries with the largest organic area are, respectively, Australia (about 36 million hectares), Argentina (4.5 million hectares) and Uruguay (about 3 million hectares) (FiBL & IFOAM, 2022).

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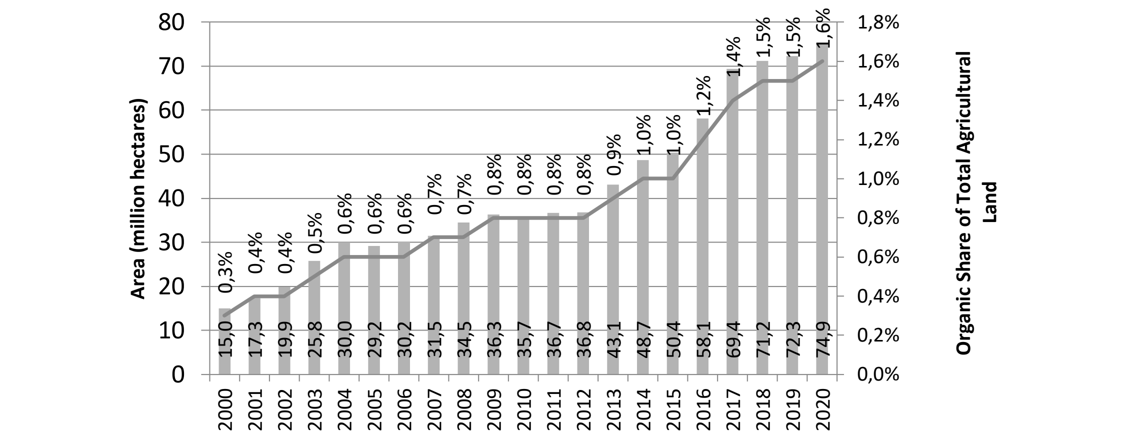
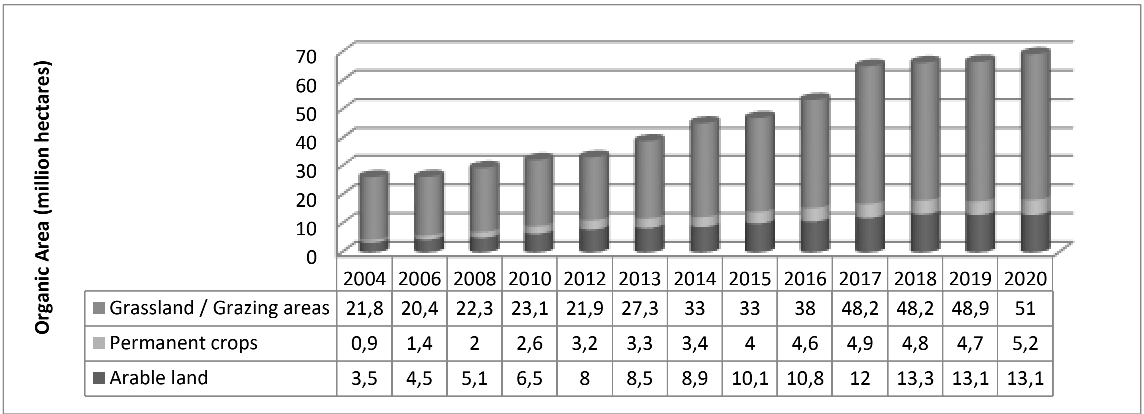


Figure 2. Growth of organic agricultural land and organic share (2000-2020) (million hectares)
Source: (FiBL & IFOAM, 2022)

Based on recent data, two-thirds of organic agricultural areas (51 million hectares) consist of grassland / grazing areas. Arable land are over 13 million hectares with a share of 18%. There is a 1% increase in 2020 compared to 2019.

Permanent crops constitute 7% of the total organic area with 5.2 million hectares. Compared to 2019, there has been an increase of 712 thousand hectares and 15.7% (Figure 3). The most important crops of this group are: olives, nuts, coffee, grapes and cocoa.

Although not included in the chart, there are more organic areas that reaches 30 million hectares in total, consisting of areas such as wild collection, beekeeping areas, aquaculture areas, forests, pastures that are not agricultural land. With these areas added, the total organic areas reach 104.9 million hectares in the world. (FiBL & IFOAM, 2022).



	2004	2006	2008	2010	2012	2013	2014	2015	2016	2017	2018	2019	2020
Grassland / Grazing areas	21,8	20,4	22,3	23,1	21,9	27,3	33	33	38	48,2	48,2	48,9	51
Permanent crops	0,9	1,4	2	2,6	3,2	3,3	3,4	4	4,6	4,9	4,8	4,7	5,2
Arable land	3,5	4,5	5,1	6,5	8	8,5	8,9	10,1	10,8	12	13,3	13,1	13,1

Figure 3. Changes of World Organic Annual, Perennial and Pasture Areas 2004-2019
Source: (FiBL & IFOAM, 2022)

As seen in table 1, although organic farming areas increased by 5.9% in Europe, 3.5% in Latin America and 9.1% in North America in 2019 compared to 2018, the organic agricultural lands of China (A decrease of 7.1% (ie 0.45 million hectares) was observed in Asia, and 0.3% (0.12 million hectares) in Oceania, due to the reduction of temporary grazing land from the statistics. While there was an increase in organic agricultural lands in 90 countries in general, a decrease was reported in 48 countries. In 41 countries, the area of organic farming has either remained unchanged or there is no new data (FiBL & IFOAM, 2022).

Table 1. Regional Changes of World Organic Agriculture Areas

Region	Organic Farming Area 2009 (ha)	Organic Farming Area 2018 (ha)	Organic Farming Area 2019 (ha)	1-Year Change 2018-2019 (%)	10-Year Change 2009-2019 (%)
Africa	1,072,124	1,854,646	2,030,830	%9.5	%89.4
Asia	2,457,915	6,364,778	5,911,622	%-7.1	%140.5
Europa	10,028,781	15,607,636	16,528,677	%5.9	%64.8
Latin America	7,539,643	8,008,581	8,292,139	%3.5	%10.0
North America	2,472,629	3,342,849	3,647,623	%9.1	%47.5
Oceania	12,145,055	35,999,373	35,881,053	%-0.3	%195.4
WORLD	35,713,927	71,172,783	72,285,656	%1.6	%102.4

Source: (FiBL & IFOAM, 2022)

Data on organic animal production are limited. However, in the light of the available data; it is understood that the organic animal production sector in the European continent is developing rapidly. In 2019, there are approximately 5.1 million cattle, 5.4 million sheep and more than 62.3 million poultry in organic enterprises in Europe. The share of organic animals in the total animal numbers in Europe is limited compared to some product groups. The main reasons for this are: the limited availability of local animal feed, the difficulties experienced in importing certified organic animal feed, the fact that organic shelters are much more costly than conventional ones, and most of the consumers do not want to pay the premium price of the organic animal products.

In the period from 2010 to 2019, the highest increase was in the number of poultry at a rate of 110%. One of the most important reasons for this increase is the big demand for organic eggs. In the same period, the number of cattle increased 81%; the number of sheep increased by 55% (Table 2).

Table 2. Organic Animal Production in Europe (2019)

	Animal	The share of organic production in the total (%)	Change from 2018 to 2019 (%)	Change from 2010 to 2019 (%)
Cattle	5,079,962	4.0	4.1	80.9
Sheep	5,413,520	3.5	-9.7	55.3
Pig	1,586,702	0.9	13.7	109.6
Poultry	62,317,071	2.5	8.0	110.0

Source: (FiBL & IFOAM, 2022)

Market

In 2019, 3.24 million tons of organic agricultural products were imported by European Union countries. Türkiye constitutes 6.5% of this import amount. When the import amount in 2019 is compared with the 2018 data, it is seen that there is an increase of 0.4% (3.23 million tons). Nearly one third (32%) of the imports of organic agricultural products of EU countries was carried out by the Netherlands. Other important importing countries in Europe are Germany (13%), England (12%) and Belgium (11%), respectively (FiBL & IFOAM, 2022).

In the table 3 there are export values of organic agricultural products in the world, but the table was prepared using the information of a limited number of countries that provide data on exports. Comparing countries with each other may lead to incorrect results due to differences in data collection methods.

Table 3. World Organic Agricultural Product Exports (million Euros)

Country	Export (Million Euros)
Italy	2 425
France	826
India	613
Australia	434
Dominican Republic	423
Denmark	406
Mexican	373
Canada	310
Kyrgyzstan	288
Other	1 187

Organic food and beverage sales exceeded 120 billion euros in 2020 (Figure 4). The countries with the largest organic markets in 2020 were the United States (€49.5 billion), Germany (€15.0 billion) and France (€12.7 billion). The largest single market was the United States with a 41% of the global market, followed by the European Union with 44.8 billion euros and 37% of the global market and China with €10.2 billion and 8.5% of the global market (FiBL & IFOAM, 2022).

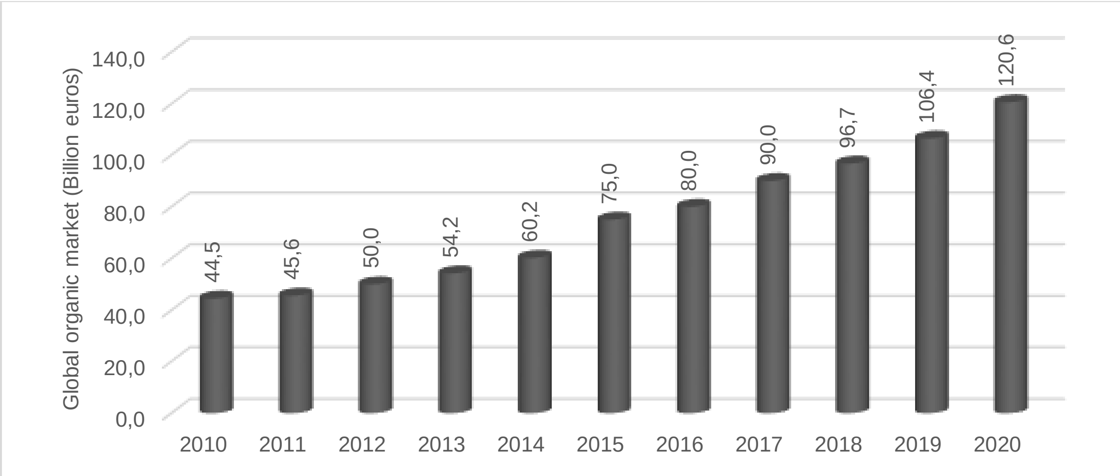


Figure 4. Organic Food Products Market (2000, 2010 - 2020) (Billion Euros)
Source: (FiBL & IFOAM, 2022)

3 countries with the highest per capita consumption are Switzerland (418 Euros), Denmark (384 Euros) and Luxembourg (285 Euro). Switzerland have the first place this year in terms of per capita consumption of organic products to some extent related to the currency exchange rates. Denmark (13.0%), Austria (11.3%) and Switzerland (10.8%) had the highest organic market shares. Organic consumption values per capita in 7 countries were above 100 Euros. Consumption per capita rose to 63.3 Euros in the European country and 101.8 Euros in the EU (Table 4).

Table 4. 10 Countries with the Highest Per Capita Consumption (2020) (Euro)

Country	Organic Consumption Per Capita (Euro)
Switzerland	418
Denmark	384
Luxembourg	285
Austria	254
Sweden	212
France	174
Germany	180
Norway	83
Netherland	78
Belgium	77

Source: (FiBL & IFOAM, 2022)

Discussion

With the COVID-19 pandemic, the interest shown in healthy products has increased even more. Organic products are classified as healthy products by consumers. This contributes to the continuation of the development of the organic market. This can be seen as an important opportunity for Türkiye. In line with the demand in the USA and the EU, our exports to these countries may be increased.

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POSTER PRESENTATIONS

An Overview of Government Policies for the Sustainability of Organic Farming in the Mediterranean Basin

Meltem Ayaz[1]

Key words: Organic Farming, Sustainability, Mediterranean Basin, Regulation, EU (European Union)

Abstract

The beginning of organic farming production activity dates back to the 1930s. Agricultural production activity in the EU is maintained and supported within the scope of the Common Agricultural Policy (CAP) according to the common market regulations.

EU organic agriculture legislation was first shaped by the Council regulation 2092/91, which entered into force in 1991 (Anonymous, 1991). In the following years, more than 44 amendments were made in this legislation. These regulations are determined by EU law. EU regulation 2092/91 has been repealed as of January 2009 and directives 834/2007, 889/2008 and 1235/2008 have entered into force as a new term.

Within the framework of EU organic agriculture legislation, trade with non-EU third countries is also subject to certain rules. The rules regarding the import of organic products from third countries are; It is carried out by the rules regarding the importation set out in Articles 32 and 33 of the Regulation (EC) No. 1235/2008 and "Regulations on Imports of Organic Products from Third Countries (EC) No. 834/2007.

From this point of view, if we look at the situation in Türkiye; It has published a regulation in order to comply with the European Community Council Regulation No. 834/2007 and the Implementing Regulation No. 889/2008, which came into force as of January 1, 2009. The "Regulation on the Principles and Implementation of Organic Agriculture" issued in 2005 entered into force by being published in the Official Gazette dated 18.08.2010 and numbered 27676. This regulation, which has been revised and updated 8 times over time, is the main source on this subject.

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Assessment of Ionomic, Phenolic and Flavonoid Compounds for a Sustainable Management of Xylella fastidiosa in Morocco

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Key words: olive quick decline syndrome; Xylella fastidiosa; Leccino; Leccinola salentina; olive; Moroccan olive varieties; Mediterranean olive varieties

Abstract

Morocco belongs to the countries ranked at a high-risk level for entry, establishment, and spread of Xylella fastidiosa (Xf), which has recently re-emerged as a plant pathogen of global importance causing olive quick decline syndrome (OQDS). Symptomatic infection by Xf leads to devastating diseases and important economic losses. To prevent such losses and damages, countries without current outbreaks like Morocco need to first understand their host plant responses to Xf. The assessment of the macro and micro-elements content (ionome) in leaves can give basic and useful information along with being a powerful tool for the sustainable management of diseases caused by this devastating pathogen. Herein, we compare the leaf ionome of four important autochthonous Moroccan olive cultivars ('Picholine Marocaine', 'Haouzia', 'Menara', and 'Meslalla'), and eight Mediterranean varieties introduced in Morocco ('Arbequina', 'Arbosana', 'Leccino', 'Ogliarola salentina', 'Cellina di Nardo', 'Frantoio', 'Leucocarpa', and 'Picholine de Languedoc'), to develop hypotheses related to the resistance or susceptibility of the Moroccan olive trees to Xf infection. Leaf ionomes, mainly Ca, Cu, Fe, Mg, Mn, Na, Zn, and P, were determined using inductively coupled plasma optical emission spectroscopy (ICP-OES). These varieties were also screened for their total phenolics and flavonoids content. Data were then involved in a comparative scheme to determine the plasticity of the pathogen. Our results showed that the varieties 'Leccino', 'Arbosana', 'Arbequina' consistently contained higher Mn, Cu, and Zn and lower Ca and Na levels compared with the higher pathogen-sensitive 'Ogliarola salentina' and 'Cellina di Nardò'. Our findings suggest that 'Arbozana', 'Arbiquina', 'Menara', and 'Haouzia' may tolerate the infection by Xf to varying degrees, provides additional support for 'Leccino' having resistance to Xf, and both 'Ogliarola salentina' and 'Cellina di Nardö' are likely sensitive to Xf infection.

Introduction

In Morocco, olive (Olea europaea subsp. europaea L.) groves have a crucial socioeconomic role, representing the main source of livelihood for many local farmers. Moroccan olive groves represent the South western most part of the Mediterranean olive growing landscape. In this country, olive cultivation and oil production are a deep-rooted tradition, both as an income for more than 450,000 farmers and a high environmental value crop, due to its role in soil protection, particularly, in mountain farms [1]. Furthermore, over the last few years, land use for olive cultivation in Morocco has increased from 946,818 ha in 2014 to 1,073,493 ha in the 2019 growing season [2] making this crop one of the most profitable and strategic horticultural crops in the country. The 'Picholine Marocaine' is the predominant variety; more than 96% of olive groves are planted with this variety [3]. Two varieties, 'Menara' and 'Haouzia', registered for cultivation in Morocco, were developed through clonal selection [4]. The analysis of the whole profile of trace elements and mineral nutrients can contribute to the evaluation the physiological status of the plant in inter-connection with the pathogen infection [5]. Studies on mineral elements accumulation in specific plant tissues, especially in the leaves, have been used to assess the physiological status of the plant [6]. Regarding disease development in plant hosts, the influence of specific mineral elements is well documented. However, the ionome has only been used in a few instances as a composite phenotypic character to assess the relationship between plants and Xf infection. Indeed, some studies understandably indicated a correlation between the content of some

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ions in the leaf and the virulence of Xf [7,8]. It was highly recommended that the host ionome and its variation could be considered as a potential tool for the control of diseases caused by this xylem-limited phytopathogenic bacterium the aim of the present work was to find a sustainable management tool for olive trees threatened by Xf. The tool consists in a thorough determination and comparison of the ionomic, phenolics and flavonoids profile of 'Picholine Marocaine', the most widespread and typical Moroccan olive variety, with those of Moroccan clonal selected varieties ('Haouzia', 'Menara', and 'Meslalla') and eight Mediterranean varieties recently introduced in Morocco ('Arbequina', 'Arbosana', 'Leccino', 'Ogliarola', 'Cellina di Nardo', 'Frantoio', 'Leucocarpa' and 'Picholine de Languedoc') to develop hypotheses related to the resistance or susceptibility of the Moroccan olive trees to Xf infection. All the varieties were grown in the same experimental olive grove and under identical pedoclimatic conditions. To the best of our knowledge, we will be the first in Morocco to carry out this type of proactive research on Xf. However, this research is easily replicable in all Mediterranean countries where olive trees are under an existential pathogenic threat.

Material and methods

2.1. Samples Collection Leaf samples were collected from uninfected 16-year-old olive trees in late December 2020 from olive groves located at the experimental station of the National Agricultural Research Institute (INRA) in Ain Taoujdate, Fez-Meknes region (Morocco). For each tree, five branches were selected, and mature leaves were detached from the median part of hardwood pedoclimatic conditions.

2.2. Extract Preparation, Assessment of Total Phenolic and Flavonoid Content After Polymerase Chain Reaction, leaves were cut and frozen at 20 ◦C for later lyophilization. Then, they were ground into powder at room temperature using an IKA A11 Basic Grinder (St. Louis, MO, USA). Extraction was based on the method previously described by Sanders et al. The total phenolic (TP) content of leaf extracts was determined using the Folin– Ciocalteu micro method [30]. And the total flavonoid (TF) content was measured using the colorimetric method with aluminum chloride [9,10]

2.3. Determination of Leaf Ionome and Soil Parameters Samples were analyzed by ICP-OES as described by Cobine et al. [11], with simultaneous measurement of Ca, Fe, Mg, Na, Mn, Na, P, S, and Zn. As controls, blanks of nitric acid were digested in parallel. Mineral concentrations were determined by comparing emission intensities to a standard curve created from certified mineral standards (SPEX CertiPrep). Three independent experiments were performed

Results

No amplified DNA was obtained from any of the tested samples using PCR, confirming the absence of the bacterium in these samples. The total concentrations of mineral elements of the leaves sampled are shown in Table 1. The elemental composition was compared with reference values of nutrient content in olive leaves [12]. The concentration of Mg, Mn, Na, and Zn was within these reference ranges. However, Fe and P were considered low or close to the minimal range. Comparing leaf Mn, Cu, Zn, and P. The same varieties also showed lower levels of Ca, Na. Concerning the four remaining varieties, 'Picholine Marocaine', 'Picholine de Languedoc', 'Ogliarola', and 'Cellina di Nardo', data indicated lower levels of Mn, Zn, Cu. These varieties showed higher levels of Ca and Na (Table 1). Nutrient concentrations are expressed in $g \cdot kg^{-1}$, except for Mn, Na, and Zn that are expressed in $mg \cdot kg^{-1}$. Ca concentration was higher than the reference (1–14 $mg \cdot kg^{-1}$).

Table 1. Elemental analysis of olive leaves expressed in weight per dry weight. The mean of three replicates was represented.

	Ca		Mg	P	Cu	Mn	Na	Zn	Fe
Reference *	mg/kg or g/kg	10–14	1–1.6	1–1.3	-	20–36	<200	4–9	90–124
Arbiquina	NA	13.20	2.04	0.82	17.35	31.18	33.30	7.80	67.05
Arbozana	NA	12.52	2.09	0.93	18.50	35.38	28.60	10.23	67.60
Menara	NA	13.35	2.01	0.72	17.03	31.18	35.75	7.86	69.46
Haouzia	NA	14.32	1.83	0.70	17.02	29.46	35.16	7.66	70.32
Picholine Marocaine	NA	19.50	0.98	0.49	10.40	23.40	41.35	5.13	80.36
Picholine Languedoc	NA	20.50	0.85	0.33	9.97	21.33	41.61	4.57	80.87
Frantoio	NA	14.45	1.75	0.68	15.25	28.82	35.05	7.25	72.34
Leucocarpa	NA	14.51	1.65	0.62	15.15	28.21	34.24	7.06	72.36
Leccino	NA	7.02	3.62	2.51	23.82	42.63	20.21	15.61	41.3
Meslalla	NA	15.30	1.50	0.53	14.93	26.38	40.31	7.01	73.65
Cellina di Nardò	NA	27.15	0.16	0.12	7.88	18.59	48.76	4.80	93.45
Ogliarola	NA	27.31	0.12	0.13	7.12	17.99	49.40	4.31	95.45

Element concentrations are expressed in g/kg, except for Fe, Mn, Na, and Zn that are expressed in mg/kg. * Reference concentrations were obtained from Kailis and Harris [14].low level of Mg. Ca concentration in 0–35 cm soil depth was lower than the reference (3000 mg·kg−1), while Mn concentration was higher than the reference (5–20 g·kg−1) (Tables 2 and 3).

Table 2. Physical and chemical properties of soil.

Soil Depth	Sand	Silt	Clay	pH	EC	OM	K2O	P2O5	CaCo3
Cm	%	%	%		mS/cm	%	$mg \cdot kg^{-1}$	$mg \cdot kg^{-1}$	%
0–35	46.8 ± 0.4	10.20	43.00	6.50	0.10	2.50	458.80	73.30	2.70
35–70	46.10	16.10	37.60	7.80	0.10	1.60	222.50	15.10	3.10

EC: electrical conductivity, OM: organic matter, K2O: potassium, P2O5: phosphorus, CaCo3: calcium carbonates. Data represent means ± standard deviation.

Table 3. Chemical analysis of soils wherein the leaf ionome profiles were evaluated.

	Mg	Cu	Mn	Na	Zn
Soil analysis ($mg \cdot kg^{-1}$ Fine Fraction)	237.6	19	25.3	2109	0.8

Values represent averages of three replicate samplings. All varieties refer to soil collected from the same area.

1.1 Determination of Total Phenolic and Flavonoid Content

The total phenolic content in leaves of the studied varieties is reported in Figure 1. Regarding results, the total phenolic content of all varieties varied considerably since several varieties showed different statistically significant values (F = 157.69, p = 0.02). ‘Leccino’ presented the statistically significant higher phenolic content (45.8 mg GAE/g) followed by ‘Arbiquina’, ‘Arbozana’, ‘Menara’, ‘Haouzia’, ‘Frantoio’, ‘Leucocarpa’, ‘Meslalla’, ‘Picholine Marocaine’, ‘Picholine de Languedoc’, ‘Cellina di Nardò’, and ‘Ogliarola’ which showed the statistically significant lower phenolic content (8.07 mg GAE/g). Concerning the total flavonoid content, statistical analyses showed a significant difference regarding the vari- ety’s values (F = 136.45, p = 0.03). ‘Leccino’ showed the highest total flavonoid content (24.49 mg GAE/g) and ‘Ogliarola’ the lowest total flavonoid content (4.89 mg GAE/g) (Figure 2)

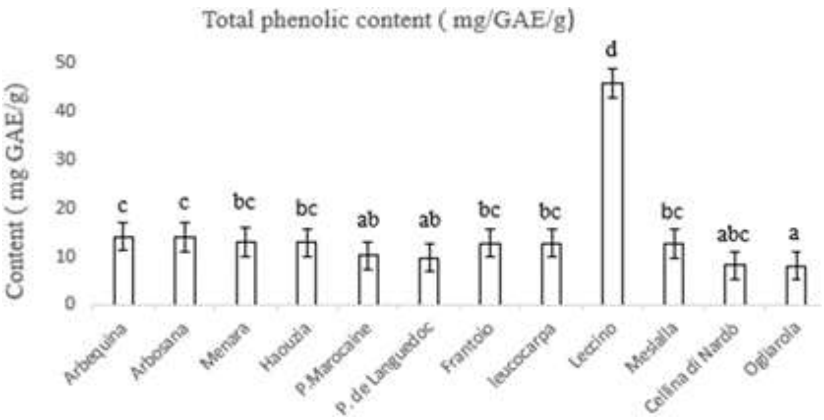

Figure 1. Total phenolic content for the studied Olive varieties (mg GAE/g).

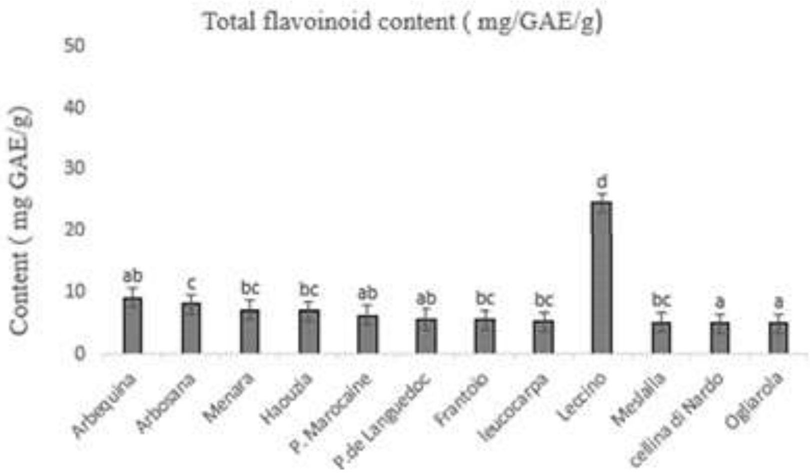

Figure 2. Total flavonoid content for the studied Olive varieties (mg GAE/g).

1.2. Principal Component Analysis

Principal component analysis (PCA) was used to determine the most significant descriptors in the data set. Only a principal component loading of more than 0.5 was considered as being significant for each factor. Thus, a total variance of 98.47% was explained by only two components. The first component consisted of 10 variables, which represent more than 90% of all total variables, and explained 91.4% of the total variance (Figure 3). The first component accounted for 91.4% of total variance, which is strongly correlated to Ca (r = 0.921), Mn (r = 0.979), Mg (r = 0.987), Na (r = 0.970), Zn (r = 0.974), Cu (r = 0.963), P (r = 0.965), Fe (r = 0.989), TPC (r = 0.939), TFC (0.865). The second function accounted for 7.06% of total inertia.

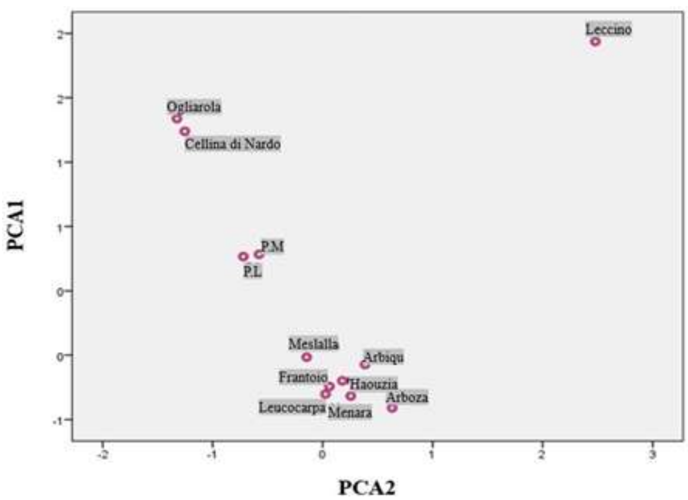

Figure 3. Principal Component Analysis

Discussion

Xylella fastidiosa continues to emerge as a major and devastating bacterial pathogen for innumerable crops, and no cure has been identified so far. Current management strategies are based on the use of cultivars showing resistance to the pathogen in the field such as 'Leccino' [13] and the control of vectors to limit the disease spread. The first requires including tolerant genotypes in breeding programs or replacing susceptible varieties in the current fields [13–14]. Many characteristics make Xf attractive for studying the effects of nutrients in plant-pathogen interactions. Specifically, since it is xylem-limited, this bacterium is found in the vessels where mineral elements are translocated throughout the plant. Consequently, we spotlight the hypothesis that differences within the ionome of non-infected Moroccan olive trees, the total phenolic and flavonoid content can give an overview of the plasticity and immunity of the Moroccan olive sector to Xf before the bacterium enters Moroccan groves [15,16].

The outcome of the present investigation shows that 'Leccino' olive variety has a higher Mn, Cu, Zn, total phenolic, and flavonoid

Content, and lower Ca and Na content which is in line with other previous work [17,18,19]. Manganese, Cu, and Zn are essential

micronutrients for plant growth; Mn is involved in the photosynthetic machinery and in the detoxification of reactive oxygen species (ROS) [20], Cu is essential for the formation of chlorophyll [21], and Zn is involved as a cofactor in many enzymes such as alcohol dehy- drogenase, carbonic anydrase, and RNA polymerase [22]. It is worth noting that these ions are also strongly involved in the plant defense machinery and in the Xf virulence. Furthermore, these ions are strongly involved in the plant defense artillery against infec- tions, including Xf [23]. Specific attention is attributed to Zn ability to reduce the pathogenicity of pathogens [24]. A Zn-finger protein gene, CAZFP1, encodes a zinc-finger transcription factor that builds up in the preliminary phase of the infection of Xanthomonas campetsris pv. vesicatoria to pepper fruits [25]. In addition, Zn-fingers binding domains are related to the effector-triggered immune response [26]. High Zn concentrations can pre- serve plants by direct toxicity and by Zn-triggered organic defenses [27,28]. This confirms the importance of crop nutrient management for a sustainable agriculture [29]. Xf bofilm formation is prohibited by Zn and Cu concentrations higher than 0.25 mM, and 200 μM respectively [30], and in planta, Zn detoxification is needed to trigger the full vir- ulence of the pathogen [31]. Within this context, previous studies have shown that the supply to the olive canopy of a zinc-copper–citric acid biocomplex, namely Dentamet®, reduces both the field symptoms and Xf subsp. pauca cell densities in the foliage allowing the trees to survive the infection [32]. Recently a high Mn leaf content would appear to match up with a relative level of tolerance in Leccino cultivar to Xf subsp. pauca [33]; the present study would corroborate this feature since both 'Ogliarola salentina' and 'Cellina di Nardò' cultivars are characterized by a lower Mn content than Leccino. The Mn ion is involved in flavonoid and lignin production thereby preserving the cultivar from infection by Xf subsp. pauca [29]. Another important ion, Ca, seems to influence biofilm formation by both extracellular ionic bridging and intracellular stimulation that relies on protein [13]. Ca increases cell attachment probably via type I pili, twitching motility and cell-to-cell attachment responsible for cell aggregation [18]. Consequently, it is a limiting factor in the initial stages of biofilm formation characterized by cell attachment, while it has a less prominent role in late stages of biofilm maturation [15]. Based on those facts, it is logical that olive varieties exhibiting high content of Mn, Cu, and Zn and low content of Ca and Na ('Arbequina', 'Arbosana', 'Menara' and 'Haouzia') would likely be more effective in resisting the development of the infection after the formation of Xf biofilm. On the other hand, the varieties showing a high content of Ca and Na and reduced content of Mn, Cu, and Zn ('Frantoio', 'leucocap' 'Meslala') would be more adapted to fight the formation of Xf biofilm in the first place. We also believe that olive varieties with deficiency of the mentioned ions would likely be extremely sensitive and prone to a fast and strong Xf infection ('Picholine marocaine', and 'Picholine de Languedoc') based on the current data.

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Phages as a potential biocontrol of phytobacteria

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Key words: Bacteriophages, Biocontrol, Erwinia amylovora, Phage cocktail, Plant pathogens.

Abstract

The ability of agriculture to continuously feed a growing world population depends essentially on the use of effective and sustainable strategies to control crop diseases. Currently used bacterial infection control strategies, involving antibiotics, pose a real threat to the environment and to human health, and are losing efficiency due to the appearance of bacterial resistance to these agents. The use of bacteriophages presents an attractive option to control plant bacterial pathogens. Numerous successful experiments and comprehensive studies have been published on bacteriophage-based biocontrol measures, discussing detailed results of phage application practices in pest management. They have led to a renewed interest in phages for the control of plant diseases caused by phytobacteria. The present review highlights the application of phages as a new therapy strategy, and looks at different challenges facing phages as biocontrol agents in agriculture. We emphasize the use of phage cocktails to prevent bacteriophage resistance and to enhance efficacy, and we discuss the different methods for the development of phage cocktails. We present protective formulations used in previous research on stabilization and storage of phage, and propose lyophilization as a privileged method for maintaining phage viability. Herein we focus on bacteriophage-mediated control of fire blight, the most destructive bacterial disease of apples and pears, which is caused by Erwinia amylovora.

Introduction

“One in nine people goes hungry. This corresponds to approximately 820 million people of the world population. Approximately 2 billion people in the world experience moderate or severe food insecurity and are exposed to an increasing risk of malnutrition and poor health. This population, of which a third suffers from hunger or malnutrition, continues to grow, pushing researchers to find lasting solutions to the constraints that stand against the achievement of food security” (The State of Food Security and Nutrition in the World [SOFI] 2019).

Climate change and agricultural crop diseases are affecting agricultural productivity, food production and natural resources, with impacts on rural food systems and livelihoods, including a decline in the number of farmers. All of this has led to major changes in the way food is distributed and consumed around the world (Pautasso et al. 2012).

Plant pathogens are a major constraint to agricultural production worldwide. They are responsible for huge yield losses (Strange and Scott 2005). Indeed, 20-30% of crops are lost worldwide each year due to plant diseases, caused by phytopathogens, among which, there are more than 200 species of phytobacteria (Douglas and Glenn 1982).

Erwinia amylovora is the causal agent of fire blight, which among the most destructive bacterial diseases of Rosaceae (Bonn and van der Zwet 2000). It represents the real enemy of several fruit trees, which are of great economic importance, such as apple and pear trees (Bonn and van der Zwet 2000). This bacterium can affect most of the tree tissues causing the death of young trees in a single season (Vanneste and Eden-Green 2000). It is present in five continents, causing significant economic losses in commercial orchards around the world (OEPP/EPPO 1983). Mansfield et al. (Mansfield et al. 2012) ranked Erwinia amylovora among the "Top 10" bacterial pathogens based on their scientific and economic importance. Despite that, the strategies used to control these phytopathogens remain a challenge for agricultural production.

The most commonly used bacterial infection control strategies are antibiotics and chemical products. However, the heavy use of antibiotics in agriculture is causing the emergence of antibiotic resistant pathogens, especially among bacteria. The transfer of this resistance to other pathogenic strains,

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especially those that infect humans, constitutes a real danger to human health (Sundin and Wang 2018). Currently agriculture needs environmentally friendly control methods, that are respectful to human, animal, and plant health, and the health of beneficial microbes, preserving the balance of the environment and reducing the threats caused by our wrong choices and unreasoned resources use.

Bacteriophages are natural killers of bacteria, having the capacity to multiply rapidly and to reduce the density of bacterial population (Weinbauer 2004). These natural inhabitants of the environment constitute new tools to fight bacterial infections (Balogh et al. 2010), which cause intolerable damage to crops of great economic and agronomic importance (Svircev et al. 2018).

The aim of this review paper is to discuss the concept of the use of bacteriophages, as a potential eco-friendly strategy, in plant diseases management. First, we will show the benefits of bacteriophages, and the interactions with their hosts. Second, we will discuss recent research, investigating the use of phage cocktails to develop an efficient pesticide and to prevent the development of phage-resistant bacteria. Then, we will illustrate how to manipulate phages in order to enhance their biocontrol potential against plant pathogens. We will focus here on E. amylovora.

- Why phages?

The interest in phages as biocontrol agents is attributed to many features that make them attractive agricultural biopesticides. They are abundant and omnipresent, which facilitates their isolation. Moreover, they are easily purified and cultured; and their manipulation does not require complicated and laborious protocols. The phages eco-friendliness lies in their non-toxic nature to eukaryotic cells and their limited effect on the microbial ecology of the surrounding environment, since they survive only in the presence of their particular host (Lehman 2007). They are natural inhabitants, do not leave residues, and are biodegradable, unlike many agrochemicals (Chanishvili et al. 2001; Pietrzak and McPhail 2004). Another feature distinguishing phages from antibiotics and chemical products is that phages are specific to their host bacteria (Basit et al. 1992). This host specificity varies among phages. Some of them are strain-specific, whereas others have demonstrated the capability of infection across a range of bacterial strains and even genera. The phages in this group are polyvalent. This particular feature may be an advantage or a disadvantage depending on the type of phage-pathogen therapy system (Loc-Carrillo and Abedon 2011). These bacteria killers have also the ability to overcome resistance. They are always in co-evolution with their host bacteria. Therefore, phages may be successfully used against multidrug-resistant bacteria. Other advantages are the ease of multiplication and the low cost of production that does not require complex technologies. Finally, they are self-replicating: a small dose of phages is enough to control a bacterial disease (Gill et al. 2007). This does not need a lot of time; most lytic cycles take 30 to 40 min (Jassim and Limoges 2017).

- Bacteriophage types used as biocontrol agents

The most crucial determinant that must be considered when choosing phages as biocontrol agents is whether the phage is lytic or lysogenic. It is necessary to know the type of the phage before choosing it as a biocontrol agent, to ensure effective and healthy control (Chan et al. 2013). Lytic phages actively infect host bacteria and kill the host to release progeny. Due to this feature, they have been used for phage therapy to control many bacterial pathogens causing disease in animals and plants (Abedon 2006). Conversely, lysogenic phages should be avoided as viable biological control agents because:

i. they are less efficient, taking time to initiate replication and destroy the host cell through lysis; most of the time, they integrate into the host genome as a latent prophage, keeping the host cell alive (Łobocka et al. 2004);

ii. some of them propagate pathogenic genes via transduction (Griffiths et al. 2005),

iii. others possess virulence genes that can make host bacteria more virulent (Howard-Varona et al. 2017; Taylor et al. 2019),

iv. and they may cause superinfection exclusion of the host (Bertozzi Silva et al. 2016); in this case, the prophage-carrying bacteria are protected from a superinfection by a similar bacteriophage (Lu and Henning 1994).

Therefore, inappropriate use of bacteriophages leads to bacterial development of bacteriophage resistance.

- Use of phage cocktails as biocontrol agents of phytobacteria

The application of a single type of phage (monophage therapy) makes it easier for bacteria to develop resistance to that phage. However, the simultaneous use of more than one phage type (polyphage therapy or phage cocktail method) may prevent the development of phage-resistant bacterial mutants (Deveau et al. 2002). In addition to the prevention of resistance development, there are other good reasons for the use of phage cocktails.

The first reason of using phage cocktails is to increase the robustness and performance of the product. In other words, phage formulation into cocktails may achieve synergy between the phages forming the cocktail, in which one augments the properties of another, resulting in higher and/or faster rates of pathogen lysis. In that case, the phages forming the cocktail create the environment for improved virulence of each other and improve their lytic capacity (Enikeeva et al. 2010).

The second reason is that the phages mixture is used to target different pathogen strains because the majority of bacterial species are characterized by a big genetic diversity. A single phage will not target all strains of a pathogen. Therefore, the polyphage method creates a complementarity between the phages forming the cocktail for a complete and effective control. Phage cocktails can also be used to target different phytopathogens and control more than one disease in the field, by formulation of a cocktail of multiple phages infecting different hosts (Schmerer et al. 2014).

- Methods for phage cocktail formulation

Ideally, before selecting each phage, it is necessary to study its host range and make sure that it does not infect beneficial strains. On the other side, phages in a cocktail should cover the widest possible range of the pathogen strains, and have different infection mechanisms, while ensuring complementary infectivity on the host. Generally, and in order to reduce the number of phages within a cocktail, they should have high adsorption, short latency, different receptors, large burst size, and broad host range (Gill et al. 2003). Based on these criteria, there are different methods to develop an effective and sustainable cocktail of phages:

- Mixture of phages that use different receptors

The sensitivity of a bacterium to phage infection initially depends on the adsorption of phages on their receptors, which serve as the initial binding sites for the phages. Therefore, the identification of these receptors is essential and critical. The nature of the receptor varies for individual phages and may include teichoic acids, lipopolysaccharides, outer membrane proteins, capsules or slime layers, flagella, and pili (Bertozzi Silva et al. 2016). Once the different receptors have been identified, phages that use different receptors can easily be selected and used as biocontrol agents into the phage cocktail to prevent the problem of resistance; because different single point mutations may not occur simultaneously (Ross et al. 2016).

- The step-by-step method

The step-by-step method (Figure 1) is based on the interaction between the wild-type bacterial strain and its phage-resistant mutants. The wild-type bacterial strain role is to isolate the first phage. Thereafter, the long interaction between this first phage and the wild-type bacterial strain results in a phage-resistant mutant (wild-type bacteria insensitive to the first phage). Then the phage-resistant mutant is used to isolate the second phage, which is able to infect first-phage insensitive bacteria. These steps may be repeated to isolate other effective phages against different forms of resistance of bacterial strains (Flaherty et al. 2001).

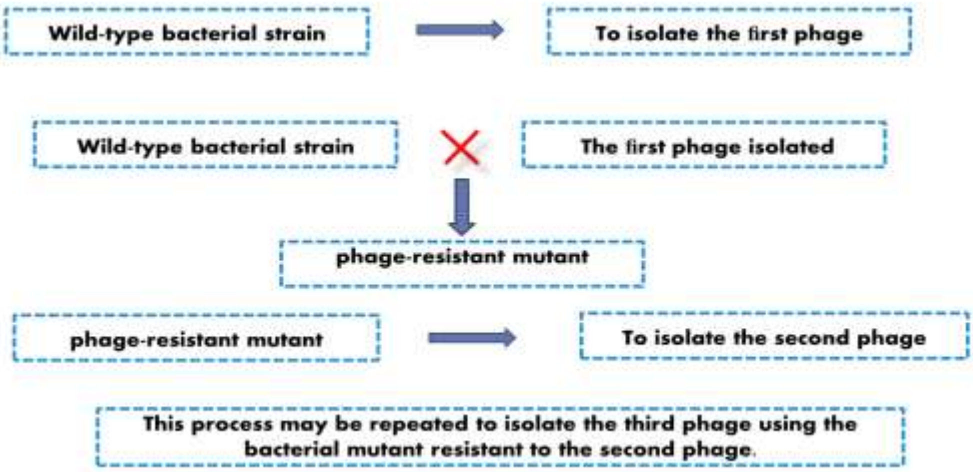

Figure 1: diagram illustrating the step-by-step method

- Use of the antivirus

This method is used to directly isolate the effective phages against the desired pathogen. It is a simple method that consists in enriching the phage samples, in liquid cultures, with mixtures of pathogen strains, and giving the effective phages time to infect the bacterial cells. Then, the antivirus is added to eliminate the other phages that remain outside the cells. The cells are then recovered to isolate the phages that were able to infect them. Finally, all the phages are combined and used as a biocontrol agent. This method is simple and fast, it makes use of the phages rich natural resources, which could be used as an effective tool to control phytobacteria.

- Considerations before using bacteriophages as biocontrol agents

After the development of a phage cocktail, comes the stage of using it as a biocontrol agent. Several factors can lower the control efficacy of phages, mainly by reducing their ability to persist on plant surfaces. Excessive heat, extreme pH, desiccation and UV light are the main environmental factors that inactivate or reduce the effectiveness of bacteriophages (Gu et al. 2012).

To protect phages, during their application as biocontrol agents, from different environmental factors, and to propagate the phages population in the field, a combination phage-bacterium is necessary (Born et al. 2015). The bacterium acts as a carrier ensuring the propagation of phages in the field. It increases phage populations before pathogens arrival, if the control is preventive, and protects phages from inactivation. The application of bacterial pathogen cells as a carrier during preventive treatment may be the cause of the pathogen introduction into an orchard (Schnabel et al. 1999). Therefore, we should preferably use non-pathogenic susceptible hosts propagate and protect phages population. Pantoea agglomerans, a Gram-negative bacterium belonging to the Erwiniaceae family, is used as a plant pathogen competitor for the management of various plant diseases such as fire blight (Balogh et al. 2010). It is used as a carrier for Erwinia amylovora phages because of its several benefits: (i) it is easily infected with Erwinia amylovora phages, (ii) it provides sacrificial host cells that propagate the phage population, (iii) it is already a biological control agent, since it can increase the treatment efficiency, and (iv) it maintains phages in their lytic replication cycle pending the arrival of pathogens (Svircev et al. 2010).

- Optimal biocontrol performance of phages on plants

Phages survival in the phyllosphere and rhizosphere is enhanced by different practices. Persistence and survival are improved if the phages are accompanied by a viable host. It has also been found that daylight, during application of phages, affects their persistence and effectiveness (Iriarte et al. 2007). However, Iriarte et al. (Zhang et al. 2018) demonstrated that, in tomato leaves, evening was the optimal time for applying phages to infect and kill their bacterial targets, resulting in longer phage persistence in the phyllosphere.

Phages can be applied either by foliar spraying or by treating the surrounding soil of the plant. Iriarte et al. (2007) found that phage persistence was lower in stems and leaves than that in roots. They also demonstrated that a proprietary mixture of phages (OmniLytics Inc.), which is active against X. perforans strain 97-2, could be detected in leaf tissue for 7 days after its application to soil, and only for 1 to 2 days after direct foliar application. This study demonstrated the systemic propagation of phages and suggested that foliar diseases are better controlled by applying the phage to the soil near the plant (Iriarte et al. 2007).

Conclusion

Phages constitute a potential biocontrol option to fight diverse plant pathogens, providing several benefits while protecting the environment, human health and biodiversity. However, their use in the therapy strategy faces different challenges; and there is a need for more research to achieve effective biocontrol. Success requires a high diversity of effective phages and a harmonic complementarity between them. It also requires more studies on phage ecology and bacteriophage-host interactions in the plant environment.

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Alternative animal feeds for Mediterranean poultry breeds to obtain sustainable products

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Project

New food chains must be environmentally friendly, foster local economies and consider social aspects. Feed production will be the mainstream of this change. SUSTAvianFEED aims to demonstrate innovative poultry farming systems by the inclusion of sustainable animal feeding: the project will develop a sustainable nutritional formula for poultry farming in which insects will play a key role and which will lead to innovative poultry farming approach.

The main objectives of the SUSTAvianFEED:

To develop a sustainable nutritional formula for poultry farming through the use of insects and the substitution of protein sources with high and negative environmental impact (as soybean or fishmeal) in the poultry feeding programs by regional agri-food sector by-products in order to follow circular economy principles.

To reduce the environmental impact of the poultry sector while offering quality, safe and affordable products.

To promote the local economy, socioeconomic growth, and local resilience of Mediterranean areas.

To improve animal health and welfare

To promote gender equality and empowerment of women.

To develop a multi-actor approach in which relevant actors of the whole value chain are involved.

[1] ALIA, Agricultural Transfomation Society,Camino del Duende, 14 La Hoya, Lorca, 30816, Murcia, Spain
[2] Murcia University, Avda. Teniente Flomesta, 5 · 30003 · Murcia, Spain
[3] Torino University, (UNITO), Via Garibaldi, 25, İtaly
[4] ISA-CM, Institut Supérieur Agronomique de Chottt Mariem,, B.**P**. 47, 4042 Chott Mériem Sousse- Tunis
[5] Rayhana Association for Women of Jendouba, Tunis
[6] EntomoAgroIndustrial, Calle Coso, 30430, Cehegín, Murcia, Spain
[7] Ege University, Agriculture Faculty, Bornova İzmir Turkiye

Partners

ALIA (Project Coordinator). Spain	Project coordinator. It will manage the overall coordination of the project (WP1) and, in addition, will be responsible for the design of the feeding program with sustainability criteria for the local poultry breeds of each country (Task 2.1). Furthermore, ALIA will be the responsible partner in the exploitation of project results and the Living Lab activities (WP4).
University of Murcia (UMU), Spain	UMU will be the leader in the development of WP2 (Development of alternative poultry feeds), including the leadership of environmental evaluation of diets based on LCA techniques (Task 2.4) as well as its nutritional evaluation (Task 2.4). Furthermore, UMU will be the responsible partner of the Environmental evaluation of pilot activities (Task 3.5). Poultry breeds: Western Mediterranean breed, autochthonous and adapted to the environment. For example: Andaluzas, Levantinas or Castellana (local)
University of Torino (UNITO), Italy	UNITO will test the effects of dietary insect larvae supplementation on birds' welfare and health (gut microbiota and microbiome) (task 3.3). Additionally, UNITO will focus its pilot activities on the Italian chicken breed "Bianca di Saluzzo", a meat-type breed. Furthermore, UNITO together will organize a final conference at a relevant international event. UNITO will also arrange local capacity building activities (Task 5.4).
Institut Supérieur Agronomique de Chott Mariem (ISA-CM), Tunisia.	ISA-CM will develop its pilot focused on meat and eggs (Autochthonous Tunisian, ecotype) production and will also develop another common pilot with Rayhana, focused on rural women development and gender perspective. In addition, ISA-CM will lead Task 3.4, about the productive traits of birds and the egg and meat quality and task 5.5., Participation in international events.
Association Rayhana, Tunisia.	Responsible for pilot actions with women's groups in Jendouba region and the analysis of the social impact of pilot actions (Task 3.7). Rayhana supports women's involvement in the project; even training on economic activities' sustainability and diagnostic activities prior to the start of the project are based on this methodology.
Entomo Consulting SL (ENTOMO), Spain.	ENTOMO will be the responsible partner of the insects' area in the project, in particular of Task 2.2, about the analysis of insects' farming in each territory and Task 3.1 about the implementation of insects' farms at local sites. In addition, it will be the Innovation manager of the project. In addition, it will lead Task 4.3, regarding the development of guidelines for Circular Economy Business Models.
Ege University (EGE), Türkiye	EGE will lead the Work Package 3: SUSTAvianFEED Pilots. Pilot activities in EGE will focus on meat production using a local breed (Anadolu-T, ecotype) EGE

	will also have the responsibility for the economic evaluation of pilot activities and be the co-responsible partner of the social analysis of consumer evaluation of the final product.
Fondazione Slow Food per la Biodiversità Onlus (SLOWFOOD). Italy. Slow Food Foundation for Biodiversity	Slow Food will lead the WP 5 Exploitation, dissemination, and communication.

Methodology

1. Multi-actor approach

2. Five pilots in four different Mediterranean countries (Tunisia, Türkiye, Spain, and Italy). Social, environmental, and economic analyses will be developed for each pilot.

3. Living Labs activities

Five pilots will demonstrate the innovative poultry feeding approach in order to obtain sustainable products. The pilot activities will be developed in four different regions of the Mediterranean area:

Spain, Tunisia, Italy, Türkiye perfectly complement each other, as they share similarities in terms of climate and environment, but also remarkable differences not only in the type of farming systems but also regarding socio-economic aspects. They will combine the production of meat and eggs.

In egg-type laying hen pilots, the egg production (number and weight) and the quality of the eggs (both external, internal, and nutritional traits) will be evaluated.

In meat-type chicken pilots' growth and slaughtering performance will be recorded. On a representative number of birds' samples of meat (breast and drumstick) will be taken for meat quality assessment.

All the pilots developed in universities will share the same basal experimental design regarding the feeding program as follows: 1) a standard commercial diet; 2) a diet including local ingredients or by-products and less soybean meal (LOC) and the inclusion of 5% dehydrated insect larvae (DIL); 3) LOC and 10% DIL. The basal diet will be formulated according to the type of chicken farming (egg-type or meat type). All pilots will also share some evaluations over the whole experimental period, namely: mortality rate, feed consumption, and body weight will be recorded. Welfare assessment will be carried out by both hematological (i.e. H/L ratio) and behavioral (i.e. ethogram). During the experimental period, at least two representative fecal samples will be taken to evaluate the evolution of fecal microbiota. At the end of the breeding cycle caecal microbiota and microbiome will be evaluated. Samples of different gut segments (duodenum, jejunum, ileum) and other organs (liver, spleen, thymus, bursa of Fabricius) will be processed for histological evaluation. RAYHANA pilot will be focused on social aspects and the empowerment of rural women, while scientific protocols and assessments will be adapted to the characteristics of the rural context.

Impacts and Expected Results

SUSTAvianFEED project will contribute to the main European and international strategies for the sustainable development, such as the:

- European Green Deal
- Sustainable Development Goals (SDGs)
- PRIMA Strategic Research and Innovation Agenda (SRIA)
- Circular Economy Action Plan of the European Commission

Furthermore, it will contribute to the impacts referred in the topic of the proposal. SUSTAvianFEED has a great potential impact on farming practice and human social environment, as described below:

- Reduction of at least 10-15% of GHGs emissions per kg of poultry feeding in comparison with the traditional ones.
- Improvement of the use of agriculture by-products to produce insects will contribute to the circular economy.
- Promote mixed crop-livestock systems, which include insect farming (to valorize agriculture waste), and alternative poultry feeding practices (including insects and agriculture by-products), thus promoting a circular economy.
- The socioeconomic growth of small-scale farmers in the Mediterranean marginalized rural areas.

Implementation

SUSTAvianFEED project is structured in five Work Packages.

i) WP1 (ALIA) is focused on the overall project management and coordination activities. It will last the whole project implementation.

ii) WP2 (UMU) and WP3 (EGE) are focused on the development of the alternative poultry feed and the pilot implementation respectively. These two WPs will be implemented considering environmental, social, and economic criteria. The development of the alternative poultry feed will start at the beginning of the project. After its elaboration, the project pilot's implementation will follow.

iii) WP4 (ALIA) presents the stakeholder interaction and end-user involvement, which will be closely related to the whole project implementation in an iterative process which will engage relevant actors of the supply chain. The interrelations among the WPs are further explained in the work package description.

iv) WP5 (SLOW FOOD) will be focused on the exploitation, dissemination, and communication activities, in order to engage a large number of different audiences and to promote further replication activities of the project. This work package will be developed during the whole project implementation.

https://www.sustavianfeed.eu/ https://www.sustavianfeed.eu/fr/

https://www.sustavianfeed.eu/it/ https://www.sustavianfeed.eu/tr/

https://www.sustavianfeed.eu/es/

e-mail: info@sustavianfeed.eu

Annex: Programme for the 4th International Conference on Organic Agriculture in Mediterranean Climates: Threats and Solutions, MAY 27-29, 2022, 11th Ecology Izmir Fair (Gaziemir / Izmir/ Türkiye)

Date	Hour Session	PRELIMINARY PROGRAMME		
May 27, 2022				
27th May 2022	8:30-9:30 AM (TR)* 7:30-8:30 AM (CET)	Registration		
27th May 2022	9.30-10.00 Morning	B HALL Opening Session **Uygun Aksoy**- ETO, President, TR **Dražen Lušić** - IFOAM-ABM, President, HR **Gerold Rahmann**- ISOFAR, President, DE **Mehmet Ali Işık**- Aegean Dried Fruit Products Exporters' Association- The Aegean Exporters' Associations, President, TR **Banu Yücel** - Faculty of Agriculture, Ege University, Izmir, Dean, TR **Başak Egesel**, GDPP, MoAF, TR Representer, TAGEM, MoAF, TR		
27th May 2022 Friday	10.30-11.30 Morning	When: May 27, 2022 09:30 Istanbul Topic: 27.05.2022 EKOLOJİ WEBINAR Please click the link below to join the webinar: https://us02web.zoom.us/j/86404291273?pwd=d01OUzA3Z2dncGtEWlovU3 NXY0o4QT09 Passcode: 330241 B HALL SESSION 1: Organic Agriculture in Mediterranean Climate: Current state of art and threats Moderator: **Constantinos Machairas**, General Secretary IFOAM Agribiomediterraneo & Board Member at Organization Earth – GR Keynote Speaker**: Mr.Petros Kokkalis** **(online)** **"Uniting the Mediterranean through sustainable farming against climate crisis"** Member of the European Parliament, Comm. on the Environment, Public Health and Food Safety; Comm. on Agriculture and Rural Development and Comm. on Fisheries, BE **"Cross border alliances and partnerships to tackle challenges of organic value-chains through innovative solutions in the Mediterranean countries"** Mara Semeraro, CIHAEM-IAMB, IT **(online)** **Organic agriculture development in Tunisia"** Samia Maammer, MoA, TN **(online)** **"Reflections of Good Manufacturing Practice Applications in Bee Products"**, **Banu Yücel**, Ege Uni., TR **"The future of the organic livestock industry in Türkiye: Problems and opportunities"**, **Gürsel Dellal**, Erkan Pehlivan, Hülya Hanoğlu, Ali Şenok, Ankara Uni., TR		
BREAK 11.45-12.00				

27th May 2022 Friday	12.00-13.30 Morning	When: May 27, 2022 09:30 Istanbul Topic: 27.05.2022 EKOLOJİ WEBINAR Please click the link below to join the webinar: https://us02web.zoom.us/j/86404291273?pwd=d01OUzA3Z2dncGtEWlovU3 NXY0o4QT09 Passcode: 330241 B HALL PANEL 1: Boosting organic production with farm to fork strategy and green deal actions Moderator: **Kürşat Demiryürek**, Ondokuzmayıs Uni., TR Invited speaker: **Gerold Rahmann** -President ISOFAR, DE **"Latest changes in organic regulations of organic farming"** Panel Speakers -**Ayhan Sümerli**, ORGUDER, TR -**Gürsel Dellal** - Ankara Uni., TR -**Vugar Babayev**, GABA (Ganja Agribusiness Assoc.) Chairman, AZ, **(online)** -**Mohammadreza Rezapanah**, CEOA/IRIPP & AIPPSS, Tehran, Ir and TIPI, IR **(online)** **Panel Discussion**		4th Mediterranean Climates Conference
LUNCH 13.45-15.00				
27th May 2022 Friday	15.00-16.00 Afternoon	When: May 27, 2022 09:30 Istanbul Topic: 27.05.2022 EKOLOJİ WEBINAR Please click the link below to join the webinar: https://us02web.zoom.us/j/86404291273?pwd=d01OUzA3Z2dncGtEWlovU3 NXY0o4QT09 Passcode: 330241 B HALL SESSION 2: Sustainability in Organic Livestock Production Moderator: **Gerold Rahmann**, President ISOFAR, DE Keynote speaker **Mahesh Chander**- ICAR- Indian Veterinary Research Institute, IN **"Research and development priorities for sustainable organic livestock production"** **"Sustainability of organic dairy cattle farms in Türkiye" İbrahim Ak**, Uludağ Uni., TR **"The role of small ruminant organic farms in Mediterranean countries to strengthen the sustainability"**, **Muazzez Cömert Acar**, Yılmaz Şayan, Nedim Koşum, Çağrı Kandemir- Ege Uni., TR **"A Qualitative Study on the Reception of New Organic Feed Production Techniques in Menemen, Aegean Region" Ülfet Erdal,** İlhami Levent Dagdelen, Brit Logstein, Stefan A. Adler, Ömer Sökmen, MoAF,IARTC, TR **"Organic Aquaculture in Türkiye: Current Position and Problems"**, **Murat Bilgüven**, Hilal KARGIN Mersin Uni., TR	When: May 27, 2022 15:00 Istanbul Topic: 27.05.2022 EKOLOJİ WEBINAR Please click the link below to join the webinar: https://us02web.zoom.us/j/86255877423?pwd=UGMzUDNYMG94V1g4aGRGTlhZd2xyUT09 Passcode: 040979 HALL C "Mediterranean Organic Olive Growers' Forum" Invited Speaker: **Onn Chen** Vice President IFOAM-ABM - C.E.O · R.A.N Fresh Produce Ltd - IL *Forum invitees: Leader Organic Farmers, Researchers, Cooperatives, Farmer Unions, NGOs **Cemal Beldek**- Çine Development Foundation-TR **Emre Bilen** -Researcher at AHCRI-Yalova, TR **Levent Köstem** - KÖSTEM Organic Olive Orchard, TR **Mustafa Tan**-UZZK, TR **Özcan Kokulu**- Gödence Cooperative-TR **Selçuk Bilgi** -Bademli Arboriculture and Agricultural Development Cooperative- TR **Uygun Aksoy**-President ETO, TR **Ünal Kaya** - Director of Olive Research Institute-Bornova, TR **Ümmühan Tibet**-UZZK, TR *(in alphabetical order)	
BREAK 16.15-16.30				

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<td rowspan="1">27th May 2022
Friday</td>
<td>16.30-18.30
Afternoon</td>
<td>When: May 27, 2022 09:30 Istanbul Topic: 27.05.2022 EKOLOJİ WEBINAR Please click the link below to join the webinar:
https://us02web.zoom.us/j/86404291273?pwd=d01OUzA3Z2dncGtEWlovU3 NXY0o4QT09
Passcode: 330241

HALL B
SESSION 3: Solutions and Opportunities in Organic Agriculture
Moderator: Yüksel Tüzel, Ege Uni., Izmir, TR
“Organic Agriculture and project oriented extension studies in Türkiye”, Başak Egesel, MoAF, TR
“Organic Agriculture in Republic of North Macedonia- major weaknesses and possible solutions for further development” Rukie Agic, MKD
“Trends in Organic cotton and Textile Sector”, Aydın Ünsal, EgeDeniz, TR
“Evaluating Organic Cotton Production in Türkiye”, Ülfet Erdal, Zerrin Çelik, Aynur Gürler, MoAF, IARTC, Izmir TR
“Organic cosmetics in the World and COSMOS Standards”, Elif Bozoklu Çimen, ECOCERT, TR
“An overview of preference and behaviour of consumers”, N. Merve Hamzaoğlu, Kültür Uni., İstanbul, TR (online)
“National and international organic farming research carried out by General Directorate of Agriculture Research and Policies (TAGEM) in Türkiye”, Ayşen Alay Vural, MoAF DG Research and Policies, TR (online)
“Actual evaluation of agricultural aspect of Paris Agreement through Regenerative and Organic Practices in Türkiye”, Seda Güleryüz (Presenter) and Ülfet Erdal, MoAF, IARTC, TR
“Got's role in the supply chain: from textile to organic agriculture“, Elif Yaraşık, Gots representative, TR</td>
<td>When: May 27, 2022 15:00 Istanbul Topic: 27.05.2022 EKOLOJİ WEBINAR Please click the link below to join the webinar:
https://us02web.zoom.us/j/86255877423?pwd=UGMzUDNYMG94V1g4aGRGTlhZd2xyUT09
Passcode: 040979

HALL C
SESSION 4: 30 Years of Agribiomediterraneo’ and 50 Years of IFOAM
Organics International
Constantinos Machairas on behalf of IFOAM-ABM</td>
<td>4th Mediterranean
Climates Conference</td>
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<tr><td colspan="5">Wrap-up of Day 1</td></tr>
<tr><td colspan="5">MAY 28, 2022</td></tr>
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28th May 2022 Saturday	10.30-11.30 Morning	When: May 28, 2022 10:30 Istanbul Topic: 28.05.2022 EKOLOJİ WEBINAR Please click the link below to join the webinar: https://us02web.zoom.us/j/84298977919?pwd=bm5WYmtrNWlENHh0ekxmT G1KS0xFQT09 Passcode: 962945 HALL B SESSION 5: Climate Change Moderator: Adamo D. Rombolà-Bologna Uni, IT Key Note Speaker**: Claudia Di Bene**, Alessandro Persiani, Francesco Montemurro, Elena Testani, Roberta Farina, Angelo Fiore, Mariangela Diacono, Council for Research and Economics, Rome and Bari, IT **(online)** **"A model approach to explore agroecological practices for climate change mitigation and adaptation in organic vegetable systems"** **"Organic Production and Water Footprint of Grape in Gediz River Basin"**, Gökşen Çapar, Ankara Uni., TR **(online)** **"Effects of Different Biochar Applications on Greenhouse Gase Emissions Under Corn Plant Growth"**, Ebru Pınar Saygan and **Salih Aydemir**, MoAF, Olive Research Institute, Izmir and Harran Uni., Urfa, TR **"The importance of genotype-nutrition interaction in organic dairy cow farming", Nagehan Nur Altan**, Muazzez Cömert Acar, Veysel Bay. Ege Univ., TR		
BREAK 11.30-12.00				
28th May 2022 Saturday	12.00-13.30 Morning	When: May 28, 2022 10:30 Istanbul Topic: 28.05.2022 EKOLOJİ WEBINAR Please click the link below to join the webinar: https://us02web.zoom.us/j/84298977919?pwd=bm5WYmtrNWlENHh0ekxmT G1KS0xFQT09 Passcode: 962945 HALL B PANEL 2: Climate change adaptation of the organic agricultural sector Moderator: **Khalid Azim**, INRA-CRRA, Agadir, MA Keynote Speaker: **Miguel A. Sánchez Monedero**, María Sánchez-García, Mariluz Cayuela, **(online)** Department of Soil and Water Conservation and Organic Waste Management, CEBAS-CSIC, Campus Universitario de Espinardo, Murcia, ES **"Recarbonization of soils with compost and biochar: lessons from a long-term field study in an organic olive orchard in Spain"** Panel Speakers **Reza Ardakani**, ISOFAR- Vice President, Professor, Agroecology and Organic Farming, Azad University, Karaj, IR **Alexis Giannarakis** IFOAM-ABM Secretariat, "Farms4Climate PRIMA Project", GR **(online)** **Hanna Winkler**, IFOAM-EU, BE **Panel Discussion**		
LUNCH 13.30-15.00				

28th May 2022 Saturday	15.00-17.00 Afternoon	When: May 28, 2022 10:30 Istanbul Topic: 28.05.2022 EKOLOJİ WEBINAR Please click the link below to join the webinar: https://us02web.zoom.us/j/84298977919?pwd=bm5WYmtrNWlENHh0ekxmT G1KS0xFQT09 Passcode: 962945 HALL B SESSION 6: Contentious Inputs Moderator: **Dilek Anaç**, Ege University (formerly), TR Pathways to phase-out contentious inputs from organic agriculture in Europe (Organic-PLUS) Project: Evaluation of system solution scenarios in on field plant trials PART I **"Organic-PLUS – research for a better organic farming"**, Judith Conroy and Ulrich Schmutz, Coventry University, UK, **Judith Conroy (**Presenter), Project Manager **(online)** **"Contentious inputs: peat, plastic and fertilisers; what we did in Organic-PLUS WP5 experiments",** Anne Kristin Loes, NORSØK, NO, WP Soil Leader **(pre-recorded video)** **"Pathways to phase-out contentious inputs from organic agriculture in Europe: Evaluation of system solution scenarios in on field plant trials", Nikolaos Katsoulas (Invited speaker)** (Presenter: Thessaly Uni., GR) (WP Plant Leader), Didier Andrivon (INRAE, FR), Miguel de Cara (IFAPA, ES), Gabriella Cirvilleri (Catania Uni., IT), Jens G. Hansen (Aarhus Uni, DK), Alev Kir (MoAF, ORI, TR), and Ulrich Schmutz (Coventry Uni., UK) **"The Tested Alternatives of Organic Farming Contentious Inputs and Key Results of the Activities", Alev KIR** (Presenter), MoAF, ORI, TR,Barbaros Cetinel (MoAF, PPRI, TR), Ünal Kaya (MoAF, ORI, TR),and Tevfik Turanlı (MoAF, PPRI, Izmir, TR) PART II **"Possible alternatives of contentious inputs for organic animal production",** Muazzez Cömert Acar, Ege Uni., TR **"Legal framework related to contentious inputs of Organic Agriculture in TR, EU and NOP",** Burçin Keremoğlu, ECOCERT, TR **"Key Messages of the Organic Olive production"**, Ünal Kaya (Director, ORI, Izmir, TR) (MoAF, TR) (Project Partner) and Tevfik Turanlı (Director, PPRI, Izmir, TR) (MoAF, TR) (Project Partner), **"Status of contentious inputs of Organic Agriculture in TR"**, Uygun Aksoy (President ETO, TR) (Project Partner)		4th Mediterranean Climates Conference
BREAK 17.15-17.30				

28th May 2022 Saturday	17.30-18.30 Afternoon	When: May 28, 2022 10:30 Istanbul Topic: 28.05.2022 EKOLOJİ WEBINAR Please click the link below to join the webinar: https://us02web.zoom.us/j/84298977919?pwd=bm5WYmtrNWlENHh0ekxmT G1KS0xFQT09 Passcode: 962945 HALL B SESSION 7: Developing Sustainable Farming Systems Moderator: **Zühre Aksoy**, Boğaziçi Uni., TR **(online)** Keynote speaker: **Stefano Canali,** Council for Agriculture Research and Economics – Research centre for Agriculture and Environment Rome, IT **(online)** "**Agroecology and Organic Farming in the Mediterranean Countries"** **"Agroecological strategies and systems: knowledge, biodiversity, resilience, productive capacity, health", Adamo D. Rombolà**, Bologna Uni., IT **"Comparative analysis and cost/benefit assessment of organic treatments applied to organic vegetable crops", Khalid Azim**, INRA-CRRA, Agadir, MA **" .."** , **Aina Calafat-Rogers** Vice President IFOAM-ABM International Projects Manager at SEAE (Sociedad Española de Agricultura Ecológica y Agroecología) – ES **(pre-recorded)** **"Suppressive effect of root knot nematodes Meloidogyne spp. during composting of tomato residues", Khalid Azim**, INRA-CRRA, Agadir, MA **"Participatory Guarantee System: Experience of BioKg in Kyrgyzstan", Asan Alymkulov,** BIO-KG Federation of Organic Development, KG **(online)** **Panel Discussion**	When: May 28, 2022 17:30 Istanbul Topic: 28.05.2022 EKOLOJİ WEBINAR Please click the link below to join the webinar: https://us02web.zoom.us/j/81095641538?pwd=ajRVZFBGWExDYkdkQUtaY2xuWXpBQT09 Passcode: 716696 HALL C SESSION 8: Scaling Up Organic Farm Management Moderator: **F. Özlem Altındişli**, MoAF,PPRI, TR **"Current Trends on Semiochemical-based Pest Control Strategies with special reference to Insect Pheromones", F. Özlem Altındişli**, Fatma Özsemerci, Tülin Kılıç, and Seher Tanyolaç, PPRI, TR **"Organic Agriculture in Tajikistan", Munira Otambekova**, FAO, TJ **"An investigation on regulations affects boosting organic production in Iran", Mohammadreza Rezapanah,** Mohammad Barzali, Roja Kianpour, Parviz Sarbazi, Yadollah Rezaei, Mohammadmehdi Ghaderi, Parastoo Hosseingholi, Samira Afsharalam, Sina Rezapanah, Fatemeh Ruhi, Zahra Fathollahi, Mobina Sadat Mohammadi, Seyed Ali Pourheidar, Davoud Hassanpanah, Masoud Naderpour and Hojjat Khademi; **(online)** **"Organic Farming Trends in Türkiye", Emre Bilen** and Gülşah Mısır Bilen, MoAF, Atatürk HCRI, TR **"Floor management methods for organic kiwi fruit orchards", Özlem Boztepe**,Gülşah Mısır Bilen, Damla Çelik Çil, Şule Işın, MoAF, Atatürk HCRI, TR	4th Mediterranean Climates Conference
WRAP-UP DAY 2				
29 May 2022				
	9.00-10.00 Morning	When: May 29, 2022 09:00 Istanbul Topic: 29.05.2022 EKOLOJİ WEBINAR Please click the link below to join the webinar: https://us02web.zoom.us/j/84887311667?pwd=ZDVBZVhEUG5CaThMUHRGU zB2RnlZUT09 Passcode: 381078 HALL B PANEL 3: Threats and Solutions in Sustainable Organic Livestock Production Moderator: **İbrahim AK**, Uludağ Uni., TR Panel Speakers: **"Threats and Solutions in Sustainable Organic Sheep and Goat Farming in Mediterranean Climates" Georgios Arsenos** – Aristotle University of Thessaloniki, GR **(online)** **"Organic Aquaculture"** Murat **Bilgüven**, Mersin Uni., TR **"Challenges of Organic Dairy Cow Production" İbrahim AK**, Uludağ Uni., TR **"Organic Feed Availability and Sustainability" Muazzez Cömert Acar**, Ege Uni., TR **"Experience in Organic Dairy Cow Farming in Türkiye" Arif Gürdal**, TR **Panel Discussion**	When: May 29, 2022 09:00 Istanbul Topic: 29.05.2022 EKOLOJİ WEBINAR Please click the link below to join the webinar: https://us02web.zoom.us/j/87147441064?pwd=MEdxYXpj dnRmU0p2elU5R3kzbkkrUT09 Passcode: 179759 HALL C SESSION 9: Improvement of Soil Fertility Moderator: Ahmet Altındişli, Ege Uni., TR **"Development of Composting Technique from Two-Phase Pomace Wastes and Its Evaluation in Organic Olive Cultivation in Türkiye", Nurhan Varol**, Hanife Tellikaraman, Erol Aydoğdu, MoAF, ORI, TR **"Pistachio shell biochar application effects on the biological properties of the soil", Ebru Saygan**, Salih Aydemir, Çiğdem Küçük; MoAF, ORI and Harran Uni., TR **"State of Organic Ornamental Plants and Soil Management"**, Gülden Haspolat, MoAF, AARI, TR **"Effect of organic nitrogen on the performance of potato in organic farming" Ahmed Harraq**, Rachid Bouabid, Hakima Bahri, and Hassan Boumchita, National School of Agriculture of Meknes, MA and Uni. of Moulay Ismail, MA, **(online)**	

<table>
<tr><td rowspan="3"></td><td colspan="4">BREAK 10.15-10.30</td></tr>
<tr><td>10.30-12.00 Morning</td><td>When: May 29, 2022 09:00 Istanbul Topic: 29.05.2022 EKOLOJİ WEBINAR Please click the link below to join the webinar:
https://us02web.zoom.us/j/84887311667?pwd=ZDVBZVhEUG5CaThMUHRGU zB2RnlZUT09
Passcode: 381078

SESSION 10: Organic products, Mediterranean diets and markets
Moderator: Dražen Lušić, IFOAM-ABM President, Faculty of Medicine, University of Rijeka, HR
"The relationship between nutrition and health with organic products", Ceyhun Dizdarer, Prof.,MD, TR
"Organic Milk Products", Harun Uysal, Ege Uni., TR
"Organic farming and markets in the World", Gülşah Mısır Bilen and Emre Bilen, MoAF, Atatürk HCRI, TR</td><td></td><td>4th Mediterranean Climates Conference</td></tr>
<tr><td>12.00-13.30 Morning</td><td colspan="3">When: May 29, 2022 09:00 Istanbul Topic: 29.05.2022 EKOLOJİ WEBINAR Please click the link below to join the webinar: https://us02web.zoom.us/j/84887311667?pwd=ZDVBZVhEUG5CaThMUHRGUzB2RnlZUT09
Passcode: 381078

EVALUATION AND CLOSING SESSION
Uygun Aksoy – ETO, President, TR, Muazzez Cömert Acar – Ege Uni., TR, Alev Kır – MoAF ORI, TR
Dražen Lušić – IFOAM Mediterranean/ Ph.D, Associate Professor at Faculty of Medicine, University of Rijeka, HR
IFOAM Leadership IFOAM, President Karen Mapusa, IFOAM-Asian President Jennifer Chang, IFOAM AgriBioMediterrannean President Eduardo Cocco (online)
Reza Ardakani –Vice President, ISOFAR, Prof., Agroecology and Organic Farming, Azad Uni., IR
Dilek Anaç – Ege Uni., (formerly), TR
İbrahim Ak – Uludağ Uni., TR</td></tr>
</table>

Conference organisers and supporters

ETO- Ekolojik Tarım Organizasyonu Derneği/Association of Ecological Agriculture Organization

ABM- IFOAM AgriBioMediterraneo

ISOFAR- International Society of Organic Farming Research

EİB-Ege İhracatçı Birlikleri/Aegean Exporters' Associations

EÜZF-Ege Üniversitesi Ziraat Fakültesi/Ege University Faculty of Agriculture

TÜBİTAK- Türkiye Bilimsel Ve Teknolojik Araştirma Kurumu/The Scientific and Technological Research Council of Türkiye

İZFAŞ-İzmir Fuarcılık Hizmetleri Kültür ve Sanat İşleri Tic. A.Ş./İzmir Fair Services Culture and Art Affairs Trade. Inc.

CIHEAM- Mediterranean Agronomic Institute of Bari

GOTS-Global Organic Textile Standard

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AKASYA

RAPUNZEL