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Editorial

Alternative Cropping Systems for Climate Change

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Climate change and increased climate variability are significant contemporary issues and create new challenges for agriculture and the whole food production chain. In addition, agriculture is one of the most vulnerable and influential sectors in science, society, policy, and practice as regards building proactive adaptation. Designing alternative cropping systems that are stable and resilient in the face of climate change is the one of the greatest challenges in agronomy. Alternative cropping systems should ensure farmer profitability and the ability to deliver multiple ecosystem services. This Special Issue aimed to collect research articles about different cropping systems that can provide resilience in the face of climate change and maintain sustainability.

The Special Issue "Alternative Cropping Systems for Climate Change" is a collection of five articles that consider different cropping systems, management practices and underutilized crop species that can be used by the farmers to maintain productivity and sustainability under different climatic conditions.

Kraus et al. [1] describes the effect of using different stimulations together with the appropriate cultivars of wheat that can have a significant effect on grain yield and thousand-grain weight (TKW). The effect of the applications of the stimulations was changed from year to year, being especially affected by temperature and precipitation. Additionally, the different cultivars showed different responses during the two years of the study, thus highlighting the significance of using well-adapted genotypes in different environments. In conclusion, the use of stimulation preparations can assist plants in resisting in biotic and abiotic stress; however, the mechanism behind this effect is still unknown and more research is needed to elucidate it.

Intercropping is a practice that has been studied extensively for the last 10 years and consists of the cultivation of two or more crop species in the same space for a considerable proportion of the growth period. In a study by Salama et al., 2022 [2], the effect of different intercropping systems of maize with forage cowpea was evaluated using different fertilization treatments and under different intercropping patterns. It was found that patterns of intercropping that increased and provided wider spacings for the component crops and reduced the competition between them (especially with the intercropping pattern where the two outer ridges in the plot were sown with maize on both sides of the ridge, while the two inner ridges were sown with forage cowpea on both sides of the ridge) resulted in a better yield and performance of the intercropping system compared with the other systems that were used. In addition, regarding the fertilization treatments, it was shown that the fertilizer application which included the application of a N starter dose and the same doses at 25, 50 and 90 days after sowing (NS1) increased the yield of both crops. Therefore, for a higher productivity of the intercropping system of maize and forage cowpea, it is important to use an intercropping pattern that reduces competition together with a fertilization scheme that includes a nitrogen starter dose in the fertilization scheme (NS1) to ensure the highest productivity from the component crops.

Moreover, Abou Chehade et al., 2022 [3] studied the effect of genotype and growing season on crop phenology and on seed yield, oil content, macronutrient accumulation and partitioning, and fatty acid composition of spring-sown safflower grown under rainfed

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conditions. Safflower is an alternative and underutilized oilseed crop that is well-adapted to dryland environments, and the use of well-adapted cultivars can provide a new crop for a rainfed cropping system especially under the conditions caused by climate change. In addition, safflower has high-quality oil and, together with its tolerance to cold and drought, can be used in many areas of the world and replace traditional oilseed crops that are not well-adapted to dryland climates such as oilseed rape. In this study [3], the effect of sowing time and cultivar on the productivity and oil quality of safflower were determined. It was found that early spring sowing together with mild and wetter conditions increased the seed yield, the oil yield of the crop and the aboveground biomass. Two of the six cultivars that were evaluated for two growing seasons, Montola 2000, which is an oleic acid-type genotype, and Sabina, which is a linoleic acid-type genotype, showed the highest oil yields and are well-adapted genotypes that can also offer different opportunities for both food and the bio-based industries based on their oil quality.

In another study, the effect of different cultivars was evaluated in an intercropping system of pea with wheat [4]. Despite the fact that intercropping is an old practice, farmers are using cultivars that were bred under monoculture and there are no cultivars that have been evaluated under intercropping systems. Therefore, the use of appropriate cultivars has not received particular attention so that the intercropping productivity can be increased with proper use of cultivars that are better adapted to intercropping conditions. In the study of Pankou et al., 2022 [4], two cultivars of field pea and six cultivars of bread wheat and all their mixture combinations were evaluated under two growing conditions. It was found that the different cultivars responded differently under the different intercropping combinations, indicating that there are cultivars that show higher grain yield in mixtures. Therefore, the mixture 'Isard'–'Mavragani' had a higher grain yield by 86.5% and 55.7% compared with the mean grain yield of all other mixtures and monocultures, respectively. In addition, the total LER value of 'Isard'–'Mavragani' was high in both years, as it was 1.954 and 1.693 in 2018–2019 and 2019–2020, respectively, indicating a significant advantage over monocultures. Moreover, other mixtures that show higher grain yield were Isard–Flamenko and Isard–Nestos. It is indicated that the proper selection of appropriate cultivars in an intercropping system can significantly increase the yield and, also under different conditions, provide a more resilient cropping system under climate change.

In the study of Ionescu et al., 2022 [5], it was stated that the European agriculture, which is a strategic sector in Europe, marked by transformations in the last 10 years as a result of the sustainable development objectives assumed by European bodies, represents a branch whose predictability in development is currently affected by exogenous events (economic crisis, geo-political crisis, soil and climate crisis, and, lastly, health crisis). It was found that the income from agriculture is influenced by the economic crises and unfavorable environmental conditions and there is a need to improve inputs in agriculture by increasing investment with an impact on the sustainable development of agriculture. In order to overcome some of the challenges it faces, smart agriculture can be used as a solution to the food crisis generated by the different uncertainty conditions. The outcome of the study is the identification of viable, implementable solutions to ensure the planned success of the sustainable development of the branch.

Together, these manuscripts help us understand the different factors that can affect crop productivity and quality, the magnitude of the consequences of the different practices, and how cropping systems and the appropriate use of crop species, cultivars and management practices can help sustain agricultural sustainability and production under these changing climate conditions.

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References

1. Kraus, K.; Hnilickova, H.; Pecka, J.; Lhotska, M.; Bezdickova, A.; Martinek, P.; Kucirkova, L.; Hnilicka, F. The Effect of the Application of Stimulants on the Photosynthetic Apparatus and the Yield of Winter Wheat. *Agronomy* **2022**, *12*, 78. [CrossRef]
2. Salama, H.; Nawar, A.; Khalil, H. Intercropping Pattern and N Fertilizer Schedule Affect the Performance of Additively Intercropped Maize and Forage Cowpea in the Mediterranean Region. *Agronomy* **2022**, *12*, 107. [CrossRef]
3. Abou Chehade, L.; Angelini, L.; Tavarini, S. Genotype and Seasonal Variation Affect Yield and Oil Quality of Safflower (*Carthamus tinctorius* L.) under Mediterranean Conditions. *Agronomy* **2022**, *12*, 122. [CrossRef]
4. Pankou, C.; Lithourgidis, A.; Menexes, G.; Dordas, C. Importance of Selection of Cultivars in Wheat—Pea Intercropping Systems for High Productivity. *Agronomy* **2022**, *12*, 2367. [CrossRef]
5. Ionescu, R.; Zlati, M.; Antohi, V. A New Approach on Making European Agriculture More Efficient under Uncertainty Conditions. *Agronomy* **2022**, *12*, 2559. [CrossRef]