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Editorial

Cropping Systems and Agronomic Management Practices of Field Crops

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1. Introduction

Agriculture is facing the challenge of a transition to sustainability to meet the growing demands for food, feed, and several other renewable nonfood raw materials under a changing climatic scenario. Research on innovative agronomic practices can help to guide this change, and can benefit the understanding of the complexity of agroecosystems. The optimization of the spatiotemporal combination of plants in farming systems (crop sequence, cover cropping, and intercropping), the reduction in the dependence on external energy input (soil tillage, agrochemicals, and mineral fertilizers), the set-up of innovative agronomic practices, and the increase in the use efficiency of native resources (radiation and rainfall, N_2, CO_2, H_2O, etc.) represent the driving forces behind this paradigmatic change. This approach will ensure the enhancement of the territorial vocation in productive and qualitative terms, also promoting several ecosystem services, from carbon sequestration to landscape ecology.

2. Overview of the Special Issue

In this Special Issue, we focus on the recent advancements in the wide scientific area of field crops in order to identify strategies and tactics calibrated site-by-site for eco-friendly and efficient agronomic management. It is a compilation of thirty-seven research articles and two reviews, where five are Editor's choice articles, and one is a feature paper. For simplicity, these original papers can be grouped into five groups:

1. Crop adaptation;
2. Weed management;
3. Fertilization;
4. Crop diversification;
5. Innovative cropping systems and agronomic practices.

2.1. Crop Adaptation

Climate change is nowadays affecting agricultural production in many areas worldwide. Consequently, it is of key importance to not only understand the impact of climate change on soil and atmosphere components of an agroecosystem, but also the study of the suitability of crops (i.e., plant species and cultivars) to changing climatic conditions and agronomic management. The studies of Mahmud et al. [1], Tuttolomondo et al. [2], and Ismael et al. [3] follow this direction, investigating the adaptability of orange fleshed sweet potatoes (*Ipomoea batatas* (L.) Lam.) to the riverbank inhabitants of the Gaibandha and Rangpur districts of Bangladesh, the productive and qualitative characteristics of three Sicilian *Salvia sclarea* L. populations, and the dynamics of rice (*Oryza sativa* L.) farming systems in Southern Mozambique to guide smallholder farmers. In another article, Zhou et al. [4] studied the effects of temperature and solar radiation on milling and the appearance quality of a number of rice varieties sowed at different times in the lower

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Citation: Anastasi, U.; Scavo, A. Cropping Systems and Agronomic Management Practices of Field Crops. *Agronomy* **2023**, *13*, 2328. https://doi.org/10.3390/agronomy13092328

Received: 31 August 2023
Accepted: 4 September 2023
Published: 6 September 2023

reaches of Huai River (Jiangsu, China). The authors found that temperature, compared to solar radiation, was the main environmental factor affecting the milling and appearance quality of rice in the studied area, and indicated the optimal thermal ranges and sowing dates to obtain a relatively high yield as well as good milling and appearance quality of rice in the lower reaches of Huai River. Similarly, Wang et al. [5] explored the characteristics of heat occurrence during maize flowering in the Huaibei Plain (Anhui, China) in order to advise summer maize cropping strategies in the studied region and in other semiarid cropping systems.

2.2. Weed Management

The increasing intensification of weed control practices has posed serious environmental issues, such as the leaching (and consequently water contamination) of glyphosate herbicide and its main degradation product aminomethylphosphonic acid (AMPA), as evaluated by Milan et al. [6]. The search for sustainable weed management techniques is of outstanding importance to reduce the negative effects associated with weed control and increase the resilience of cropping systems. This Special Issue involves two review articles that discuss two important and innovative aspects of weed management, i.e., the exploitation of allelopathy [7] and the use of encapsulated herbicides in organic formulations [8]. Of course, the choice of the weed management practice used should be associated with the context of the cropping system. For instance, Nazir et al. [9] found that the lowest rate of nutrients removed via weeds in rice across temperate climates depended on the combination between the establishment method (transplanting, direct seeding, or a system of rice intensification) and the adopted weed management practice. Furthermore, to contrast the increasing infestations of indigenous and exotic weeds in temperate regions, Iqbal et al. [10] studied the potential fit of forage cowpea (*Vigna unguiculata* (L.) Walp) in the temperate Himalayan region of Pakistan by dissecting the interactive effect of genetic potential and row configuration on weed density, growth attributes, biomass yield, and the nutritional quality of the crop.

2.3. Fertilization

The Special Issue published five research articles on this topic. In the first article, Singh et al. [11] applied the soil test crop response (STCR) in the fertilizer approach instead of the generally recommended dose (GRD) methodology to markedly enhance the productivity, profitability, and nutrient use efficiency of rice. In the second article, 17-year-old integrated nutrient management under a maize–wheat cropping system was studied by Dhaliwal et al. [12] for the buildup of organic carbon, microbial communities, and soil nutrient status. Nevertheless, this Special Issue dealt with technical aspects of fertilization, such as the subsurface application of mineral fertilizers to decrease the accumulation of nutrients in the top soil layers under no-tillage systems [13], the application of compost by microdosing to double the fertilized area and improve sorghum (*Sorghum bicolor* [L.] Moench) productivity in Southern Mali [14], or the use of plasma-treated cattle slurry to produce nitrogen-enriched organic fertilizers [15].

In addition, in the present Special Issue, attention has also been paid to the combined effect of fertilization with weed management [16], irrigation [17,18], the crop establishment method [19], crop variety [20], sowing density [21,22], seed priming [23], and fungicide application [24]. For instance, with regard to the fertilization–irrigation combination, Abdou et al. [17], in light of the water shortage caused by climate change, proposed a new agro-management practice (deficit irrigation and higher nitrogen fertilizer) for lowland rice in semiarid conditions as an alternative to the flooding system. In a similar experiment, Bhatt et al. [18] suggested the optimal potassium application rate for sugarcane (*Saccharum officinarum* L.) cropping systems under the potassium-deficient water-stressed conditions of Northern India.

2.4. Crop Diversification

The optimization of the spatiotemporal arrangement between crops through cover cropping, intercropping, or crop rotation is an ancient practice that has been gaining popularity in recent years by virtue of its numerous ecosystem services [25]. Five research articles have been published in this Special Issue on this topic. In the study of Johnson and co-authors [26], the interseeding of winter camelina (*Camelina sativa* (L.) Crantz) and winter rye (*Secale cereale* L.) into soybean (*Glycine max* (L.) Merr.) was investigated in the northern plains of the USA. Abbas et al. [27] demonstrated that maize–green gram intercropping is a sustainable agronomic practice to increase maize production and reduce weed infestations for smallholder farmers in semiarid environments. Kumar and co-workers [28], analyzing different crop diversification schemes under jute (*Corchorus olitorius* L.)-based cropping systems, suggested a jute–rice–baby corn scheme for system productivity and a jute–rice–pea scheme for system sustainability, with both productivity and sustainability being higher when the recommended doses of fertilizers were applied with crop residue incorporation. The management of cover crops shows outstanding importance in increasing their efficacy in agroecosystems [25]. The works of Salama and Abdel-Moneim [29] and Cottney et al. [30] deal with cover crop management. The former article evaluated the manipulation of sowing schedule and maize harvest regime in a soybean–fodder–maize intercropping system in Northern Egypt, whereas in the latter one, the choice of cover crop genotype and sowing date and their effects on the subsequent cash crop were studied in Northern Ireland.

2.5. Innovative Cropping Systems and Agronomic Practices

In order to contrast the harmful effects of climate change and to meet the needs of a growing global population, in this Special Issue, several innovative cropping systems and agronomic practices have been proposed. The aim of the study by Larkin et al. [31] was to examine four different potato cropping systems designed to address specific management goals (soil conservation, soil improvement, disease suppression, and a status quo standard rotation) for potato crop growth and yield characteristics under both irrigated and rainfed conditions in Maine (USA). Bunyangha et al. [32], comparing two paddy rice farming pathways (smallholder and large-scale commercial) and an adjacent natural wetland in the Mpologoma catchment (Uganda), highlighted that large-scale commercial paddies not only had higher richness and diversity than natural wetland and smallholder paddies, but also underscored the role of soil in influencing the macroinvertebrate community in rice paddies. In light of the production increase in quinoa worldwide (*Chenopodium quinoa* Willd.), Alvar-Beltrán et al. [33] quantified, for the first time, greenhouse gas emissions (CO_2, CH_4, and N_2O) and crop productivity (yields and biomass) under conventional (urea) and organic (digestate) fertilization. Analyzing agronomic management (tillage, weed control, growth regulation, rate of nitrogen and sulfur fertilizers) in the production of winter oilseed rape (*Brassica napus* L.), the most important oilseed crop in the temperate climates, Sokólski and co-authors [34] found that the chemical components of seeds were differently affected by tillage systems, that an increase in the N rate application enhanced the total protein content and decreased the crude fat content, and that sulfur fertilization increased glucosinolate concentrations. In another work, Akinseye et al. [35], adopting the Agricultural Production Systems sIMulator (APSIM) model in the three major agroecologies of North-Eastern Nigeria, identified the optimal sowing time and cultivar choice for sorghum productivity to overcome the low soil fertility and early terminal drought in the studied zone.

Regarding the innovative agronomic practices proposed here, Sun and co-workers [36] studied the border effects (in terms of dry matter, photosynthetic characteristics, and yield components) of winter wheat under hole sowing cultivation, a new wheat agricultural technology integrating rain, drought resistance, and the efficient utilization of light and heat resources. Madala et al. [37] evaluated, for the first time, the effects of planting pregerminated buds on stand establishment in sugarcane, while Li et al. [38] assessed the effect of mechanized transplanting properties on sweet potato growth and yield. Investigating the combination between soil management systems (conventional and no-tillage) and pre-harvest desiccation on the physiological quality of soybean seeds, Silva et al. [39] reported that the use of desiccant is dependent on the soil management system and that soybean seed longevity was higher in the no-tillage system, although desiccant application reduced it. Investigating the optimization of planting density in alpine mountain strawberry cultivation (South Tyrol, Italy), Soppelsa et al. [40] indicated that a middle planting density can be a fair compromise in terms of plant growth, yield, and farm profit.

3. Conclusions

In summary, the manuscripts collected in this Special Issue provided a relevant knowledge contribution to the cropping systems and agronomic management practices of field crops under a climate change scenario. We sincerely thank all of the contributing authors and reviewers, as well as the Academic Editors and the Managing Editor Amanda Li, for the time that they have dedicated to this successful Special Issue.

Author Contributions: U.A. and A.S. contributed equally to this article. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest: The authors declare no conflict of interest.

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