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Editorial

Special Issue on Precision Technologies and Novel Farming Practices to Reduce Chemical Inputs in Agriculture

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The sustainability of agriculture is a key point to feed human population in the future. Nowadays, food production depends on the large use of chemical and non-chemical inputs such as plant protection products (PPP) and fertilizers. Inputs potentially generate air, water, and soil pollution, and contribute to the loss of biodiversity, climate change, and resource depletion.

PPP and chemical fertilizers application are worldwide recognized as two of the agricultural practices having a high impact on the environment and human health. Today, the equation of high efficacious/efficient agricultural practices and reduced hazardous inputs could be concurrently balanced by adopting the most appropriate and innovative technologies to reduce the inputs at source by also giving preference to the most efficient agricultural practices.

This Special Issue aims to collect and present research on novel technologies and strategies to replace traditional chemical inputs and to improve the environmental sustainability of agriculture food production. Five research papers on the subjects of plant protection products and fertilizers application are presented in this Special Issue.

Wang et al. [1] studied drift potential characteristics of flat fan head nozzles by combining computational fluid dynamics (CFD) and wind tunnel tests. The research provided useful information to accurately simulate the actual drift, and data to support the optimization of atomization parameters and drift characteristics from flat fan nozzles under different spraying pressures and crosswinds. Lamare et al. [2] developed and evaluated a smart sprayer for bed-grown carrots, employing variable nozzle spacing and boom height to match the target zone width at different crop stages. The authors concluded that bed spray configurations can improve canopy depositions and limit spray drift potential compared to a conventional broadcast application when the boom height and the nozzle spacing are adjusted according to the growth stage of the crop. The paper by Sedlar et al. [3] presents the result of a set of trials carried out to prolong the biological activity and fungicide resistance to environmental conditions such as rainfall and solar radiation. Copper hydroxide deposit quantity under field and laboratory conditions depending on the amount of a pinole-based wetting agent and nozzles type were tested on sugar beet leaves. The results indicated an increase in copper hydroxide deposits with the increase in wetting agent rates regardless to the type of tested nozzle and in both laboratory and field experiments. Additionally, Cerruto et al. [4] validated a custom-made test bench to measure droplets size being this parameter the most important feature affecting biological efficacy of the treatment, environmental pollution, and operator safety. Results showed that an increase in working pressure caused an increase in drop pulverization regardless of the type of nozzle, and drop pulverization was higher for the turbulence nozzle than for the two air induction nozzles. Therefore, the results validated the functionality of the proposed measurement system.

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All studies, conducted under laboratory and/or field conditions, underline that the characterization of spray parameters and the quantification of their effects on both canopy deposits and off-target losses (e.g., in-field ground losses and spray drift) is an essential step to improve the current spray application techniques. Only through the individuation and therefore the proper selection of optimized spray application parameters there will be the chance to reduce the chemical inputs as a positive side effect of efficient spray application able to maximize canopy deposition meanwhile minimizing off-target losses.

Finally, the study by Hendriks et al. [5] analyses the environmental and agronomic effect of different bio-based fertilizers (BBFs) on potato growing in sandy soil. The study showed that all BBFs (raw and refined) can be safely used in replacement of chemical fertilizers, both under agronomic and environmental perspectives. However, as the adoption of some BBFs is currently hampered by policy restrictions or by technical limitations further research and political actions are needed.

Even though the Special Issue is now closed, research on new farming practices and technologies for a sustainable agriculture will keep on addressing issues related to the optimization of input utilization in view of a future environmentally friendly food production.

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