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Editorial: Methods in climate-smart agronomy

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Editorial on the Research Topic
Methods in climate-smart agronomy

Changing climatic conditions characterised by a rise in extreme events are increasingly impacting the productive capacities of major crops and posing growing challenging to traditional farming practices. These practices often fail to meet the demand for sufficient food production for the world's growing population while reducing the associated environmental impact (Sulser et al., 2021; Dorward and Giller, 2022).

The actual production level of our cultural systems is increasingly subject to adverse climatic conditions such as heat waves, drought periods, heavy rainfall and late frosts, among others. These conditions exacerbate the gap between the actual and the potential production level. This gap cannot be reduced, as was the case in the past, through the heavy use of cultivation inputs (e.g. fertilisers, pesticides, irrigation water, herbicides, etc.) due to their strong environmental impact (Pradhan et al., 2015). Moreover, public opinion is increasingly adopting a negative stance toward the use of chemical inputs in agriculture, reflecting a growing concern about their adverse effects.

There is therefore a need to adopt agronomic and crop management that manages to optimise production and environmental needs. Recent advances in technology, precision agriculture and sustainable farming practices offer promising solutions to address the complex challenges posed by climate change, while promoting the economic prosperity of the agri-food sector (Das et al., 2022).

More specifically, the use of new technologies (e.g. information technology, nanotechnology, biotechnology, cognitive science, robotics, artificial intelligence, etc.), new tools (e.g. simulation models, GIS, drone, satellites, sensors, etc.) and new methodologies (e.g. precision agriculture, blockchain, digital platform, data analytics) can certainly represent one of the solutions to enhance agricultural productivity, strengthen resilience to climate change and mitigate the negative impacts of these changes, all while promoting food security and sustainable development (DeWit et al., 2020; Ivashkiv et al., 2020; Zougmoré et al., 2021).

Thus focusing on the importance of adopting climate-smart agronomic practices to ensure sustainable food production, a total of four manuscripts have been accepted for publication in this Research Topic to enhance understanding of the technologies, tools and methodologies that can be adopted to solve the intriguing challenges posed by climate

change to agricultural systems. Three of these are research articles and one is a review article:

- In Thompson et al., it was examined how improved equipment for spectrometric measurements in the field can enable more accurate studies of crop development in response to hot and dry environments. In particular, the advantages and disadvantages of the new method were compared with the traditional approach and other approaches reported in the literature.
- In Bhandari et al., a geospatial approach was used to estimate regional (Mississippi Delta) wind damage on maize in function of nitrogen management and row orientation and to support producers and other stakeholders in the decision-making process for more extreme weather events that may occur in the future.
- In Jimenez-Berni et al., two very important elements are examined when adopting new technologies: cost and the possibility of innovation. In this case, the device adopted to measure crop evapotranspiration (ET) has a much lower cost than the devices normally used, and also makes possible the determination of ET at four different positions within a field or in four different fields of the same crop, thus allowing the spatial variability of ET to be assessed.
- In Demo and Bogale, the review article aimed to demonstrate the effectiveness of ground mulching in water conservation in arid regions where agricultural sustainability is at risk due to drought, heat stress, and the inefficient use of limited water resources during the cropping season. Ground mulching is essential for minimizing surface evaporation and hence decreasing water loss.

From these four articles, it emerges that climate-smart agronomic solutions can be represented by the use of innovations (i.e. instruments and methodologies), but also by the suitably adapted implementation of commonly used techniques (i.e. mulching).Despite the diversity in approaches, the overarching objective remains consistent: to enhance agricultural productivity and strengthen resilience to climate change.

Author contributions

MB: Methodology, Writing – original draft, Writing – review & editing. FM: Methodology, Writing – original draft, Writing – review & editing.

Conflict of interest

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