Perspective
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Optimal Irrigation and Fertilizer Use in Arid Regions

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Perspective

As the world's population grows, so does the demand for food and fibre. However, the growing threat of climate change puts additional strain on agro ecosystems to achieve this goal. The intensification of agro ecosystems to produce more food and fibre raises the demand for freshwater, a resource that is in short supply in many parts of the world.

As a result, effective irrigation is critical for increasing crop growth and productivity.

However, due to increased human demand, an adequate supply of high-quality water is frequently in short supply. With growing concerns about the use of scarce water resources, there has been renewed interest in improving water use efficiency in a variety of settings. Water and fertiliser application are two of the most important yield improvement strategies in crop production, and they are especially important in arid areas.

Crop modelling studies have revealed that while optimal water-nutrient application modes are beneficial for lowering inputs, they are not conducive to maximising yields by utilising crop compensation and self-regulation capacities. Higher energy costs and limited nutrient resources will result in higher fertiliser prices and environmental pollution in the future.

To address these issues, effective water and nutrient management strategies are required to achieve optimal crop yield in arid conditions. This Research Topic aims at focusing on the impacts of irrigation and fertilization in terms of the changes in soil water levels, nutrient content on crop production and quality. Improved water management strategies to increase productivity, improve quality, and improve the resilience of crops will be documented.

The Research Topic will include studies on the effects of fertigation on crop productivity as well as the adaptation mechanisms that allow plants to survive extreme water or nutrient deficit events. The following are some examples of topics that will be considered are:

1. New methodologies and technologies that promote water (and related nutrient use efficiency) in crop production

2. Mechanisms of crop compensation and self-regulation capacities under water or in nutrient deficit

3. Improved coupling of water-fertilizer addition for enhancing crop productivity

4. Promotion of water and fertiliser use efficiency through optimization of root and shoot functional traits

5. New modelling approaches and decision support tools to encourage the use of water efficiency in farming systems

6. Development of novel approaches to agricultural water foot printing

7. Tran's boundary and policy issues concerning agricultural water use

Nutrient stress can be alleviated by providing nutrients in the appropriate amounts and at the appropriate times when the plant requires them the most. Fertilizer recommendations using the Nutrient Expert (NE) decision support system have been demonstrated in field studies in cereal crops to improve crop yields. However, such information is scarce in the case of cotton, a commercial crop. This indicates that farmers used more P fertiliser. Farmers in the region, on the other hand, used a very small amount of K. Despite having the highest cultivation costs, the NE treatment had the highest net returns, followed by the STCR and RDF treatments. Our research shows that the NE-based fertiliser recommendation not only produces high yields but is also profitable.

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