Editorial

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Research in agriculture serving resilience in a fluctuating environment

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Intense spatial and temporal heterogeneity is the main implication of climate changes. It seems that agricultural systems are going to be faced with a double contrasting challenge: The demands for higher productivity to sustain an ever increasing global population accounting at the same time for the detrimental effects of environmental diversity on crop productivity. Extreme precipitation events, drought, heat, frost and other types of damaging weather are expected to occur more frequently and more intensively. There is now more skepticism and concern that future agriculture ought to be resilient serving sustainability in a tremendously fluctuating environment ranging from marginal to propitious.

Water is the most crucial resource that agriculture relies on, and farming accounts for about 70% of the globally water usage. Farming also contributes to water pollution from excess nutrients, pesticides and other pollutants and improving water quality is ranked as a top environmental concern. Climate change will provide agriculture with more competition for water resources, affecting supply, changing the amount and distribution of precipitation during the growing season. Wastewater recycle, water reuse and sustainable management of water resources are of prime importance to tackle the potential scarcity of water the world is going to confront. Even though the aspect of water management has been the focal point of interest of many projects for many years, the issue of integrated water management is not satisfactorily solved. Further, crops effective use of water input is essential to adapt to ongoing climate changes and allow farming and food production into the future as well.

Chemical resources also have a well-established role in agriculture. Large amounts of fertilizers and pesticides are used to regulate the plant growth and control pests, weeds and diseases. They have contributed to increased food production and the benefits in terms of economic returns have led to their wide adoption. Nevertheless, injudicious usage can result to residues of either the parent compounds or their metabolites in natural resources (surface and groundwater bodies, soil, atmosphere), wildlife and food, imposing human health and environmental risk. Application of insecticides and fungicides without keeping the established pre-harvest interval is a matter of great urgency due to their toxicity. Herbicide usage has increased as chemical control of weeds has increasingly replaced cultivation and genetically modified cultivars with enhanced tolerance to those compounds have been introduced. Hence, the improvement of spraying equipment, the use of more selective pesticide with higher efficacy, the invention of biodegradable biological alternatives and the combined application of biological agents with chemical methods can reduce the environmental impact of crop protection processes.

Soil is a fundamental natural resource, thus maintaining or even improving its properties is crucial for agriculture and livestock. However, a modern problem that agriculture has to cope with is the decline in arable land that is desertification, caused by human activity and climate changes. Improper soil use leads to soil degradation, comprising erosion, decline in fertility and structure, salinity, acidity, loss of organic matter and pollution from toxic chemicals. Climate changes probably worsen these implications. Sustainable land use can reduce their impact preventing soil erosion and degradation and the loss of valuable land to desertification.

So far, crop management and genetic improvement of crops have vitally contributed to food adequacy. For major crops like wheat, maize and rice which serve almost 60% of human needs, directly and mainly indirectly through food, feed and fuel, plant breeding and agronomy along with the development of inorganic fertilizers and modern pesticides reached spectacular achievements. During the last century threefold and fivefold increase of yield potential was accomplished for wheat and maize, respectively. Unprecedented growth in global demand for cereals makes the continuation of genetic improvement a major challenge for the coming decades. Moreover, the possibility to bridge the considerable gap between the potential and accomplishable yield offers additional room for research serving sustainable agriculture and food security, since cereals are the main calorie source. Capacity of legumes to assimilate atmospheric nitrogen and improve soil carbon and organic matter content, combined with their high nutritive value as food and feed, render them unique for rotation programs and are valuable in sustainable crop production systems. Cereals and legumes are the basis of animal husbandry, products of which are the main protein source. Besides stable food, antioxidant-rich fresh vegetables and fruits are inextricable part of human diet. Ability to fight infection and disease strengthens thanks to their nutritional value and high level of vitamins, minerals and fibers.

These are some of the key topics that merit our consideration in future agricultural research activities. Addressing these and other important issues is mandate to promote sustainability of agriculture, enable agro-ecosystems to exhibit plasticity and flexibility to environmental diversity and enhance the possibility to meet future high demands for food. Publication of valuable findings in 'Advances in Plants and Agricultural Research' would be a viable option for researchers seeking for credible, professional and of high academic quality journals.

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Conflict of interest

The author declares no conflict of interest.

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