Editorial: Could advances in geoinformatics, irrigation management and climate adaptive agronomic practices ensure the sustainability of water supply in agriculture?

PROMISING FEATURES

The Food and Agriculture Organization (FAO) predicts that up to 2050, food production will increase by about 70% above today’s levels. This increase in food production could be accomplished by developing more agricultural land and transitioning from rainfed to irrigated agriculture. The development of the agricultural sector is interrelated with the effective management of water resources as irrigated agriculture is the world’s largest water consumer with trends of increasing irrigation needs and pollution load in the oncoming years (Ricciardi et al. 2020). Water supply in the rural sector is expected to be most affected by climate change with reduced crop yields due to declining water availability and abandonment of climate-disadvantaged parcels.

Agricultural production stability faces many challenges related to climate-water effects, with the following being of utmost importance: changes in levels and frequency of precipitation, more frequent dry spells, increased extreme weather events including flash droughts/floods, losses of agricultural lands due to water erosion, salinization of coastal cultivated areas and freshwater, as well as surface and groundwater contamination by fertilizers or other agronomically related sources of pollution. Introducing and incorporating efficient use and management practices of irrigation water to new climate-smart production methods is a vital priority for major sectoral policies, notably the Common Agricultural Policy (Kourgialas, 2021).

In line with this, of high importance for water policy makers is to establish effective agricultural water management strategies to enhance preparedness and capacity to respond to the impacts of climate change and anthropogenic interventions. These strategies should focus on three key objectives, which, once they scale up, can increase the resilience of agriculture as a whole. These three objectives are related to: advanced geoinformatics tools, proper irrigation management and climatic water – adaptive agronomic practices (Grafton et al. 2018).

Thereby, the answer to the question of this Editorial ‘Could advances in geoinformatics, irrigation management and climate adaptive agronomic practices ensure the sustainability of water supply in agriculture?’ is certainly YES. The sustainability of water supply in cropping systems could be effectively addressed based on the advantages that raised from the above-mentioned key objectives divided in turn into the following scientific topics:

• Precision agriculture and irrigation technologies – In situ and satellite remote sensing
• GIS and advanced decision-making models in water resources under climate change scenarios – Forecasting of environmental risks and pollution loads in agriculture
• Optimization of efficiency of irrigation systems and distribution of water
• Management of water salinity and reuse of treated water for irrigation
• Proper agronomic practices for water saving at farm and catchment scale
• Choosing crops that are genetically more tolerant to environmental stress and extreme weather conditions

THIS SPECIAL ISSUE

In this Special Issue (SI) of Water Supply, 33 papers were selected that contribute to a broad discussion and demonstration of state-of-the-art multifunctional role of water resources in agriculture. The aim of this SI is to provide insights into novel modelling (monitoring, analyzing/visualizing and prediction) approaches, irrigation management and agronomic practices to investigate the adaptability of water supply and crop production systems to changing environment.

The inspiration came from the international conference ‘Water Efficiency & Climate Resilient Agriculture’ organized by the AgroClimaWater project (LIFE14 CCA/GR/000389), ‘Promote water efficiency and support the shift towards climate resilient agriculture in Mediterranean countries’ co-funded by the European Commission (http://www.lifeagroclimawater.eu/).

This SI presents characteristic examples of new technologies and decision support systems (e.g., artificial intelligence/optimization modelling approaches, Big Geo data) in water efficiency at different levels, including: water supply hydraulic...
infrastructure systems, water retention measures, less exposed to evaporation and better adapted to infiltration, solutions to reduce water demand and developing techniques for reusing water. Specifically, this SI brings advances in precision irrigation techniques adapted to the actual needs of plants at farm and extended scale applications (Filintas et al. 2021; Markos & Radooglou 2021; Mousabeygi et al. 2021). Also, new modelling approaches to predict and/or monitor water dynamics (Kader et al. 2021; Mridha & Rahman 2021; Sihag et al. 2021; Tziazios et al. 2021; Xu et al. 2021) or pollutants transport such as salinity (Daghari et al. 2021; Yuan 2021) and nitrates (Bian et al. 2021; Nie et al. 2021) are provided. An important part of this SI is covered by optimal water allocation and the newest developments in irrigation management (Cortés-Ruiz & Azuz-Adeath 2021; Lyra et al. 2021; Mahdavi & Morianou et al. 2021a; Wei et al. 2021). Successfully tested methods for improving irrigation efficiency for quantity (Hui et al. 2021a, 2021b) and quality (Jie et al. 2021; Lemos et al. 2021; Lima et al. 2021; Tao et al. 2021; Xie & Hung 2021; Zhang et al. 2021) are also addressed as one of the utmost prospectives in agricultural water management. Notable results on hydraulic irrigation networks and equipment/systems (Samarinas & Evangelides 2021; Shi et al. 2021; Sun et al. 2021) are presented as well. Finally, this SI highlights the benefits in the adaptability of agronomical practices and decision-making systems to release climatic water effects on crops and ensure long-term stability of ecosystems (Biswas et al. 2021; Economidou et al. 2021; Gkiatas et al. 2021; Morianou et al. 2021b; Ragkos & Ambas 2021).

Many appreciations to the authors for their particularly interesting papers, which we would like to believe have contributed to the improvement of our scientific knowledge in the field of water supply in agriculture. Furthermore, I would like to express my deepest thanks and gratitude to the reviewers and the Water Supply (IWA Publishing) staff who contributed to a successful preparation of this SI.

I hope you enjoy the read and be inspired.

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