

Editorial

## Editorial for the Special Issue “Sustainable Agriculture for Climate Change Adaptation”

Kathy Lewis and Doug Warner \*

Agriculture & Environment Research Unit, School of Life & Medical Sciences, University of Hertfordshire, Hatfield AL10 9AB, UK; k.a.lewis@herts.ac.uk

\* Correspondence: d.j.warner@herts.ac.uk

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As we lie firmly entrenched within what many have termed the Anthropocene, the time of humans, human influence on the functioning of the planet has never been greater or in greater need of mitigation. Climate change, the accelerated warming of the planet’s surface attributed to human activities, is now at the forefront of global politics. The 21<sup>st</sup> United Nations Climate Change Conference of the Parties (COP21) Paris Agreement saw a landmark agreement reached between countries belonging to the United Nations Framework Convention on Climate Change (UNFCCC). The agreement seeks to arrest climate change and maintain the global temperature rise below a 2 °C increase compared to pre-industrial levels, and to devise means and ways to adapt to its effects.

The agriculture sector not only contributes to climate change but, as a land-based industry, is also greatly affected by climate change. Agriculture has a key function in the role of the carbon and nitrogen cycles, contributing a significant proportion of methane and nitrous oxide toward global greenhouse gas (GHG) emissions, more than any other sector. The Organisation for Economic Co-operation and Development (OECD) states that 17% of GHGs arise from agricultural activities directly, with a further 7% to 14% due to changes in land use. Agriculture will be affected by climate change, particularly in some parts of the world, where the extremes of its impact will be felt severely. Flooding and droughts are predicted to increase in frequency with an associated detrimental impact on crop productivity either due to prolonged water shortages or the creation of anoxic soil conditions and crop hypoxia. Flooded soils also promote the denitrification process and an increase in the release of nitrous oxide.

The type of risk and the severity of its impact is spatially explicit, with different parts of the planet and their associated crop production systems subject to more intense effects and levels of threat, as illustrated for Iran by Alamgir et al. [1] and Bangladesh by Mirgol et al. [2]. The sub-Saharan region of Africa is becoming increasingly vulnerable to drought and temperature rises and farmers will need to adapt the types of crops they grow and their associated management practices [3–6]. Other parts of the world, including North America, may experience warmer winters, resulting in diminished vernalisation [7,8], a process required to promote flowering in certain types of crops. It is not all bad news, however. Significant potential exists to both adapt to and mitigate climate change within the agricultural sector. Any changes will need to be implemented in a sustainable manner to ensure that the solution does not cause other socio-economic or environmental problems. Each potential solution must also be tailored to individual regions and farming systems, as highlighted by Zheng et al. [9] in Australia. The introduction of Climate-Smart Agriculture and technology for use by smallholder farmers in South America, Africa and Asia [10–12] and the provision of farming subsidies to promote further engagement with these techniques is demonstrated by Arunrat et al. [13]. The growing of novel crops such as *Cannabis sativa* for energy production in Europe [14] or the utilisation of plant breeding to develop novel wheat varieties capable of reducing nitrous oxide emissions [15] are other examples.

All these factors are explored in this Special Issue. We are pleased to include a range of quality academic contributions from across the five continents, providing a truly global perspective. Multiple crops and production systems are represented, including studies that utilise valuable research completed with limited resources available.

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