

# The Fifth Industrial Revolution in Agricultural Sciences

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Dear Sir,

I have carefully read the article by Sundar and Asokhan [1] on the relevant role that drone technology is playing in agricultural sciences. Drones are increasingly integrating the applications of artificial intelligence (AI) [1,2]. This article also argues that AI has influenced the agricultural sector and is finding solutions to modern-day problems such as labour scarcity, less productivity, and other consequences [1]. AI applications in building solutions for agriculture-related problems empower farmers to continue farming sustainably, protecting natural resources, improving quality, and ensuring quick market penetration of various crops [1,3]. However, AI is becoming widespread in a vast variety of productive sectors, which is a sign of a significant change in technological and productive paradigms that translate into the arrival of the fifth industrial revolution [4-8]. This letter to the editor aims to explain how the Fifth Industrial Revolution penetrates processes worldwide, particularly in agricultural sciences.

First, let us consider that the first *Homo sapiens* appeared about 300,000–200,000 years ago. Since then, thanks to their accumulated knowledge, human beings have generated changes in the techno-scientific paradigms that guide production processes. Thus, some 12,000 years ago, the agricultural revolution took place, and much later, the scientific revolution (16th and 17th centuries) enlightened the world. However, concerning industrial production processes, until recently, four industrial revolutions have been reported: (i) the first industrial revolution (1784 onwards), based on greater mechanisation driven by steam power; (ii) the second industrial revolution (1870 onwards), characterised by the division of labour, assembly lines and mass production; (iii) the third industrial revolution (1969 onwards), based on advances in electronics, the advent of computers which contributed to automation; (iv) and the fourth industrial revolution (from the 21st century onwards), characterised by networks, the internet of things and cyber-physical systems [6,9]. Second, even though we are observing these advances, the world has changed profoundly in the last five years, so unpredictable that it makes one doubt whether we are still in the fourth industrial revolution. Socio-political tensions and armed conflicts, social and migratory crises, the effects of climate change, advances in technologies such as AI and biotechnology, and all the impacts and adaptations rapidly implemented by the COVID-19 pandemic accelerated the arrival of the fifth industrial revolution [10,11]. The so-called Industry 5.0 is inserted in it, whose main dimensions are human-centricity, sustainability and resilience [11]. Society 5.0 will be using the advances of Industry 5.0.

In particular, the fifth industrial revolution possesses specific distinctive characteristics that will impact the agricultural sciences, highlighting among them: (i) mass customisation, which is a marketing and manufacturing technique combining the flexibility and personalisation of custom-made agricultural products with the low unit costs associated with mass production; (ii) cross-cultural collaboration, creating a need for strategic and relational skills that deal with working in plural and multi-layered agricultural markets; (iii) personalisation, implying focusing on the requirements of people as users, patients, beneficiaries or clients [6-8]; (iv) environmentally friendly technological processes, whose application in agricultural sciences includes, for example, the internet of things [2,11], AI [3], robotics (and cobotics) [6-9], to help make agriculture more sustainable; (v) cyber-physical systems that use embedded computing and sensor networks to monitor and manage the physical environment, collaborating with a more efficient and effective precision agriculture, with the potential for substantial economic and environmental benefits; and (vi) AI, that reinforces all the previous characteristics, possessing applications in a vast diversity of productive processes [3], being the most distinctive characteristic of the fifth industrial revolution (Figure 1).

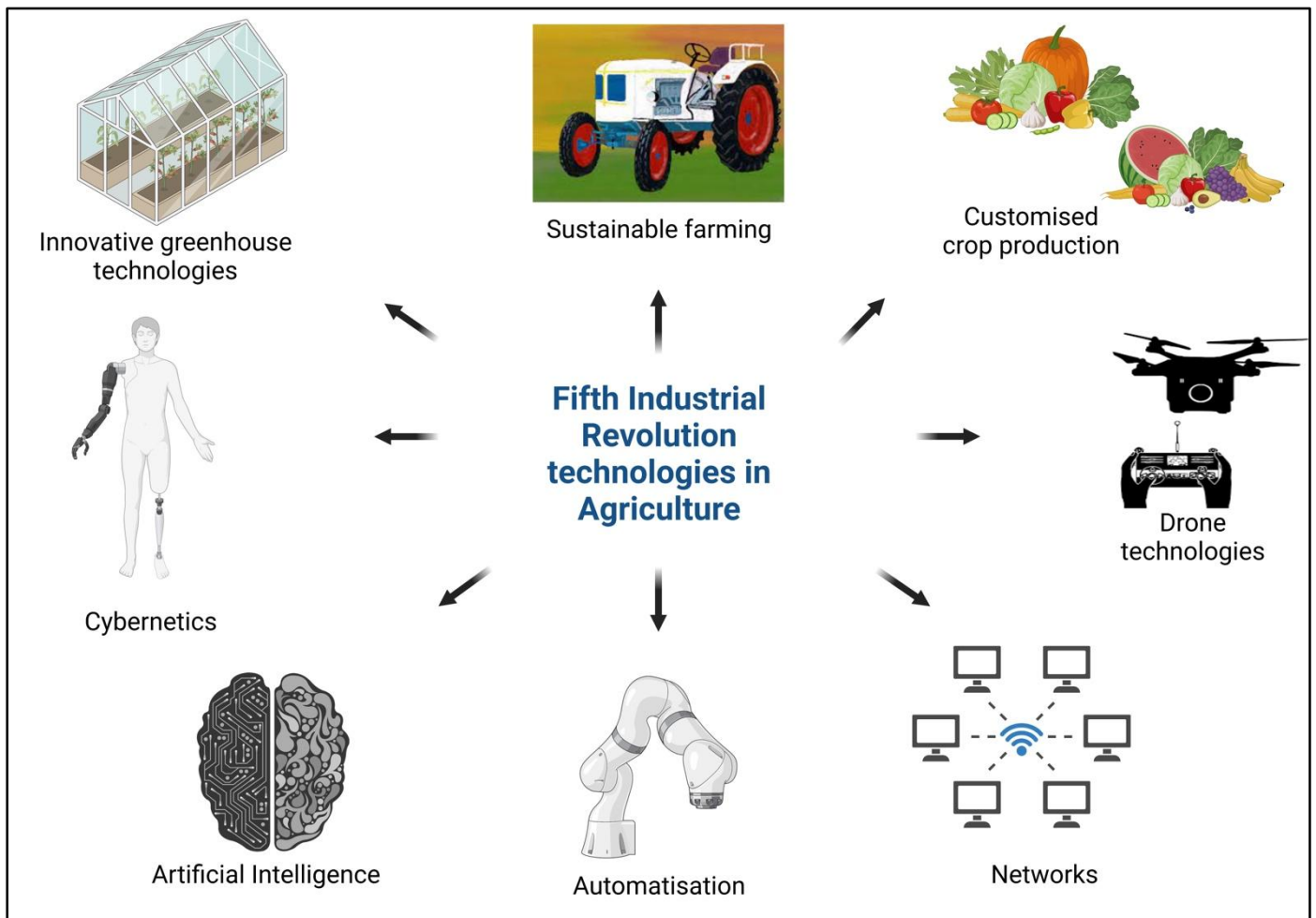
Key words: Drone, Agricultural Revolution, Industrial Revolution, Agriculture technology, Agricultural engineeringf

## Conclusion

In conclusion, the profound changes in recent years have moved us from the fourth industrial revolution to the fifth industrial revolution. The latter has a profound impact on the agricultural sector, with advances that were only imagined in the future but are already observable in the present. We must be adapted to them.

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**Figure 1.** Fifth Industrial Revolution technologies that will be impacting agricultural sciences. **Source: BioRender (2023) [12].**

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