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Smart Farming Revolution: Taking the step towards Agriculture 4.0 and 5.0 in challenging times



SMART PAPERS



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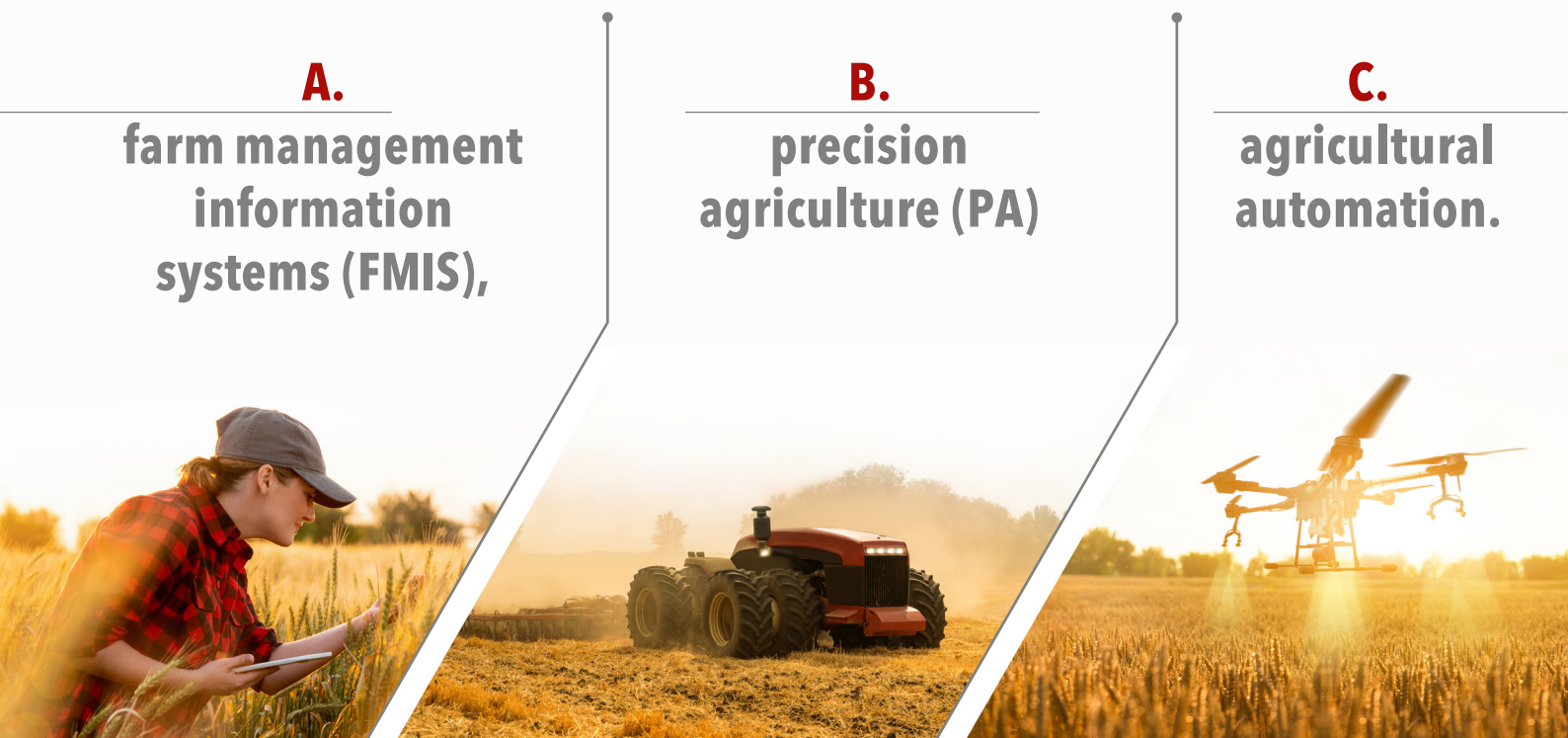
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Introduction

Smart farming represents the integration of ICT capabilities into agriculture, enabling IoT tools, geo-positioning systems, big data analytics, automation, unmanned vehicles and robotics to achieve higher efficiency on crop production with increased quality in a sustainable basis. The concept is also known as 'Agriculture 4.0', or 'digital farming', due to the recent developments in telematics and data management combined with Precisions Agriculture to improve farm operations. Then, big engineering challenges has opened the way for the next-generation farming, 'Agriculture 5.0'. New disruptive technologies have emerged, entailing autonomous functions by using robotics and AI applications, with an immediate effect on labor workforce augmentation and higher volumes of productivity at quicker times. ¹

Its most predominant technologies are classified into three main categories:



1. Saiz-Rubio, V., Rovira-Más, F. (2020). From smart farming towards agriculture 5.0: A review on crop data management. *Agronomy*, 10(2), 207

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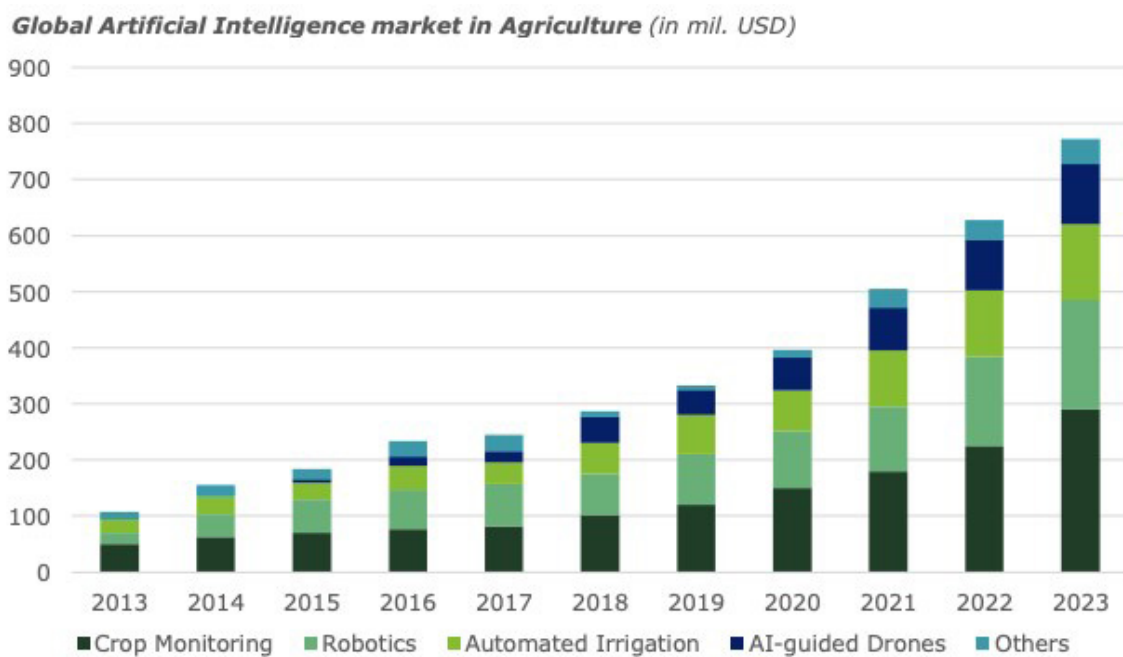
FMIS mostly involves software systems collecting, processing and storing digital data. PA aims to optimize output, improve economic returns, and reduce environmental impact. Robotics in agriculture leverage AI and machine learning to enhance computer vision, navigation tools and process automated applications.²

Those capabilities are critical given the current landscape. According to World Bank data, the market size of global agriculture is USD 2.4 trillion, which is only getting bigger as the population constantly grows. Farming provides jobs for 1.3 billion people, which accounts for 19 percent of the world’s population, indicating that agriculture is the primary source of income of about 58 percent of India’s population.

Furthermore, underdeveloped nations rely on this sector for a high proportion of their GDP, while production in the developed exceeds industry benchmarks by adopting advanced tools.

The global market for Agriculture 5.0 is valued at USD 240 million in 2017 and is expected to reach USD 790 million by the end of 2021, growing at a GAGR of 21.8 percent. Crop monitoring, robotics, and automated irrigations appear to be the three fastest growing AI applications in the farming industry.³ (Figure 1).

Figure 1 | The global AI Agriculture market, in millions USD. Deloitte Touche Tohmatsu Limited. (2020, January). Transforming agriculture through digital technologies.



2. Balafoutis, A. T., Evert, F. K. V., Fountas, S. (2020). Smart farming technology trends: Economic and environmental effects, labor impact, and adoption readiness. *Agronomy*, 10(5), 743.

3. Deloitte Touche Tohmatsu Limited. (2020, January). *Transforming agriculture through digital technologies.*

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Nevertheless, global megatrends, including climate change, Covid-19 impact, food insecurity, and malnourishment in developing countries, have put more pressure on the world to achieve the Zero Hunger goal by 2030. It is estimated that 2 billion people are exposed to severe food deficiency with no access to safe, sufficient and nutritious food, with the number bound to surpass 840 million by 2030. Covid-19 pandemic aftermath is not included in this equation, which means adding between 83 and 132 million people to the total number of undernourished people.⁴

Smart Agriculture is a much-needed innovation to accommodate the growing population's food demand. Countries like India, Pakistan and China, which are densely populated and heavily dependent on their agriculture sector to boost the economy, are seeking for technological advancements that can give their farmers the required edge in bringing farming into the new age of technology. Farm data can quickly help pinpoint weak and strong points in the current harvesting strategies.

The advent of Internet of Things (IoT) has greatly reshaped the agricultural sector. IoT, which connects digital and physical worlds by utilizing data to predict and automate business processes, has transformed smart farming operations. Other emerging technologies, such as cloud computing and artificial intelligence, have improved the decision-making process thanks to advanced analytics.⁵



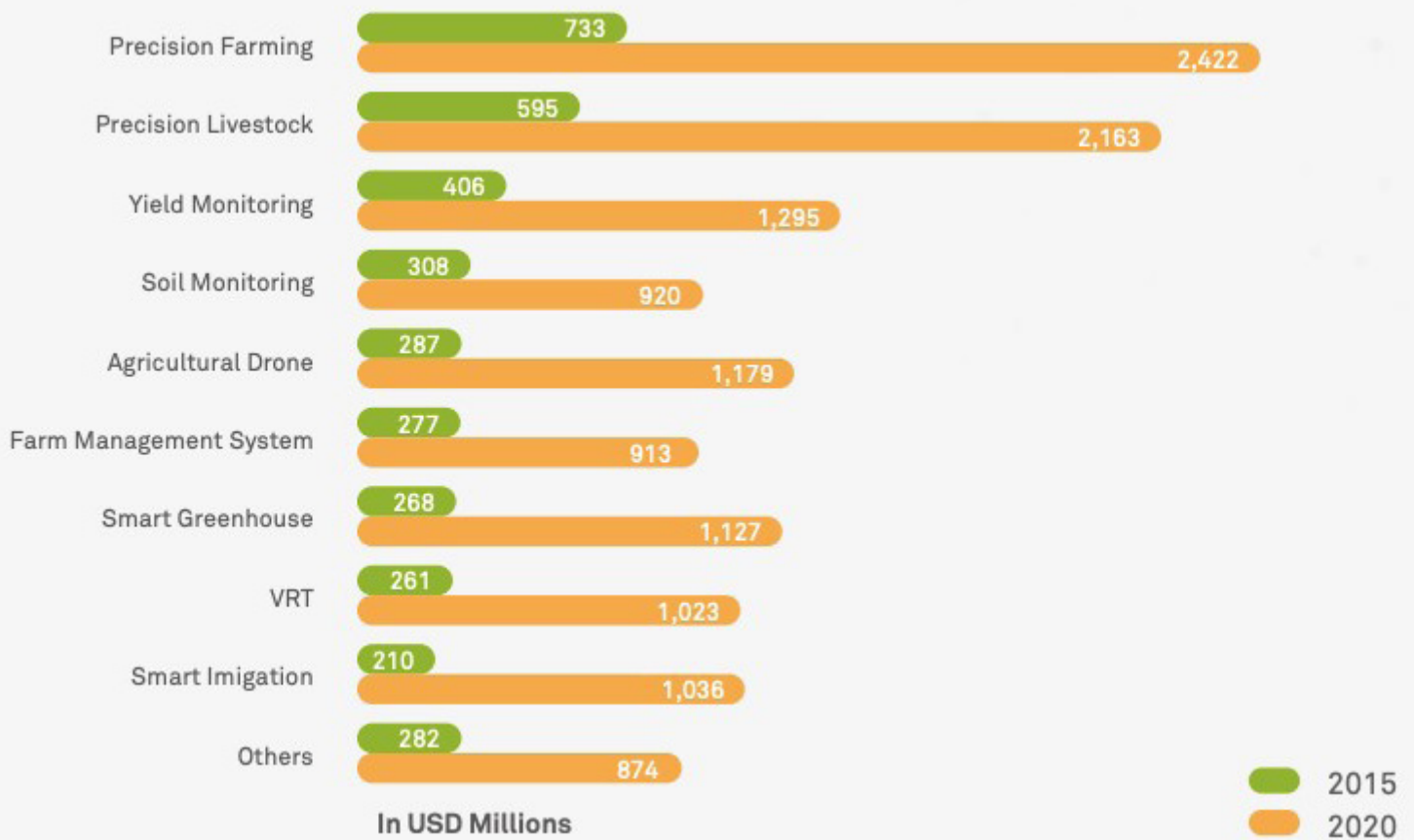
4. FAO. (n.d.). Key messages.

5. Deloitte Touche Tohmatsu Limited. (2021). Insights on the cloud.

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Smart applications can now help businesses invest in minimum infrastructure and ensure cost savings. The former can take multiple types, including private cloud, multi-cloud, or hybrid, while the latter enables next-generation autonomous algorithms for well-informed decisions. ⁶

Figure 2 | MarketsandMarkets Research Private Ltd. (2020). *The Connected Farm: A smart agriculture market assessment.*



6. Deloitte Touche Tohmatsu Limited. (2019). Analytics and Cognitive: Welcome to the age of WithTM



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