



xarvio™
The Digital Farming
Company

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Digitization Is Essential to the US's Farming Future



Farmers and their fields are the lifeblood of global food production. They play an indispensable role in ensuring we have an adequate supply of safe and sustainably produced food as we prepare to see unprecedented growth in our world population in the next 30 years. It is critically important to society that farmers are economically successful and efficient without facing an excessive amount of risk. However, due to many factors, rapid changes are occurring in the farming industry in many parts of the world including the U.S. Between 1950 and 2000, the number of farmers declined by 73 percent, from 7.6 to 2.06 million. During the same period, hired farmworkers declined from 2.33 million to 1.13 million, a 52-percent reduction.¹

Farmers today find themselves under tremendous economic pressure to maximize their acreage and increase production, while reducing their impact on the environment. Simply put, they must produce more with less resources. This, coupled with an increasing demand from consumers for greater transparency in food production and a declining agricultural labor force, presents the necessity for innovation.

At the turn of the 20th century, improvements through mechanization led to the first "agricultural revolution," which increased productivity dramatically. The second agricultural revolution beginning in the 1960's, spurred by improved crop breeding and genetics, led to significant yield improvements that continue today. However, this rate of yield improvement from plant genetics is slowing. Based on world population predictions, today's plant genetics and machinery alone will not be sufficient to meet future demand for food.

Technological advancements have the potential to tackle these challenges in the decades to come. Strengthening the industry requires digital farming solutions that leverage available data and innovative technologies to increase yields, optimize inputs and improve operating efficiency. However, there are numerous headwinds facing the digitization in the agriculture industry.

Though digital technology has the potential to significantly improve farming by improving financial performance and enhancing crop yield, it is still not widely utilized today. Less than 20 percent of acreage is managed with the support of digital technologies.² Further, in 2017, the U.S. Department of Agriculture (USDA) reported that 29 percent of U.S. farms have no access to the internet.³ Yet, new precision technologies have the potential to allow for 70% higher yields on existing agricultural land by 2050.⁴ It is incumbent upon ag-tech and crop input providers to meet these challenges head-on and help find solutions, so farmers can benefit from new technologies as quickly and effectively as possible.

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Digital solutions can help secure a more productive, safe and efficient future for the agriculture industry by:



AUTOMATING DATA TO IMPROVE DECISION MAKING.

Data offers the foundation for the geo-location of real-time inputs and precision technology. Mobile technologies automate data collection and analysis for growers that is easy to access, available on demand, and easy to share with other growers so more farmers can grow their crops cost-effectively and more efficiently. Analytics can help farmers determine what to plant, where to plant and when, as well as how to best manage crops for robust yields. Precision technologies have proven to boost profit by up to \$40,000 on a 2,400-acre farm.⁵



OPTIMIZING CROP PROTECTION TO IMPROVE EFFICACY OF PRODUCTS AND REDUCE ENVIRONMENTAL IMPACT.

Digital technologies offer precision, so farmers have accurate information to improve the yield and health of their crops while reducing the amount of crop protection products applied per acre. Having the knowledge and equipment to apply the right product, at the right time and only in the optimal areas of each field will allow farmers to improve profitability and help them take better care of their land.



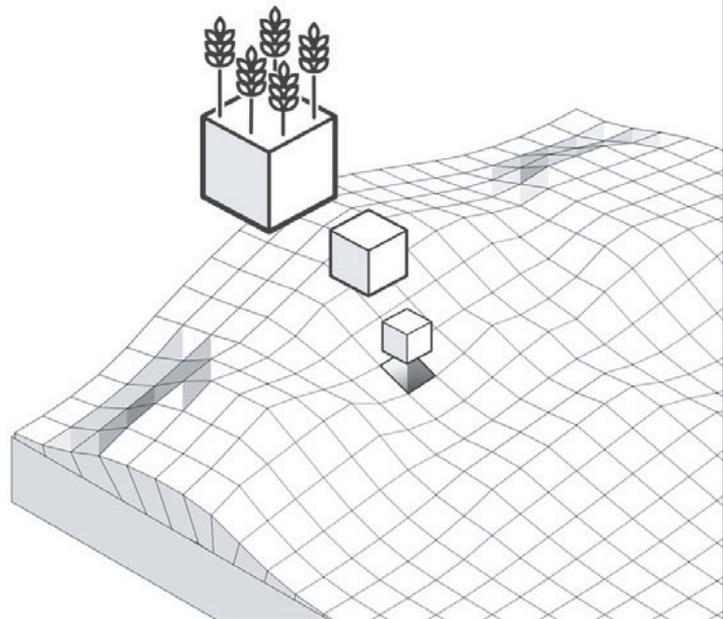
FOSTERING COLLABORATION BETWEEN STAKEHOLDERS TO ADVANCE SUSTAINABILITY AND TRACEABILITY.

Industry stakeholders must work together to ensure that valuable and real-time data — which increases grower productivity and traceability — is available, shared and fully integrated among available tools and technologies. Access to and sharing of data on the health of our crops increases transparency and accountability across the value chain, ultimately enhancing consumer confidence and peace of mind.



The building-blocks of a safe and efficient future for agriculture are already apparent through:

- **A shift towards utilizing artificial intelligence (A.I.)** Every day, farmers have to select crop varieties, determine planting dates, manage pests, and ensure crops are getting the right nutrients. These decisions are impacted by constantly shifting climate conditions and changes in the field. Analyzing historical data, including yields, climate, soil and fertilizer inputs, coupled with the increasing availability of real-time data, to make informed decisions is near impossible for human beings alone. Effectively leveraging technology and complex algorithms have the power to deliver insights for effective risk management and smart decision-making. For example, image recognition technology utilizing such A.I. is available to farmers today via mobile applications, enabling farmers to recognize weeds, diseases, insects and other crop threats in real-time so they can make precise decisions about the application of necessary crop protection products. In the future, this image recognition technology will also be available on tractors, combines, and sprayers equipped with specialized sensors.
- **Incorporating remote imagery (satellite, airplane or drone) that improves crop production and promotes better land stewardship.** Remote imagery provides farmers with sub-field level metrics that offer an earlier and more comprehensive detection of yield-robbing crop threats, enabling more effective agronomic decision making. Imagery allows for analyzing the vegetation heterogeneity and health of farmer's fields, which can then inform disease management and optimal application of crop protection products.
- **Improvements in wireless and mobile technology that use data to inform future production.** The availability and increased use of mobile devices has the potential to transform agriculture and make useful information available to farmers at their fingertips. While mobile applications that can make farming more productive and efficient are available and continue to be in development, next-generation 5G networks are expected to be 100 times faster than current 4G networks. They can also carry more data, making them ideal to transmit data from sensors and other tools in the field.⁶



1 Farm Labor, US Department of Agriculture (USDA) Economic Research Service
2 Digital Agriculture: Improving Profitability, Accenture
3 Rural Broadband, Farm Bureau
4 Digital Technologies in Agriculture: adoption, value added and overview, Medium
5 Farming: There's An App for That, National Geographic
6 How 5G will change the future of farming, CNN Business

Xarvio's digital portfolio is at the forefront of improving farming practices by providing agricultural knowledge that helps growers determine the best application of crop inputs to optimize yields. Leveraging mobile technology, xarvio's tools use data, analytics and A.I. to allow growers to instantly identify weed and disease threats and optimize their fungicide applications. Xarvio solutions, Scouting and Field Manager, help farmers identify and manage disease threats, and provide insights to optimize crop protection applications for each field. For example, xarvio technology trials in Brazil have demonstrated a 30% reduction in herbicide usage in soybean production while maintaining yields. Xarvio has produced similar results in fungicide applications for farmers in Europe and Canada. With the introduction of Field Manager technology in the U.S., xarvio is expecting to bring similar benefits to U.S. farmers as well.