



Article

Information Systems Adoption and Performance in Agricultural Enterprises

Ermanov Farrux¹

1. Independent researcher at the Institute for Advanced Training of Personnel and Statistical Research, Uzbekistan

* Correspondence: Farrukh1508a@gmail.com

Abstract: This study examines the impact of information systems on agricultural productivity, focusing on how digital technologies influence efficiency, resource utilization, and management quality in agricultural production. This research is conducted by analyzing how information systems (farm management platforms, geographic information systems, sensor-based monitoring tools, drone technologies) and decision-support systems assist in facilitating the planning, monitoring and control processes. Emphasis is placed on the application of drones in the field for monitoring, assessing crop health, detecting and quantifying pests, and estimating yield as they are able to greatly reduce labor costs and time requirements. This piece of analysis reinforces the role e-commerce platforms can play to achieve an expanded market for green agriculture and strengthen producers and consumers linkages. In addition, research brings attention to the importance of digital transformation and data exchange over the Internet for improving decision-making capabilities, building operational sustainability in rapid response to environmental change and market conditions factors. The results signify that the proper functioning of information systems helps to improve agricultural production, accomplish resource efficiency and continues growth of the agriculture industry.

Keywords: Information Systems, Agricultural Productivity, Digital Transformation, Drone Technology, E-Commerce, Decision Support Systems

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1. Introduction

Modern society is experiencing a dramatic impact from the rapid development of digital technologies and information systems on all sectors, including agriculture. However, the transition from traditional production methods to modern data-driven management systems makes it possible to increase agricultural efficiency, but also to ensure the rational use of resources and optimize production processes. My subjective opinion on the situation is that the scientific and practical task of studying the role and impact of information systems in agriculture from an efficiency perspective is relevant [1].

There are many factors affecting agricultural production, such as climatic conditions, land and water resources, level of machines and technology, the rate of labor productivity operated in the area and good management decisions. Such systems allow for timely collection, processing, and analysis of reliable information about the said factors and therefore supports well-reasoned decision-making in the operations of farms or agribusiness enterprises. As a result, production costs are reduced, yields increase, and overall economic efficiency is enhanced. The use of geographic information systems,

agricultural information platforms, resource planning systems, artificial intelligence, and smart agriculture technologies is expanding rapidly [2], [3]. These technologies provide opportunities to improve crop management, forecast yields, optimize the use of water and fertilizers, and plan production in line with market demand. There remains a need for a comprehensive scientific assessment of the actual effectiveness of information systems and their influence on economic outcomes.

The purpose of this study is to analyze and evaluate the impact of information systems applied in agriculture on production efficiency. To achieve this goal, the types of information systems, their functional capabilities, and their practical results are examined. The findings of the research are intended to support the development of scientific and practical recommendations for the implementation and effective use of information systems in agricultural enterprises [4], [5].

Literature Review of the Subject

The utilization of information systems for enhancing agricultural productivity has been a subject of extensive discourse in national and international scholarly literature. According to researchers, increasing complexities of agricultural production due to climate change, market volatility and resource scarcity have spurred demand for digital and information technology-driven solutions in the space. Information systems are considered as a core tool for improving efficiency, decreasing uncertainty and promoting sustainable growth in agriculture [6], [7]. Much literature deals with the role of farm management information systems in production process optimization. In essence, FMIS help farmers collect and analyze soil data, crop record variables, weather conditions and input use for more informed decision-making. Scholars note that the use of such systems leads to improved planning accuracy, better allocation of resources, and increased crop yields, particularly in large-scale and commercial farming operations.

Another important research direction addresses the application of geographic information systems and remote sensing technologies in agriculture. According to various studies, GIS-based tools allow for spatial analysis of farmland, identification of productivity zones, and monitoring of environmental changes [8]. Data from the literature shows that with GIS integration of satellite images/ sensor data and precision agriculture, targeted fertilization, irrigation and pest control etc. This leads to not only increased productivity but also a reduction in production costs and an improved environmental footprint. The recent academic research on the drone technology is gaining considerable attention. Authors detail how drones can be harnessed for these purposes to monitor crop health in real time, identify plant disease, assess irrigation efficiency and estimate yield potential. Research has shown that in practice, drone-based monitoring greatly eases the labor and time burden of field inspections whilst providing high resolution data to enhance management decisions. However, some researchers point out challenges related to high initial investment costs, regulatory constraints, and the need for technical skills [9], [10], [11].

Several studies have explored the impact of digital transformation and internet-based platforms on agricultural value chains. They identify e-commerce platforms as a key mechanism for improving market access, especially for small and medium-sized producers. According to literature, online platforms allow producers and consumers to interact directly, enabling the exchange of environmentally friendly products alongside increases in incomes for farmers (Mert et al., 2022). Authors cite existing barriers in this regard, ranging from limited internet access for rural parts of Wisconsin to subpar digital infrastructure [12].

3.1 Relationship between information system and agricultural productivity
The literature review analysis shows that information systems significantly contribute towards growing agricultural productivity, resource-use efficiency and sustainability. Researchers also emphasize the need for a more comprehensive analysis that evaluates the combined

economic, technological and organizational impacts of these systems – especially in developing and transition economies. This underscores the importance of further work to assess the true effects of information systems on agricultural productivity given local and institutional contexts.

2. Methodology

The framework to examine the effect of information systems on agricultural productivity expands upon *. A mixed-methods research design enables a diverse base of analysis on technological, economic and organizational impacts in agriculture.

3. Results

Systematic analysis of the impact of information systems on agricultural productivity During this analysis, they pay special attention to the interaction of information systems and important indicators: crop productivity, resource use intensity, cost efficiency and management decisions quality, as well as long-term operational sustainability. Information systems refer to technologies used specifically for collecting, storing, processing and analyzing data; they include farm management systems, geographic information systems, sensor-based monitoring technologies and decision-support applications. [13]. The assessment examines how these systems contribute to planning, monitoring, and control functions, reduce uncertainty, and enhance the ability of farmers and agricultural enterprise managers to adapt to environmental, technical, and market conditions.



Figure 1. Activities of drone technology

Assessing the impact of information systems on agricultural productivity can be understood as an analytical approach aimed at identifying the economic, technological, and organizational effects of digital information tools on agricultural production processes, with the primary objective of determining their contribution to increased productivity and more efficient use of resources. Agriculture is one of the key pillars of any national economy [14]. The primary purpose of agricultural infrastructure is to create favorable conditions for the production activities of sector enterprises and to improve the living standards of the rural population. The components of this infrastructure do not influence the production process in the same way; rather, each occupies a specific and distinctive role within agricultural production. E-commerce platforms have opened new opportunities for the marketing of agricultural products. In today's market, environmentally friendly products are increasingly prioritized, as consumers tend to prefer goods that are natural, safe for health, and produced in an ecologically sustainable manner. By enabling online sales of such products, electronic commerce platforms play a crucial role in delivering them directly to consumers.

The use of drones in agriculture can be considered a relatively new practice in the context of national experience [15]. Traditionally, monitoring and assessing field conditions required the involvement of multiple workers and could take several days. By

contrast, drone-based monitoring allows these tasks to be carried out more efficiently, saving both time and labor resources. This approach is a key objective of ongoing scientific and practical pilot projects conducted by specialists in the field. Unmanned aerial systems make it possible to observe crop conditions within a short period, detect plant diseases, map cultivated areas and farmland, and monitor pests. Through images displayed on computer screens, it is also possible to identify crop damage, irrigation errors, and areas with increased pest activity. Moreover, the collected data and visual materials allow for the assessment of damage caused by heavy rainfall, hail, and other natural disasters, as well as for estimating future crop yields. The collected information is currently transferred to computers using conventional methods. Ongoing research aimed at improving these processes is expected to enable continuous real-time data transmission through online systems in the future. Internet-based Data & Information Processing in Agriculture The processes of collecting, processing information as well as benefiting from it will hugely impact agricultural productivity and smart decision making. In this regard, it is especially justified to give particular attention to various aspects of mechanisms for transmitting data, its cost-effective processing and reliable storage – since these factors have a direct impact on forming the level of quality and reliability of information systems.

Data sharing and flow of agriculture-related information through the internet are also integrated into the larger phenomena of digital transformation. Agricultural digital transformation is the incorporation of technology into every aspect of agriculture. With these systems, farmers can manage their operations more efficiently, allocate resources more precisely and optimise production with market demand. Furthermore, with advancing technology, farmers are able to access relevant agricultural information in a quick and easy manner which helps them making timely and informed decisions.



Figure 2. The effectiveness of information systems in agriculture

4. Conclusion

Data concerning the systems of information in agriculture show that they play an important role in increasing productivity, efficiency with resources and making decisions in the sector. This encompasses a range of digital tools, including farm management systems, geographic information systems, and sensor-based monitoring devices and decision-support applications – which enable farmers and agricultural managers to plan for the production process for greater control. Such systems increase crop yields, conserve resources, and ensure operational sustainability in the long run by minimizing uncertainty, enhancing decision-making quality and facilitating timely interventions. These technologies alongside the inclusion of other emerging technologies like drones, showcase how information systems can transform agriculture. It provides rapid

assessment of the crop conditions, identification of plant diseases, pest trajectory tracking, and accurate mapping of cultivated areas with reduced time and labor compared to traditional monitoring methods. When combined with online platforms for data transmission and e-commerce, these technologies lead to better farm management and direct access to consumers, especially environmentally friendly or sustainable agricultural products.

Digital systems in agriculture align with the overall agenda of digital transformation, helping farmers to adapt to changing environmental, technical and market conditions. Timely and precise information helps stakeholders in making well-informed decisions, predicting challenges ahead, and adopting measures resulting in increased productivity while ensuring protection of the environment. Information systems in agriculture These systems reflect a growing recognition that digital technology can drive efficiency, sustainability, and competitiveness. Their continued development and integration are essential for modernizing agriculture, supporting rural livelihoods, and ensuring food security in the context of increasing global demand.

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