

AGRICULTURAL DECENTRALISED PLATFORMS: ENHANCING MARKETING AND SALES

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Abstract

The research on low adoption of software solutions has yielded unexpected insights, revealing the need for a revolution in the way we interact, not only on developing innovative technologies and creating disruptive software solutions, but also in the market space. The findings emphasized that the software solutions available for achieving economic efficiency in agriculture are complex and only partially meet the needs and expectations of farmers, presenting an opportunity for the development of new personalised solutions. The study also found that traditional marketing strategies are too limited to be applied in agriculture, emphasising the importance of collaboration between all actors involved in the process. Factors such as cost, accessibility, trust in technology and time constraints were found to be affecting the adoption of software solutions for agriculture. The article highlights the benefits of forming producer groups for small-scale farmers and decentralised platforms to achieve economies of scale, share resources, and improve access to credit and market opportunities. Additionally, the article discusses the vulnerabilities present in digitised farming processes, emphasising the need for resilience and innovative solutions to promote the sector's long-term sustainability.

Key words: digital farming, revolutionized communication, digital agriculture apps, software-driven marketing, decentralised platforms

In recent years, there has been an increasing demand for technological solutions to improve the efficiency and productivity of the agricultural sector (Barrett, 2020; Berthet, 2018). This has led to the emergence of several agricultural software applications that aim to provide solutions to the challenges faced by farmers and other stakeholders in the sector. However, despite the potential benefits of these software applications, their adoption rate in the Romanian market has been relatively low. The adoption of software is a critical issue that affects individuals, businesses, and society as a whole. As highlighted by Khanna, understanding the determinants of technology adoption is crucial to its success. This includes factors such as the potential benefits of software, the availability of necessary infrastructure, and ease of use for potential users. To address these challenges, it is essential to increase awareness among farmers about the potential benefits of agricultural software applications and how they can improve their productivity and profitability. This can be achieved through targeted marketing campaigns, farmer education programs, and partnerships with agricultural associations and cooperatives. In addition, developers and vendors of agricultural software applications need to invest in

effective marketing strategies and user-friendly designs that can help increase their adoption rate. By doing so, the agricultural sector in Romania can reap the benefits of technological advancements and achieve sustainable growth and development.

Decentralised agricultural platforms have emerged as a promising solution to enhance marketing and sales in the agriculture industry. These platforms (See figure 2) are designed to connect farmers directly with buyers and provide them with access to information, resources, and tools that can help them improve their farming practices, increase their productivity, and reduce their costs.

By leveraging the power of blockchain technology, these platforms enable farmers to sell their products directly to consumers without intermediaries, thereby reducing transaction costs and increasing profit margins. This has the potential to revolutionise the agriculture industry by creating a more efficient and transparent market that benefits all stakeholders.

One of the key benefits of decentralised agricultural platforms is that they provide farmers with access to real-time market information, which can help them make better decisions about what to

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grow and when to sell their products. This information can also help them negotiate better prices with buyers and improve their overall profitability.

Another benefit of these platforms is that they enable farmers to collaborate with each other and share resources and knowledge. This can help them improve their farming practices, reduce their costs, and increase their productivity.

Agricultural decentralised platforms can also help buyers by providing them with access to a wider range of products and enabling them to source products directly from farmers. This can help them reduce their costs and improve the quality of the products they sell.

Overall, decentralised agricultural platforms have the potential to transform the agriculture industry by creating a more efficient, transparent, and sustainable market that benefits all stakeholders. As such, they represent a significant opportunity for farmers, buyers, and other stakeholders to enhance their marketing and sales strategies and improve their overall profitability and competitiveness.

MATERIAL AND METHOD

Our research studies in trying to understand the lower adoption of marketing strategies covered four directions. To understand the low adoption of agricultural software applications within the Romanian market, we first try to identify the needs and expectations of farmers. We interviewed medium size vegetable farms from the Moldavian region in order to identify the needs and expectations of farmers in terms of software solutions for economic efficiency in agriculture and understood that the existing solutions are hard to implement or too expensive for their benefits and do not cover all their expectations. In this sense, we identified an opportunity to develop new improved and personalised solutions that meet farmers' needs and expectations.

The attempt to evaluate the effectiveness of existing marketing strategies for software solutions for economic efficiency in agriculture made us realise that the classic marketing strategies are too specific, limited in space and time and personalised to the technology provider and customer needs and are hard to be generalised. No clear statement can be formulated regarding the identification of marketing strategies that are working best and which ones need to be improved or abandoned. Anyway, starting in 2004, it was observed that the process of introducing new technology in the agricultural sector had undergone a shift. It is no longer enough to simply develop a new invention and rely on marketing campaigns to persuade farmers to adopt it (Boehlje M., 2004).

A recurrent identified factor in all research studies effectuated and also referenced from

literature is the need for better collaboration between all the actors involved, from farmers to technology providers, customers and marketing providers. Development of new marketing strategies and new ways of interacting should, be developed and provided in order to efficiently facilitate their collaboration.

A study published in the journal "Agricultural Economics and Rural Development" analysed how Romanian farmers use information and communication technology (ICT) in their agricultural businesses and identified several factors that affect the adoption of software solutions for agriculture, such as the costs, accessibility and degree of trust in these technologies. In his work, Khanna provides a comprehensive analysis of the factors that impact the adoption of emerging digital technologies. He not only identifies these determinants but also explores how policymakers can design effective incentives to promote the cost-effective adoption of these technologies. Khanna acknowledges the challenges that come with implementing policies to encourage digital technology adoption, but he also highlights the immense opportunities that these technologies can offer in overcoming these challenges. With the right incentives and support, digital technologies (Bronson, 2019) can facilitate economic growth, improve public services, and enhance overall societal well-being. Khanna's insights provide valuable guidance for policymakers, businesses, and individuals seeking to harness the full potential of emerging digital technologies (Khana M., 2020).

Apart from specific impediments such as high costs, lack of trust in technology itself or its providers, the fear of change and the complexity of implementing and adopting new techniques or technologies, the lack of time to realise possible benefits of the new solution for the future, the difficulty to create partnerships and collaboration could be considered as the most frequent impediment to the adoption of software solutions for agricultural economic efficiency.

The modern economy strives to balance the quantitative and qualitative aspects of food production in order to meet consumer demand while also considering their physiological needs. Agromarketing plays a pivotal role in increasing agricultural production to satisfy the food requirements of the population and stimulate domestic production. However, the decentralised nature of agricultural production with a large number of dispersed farmers and varying economic power creates issues for both farmers and processors. To address these challenges, the formation of producer groups can provide advantages in terms of production and recovery. Collaborative efforts among farmers can help streamline the production process, reduce costs, and increase bargaining power. By joining forces, small-scale farmers can achieve economies of scale, share resources, and improve their access to credit and market

opportunities. In addition, forming producer groups can enhance the competitiveness of the agricultural sector and contribute to the overall economic growth of the region (Iancu T., 2014).

In his work, Bökle offers a comprehensive analysis of the current state of digitisation in agriculture and highlights the vulnerabilities present in digitised farming processes. Among the most critical vulnerabilities is the lack of interoperability and the dependency on internet connectivity. Bökle identifies the requirements that must be met to address these vulnerabilities in future IT systems, resulting in successive levels of resilience tailored to individual farms' needs and adjusted to their mobile (Emeana, 2020) and landline internet supply. These findings are incorporated into a conceptual framework for a highly digitised fictive farm that prioritises resilience by incorporating decentralised storage and computing capacities, internet-independent communication networks, and collaborations with machinery rings and contractors. By focusing on resilience and adopting innovative solutions (Hao, 2019) to overcome vulnerabilities, Bökle's work offers valuable insights for those seeking to improve the digitisation of agriculture and promote the sector's long-term sustainability.

RESULTS AND DISCUSSIONS

Ofori's research study's results demonstrate that the time it takes for farmers to adopt embodied-knowledge technologies, like automated guidance and section control, is statistically shorter compared to information-intensive technologies, such as yield monitors, precision soil sampling, and variable rate fertility (Ofori E., 2020). Additionally, the duration of time to adoption was found to be indirectly proportional to the commercialisation date of embodied-knowledge technology, while it was directly proportional to information-intensive technology. Furthermore, there were differences in the time-to-adoption among technologies within these two broad categories, and the adoption duration varied across farm locations and between both types of technologies. The research found that millennial farmers are more likely to adopt both types of technologies sooner than baby boomers, while factors such as net farm income, percentage changes in debt-to-asset ratio, corn to total crop acres, and machinery investment had no significant impact on time-to-adoption for both technology types. On the other hand, for precision agriculture technologies, time-to-adoption varied based on farm location, generation of farmer, number of workers, years of farming experience, total acres cropped, and the cost of crop insurance, with some variations present (Cllap, 2020).

The degree to which Precision Agriculture (PA) is being adopted at the farm level across the

globe was assessed through the analysis of data that is publicly accessible by James Lowenberg-DeBoer J. and Erickson B., which conclude that the adoption of PA is not slow, only the adoption of the variable rate technology (VRT) with which PA is often associated with. In fact, the adoption of certain Precision Agriculture (PA) technologies, such as GNSS guidance and associated tools for sprayer boom control and planter row or section shutoffs, is rapidly increasing worldwide. These technologies are becoming standard practice in mechanised agriculture and are being adopted as quickly as any other agricultural technology in recent times, including GM seeds. Unlike GMs, however, the use of GNSS guidance has not faced regulatory or social/political concerns in some regions, allowing for its wider implementation.

The main PA adoption gap exists in non-mechanized medium and small farms in the developing world (Chandra, 2021, GSMA, 2020), as few cost-effective PA technologies have been developed and commercialised for these farms, and the strategy of selling simplified versions of industrialised country technology has proven largely unsuccessful (Lowenberg-DeBoer J., Erickson B., 2019).

The landscape of introducing new technology in the agricultural industry is evolving. Merely creating a new invention and promoting it through marketing campaigns to convince farmers to adopt it is no longer sufficient (Boehlje M., 2004).

After reviewing the literature, Boehlje Michaelit identified six business challenges that need to be addressed in order to successfully commercialise agricultural technology as Creating Value, Gaining Customer/Consumer Acceptance, Capital Market Access, Value Capture/Sharing, Protecting Intellectual Property, and Innovation Strategy.

Introducing any new technology (Kenny, 2021; Jayarman, 2015) in business poses a fundamental challenge of generating value for the customer (McCampbell, 2021; Wigboldus, 2016). However, even if the technology promises to create value for the customer, the pace at which it is adopted and brought to market can significantly affect its financial and business success. The speed of commercialisation, or time to market, has emerged as a critical challenge in the information technology and biotechnology sectors in recent years.

In an article published in the journal "Precision Agriculture", researchers examined the marketing strategies of software solutions for agriculture in Europe and concluded that offering customised solutions adapted to the needs of each customer is essential for the success of marketing

these products. In Romania, there is also research and studies on marketing strategies for software solutions for agriculture. Overall, these studies show that one of the most important marketing strategies is developing partnerships with agricultural farms and providing customised solutions tailored to their needs.

A study published in the magazine "Economic Insights-Trends and Challenges" analysed the prospects of the software solutions market for agriculture in Romania and concluded that greater development of the IT infrastructure in the agricultural sector is necessary, as well as better collaboration between the actors in the market to increase adoption of agriculture software solutions.

In conclusion, in Romania, the development of partnerships with agricultural farms, the provision of customised solutions adapted to their needs, as well as the improvement of the IT infrastructure in the agricultural sector are important strategies for the successful commercialisation of software solutions for agriculture.

The mentioned research studies confirm the need for new innovative strategies for commercialisation of agricultural software solutions that can provide a safe and efficient way of interacting and sharing information (Wiseman, 2019a; Wiseman, 2019b). With the increasing prevalence of cyber threats such as hacking, phishing, and identity theft, it has become crucial to develop solutions that can protect individuals and organisations from these risks. To achieve this goal, it is necessary to invest in research and development of new technologies, platforms, and tools that can enhance security, privacy, and data protection (Van der Burg, 2021, Wolfert, 2017). This may involve leveraging advanced encryption techniques, developing secure communication protocols, implementing robust authentication mechanisms, and designing user-friendly interfaces that make it easier for people to manage their online identities and personal information (Higgins, 2020).

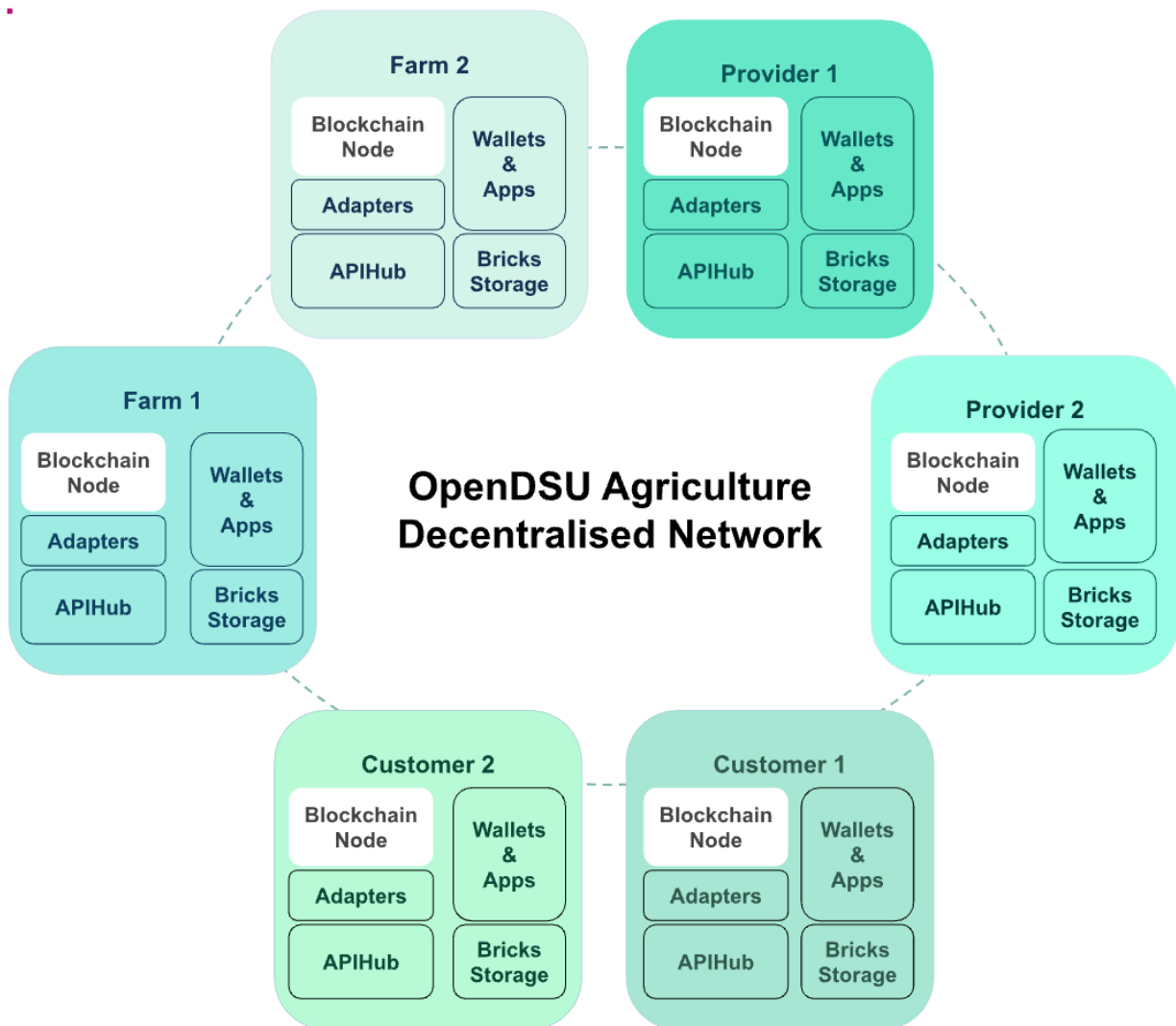


Figure 1 OpenDSU Agriculture Decentralised Network

The development of high tech secure decentralised solutions (Alboae S., 2019, Ursache C., 2023) applied in the field of agriculture could be the innovative suitable marketing strategies for agriculture software solutions and change the way of interaction, bringing important benefits for the entire ecosystem starting with the technology providers and finishing with farmers and their customers. As identified in the above-mentioned sections, the agriculture sector is in need of a new way of interacting between actors, and the OpenDSU technology presents a promising solution. By utilising the innovative approach of creating a decentralised platform (Balan A. *et al.*, 2023), OpenDSU can provide an easy and secure means of sharing confidential data within the industry. The technology's hierarchical blockchains and anchoring methodologies ensure that data remains self-sovereign (Ursache, 2023; Carolan, 2018), creating trust in an otherwise untrusted system (Balan A., 2023; Balan A. *et al.*, 2023).

The benefits of such a platform (Noyal K., 2021) are numerous, as it enables a new way of interaction that is more efficient, transparent, and accountable. By implementing OpenDSU

technology, the agriculture sector can enjoy the benefits of improved collaboration and streamlined processes, ultimately leading to greater productivity and sustainability. The innovative nature of OpenDSU technology makes it a game-changer for the industry, providing a solution to the identified need for change in the way actors interact in agriculture.2

In addition to the usual benefits mentioned above, such as transparency, security and increased efficiency, the development of a decentralised platform for agriculture offers a number of other advantages. These include: improving the process of tracking products throughout the entire supply chain, increasing sustainability (Agyekumhene, 2020) by reducing waste and environmental impact, as well as reducing costs for all parties involved. A decentralised platform can also provide greater flexibility and autonomy for producers, distributors, and consumers, allowing them to make faster and better-informed decisions based on their specific needs. Additionally, by eliminating intermediaries and reducing the risks associated with financial transfers, such a platform can promote closer and more profitable collaboration among all actors in the agricultural industry.

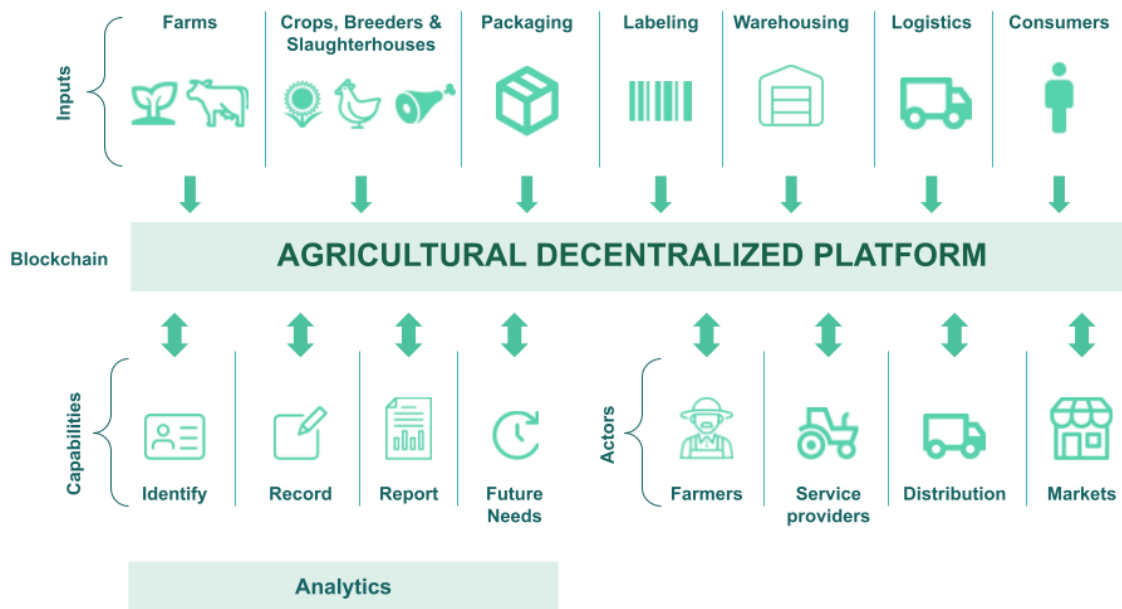


Figure 2 Visualization of a decentralised agricultural platform enhancing marketing and sales of services and products over a supply chain process from farmers to market

The use of a decentralised platform as an innovative marketing strategy can bring additional benefits beyond the usual advantages associated with the adoption of software in agriculture. In fact, it can help address many of the problems related to

software adoption that often hinder the industry's progress. One such issue is the lack of trust in new technologies, which can lead to resistance or slow adoption rates. By utilising a decentralised platform, trust can be established through increased

transparency and security, ultimately leading to greater acceptance and adoption of the technology. Additionally, the decentralised nature of such a platform can address concerns around data privacy and ownership, providing producers and consumers with greater control over their information.

By embracing decentralised platforms as part of their marketing strategies, agricultural businesses can position themselves as leaders in innovation (Ayre, 2019) and demonstrate their commitment to improving the industry as a whole. Ultimately, by utilising innovative strategies such as decentralised platforms, the agriculture sector can overcome many of the challenges associated with software adoption and move towards a more sustainable and efficient future.

CONCLUSIONS

In conclusion, the lower adoption of software in Romanian agriculture has been the subject of intense study, revealing several factors that contribute to this phenomenon. A critical aspect identified is the need for partnerships with agricultural farms to provide customised solutions tailored to their specific needs, along with better collaboration between the various actors in the market. Additionally, cost and trust have been identified as significant barriers to adoption. To address these challenges, the development of decentralised platforms (Balan A. *et al.*, 2022) has been proposed, which can help overcome these hurdles and accelerate the adoption of agricultural software solutions. By utilising such platforms (Halid, 2022), the industry can establish greater transparency, security, and trust while reducing costs and promoting collaboration among stakeholders. As such, the development of decentralised platforms (PharmaLedger, onsite) represents a promising solution that can contribute to the growth and sustainability of the agriculture sector in Romania and beyond.

Maximising the impact of agricultural software solutions: Developing innovative agricultural software solutions can have a significant impact on agricultural efficiency and productivity, but to maximise this impact, they must be adopted by farmers. Agriculture decentralised platforms can help increase farmer adoption, which can lead to improved agricultural sustainability and productivity.

Contributing to the development of smart agriculture (Bronson, 2018): Smart agriculture, which uses state-of-the-art technology to monitor, evaluate and improve crop performance, can significantly contribute to increasing efficiency and productivity in agriculture. The use of decentralised

platforms for agriculture software solutions can help increase the adoption of these technologies, which can lead to greater development of smart agriculture.

Improving agricultural sustainability: Agriculture software solutions can help reduce pesticide and fertiliser use, optimise water use, and reduce carbon emissions. Effective marketing strategies which include decentralised platforms, can help increase the adoption of these solutions, which can lead to more sustainable agriculture.

Increasing competitiveness in the agricultural sector: The use of software solutions for agriculture can help increase productivity and efficiency, which can lead to increased competitiveness in the agricultural sector. Through decentralised agriculture platforms, the adoption of these solutions by farmers can increase, which can lead to greater competitiveness in the agricultural sector.

Therefore, the development of decentralised agriculture platforms can bring significant benefits to the entire industry, from producers and distributors to consumers and the environment.

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