

Review

A Review of the Implementation of Financial Technology (Fintech) in the Indonesian Agricultural Sector: Issues, Access, and Challenges

Fathi Rufaidah ¹, Tuti Karyani ^{2,*}, Eliana Wulandari ² and Iwan Setiawan ²

¹ Doctoral Program of Agricultural Science, Faculty of Agriculture, Universitas Padjadjaran, Bandung 45363, Indonesia; fathi20001@mail.unpad.ac.id

² Department of Socioeconomics, Faculty of Agriculture, University of Padjadjaran, Bandung 45363, Indonesia; eliana.wulandari@unpad.ac.id (E.W.); iwan.setiawan@unpad.ac.id (I.S.)

* Correspondence: tuti.karyani@unpad.ac.id

Abstract: Technological developments, especially in the financial sector, are slowly changing the financial industry through digitalization towards fintech. The application of fintech has been introduced to Indonesia in the last few years; however, the existence and development of fintech in Indonesia still needs to be studied further. This review provided a comprehensive overview of farmer technology accessibility, fintech preferences, fintech application impacts, fintech application problems, and challenges in the future. The review data are taken from the primary and secondary data related to fintech from numerous publications in Google Scholar, the interview of Indonesian farmers, and Indonesian Government data, including the Central Statistics Agency. This study confirmed that a fintech provider has been developed in Indonesia. The farmers' accessibility to fintech was different between urban and rural areas due to the farmers' education levels and the availability of the infrastructure. Fintech can provide practicality, ease of access, comfort, and cost-effectiveness, and can solve existing problems in Indonesian society. However, several problems arise, including infrastructure and internet access that is less supportive, as well as a lack of education, competent workers, and regulation. Agricultural fintech is a promising business in the future, despite the many challenges that need to be overcome for a stronger agricultural sector.

Keywords: agriculture; fintech; Indonesian farmers; technology



Citation: Rufaidah, Fathi, Tuti Karyani, Eliana Wulandari, and Iwan Setiawan. 2023. A Review of the Implementation of Financial Technology (Fintech) in the Indonesian Agricultural Sector: Issues, Access, and Challenges. *International Journal of Financial Studies* 11: 108. <https://doi.org/10.3390/ijfs11030108>

Academic Editors: Muneer M. Alshater and Rim El Khoury

Received: 3 April 2023

Revised: 31 July 2023

Accepted: 17 August 2023

Published: 4 September 2023



Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

For an agricultural country like Indonesia, agriculture should be one of the important sectors and strategies in supporting economic growth. The agricultural sector's contribution to the national GDP was recorded at 14.27% (BPS 2021). Ideally, the agricultural sector's contribution to the national GDP should be more than these data, because Indonesia's tropical climate and natural resources are a good geographical and ecological supporting factor for agriculture. Indonesia has no constraint conditions such as those experienced by countries with sub-tropical climates. The agricultural sector is an important pillar for developing other sectors (Banson et al. 2016). The agricultural sub-sectors contributing to national GDP are food crops, horticulture, and plantation. Regarding GDP contribution, horticulture is greater than food crops and plantations (Azahari 2008).

West Java is one of the Provinces in Indonesia with an extensive agricultural sector and the highest number of agricultural workers involved. The BPS (2020) emphasized that the total labor force in West Java has amounted to 128.45 million people, where 29.76% among them, i.e., 38.23 million people, are agricultural sector workers. The situation is unfortunate, in that most of them live below the poverty line. According to the BPS (2020), there are 3.92 million poor people (7.88%) in West Java, and 43.64% of them are rural poor

people in the agricultural sector. About 85% are categorized as smallholder farmers with land ownership of less than 0.2 hectares.

In addition to the small land ownership, the low standard of Indonesian farmers' living is due to the low management of agricultural enterprises, especially agricultural financing, information on market conditions, and limited access to capital. The development of agribusiness is inseparable from business capital (Soetriono et al. 2006). In fact, with strong capital, smallholders can create more supportive facilities and broader marketing, so that they can depend less on the middleman (Ashari 2009).

It is implied that, in order to strengthen and improve the management of smallholder farming businesses, it is necessary to have the availability and accessibility of financial resources that farmers can use. The government and various related parties have tried to improve the access of farmers and rural communities to capital services, both through the development of formal financial institutions (banks) and village-scale cooperative units and farmer corporations, as well as farm credit policies, food security credits, and people's business credit (Kadarsan 1995; Rachmaniyah and Nugroho 2019).

Recently, there is a new emerging technology based on financial services, namely fintech. Fintech is becoming a hot and popular topic of discussion. However, the interaction between information technology and financial services is not a new topic. This fintech-based application has begun to be popularly discussed in recent years, especially with the presence of the 4.0 Industrial Revolution. Nguyen (2022) reports that fintech is the financial products and services that rely on technology to improve the quality of traditional finance. In addition, it is fast and easy to use. Thaker et al. (2020) expect that this information technology can encourage the emergence of specialists who create a market with the best products that match customer preferences. As a result, financial services are no longer only provided by financial institutions, since several startups have begun to provide fintech services, and their presence is competition for conventional banks.

Fintech has been widely used in the agricultural sector in order to support agriculture sustainability by offering farmers convenient funding through crowdfunding and digital payment systems (Anshari et al. 2019). Previous studies have shown that implementing fintech in several countries, including India, Ghana, China, and Southeast Asian countries, has a positive impact but still faces problems and challenges (Menkeh 2021; Yang et al. 2021). Menkeh (2021) reports that the main factors influencing the adoption of fintech among farmers in Ghana are the availability of internet networks, education, and the costs required to buy mobile phones or computers. Hinson et al. (2019) state that the biggest obstacles faced in adopting fintech in developing countries include the unavailability of adequate infrastructure, the difficulty of accessing investment, and the lack of education about fintech among farmers.

Fintech positively impacts productivity for those farmers who use fintech as a capital provider (Menkeh 2021). In China, fintech plays a role in strengthening the implementation and adoption of green finance policies to support a sustainable rate of economic growth (Yang et al. 2021). The existence of fintech provides a significant increase in income compared to before using fintech (Herlinawati and Arumanix 2017). Niu et al. (2020) estimate that the use of digital financial services by farmers has a positive effect in terms of increasing the ability of farmers to overcome business risks which will have a more positive effect on farm business performance than traditional banks provide.

Fintech has been recently introduced to Indonesia's people, especially farmers. Two models of fintech in Indonesia are crowdfunding and peer-to-peer lending (Bruton et al. 2015). Farmers' knowledge of fintech and its accessibility influence their preferences for fintech.

Fintech also has a positive impact on the public financial services in several cities of Indonesia (Jaya 2019; Anggraeni 2020), especially in increasing the business performance and productivity of Micro, Small Medium Enterprises (MSMEs) (Zanaria 2021), making transactions and investments easier for everyone (Anzelina 2021). However, implementing fintech still has problems because, as a new capital institution and service, fintech is not

necessarily accepted and used (accessed) by farmers. Farmers and the fintech industry should understand, fill in, and agree upon many factors in its application. However, there is still a lack of studies regarding the issues, access, and challenges of fintech in Indonesia. This review aims to provide a comprehensive overview of the issue, problems, and challenges in implementing fintech in the agricultural sector in Indonesia.

2. Literature Review

Digitalization is changing not only the work of agricultural enterprises but also the entire agricultural system as a whole. The use of digital technologies can potentially (i) increase crop yields and productivity, (ii) optimize resources to invest in the process, and (iii) eventually increase profitability. Digitalization can also improve farmers' working conditions and reduce agriculture's environmental impact. It reduces the problems associated with isolating rural areas and increases opportunities for social inclusion. Digital technology offers opportunities to develop new types of businesses, which can increase the attractiveness of rural areas, especially for the younger generation (Rivza et al. 2019).

Fintech is a financial service innovation with modern technology that aims to introduce practicality, ease of access, convenience, and economical costs (Sukma 2016; Chrismastianto 2017). Access to financial services encourages the ability of farmers to develop farming businesses. The existence of financial institutions that provide services to farmers can support the success of farming to generate positive perceptions and encourage farmers' motivation to implement new technology (Rukka 2003). Fintech itself is divided into several basic forms, including the financial sector (banking, investment, insurance, etc.), business processes (payments, investment, trade, infrastructure, etc.), and the consumer segment (retail or company), based on the form of interaction (business-to-business, business-to-customer, customer-to-customer) (Alt and Puschmann 2012).

Farmers' decisions to use fintech depend on the internal conditions, external conditions, and perceptions of new technologies. Lionberger (1960) states that the internal factors that influence farmers' decisions are age, education level, land area, income level, participation in groups, information-seeking activities, courage to take risks, attitude towards change, work motivation, aspirations, fatalism, and dogmatism (a closed belief system). Furthermore, external factors include government policies, institutions, social systems, and natural resources (Zulvera et al. 2014).

The behavior of farmers in making financial decisions is a mental process or behavioral change in a person in the form of knowledge (cognitive), attitudes (affective), and skills (psychomotor), since they are familiar with renewable technology until they decide to adopt the technology (Rogers 1995). Bloom (1956) divides behavior into three domains, namely knowledge (cognitive), attitude (affective), and action (psychomotor). Individuals formerly know the stimulus to generate knowledge. Furthermore, the affective domain arises in the form of attitudes toward known objects. In the end, after the object is known and fully realized, a response arises in the form of an action or skill (psychomotor domain).

In addition to internal and external factors, farmers' perceptions are a factor that influences farmer behavior in making decisions for financing. Rogers (1995) considers that the level of decision-making of an innovation depends on the adopter's perception of the characteristics of the technology. Five attributes that support the explanation of the level of perception in the decision-making of innovation include relative advantage, suitability, complexity, trialability, and observability. Rogers (1995) suggests five stages of the decision process in implementing a technological innovation, namely the knowledge stage, the persuasion stage, the decision stage, the implementation stage, and the evaluation stage.

3. Fintech Accessibility

In Indonesia, the adoption and accessibility of fintech by farmers for agricultural activities in both capital and rural areas are different. Angendari (2021) states that there are differences in the level of information and communication technology (ICT) adoption between rural and urban areas. One of the reasons for the limited access to fintech

in agriculture is the need for more infrastructure, more information, and the reduction in the younger generation's willingness towards agriculture. In making technological infrastructure more available, the challenges in rural areas are caused by demographic and psychological factors. Moreover, the urbanization of the young population in urban areas is the cause of the abandonment of small-scale agriculture businesses in rural areas (Ramadhan 2020).

Fintech is believed to be more accessible than informal and non-formal financial service institutions because it can be operated directly. Karyani (2012) states that narrow land ownership and rigid financing schemes cause farming communities to be unable to access formal financing sources easily. Hence, this sector needs to be addressed, with the average credit channeled to the agricultural sector only around 2%-3%. With fintech engaged in agriculture, farmer empowerment activities can be carried out by becoming an investor to finance farmers' cultivation in Indonesia, so that farmers can more easily gain access to capital to run their agricultural cultivation businesses. In addition, agricultural fintech also has a role in guiding farmers in Indonesia, both in terms of product marketing and online capital management.

4. Fintech Services in Agricultural Finance

The concept of information technology in the financial sector has triggered the emergence of various startup companies. Fintech in Indonesia continues to increase yearly (Avisha et al. 2019). A total of 102 fintech platforms available in Indonesia are recorded and licensed by the Financial Services Authority (in Bahasa Indonesia: Otoritas Jasa Keuangan/OJK) (OJK 2023). The fintech available in Indonesia is divided into two models, namely crowdfunding and peer-to-peer lending (Bruton et al. 2015). In addition, fintech is also available in both a government-managed form, like *Kartu Tani*, and a private-managed form, like Tanifund, IGrow, Vestifarm, and Crowde. Fintech providers are expected to be the solution for farmers who need access to financial support.

Each provider provides different services, information, user flows, and characteristics that attract farmers to use the service, such as a mediating lending, crowdfunding, online payments, online investment, and personal finance (Nizar 2017). In addition to services or facilities, each platform provides different financing and flow information, which can affect farmers' understanding and response. The complexity of the flow and information of financial services makes it difficult for farmers to use the platform, causing delays in financing. This fintech brings investors and loan seekers to one platform. Later, investors will become interested in the loaned funds (Frandya and Bosnia 2018). In general, the investors who conduct crowdfunding provide support for ideas and innovations proposed by entrepreneurs who will manage the funds.

The feasibility of financing is determined by various factors, such as the 5Cs (Character, Capacity, Capital, Condition, and Collateral). The eligibility of credit loans based on Abbadi and Karsh (2013) is collateral or guarantee, character or background of borrowing, capacity or business potential of land, capital or savings/savings, and macro-economic conditions or conditions of a region. In addition to these factors, other factors used to select farmers who deserve assistance are based on the ability and experience of farmers in managing agricultural businesses, land area, and their involvement in agricultural associations (such as farmer groups) (Anyiro and Oriaku 2011).

5. Farmers' Preference for Fintech

Consumer preferences can show the preference level for various choices of existing service products (Kotler 1999). Preference is the degree of liking (a tendency of the heart) to something or whether a person likes or dislikes the assessed product or service. The preference for an object is strongly influenced by attitudes and is often used to predict behavior, whether this be the behavior of individuals, groups or even a nation. However, a person's attitude toward an object does not always constitute displaying negative behavior towards the object (Azwar 2002).

Internal and external factors influence the farmers' behavior in selecting fintech. The internal factor is the main factor, from the farmer himself, that can direct power based on personal demands in order to influence a decision or desire to achieve certain goals (Waldi et al. 2019). According to Kartasapoetra (1988), internal factors that influence farmers' preferences are the farmer's age, level of education, gender, and farming experience. In addition to internal factors, external factors also greatly affect farmers' preferences. External factors are a condition that affects farmers who come from outside themselves, such as land, interaction with extension workers, farming facilities, involvement in farmer groups, and access to credit (Rachman and Suhartini 2016).

Farmers' knowledge of fintech will determine farmers' preference for fintech itself. The knowledge farmers possess will come from the availability of clear and precise information about financing for farming. Farmers' knowledge is obtained from counseling activity that provides socialization about various sources of financing around farmers and various information related to the terms and conditions applied for obtaining funding, as well as what kind of activities need to be carried out to gain access to financing information.

The results of previous research by Agatha and Wulandari (2018) show that most farmers need access to formal sources of financing. This could be due to the limited information obtained by the farmer. However, the information plays a vital role in financing farming. Precise and clear information can determine success in obtaining financing, such as availability and clarity of the characteristics, terms, conditions, and procedures of funding. This can increase the opportunity to obtain financing for farmers. Several efforts need to be made related to the dissemination of financing information, i.e., counseling activities for various sources of financing information and several necessary conditions to obtain financing, as well as facilitation and assistance activities for access to financing information. Training and assistance activities in accessing various financing information are expected to increase opportunities for obtaining financing for farmers.

The dissemination of information, especially related to financing, is important to carry out. A previous study by Harsanto (2014) states that the world has recently become interconnected, and advanced ICT today has the effect of faster communication and economies. Information technology can be used to develop a business (Permana and Cendana 2019). In general, the sources of financing found around farmers are fintech, banks, microfinance institutions (MFIs), government support through farmer groups, traders, agricultural production shops, and other sources of financing such as financing from family, neighbors, and friends.

Socialization is an important strategy, since farmers, as agricultural business actors, need information about banking products that can provide capital support. Socialization of banking products can be carried out through brochures. The brochure is an important part of promotional strategy in disseminating information related to an institution's business (Susilowati 2018). The authors explained that sharing information, for example, in the form of brochures, is an effort to introduce the institution and its products to the public.

In an earlier study by Lestari (2012), the participation and activeness of farmers in training or other similar activities can determine the success of the program. Farmers have important roles by showing high attendance and enthusiasm in implementing activity programs (Lestari 2012) and playing an active role in discussion activities (Mughtar et al. 2015; Wulandari and Supyandi 2019). In addition, the willingness of the farmer to implement all the information obtained in the program in their real life is also important.

6. The Role and Impact of Fintech in the Development of the Agricultural Sector

The presence of fintech recently contributed to the development of agriculture. Fintech companies not only help finance businesses' capital but also digital payment services and financial arrangements. In addition, fintech companies in the agricultural sector provide services in the field of cooperation by involving farmers and investors in capital participation, seed purchases up to the profit distribution, and farmers' monthly payroll. Several studies reported the impact of fintech in agricultural sector as described in the Table 1.

As the previous report, fintech service certainly makes it easier for farmers to access the various facilities provided. Being an agricultural fintech partner will increase the dignity of farmers, because it is directly associated with investors and fintech itself, which is equipped with a modern IT system to allow farmers access to all services. Agricultural fintech has a great opportunity to revitalize agriculture, driven by a transformative agribusiness funding system through peer-to-peer investment (Fitriani 2018).

Table 1. The impacts of fintech implementation in agricultural sector based on numerous earlier studies.

Objective	Keywords	Research Gap	Outcome	Sources
Finding out the role of crowdfunding-based fintech in funding agricultural businesses.	Agricultural Sector, Financial Technology, I-Grow	The influence of peer-to-peer-lending-based fintech (I-Grow) on the welfare of farmers.	Fintech I-Grow is able to become an effective alternative provider of capital. It acts as an intermediary between investors and farmers. The funding scheme is transparent and easy to understand. Farmer partners gain more certainty in their work systems and productivity.	Widiastuti et al. (2018); Fatimah et al. (2020)
Knowing the relationship between green finance, fintech, and rapid economic development.	Green finance, Fintech, High-quality economic development, China	The relationship between green finance, fintech, and economic development is analyzed using a panel regression analysis.	Fintech plays a role in strengthening the implementation and adoption of green finance policies to support sustainable economic growth.	Yang et al. (2021)
Creating a smart contract financial system based on blockchain technology.	Agricultural value chain financing, Innovation model, Direct financing, Block chain technology	The potential and influence of smart contracts based on blockchain technology in the agricultural sector.	Fintech innovation in the field of blockchain technology is effective in increasing the growth of companies that have adopted a smart contract system. The growth of companies adopting this system is 2.3% per year and is predicted to grow continuously.	Zhang (2020)
Finding out the attractiveness of agribusiness crowdfunding platforms for farmers and also the factors that influence farmers' interest in these platforms.	Agriculture, Crowdfunding, Financing	There are additional observations about the added value of crowdfunding platforms.	Farmers are very interested in fintech crowdfunding platforms because they do not require guarantees. Fintech provides cultivation assistance, certainty about crop buyers, disbursement of funds in the form of goods, profit sharing schemes, and loan repayments in the form of harvests.	Pratiwi et al. (2020)
Finding out the strategy undertaken in providing agricultural capital digitally, using SOAR analysis.	Capital, Financial technology, Peer-to-peer lending, SOAR Analysis	Opportunities, aspirations, and results.	Fintech has carried out a good strategy by taking a gradual approach in partnering with farmers in remote areas and implementing a loan repayment method in the form of tonnages adjusted to economic and market conditions.	Palupi et al. (2021)

Table 1. Cont.

Objective	Keywords	Research Gap	Outcome	Sources
Knowing the impact of the existence of fintech on MSMEs during the COVID-19 pandemic.	Financial Technology, Financial Inclusion, National Economy	The impact of fintech lending on the economic sector and economic institutions (MSMEs).	Fintech had a positive impact on the sustainability of economic activity during the COVID-19 pandemic. Fintech's contribution has helped many people who have still not been served by formal financial institutions in conducting financial transactions according to their needs. Farmers who are generally located far from areas served by formal financial institutions are greatly helped by the existence of fintech, which can meet the capital needs of farming businesses.	Marginingsih (2021)
Knowing the impact of the COVID-19 pandemic on peer-to-peer lending	Small business, COVID-19 crisis, Fintech credit	The effect of the pandemic on the demand and supply of agricultural products, the effect of a decrease in demand on capital lending activities.	Fintech-based capital loans were a good alternative for farmers during the COVID-19 pandemic.	Liu et al. (2022)
Finding out the effect of fintech understanding and financial inclusion on the productivity of MSMEs in Bandar Lampung City.	Fintech, Financial Inclusion, MSME Productivity	More focus on the object of research in the form of MSME actors.	There is a positive correlation between knowledge, insight, and the use of fintech on the business performance and productivity of Micro, Small, Medium Enterprises (MSMEs) in Bandar Lampung City. MSMEs with a good understanding about fintech and financial inclusion have higher productivity.	Zanaria (2021)
To determine the role of fintech and the impact of fintech implementation on the UMKM financial transactions in the Kebumen district	Fintech, Impact of Fintech Implementation, Role of Fintech	Apart from the positive impact of fintech, they have not yet identified the challenges faced by farmers in implementing fintech in Kebumen.	Fintech implementation has a positive effect on MSMEs' financial transactions in the Kebumen Regency.	Anggraeni (2020)
To determine the impact of financial inclusion on service education public finance through financial technology	Financial inclusion, Financial technology, Public financial service education	The knowledge and problems faced by farmers regarding fintech in Sleman need to be studied more deeply.	Financial inclusion through fintech has a positive impact on public financial service education in the Sleman Regency in 2018.	Jaya (2019)
To determine the development of financial technology (fintech) in Indonesia	Fintech, Innovation, Crowdfunding, Micro, small and medium enterprises	The nature of the problem of applying fintech, especially for the unbanked, has not been revealed.	Fintech is more efficient and effective compared to other financial services, therefore many people are motivated to use fintech.	Safitri (2020)

Table 1. Cont.

Objective	Keywords	Research Gap	Outcome	Sources
To identify the adoption of fintech innovation in Indonesia	Financial technology attitude, Financial literacy, Individual innovativeness, Unbanked population, Sustainable Development Goal 8	In this research, the use of innovation is only related to adoption, but the means of implementation and the impact of fintech have not been revealed.	Innovation and user attitudes influence fintech adoption in Indonesia. The using of fintech requires less financial literacy and has the potential to reach the unbanked population. Information and Communication Technology (ICT) infrastructure needs to be improved to accelerate fintech inclusion.	Setiawan et al. (2021)
To identify how fintech adoption and financial literacy affect Indonesian SMEs' performance	Fintech, Financial Literacy, SMEs' Performance	More variables than adoption of financial technology should be added in order to identify other factors influencing the performance of SMEs.	Fintech adoption positively and significantly influences SMEs' performance.	Utami and Sitanggang (2021)
To explore the determinants of Indonesian SMEs in adopting fintech services during the COVID-19 pandemic	Digitization in finance, Indonesian SMEs, Extended TAM, Sustainable Development Goals 10, SME Innovativeness	The nature of the geographic locations of SMEs businesses, since there is still a huge gap between urban and rural areas in adopting financial services.	Perceived usefulness, perceived ease of use, user innovativeness, government support, and trust have a direct impact on behavioral intentions to adopt Fintech among Indonesian SMEs, unlike financial literacy.	Nugraha et al. (2022)
To provide an overview of the use of fintech in agriculture	Financial technology, Agriculture, Credit, Risk, Financial literacy	How to tailor policy recommendations in a context-appropriate way in terms of fintech implementation.	Policy takeaways for fintech in agriculture to promote growth, enhance financial inclusion, and improve regional economic integration.	McIntosh and Mansini (2018)
To identify the impact of financial technology on household consumption by using the theory of the absolute income hypothesis.	Household consumption, Theory of absolute income hypothesis, Financial technology, Partial adjustment model, Chow test	The impact of fintech in urban and rural household consumption.	Fintech is one of the factors driving economic growth in Indonesia but, on the other hand, it motivates people to consume more, which has the potential to cause higher inflation rates.	Saraswati et al. (2022)
To measure the effect of Financial Technology Information System (fintech) service quality on customers' satisfaction level in a coffee shop business managed by young businessmen	Financial Technology, Small and Middle Company, Customer Satisfaction Level	The literature has not yet dug deep into the data and changing perspectives on fintech, in order to not only focus on e-payments, but also develop and expand other features of fintech such as savings and loans, business capital, investment, crowdfunding, peer-to-peer lending, block chain, and others.	The fintech information system has affected customer satisfaction levels, and it has a significant effect on the System Quality Variable value of 8.187 with the T-Table being 2.00 with a significance of 0.00. It is proved that fintech quality has a positive effect on customer satisfaction levels.	Hutapea (2020)

Table 1. Cont.

Objective	Keywords	Research Gap	Outcome	Sources
To analyze the effect of financial technology peer-to-peer lending on the Indonesian economy in the digital era	Financial Technology, Peer-to-Peer Lending, Economic Growth	The influences of P2P fintech after the covid pandemic have not been well identified.	P2P lending financial technology had a significant positive effect on Indonesia's economic growth and had an 68,18 percent effect on economic growth.	Fisabilillah and Hanifa (2021)
To identify the impact of fintech on eighteen MSMEs in the city of Magelang.	Fintech, MSMEs	The challenges of MSMEs described in this study have not been clearly identified.	Fintech plays an important role in improving the performance of UMKM, namely in the form of increasing operational efficiency and the efficiency enjoyed by its members; however, the application of Fintech in MSMEs also has its own challenges.	Rahardjo et al. (2019)
To find out the various kinds of perceptions that can influence a person's interest in using fintech	Fintech, Perceived Convenience, Trust, Effectiveness, Interest, MSME	The types of fintech that are in demand by MSMEs need to be identified more deeply.	Perceived convenience has a positive effect on interest in using fintech. The effect of trust has a negative effect on the interest in using fintech and effectiveness has a positive effect on the interest in using fintech.	Noviyanti and Erawati (2021)
To identify how fintech can become a prima donna that grabs the attention of many financial industry players	Fintech, MSMEs, Finance	How it will be able to improve the fintech-based economy in Indonesia and also add to the development of more advanced fintech in the Indonesian economy.	The increasing expansion of the fintech financing business, such as in peer-to-peer lending, opens up other options for lenders. Peer-to-peer lending is a type of loan that focuses on the lower-middle market segment.	Maulana et al. (2022)

7. Problems of Fintech in the Development of the Agricultural Sector

The application of technology in Indonesia still faces numerous problems, especially for a local society which are not ready yet to accept changes in economic activity. On the other hand, fintech that has been registered by Bank Indonesia can help finance small and medium enterprises to develop their businesses by becoming a place for easy and safe lending transactions. Structural problems in Indonesian agricultural financing resulted from several factors ([Arifin 2009](#)), namely: (1) a lack of information and poor communication between banks and the agricultural sector; (2) the structural dualism of modern (large-scale) agribusiness financing for people with small-scale business; and (3) the micro-pragmatism of banking business and macro-policy skepticism, so that one of the solutions to overcome the problem of agricultural business financing is the establishment of agricultural banks.

The obstacles during the development of agribusiness fintech are: (1) differences in the conditions of infrastructure between cities and villages, where the use of fintech highly relies on internet access. A limited internet network, especially in remote areas and underdeveloped villages, impedes fintech dissemination. (2) A limited fintech literacy among farmers. (3) Differences in the condition of human resources in adapting and adopting technological applications. The limited number of workers who have the adequate ability and willingness to use fintech has hampered the spread of agricultural fintech. (4) The limited laws governing fintech create obstacles to its dissemination. (5) The lower financial literacy in rural communities, especially in terms of people who do not know how to use fintech, as well as its benefits and goals. Due to low financial literacy, people do not have a good financial management plan. This needs an urgent solution through conducting

socialization and discussion through social media networks (Arifin 2009; Hermansyah et al. 2020; Menkeh 2021).

Several studies reported that the implementation of fintech has many problems. The current problem is the close relationship and high trust of farmers with informal financial service institutions that are potentially exploitative. Earlier studies by Hermansyah et al. (2020) and Marginingsih (2021) in all agroecosystem zones of West Java revealed that farmers who establish capital cooperation with dealers and agricultural facilities shop owners are subject to the obligation to sell their farm products to lenders; otherwise, they will be subject to a penalty in the form of no longer receiving loan services in the future. Saksonova and Kuzmina-Merlino (2017) reported that respondents are generally unaware of fintech services in Latvia and their associated innovations and new financial products. Fintech provides modern, high-quality services conveniently and effectively for their clients anywhere and anytime.

But, on the other hand, it is possible that fintech can threaten traditional financial organizations (Saksonova and Kuzmina-Merlino 2017). In fintech peer-to-peer lending, there are many cases of defaulting due to loan recipients being unable to repay their loans following the agreed period, which has created new problems related to improper billing practices by the providers. Also, the misuse of personal data by the fintech peer-to-peer lending provider caused immaterial losses on the part of the borrower (Disemadi et al. 2020).

8. Challenges and Future Perspectives for Fintech Implementation in Indonesia

Efforts to strengthen farmers' access to financial services have increased significantly during the era of reformation and regional autonomy (Sulaiman and Inounu 2017; Arifin and Sari 2020). However, for the last 20 years, farmers' access to formal financial services has not improved so much. Informal and non-formal sources of capital, such as dealers, shops for agricultural production facilities, families, and loan sharks, are still popular choices for farmers. The reason behind this situation is the ease of offered terms, conditions, and application procedures, the closeness of distance and social conditions, as well as familial ties and mutual trust issues.

The high dependence of farmers on informal and non-formal capital services is caused by the presence of service creation and innovation in both informal and non-formal agencies (Setiawan 2015). The results of previous studies by Setiawan (2002, 2012, 2015) in West Java, revealed that the more frequent and longer a farmer's partnerships with informal and non-formal services, the higher the trust among them and the easier they find it to obtain a capital loan. The collateral used for capital lending is no longer secure but relies on a trusted person's big name.

The ease of procedure, the close social and physical distance, the accuracy and speed of service time, the suitability of services to needs, the dispensation of services, the impression of "no bank interest", and various bonuses awarded were identified as contributing factors to the strong bonding of farmers with informal and non-formal financial service institutions. An earlier study by Taylor et al. (2012) reported that all of the strategies mentioned above are categorized as the success of the creation and innovation of service institutions. However, formal financial services have performed the same thing. Still, they need to eliminate their previous bad image, such as in terms of their complicated procedures, being only available in cash, not being flexible, and so on.

Farmers realize that the lender's purchase price is lower than the actual market price. The price gap can reach IDR 200–300 per kilogram. At first glance, this is seen by farmers as reasonable, even in return for the kindness provided by the informal financing institution or another borrower. However, a deeper analysis showed that the price gap equals the loan interest charged at the purchase price or harvest. If accumulated, the price gap is greater than the bank's rate. This mode is often hidden behind the close partnerships between farmers and loan sharks; thus, an earlier study by Setiawan et al. (2021) called this creative capitalism. From this perspective, agricultural fintech is a promising business in the future. Surely all these processes require significant effort. Agricultural fintech companies should

ensure and convince investors and be able to carry out community development work. Fintech companies must be trusted to gain many partners and then be able to train partners to have integrity and competency.

9. Conclusions

Several fintech providers have been developed in Indonesia, but there are many problems regarding farmers' access to fintech. This could be affected by several factors, including the farmers' knowledge of the technology. Therefore, solutions are needed to improve farmers' access to financial services (uncomplicated terms, conditions, and procedures), gain the farmers' trust, match their services to their needs, and eliminate the practice of exploitation and other aspects of creative capitalism. Financial services based on fintech were offered as alternative solutions. However, some Indonesian people are still not familiar with fintech, which is mainly caused by limited access and knowledge regarding fintech. Therefore, some recommendations for improving the implementations of fintech in the agricultural sector are required, such as increasing public understanding of fintech. The government or related parties must provide a lot of information through financial literacy and inclusion programs. In addition, the government and fintech companies must consider improvements in IT infrastructure so that fintech users become more widely known among the public, especially farmers.

Author Contributions: Conceptualization, F.R. and T.K.; methodology, F.R.; formal analysis, F.R.; investigation, F.R.; resources, F.R.; data curation, F.R.; writing—original draft preparation, F.R.; writing—review and editing, T.K., I.S. and E.W.; visualization, T.K.; supervision, T.K., I.S. and E.W. All authors have read and agreed to the published version of the manuscript.

Funding: This study was funded by Universitas Padjadjaran, Grant No. 2203/UN6.3.1/PT/2022 and the APC was funded by Universitas Padjadjaran.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: We thank all of the members of our laboratory for helpful their discussions throughout the research.

Conflicts of Interest: The authors declare no conflict of interest.

References

- Abbadi, Suleiman M., and Sharif M. Abu Karsh. 2013. Methods of evaluating credit risk used by commercial BANK. *International Research Journal of Finance and Economics* 111: 146–59.
- Agatha, Muthia Khansa, and Eliana Wulandari. 2018. Analisis faktor-faktor yang mempengaruhi produksi kentang di Kelompok Tani Mitra Sawargi Desa Barusari Kecamatan Pasirwangi Kabupaten Garut. *Jurnal Ilmiah Mahasiswa Agroinfo Galuh* 4: 772–78.
- Alt, Rainer, and Thomas Puschmann. 2012. The rise of customer-oriented banking-electronic markets are paving the way for change in the financial industry. *Electronic Markets* 22: 203–15. [\[CrossRef\]](#)
- Angendari, Dewa Ayu Diah. 2021. Menelaah pesan pemerintah terkait krisis COVID-19 di media sosial. *Jurnal Riset Komunikasi* 4: 247–60. [\[CrossRef\]](#)
- Anggraeni, Diyah Pusvita. 2020. Peran Fintech dan Dampak Implementasi Fintech pada Transaksi Keuangan UMKM di Kabupaten Kebumen. Bachelor tesis, STIE Putra Bangsa, Kebumen, Indonesia.
- Anshari, Muhammad, Mohammad Nabil Almunawar, Masairol Masri, and Mahani Hamdan. 2019. Digital marketplace and FinTech to support agriculture sustainability. *Energy Procedia* 156: 234–38. [\[CrossRef\]](#)
- Anyiro, Chidozie Onyedikachi, and B. N. Oriaku. 2011. Access to and investment of formal micro credit by small holder farmers in Abia State, Nigeria. A case study of Absu Micro Finance Bank, Uturu. *Journal of Agricultural Sciences* 6: 69. [\[CrossRef\]](#)
- Anzelina, Rahma Septi. 2021. Pembiayaan Dan Manfaat Financial Technology (Fintech) Syariah Pada 212 Mart. *Syiar Iqtishadi: Journal of Islamic Economics, Finance and Banking* 5: 68–92. [\[CrossRef\]](#)
- Arifin, Busnanul, and Atika Mayang Sari. 2020. *Analisis Ekonomi Pangan dan Pertanian*. Bogor: IPB Press.
- Arifin, Zainul. 2009. *Dasar-Dasar Manajemen Syariah*. Tangerang: Azreta Publisher.
- Ashari, Ashari. 2009. Optimalisasi kebijakan kredit program sektor pertanian di Indonesia. *Analisis Kebijakan Pertanian* 7: 21–42.
- Avisha, Astari, Anne Charina, Trisna Insan Noor, and Gema Wibawa Mukti. 2019. Crowdfunding Sebagai Akses Alternatif Permodalan Berbasis Teknologi Digital Pada Kegiatan Pertanian (Studi Kasus di PT Crowde Membangun Bangsa). *Jurnal Pemikiran Masyarakat Ilmiah Berwawasan Agribisnis* 5: 1–22. [\[CrossRef\]](#)

- Azahari, Delima Hasri. 2008. Membangun kemandirian pangan dalam rangka meningkatkan ketahanan nasional. *Analisis Kebijakan Pertanian* 6: 174–95.
- Azwar, Anas. 2002. *Pengantar Epidemiologi*. Penerbit Binarupa Aksara. Jakarta Barat: Edisi Revisi.
- Banson, Kwamina Ewur, Nam C. Nguyen, and Ockie J. H. Bosch. 2016. Using system archetypes to identify drivers and barriers for sustainable agriculture in Africa: A case study in Ghana. *Systems Research and Behavioral Science* 33: 79–99. [CrossRef]
- Bloom, Benjamin. 1956. *Taxonomy of Educational Objectives: The Classification of Educational Goals—Handbook 1. Cognitive Domain*. New York: David McKay.
- BPS. 2020. Laju Pertumbuhan sub Sektor Pertanian Tanaman Pangan, Hortikultura dan Perkebunan. Available online: <https://www.bps.go.id/indicator/11/104/3/-seri-2010-laju-pertumbuhan-pdb-seri-2010.html> (accessed on 4 March 2021).
- BPS. 2021. Penduduk 15 Tahun Ke Atas Yang Bekerja menurut Lapangan Pekerjaan Utama 2004–2012. Available online: <https://www.bps.go.id/statictable/2009/04/16/970/penduduk-15-tahun-ke-atas-yang-bekerja-menurut-lapangan-pekerjaan-utama-1986-2022.html> (accessed on 4 March 2021).
- Bruton, Garry, Susanna Khavul, Donald Siegel, and Mike Wright. 2015. New financial alternatives in seeding entrepreneurship: Microfinance, crowdfunding, and peer-to-peer innovations. *Entrepreneurship Theory and Practice* 39: 9–26. [CrossRef]
- Chrismastianto, Imanuel Adhitya Wulanata. 2017. Analisis SWOT implementasi teknologi finansial terhadap kualitas layanan perbankan di Indonesia. *Jurnal Ekonomi dan Bisnis* 20: 133–44.
- Disemadi, Hari Sutra, Mochammad Abizar Yusro, and Wizna Gania Balqis. 2020. The Problems of Consumer Protection in Fintech Peer to Peer Lending Business Activities in Indonesia. *Sociological Jurisprudence Journal* 3: 91–97. [CrossRef]
- Fatimah, Anggun N., Andi Nirmalasari, Anindyo S. Dwiputra, Putri Neva Lumeta, and Reno Dalu Maharso. 2020. Peer to Peer Lending Platform Igrow dalam Pemberdayaan Komunitas Petani. In *Prosiding Seminar Nasional 2019 Pengembangan SDM Indonesia untuk Mendorong Pertumbuhan Ekonomi Digital*. Jakarta: Puslitbang Aptika dan IKP. ISBN 978-602-1281-31-4.
- Fisabilillah, Ladi Wajuba Perdini, and Nurul Hanifa. 2021. Analisis pengaruh fintech lending terhadap perekonomian Indonesia. *Indonesian Journal of Economics, Entrepreneurship, and Innovation* 1: 154–59.
- Fitriani, Hanik. 2018. Kontribusi fintech dalam meningkatkan keuangan inklusif pada pertanian (Studi analisis melalui pendekatan keuangan syariah dengan situs peer to peer lending pada pertanian di Indonesia). *El-Barka: Journal of Islamic Economics and Business* 1: 1–26. [CrossRef]
- Franedy, Roy, and Tito Bosnia. 2018. Ini Dia Empat Jenis Fintech di Indonesia. CNBC Indonesia. Available online: <https://www.cnbcindonesia.com/tech/20180110145800-37-1126/ini-dia-empatjenis-fintech-di-indonesia> (accessed on 15 February 2023).
- Harsanto, Budi. 2014. Aspek Etik dan Sistemik dalam Ekonomi dan Bisnis Islam. *Al Qalam* 31: 187–212. [CrossRef]
- Herlinawati, Erna, and Evy Ratno Arumanix. 2017. Analisis pendapatan UMKM sebelum dan sesudah menerima kredit tunas usaha rakyat. *Jurnal Indonesia Membangun* 16: 1–13.
- Hermansyah, Reza Fawzian, Astrie Krisnawati, and Nora Amelda Rizal. 2020. Analisis Model Fintech dan Digital Marketplace dalam Menunjang Industri Pertanian di Kelurahan Margamekar Kecamatan Pangalengan. *eProceedings of Management* 7: 5257–66.
- Hinson, Robert, Robert Lensink, and Annika Mueller. 2019. Transforming agribusiness in developing countries: SDGs and the role of FinTech. *Current Opinion in Environmental Sustainability* 41: 1–9. [CrossRef]
- Hutapea, Riauli Susilawaty. 2020. The effect of financial technology (fin-tech) on customer satisfaction level (a case study on SMEs). In *International Seminar of Science and Applied Technology (ISSAT 2020)*. Amsterdam: Atlantis Press, pp. 668–74.
- Jaya, I. Made Laut Mertha. 2019. The impact of financial inclusion on public financial services education through financial technology in Sleman Regency, Indonesia. *Esensi: Jurnal Bisnis dan Manajemen* 9: 155–74. [CrossRef]
- Kadarsan, Halimah W. 1995. *Keuangan Pertanian dan Pembiayaan Perusahaan Agribisnis*. Jakarta: Gramedia Pustaka Utama.
- Kartasapoetra, A. G. 1988. *Teknologi Budaya Tanaman Pangan di Daerah Tropis*. Jakarta: Bina Aksara.
- Karyani, Tuti. 2012. Fungsi intermediasi lembaga keuangan perdesaan dalam mendukung pembiayaan pertanian di Jawa Barat. *Indonesian Journal of Applied Sciences* 2: 40–44.
- Kotler, Philip. 1999. *Marketing Management: The Millennium Edition*. Upper Saddle River: Prentice Hall, vol. 199.
- Lestari, Dian. 2012. Analisis partisipasi petani dalam kegiatan sekolah lapang pengelolaan tanaman terpadu (SL- PTT) di Desa Gerung Utara Kecamatan Gerung Kabupaten Lombok Barat. *Jurnal Pertanian Media Bina Ilmiah* 6: 70–77.
- Lionberger, Herbert Frederick. 1960. *Adoption of New Ideas and Practices: A Summary of the Research Dealing with the Acceptance of Technological Change in Agriculture, with Implications for Action in Facilitating such Change*. Ames: Iowa State University Press. 164p.
- Liu, Yun, Yun Zhang, Yifei Zhang, and He Xiao. 2022. Small business owners' Fintech credit in crises: Theory and evidence from farmers under the COVID-19. *Pacific-Basin Finance Journal* 71: 101692. [CrossRef]
- Marginingsih, Ratnawaty. 2021. Financial Technology (Fintech) Dalam Inklusi Keuangan Nasional di Masa Pandemi COVID-19. *Moneter-Jurnal Akuntansi dan Keuangan* 8: 56–64. [CrossRef]
- Maulana, Sabda, Iskandar Mustofa Nasution, Yamato Shino, and Arop Ria S. Panjaitan. 2022. Fintech as a financing solution for micro, small and medium enterprises. *Startupreneur Business Digital (SABDA Journal)* 1: 72–83. [CrossRef]
- McIntosh, Craig, and Caio Scuarcialupi Mansini. 2018. *The Use of Financial Technology in the Agriculture Sector*. ADBI Working Paper 872. Tokyo: Asian Development Bank Institute.
- Menkeh, Muafueshiangha Ibrahim. 2021. The impact of fintech (financial technology) on smallholder farmers in Ghana. *Global journal of Business and Integral Security* 1: 1–12.

- Muchtar, Karmila, Djoko Susanto, and Ninuk Purnaningsih. 2015. Adopsi teknologi petani pada sekolah lapangan pengelolaan tanaman terpadu (SL-PTT). *Jurnal Penyuluhan* 11: 176–85. [CrossRef]
- Nguyen, Thi Anh Nhu. 2022. Does financial knowledge matter in using fintech services? *Evidence from an Emerging Economy. Sustainability* 14: 5083.
- Niu, Geng, Qi Wang, and Yang Zhou. 2020. Education and FinTech Adoption: Evidence from China. SSRN 3765224. Available online: <https://ssrn.com/abstract=3765224> (accessed on 12 February 2023).
- Nizar, Muhammad Afdi. 2017. Teknologi keuangan (Fintech): Konsep dan implementasinya di Indonesia. *Warta Fiskal* 5: 1–13.
- Noviyanti, Akhnes, and Teguh Erawati. 2021. Pengaruh Persepsi Kemudahan, Kepercayaan dan Efektivitas terhadap Minat Menggunakakan Financial Technology (Fintech)(Studi Kasus: UMKM di Kabupaten Bantul). *Jurnal Ilmiah Akuntansi Dan Finansial Indonesia* 4: 65–74. [CrossRef]
- Nugraha, Deni Pandu, Budi Setiawan, Robert Jeyakumar Nathan, and Maria Fekete-Farkas. 2022. FinTech adoption drivers for innovation for SMEs in Indonesia. *Journal of Open Innovation: Technology, Market, and Complexity* 8: 208. [CrossRef]
- OJK. 2023. Perusahaan Fintech Lending Berizin. Available online: <https://www.ojk.go.id/id/kanal/iknb/financial-technology/Documents/Penyelenggara%20Fintech%20Lending%20Berizin%20di%20OJK%20per%20Maret%202023.pdf> (accessed on 20 May 2023).
- Palupi, Ignatia Rahmadani Putri, Agriani Hermita Sadeli, Tuti Karyani, and Endah Djuwendah. 2021. Analisis strategi financial technology peer-to-peer lending PT Crowde membangun bangsa sebagai permodalan pertanian digital. *SEPA: Jurnal Sosial Ekonomi Pertanian dan Agribisnis* 18: 70–79. [CrossRef]
- Permana, Silvester Dian Handy, and Maya Cendana. 2019. Pemanfaatan Sosial Media sebagai Strategi Promosi bagi Sustainability Bisnis UMKM. *ETHOS: Jurnal Penelitian dan Pengabdian kepada Masyarakat* 7: 163–69. [CrossRef]
- Pratiwi, Putu Yani, Ika Yanuarti, and Wim Prihanto. 2020. Faktor-faktor yang mempengaruhi petani dalam memilih platform crowdfunding (Studi kasus pada petani hortikultura di Desa Sumberejo, Magelang). *Ultima Management: Jurnal Ilmu Manajemen* 12: 83–103. [CrossRef]
- Rachman, Handewi P. S., and Sri Hastuti Suhartini. 2016. Ketahanan Pangan Masyarakat Berpendapatan Rendah di Jawa Tengah dan Nusa Tenggara Barat. Available online: <https://repository.pertanian.go.id/server/api/core/bitstreams/3d6bfdef-aac8-4ba8-9168-b8d6e6b1057e/content> (accessed on 10 July 2023).
- Rachmaniyah, Fatichatur, and Arief Yuswanto Nugroho. 2019. Fenomena perkembangan Crowdfunding di Indonesia. *Ekonika: Jurnal Ekonomi Universitas Kadiri* 4: 34. [CrossRef]
- Rahardjo, Budi, Khairul Ikhwani, and Alkadri Kusalandra Siharis. 2019. Pengaruh financial technology (fintech) terhadap perkembangan UMKM di Kota Magelang. In *Prosiding Seminar Nasional Fakultas Ekonomi Untidar 2019*. Magelang: Universitas Tidar.
- Ramadhan, Gilang. 2020. Fintech dan Collaborative Governance dalam Pertanian di Banten. *Jurnal Ilmu Administrasi: Media Pengembangan Ilmu dan Praktek Administrasi* 17: 145–60. [CrossRef]
- Rivza, Baiba, M. Kruzmetra, Ina Gudele, and Diana Foris. 2019. Digitalization as an essential growth factor contributing in SME development (experience of Latvia and Romania). *Agronomy Research* 17: 261–70.
- Rogers, Everett Mitchell. 1995. *Diffusion of Innovations*, 5th ed. New York: The Free Press.
- Rukka, Hermaya. 2003. Motivasi Petani Dalam Menerapkan Usahatani Organik Padi Sawah. Tesis, Program Pascasarjana, Institut Pertanian Bogor, Bogor, Indonesia.
- Safitri, Teti Anggita. 2020. The development of fintech in Indonesia. In *1st Borobudur International Symposium on Humanities, Economics and Social Sciences (BIS-HESS 2019)*. Amsterdam: Atlantis Press, pp. 666–70.
- Saksonova, Svetlana, and Irina Kuzmina-Merlino. 2017. Fintech as Financial Innovation—The Possibilities and Problems of Implementation. Available online: https://www.um.edu.mt/library/oar/bitstream/123456789/30472/1/Fintech_as_Financial_Innovation_The_Possibilities_and_Problems_of_Implementation_2017.pdf (accessed on 4 March 2021).
- Saraswati, Birgitta Dian, Ghazali Maski, David Kaluge, and Rachmad Kresna Sakti. 2022. The impact of financial technology on consumption function of the theory of absolute income hypothesis: A partial adjustment model approach (the Indonesian evidence). *Business: Theory and Practice* 23: 109–16. [CrossRef]
- Setiawan, Budi, Deni Pandu Nugraha, Atika Irawan, Robert Jeyakumar Nathan, and Zeman Zoltan. 2021. User innovativeness and fintech adoption in Indonesia. *Journal of Open Innovation: Technology, Market, and Complexity* 7: 188. [CrossRef]
- Setiawan, Iwan. 2002. Tingkat Keberdayaan Komunikasi Petani dan Faktor Faktor yang Mempengaruhinya. Doctoral dissertation, Sekolah Pascasarjana Institut Pertanian Bogor, Bogor, Indonesia.
- Setiawan, Iwan. 2012. Agri Bisnis Kreatif: Pilar wirausaha masa depan. In *Kekuatan dunia Baru Menuju Kemakmuran Hijau*. Jakarta: Penebar Swadaya.
- Setiawan, Iwan. 2015. Perkembangan Kemandirian Pelaku Brain Gain Sebagai Alternatif Inovasi Regenerasi Pelaku Agribisnis Di Dataran Tinggi Jawa Barat. Doctoral dissertation, Bogor Agricultural University (IPB), Bogor, Indonesia.
- Soetrisno, Soetrisno, Anik Suwandari, and Rijanto Rijanto. 2006. *Pengantar Ilmu Pertanian (Agraris, Agrobisnis, dan Industri)*. Malang: Intimedia Kelompok Intrans Publishing.
- Sukma, Deni. 2016. Fintechfest, mempopulerkan teknologi finansial di Indonesia. ArenaLTE. Available online: <https://arenalte.com/berita/industri/fintech-di-indonesia/> (accessed on 16 March 2023).
- Sulaiman, Andi Amran, and Ismeth Inounu. 2017. Asuransi Pengayom Petani. IAARD Press. Available online: <http://ppid.pertanian.go.id/doc/1/Buku%20Seri/Asuransi%20Pengayom%20Petani.pdf> (accessed on 12 February 2023).

- Susilowati, Latip. 2018. Model strategi tumbuh dan bertahan pada pengelolaan Baitul Maal Wat Tamwil (BMT) di Kabupaten Tulungagung dan Ponorogo. *Iqtishadia Jurnal Ekonomi dan Perbankan Syariah* 5: 163–87, E-ISSN: 2442-3076. [[CrossRef](#)]
- Taylor, Edward W., Deborah Duveskog, and Esbern Friis-Hansen. 2012. Fostering transformative learning in non-formal settings: Farmer-field schools in East Africa. *International Journal of Lifelong Education* 31: 725–42. [[CrossRef](#)]
- Thaker, Hassanudin Mohd Thas, Ahmad Khaliq, K. Chandra Sakaran, and Mohamed Asmy Mohd Thas Thaker. 2020. A discourse on the potential of crowdfunding and Islamic finance in the agricultural sector of East Java, Indonesia. *Jurnal Ekonomi dan Keuangan Islam* 6: 10–23. [[CrossRef](#)]
- Utami, Novia, and Marsiana Luciana Sitanggang. 2021. The Effect of Fintech Implementation on The Performance of SMEs. *Journal of International Conference Proceedings (JICP)* 4: 407–17. [[CrossRef](#)]
- Waldi, Robi Deslia, Bambang Hero Saharjo, and Israr Albar. 2019. Pengaruh faktor internal dan eksternal petani terhadap pencegahan kebakaran lahan gambut. *Jurnal Silvikultur Tropika* 10: 83–88. [[CrossRef](#)]
- Widiastuti, Tika, Raditya Sukmana, Imron Mawardi, Wahyuningsih, and Imam Wahyudi Indrawan. 2018. The role of financial technology for the agricultural sector in Indonesia: Case study of I-Grow FinTech company. In *Increasing Management Relevance and Competitiveness*. Boca Raton: CRC Press, pp. 509–14.
- Wulandari, Eliana, and Dika Supyandi. 2019. Financial access of farmers and factors associated with the access: Empirical evidence of banana farms in West Java, Indonesia. In *IOP Conference Series: Earth and Environmental Science*. Bristol: IOP Publishing, vol. 334, p. 012059.
- Yang, Yuxue, Xiang Su, and Shuangliang Yao. 2021. Nexus between green finance, fintech, and high-quality economic development: Empirical evidence from China. *Resources Policy* 74: 102445. [[CrossRef](#)]
- Zanaria, Yulita. 2021. Pengaruh Pemahaman Fintech dan Inklusi Keuangan Terhadap Produktivitas UMKM di Kota Bandar Lampung. In *UMMagelang Conference Series*. Magelang: Muhammadiyah University, Magelang, pp. 82–96.
- Zhang, Dehua. 2020. The innovation research of contract farming financing mode under the block chain technology. *Journal of Cleaner Production* 270: 122194. [[CrossRef](#)]
- Zulvera, Zulvera, Sumardjo Sumardjo, Margono Slamet, and Basita Ginting. 2014. Faktor-Faktor yang Berhubungan dengan Keberdayaan petani Sayuran Organik di Kabupaten Agam dan Tanah Datar, Provinsi Sumatera Barat. *MIMBAR: Jurnal Sosial dan Pembangunan* 30: 149–58. [[CrossRef](#)]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.