Research on World Agricultural Economy
https://journals.nasspublishing.com/index.php/rwae

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The Role of Financial Inclusion and Technology on Farmers' Attitude and Income

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ABSTRACT

Interacting in a dynamic society and the demands of a modern lifestyle demand fast movement in meeting complex financial needs. This study aims to investigate how financial inclusion and technology influence farmers' financial attitudes and income in the Sulawesi Selatan district, Indonesia—a total of 657 participants who filled out the questionnaire and joined this study. Structural equation modelling (SEM) was used to examine the research hypotheses. This study confirms that financial inclusion has a greater effect on farmers' financial attitude. Whereas, financial technology does not have a positive effect on farmers' financial attitude. Furthermore, farmers' financial attitude has a positive and significant effect on farmers' income. Interestingly, farmers' financial attitude partially mediates the role of financial inclusion and technology on farmers' income. This study contributes to the understanding of the impact of financial inclusion and technology on farmers' financial attitudes and income in Sulawesi Selatan, Indonesia. It reveals that financial inclusion significantly enhances farmers' financial attitudes, while technology does not have a positive effect. Additionally, farmers' financial attitudes have a positive influence on their

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ARTICLE INFO
Received: 5 May 2025 | Revised: 12 June 2025 | Accepted: 20 June 2025 | Published Online: 4 August 2025
DOI: https://doi.org/10.36956/rwae.v6i3.2118

CITATION
Yusuf, S., Bora, A., Irwan, I., et al., 2025. The Role of Financial Inclusion and Technology on Farmers' Attitude and Income. Research on World Agricultural Economy. 6(3): 794–808. DOI: https://doi.org/10.36956/rwae.v6i3.2118

income and partially mediate the relationship between financial inclusion, technology, and income. These findings highlight the importance of policies that not only improve access to financial services but also promote financial literacy and positive attitudes. This research serves as a valuable reference for policymakers and educational institutions aiming to foster entrepreneurship among rural populations.

Keywords: Financial Inclusion; Financial Technology; Farmers' Attitude; Farmers' Income; Indonesia

1. Introduction

One of the pressing issues faced by many countries, including Indonesia, is the high unemployment rate [1]. South Africa currently holds the highest unemployment rate globally, with a staggering figure of 32.6% in 2023, followed by Spain at 11.6%. In Indonesia, the Central Statistics Agency (BPS) reports that the unemployment rate reached 7.86 million people in 2023, translating to an Open Unemployment Rate (TPT) of 5.32% of the total workforce of 147.71 million. Notably, this 5.32% of open unemployment is predominantly comprised of millennials and educated individuals, including those with bachelor's and diploma degrees [2]. Despite the alarming statistics, a comprehensive policy to effectively address the unemployment crisis has yet to be implemented. As a developing nation with the world's fourth-largest population, Indonesia possesses significant labor market potential, particularly with a substantial number of farmers across various regions [3]. However, the persistent challenge of unemployment remains a critical concern. This situation calls for innovative policy solutions that leverage the country's agricultural sector and educational resources to create job opportunities, particularly for the youth and educated workforce, thereby fostering economic growth and stability [4].

Several studies state that financial literacy has an important role in increasing farmers' social capital and public awareness of innovation, including their attitudes and innovation [5, 6]. One effort to increase financial literacy is to increase farmers' knowledge, skills, and confidence, enabling them to manage their finances more effectively [7]. Financial education poses a significant challenge for developing countries, including Indonesia, particularly in the financial and banking sectors, where there is a moral responsibility to increase financial literacy and support the decision-making processes [8]. Apart from that, farmers' understanding of finance is still low, and most farmers still don't understand how to manage their income. Thus, the level of financial literacy and technology is closely related to financial management, where the higher a person's level of financial literacy, the better their financial management [9]. Hence, enhancing financial literacy among farmers is crucial for fostering social capital and promoting innovation within the agricultural sector. Financial knowledge, skills, and confidence enable farmers to manage personal finances more effectively, ultimately leading to better decision-making and increased financial stability. However, the challenge remains significant in developing countries like Indonesia, where financial education is often lacking.

Apart from financial literacy, financial inclusion has emerged as a global priority, with governments worldwide implementing various initiatives to empower communities, reduce poverty rates, and narrow income gaps while supporting the stability of financial systems among farmers [10]. Financial inclusion plays a crucial role in driving economic growth by expanding access to credit, insurance, and other essential financial services, thereby providing farmers with the resources necessary to enhance their income, consumption, and overall independence within society [11, 12]. Furthermore, financial inclusion, coupled with technology, significantly contributes to economic growth by fostering skill development and creating job opportunities, ultimately benefiting the broader community. However, a notable gap exists in the form of a lack of clear indicators to measure the level of financial inclusion among various demographics, including farmers. This raises important questions about the actual impact of financial inclusion and technology on farmers' social capital and their capacity for innovative thinking in their agricultural practices. Addressing these questions is essential for developing ef-

fective policies and programs that can enhance financial inclusion and, in turn, empower farmers to thrive in an increasingly competitive environment.

In this modern era, a farmer's needs often demand quick access to cash, creating an immediate demand for funds. Such a situation allows individuals to face liquidity constraints despite owning valuable assets[13]. The fundamental challenge in several countries, including Indonesia, lies in effectively increasing farmers' financial inclusion and access to technology. These elements play a crucial role in shaping farmers' attitudes and behaviors, significantly influencing their willingness to innovate and achieve financial independence[14]. Moreover, financial inclusion and literacy are vital factors that affect not only farmers but also students, impacting their attitudes and behaviors, particularly in terms of interaction and communication patterns[15]. Despite the importance of these relationships, existing studies and literature often overlook the comprehensive examination of how financial inclusion and technology specifically affect farmers' attitudes. Instead, much of the research tends to concentrate on broader business and social action aspects, leaving a gap in understanding the nuanced ways in which financial inclusion and technology can empower farmers. This oversight highlights the need for targeted research that delves deeper into the interplay between financial inclusion, technology, and farmers' attitudes. By addressing this gap, stakeholders can develop more effective strategies and policies that not only enhance financial access but also foster a culture of innovation and self-sufficiency among farmers, ultimately contributing to rural development and economic growth.

Based on the description above, previous research on financial inclusion and technology has used a unit of analysis at the macro level, specifically at the district/city or provincial level. The weakness of previous research is that it does not specifically discuss the relationship between financial inclusion and technology and its influence on farmers' financial self-efficacy, especially in growing their motivation to become professional farmers[16]. Thus, research related to financial inclusion and technology at the farmer level is important to determine the extent to which financial inclusion and technology impact social capital among farmers, which then tests whether social capital influences people's interest in becoming professional farmers[17, 18]. This research aims to obtain information on the extent to which inclusion and technology play a role among farmers in Indonesia. The results of this research can also serve as a reference for efforts to increase farmers' financial awareness.

2. Literature Review

2.1. Digital Divine Theory

The digital divide theory significantly correlates with farmers' financial literacy and inclusion, particularly in rural areas where access to technology and the internet is limited[19, 20]. It creates barriers that prevent farmers from fully engaging with digital financial services, which are essential for enhancing financial literacy and inclusion[21]. Farmers struggle to obtain information about financial products, resulting in a lack of understanding and confidence in using these services, particularly when it comes to reliable internet access or digital tools. Financial literacy is crucial for farmers to make informed decisions regarding loans, savings, and investments[22]. However, the digital divide exacerbates existing inequalities, as those with limited access to technology are often less informed about available financial resources. Moreover, the digital divide can perpetuate a cycle of exclusion, where farmers who lack digital literacy are unable to access vital financial services. In Sulawesi Selatan, a region known for its significant rice production, these challenges are particularly pronounced. Many farmers in this district may be hesitant to adopt digital financial services due to cultural factors and trust issues, opting instead for traditional financing methods. This skepticism is often rooted in concerns about the reliability and security of fintech solutions. Additionally, the lack of adequate support systems, such as education and infrastructure, further hinders farmers' ability to mobilize towards digital financial tools. Addressing these contextual factors is essential for improving financial literacy and inclusion among farmers in Sulawesi Selatan, ultimately enhancing their economic resilience and productivity (**Figure 1**).

2.2. Financial Inclusion and literacy

In the context of Sulawesi Selatan, financial governance and institutional performance cannot be fully understood without considering the region's unique sociocultural and administrative landscape. Local cultural norms, such as siri' na pacce, a value emphasizing dignity, shame, and social responsibility, deeply influence ethical behavior in public financial management. This cultural orientation encourages accountability but may also contribute to informal practices that bypass formal regulations among farmers. However, region-specific governance challenges, such as limited digital infrastructure, bureaucratic inertia, and disparities in administrative capacity across districts, also affect the effectiveness of budget planning, transparency, and service delivery. Moreover, decentralization policies in Indonesia have granted more financial autonomy to the local level; yet, many local governments in Sulawesi Selatan struggle with the technical and human resource readiness to manage these funds efficiently. Therefore, integrating the effects of financial literacy and inclusion on farmers' financial self-efficacy and income is pivotal to ensuring both formal structures and informal dynamics at the regional level.

Farmer professionalism is increasingly recognized as a viable solution for alleviating unemployment and creating job opportunities, while also fostering progress and innovation within the agricultural sector[23]. However, the journey to becoming a professional farmer involves numerous considerations, particularly regarding the acquisition of business capital. In developed countries, research has shown a positive correlation between age and professionalism among farmers, indicating that older individuals often have more resources and experience to draw upon[24, 25]. Conversely, younger individuals frequently pursue professionalism out of necessity, often viewing it as a last resort due to limited job opportunities in the formal sector. This trend is compounded by challenges faced by the younger generation in accessing financial services, as many financial products require the signature and approval of a parent or legal guardian. Consequently, young entrepreneurs often encounter significant barriers when trying to secure the credit and capital necessary to start, maintain, and grow their businesses[26]. Addressing these challenges is crucial for empowering young farmers and enabling them to transition into professional roles, thereby contributing to economic development and sustainability in the agricultural sector.

Financial inclusion refers to a condition in which every member of society has timely, smooth, and safe access to a variety of quality formal financial services at affordable costs, tailored to their needs and capabilities[27]. In essence, financial inclusion ensures that all individuals can access essential financial services, including savings accounts, insurance, credit facilities, and investment opportunities. Financial inclusion can significantly enhance economic capacity, ultimately leading to improved community welfare towards facilitating easy access to these services across all societal levels. The performance of financial inclusion is measured using three indices: the banking services penetration index, the banking services availability index, and the banking services usage index[28]. These indices provide a comprehensive view of how effectively financial services are integrated into individuals' lives. Financial inclusion and entrepreneurial formation, proposing a model that suggests financial inclusion can alleviate credit constraints faced by entrepreneurs. This relationship is crucial, as it highlights how access to financial services can empower individuals to engage in entrepreneurial activities, fostering innovation and economic growth within communities.

In the realm of business, merely knowing about and having access to financial service products is insufficient to instil confidence in an individual's ability to start a venture. An optimal level of financial literacy is equally essential. Many individuals may be aware of various financial products and services, including those offered through financial technology, yet they often struggle to utilize these resources effectively. This challenge is particularly evident among farmers in Indonesia, where the level of financial inclusion remains minimal. The lack of financial inclusion can significantly hinder farmers' ability to make informed business decisions, ultimately affecting their entrepreneurial success. Some studies demonstrated

that financial inclusion is a critical prerequisite for enhancing financial attitudes and self-efficacy among individuals[29]. Financial literacy, defined as an individual's knowledge and skills in making sound financial decisions, plays a pivotal role in this context[30]. Furthermore, several studies have established a strong correlation between financial inclusion and financial literacy, particularly about farmers' communication and social interaction patterns[31]. This relationship underscores the importance of not only improving access to financial services but also fostering financial literacy to empower farmers, enabling them to engage more effectively in their businesses and contribute to overall economic development.

Financial literacy is intricately linked to effective financial management, with research indicating that individuals with higher levels of financial literacy tend to exhibit superior financial management skills. Personal financial management encompasses the application of financial management principles at the individual level, involving the planning, management, and control of finances. These practices are crucial for achieving financial well-being and stability. Consequently, a higher financial inclusion index is associated with an elevated level of financial literacy, suggesting that as individuals gain better access to financial services, their understanding and application of financial concepts improve. Moreover, the relationship extends to the social capital index among students, which can enhance self-efficacy. Social capital, defined as the networks and relationships that facilitate cooperation and support within a community, plays a significant role in fostering confidence and motivation among individuals. Therefore, as students develop their social capital, they are likely to experience increased self-efficacy in their financial decision-making and management. Based on these observations, this study proposes the following hypothesis:

H1. *Financial inclusion has a positive effect on farmers' financial self-efficacy.*

H2. *Financial inclusion has a positive effect on farmers' financial literacy.*

H3. *Financial literacy has a positive effect on farmers' financial self-efficacy.*

2.3. Farmers' Self-Efficacy

Self-efficacy refers to an individual's confidence in their ability to perform tasks and achieve goals, particularly in the context of farming and entrepreneurship[32, 33]. It encompasses the belief that one possesses the necessary skills and competencies to succeed in business endeavors[34, 35]. Further, it emphasizes that farmers' self-efficacy is rooted in their faith in their talents and capabilities, which can significantly influence their approach to farming and business management. Increasing self-efficacy among farmers is crucial, as it empowers them to take calculated risks and make informed decisions that can lead to business growth. A foundational aspect of enhancing self-efficacy is fostering a strong understanding of financial inclusion. When farmers are well-informed about the financial services available to them, they are better equipped to leverage these resources effectively. This understanding enables them to access credit, insurance, and other essential financial products for business development. Farmers' stakeholders can help farmers build their self-efficacy, ultimately leading to more successful and sustainable agricultural practices that promote financial inclusion and enhance financial literacy. This empowerment not only benefits individual farmers but also contributes to the overall economic development of rural communities, as confident and capable farmers are more likely to innovate and expand their businesses.

Self-efficacy is a psychological construct that reflects an individual's assessment of their capabilities to perform tasks and make decisions, determining whether they believe they can execute actions effectively or ineffectively, correctly or incorrectly, and whether they can achieve desired outcomes[36]. In simpler terms, self-efficacy refers to an individual's confidence in their ability to succeed in various endeavors, including entrepreneurship. This sense of self-efficacy plays a critical role in shaping an individual's approach to challenges and opportunities. When individuals possess high self-efficacy, they are more likely to take initiative, persist in the face of difficulties, and remain resilient when encountering setbacks. This confidence can significantly influence their willingness to engage in entrepreneurial activities, as they believe in their capacity to navigate the

complexities of starting and managing a business. In the context of farming and entrepreneurship, self-efficacy empowers individuals to make informed decisions, seek out resources, and effectively leverage financial services. Farmers can enhance their entrepreneurial skills, leading to greater innovation, productivity, and overall success in their agricultural ventures, thereby fostering a strong sense of self-efficacy. Ultimately, cultivating self-efficacy is essential for encouraging individuals to pursue their goals and realize their potential in the business landscape.

Farmers' professionalism is influenced by personality characteristics, such as self-efficacy and the need for achievement and knowledge. Self-efficacy can influence a farmer's professionalism because starting a business requires self-confidence and belief that the business will achieve success. Farmers are often faced with the situation of having to take risks for the success of their business. Therefore, when individuals have high confidence, it can support their level of creativity in taking advantage of existing business opportunities and achieving their goals. Farmers' self-efficacy is a significant determining factor that can foster entrepreneurial intentions [37, 38]. Memon et al. (2019) also argue that farmers' self-efficacy dominates in managing and avoiding business ambiguity faced by farmers. Self-efficacy also indicates a high intrinsic interest in farmers' attitudes and behavior [39, 40]. Therefore, this research aims to determine the influence of self-efficacy on farmers' income:

H4. *Self-efficacy has a positive effect on students' entrepreneurial intentions.*

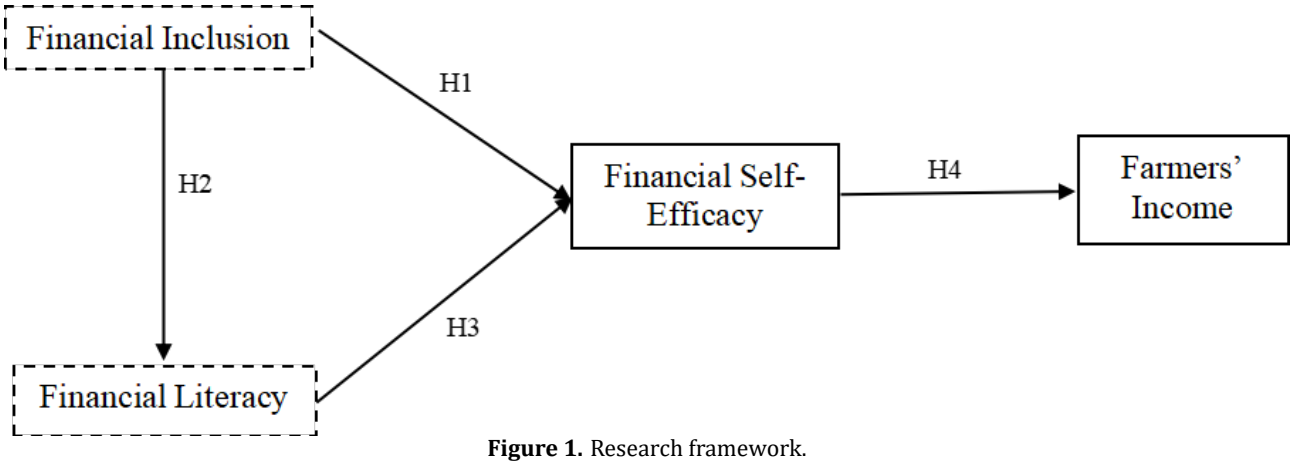

Figure 1. Research framework.

3. Methodology

3.1. Questionnaire Design

This study employed rigorous sampling procedures and technological tools to ensure the reliability and validity of the data collected from farmers in Sulawesi Selatan. Respondents were asked to complete the survey anonymously, with the order of measurement items randomized and labels for constructs obscured to alleviate concerns regarding random selection among Indonesian farmers. The research targeted active farmers in the Sulawesi Selatan district, utilizing both offline and online surveys conducted from August 1, 2024, to October 30, 2024. Before the formal survey, a pre-test and pilot test were conducted to validate the wording of the survey items. The Likert scale ranged from 1 (strongly disagree) to 7 (strongly agree), allowing for nuanced responses. A pre-test on measurement items and constructs was conducted to identify any construct items that were not understood by the participants, thereby helping the writer avoid potential bias in the validation results from Indonesian language experts (**Appendix A**) [41, 42].

An anonymized controls and filters were implemented, ensuring that participants met the criteria of being registered with local farmer organizations to enhance the survey's validity. Regarding post-detection,

this study employed Harman's single-factor test [43] and the common latent factor (CLF) analysis. The rationale for adopting the common latent factor (CLF) approach to conduct post-detection analysis is the inherent weakness of Harman's single-factor test in detecting the CMV. The explained variance of the first factor is 43.51% which is less than 50.00%. Besides, the factor loading of CLF was 0.38, indicating a 0.27% variance in CMV. The EFA result shows no significant problem with common method variance in the data.

Structural Equation Modeling (SEM) was utilized to analyze the relationships between research constructs, employing AMOS and SPSS software for data analysis. This comprehensive approach not only strengthened the study's methodological framework but also facilitated a deeper understanding of the factors influencing financial literacy and inclusion among farmers in the region. This study asked respondents to fill out the survey anonymously, randomized the order of measurement items, and obscured the labels for the constructs to reduce respondents' concerns about random selection among Indonesia farmers. Anonymized controls and filters, along with a random concept, were used in this research to ensure the validity of the survey and prevent bias [44]. Filter questions are used to ensure participants have met the requirements to participate in the poll, namely that they must be registered as farmers in the local farmer organisation.

3.2. Data Analisys

The statistical software programs used for data analysis were AMOS 22 and SPSS 22. Structural Equation Modeling (SEM) was used to test the proposed model and research hypotheses. The main benefit of using SEM is that it can analyze different factors and regressions to test the model, allowing all path coefficients to be estimated simultaneously. SEM provides three important method features. First, it is used to determine the causal effects of observed variables, and the structural relationships between variables allow a clear description of the theory examined in this research. A comprehensive hypothesized model was used to validate all variables and determine their consistency with the investigation. Second, descriptive analysis uses a valid frequency distribution. Third, common method variance (CMV) has been adopted as an anticipatory and post-detection procedure.

4. Result

4.1. Respondent Demographics

Table 1 provides details regarding the demographic characteristics of the participants. Overall, there were 81.3% more women than men responding, with 18.7% being men. In addition, participants aged 19–23 years constituted the largest percentage of the sample (84.7%), followed by participants aged < 18 years (9.8%) and > 23 years (5.5%). Furthermore, the majority came from the Faculty of Economics and Business (69.7%), the Faculty of Health (14.4%), the Faculty of Education (11.9%) and the Faculty of Engineering (4.0%).

4.2. Measurement Model

The CFA model for the observed variables has a good fit. Model fit and Cronbach's Alpha for all constructs showed good convergent validity and reliability. Furthermore, the results of the measurement model (CFA) show that all constructs have a good fit [45]. **Table 2** shows adequate discriminant validity of this study.

4.3. Structural Model

This research provides empirical evidence that financial inclusion has a significant and positive influence on farmers' self-efficacy ($\gamma 11 = 0.253^{**}$, $p < 0.01$), and farmers' financial literacy ($\gamma 21 = 0.359^{***}$, $p < 0.001$). Financial inclusion also has a significant and positive effect on farmer self-efficacy ($\gamma 11 = 0.374^{***}$, $p < 0.01$), supporting H1, H2, and H3. Furthermore, this research also confirms that farmers' efficacy has an important role in influencing farmers' income ($\beta 21 = 0.120^{*}$, $p < 0.001$) (**Table 3**).

Table 1. Respondent demographics.

Demographic Items	Frequency	Percentage (%)
Gender		
Male	341	51.9
Female	316	48.1
Age		
<30	232	35.3
31–50	277	42.2
>50	148	22.5
Experience as farmer		
<5 years	161	24.5
6–10 years	148	22.5
11–20 years	173	26.4
>20 years	175	26.7
Income a year		
$1,000–5,000	171	34.6
$6,000–10,000	257	52.0
>$10,000	66	13.4

Table 2. Measurement result.

Constructs	MLE Estimates Factor Loading/Measurement Error		Squared Multiple Correlation (SMC)	Composite Reliability (CR)	Average of Variance Extracted (AVE)	Cronbach's α
Financial Inclusion				0.878	0.593	0.859
FI1	0.613	0.624	0.376			
FI2	0.751	0.436	0.564			
FI3	0.825	0.319	0.681			
FI4	0.846	0.284	0.716			
FI5	0.793	0.371	0.629			
Financial Literacy				0.897	0.594	0.893
FL1	0.768	0.410	0.590			
FL2	0.784	0.385	0.615			
FL3	0.879	0.227	0.773			
FL4	0.828	0.314	0.686			
FL5	0.699	0.511	0.489			
FL6	0.643	0.587	0.413			
Self-Efficacy				0.905	0.656	0.905
SE1	0.777	0.396	0.604			
SE2	0.774	0.401	0.599			
SE3	0.810	0.344	0.656			
SE4	0.847	0.283	0.717			
SE5	0.839	0.296	0.704			
Farmers' income				0.906	0.616	0.905
FE1	0.761	0.421	0.579			
FE2	0.811	0.342	0.658			
FE3	0.807	0.349	0.651			
FE4	0.795	0.368	0.632			
FE5	0.797	0.365	0.635			
FE6	0.736	0.458	0.542			

Note: $\chi 2/df$ = 3,742, Goodness-of-Fit Index (GFI) = 0.891, Nonnormed fit index (NFI) = 0.898, Comparative Fit Index (CFI) = 0.898, Incremental fit index (IFI) = 0.899, and Root Mean Square Error of Approximation (RMSEA) = 0.057.

Table 3. Proposed model result.

Hypotheses	Symbol	Path			Coefficients	Test Results
H1	γ11	Financial Inclusion	→	Self-Efficacy	0.253**	Supported
H2	γ11	Financial Inclusion	→	Financial Literacy	0.359***	Supported
H3	γ21	Financial Literacy	→	Self-Efficacy	0.374***	Supported
H4	β21	Self-Efficacy	→	Farmers' Income	0.120*	Supported

Note: Significant at *: $p < 0.05$, **: $p < 0.01$, ***: $p < 0.001$.

5. Discussion

This result shows that farmers gaining greater access to formal financial services, such as banking, credit, insurance, and digital financial technologies, has a strong correlation with farmers' confidence and ability to manage farming-related financial tasks and business decision processes in Indonesia [33]. Financial inclusion empowers farmers by providing them with resources and tools to make informed choices, access capital, and effectively manage risks. However, local barriers, such as inadequate infrastructure, limited internet connectivity, and low digital literacy, can hinder the adoption of fintech solutions in rural areas. These barriers can prevent farmers from fully utilizing available financial services, thereby limiting their potential benefits. Despite these challenges, increased access leads to improved perceptions of farmers' capabilities, reinforcing self-efficacy. This highlights the importance of extending financial services to underserved farming communities as a means of enhancing not only financial access but also psychological and behavioral empowerment. The findings confirm prior studies and underscore the need for policies and programs that promote inclusive financial systems, as they play a crucial role in strengthening farmers' self-efficacy, which may further improve farmers' productivity and income outcomes in China and India [20, 46].

This result shows that a farmer's gain greater access to formal financial services such as banking, credit, insurance, and digital financial technologies has a strong correlation to farmers' confidence and ability to manage farming-related financial tasks and the business decision-making process. Financial inclusion empowers farmers by providing them with the necessary resources and tools to make informed choices, access capital, and effectively manage risks. This increased access leads to improved perceptions of their capabilities, reinforcing self-efficacy. It highlights the importance of extending financial services to underserved farming communities as a means of enhancing not just financial access but also psychological and behavioral empowerment. Overall, the finding underscores the need for policies and programs promoting inclusive financial systems, as they play a crucial role in strengthening farmers' self-efficacy, which may further improve their productivity and income outcomes [47]. This means that financial inclusion is believed to encourage an increase in business opportunities, which has become a significant concern for the government in its policy of creating jobs, promoting economic growth, and alleviating poverty among farmers. These findings are in line with studies conducted by Alazzabi et al. [22] and Marus et al. [48], which also stated that financial inclusion has a significant and positive effect on growing farmers' self-efficacy.

This result suggests that as farmers gain better access to formal financial services such as savings, credit, insurance, and digital financial platforms, they are more likely to acquire essential knowledge and skills related to managing their finances effectively. Financial inclusion not only provides the tools but also encourages engagement with formal financial systems, which exposes farmers to educational opportunities and familiarizes them with financial concepts. Consequently, their understanding of budgeting, investment, loan management, and risk mitigation improves, equipping them to make wiser financial decisions [49]. This study also confirms that the role of financial inclusion is not merely a mechanism for access to resources, but also a catalyst for enhancing financial knowledge. The positive link between inclusion and literacy underscores the importance of developing inclusive financial policies that incorporate financial education components, thereby empowering farmers to utilize financial products with confidence and efficiency. Ultimately, improving financial literacy through inclusion can contribute to better financial behaviors, increased economic resilience, and improved livelihood

outcomes for farmers.

The farmers enhance their understanding of financial concepts and practices such as budgeting, saving, investing, and managing debt, and they become more confident in their ability to make informed financial decisions. Financial literacy equips farmers with the knowledge and skills necessary to navigate financial challenges, assess risks, and seize opportunities, thereby fostering a sense of competence and control over their financial situations [50]. It suggests that educational initiatives aimed at improving financial knowledge can significantly empower farmers, enhancing their confidence in managing their finances and making sound business decisions. This relationship underscores the importance of integrating financial education into programs that promote financial inclusion, as it not only improves financial literacy but also boosts self-efficacy. Ultimately, enhancing both financial literacy and self-efficacy can lead to better financial outcomes and improved overall well-being for farmers [51].

Farmers who possess greater confidence in their financial management abilities and decision-making skills are more likely to engage in productive farming practices, which can lead to higher income levels [52]. Self-efficacy empowers farmers to take calculated risks, invest in their operations, and pursue growth opportunities, ultimately enhancing their economic performance. Confident farmers are more likely to adopt innovative practices, seek out new markets, and effectively manage resources, all of which can contribute to improved financial outcomes. It suggests that initiatives aimed at building farmers' confidence in their financial capabilities, such as training programs, mentorship, and access to resources, can have a direct positive impact on their economic well-being [53–55]. This finding underscores the interconnection between psychological factors and financial performance, emphasizing the need for holistic approaches that address both self-efficacy and practical financial skills to improve farmers' livelihoods.

6. Conclusion

Financial inclusion has a positive influence on both financial literacy and self-efficacy, which in turn enhance farmers' confidence and ability to manage their finances effectively. These relationships underscore the critical importance of expanding access to formal financial services, which can empower farmers both economically and psychologically. Financial inclusion serves as a foundational pillar, enabling farmers to access essential financial products and services, such as savings accounts, credit, insurance, and digital financial technologies. The positive and significant effect of financial inclusion on financial literacy suggests that access to these services encourages farmers to engage more deeply with financial concepts, improving their understanding and skills. This enhanced literacy equips farmers to make informed financial decisions, effectively manage risks, and optimize resource allocation. Consequently, financial literacy acts as a critical mediator, translating access into meaningful financial behavior and improved economic outcomes. Moreover, financial literacy has a positive influence on self-efficacy, reinforcing farmers' confidence in their ability to navigate financial challenges and make informed decisions.

Self-efficacy also emerges as a key psychological factor driving farmers' motivation and persistence in managing their farming businesses. Higher self-efficacy enables farmers to take the initiative, adopt innovative practices, and effectively utilize financial resources, which collectively contribute to improved productivity and increased income. The study also establishes a direct positive relationship between self-efficacy and farmers' income, indicating that confidence and financial management capabilities translate into tangible economic benefits. Although the effect size is moderate, the finding is important as it shows the real-world implications of psychological empowerment on livelihood outcomes. This highlights that improving farmers' financial knowledge and access alone is not sufficient; fostering their confidence and self-belief is equally essential for sustainable development. Policymakers, financial institutions, and agricultural extension services should collaborate to develop inclusive financial products that are both accessible and affordable, accompanied by education and capacity-building efforts tailored to farmers' needs.

Financial education programs should be designed to build relevant knowledge and skills related to budget-

ing, savings, investment, credit management, and risk mitigation. These programs must be accessible, culturally appropriate, and delivered in local languages to ensure maximum outreach and comprehension. Interactive and community-based learning approaches—such as farmer group meetings, peer mentoring, and digital platforms can enhance engagement and reinforce learning outcomes. Building farmers' self-efficacy represents another key practical focus. Interventions should empower farmers by boosting their confidence in managing financial matters and making business decisions. This can be facilitated through hands-on training, success stories, and mentor support that demonstrate practical financial skills and encourage a growth mindset. Strengthening self-efficacy enables farmers to overcome challenges, take calculated risks, and pursue innovative farming practices that lead to higher productivity and income. Financial institutions and policymakers should also consider integrating financial inclusion and literacy initiatives with broader rural development programs. Linkages with agricultural extension services, market access initiatives, and entrepreneurship support can create synergistic effects that amplify farmers' economic outcomes. Monitoring and evaluation mechanisms should be established to track progress and adapt strategies in response to farmers' evolving needs.

This study has several limitations that should be considered when interpreting the findings and guiding future research. First, the cross-sectional research design limits the ability to establish causal relationships among financial inclusion, financial literacy, self-efficacy, and farmers' income. Longitudinal studies would provide deeper insights into how these variables evolve and influence one another dynamically. Second, the study sample was restricted to farmers in Sulawesi Selatan district, Indonesia, which may limit the generalizability of the findings to other regions with different socioeconomic and cultural contexts. Future research could expand the geographic scope to include diverse farming communities and countries, thereby validating and comparing results. Third, the study relied on self-reported questionnaire data, which might be subject to biases such as social desirability or inaccurate recall. Incorporating objective financial data or mixed-method approaches that combine qualitative and quantitative data could enhance validity and provide a richer contextual understanding. Additionally, while financial inclusion and literacy were examined, other factors that might influence farmers' income and behaviors—such as access to markets, government policies, climate variability, and social networks—were not explored in depth. Future studies should consider these multidimensional influences to gain a holistic view. Moreover, the role of technology and digital financial services is rapidly evolving, and their impact on farmers' financial behavior and income deserves further detailed investigation, particularly in light of increasing mobile and internet penetration in rural areas. Finally, future research could explore intervention-based studies that test specific financial education or inclusion programs to establish evidence-based best practices for empowering farmers.

Author Contributions

Conceptualization, S.Y., I.I., and M.R.; methodology, S.Y. and A.B.; formal analysis, A.B. and M.R.; investigation, A.B. and M.R.; writing-original draft preparation, S.Y. and A.B.; writing-review and editing, I.I. and M.R.; supervision, S.Y. and I.I.; project administration, A.B. All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

The authors declare that anonymized data will be available upon request. to obtain it, please contact the

corespondence author.

Conflicts of Interest

The authors declare no conflicts of interest.

Appendix A

Financial inclusion

I can access to a formal bank account or mobile banking service

I often use financial services such as savings accounts, and loans

I can use digital financial technology (e.g., mobile payment apps or online banking)

I ever received a loan from a formal financial institution to support farming activities

I feel formal financial services are affordable and meet ir needs as a farmer

Financial literacy

I understand the following financial terms: interest rate, loan, and savings account

I have ability to create and manage a budget for our farming activities

I can evaluate different investment options for our farming business (e.g., purchasing equipment, seeds, or land)

I familiar with the process of applying and managing a loan from a financial institution

I knowledgeable about financial products to manage risks associated with farming

Farmers' self-efficacy

I confident and have ability to make effective financial decisions for our farming business

I capable in keeping accurate financial records for our farming activities

I confident and have ability to find solutions when faced with financial challenges

I confident and have ability to make informed investment decisions in farming operations

I comfortable in seeking financial advice or assistance when needed for our farming business

Farmers' Financial income

Our farming income increase over the past 3 years

Our farming income meet our household's needs

Our income comes from farming activities

Our income is stable is monthly from farming

I doesn't have financial difficulties related to fluctuations in or farming income

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