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Analysis of Horticultural Value Chain Dynamics among Smallholder Farmers Facing Digital Market Disruptions

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A B S T R A C T

This study analyzes the dynamics of the horticultural value chain in smallholders facing digital market disruption in Enrekang Regency, South Sulawesi. The research aims to examine how access to digital markets affects the distribution of value, marketing relationships, and farmers' participation in the horticultural value chain. The research uses a mixed method approach with the main framework of Value Chain Analysis. The data was collected through in-depth interviews and field observations of ten key informants consisting of six horticultural farmers, one collector, one market trader, one agricultural extension worker, and one digital marketer. Data observation was carried out in the production and marketing period of 2025. The results of the study show that access to digital markets increases the transparency of price information, opens up alternative marketing channels, and strengthens farmers' bargaining positions in the market system. These findings suggest that the integration of digital market mechanisms in horticultural value chains has the potential to improve the efficiency of value distribution and support the economic resilience of smallholders.

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INTRODUCTION

Digital transformation in the agricultural sector is one of the important agendas in the development of the global food system because digital technology is able to improve the efficiency of production, distribution, and marketing of agricultural commodities. The development of information technology has encouraged the emergence of digital-based marketing systems that allow direct interaction between producers and consumers without going through a long distribution chain. In the context of modern agricultural economics, market digitalization is considered to be able to reduce information asymmetry which has been the main obstacle for smallholders in obtaining wider market access (Rotz et al., 2021). In addition, the development of digital platforms in the agrifood sector also provides opportunities for farmers to obtain real-time price information thereby increasing market transparency (Carolan, 2020). This transformation marks an important change in the global agribusiness system that is increasingly integrated with digital technology. Therefore, an analysis of changes in the structure of the agricultural market due to digitalization is important to understand its implications for the value distribution system in the agricultural value chain.

In the agribusiness system, the value chain is an important analytical framework for understanding how economic value is created and distributed among various market participants. The agricultural value chain includes all activities involved in the production, distribution, and marketing process of agricultural products to end consumers. Horticultural commodities have different characteristics from other agricultural commodities because they are perishable and highly dependent on distribution efficiency in the marketing chain. According to a study conducted by Devaux et al. (2021), the efficiency of the horticultural value chain is greatly influenced by coordination between actors in the distribution system as well as access to adequate market information. In many cases in developing countries, horticultural value chains are still dominated by traditional marketing systems involving various intermediaries, resulting in long distribution chains and high marketing costs. This condition often results in an uneven distribution of profits between farmers as the main producer and other market participants.

The phenomenon of inequality in the distribution of value in the horticultural value chain is also seen in the agricultural sector in various developing countries, including Indonesia. Smallholders are often in a weak bargaining position due to limited access to pricing information, marketing networks, and distribution infrastructure. In traditional marketing systems, farmers often rely on middlemen to sell their products so that the prices received at the farmer level are relatively lower than the prices at the market level (Liverpool-Tasie et al., 2020). This dependence causes most of the economic value in the marketing chain not to be optimally enjoyed by farmers. On the other hand, the development of digital technology is starting to open up new opportunities for farmers to expand market access and obtain more transparent price information. Therefore, the integration of digital technology in horticultural

marketing systems has the potential to change the structure of value distribution in the agricultural value chain.

Although various studies have discussed agricultural value chains and digital transformation in the agribusiness sector, there are still significant research gaps. Most previous studies have focused more on the efficiency of value chains in conventional marketing systems without in-depth examining the influence of digital market disruptions on the distribution of economic value in the horticultural value chain. Research conducted by Bronson and Knezevic (2021) shows that the digitalization of agriculture has the potential to change the market power relationship between actors in the agrifood value chain. However, the impact of digitalization on changes in the structure of value distribution between farmers and other market participants still requires a more in-depth empirical study. In addition, studies that specifically analyze the dynamics of horticultural value chains in the context of digital market disruption in smallholders are still relatively limited. This condition shows that there is a research gap that is important to be studied in the context of agricultural economics at the local level.

Based on the research gap, this study aims to analyze the dynamics of the horticultural value chain in smallholders facing digital market disruption in Enrekang Regency, South Sulawesi. This study specifically examines how access to digital markets affects marketing relationships between actors in the horticultural value chain, the distribution of economic value in marketing systems, and the bargaining positions of smallholders in market systems. In addition, this study also aims to identify changes in the distribution pattern of horticultural products that occur due to the development of digital technology in the agricultural marketing system. This analysis of value chain dynamics is important to understand how changes in market structure affect the well-being of smallholders in the modern agribusiness system (Birner et al., 2021).

This research makes an important contribution both theoretically and practically in the development of agricultural economics and agribusiness. Theoretically, this study expands the study of agricultural value chain analysis by including the perspective of digital market disruption as a factor that affects the distribution of value in the horticultural marketing system. This approach provides a more comprehensive understanding of how digital technologies can affect market structures and relationships between actors in the agrifood value chain. Practically, this research is expected to provide policy recommendations for the government and stakeholders in designing strategies to strengthen the horticultural value chain based on digital technology. The integration of digital technology in the agricultural marketing system is considered to be able to increase the efficiency of the distribution of horticultural products and strengthen the economic position of small farmers in the modern market system (Klerkx et al., 2022).

LITERATURE REVIEW

Horticultural Value Chain Dynamics in Agribusiness Systems

The horticultural value chain is an analytical framework used to understand how economic value is created, distributed, and utilized by various actors in the agribusiness system. The concept of value chain describes the relationship between economic actors starting from the process of production, processing, distribution, to marketing agricultural products to end consumers. In the context of horticulture, the value chain has a high complexity due to the characteristics of products that are perishable and require an efficient distribution system. A study conducted by Gereffi and Lee (2020) shows that the efficiency of the agricultural value chain is greatly influenced by coordination between market participants and the ability of the distribution system to manage the flow of products and information effectively. In addition, research by Ponte et al. (2021) confirms that an unbalanced value chain structure often leads to an uneven distribution of economic value among actors in the agrifood system. In many cases in developing countries, smallholders are often at a disadvantage in the value chain due to limited access to markets, information, and technology. Therefore, an analysis of the dynamics of the horticultural value chain is important to understand how the distribution of economic value is formed in the agricultural marketing system.

H1: The structure of the horticultural value chain affects the distribution of economic value among market participants in the agricultural marketing system.

The Role of Smallholders in Agricultural Value Chain Systems

Smallholder farmers are a major actor in agricultural production systems in many developing countries. They play an important role in the provision of food and agricultural commodities, including horticultural commodities that have high economic value. However, smallholders often face various structural constraints such as limited access to capital, technology, and extensive marketing networks. A study by Lowder et al. (2021) shows that smallholder farmers account for more than one-third of global food production, but most of them still face limitations in gaining access to modern market systems. This condition causes smallholders to often be in a weak bargaining position in the agricultural value chain. Another study conducted by Meemken and Bellemare (2020) explains that limited market access is one of the main factors affecting the welfare of smallholders in the agribusiness system. Therefore, strengthening the role of smallholders in the agricultural value chain is one of the important strategies in improving market efficiency and rural economic welfare.

H2: The participation of smallholders in the horticultural value chain affects the bargaining position and economic well-being of farmers in the agricultural marketing system.

Digital Market Disruption in Agricultural Marketing Systems

The development of digital technology has brought significant changes in the agricultural marketing system, especially through the emergence of various digital platforms that connect producers with consumers directly. Digitization of agricultural markets allows farmers to access price information, market demand, and distribution opportunities more quickly and transparently. According to research conducted by Labarthe et al. (2021), digital technology in the

agricultural sector plays an important role in improving market efficiency by reducing transaction costs and accelerating the flow of information in the agrifood value chain. In addition, a study conducted by Eastwood et al. (2022) shows that the digitalization of agricultural marketing systems can create a more inclusive form of market relations between farmers and consumers. However, the adoption of digital technology in the agricultural sector still faces various challenges such as limited technological infrastructure and digital literacy among smallholders. Therefore, an analysis of the impact of digital market disruption on agricultural marketing systems is important to understand how digital technology affects the dynamics of the horticultural value chain.

H3: Digital market disruptions affect distribution efficiency and marketing relationships in the horticultural value chain.

Integration of Digital Technology in the Horticultural Value Chain

The integration of digital technology in the horticultural value chain is one of the strategies that is increasingly applied in the modern agribusiness system. Digital technology not only plays a role in improving marketing efficiency, but also helps to strengthen coordination between actors in the agricultural value chain. Research conducted by Tzachor et al. (2023) shows that the use of digital technology in the agrifood system is able to increase market transparency and improve the mechanism of value distribution in the agricultural value chain. In addition, research by Wolfert et al. (2021) confirms that the digitization of agricultural value chains can shorten distribution channels and improve logistics efficiency in agricultural product marketing systems. With digital technology, farmers have a greater opportunity to be directly involved in the marketing system without having to rely entirely on traditional intermediaries. Therefore, the integration of digital technology in the horticultural value chain has the potential to increase market efficiency while strengthening the bargaining position of smallholders in the agribusiness system.

H4: The integration of digital technologies in the horticultural value chain improves marketing efficiency and strengthens the bargaining position of smallholder farmers.

METHODOLOGY

Types and Approaches to Research

This study uses a mixed method approach with a convergent case study design to analyze the dynamics of horticultural value chains in smallholders facing digital market disruption. This approach was chosen because it allows the integration of qualitative and quantitative data so that it can provide a more comprehensive understanding of changes in the structure of marketing and value distribution in the agribusiness system. The mixed method approach is increasingly used in agricultural research because it is able to link the analysis of social processes in the value chain with economic indicators such as prices, distribution costs, and marketing margins. In the context of modern food systems, this method is considered effective for explaining the interactions between market actors, product distribution mechanisms, and technological changes that affect agricultural marketing systems (Molina-Azorin & Fetters,

2020). This approach also allows for the integration of empirical findings derived from in-depth interviews with the analysis of value chain economic data in a more systematic manner (Fàbregues et al., 2021). Thus, this study can provide a more comprehensive picture of the dynamics of marketing relationships and changes in the distribution of value in the horticultural value chain.

Research Location, Population, and Sampling Techniques

The research was conducted in Enrekang Regency, South Sulawesi Province, which is one of the horticultural production centers in eastern Indonesia. This area was chosen because it has high horticultural production activities and the development of the use of digital technology in the marketing of agricultural products. The research population includes all actors involved in the horticultural value chain, including farmers, intermediary traders, market traders, and digital marketers. The sampling technique uses purposive sampling, which is to select informants who are considered to have relevant information about the production, distribution, and marketing processes of horticulture. This approach is commonly used in value chain research because it allows researchers to obtain in-depth information from actors who play a direct role in the marketing system (Gill, 2020). The number of participants in this study is 10 people, consisting of 6 horticultural farmers, 1 collector, 1 market trader, 1 agricultural extension worker, and 1 digital marketer. This composition was chosen because it is able to represent the main actors who play a role in the formation of economic value in the horticultural value chain.

Data Collection Techniques

The research data was collected through three main techniques, namely in-depth interviews, field observations, and documentation. The interviews were conducted in a semi-structured manner to explore information about horticultural marketing patterns, pricing mechanisms, relationships between market participants, and the use of digital technology in marketing activities. Field observations were carried out to see firsthand the product distribution process, market transaction activities, and marketing practices carried out by farmers and traders. Documentation techniques are used to obtain additional data in the form of production records, commodity price data, and marketing information available at the local level. The use of several data collection techniques aims to increase the validity of findings through the process of triangulating data sources. This triangulation approach is important in agribusiness research because it can improve the accuracy of interpretation of the dynamics of agricultural marketing systems (Motulsky, 2021). In addition, data verification is carried out through a reconfirmation process to informants so that the information obtained remains consistent with field conditions.

Research Implementation Procedure

The research is carried out through several systematic stages. The first stage is the initial identification of the horticultural value chain to find out the actors involved as well as the distribution channels of products from farmers to consumers. The second stage is the collection of field data through interviews and observations of the selected informants. The third stage is the mapping of the horticultural value chain, which includes the analysis of product flows, information flows, and marketing relationships between actors in the

distribution system. The next stage is the analysis of the distribution of economic value, which is to identify the differences in prices, marketing costs, and margins obtained by each market participant. The final stage is the integration of qualitative and quantitative analysis results to explain how changes in marketing systems due to the use of digital technology affect the dynamics of the horticultural value chain. This integrative approach is widely used in modern value chain research because it is able to link institutional analysis with more measurable economic indicators (Guetterman et al., 2021).

Data Analysis Techniques

The data analysis in this study uses the Value Chain Analysis (VCA) framework. This analysis is carried out through several stages, namely identification of actors in the value chain, mapping of product distribution flows, analysis of marketing relationships, and calculation of marketing margins at each level of market participants. Qualitative data from interviews were analyzed using thematic analysis to identify patterns of relationships between actors, pricing mechanisms, and changes in marketing systems due to digital disruption. Thematic analysis is an effective method for interpreting qualitative data related to social dynamics in the agribusiness system (Byrne, 2021). Meanwhile, quantitative data such as product prices, distribution costs, and marketing margins are analyzed using descriptive statistics to see the distribution of economic value in the horticultural marketing chain. The qualitative data processing process is carried out with the help of NVivo software, while quantitative data analysis is carried out using Microsoft Excel. The use of data analysis software helps to increase the transparency of the analysis process and make it easier to systematically manage research data (Allsop & Sage, 2022).

RESULTS AND DISCCUSION

1. Digital Market Access Increases Transparency of Price Information

The results of value chain mapping show that prior to the adoption of digital channels, price information at the farmer level mainly came from collectors and market traders, making it difficult to verify price variations independently. After some farmers started using digital channels, the flow of price information became more open because farmers could compare offers from several parties in a faster time. The findings of interviews and observations show that price transparency not only helps farmers determine the time of sale, but also reduces dependence on a single source of information.

Price documentation data during November 2025 shows a clear change in the scope of price information, as the average number of price sources accessed by farmers increases from one source to three to four sources per week. Comparison of transactions shows that farmers' selling prices on transactions that use digital references increase by an average of six to nine percent compared to transactions that rely entirely on information from intermediaries in the same week. This consistency can be seen in the integration of thematic analysis results through NVivo and descriptive statistical summaries through Excel, both of which lead to a pattern of increasing the visibility of price information at the farmer level.

The findings are supported by farmers' statements that say "*Now I can check the price in the same group in the buyer's chat, so I don't immediately trust just one person.*" (F2-11, November 06, 2025). Other farmers explained "*If there is a low bid, I say I see it somewhere else it is higher, so I will wait.*" (F5-14, November 18, 2025). From the intermediary side, the collector also acknowledged this change through a statement "*Farmers are quick to know the price, so if I give the price too low, it is usually rejected.*" (L-01, November 20, 2025). The price component shows an increase in the average selling price of farmers of six to nine percent in transactions with digital references. The same data also shows an increase in the number of price information sources accessed by farmers to three to four sources per week based on observations and documentation during November 2025.

2. Digital Channels Open Alternative Marketing Channels and Shorten the Distribution Chain

The Value Chain Analysis mapping identifies two main marketing channels, namely traditional channels that flow from farmers to collectors and then to market traders, as well as digital-based alternative channels that flow from farmers to direct buyers or communities with local delivery support. Field findings show that digital channels have not yet replaced traditional markets, but serve as an additional option when market prices drop or when farmers need faster buyers. Transaction observations show that farmers are leveraging digital communication to receive small to medium-sized orders, especially from household buyers and micro-scale traders who demand fast supply.

From a quantitative perspective, the volume of sales through digital channels is indeed smaller, but it provides flexibility because throughout November 2025 the portion of digital sales volume will be in the range of twelve to eighteen percent of the total weekly volume of farmers who actively use these channels. Although the volume portion is limited, digital channels show efficiency in certain cost components, especially lowering the cost of finding buyers and shortening transaction times because communication is done through text messages. The integration of qualitative and quantitative findings in a convergent design confirms that digital channels play a role in reducing dependence on a single channel, while forming a value chain configuration that is more adaptive to market changes.

The farmers' explanations corroborated this finding, one of which stated "*If the market is falling, I try to throw it in the status, usually someone takes it for a small sale.*" (F1-09, November 04, 2025). Other farmers emphasized "*I didn't leave the collector, but now there are other options, especially if the goods have to come out quickly.*" (F6-16, November 22, 2025). From digital marketers, the statements that emerged were "*The important thing is that farmers are ready to take photos of the goods and give them stock, later I will help find buyers and arrange shipping.*" (D-01, November 25, 2025). The channel component shows that the portion of marketing volume through digital channels is in the range of twelve to eighteen percent of the weekly volume in active user farmers. Transaction observation data during November 2025 also shows that the buyer search time tends to be shorter because communication is carried out directly through digital channels.

3. Transparency and Alternative Channels Strengthen Farmers' Bargaining Positions and Change Negotiation Patterns

Thematic analysis shows that the most real impact of digital market disruption occurs on negotiation patterns, especially when farmers have price comparisons and buyer choices. Farmers who obtain price information from digital channels tend to negotiate with more confidence, including rejecting initial offers and asking for adjustments based on quality and volume. At the level of market relations, the role of collectors is not lost, but the unilateral pricing mechanism is weakened as farmers have comparative data and other marketing channel options. Quantitatively, the analysis of marketing margins shows that there is a shift in value distribution that is more favorable to farmers in transactions connected to digital channels, because margins that were previously concentrated on intermediaries are starting to narrow on some daily commodities.

The November 2025 recap shows that the total marketing margin on traditional channels is in the range of thirty-five to forty-two percent, while transactions using digital channels or digital reference-based negotiations are in the range of twenty-eight to thirty-four percent. This margin difference does not automatically eliminate the function of intermediaries, but marks a more balanced redistribution of value when farmers master the information and have alternative channels. These findings are consistent with the convergent design as the interviews describe the mechanism of changes in bargaining power, while margin descriptive data show a measurable change in the distribution of value.

The farmers' statement strengthened the mechanism, one of which said "*In the past, if the collector said that, yes, now I ask first, I match, then I let it go.*" (F3-12, November 12, 2025). Market traders also stated "*Farmers now like to compare prices, so we also have to give a reason to cut prices.*" (R-01, November 16, 2025). In terms of institutional support, agricultural extension workers explained "*If farmers have access to information, they are usually more courageous to negotiate and better understand the profit and loss calculation.*" (P-01, November 27, 2025). The margin component shows that the total marketing margin on traditional channels is in the range of thirty-five to forty-two percent. In transactions supported by digital channels, the total marketing margin is in the range of twenty-eight to thirty-four percent based on a recap of marketing prices and costs during November 2025.

The results show that access to digital markets contributes significantly to increasing the transparency of price information at the level of horticultural farmers. These findings show that farmers' ability to obtain price information from a variety of sources strengthens their position in the marketing decision-making process. From the perspective of information economy theory, price transparency plays an important role in reducing information asymmetry between producers and other market participants. A study by Aker and Fafchamps (2020) confirms that access to information technology can improve the efficiency of agricultural markets because farmers can obtain more accurate and up-to-date price information. In addition, research conducted by Abate et al. (2021) shows that the use of digital technology in agricultural marketing systems

can increase farmers' income through increased access to market information. The findings in this study strengthen this argument by showing that increasing price transparency through digital channels can increase the selling price received by farmers. These results also indicate that changes in the information structure in the horticultural value chain affect the distribution of economic value among market participants, thus supporting the first hypothesis (H1) that the structure of the horticultural value chain affects the distribution of economic value among market participants in the agricultural marketing system. Thus, access to digital information not only serves as a means of communication, but also as an important instrument in strengthening the economic position of farmers in the horticultural value chain.

In addition to increasing price transparency, this study also shows that digital channels open up a more flexible alternative to marketing channels for farmers. In traditional marketing systems, farmers generally rely on intermediaries such as collectors and market traders to distribute their products. This dependence often causes farmers' bargaining positions to be weak due to limited market choices. The findings of this study are in line with the concept of global value chains which emphasizes that diversification of marketing channels can improve distribution efficiency and expand market access for small producers. Research by Trienekens (2021) explains that the integration of digital technology in the agrifood value chain is able to shorten distribution channels and improve coordination between market players. In addition, a study by Reardon et al. (2022) shows that the development of digital technologies in the global food system has driven the emergence of new marketing models that allow manufacturers to reach consumers more directly. The results of this study reinforce these findings by showing that although the volume of digital marketing is still limited, its existence is able to provide additional flexibility for farmers in managing price and market demand risks. These conditions show that the involvement of smallholders in various marketing channels strengthens their participation in the horticultural value chain and has an impact on improving the bargaining position of the economy. Therefore, these findings support the second hypothesis (H2) which states that smallholder participation in horticultural value chains affects farmers' bargaining position and economic well-being in agricultural marketing systems.

Findings on changes in price negotiation patterns also make an important contribution to understanding the dynamics of market power in the horticultural value chain. With increased access to price information, farmers have a better ability to negotiate prices with other market participants. Within the framework of the theory of bargaining power in the value chain, access to information is one of the main factors that affect the bargaining power of economic actors in the market system. Research by Bellemare and Bloem (2022) shows that access to market information can improve the negotiation ability of smallholders in agricultural trade transactions. In addition, research by Minten et al. (2023) confirms that transparency of price information is able to reduce the dominance of intermediaries in the agricultural marketing system. The results of this study show that changes in the distribution of marketing margins are an indication of

a shift in market power that is more balanced between farmers and distribution actors. Thus, the integration of digital technology not only affects the efficiency of product distribution, but also changes the structure of power relations in the agricultural value chain. This change shows that digital market disruption is able to affect marketing relationships as well as distribution efficiency in the horticultural value chain, thus supporting the third hypothesis (H3) that digital market disruption affects distribution efficiency and marketing relationships in the horticultural value chain.

However, the findings of this study also show that digital channels have not completely replaced the role of traditional marketing systems. Most farmers still maintain relationships with collectors due to the factors of trust, ease of transaction, and guaranteed absorption of products. This condition shows that digital transformation in the agricultural sector is gradual and does not necessarily replace pre-existing market structures. A study conducted by Klerkx and Begemann (2020) states that the adoption of digital technology in the agrifood sector is often influenced by local social, institutional, and infrastructure factors. In addition, research by Barrett et al. (2022) shows that the success of digitalization in agricultural value chain systems is highly dependent on the readiness of market institutions as well as the capacity of business actors to adopt new technologies. In the context of this study, the limitations of digital literacy and access to infrastructure are still factors that affect the level of use of digital technology by horticultural farmers. However, despite this gradual transformation, research findings still show that the integration of digital technologies contributes to improving marketing efficiency as well as strengthening farmers' bargaining positions in the market system.

From the perspective of agricultural economics development, the results of this research make an important contribution in enriching the study of the dynamics of horticultural value chains in the digital era. This research shows that digital market disruption not only impacts changes in marketing technology, but also affects the distribution of economic value in the agribusiness system. These findings are in line with research conducted by Coglianese and Lehr (2023) which states that digitalization in the economic sector can create structural changes in market mechanisms and relationships between economic actors. In addition, a study by Benami et al. (2021) confirms that digital technology has the potential to increase the inclusivity of food systems by strengthening smallholder access to markets. In this context, the integration of digital technologies in the horticultural value chain not only improves marketing efficiency, but also creates fairer value distribution opportunities for smallholders. Thus, the findings of this study also strengthen the fourth hypothesis (H4) which states that the integration of digital technology in the horticultural value chain can improve marketing efficiency while strengthening the bargaining position of smallholders in the agribusiness system.

Although it makes an important contribution, this study has some limitations that need to be noted. First, the relatively limited number of participants makes the results of this study more exploratory and contextual in certain research areas. Second, the quantitative analysis used is still limited to

descriptive statistics so that it has not been able to explain causal relationships in more depth. In addition, this research was conducted in a relatively short period of time so that it could not capture the dynamics of market changes in the long term. Therefore, further research is recommended to use a longitudinal approach with a wider area coverage in order to provide a more comprehensive picture of the impact of digitalization on the agricultural value chain. Advanced studies can also integrate econometric methods or market network analysis to understand the relationships between actors in agricultural distribution systems in greater depth (Herrero et al., 2021). With this approach, future research is expected to be able to provide a broader understanding of the dynamics of digital transformation in the agribusiness system and its impact on the economic sustainability of smallholders.

CONCLUSIONS AND RECOMMENDATIONS

This research shows that the integration of digital markets in the horticultural value chain contributes to increasing the transparency of price information, expanding alternative marketing channels, and strengthening the bargaining position of smallholders in the agricultural marketing system. Access to price information from a variety of sources allows farmers to make more rational marketing decisions and reduces reliance on traditional intermediaries. In addition, the existence of digital channels also helps to create a more flexible and adaptive value chain configuration to market changes. Therefore, strengthening farmers' digital literacy, developing information technology infrastructure in rural areas, and policy support for agricultural digital marketing platforms are important steps to improve distribution efficiency and economic welfare of smallholders in the modern agribusiness system.

FURTHER STUDY

This study has limitations in the number of participants and relatively limited coverage of the area so that the research findings are still contextual at the study location. In addition, the quantitative analysis used is still descriptive so it is not able to explain the causal relationship in more depth. Further research is suggested to use a wider coverage of the region as well as more comprehensive quantitative analysis approaches, such as econometric analysis or market network analysis, to understand the dynamics of digital transformation in the agricultural value chain in more depth.

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