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Resistance to Agricultural Commercialization with Lack of Marketing Digital Adoption in Indonesia's Dieng Plateau

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ABSTRACT

Dieng Plateau is one of the largest vegetable-producing areas in Indonesia, and most of the inhabitants work as farmers. While shifting to commercial agriculture with marketing digital skill can improve farmers' lives, it faces obstacles that cause resistance. The barriers that arise from the commercialization of agriculture in Indonesia are that the scale of agricultural business is generally relatively small, capital is limited, and the use of technology is still simple. Agriculture in the Dieng plateau is seasonal and relies heavily on family labor, with limited access to credit, technology, and markets. Wholesalers and the lack of supply of quality seeds for farmers mainly dominate the market for agricultural products. So, this research explains the obstacles that cause farmers to resist commercialization. The observed barriers included five factors: barriers from factors of production and innovation, such as difficulty adopting digital marketing, lack of relative advantages, lack of compatibility, and complexity. This study tests a constraint model of commercial farming using five factors. The data was collected from 280 farmers who own their land and are not farm laborers. The sampling technique used was purposive sampling with the criteria of individuals having a livelihood as farmers, aged more than 18 years, and owning their land. Data collection uses a questionnaire that has a five-point Likert scale—data analysis technique using PLS-SEM. The results support the hypothesis, suggesting a robust barrier to the commercialization model.

1. INTRODUCTION

This study analyzes the resistance to commercializing agricultural products in the Dieng plateau, Indonesia. Dieng is one of Indonesia's largest vegetable producers, with a land area of around 10,000 hectares. Horticultural crops will contribute 1.57% of Indonesia's Gross Domestic Product in 2022. Unfortunately, the people of Dieng, the largest supplier of horticulture in Indonesia, are still considered poor, have high risks in production and marketing, and have untapped commercial agricultural potential [1]. Various obstacles arise when farmers are faced with commercializing their agricultural products. According to the researches [2, 3], seed shortages and land degradation are significant problems from a production perspective. Access to fertilizers and other production inputs, such as seeds, remains a significant barrier for smallholders [2]. This condition ultimately impacts the quantity and quality produced [3]. Another obstacle is farmers' lack of technical skills, a lack of production technology, a low level of mechanization, and limited development and transfer of production technology [2].

Limited adoption of innovative technology is also an obstacle to agricultural commercialization. Agricultural commercialization can be successful if it involves marketing technology through social media. Felix et al. [4] found that no overall social media marketing strategy can help in customer exposure and acquisition. Social media marketing can generate compelling opportunities to increase exposure and sustainable customer acquisition. Many scientific articles show that social media marketing can increase exposure. However, most scientific research findings focus on one SNS network and do not discuss social media. For example, many studies only use one platform for their research settings, Facebook, Instagram, and YouTube [5, 6]. These studies fail to recognize the commercialization of agriculture fully. Grigorescu et al. [7] found that nearly half of all single-owner business structures failed for various reasons. Tuni et al. [8] show that digital marketing can be the primary key to the survival of individual companies. This study discusses the resistance to agricultural commercialization in several parts. The introduction section presents farmers' commercialization problems; the second part discusses the study of theories and hypotheses related to commercialization barriers. The third part analyzes the methods used to solve the problems and the hypotheses proposed in this study. The fourth section contains research data analysis, then discusses the conclusive research findings, limitations, and suggestions for future researchers.

2. LITERATURE REVIEW

2.1 Farming commercialization

Farming commercialization is the key to socio-economic transformation, which is expected to increase production efficiency and improve household welfare [9]. Subsistence farming is self-sufficient, where farmers focus on cultivating enough food for themselves and their families. While commercial agriculture is agriculture that aims to meet trade needs. The commercialization of farming has been promoted as a strategy to improve the welfare of rural people. The welfare significance of commercialization is primarily in rural areas where households have a direct livelihood from agriculture [10]. Benefits that can be expected from commercialization are: increasing household income, consumption, food security, and nutrition. Agricultural commercialization is usually done by establishing industries that can create additional jobs and add value to agricultural products [10].

Wilk et al. [11] found that most agricultural business structures were carried out and managed individually. Conceptually, the benefits of agricultural commercialization are: (1) increasing income through specialization and the production of commodities demanded by the market based on comparative advantage. This income increase is expected to help increase food security and household nutrition. Income generated from the sale of agricultural produce can facilitate the purchase of non-food items such as health care, agricultural materials, education, and household assets. (2) Commercialization can increase production scale, labor demand, and local job creation. Commercial-scale agriculture is expected to positively impact food production, food security, family welfare, and rural livelihoods [10].

Commercialization has various definitions depending on its focus and extent, and measurement. Commercialization is seen as an increase in the proportion of marketed output. Agricultural commercialization is the extent to which farmers' products are connected to the market. This relationship can be observed at certain times or as a dynamic process in which households increase their interaction with input or output markets from time to time [12]. The commercialization of agriculture implies a shift, often gradual, away from subsystems. The modern agricultural approach requires that production and input decisions are based on profit maximization and strengthen the vertical relationship between input and output markets [13]. When put to good use, commercialization results in increased welfare for farmers through comparative advantage and increased growth in total factor productivity [14].

Agricultural commercialization is an agricultural transition, which refers to the importance of increasing agricultural productivity, labor productivity, market development, and industrial sector growth. This increase in productivity can be achieved through commercialization [15]. Commercialization is at the heart of the process of structural transformation as a more excellent orientation of input markets increases the demand for industrial and technological goods essential for production, increases household welfare through job creation and increases labor productivity, and allows the transfer of surplus in the form of food, labor, and capital. From the agricultural sector to other sectors [16].

2.2 Resistance to commercialization

Innovation resistance is a behavior that does not want to change and persists in the status quo, especially if the change causes a dramatic change from existing habits [17]. Marakas and Hornik [8, 18] explain resistance behavior as a response to oppose the existence of a new system. Resistance to change is illustrated as a negative response related to a farmer's emotional, cognitive, and intentional dimensions. Farmers try to restrain their desire to adopt commercialization in this condition of resistance to change. Farmers will direct their actions to survive in previous conditions [8]. Kilimani et al. [9] show that agricultural commercialization interventions are beneficial in increasing income and agricultural production and improving the nutrition of farming families.

Kilimani et al. [9] define barriers to commercialization as obstacles that cause farmers' resistance to transition from subsistence-oriented to market-oriented agriculture. From a broader perspective, these commercialization constraints include barriers that arise due to production, marketing, distribution, customer support, sales, and other relevant functions that result in the sale of a product [19]. The role of infrastructure and market access in agricultural commercialization provides obstacles to the commercialization of technology-based agriculture [14].

2.3 Barrier to commercialization

2.3.1 Lack of production factors

Technological innovation involves several aspects of production, such as cost, production scale, product quality, and diversification, which are very important for commercializing agriculture. Agricultural commercialization can be explained as the proportion of marketed agricultural production. Pingali et al. [16] classify subsistence, semi-commercial and commercial agriculture based on market orientation. Subsistence farming implies that farmers' produce is only for household consumption. In semi-commercial farming, farmers participate in the market and, at the same time, ensure food security for households [13]. Commercial-based growers are entirely focused on maximizing profits. Commercialization also broadens and deepens farmer's market transactions regarding inputs and outputs. Transactions from farmers initially affect the product market. As a result, the participation of farmers in other markets will also have an added significance because the proportion of output marketed is colossal.

However, integrating farmers into markets and products is indirect and straightforward due to the endemic drawbacks of market failure and market loss in developing countries [11]. Integration of farmers into the market requires building links and strengthening existing new relationships between farmers, on the one hand, and microfinance companies, traders, and other farmers readily leasing land and supplying labor [8].

Hypothesis 1: Lack of production factors affects the resistance to agricultural commercialization.

2.3.2 Lack of digital marketing knowledge

Digital marketing refers to all marketing efforts carried out through digital means, for example, Instagram, Facebook, TikTok, and Social Network Sites (SNS), which aim to develop customer relationships and promote brand awareness through digital means [8, 20]. Digital marketing is easier to do through social media, and the role of social media in

commercialization makes it easier for farmers to interact with consumers freely. It offers many ways for marketers to reach and engage with consumers, thus increasing customer engagement and providing opportunities to increase company profits regardless of the number of brands [21]. Voorveld et al. [22] show that digital marketing has three categories, namely: paid content or advertisements, personal content, such examples, social media pages, and content from user reviews and media coverage. Incompetence to adopt digital marketing causes resistance to commercialization for farmers [8].

Hypothesis 2: Lack of knowledge about digital marketing affects the resistance to agricultural commercialization

2.3.3 Innovation characteristics

Simpson and Clifton [23] show that DOI theory can be used to explain innovative new technologies spreading between cultures and communities. Tuzel and Hobbs [24, 25] show that DOI theory can be applied to digital marketing, business plans, and social networking sites. The Diffusion of Innovation Theory (DOI) [26] and the Technology Acceptance Model (TAM) [27] are often applied as the fundamental theories of technology adoption. Technology attributes, according to DOI, have a broader scope than TAM. The DOI theory states that the perceived characteristics of innovation are relative advantage, complexity, compatibility, trialability, and observability. However, according to Aubert et al. [28], trial and adoption have a negative relationship. DOI theory is felt to be less accurate in predicting the strength of the adoption of digital farming technology [29]. Some of the perceived characteristics of innovation used in this study are relative advantage, compatibility, and complexity.

Vasumathi and Arun [30] show that relative advantages such as increased agricultural productivity can drive adoption, while high production costs and time are barriers [29]. The motivations influencing farmer technology adoption are often well-informed farm management, reduced use of inputs, and high yields. The relative advantage of agricultural commercialization can be demonstrated by increasing productivity [31].

Hypothesis 3: Lack of relative advantage affects resistance to agricultural commercialization

Brugere et al. [32] state that compatibility is how well innovation is in line with established norms, values, practices, and previous experiences of potential adopters [26]. Compatibility of new agricultural technologies with existing machinery, poor telecommunication infrastructure, and data interoperability are constraints to adopting agricultural and digital technologies [12]. Compatibility actualized in positive exploratory experiences can facilitate adoption, and this is because non-adopters have an overly optimistic previous impression of the ease of use of new technologies [29].

Hypothesis 4: Lack of compatibility affects the resistance to agricultural commercialization.

Complexity is the degree to which a new method or technology has an effect that is difficult to understand. Less complex innovations are generally more readily and widely accepted [31, 32]. Studies that use interviews with farmers and experts say that the complexity of manipulating data and machines is a barrier to adoption. Complexity as an attribute of innovation faced by farmers is the complexity of manipulating data and agricultural machinery technology [33].

Hypothesis 5: Perceived complexity affects the resistance to agricultural commercialization.

3. RESEARCH METHOD

3.1 Research paradigm

This study adheres to the positivism paradigm. The positivism paradigm holds that reality is single, tangible, and divisible and emphasizes the occurrence of causal relationships whose testing is carried out on a value-free basis. This study uses a survey of farmers because it considers several factors that explain the phenomenon of agricultural commercialization under study [34]. Research on the behavior of rejection or unwillingness to adopt innovation previously suggested developing future research in a more accurate context to have better explanatory power [10, 17].

3.2 Population and sample

The population in this study were all farmers in the Dieng plateau. Sampling was conducted by non-probability sampling because researchers cannot know with certainty the number of farmer populations reluctant to adopt commercialization. In this stage, sampling is used based on judgment or purposive sampling. This sampling technique allows the sample to be selected based on the researcher's assessment that the respondent is the most appropriate person to be the research sample. The unit of analysis in this study is the individual. The number of samples taken refers to the opinion of Hair et al. [35], which states that the minimum number of samples for a data test to have statistical power that can be accounted for is five to ten times the parameters analyzed. Respondent criteria are individuals involved in the commercialization decision-making process, individuals whose livelihoods are farmers, are over 18 years old, have their land, work their fields, or are not employed by other parties.

The purpose of using the purposive sampling method is to get research subjects who can provide accurate information about the behavior of farmers' commercialization barriers. The sample size refers to the opinion of the study [35], which states that the minimum number of samples for a data test to have predictive power that can be accounted for is five to ten times the parameters analyzed. The number of parameters analyzed in this study is 18. So the minimum sample is 180 respondents. The number of samples used in this study was 280 farmers. Data was collected using a questionnaire that was prepared based on a five-point Likert scale. Questionnaires were distributed directly to farmers face-to-face to avoid bias due to an erroneous understanding of the proposed research questionnaire.

3.3 Data analysis technique

The data analysis technique used in this study is a structural model using Partial Least Square (PLS-SEM). Partial least squares is a multivariate statistical technique that simultaneously handles many response and explanatory variables. PLS has the advantage that the data does not have to be normally distributed multivariate. Indicators can scale categorical, ordinal, interval, and ratio data, and the sample size does not have to be significant.

3.4 Operational definition of research variables

3.4.1 Resistance to commercialization

Resistance to commercialization is the individual behavior

of not doing something immediately or even delaying or not wanting to adopt agricultural commercialization. Instruments measuring farmers' resistance to commercialization [2, 14, 27]. Indicators for measuring resistance to commercialization are as follows: (1) not willing to commercialize, (2) still using the old way of selling through mediators, (3) not having the desire to commercialize agricultural products.

3.4.2 Lack of production factors

Lack of production factors hinders farmers from participating in the output market and commercialization due to limited production factors. The indicators are adopted from [2, 36, 37] as follows: (1) uncertainty over the condition of the soil and natural resources, (2) lack of access to adequate production inputs, such as fertilizers, herbicides and high-yielding varieties of seeds, (3) production yields are still low.

3.4.3 Lack of marketing digital knowledge

Digital marketing is the marketing or promoting a brand or product using digital media or the internet. Lack of digital marketing is still a lack of understanding of digital marketing owned by farmers. Several indicators of obstacles related to digital marketing in commercialization refer to [8, 22], which state that: (1) lack of understanding of social media marketing, (2) inadequate market information and market access; (3) lack of proficiency in using the internet.

3.4.4 Lack of relative advantage

The relative advantage is the degree to which a commercialized innovation is perceived as better than traditional farming. Lack of relative advantage is a condition in which commercial agriculture is considered to have no relative advantage over traditional agriculture. Relative advantage is measured using research instruments [31, 38]. Indicators of relative advantage are as follows: (1) commercialization of agriculture through digital marketing is easy to learn, (2) commercialization makes it easier for farmers to access marketing sources for agricultural products, and (3) farmers understand that commercialization makes farmers more productive.

3.4.5 Lack of compatibility

Compatibility is the extent to which commercialization is perceived as consistent with prevailing values, past experiences, and adopters' needs. Lack of compatibility is the perception that farmers have that commercial farming is not compatible with the way they have worked so far and requires significant effort to adopt it. The instrument for measuring suitability was adopted from [17, 31]. Indicators for measuring the suitability of agricultural commercialization are as follows: (1) Commercialization causes me to have to work harder in production, (2) commercialization can create added value for agricultural products, and (3) Commercialization requires a higher effort in marketing agricultural products.

3.4.6 Complexity

Complexity is the degree to which commercialization is perceived as challenging to understand and use. Instruments for measuring innovation complexity [31]. Indicators for measuring complexity are as follows: (1) it is difficult for farmers to obtain information about commercialization, (2) it is difficult for farmers to understand how to commercialize their agricultural products, and (3) it is difficult for farmers to understand how agricultural commercialization works.

4. RESULTS

4.1 Characteristics of respondents

The research was conducted in the Dieng Plateau, Banjarnegara, Central Java, Indonesia. The Dieng Plateau was chosen deliberately because all its inhabitants work as farmers, and it is the center of food security on the island of Java and its surroundings. The Dieng Plateau has a relatively high poverty rate, diverse agricultural production, and great distances to markets. Farmers in the study area grow various types of crops, such as potatoes, chilies, carrots, cabbage, and leeks, mainly for household consumption and sales in the local market. Many farmers in the Dieng Plateau raise livestock on a small scale, namely sheep known as the Batur Sheep. The Dieng Plateau has a market that is at most 10 kilometers from residential areas. The most significant production is potatoes. The average harvest amount is 15 tons per hectare—time to plant potatoes three times a year. Interviews were conducted in the local language by a team of interviewers trained and supervised by researchers. The structured questionnaire was carefully tested before the survey. Demographic data of farmer households can be seen in Table 1. The sample used in this study was 280 farmers who had agricultural land, not farm laborers.

Table 1. Characteristics of respondents

Demographic characteristics	Description	Percent
Gender	Female	78.2
	Male	21.8
Age (years)	30-35	16.1
	35 - 40	30.7
	41-45	22.5
	> 45	30.7
Education of thehead of household	Secondary School	66.8
	High School Equivalent	30.0
	Bachelor	3,2
Land area	1-3 hectares	58.6
	4-6 hectares	38.9
	>6 hectares	2.5

The characteristics of the respondents in Table 1 show that most of the farmers who work their fields are men. Some women only work in their fields at certain times and only do the planting, cleaning of grass, and harvesting. Other tasks such as hoeing or land preparation, fertilizing, spraying pesticides, and watering are carried out by male farmers. Farmers in the Dieng plateau are farmers with low education because these farmers usually inherit their parents' work, which is only farming, so there is no time to continue studying. Most of the farmers carry out the processing of their agricultural land with their families. Data on the characteristics of these respondents causes the level of resistance to innovation to be high. This opinion has been expressed by Roger [26], who states that individuals with low levels of education, old age, and low-income levels are included in the laggard category in innovation adoption or the group that is the slowest to adopt innovations. This is the condition of farmers in the Dieng highlands which causes farmers to be unmotivated to adopt commercial agriculture. Farmers prefer traditional farming patterns that do not require much effort in producing and selling their crops. Farmers with traditional farming methods often suffer losses due to price manipulation by intermediaries and fluctuations in fertilizers and pesticides

used in growing vegetables.

4.2 Validity and reliability test results

Smart-PLS uses to test the hypothesis in this study with the Structural Equation Model (SEM) approach. This approach is often used in social science studies because of its accuracy in analyzing psychometric models. According to Kim and Lee [39] and Wijaya et al. [40], Smart-PLS is used for the following reasons: (1) hypothesis testing can be carried out if the distribution is not normal; (2) can be used with less than three items, and (3) can be used regardless of sample size. The PLS-SEM step consists of reflective measurement and assessment of the structural model. Assessment of the reflective measurement model revealed reflective indicator loading, internal consistency reliability consisting of Cronbach's alpha and composite reliability, convergent validity through Average Variance Extracted, and discriminant validity using the Heterotrait-Monotrait Ratio (HTMT).

Meanwhile, statistical assessments such as VIF values, path coefficients, t-statistics, and p-values are used to evaluate the structural model. The t-test is used to assess the significance of the relationship between variables. The reliability structure of the questionnaire uses the Cronbach value of each variable to verify internal consistency between the questionnaire items. The results of testing the validity and reliability can be seen in Table 2.

Table 2. Results of loading factor, validity, t-value

Latent Variable	Indicator	Loading factors	t-value
Lack of production factors	PF1	0.851	20.571
	PF2	0.900	25.205
	PF3	0.922	24.175
Lack of digital marketing knowledge	DM1	0.905	18.093
	DM2	0.924	18.963
	DM3	0.916	24.794
Lack of relative advantage	RA1	0.806	13.080
	RA2	0.875	15.455
	RA3	0.854	12.230
Lack of Compatibility	Com1	0.815	10.787
	Com2	0.859	12.819
	Com3	0.794	9.230
Complexity	Cplx1	0.870	16.105
	Cplx2	0.858	19.654
	Cplx3	0.781	13.749
Resistance to Commercialization	Res1	0.894	38.339
	Res2	0.925	40.087
	Res3	0.927	39.441

Table 2 shows the loading factor for each variable in the range of 0.781 to 0.927, which is a good value. Each variable is almost even and consistent [35]. Table 2 also contains information about the measurement model, such as factor loading, t-value, internal consistency, Cronbach's alpha, and AVE (Average Variance Extracted).

The convergent validity of the measurement model is demonstrated by observing: (1) item reliability; (2) composite reliability; and (3) Average Variance Extracted (AVE) for the reliability of the items using Cronbach's alpha value. Table 2 shows that all Cronbach's alpha value constructs are more significant than the 0.70 threshold. Each construct in Table 2 has a composite reliability greater than 0.5, indicating good internal consistency reliability among latent variables. Furthermore, to analyze variance, the AVE of all constructs has a value greater than 0.5, which indicates that these items meet the convergent validity criteria. A high AVE indicates that the measurement process in the developed model is of high quality and can explain the model.

Table 3. Results of reliability

Latent Variable	Cronbach's Alpha	Composite Reliability	AVE
Production factors	0.870	0.921	0.794
Lack of digital Marketing knowledge	0.903	0.939	0.837
Lack of Relative Advantage	0.800	0.882	0.715
Lack of Compatibility	0.762	0.863	0.678
Complexity	0.787	0.875	0.701
Resistance to Commercialization	0.903	0.939	0.838

Discriminant validity analysis in this study used the Fornell-Larcker criterion observed from the AVE square root for each latent variable and the correlation coefficient between other variables. In Table 3, the Fornell-Larcker criteria for discriminant validity are presented by showing the correlation matrix between items (the diagonal elements represent the square root of the AVE). The observed diagonal elements are more significant than the other correlation values between other latent variables, so they meet the discriminant validity requirements.

Table 4. Results of discriminant validity based on Fornell–Larcker criterion results

	Comp	Cplx	DM	PF	RA	Res
Lack of Compatibility	0.823					
Complexity	0.509	0.837				
Lack of digital Marketing knowledge	0.379	0.537	0.915			
Lack of production factors	0.438	0.628	0.584	0.891		
Lack of relative advantage	0.364	0.505	0.410	0.453	0.845	
Resistance of Commercialization	0.517	0.690	0.647	0.721	0.531	0.915

Table 5. Additional validity discriminant measurement results based on HTMT

	Comp	Cplx	DM	PF	RA
Complexity	0.659				
Lack of digital marketing knowledge	0.455	0.624			
Lack of production factors	0.535	0.752	0.652		
Lack of relative advantage	0.467	0.635	0.483	0.544	
Resistance of Commercialization	0.623	0.810	0.715	0.811	0.625

Several studies have shown that using the Fornell-Larcker criteria is insufficient for discriminant validity analysis. The

HTMT ratio to determine discriminant validity is required. According to the studies [41, 42], the maximum threshold value for HTMT is 0.9. Table 5 shows the HTMT statistics that support discriminant validity.

4.3 Hypothesis testing results

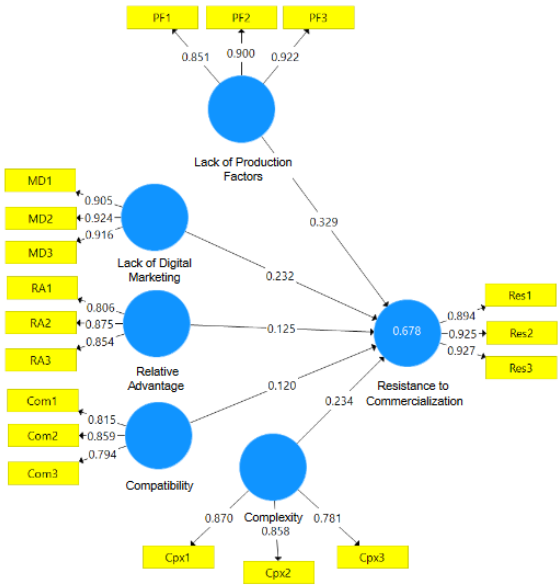

Figure 1. The model of resistance to commercialization

Figure 1 shows a structural model based on which has 18 items. The results of the structural model analysis are shown in Table 5. The suitability of the model resulting from Smart-PLS shows acceptable suitability, and the value of its R^2 shows this. If the R^2 value is more significant than 0.67, it is considered high [38, 43]. The variance between 0.33 and 0.67 is considered moderate, while between 0.19 and 0.33, it is considered weak. Overall, the proposed model accounts for 67.8% of the variance in resistance to commercialization. They have standardized Root Means Square Residual (SRMR) to assess the PLS model's fit. A good match is defined by an SRMR value of less than 0.10 [44]. The SRMR value in the study was 0.058. Hu and Bentler [44] showed that a model meets the model fit criteria if the RMS Theta or Root Mean Square Theta value is < 0.102 and the NFI value is > 0.9.

Table 6. Hypothesis testing results

	Original Sample (O)	t-statistics	p values
Lack of production factors → Resistance to commercialization	0.329	4.496	0.000
Lack of digitalmarketing knowledge → Resistance to commercialization	0.232	3.297	0.001
Lack of relative advantage →Resistance to commercialization	0.125	2.627	0.009
Lack of compatibility→Resistance to commercialization	0.120	2.666	0.008
Complexity → Resistance to commercialization	0.234	3.188	0.002

The results of this study indicate that the Theta value is 0.019, and the NFI is 0.923. So it shows a very suitable model. The model has reliability and validity and can explain the hypothesized relationship according to the measured R^2. Table 5 shows the path coefficient values, standard deviation, sample mean, t-statistic, and significance level (p-value). All paths have a t-statistic greater than 1.96 and a p-value less than 0.05, showing significant results. All hypotheses put forward in this study are supported. Table 6 shows information about the direct effect of each relationship between variables.

Table 6 shows the path coefficient values, standard deviation, sample mean, t-statistic, and significance level (p-value). All paths have a t-statistic greater than 1.96 and a p-value less than 0.05, showing significant results. All hypotheses put forward in this study are supported.

5. DISCUSSION AND IMPLICATION

The research focuses on the resistance to agricultural commercialization among farmers in the Dieng plateau. This study identifies commercialization barriers caused by lack of production factors, lack of digital marketing knowledge, and innovation adoption characteristics. This study's results are consistent with previous research on the aversion to the commercialization of farmers. The first hypothesis in this study states that the productivity factor influences commercialization resistance. An exploratory study on barriers to productivity factors found that farmers in the Dieng plateau often face a shortage of vegetable seeds. The stock of superior seeds on the market does not meet production needs. The limited supply of seeds has long been a farmer's issue but has not been resolved until now. The government's seed center provides the availability of quality seeds. However, the seeding results are insufficient for agriculture in Dieng. So that many farmers do their breeding of these seeds, and the result is not getting seeds in generation zero. So, the quality of these seeds is deficient, and the production results are not optimal and even decrease yearly. This problem has not been resolved until now. This resistance causes uncertainty in production results, and farmers are hesitant if they have to partner as suppliers with large companies that are supposed to be the primary consumers. Besides that, the lack of good-quality organic fertilizers also causes decreased production. Most of the agriculture in Dieng is fertilized with chemical fertilizers and fertilizers from livestock manure that have not been processed, causing many diseases to the soil and plants.

Using chemical fertilizers and manure without prior processing causes severe land degradation. Agricultural land becomes diseased and becomes saturated. So it is no longer optimal if planted. The high cost of making organic fertilizer and the long harvest period is one of the reasons why farmers are reluctant to use organic fertilizer. Lack of knowledge about land damage due to reckless farming is also the cause of poor vegetable production. This factor of production constraints causes farmers to be reluctant to commercialize. This research supports the findings [36, 45], which show that the barriers for farmers to participate in the commercialization of vegetables are due to unpredictable soil conditions. In addition, farmers are faced with difficulties in accessing production factors, namely fertilizers, herbicides, and high-yielding varieties of seeds. Another obstacle to production factors is low production yields [37, 45], which causes farmers to hesitate to enter the realm of commercialization. Based on the study's

results, this production factor constraint has the most significant influence on the commercialization of farmers. The influence of this production factor is 32.9% in predicting farmers' resistance to agricultural commercialization.

This study proposes a second hypothesis about the effect of a lack of digital marketing knowledge on farmers' resistance to engaging in commercial farming. For most of the Dieng highland farmers, understanding of the use of social media is still shallow. Farmers do not understand social media applications, how to use them, and the benefits of using social media to market their agricultural products. This lack of knowledge about social media affects farmers' resistance to commercialization because farmers still think that online sales transactions have many risks. The risks of using digital marketing for commercialization frighten farmers because much information shows that many farmers are deceived when selling online. A lack of digital literacy causes farmers to be reluctant to carry out commercialization. Yadav and Rahman [8, 21] also show that farmers with little understanding of digital marketing impact commercialization resistance. Another barrier to agricultural commercialization arises from inadequate market information and market access. Many farming families in Dieng can only sell their crops to intermediates because farmers cannot access other markets. Farmers' produce per family in one harvest cannot be sold directly to consumers because these vegetable products are usually in large quantities, cannot last long, and must be consumed immediately. The power of access to large markets that farmers do not yet have causes barriers to commercializing their agriculture. The results of this research support [5, 6, 8], which state that farming commercialization will not be successful without ownership of access to markets. Another indicator that hinders agricultural digital marketing is the lack of internet skills. The study results show that most farmers do not understand internet use and how marketing applications can be made via the internet.

The third hypothesis states that perceptions of poor relative advantage may influence the resistance to agricultural commercialization. The study results show that many farmers in Dieng perceive commercialization as no better than current sales methods. Because vegetable production has a large tons capacity, they think the best way is to sell it to intermediaries. Farmers perceive that digital marketing as a prerequisite for success is not easy to learn. Commercialization, if carried out by the farmers themselves, is no easier than direct wholesale sales to intermediaries. For Dieng farmers, agricultural commercialization is inappropriate for small farmers because commercialization efforts require more fabulous hard work. Farmers in Dieng don't want to think about anything other than just producing vegetables. Farmers deny the perception that commercialization will make farmers more productive. Farmers in Dieng generally do not perceive commercialization as better than sales that have been carried out so far, so farmers are reluctant to carry out commercialization. The results of this study support [29], who stated that poor perception of relative advantage could weaken the desire to adopt agricultural commercialization.

The fourth hypothesis states that compatibility may influence the resistance to supported agricultural commercialization. The study results show that Dieng farmers state that commercialization does not follow current agriculture. According to farmers, commercialization cannot increase farmers' production because it is difficult for farmers to sell directly to consumers and large companies. Dieng Farmers must strive to meet commercialization requirements if commercialization is to be implemented. These Dieng farmers believe their farming life has been excellent and suitable since long ago. So commercializing farmers didn't fit into their farming culture long. This perception of incompatibility causes farmers to become resistant to the commercialization of agriculture. The results of this study support [28, 33], which showed a negative relationship between perceived conformity and adoption resistance.

The fifth hypothesis, which states that perceived complexity influences adoption resistance, is supported. The complexity that is part of the attributes of agricultural innovation is a condition of difficulties farmers face in carrying out commercialization. The results of this study indicate that Dieng farmers find it difficult to access market information, production inputs, and access to the government. Farmers in the Dieng plateau only focus on agricultural cultivation, and market access is usually left to other parties. Government assistance is also lacking. So farmers also lack knowledge about quality agricultural cultivation. Many Dieng farmers have difficulty understanding how agricultural commercialization works. They don't even understand commercialization. This understanding of farmers is only limited to selling their agricultural products. Dieng farmers think that the commercialization of agriculture is quite complicated to do. So they are reluctant to adopt commercialization. The results of this study are in line with [13, 28, 33], which shows that the higher the level of complexity of commercialization, the more reluctant farmers will be to adopt it.

6. CONCLUSIONS

The main objective of this study is to analyze the resistance to agricultural commercialization. The study was conducted on farmers in the Dieng highlands, Indonesia. The Dieng Plateau supports food security in the vegetable sector. The production of vegetables in the Dieng plateau is very abundant, and it is impossible to sell them in retail. The most appropriate selling technique is wholesale trading, usually handled by intermediaries. Several references state that commercialization is the most appropriate idea to overcome barriers to selling vegetables to farmers in some agricultural regions. Tuni et al. [8] showed that farmers who are poor or have a low production scale should have switched to commercial farming. These farmers should not linger with traditional farming, which doesn't give them much profit. Agricultural commercialization that shifts from traditional agriculture to more market-oriented agriculture can increase productivity growth, income growth, employment growth, and poverty reduction [12, 46]. Commercializing farming could also increase the food supply in urban areas, with broader growth in welfare. After controlling for other relevant factors, Ogutu and Qaim [12] assert that commercialized agriculture can generate higher household incomes than traditionally oriented ones.

However, the results of this study indicate that many farmers are still reluctant to commercialize or even avoid it. Some of the obstacles farmers face related to commercialization include obstacles from their production factors. Obstacles to production factors can be observed from the common pro-environmental farming patterns, the lack of superior seeds, and the lack of knowledge about improving agricultural quality. Another barrier to commercialization is

insufficient knowledge of digital marketing; farmers still do not understand computer or internet technology. In general, many farmers already use smartphones, but unfortunately, farmers have not been able to take advantage of smartphone technology for business. Smartphones are only used for calling and sharing messages. Other obstacles that make farmers reluctant to commercialize are the perceived low relative advantages of commercialization, the incompatibility of commercialization with past farmer agricultural business patterns, and perceptions of the complexity of the technology used for commercialization by farmers. The findings of this study conclude that all the proposed hypotheses are supported and significant.

This research contributes to the literature, which primarily analyzes the impact of the multidimensional barrier to commercialization on adoption resistance. Analyzing several dimensions of barriers to commercialization is essential because policymakers can use the results of this analysis to treat farmers more precisely to accelerate agricultural commercialization. The results showed that the barriers to agricultural commercialization were still high. This makes sense because Dieng is located far from the market in the highlands and has landed on a mountain with winding roads that discourage buyers from reaching it. In addition, the promo for products produced in the Dieng Plateau is also less exposed. Farmers in Dieng still have a very traditional culture of farming. Changes in farming methods are also challenging to implement. Even replacing intercropping has never been done. Farmers are reluctant to change crop types because they do not have good knowledge about the crop, and access to markets for other crops is also lacking. This condition also exacerbates the barriers to agricultural commercialization in the Dieng plateau.

7. LIMITATIONS AND FUTURE RESEARCH

This study's sample was limited to farmers with agricultural land and not farm laborers. This study does not analyze in more depth the production and transportation costs from the farmers' homes to the market and does not analyze how much the farmers receive from their production. So that it cannot be calculated how much profit or margin farmers can obtain from selling agricultural products. Thus, it can be used to determine the effectiveness of marketing that farmers have carried out with conventional sales models through intermediaries. For future research, it is better to carry out an in-depth exploratory study to explore the farmers' obstacles in commercialization.

Farmers with insufficient knowledge of technology need to be re-examined to determine which technologies they do not have. This technology includes knowledge of production processes, cultivation, and technology in the field of marketing. This in-depth exploratory research can provide more complete findings on the barriers to agricultural commercialization. So that the agricultural commercialization program, as many have suggested from the results of previous research, can be carried out correctly and increase farmers' income and improve welfare in farmer households. The role of this technology is also able to create effectiveness and efficiency in business processes and create jobs and new business opportunities. The role of digital literacy also needs to be analyzed further to find out the understanding of digital technology owned by farmers. This digital literacy can increase the knowledge and skills to use digital media, communication tools, or networks in finding, evaluating, using, creating information, and utilizing it in a healthy, wise, intelligent, and appropriate manner.

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