

Nutmeg and Farmers of Morella: Assessing Welfare Through the Lens of the Value Chain

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Abstract

Nutmeg farmers in Morella Village, Leihitu District, Central Maluku Regency, who cultivate nutmeg as their primary livelihood, continue to operate within a traditional system passed down through generations despite having a weak bargaining position in the market. This study examines the relationship between the value chain and the welfare of nutmeg farmers in Morella Village. This research was conducted in January 2025 in Morella Village, Leihitu District, Central Maluku Regency. Primary data were collected from a sample of 84 farmers and determined using the Slovin formula. Data were collected through structured interviews, using a research questionnaire. The collected data were analyzed using a quantitative approach with statistical analysis through Structural Equation Model-Partial Least Squares (SEM-PLS), aimed at conducting path analysis with latent variables. The results indicate that the value chain significantly influences the welfare of nutmeg farmers in Morella. This implies that improvements in the value chain can directly enhance farmers' income. By adopting good agricultural practices, improving market access, utilizing modern technology, and ensuring the availability of agricultural inputs, farmers can obtain greater value from their products. This study also shows that farmers with better access to market information and technology tend to have stronger bargaining positions, which ultimately leads to increased income and contributes to improved welfare.

Keywords:

Agriculture development,
Farmer welfare,
Morella village,
Nutmeg,
Value chain.

1. Introduction

Indonesia is an agrarian country with vast land area and diverse biodiversity. Given the growing population, the agricultural sector plays a significant role in both the economy and meeting the fundamental requirements of the community. The majority of the population now lives below the poverty line, therefore the agricultural sector also contributes to enhancing community welfare (Ngadi et al., 2023). The role of the plantation sub-sector in national development as one of the important sub-sectors in the agricultural sector has traditionally contributed to the Indonesian economy.

The province of Maluku has great potential in agriculture and plantations. Agriculture in Maluku produces vegetables, fruits, and medicinal plants. Maluku is one of the largest nutmeg producers in Indonesia after North Sulawesi, North Maluku, and Aceh (Direktorat Jenderal Perkebunan, 2024) and also produces cocoa, cloves, nutmeg, sago, coffee, and so on.

Based on the Badan Pusat Statistik Province of Maluku (2025), it is known that the largest area and production of nutmeg in Maluku Province is in Central Maluku Regency with an area of 12,559.84 hectares and a production of 2,295.45 tons, so it can be said that nutmeg is one of the leading commodities for the people of Central Maluku. Nutmeg, as the main plantation crop produced by farmers, is generally sold in various forms, ranging from seeds, full, and fruit pulp. Morella Village, as

one of the villages included in the administrative area of Central Maluku Regency, also contributes as a nutmeg-producing area.

Nutmeg, as one of the important plantation crops, has promising prospects for cultivation with high economic value in Morella. It also contributes to the provision of employment opportunities, which is an added value in rural and remote areas (Raihan et al., 2024). This role is strategically important as it can increase the income of the local community. The main actors in the nutmeg commodity value chain in Morella are farmers, traders, and the processing industry. The number of farmers is quite large and they are decisive in the continuity of supply and quality of nutmeg, but the weak capacity of farmers has made their position in the nutmeg trade chain very weak, resulting in low incomes for farmers. This situation is caused by at least three major obstacles in the nutmeg value chain in Morella Village, namely: (1) The absence of a nutmeg trading system results in uncertainty in prices and supply, and causes farmers to be heavily dependent on middlemen; (2) Farmers' capacity (in terms of good cultivation, business management, and institutional management) results in low continuity of nutmeg supply to traders and limited access to agricultural information and market sources; and (3) The lack of other supporting institutions results in weak capacity among the main actors in the nutmeg value chain.

Therefore, in order to truly improve farmers' welfare, the reform and strengthening of the nutmeg value chain must focus on increasing farmer capacity, developing processing technology, and expanding fair market access (Ijassi et al., 2025). Sustainable value chain development also includes the role of government policies and related institutions in creating a favorable environment for nutmeg farmers. Sustainable nutmeg production can be ensured through quality standardization, transparent trading mechanisms, and incentives for agricultural innovation (Satama-Bermeo et al., 2025). Improving the welfare of nutmeg farmers depends not only on production and marketing factors, but also on strengthening partnerships in the value chain, both between farmers and between farmers and other actors such as processors and exporters, thereby enabling knowledge transfer, access to technology, and a more equitable distribution of profits, thereby strengthening the bargaining position of nutmeg farmers in local and global markets (Bosompem et al., 2024).

The development of a nutmeg value chain based on increasing farmer capacity also opens up opportunities for product diversification and value addition, such as organic nutmeg products, which are increasingly in demand in the international market (Qu et al., 2023). This diversification is expected to increase the selling value of nutmeg and expand the market, so that farmers' incomes can also increase in line with product quality improvements. This step is a key strategy in strengthening the economic resilience of farmers during periods of global market uncertainty. Based on the above description, this study aims to analyze and understand the relationship between the value chain and the welfare of nutmeg farmers in Morella Village.

2. Method

This research was conducted in Morella Village, Leihitu District, Central Maluku Regency in January 2025. In this study, the researcher used quantitative research methods. As a scientific approach or because it satisfies scientific principles in a tangible or empirical, objective, quantifiable, logical, and methodical manner, quantitative research is based on the positivist philosophy (Sugiyono, 2017). The focus of quantitative research is on analyzing numerical data, or numbers, which are subsequently examined using the proper statistical techniques.

Populations and Samples

According to Sugiyono (2017), the population is the region of generalization made up of items or individuals with specific numbers and attributes chosen by the researcher to be examined before conclusions are made. The population in this study is all 541 nutmeg farmers in Morella Village.

A sample is a part of the population that has the same characteristics as the population (Sugiyono, 2017). The sample size was determined using a statistical calculation, namely the Slovin formula. This formula was used to determine the sample size from a known population of 541 nutmeg farmers. The precision level set in determining the sample was 10%. Therefore, 84 farmers were determined as the sample size based on the calculation results using the Slovin formula.

Data Collection

The data collection method in this study was to conduct direct interviews with the research subjects, namely nutmeg farmers in Morella Village. A questionnaire was employed as the data

collection tool. A questionnaire is a tool used to gather data in which participants are given a list of written statements or questions to complete.

Data Analysis

With the help of SmartPLS 4.0, which attempts to conduct path analysis with latent variables, this data will be examined quantitatively using statistical analysis, namely Structural Equation Model-Partial Least Squares (SEM-PLS). This analysis is often referred to as the second generation of multivariate analysis (Ghozali & Latari, 2015). This SEM model includes one exogenous latent variable and one endogenous latent variable.

Table 1
Operational definitions of variables and indicators

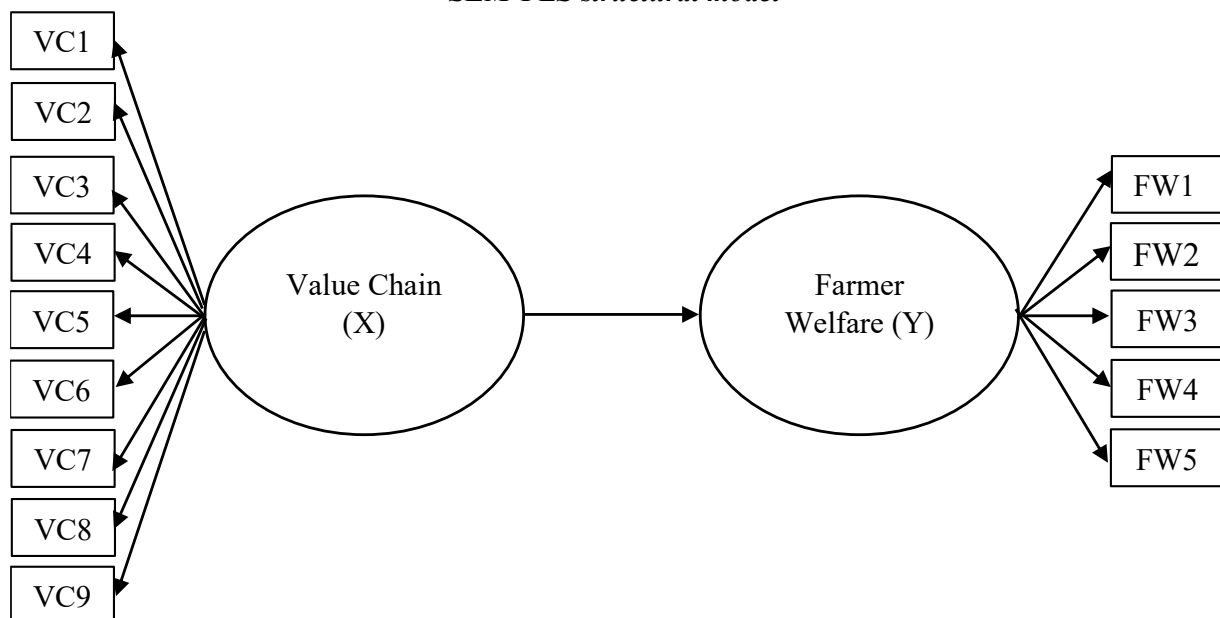
Variable	Definition	Indicators	Measurement Items
Value Chain (X) (Michael E. Porter, 2008)	The entire series of activities carried out by the main actors and supporters, ranging from cultivation, harvesting, post-harvesting, processing, to distribution and marketing of nutmeg in Morella Village.	Internal logistics	- Procurement efficiency - Inventory levels - Warehouse space utilization
		Operational	- Delivery time - Transportation costs - Level of damage to goods - Customer satisfaction
		External logistics	- Supply chain transparency - Partnerships - Logistics costs - Response to market demand
		Marketing and Sales	- Sales volume
		Service	- Response time - Problem resolution rate - Product return frequency
		Infrastructure	- Availability of access roads - Transportation - Market facilities
		Human resources	- Farming skills - Work experience - Involvement in farmer groups - Access to agricultural extension services - Farmers' level of education
		Technology	- Use of modern agricultural tools - Access to agricultural information - Post-harvest handling systems - Innovation in cultivation - Use of information technology
		Procurement	- Availability of quality seeds - Access to agricultural inputs
		Farmer Welfare (Y) (Fahrudin, 2019)	The level of fulfillment of the economic, social, and livelihood sustainability needs of nutmeg farmers in Morella Village as a result of their
Crop Productivity	- Harvest yield - Harvest frequency - Plant density		

Variable	Definition	Indicators	Measurement Items
	involvement in the nutmeg value chain.	Labor	- Average working hours
		Productivity	- Skill level - Worker health
		Working Age	- Productive Age - Youth Engagement
		Access to Services	- Easy access for farmers to services such as education and health care

Source: Developed by the author

Table 1 outlines the detailed measurement of variable indicators. Indicators for variables can be measured using a Likert scale. Measurements use a Likert scale with response scores from 1 to 5 (Ruaa Al Juboori, et al., 2025). The scores are processed into composite scores according to the predetermined method (Nabila et al., 2023). This study consists of a value chain with 9 indicators and farmer welfare with 5 indicators (Figure 1).

Figure 1
SEM-PLS structural model



Source: Developed by the author

3. Results and Discussion

3.1 Results

Respondent Characteristics

Based on interviews and questionnaires distributed, data was obtained on the characteristics of nutmeg farmer respondents, grouped according to age, education level, number of dependents, harvest yield, and income. The characteristics of the 84 nutmeg farmer respondents can be described as follows.

Table 2
Characteristics of Nutmeg Farmer Respondents in Morella Village

Respondent Characteristics	Frequency	Percentage %
Grouped according to age (Year)		
Generation Alpha (1 – 15)	0	0
Generation Z (16 – 30)	0	0
Generation Y / Milenial (31 – 45)	19	22.62
Generation X (46 – 60)	40	47.62
Baby Boomers (61 – 79)	23	27.38
The Builders (> 79)	2	2.38

Respondent Characteristics	Frequency	Percentage %
Education level		
Not Attending School	10	11.90
Elementary School	11	13.10
Junior High School	12	14.29
Senior High School	41	48.81
Bachelor	10	11.90
Number of dependents (Persons)		
1	0	0
2	5	5.95
3	7	8.33
4	17	20.24
5	17	20.24
6	21	25
7	10	11.90
8	7	8.33
Harvest yield (Kg/Ha/Year)		
150 – 172	7	8.33
173 – 195	14	16.67
196 – 218	37	44.05
219 – 241	25	29.76
242 – 264	1	1.19
Income (Rp/Ha/Year)		
49.500.000 – 56.760.000	7	8.33
56.760.001 – 64.020.001	14	16.67
64.020.002 – 71.280.002	37	44.05
71.280.003 – 78.540.003	25	29.76
78.540.004 – 85.800.004	1	1.19

Source: processed primary data, 2025

Generation X (aged 46–60 years), which dominates the data with 47.62% of the largest group of respondents from nutmeg farmers in Morella Village. This generation is known for being adaptive, flexible in the face of change, and open to the use of modern technology. The influence of this generation is very important in agricultural performance because they tend to combine traditional experience with new innovations (Novisma & Iskandar, 2023).

The majority of respondents have completed high school/equivalent education, namely 41 people (48.81%). This composition shows the same condition as the average highest education of residents aged 15 years and above according to *Badan Pusat Statistik Maluku* (2025), where the highest diploma of Maluku Province residents is high school/vocational school equivalent at 36.43%. Higher educated farmers typically possess superior cognitive abilities, which allow them to manage their farms more rationally. The development of technology in agriculture also requires skills in applying this technology (Mariyono et al., 2021).

The majority of nutmeg farmers, namely 21 farmers (25%) in Morella Village, have 6 family members (including themselves) to support. The more dependents a family has, the greater the impact on the family's expenditure. It is possible that with more dependents, the amount of money allocated to each child will decrease if it is not accompanied by sufficient income. In addition, the number of dependents can be a reason for someone to work. For example, a worker who has dependents will be more motivated because he realizes that it is not only he who will enjoy the results, but there are other people who are waiting for his hard work and who are his responsibility (Fikire & Zegeye, 2022).

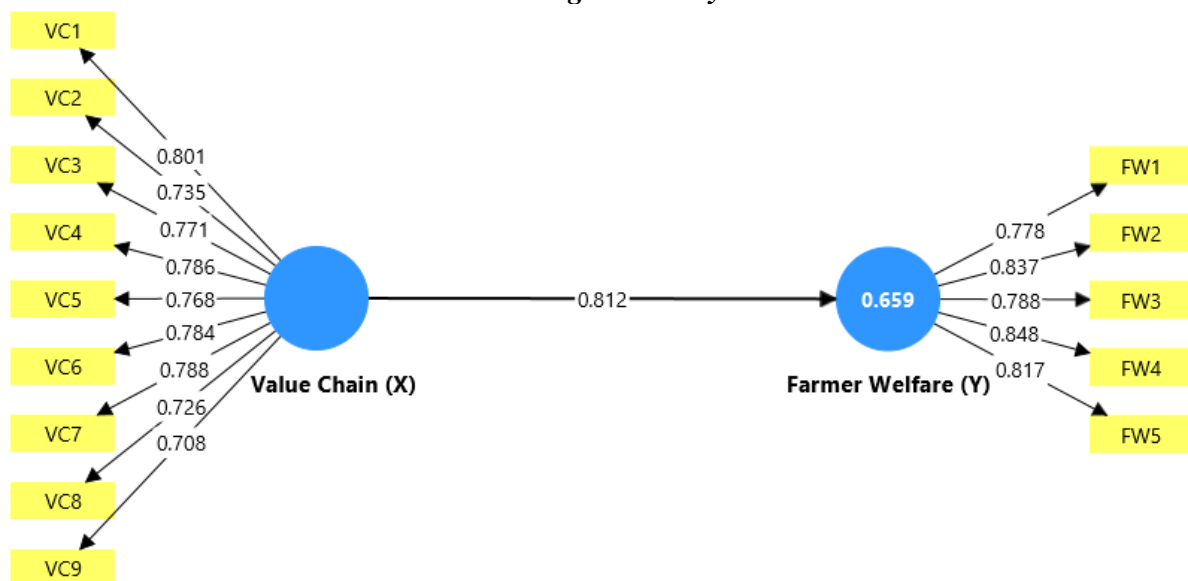
The majority of farmers (44.05%) produce between 196 and 218 kg/ha of nutmeg. When compared to the number of nutmeg production and harvest according to *Badan Pusat Statistik Maluku* (2025) and *Direktorat Jenderal Perkebunan* (2025), in Central Maluku Regency it is 183 kg/ha, in Maluku Province it is 157 kg/ha, while nationally, nutmeg production is 142 kg/ha. This indicates that most farmers have a fairly good harvest yield, which can positively contribute to their welfare (Ricciardi et al., 2021).

The majority of farmer respondents had an annual income from nutmeg harvests of between Rp.64,020,002 and Rp.71,280,002, totaling 37 people (44.05%). This percentage reinforces the position of nutmeg as a reliable commodity that can improve farmers' living standards, although it should be noted that variations in spending patterns and the specific needs of each family can affect the actual level of adequacy in Morella Village (Agbenyo et al., 2022).

Measurement Model Evaluation (Outer Model)

The measurement model, also known as the outer model, describes how observable variables, or manifest variables, are related to latent variables for measurement purposes (Hair et al., 2020). Convergent validity, discriminant validity, and reliability tests were among the tests used in this work to assess the measurement model. Convergent validity measures how much the indicators of latent variables share variance with each other, usually indicated by factor loadings. To evaluate discriminant validity, which tests how different a construct is from other constructs using cross loading values, Fornell-Larcker criteria, and Average Variance Extracted (AVE). In the meanwhile, reliability tests use Cronbach's alpha and composite reliability values to assess how well a measurement tool can be relied upon to measure a construct.

Figure 2
Convergent Validity



Source: Primary data processed by SmartPLS, 2025

Table 3
Loading Factor and AVE Value

Latent Variable	Indicators	Farmer Welfare (Y)	Value Chain (X)	AVE	Description
Farmer Welfare	(FW1) Income	0.778		0.663	Valid
	(FW2) Crop Productivity	0.837			
	(FW3) Labor Productivity	0.788			
	(FW4) Working Age	0.848			

	(FW5) Access to Services	0.817		
	(VC1) Internal logistics	0.801		
	(VC2) Operational	0.735		
	(VC3) External logistics	0.771		
	(VC4) Marketing and Sales	0.786		
Value Chain	(VC5) Service	0.768	0.583	Valid
	(VC6) Infrastructure	0.784		
	(VC7) Human resources	0.788		
	(VC8) Technology	0.726		
	(VC9) Procurement	0.708		

Source: Primary data processed by SmartPLS, 2025

The convergent validity of measurement models employing reflecting indicators can be assessed by looking at the association between item scores or construction indicators. The indicator is deemed legitimate if the factor loading value exceeds 0.70 (Kephart et al., 2018). Because each construct's AVE (Average Variance Extracted) value is higher than 0.50, the model satisfies the criterion for convergent validity (Cheung et al., 2023). In other words, each construct is well represented by the indicators used collectively to measure it.

Table 4
Cross Loading

	Farmer Welfare (Y)	Value Chain (X)
FW1	0.778	0.661
FW2	0.837	0.671
FW3	0.788	0.596
FW4	0.848	0.698
FW5	0.817	0.671
VC1	0.552	0.801
VC2	0.644	0.735
VC3	0.645	0.771
VC4	0.701	0.786
VC5	0.545	0.768
VC6	0.684	0.784
VC7	0.612	0.788
VC8	0.508	0.726
VC9	0.631	0.708

Source: Primary data processed by SmartPLS, 2025

The cross-loading results show > 0.70 for all indicators, demonstrating that the measurement model has successfully satisfied the requirements for discriminant validity. Each variable must have a cross-loading value above 0.70 to meet the discriminant validity criteria (Hair et al., 2021).

Table 5
Fornell-Larcker

	Farmer Welfare (Y)	Value Chain (X)
Farmer Welfare (Y)	0.814	
Value Chain (X)	0.812	0.764

Source: Primary data processed by SmartPLS, 2025

The AVE square root value for each construct must be higher than that of other constructs (Fornell & Larcker, 1981). Thus, it can be said that each construct has discriminant validity.

Table 6
Reliability Test

	Cronbach's alpha	Composite reliability (rho_c)
Farmer Welfare (Y)	0.872	0.907
Value Chain (X)	0.911	0.926

Source: Primary data processed by SmartPLS, 2025

Based on Table 6, The composite reliability and Cronbach's alpha are both greater than 0.70 (Barati et al., 2019). This indicates that the constructs in this study have met the requirements for high reliability. In other words, the same concept is consistently measured with the indicators used in each construct, and the measurement results can be trusted for further analysis.

Structural Model Evaluation (Inner Model)

The structural model (inner model) evaluation is assessed as the next stage in analyzing PLS-SEM findings after the measurement model (outer model) has produced satisfactory results. To find evidence that the theoretical model is valid, the structural model uses multicollinearity tests, R-Square, F-Square, and goodness of fit tests (Hair et al., 2019).

Table 7
Multicollinearity Test

	VIF	Description
FW1	1.856	Strong
FW2	2.243	Strong
FW3	1.981	Strong
FW4	2.241	Strong
FW5	2.219	Strong
VC1	2.778	Strong
VC2	2.717	Strong
VC3	2.357	Strong
VC4	2.449	Strong
VC5	2.609	Strong
VC6	2.232	Strong
VC7	3.239	Strong
VC8	2.810	Strong
VC9	1.760	Strong

Source: Primary data processed by SmartPLS, 2025

Every variable indicator's VIF value is less than 5, as Table 7 demonstrates, indicating no collinearity between the measured variables (Gwelo, 2019). Thus, this research model is free from multicollinearity issues. Therefore, parameter estimates and relationships between variables can be accepted for further analysis because the research model has met the criteria for freedom from multicollinearity.

Table 8
R-Square

	R-square
Farmer Welfare (Y)	0.659

Source: Primary data processed by SmartPLS, 2025

The R-Square criteria, according to Chin (1998), are divided into three categories: strong, moderate, and weak, based on R-Square values of 0.67, 0.33, and 0.19, respectively. To determine whether there is a significant impact of exogenous latent factors on endogenous latent variables, changes in R-Square values are used. Exogenous latent variables in the form of value chains contribute 65.9% to farmer welfare, according to the findings in Table 8.

Table 9
F-Square

	f-square
Value Chain (X) -> Farmer Welfare (Y)	1.931

Source: Primary data processed by SmartPLS, 2025

Values of 0.02, 0.15, and 0.35 are typically used to assess f-square values as measures of small, medium, and large effects. Additionally, if the effect size value is less than 0.02, the variable is considered to have no effect (Hair et al., 2021). Therefore, a value of 1.931 means that the effect of the value chain variable (X) on the farmer welfare variable (Y) is in the large category.

Table 10
Goodness of Fit

Average communalities index	Average R-Square	Index GoF
0.623	0.659	0.641

Source: Primary data processed by SmartPLS, 2025

The data shows that the average communalities index is 0.623, the average R-square is 0.659, and the Goodness of Fit (GoF) value is 0.641. GoF is determined by taking the square root of the product of the average R-Square and the average communalities index, because communalities are obtained from the square of the loading factor value. According to Wetzal et al. (2018), A strong model fit is indicated by a GoF value of 0.36, whereas a low fit is indicated by a value of 0.1. The model goodness-of-fit test yielded a result of 64.1%, which is above the established benchmark, indicating that the research model is suitable for application.

Table 11
Hypothesis Testing

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics ((O/STDEV))	P values
Value Chain (X) -> Farmer Welfare (Y)	0.812	0.820	0.034	23.605	0.000

Source: Primary data processed by SmartPLS, 2025

The purpose of hypothesis testing in this study is to determine whether the suggested hypothesis has a noteworthy impact. The t-statistic value must be higher than the t-table value (1.96), and the p-values must be less than 5% at a 95% confidence level, in order to determine the significance level of the influence of the association between variables. If the p-value is less than 0.05 and the t-statistic value is more than 1.96, the hypothesis is considered significant or accepted. Nonetheless, the hypothesis is deemed insignificant or rejected if the p-value is greater than 0.05 and the t-statistic value is less than 1.96. The results of the hypothesis test of the value chain (X) on farmer welfare (Y) produced a value that was in accordance with the benchmark, indicating that there was a significant effect of the value chain (X) on farmer welfare (Y), so the hypothesis was accepted.

3.2 Discussion

According to the results of the Structural Equation Modeling-Partial Least Square (SEM-PLS) analysis, the wellbeing of nutmeg farmers in Morella Village, Central Maluku Regency, is positively and significantly impacted by the value chain variable. This is indicated by high path coefficient values and a strong level of statistical significance. The value chain, which consists of various main and supporting activities such as internal and external logistics, operations, marketing, services, infrastructure, human resources, technology, and procurement, forms a systematic framework that can improve the effectiveness and efficiency of the production and marketing processes for nutmeg commodities. Optimizing the value chain strengthens farmers' bargaining position, reduces production and distribution costs, and expands market access, ultimately increasing their income and welfare.

The findings of Wardah et al. (2024) are consistent with the results of this investigation, which show that an increase in added value and market control by farmers has a positive impact on the farmers'

income. Better income also increases farmers' financial capacity to reinvest in their farming businesses, which in turn can increase productivity and the sustainability of agricultural businesses. Therefore, interventions that can increase farmers' income are a major focus in the development of sustainable agribusiness.

In its implementation, efficient internal and external logistics can reduce production costs and facilitate the distribution of crops, while well-organized marketing and sales expand market access and maintain price stability. Adequate infrastructure and strengthening human resource capacity through training and access to technology also contribute to increasing productivity and innovation in farming businesses. By building and optimizing the value chain as a whole, nutmeg farmers in Morella Village can increase their income, improve their socio-economic welfare, and respond to market dynamics in a more adaptive and competitive manner (Jannah & Hasyiyati, 2024).

4. Conclusion

Based on the results of data analysis and discussion conducted on the impact of the value chain on the welfare of nutmeg farmers in Morella Village with a research sample of 84 respondents and data analysis tools using Structural Equation Modeling-Partial Least Square (SEM-PLS), it can be concluded that the value chain has a significant effect on farmer welfare.

Considering the importance of the value chain in improving the welfare of nutmeg farmers in Morella Village, several strategic steps need to be taken, such as encouraging the adoption of modern technology through regular training. A transparent market information system will help farmers make better decisions regarding sales. In addition, access to financial institutions must be facilitated to support business capital, and diversified marketing channels need to be developed so that farmers can obtain better prices. Institutional strengthening through farmer organizations is also important to strengthen bargaining power and collaboration throughout the value chain. With these steps, it is hoped that farmers' welfare will increase significantly.

Research Limitations. This study has several limitations that should be acknowledged. First, the sample was limited to nutmeg farmers in Morella Village, which may limit the generalizability of findings to other nutmeg-producing regions or different agricultural contexts. Second, the cross-sectional design of this study captures data at a single point in time, precluding the ability to establish causal relationships or observe changes in farmer welfare over time. Third, the reliance on self-reported data from farmers may introduce response bias or social desirability effects. Finally, while the SEM-PLS model explains 65.9% of the variance in farmer welfare, other potentially important factors not included in the model (such as climate conditions, government policies, or market volatility) may also influence farmer welfare outcomes.

Future Research Directions. Future research should address these limitations and extend this work in several directions. Longitudinal studies tracking farmer welfare over multiple harvest seasons would provide valuable insights into the temporal dynamics of value chain impacts and allow for stronger causal inferences. Expanding the geographical scope to include nutmeg farmers from other districts in Maluku Tengah or other provinces would enhance the generalizability of findings and enable comparative analyses across different production contexts. Additionally, mixed-methods approaches incorporating qualitative interviews could provide deeper understanding of the mechanisms through which value chain participation influences farmer welfare and capture farmer perspectives that quantitative measures may miss. Future studies might also examine the moderating effects of external factors such as climate change, price fluctuations, and policy interventions on the value chain-welfare relationship. Finally, comparative research examining value chains across different agricultural commodities would contribute to a broader theoretical understanding of agricultural development and farmer welfare.

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