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FACTORS AFFECTING THE SUCCESS OF INCLUSIVE BUSINESSES OF CASSAVA FARMER IN SUPPORTING FOOD SECURITY AND FARMER WELFARE

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Abstract. The inclusive business model involves farmers in the cassava value chain, thereby providing them with market opportunities. The success of inclusive business is expected to increase food security and balance village development, which will have a major impact on efforts to improve cassava farmers' welfare. The objectives of this research are to analyze the factors that influence the success of inclusive businesses for cassava farmers. The research method used is a quantitative method. Primary data were obtained through structured interviews using questionnaires given to 120 respondents, whereas secondary data were obtained from relevant literature studies. The data obtained will be analyzed based on its objectives, SEM analysis. The results show that the factor that most indirectly influences inclusive business is farmers' motivation to adopt innovation and technology. Meanwhile, the variables that have a direct influence are the adoption of technological innovation, partnerships, financial access, and the role of the government.

Keywords: inclusive business, value chain, cassava, SEM

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INTRODUCTION

Cassava (*Manihot esculenta*) is a vital agricultural commodity that plays an important role in supporting Indonesia's food security and self-sufficiency. It is considered a strategic national commodity, serving as food, animal feed, and biofuel. Cassava has been positioned as a priority within the National Medium-Term Development Plan (RPJMN), particularly through initiatives such as the Triple Export Movement (Gratieks) and the food estate program. These initiatives offer farmers promising opportunities to further develop and scale up their cassava farming businesses.

In 2022, Indonesia was the fifth-largest producer of cassava in the world, followed by Nigeria, the Republic of the Congo, Thailand, and Ghana (FAO, 2022). Indonesia produces approximately 19 million tons of cassava annually, generating an estimated revenue of IDR 20 trillion per year. From 2000 to 2020, the harvested area for cassava declined at an average rate of 9.4% per year, while productivity showed a positive trend, increasing by 3.23% annually. In parallel, the volume and value of cassava exports experienced substantial growth, averaging 72.63% and 89.89% per year, respectively

(BPS, 2020). On the consumption side, per capita monthly cassava consumption rose by 0.22 kg. This rise in productivity is strategically targeted at bolstering national food security. Additionally, from 2000 to 2020, both farm-gate price and domestic demand for cassava increased at average annual growth rates of 13.08% and 9.8%, respectively.

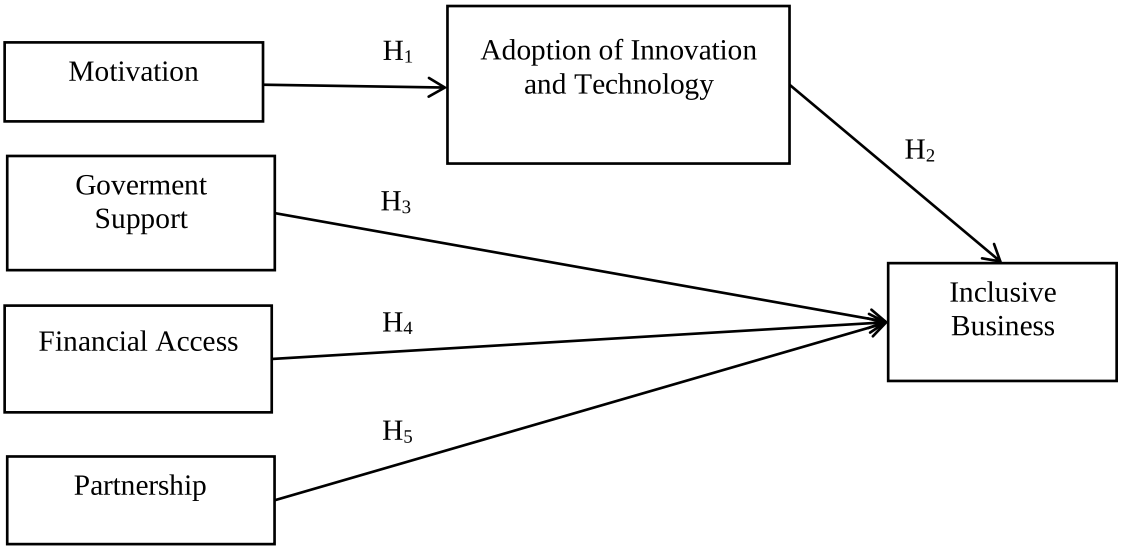
Given the data above, there is a need for an approach that promotes greater inclusion of smallholder farmers in the agricultural value chain through inclusive business models. The success of inclusive cassava businesses can significantly contribute to strengthening food security and promoting balanced rural development, ultimately improving cassava farmers' livelihoods. Inclusive business models are designed to enable smallholder farmers to actively participate in the value chain. Such participation supports farmers in increasing their income, improving access to technology, and gaining better market access, all of which contribute to enhancing their overall welfare.

Inclusive business models have a positive impact on sustainable farming performance and farmers' involvement in the value chain (de Boer et al., 2019). Several factors are considered influential in inclusive business, including capital, finance, knowledge, skills, social capital, and broad market access (Horton et al., 2016). Farmers' responses to new knowledge and innovations adopted in managing their farms vary depending on the type of adjustment required, which in turn can enhance their inclusivity (Kelly et al., 2015; FAO, 2022; Ros-Tonen et al., 2019; Saptana et al., 2024). Furthermore, the integration of organizational structures can help mitigate risks, which aligns with findings by Bijman & Wijers, (2019), Permatasari (2018), and Chamberlain & Anseeuw (2019) emphasize that inclusive models embedded in cooperatives foster strong, mutually beneficial partnerships. Based on the data and literature reviewed, the objective of this study is to analyze the factors that influence the success of inclusive business models among cassava farmers.

METHOD

This research employs a quantitative method. Respondents were selected using a purposive sampling technique based on specific predetermined criteria. The sample size was determined in accordance with the recommendation by Hair et al. (2019) suggesting that the minimum sample size for PLS-SEM estimation should be 5 to 10 times the maximum number of variables. Based on the number of variable indicators analyzed in this study, a minimum sample size of 120 respondents is obtained.

The data collected for this study consist of both primary and secondary data. Primary data were collected through questionnaires and subsequently analyzed in detail to obtain comprehensive results. The validity and reliability of the research questionnaire was tested to ensure the accuracy and consistency of the collected data. Validity was assessed based on the significance level of the correlation between each item's score and the total score. An item was considered valid if the level of significance was 0.05 and invalid otherwise (Ghozali & Latan, 2015). Reliability was measured using Cronbach's Alpha (α), where a variable is deemed reliable if the Cronbach's Alpha value exceeds 0.60. If the value is below 0.60, the data are considered unreliable (Ghozali, 2018). Secondary data were obtained through literature reviews of scholarly publications, books, documents, and other sources relevant to this research. Based on the study objectives, five research hypotheses are proposed as follows:

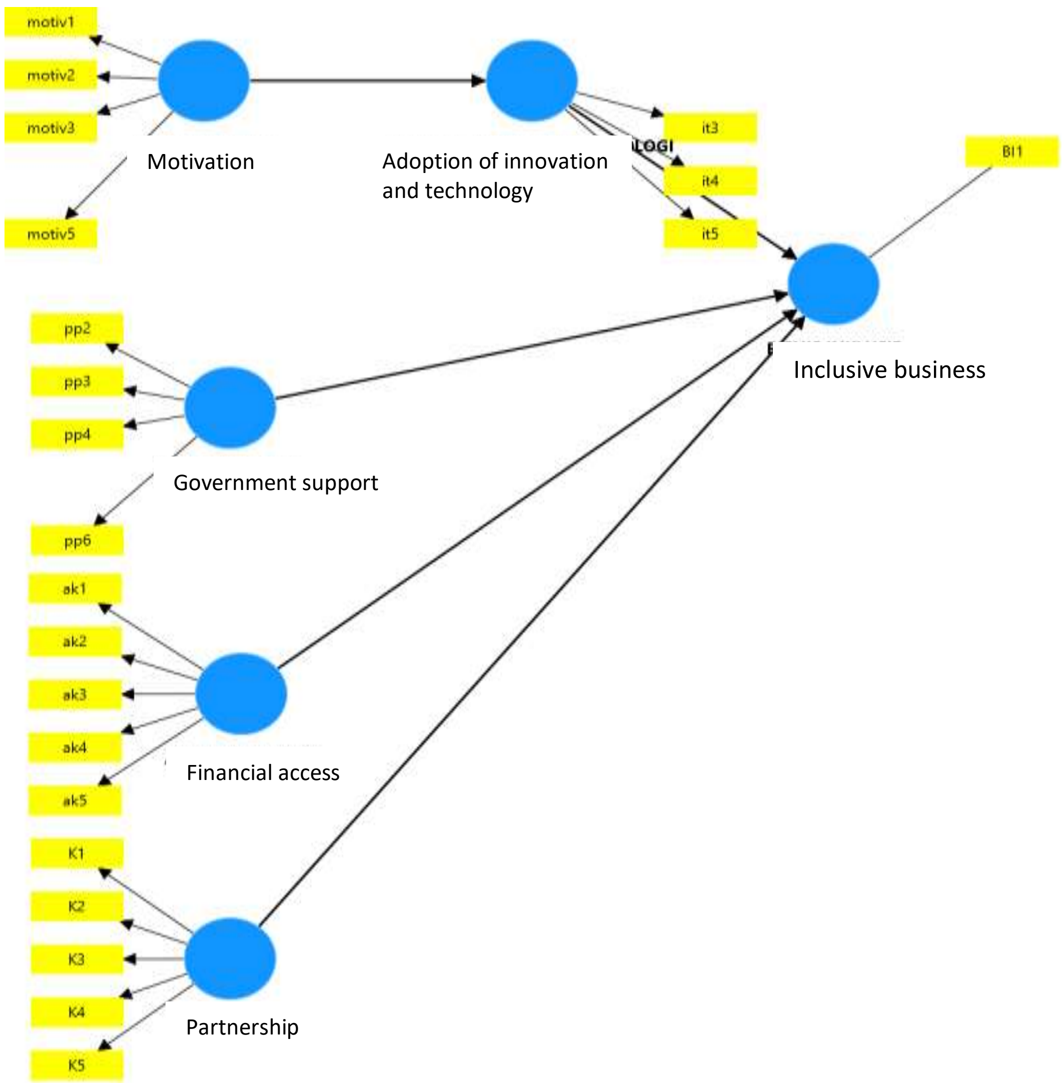


Source: Data Processed, 2024

Figure 1. Research Model

The following are the hypotheses in this study:
(H1) Farmers’ motivation positively affects innovation and technology,
(H2) Innovation and technology adoption positively affect inclusive businesses.
(H3) Government support positively affects inclusive businesses.
(H4) Financial access positively affects inclusive businesses.
(H5) Partnerships positively affect inclusive agribusiness.

The data were analyzed using the partial least squares structural equation modeling (PLS-SEM) approach, focusing on the indicators that define each variable. This model was structurally developed to understand the relationships between variables and serves a predictive purpose. Figure 2 illustrates the relationships between the variables and their indicators in the PLS model.



Source: Data Processed, 2024

Figure 2. The PLS-SEM research model

The criteria in analyzing SEM-PLS through the outer model involve assessing the model's validity and reliability using convergent validity, discriminant validity, composite reliability, and Cronbach's alpha. Convergent validity in PLS-SEM is evaluated through loading factors, with values above 0.70 indicating a strong statistical relationship between the indicators and latent variables, thus reflecting high validity (Ghozali & Latan, 2015). Discriminant validity ensures that each latent construct is distinct from others, assessed by comparing the square root of the Average Variance Extracted (AVE) of each construct with its correlations with other constructs. Composite reliability and Cronbach's alpha are used to assess model reliability, with values above 0.70 indicating acceptable and optimal levels of reliability (Hair et al., 2019).

The next step in structural measurement involves evaluating the paths or relationships between variables in the SEM analysis. This analysis was used to test the significance and predictive power of the model in relation to the proposed hypotheses. The coefficient of determination (R^2) and path coefficients (t-values) were assessed for each path to determine the significance of the hypothesized relationships. Subsequently, model validity was evaluated using the goodness of fit (GOF), indicated by the standardized root mean square residual (SRMR), with a threshold of 0.08, and the normed fit index (NFI), with a cutoff value of 0.90. These values indicate the adequacy of the model in fitting the observed data.

RESULT AND DISCUSSION

The validity and reliability of each latent indicator—covering farmer motivation, adoption of innovation and technology, government role, financial access, partnership systems and certification, and inclusivity—were tested using SmartPLS 3 software. In the model parameter estimation process, the PLS-SEM algorithm was employed to identify the relationships among latent variables. This algorithm effectively processes the data to estimate path coefficients, assess the strength and direction of the relationships between variables, and evaluate the constructs' validity and reliability.

Evaluation of the Outer Model by Testing Reliability

This study's measurement model consists of a reflective measurement model, where the variables of farmer motivation, government role, financial access, partnership, and inclusive business are measured reflectively. The measurement model evaluation involves assessing data validity through convergent validity. Convergent validity is measured using the Average Variance Extracted (AVE) statistic, as presented in Table 1. Hair et al. (2019) state that the evaluation of a reflective measurement model consists of a loading factor greater than 0.7, composite reliability exceeding 0.7, and Cronbach's Alpha above 0.7. Convergent validity is indicated by an AVE value greater than 0.5.

Table 1. Outer loading, composite reliability, and AVE

Variable	Measurement Item	Outer Loading	Cronbach's Alpha	Composite Reliability	(AVE)
Inclusive Business	BI1	1.000	0.809	0.822	0.839
Partnership	K1	0.850	0.886	0.916	0.685
	K2	0.800			
	K3	0.783			
	K4	0.790			
The adoption of innovation and technology	It3	0.822	0.770	0.853	0.743
	It5	0.901			
Financial Access	AK 2	0.918	0.890	0.925	0.804
	AK 3	0.904			
	AK 5	0.867			
Government Support	Pp2	0.804	0.894	0.898	0.691
	Pp3	0.725			
	Pp4	0.950			
	Pp6	0.829			
Motivation	Motiv1	0.829	0.852	0.898	0.691
	Motiv2	0.718			
	Motiv3	0.931			
	Motiv5	0.768			

Source: Data Processed, 2024

The next step in evaluating the measurement model is to assess data validity and reliability through discriminant validity composite reliability, respectively. Discriminant validity is conducted to ensure that each latent variable construct is distinct from other variables. This value can be observed through cross loadings, which serve to determine whether the construct possesses adequate discriminant validity by comparing the loading values. The loading on the intended construct must be higher than that on other constructs.

The cross-loading method involves assessing the correlation between variables and comparing them with other variables. This comparison can be visualized through the output of cross loading values generated by the PLS algorithm, as presented in Table 2.

Table 2. Cross-Loading Discriminant

	Adoption of innovation and technology	Financial Access	Inclusive Business	Partnership	Motivation	Goverment Support
BI1	0.112	-0.242	1.000	0.285	0.106	0.103
K1	0.264	0.178	0.296	0.850	-0.004	0.250
K2	0.142	-0.125	0.208	0.800	0.063	0.154
K3	0.483	0.183	0.225	0.783	0.232	0.476
K4	0.198	-0.085	0.141	0.790	0.089	0.184
K5	0.251	-0.106	0.260	0.909	0.162	0.456
ak2	0.316	0.918	-0.290	-0.005	-0.039	0.178
ak3	0.457	0.904	-0.140	0.040	0.011	0.375
ak5	0.483	0.867	-0.155	0.074	0.009	0.265
it3	0.822	0.413	-0.029	0.001	0.373	0.303
it5	0.901	0.352	0.194	0.502	0.433	0.351
motiv1	0.406	0.079	0.101	-0.065	0.716	0.128
motiv2	0.153	-0.171	0.068	0.284	0.718	0.083
motiv3	0.539	0.053	0.044	0.148	0.931	0.295
motiv5	0.177	-0.293	0.222	0.225	0.768	0.162
pp2	0.270	0.316	0.053	0.217	0.110	0.804
pp3	0.348	0.532	-0.026	0.113	0.244	0.725
pp4	0.383	0.230	0.106	0.406	0.239	0.950
pp6	0.354	0.384	0.045	0.219	0.286	0.829

Source: Data Processed, 2024

Table 2 shows that all measurement items for each variable exhibit high correlation with their respective constructs and weak correlations with other variables. Therefore, it can be concluded that the overall discriminant validity based on cross loadings is satisfied.

The next assessment can be conducted by comparing the correlation values between variables with the square root (√) of the AVE values for each variable. The results of this comparison are presented in the Fornell-Larcker Criterion output, as shown in Table 3.

Table 3. Discriminant values based on fornell-larcker validity

	Adoption of Innovation and Technology	Financial Access	Inclusive Business	Partner-ship	Motivation	Govern-ment Support
Adoption of Innovation and Technology	0.813					
Financial Access	0.375	0.843				
Inclusive Business	0.168	-0.225	1.000			
Partnership	0.382	0.049	0.285	0.828		
Motivation	0.426	0.017	0.113	0.136	0.821	
Goverment Support	0.418	0.290	0.103	0.380	0.228	0.831

Source: Data Processed, 2024

The evaluation of discriminant validity based on the Fornell-Larcker criterion requires that the square root of the AVE for each variable is greater than the correlations between that variable and other variables. Based on Table 3, it is shown that the variables of innovation and technology adoption, access to finance, partnership, motivation, and the role of government all demonstrate satisfactory discriminant validity according to the Fornell-Larcker criterion. This analysis concludes that the data in this model are valid and meet the necessary criteria for further testing in the subsequent analysis stages.

Hair et al. (2019) recommend the use of HTMT (Heterotrait–Monotrait Ratio of Correlations) as this measure of discriminant validity is more sensitive and accurate in detecting discriminant validity. The recommended threshold value is below 0.90. The HTMT values in this study are presented in Table 4. The test results show that the HTMT values for all pairs of variables are below 0.90, indicating that discriminant validity is achieved.

Table 4. Discriminant of HTMT

	Adoption of Innovation and Technology	Financial Access	Inclusive Business	Partner-ship	Motivation	Govern-ment Support
Adoption of Innovation and Technology						
Financial Access	0.616					
Inclusive Business	0.159	0.228				
Partnership	0.467	0.183	0.289			
Motivation	0.505	0.212	0.142	0.290		
Goverment Support	0.514	0.510	0.070	0.314	0.248	

Source: Data Processed, 2024

Evaluation of the model fit

PLS is a variance-based SEM analysis aimed at testing theoretical models with a strong emphasis on prediction studies. Therefore, several measures have been developed to indicate the acceptability of the proposed model, such as R-squared and SRMR (Hair, Risher, et al., 2019). The model fit evaluation in this study is presented in Table 5 and Table 6.

Table 5. R-Square value

	R-Square	Adjusted R-Square
Adoption of Innovation and Technology	0.182	0.163
Inklusive Business	0.168	0.087

Source: Data Processed, 2024

The R-squared statistical measure reflects the extent to which the variation in an endogenous variable can be explained by other exogenous variables in the model. According to Chin (1998), the qualitative interpretation of R-squared values is as follows: 0.19 indicates a weak effect, 0.33 indicates a moderate effect, and 0.66 indicates a strong effect. Based on Table 5, it can be seen that the combined influence of motivation on innovation and technology adoption is 18.2%, indicating a weak effect. Similarly, the combined influence of motivation and innovation and technology adoption on inclusive business amounts to 16.8%.

SRMR (Standardized Root Mean Square Residual) is a value that indicates the model fit, representing the difference between the empirical correlation matrix and the model's estimated correlation matrix (Yamin, 2023). According to Hair et al., (2019), an SRMR value below 0.08 indicates a good model fit. Based on Table 6, the model estimation result shows an SRMR value of 0.105, which suggests that the model achieves an acceptable fit. This indicates that the empirical data can adequately explain the relationships among the variables within the model.

Table 6. SRMR value

	Estimated Model
Srmr	0.105
d_Uls	7.790
d_G	2.546
Chi-Square	489.665
Nfi	0.491

Source: Data Processed, 2024

Subsequently, the evaluation of the structural model focuses on testing the hypothesized relationships between variables. This evaluation is conducted in three stages, with the first stage involving the assessment of multicollinearity among variables through the Inner VIF (Variance Inflation Factor). An Inner VIF value below 5 indicates that there is no multicollinearity among the variables (Table 7).

Multicollinearity Test

Prior to testing the hypotheses of the structural model, it is essential to assess whether multicollinearity exists among the variables, using the inner VIF statistical measure. The estimation results presented in Table 7 indicate that all VIF values are below 5, suggesting a low level of multicollinearity among the variables. This finding supports the robustness of the parameter estimates (unbias) within the PLS-SEM framework.

Table 7. Colinearity inner model

	Inovation and Technology Adoption	Access to Finance	Inclusive Business	Partner-ship	Motivation	Governnent Support
Inovation and Technology Adoption			1.455			
Access to Finance			1.224			
Inclusive Business						
Partnership			1.290			
Motivation	1.000					
Governnent Support			1.353			

Source: Data Processed, 2024

Hypothesis Testing

Hypothesis testing between variables is conducted by examining the t-statistic value or the p-value. If the calculated t-statistic exceeds 1.96 (the critical value of the t-distribution) or if the p-value is less than 0.05, it indicates a significant relationship between the variables. In addition, it is important to provide a 95% confidence interval for the estimated path coefficients (Table 6). The third step evaluates the F-square value, which measures the direct effect of independent variables at the structural level (Hair et al., 2021) using the following criteria:

Value of F-square = 0.02 means low

Value of F-square = 0.15 means moderate

Value of F-square = 0.35 means high.

Direct Hypothesis Testing

The direct hypothesis testing aims to examine the relationships between innovation and technology adoption, access to finance, partnerships, farmers' motivation, and the role of government in influencing inclusive business. The results of this analysis are presented in Table 8. Based on the hypothesis results presented in Table 8, the following findings are obtained:

Table 8. Direct effect hypothesis testing

Testing	Path Coeffi-cient	P-Value	95% Confidence Interval		F^2	Hypothesis
			Lower Limit	Upper Limit		
Motivation -> Inovation and Technology Adoption	0.426	0.000	0.208	0.679	0.222	significant
Inovation and Technology Adoption -> Inclusive Business	0.190	0.000	-0.193	0.480	0.030	significant
Government Support-> Inclusive Business	0.034	0.000	-0.293	0.300	0.001	significant
Financial Access -> Inclusive Business	-0.316	0.000	-0.564	0.328	0.098	significant
Partnership -> Inclusive Business	0.216	0.000	-0.147	0.491	0.043	significant

Source: Data Processed, 2024

First Hypothesis (H1): Farmer motivation has a positive influence on innovation and technology

The first hypothesis (H1) is accepted, indicating a significant influence of farmer motivation on technology adoption. This means that any change in farmer motivation will increase the adoption of technology. Within the 95% confidence interval, the magnitude of the influence of motivation on technology adoption ranges between 0.208 and 0.679. Nevertheless, the effect of motivation on the adoption of innovation and technology is substantial. Farmer motivation relates to how they are driven to act or undertake certain actions. Therefore, the presence of farmer motivation will influence the business models they practice. The willingness of farmers to adopt innovation and technology will certainly encourage the development of their farming activities. Understanding farmers' attitudes and willingness, particularly in relation to perceived benefits, is crucial in agricultural practice, as farmers are more likely to adopt and follow practices that are considered profitable (AE et al., 2017). The motivation that needs to be enhanced in the adoption of innovation and technology among cassava farmers is the timely and appropriate use of fertilizers. The majority of farmers have not yet applied fertilizers according to recommended guidelines, which affects the cassava production yield. In addition, the cultivation technologies employed remain traditional, encompassing land preparation, planting, harvesting, and post-harvest processes. Therefore, farmers require greater support from external parties or other stakeholders to provide training and introduce innovations and technologies.

Second Hypothesis (H2): The adoption of innovation and technology has a positive influence on inclusive business

Second Hypothesis (H2) is accepted, indicating a significant influence of innovation and technology adoption on inclusive cassava business. This means that any change in the level of innovation and technology adoption will enhance the inclusive cassava business. Within the 95% confidence interval, the magnitude of the influence of innovation and technology adoption by farmers in improving inclusive business ranges between 0.193 and 0.480. Nevertheless, the effect of innovation adoption on inclusive business remains relatively low. Therefore, programs aimed at increasing the adoption of innovation and technology by farmers are considered essential, as enhanced adoption of innovation and technology by farmers can improve the inclusive business by 0.48. This finding is consistent with previous studies (Hilmanugraha, 2017; Ronaghi & Forouharfar, 2020; Faqih et al., 2023; Triandini et al., 2023; Ningsih, 2024; Richard, 2024) stating that technology and innovation are key drivers in enhancing productivity and achieving sustainable and inclusive economic growth. Cassava farmers in the study area have practiced farming in the same traditional ways for generations. The limited use of technology and the predominance of manual production processes have resulted in suboptimal production capacity and unachieved production efficiency. Therefore, standardizing cassava quality is necessary to increase market absorption of cassava. Product development, such as processed cassava, is an effort that can be undertaken to increase the added value of cassava commodities (Kusnandar et al., 2016).

Third Hypothesis (H3): The role of government has a positive influence on inclusive business

The third hypothesis (H3) is accepted, indicating a significant influence of government roles on inclusive business. This means that any change in government policy will enhance the inclusiveness of the cassava business. Within the 95% confidence interval, the magnitude of the influence of government policy is 0.30. Nevertheless, the effect of government policy on the inclusiveness of the cassava business remains relatively low. This finding is not in line with the opinion that the government plays a key role in achieving inclusive business and integrating it into low-income communities. The government's role can serve as a conducive support both financially and in terms of infrastructure (Jezeer et al., 2019). Virianita et al. (2019) state that the government can establish regulations to protect cassava farming areas and safeguard the tapioca industry from upstream to downstream. Second, the government can establish research institutions and cassava product development centers. Third, the government can provide extention, improve farmers' life skills, and facilitate access to appropriate agricultural technology (modernization of agricultural equipment). Fourth, regulations related to cassava price control can be implemented. Fifth, the government can facilitate access to capital and markets.

Fourth Hypothesis (H4): Access to finance has a positive influence on inclusive business

The fourth hypothesis (H4) is accepted, indicating a significant influence of financial access on inclusive business. This means that any change in farmers' ability to access financial resources will enhance the inclusiveness of the cassava value chain business. Within the 95% confidence interval, the magnitude of the influence of farmers' access to finance on improving inclusive business ranges between 0.328 and 0.564. Nevertheless, the effect of access to finance on inclusive business remains relatively low. Therefore, programs aimed at improving farmers' access to finance are considered important, as enhanced financial access can increase the inclusivity of the business by 0.328. This finding is consistent with previous studies by Zulfiqar et al., (2016) and Hilmanugraha, (2017) state that financial inclusion is considered an essential means of achieving the goal of inclusive economic growth, as it enables individuals to participate in the growth process by improving their access to economic opportunities and expanding their choices.

The analysis conducted in the research area shows that the majority of farmers rely on personal funds to finance their cassava farming activities. In cases of financial shortages, they often resort to using the cassava itself as a source of funding through an advance selling system (known locally as *ijon* or *tebas*), which constitutes tied financing. However, when farmers are bound by the *tebas* system, they become price takers, which place them in a disadvantaged position. Therefore, it is necessary to introduce more accessible financing options to help farmers obtain capital without such constraints.

Fifth Hypothesis (H5): Partnership has a positive influence on inclusive business

The fifth hypothesis (H5) is accepted, indicating a significant influence of partnerships on inclusive business. This means that any improvement in farmers' ability to establish partnerships will enhance the inclusiveness of the cassava value chain business. Within the 95% confidence interval, the magnitude of the influence of farmers' partnerships on improving inclusive business ranges between 0.147 and 0.491. Nevertheless, the effect of partnerships on inclusive business remains relatively low. Therefore, partnership programs for farmers are considered important, as increased partnerships can enhance inclusive business by 0.491. According to Putri et al. (2018) the existence of integration within a mutually beneficial support system is essential in addressing the real needs of farmers. Partnerships among small-scale farmers can provide market guarantees and improve farmers' access to high-quality seeds. This is in line with (Apriyani, 2024). who states that farmers who establish partnerships with cooperatives tend to have higher levels of inclusiveness. One form of support provided by the government is through the Agricultural Extension Program, which implements agricultural development activities as outlined by the Ministry of Agriculture in the SIPP 2015–2045. The agricultural development outlined by the Ministry of Agriculture including four programs namely achieving self sufficiency and sustainable self sufficiency, promoting food diversification, increasing added value, competitiveness and exports, as well as enhancing welfare of the farmers. In the research area there are 140 farmer groups, with food crops being one of the main commodities cultivated. Agricultural development activities include the provision of assistance in the form of agricultural machinery and food crop seeds. The partnership model applied in the research area follows a general trade pattern, in which partnerships involve marketing cooperation, provision of business locations, or procurement of agricultural products from farmers by large or medium-sized companies, conducted in an open and transparent manner.

CONCLUSIONS

This study set out to analyze the factors that influence the success of inclusive business models for cassava farmers, with the broader aim of supporting food security and improving farmer welfare. Using a quantitative approach and SEM-PLS analysis, the research examined the roles of farmer motivation, adoption of innovation and technology, partnerships, access to finance, and government support.

The result of the study shows that farmers’ motivation to adopt innovation and technology has a significant indirect impact on the success of inclusive business of cassava farmer. Factors such as the adoption of innovation and technology, partnerships, access to finance, and the role of government have a direct influence on the level of success of inclusive business of cassava farmers. By highlighting these factors, the study contributes to the design of more effective inclusive business strategies that strengthen cassava farmers’ integration into the value chain. In turn, this integration is expected to enhance productivity, increase incomes, and promote balanced rural development, thereby achieving the dual aims of ensuring food security and improving farmer welfare.

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