

Statistical study on agribusiness competencies and extension models for pepper cultivating farmers in West Kalimantan, Indonesia

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Abstract

Objective: The objective of this research is to examine the impact of farmer factors like educational level, learning process, involvement in local institutions, and accessibility to information and capital sources, and agribusiness facilities on agribusiness competencies of pepper farmers and the extension model.

Methodology: The participants of this research are 160 pepper farmers from 14 sub-districts in West Kalimantan Border region, Indonesia. The farmers were selected by Multistage cluster sampling. The data was gathered by surveys and documentation from pepper farmers. Structural Equation Modeling (SEM) approach was employed for processing and analysis of pepper farmer's data.

Result: There is a direct impact of pepper farmer's formal education and learning process, and accessibility to capital sources and agribusiness facilities on their agribusiness competence. Moreover, pepper farmer's formal education directly influences their participation in community institutions. There is a direct effect of pepper farmers' accessibility to information sources and participation in community institutions on their learning process (accessibility to extension services). Direct relationship exists between pepper farmer's accessibility to capital sources and agribusiness facilities.

Conclusion: To carry out the extension process effectively and efficiently, agricultural extension workers who aim at enhancing the agribusiness competence of pepper farmers must pay attention to the influencing factors of agribusiness competence.

Keywords: Pepper farmers, Agribusiness competence, Education level, Accessibility, Participation.

Introduction

Pepper is the fourth plantation commodity in terms of foreign currency after palm oil, rubber, and coffee in Indonesia. Indonesia is one of the major producers and exporters of pepper worldwide. Other countries which are major producers of pepper are Brazil, Vietnam, Malaysia, and India. Data from the International Pepper Community, or IPC (2018), shows that Indonesia's market share in pepper exports is falling. From 2008-2016, Indonesia remained the second-largest pepper production and exporter, after Vietnam, but in 2017 and 2018, Indonesia overtook Brazil to become the third-largest pepper exporting nation in the world (Fazaria, 2016).

In Indonesia, pepper productivity is still below 1,000 kg per hectare while it is more than 2,000 kg per hectare in other nations. Low productivity of pepper and quality of pepper resulted by conventional processing techniques are issues in pepper productivity in Indonesia (Rosman, 2016). The yearly rate of decline in national pepper production was 2.29% from 2014 to 2020. A drop of 10% exists between 2014 and 2015 in pepper production in Indonesia and the lowest productivity ever recorded was approximately 798 Kg/ha in 2017 (Ditjenbun, 2020). The factors related to underdeveloped pepper agribusiness sector in Indonesia identified by Kemala (2015) are as follows.

- * Lack of technology use by pepper farmers
- * Scarcity of readily accessible, low-cost agricultural equipment
- * Unavailability of variety in pepper-based products
- * Increased competition for pepper export globally
- * Lack of farmer understanding regarding pepper production and export studies

There are six regions in which pepper is majorly cultivated in Indonesia. These regions include Lampung, Bangka Belitung Islands, South Sulawesi, South Sumatra, Southeast Sulawesi, and West Kalimantan. The mean pepper production in these regions was approximately 5,001 tonnes which accounts for around 5.74 percent of the overall pepper production in Indonesia (Ditjenbun, 2019). According to the "Dirjen National Export Development 2020", West Kalimantan is appended to the list of major pepper cultivating and exporting regions in Indonesia by 2020. Nearly 9,509 hectares accounting for 90% of overall pepper cultivated areas in West Kalimantan province are found in the province's border regions. These border areas include the cities of Sintang, Sanggau, Sambas Regencies, Kapuas Hulu, and Bengkayang in West Kalimantan.

The preliminary findings from interviews with leaders belonging to various border communities and the "Plantation and Livestock Service Office" in Sanggau Regency were analyzed. These findings indicate that the infrastructure of such border areas is still unsupportive, forcing a few pepper farmers to wait more for pepper traders. In addition, the post-harvest handling of pepper was not carried out properly, which is evident from greater levels of dirt and microorganisms. Extension programmes in agriculture have traditionally been the primary means of spreading knowledge on farm technology, supporting adult education in rural areas, and aiding farmers in the improvement of their technical and administrative abilities on the farm (Danso-Abbeam et al. 2019). Extension programmes must be designed to raise productivity and income from pepper farms, lessen the burden of poverty, and lessen the risk of hunger in Indonesia. There are several factors of pepper farming which

influence the agribusiness competencies in Indonesia. The degree to which factors of pepper farming impact the agribusiness competencies in Indonesia are the focus of this paper.

Research Methodology

The main goal behind this research is to identify the impact of different variables associated with pepper farmers on agribusiness competencies and extension programs in West Kalimantan, Indonesia. Figure 1 is a schematic representation of the framework for assessing pepper cultivating farmer's competency in agribusiness.

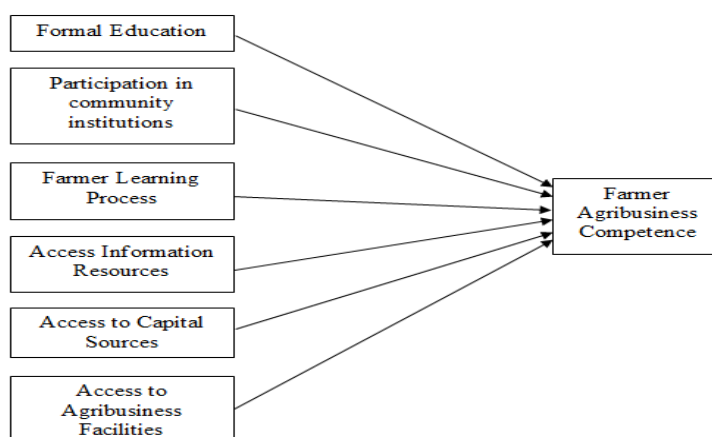


Figure 1. Research Thinking Framework

The participants of this research are pepper cultivating farmers from 14 sub-districts in West Kalimantan Border region, Indonesia. The farmers were selected by Multistage cluster sampling. After MCS, 160 pepper cultivating farmers were selected as participants for our study. The research methodology followed in this paper is a quantitative research. The data was gathered by surveys and documentation from pepper farmers. Structural Equation Modeling (SEM) approach was employed for processing and analysis of pepper farmer's data. The feasibility of the model representing the relation existing between factors related to pepper cultivating farmers must be identified. The model feasibility can be evaluated by various approaches like Root-mean-square error-of-approximation (RMSEA), Chi-square test, Goodness-of-fit index (GFI); Adjusted GFI (AGFI), Tucker-Lewis index (TLI), Comparative fit index (CFI), non-normalized fit index (NNFI) or Root-mean-squares residual (RMSR). Table 1 given below illustrates the criteria that were used to evaluate the model feasibility.

Table 1. Evaluation criteria for various model feasibility analysis methods

S.No	Feasibility Evaluation Method	Evaluation Criteria
2	RMSEA	The value of 0.08 means model is good fit and value of 0.05 means model is close fit.
1	Chi Squares	If the value is smaller, then the model fit is better
3	GFI	The value of 0.90 means model is good fit
4	AGFI	The value of 0.90 means model is good fit
6	TLI/NNFI	The value of 0.90 means model is good fit
5	CFI	The value of 0.90 means model is good fit
7	RMSR	The value of 0.50 means model is good fit

(Source: Widarjono (2015); Haryono and Wardoyo (2013))

Results And Discussion

This section is dealt with the statistical analysis of factors like educational level, learning process, involvement in local institutions, and accessibility to information and capital sources, and agribusiness facilities on agribusiness competencies of pepper farmers and the extension model in Indonesia.

Correlation among research factors

The exogenous variables having direct and positive impact on endogenous variables are determined from SEM analysis and listed as follows. Significant correlation exists between accessibility to information source and learning process of pepper farmers (CR = 2,328 and p = 0.020), participation of pepper farmers in community institutions and their learning process (CR = 2.019 & p = 0.044), pepper farmer's formal education and their competence in agribusiness (CR = 2.890 & p = 0.004), pepper farmer's accessibility to agribusiness facilities and their competence in agribusiness (CR = 14.658 & p = 0.000), pepper farmer's accessibility to capital sources and their competence in agribusiness ccessiblity (CR = 3,449 & p = 0.000), and learning process of pepper farmers and their agribusiness competence (CR = 25.256 & p = 0.000).

Alterations to the hypothesized correlations among research factors

Correlation model representing ideal correlation among factors related to pepper farmers can be obtained by adjusting the model in light of the importance of the association between exogenous variables. Depending on this consideration, significant correlation exist between Because of the positive and substantial association between pepper farmer's formal education and their participation in community institutions, and pepper farmer's accessibility to agricultural facilities and accessibility to capital sources. Thus, a modified model representing correlation among factors related to pepper farmers is obtained by correlating these variables, as seen in Figure 2.

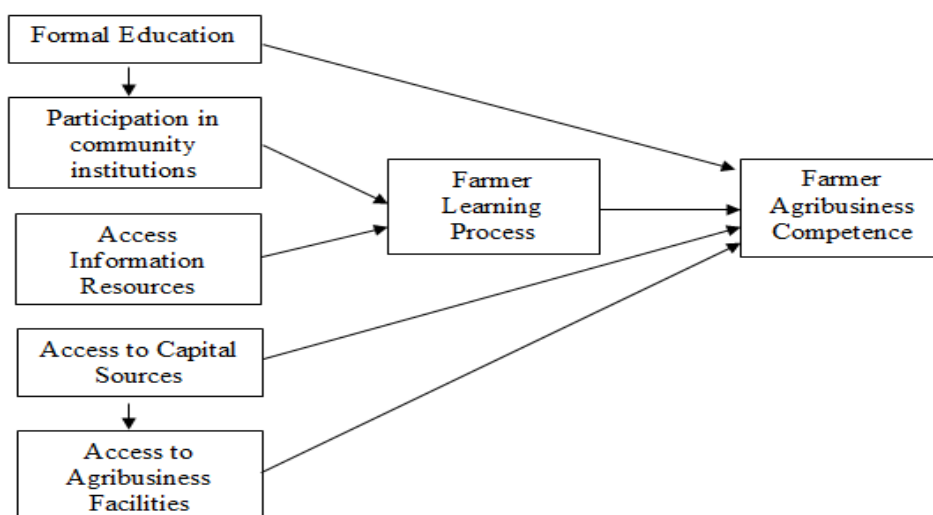


Figure 2. Alterations to the hypothesized correlations among research factors

Significant correlation determined by SEM analysis exists between pepper farmer's formal education and their agribusiness competence (CR = 2.776 and p = 0.006), pepper farmer's

participation in community institutions and their learning process (CR = 2.017 & p = 0.035), pepper farmers' accessibility to information sources and their learning process (CR = 2.723 & p = 0.006), pepper farmers' accessibility to capital sources and their accessibility to agribusiness facilities (CR = 15.924 & p = 0.000), pepper farmers' formal education and their competence in agribusiness (CR = 2.376 & p = 0.017), pepper farmers' accessibility to agribusiness facilities and their competence in agribusiness (CR = 16,259 & p = 0.000), pepper farmers' accessibility to capital sources and their competence in agribusiness (CR = 2.825 & p = 0.005), and pepper farmer's learning process and their agribusiness competence (CR = 24,601 & p = 0.000).

Analysis of feasibility of modified correlation model

The feasibility of modified model representing correlation among factors related to pepper farmers is shown in table 2. Table 2 shows that the modified model representing correlation among factors related to pepper farmers is feasible and satisfactory. In this way, the correlation and effect between exogenous and endogenous factors may be explained by this modified correlation model.

Table 2. Feasibility of modified correlation model

S.No	Evaluation Method	Limit Value	GFI	Inference
1.	RMSEA	0.08	0.063	Modified correlation model fits good
2.	Chi-Square	< 214,477	29,411	Modified correlation model fits good
2	Significance probability	0.05	0.044	Modified correlation model fits good
3	DF	>0	18	Modified correlation model overfits
8	CMIN/DF	2.0	1,634	Modified correlation model fits good
6	CFI	0.95	0.980	Modified correlation model fits good
7	TLI	0.95	0.960	Modified correlation model fits good
4	NFI	0.90	0.952	Modified correlation model fits good
5	IFI	0.90	0.981	Modified correlation model fits good

Total, Direct, and Indirect Influence between research variables

The degree of the total, direct, and indirect effect of exogenous factors on endogenous factors is presented in table 3.

Table 3. Total, Direct, and Indirect Influence between research variables

Exogenous Factors	mediator	Endogenous factors	Total Influence	Direct Influence	Indirect Influence	Inference
Pepper farmer's formal education	-	Pepper farmer's participation in community institutions	0.202	0.202	-	Direct Impact
Pepper farmer's formal education	Pepper farmer's Learning process	Pepper farmer's agribusiness competence	0.079	0.059	0.020	Direct Impact
Pepper farmer's formal education	Pepper farmer's participation in community institutions	Pepper farmer's Learning process	0.033	0.000	0.033	Mediator is their participation
Pepper farmer's participation in community institutions	-	Pepper farmer's agribusiness competence	0.162	0.162	-	Direct Impact
Pepper farmer's participation in community institutions	Pepper farmer's Learning process	Pepper farmer's agribusiness competence	0.099	0.000	0.099	Mediator is learning processes
Pepper farmer's accessibility to Information sources	-	Pepper farmer's Learning process	0.209	0.209	-	Direct Impact
Pepper farmer's accessibility to Information sources	Pepper farmer's Learning process	Pepper farmer's agribusiness competence	0.127	0.000	0.127	Mediator is Learning processes
Pepper farmer's accessibility to capital sources	-	Pepper farmer's agribusiness competence	0.111	0.111	-	Direct Impact
Pepper farmer's accessibility to capital sources	Means	Pepper farmer's agribusiness competence	0.609	0.111	0.498	Mediator is Means
Means	-	Pepper farmer's agribusiness competence	0.639	0.639	-	Immediate impact
Pepper farmer's Learning process	-	Pepper farmer's agribusiness competence	0.609	0.609	-	Direct Impact

The pepper farmer's competence in agribusiness in West Kalimantan is observed to be 66.2% of the expected managerial and technical competencies. The pepper farmer's technical competence was 73.5 % of the expected technical competence, and the managerial competence

was 47.9% of the expected managerial competence. The technical and management competence of pepper farmers make up their competence in agribusiness. However, the duties and responsibilities of farmers as the primary factors in agricultural management are less often linked to farmers' agribusiness capabilities (Rayuddin, 2010). Managerial skills incorporate management regarding plan, organization, implementation, and supervision of farming activities, network creation ability, and the decision-making ability. Technical capabilities incorporate the equipment preparation, cultivation skills, product processing skills, and marketing skills.

The Impact of pepper farmer's formal Education on Agribusiness Competence

The result shows that the pepper farmer's formal education positively influences their competence in agribusiness. This indicates that if the pepper farmer's formal education is greater, and then their agribusiness competence is also greater in terms of managerial and technical aspects. This is consistent with the findings of studies conducted by Muhibuddin (2015) and Syarief (2015), which found that farmers' proficiency levels rose after completing formal schooling. Prijono and Pranarka (1996) state that the primary goal of education is to instil knowledge and skills. According to Mastuti (2016), an agribusiness system includes acquisition and distribution of production facilities through agricultural processes and marketing goods to the end customer.

The Impact of pepper farmer's formal Education on Participation in Community Institutions

Pepper farmer's formal education directly impacts their participation in community institutions in Indonesia. This indicates that if the pepper farmer's formal education is greater, and then their participation in community institutions is also greater. Knowledge has a effective impact on community participation, according to research by Waluyo and Solikah (2021), and Rahmat et al. (20021) found that people with more education are more likely to grasp the concepts behind the programme development that will take place at the Community Empowerment Institution. Knowledge increases in proportion to a person's degree of education (Nursalam (2017). Through the process of learning, a person gains invaluable life experience (Klausmeier and Goodwin, 1975). Education, as described by Wiriatmadja (1990), is an effort to alter one's conduct via the use of scientific and technological information. When farmers have accessibility to education, they are more likely to be active members of their communities. According to Adisasmitha and Raharjo (2006), community participation includes actions in programme design and execution.

The Impact of pepper farmer's Participation in Community Institutions on Learning Process

From the results, it is observed that the pepper farmer's participation in Indonesian community institutions directly influences their learning process. The findings of research by Rosalia et. al. (2019), which conclude that the farmer involvement has an impact on Agribusiness efficiency, and those of Alif's research (2017), which found that the agricultural extension implementation through demonstrations affects the farmer involvement, both support this. Because the agricultural extension programme is conducted in line with the requirements and circumstances of the resources they have, farmer participation is important (Ife and Tesoriero, 2008). The structure that promotes coordination in terms of individual expectations is a requirement for participation in institutions (Susanto, 2006).

The Impact of pepper farmer's accessibility to Information Sources on Learning Process

It is observed that the pepper farmer's accessibility to information sources directly influences their learning process. The findings of studies by Harijati (2007) and Syarief (2015),

which revealed that accessibility to information sources will enhance the learning process in extension programs and boost farmer competency, are consistent with our results. According to study by Andriaty et al. (2011), marketing information and post-harvest are not as important to farmers. Meetings are the most often used medium for obtaining information, followed by electronic and print media. Age, cosmopolitanism, and the degree of information utility are among factors that influence accessibility to information.

The Impact of pepper farmer's learning process on Agribusiness Competence

The pepper farmer's learning process directly impacts their competence in agribusiness. The findings of a study by Kustiari et al. (2015) indicating the efficiency of extension program has a substantial impact on growers' competence confirm our results. The extension program's functionality, communication strategy all affect how successful the extension program is. A non-formal education programme for farming families called "agricultural extension" attempts to help farmers gain better technical skills, knowledge, positive attitude shifts, and more independence in agriculture land management. Farmer groups must utilize learning tool to improve their understanding, attitudes, and abilities (Parissing, 2019).

The Impact of pepper farmer's accessibility to Capital Sources on Agribusiness Competencies

The pepper farmer's accessibility to capital sources directly impacts their competence in agribusiness. The findings of study by Syarief (2015), which show that accessibility to finance sources adds favourably to farmers' competency confirm our findings. According to Sudaryanto and Agustian (2015), farmers may still maximise their agricultural resources with enough money to raise their company earnings, which in turn boosts their income and welfare. Farmers are said to have another option to raise their income which is equitable access to financing. Capital in agricultural production includes fixed capital and non-fixed capital. The term "fixed capital" refers to expenses made during the manufacturing process that do not exhaust themselves throughout a single production process, such as production components like land, buildings, and equipment. While non-fixed capital is the production expenses for purchasing seeds, fertiliser, or labour costs (Soekartawi, 2003).

The Impact of pepper farmer's accessibility to Capital Sources on Accessibility to Agribusiness Facilities

The pepper farmer's accessibility to agribusiness facilities is positively influenced by their accessibility to capital sources. The findings are in consistence with findings of Tedjaningsih and Sufyadi (2020) which reveal that there is a link between farming sustainability and social capital variables. Farmers may maximise their agricultural resources to boost company profitability, which in turn raises their income and wellbeing if they have access to enough capital (Sudaryanto and Agustian, 2015). This money may make agricultural businesses more accessible. The effective deployment of agribusiness systems depends on the availability of agricultural infrastructure. Infrastructure development as a component of public services will be beneficial if it is in line with farmers' requirements and interests, can support their business development, and can spur the expansion of new enterprises. Farmers are the primary players in the development of agriculture and are the recipients of the services offered by the organisations that support agriculture. If there is no divergence between agribusiness' supporting institutions and its commercial activity, it will function effectively (Tedjaningsih, 2017).

The Impact of pepper farmer's accessibility to Agribusiness Facilities on Agribusiness Competence

Based on the results, it is noted that pepper farmer's accessibility to agribusiness

facilities significantly impacts their competence in agribusiness. The findings of Syarief's (2015) study, which demonstrate that production facilities have a considerable impact on farmer competence, are in support of this result. Farmers' ease access to production facilities as a result of government policy, according to Rayuddin (2010), Simamora, and Luik (2019), has an impact on raising farmer competence. The success of the learning process applied to agriculture systems and enterprises depends on the completeness of the facilities and teaching aids.

Conclusion

The findings of the research shows that pepper farmer's learning process, formal education, and accessibility to capital sources and agribusiness facilities directly impacts their competence in agribusiness. In addition, pepper farmer's formal education significantly influences their participation in Indonesian community institutions. The pepper farmer's participation in community institutions and accessibility to information sources directly impacts their learning process and their accessibility to capital sources influences their accessibility to agribusiness facilities.

To increase the agribusiness proficiency of pepper growers in West Kalimantan, Indonesia, following strategies can be adopted. Agricultural extension workers must take into account the farmer's degree formal education of farmers, the learning process, their accessibility to sources of finance, and agribusiness facilities in order to develop the agribusiness competence of pepper farmers. To enhance farmers' learning processes, it is important to take into account their involvement in local institutions as well as their access to their own informational resources. Extension workers need to pay attention to farmers' levels of formal education to improve farmer engagement in community institutions. Extension personnel need to pay attention to financial source that pepper farmers in West Kalimantan possess to improve access to agribusiness facilities.

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Declaration Of Conflict Interest

Source of funding is none, and the authors declare that they have no conflict of interest.

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