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Model of food independence of livestock subsector: A case study of community empowerment in Batu City East Java Province, Indonesia

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This study uses a quantitative analysis approach that aims to analyze the Food Subsector Model for Livestock Subsector through community empowerment in Batu City. Sampling was carried out using a purposive sampling method of 52 farmers or breeders and 11 farmer or livestock groups. The Data Collection Technique is done by filling out the questionnaire which is done by structured interview technique. Structured interviews in the form of interviews using written alternative answers questions already exist in the form of questionnaires. Data analysis in this study uses a Structural Equation Modeling (SEM) model with a Generalized structured component analysis (GSCA) approach. This study found that 1) farmer participation affect the changes in farmer behavior. 2) Community Empowerment affect the changes in farmer behavior 3) Changes in behavior affect the level of food independence of the livestock subsector 4) The level of food independence is significant and positive influences the stability of food availability.

Keywords: Participation, Community Empowerment, farmer behavior, livestock subsector, stability of food availability

INTRODUCTION

The livestock sub-sector has a strategic role in the development of the agricultural sector, namely in an effort to strengthen food security to meet the needs of animal protein, empower the economic community, and can drive regional development (Asresie., Zemedu., and Adigrat, E. 2015), Saputra and Widodo, 2016; Zougmore et al., 2016; Dinh, 2017; Asresie et al., 2019 Saravia-Matus et al., 2018; Enahoro et al., 2019; Hariyanto & Anwar, 2019). In particular the livestock sub-sector recently has received little attention because the government is more focused on an efforts to increase rice that deplete the national economy. The main livestock population such as cattle, buffaloes and goats have depleted which continues to increase every year. This ongoing depletion threaten the

sustainability of livestock production in the country, so it is feared the number of imports will continue to increase (Yusdja dan Winarso, 2016).

The implementation of a food security program to support food independence and food sovereignty, in the implementation of fulfilling food needs still depends on international trade and bargaining positions that are not yet adequate. Indonesia has not been able to optimally protect farmers from the invasion of imported food from other countries (Rachmat, 2015). The availability factor on local food and the openness of international trade are the driving factors for Indonesia to be able to build food independence and food sovereignty (Suryana, 2014).

Food independence is essentially community empowerment, this means increasing the independence and capacity of the community to

play an active role in realizing food availability, food affordability, and food utilization/consumption of food and nutrition from time to time. Communities involved in implementing a system of food independence include food producers, entrepreneurs, consumers (communities), government apparatus, universities, research institutions and non-governmental organizations (Darwis and Rusastra, 2016).

Community empowerment can be realized through active community participation facilitated by the empowerment actors (Witteveen and den Boer, 2019; Pagès et al., 2019). The main target of community empowerment is those who are weak and do not have the power, strength or ability to access productive resources or people who are marginalized in development. The final goal of community empowerment is to empower the community so that they can improve their family standard of living and optimize the resources they have (Widjajanti, 2011). Building food independence is the best strategy to get out from the food crisis (Swastika, 2014).

Agricultural development, including the livestock sub-sector (Idrisa and Ogunbameru, 2018; Bachev et al., 2019; Evangelou, 2019), has a very important role in increasing food independence, increasing the income of farmers-breeders, employment opportunities, sources of income and economic development in the regional and national (Yulia, et al, 2017). Agricultural development in supporting food independence is influenced by the adoption of innovation in supporting availability, affordability, nutritional utilization/food consumption and food security, with the adoption of sustainable innovations between givers and recipients so that to be able to reach the planned target (Zuriani and Martina, 2016).

Extension activities are basically a process of community empowerment that aims to increase the capacity and productivity and independence of the community to be able and have the power to solve their own problems. Counseling/ Extension as an empowerment process is able to realize an independent, dynamic and progressive society and partner with other communities to realize food independence (Sadono, 2008).

Community empowerment can be pursued through increasing the capacity of human resources (HR) in order could compete entering the labor market and business opportunities that create and increase household income, increasing household income has a positive impact, one of which is increasing household purchasing power

to access food has also increased. The ability to buy will give them the freedom to choose diverse foods to fulfill their nutritional adequacy (Rahmiyati, 2016).

Based on the research results of Asmara, Hanani and Mutisari (2012), aspects that affect the condition of food security in Batu City are aspects of poverty, health and livelihood aspects, as well as aspects of food vulnerability. This is partly due to the unique characteristics of Batu City because its economic and socio-cultural characteristics are more similar to a district/regency that has several villages than a city. Based on the analysis of food security using composite indicators, it can be seen that Batu City has 3 villages (12.5%) which are categorized as food security, 10 villages (41.67%) are included in the category of sufficient food security, 8 villages (33.33%) are included in the category slightly food insecurity, 2 villages (8.33%) included in the category of food insecurity and 1 village (4.17%) included in the category of very food insecurity.

Another problem in building food self-sufficiency/independence in the livestock sub-sector in Batu City is related to decreasing agricultural and livestock land area, decreasing the interest of the younger generation to conduct livestock farming business due to a shift in economic values from livestock farming activities which are considered as not meeting the secondary and tertiary needs.

The constraints and challenges of the food self-sufficiency/independence development can be bridged by developing the potential of agriculture and livestock as an optimized agricultural integration system. Food self-sufficiency/independence in the livestock sub-sector is expected to be achieved with the support of the empowerment of farmers-breeders in increasing production and productivity that adheres to sustainable natural resources, the improvement and changing of agricultural-livestock human resources, increasing socio-economic values and the improvement of product quality and food value added with dignified local wisdom so that farmers-breeders have a high bargaining position and competitiveness towards the resulting product. From the results of the description above, it is necessary to formulate a food independence model in the livestock sub-sector through community empowerment in Batu City.

MATERIALS AND METHODS

This study uses a quantitative analysis

approach which aims to analyze the Livestock Subsector's Food Independence Model through Community Empowerment in Batu City by considering the following: Batu City has implemented several community empowerment programs, especially the livestock sub-sector, in realizing food independence (Bumiaji Subdistrict, Batu Subdistrict and Junrejo Subdistrict). In addition, Batu City is a tourist city with domestic and foreign tourist arrivals, making it a place for potential livestock food transactions and distribution. Sampling was carried out using a purposive sampling method of 52 farmers or breeders and 11 farmer or livestock groups. The Data Collection Technique is done by filling out the questionnaire which is done by structured interview technique. Structured interviews in the form of interviews using written questions that are alternative answers already exist and can be in the form of questionnaires.

Data analysis in this study uses a Structural Equation Modeling (SEM) model with a Generalized structured component analysis (GSCA) approach that offers researchers the ability to analyze the SEM. GSCA is an analysis of the 3rd generation Structural Equation Model developed by Heungsun Hwang, Hec Montreal and Yhoshio Takane in 2004. The aim is to replace factors with linear combinations from indicators (manifest variables) in SEM analysis. This analysis approach uses the least square method in the parameter estimation process. GSCA was developed to avoid the lack of PLS (Partial Least Square), which is equipped with global optimization procedures such as procedures in SEM, while maintaining local optimization procedures (such as in PLS) so that it is powerful for confirming theory. The GSCA method can also be applied to relationships among complex variables (can be recursive and reciprocal), involve higher-order components (factors) and multi-group comparisons.

RESULTS AND DISCUSSION

Goodness of Fit Model

The first stage of this compatibility/goodness of fit test is intended to evaluate in general the degree of compatibility or Goodness of Fit (GOF) between the data and the model. Structural Equations do not have the best statistical test that can explain the predictive power of the model. Instead, some GOF or *Goodness of Fit Indices* (GOFI) sizes can be used together or in combination. None of the GOF or GOFI measures

can be exclusively used as a basis for evaluating the overall suitability of the model/ goodness of fit. The best guidance in assessing the suitability of a model/ goodness of fit is a strong substantive theory. If the model only shows or represents a substantive theory that is not strong, and even though the model has a very good model suitability/ goodness of fit, it is rather difficult for us to assess the model

The overall suitability test of the model/ goodness of fit relates to the analysis on the GOF statistics produced by the program, in this case the GSCA. Using the GOF measurement guidelines and GOF statistical results, then the overall model suitability/ goodness of fit analysis can be carried out in table 1.

FIT = 0,661

FIT shows the total variance of all variables that can be explained by a particular model. FIT values range from 0 to 1. So, the model formed can explain all existing variables equal to 0,661. Exogenous variables that can be explained by the model amounted to 66,1% and the rest (33,9%) can be explained by other variables. Means a model good fit to explain the studied phenomenon.

AFIT = 0,641

Adjusted from FIT is almost the same as FIT. However, because the exogenous variables that affect endogenous are more than one variable, it would be better if the interpretation of the accuracy of the model uses FIT that has been corrected or uses AFIT. Because as more variables influence then the value of FIT will be greater because the proportion of diversity will also increase so that to adjust to the existing variables can use a corrected FIT. If seen from the AFIT value which is 0,641, the model that can be explained by the model is 64,1% and the rest (35,9%) can be explained by other variables.

Goodness of Fit Indices (GFI) = 0,99

Goodness of Fit Indices (GFI) is a measure of the accuracy of the model in producing observed matrix covariance. This GFI value must range from 0 to 1. Although in theory GFI may have a negative value but it should not happen, because the model that has a negative value is the worst model. GFI values greater than or equal to 0,9 (0,99> 0,900) indicate the fit of a model (Diamantopaulus, 2000 in Ghozali, 2005).

Table 1: Result of Goodness of fit Index (Inner Model)

Goodness of fit Index	Cut of Value	Result	Information
FIT	> 0,500	0,661	Model good fit
AFIT	> 0,500	0,641	Model good fit
GFI	> 0,900	0,99	Model good fit
SRMR	< 0,080	0,134	Model Poor fit

SRMR (Standardized Root Mean Square Residual)= 0,134

Standardized RMR represents the average/mean value of all standardized residuals, and has a range from 0 to 1. Models that have good fit will have a value of Standardized RMR less than 0,08.

The model proposed in this study has an SRMR value of 0,134, because the SRMR value is greater than 0,08, it can be concluded that the model is declared Poor fit.

Model Pengukuran (Outer model / Measurement Model)

The measurement model is a model with the results of calculations based on calculations using the GSCA program. The method used is Confirmatory Factor Analysis, wherein using this tool will be known that the existing indicators can really explain a construct. The purpose of the measurement model is to describe how well the indicators in this study can be used as instruments for measuring latent variables.

Evaluation of the validity of the measurement model can be done by looking at the estimation results of the loading factor. A variable is said to have good validity for the construct or latent variable if the t-value of the loading factor is greater than the critical value ($\geq 1,96$) and/or the standard loading factor $\geq 0,50$. While the evaluation of the reliability from the measurement model in GSCA can use *Construct Reliability* (CR $\geq 0,70$) and *Average Variance Extracted* (AVE $\geq 0,50$). Recapitulation of the results of evaluation of validity and reliability can be seen in Table 2.

Based on Table 2, it can be seen that all values of Loading factor $\geq 0,50$ (Valid), and the value of AVE $\geq 0,50$ (Valid), While from the results of reliability calculations show that all the value of Cronbach Reliability (CR) $\geq 0,70$ (Reliable). Thus it can be concluded that all of these latent variables have good and decent indicators. In detail, in order to find out the most dominant indicators in contributing to latent constructs are explained as follows.

1.The best indicator in forming the Participation variable is the quality of participation with the highest factor loading of 0.884. Thus, if the

management wants to increase the value of the Participation variable, then the statistically recommended indicator to be prioritized for improvement is an indicator of the quality of participation.

- The best indicator in forming the Community Empowerment variable is Education with the highest loading factor of 0,949. Thus if the management wants to raise the value of the Community Empowerment variable then statistically recommendations regarding indicator need to be prioritized for improvement is indicator of Education.
- The best indicator in forming the Behavior Change variable is Attitude with the highest factor loading of 0.902. Thus, if the management wants to raise the value of the Behavior Change variable, the statistical recommendations on indicators that need to be prioritized for improvement are indicators of Attitude).
- The best indicator in forming the Food Independence Level of the Livestock Subsector variable is Utilization/ consumption of food with the highest loading factor of 0,886. Thus, if the management wants to raise the value of the Food Independence Level of the Livestock Subsector (Y4) variable then statistically recommendation regarding indicators that need to be prioritized for improvement is indicator of Utilization/consumption of food.
- The best indicator in forming the Stability of Food Availability variable is Household food consumption with the highest loading factor of 0,925. Thus, if the management wants to raise the value of the Stability of Food Availability variable then statistically recommendation for indicators need to be prioritized for improvement is the indicator of Household food consumption

Model Struktural (Structural model)

This section related with the evaluation to the coefficients or parameters that indicate a causal relationship or the effect of one latent variable on other latent variables. A causal relationship is declared insignificant if the value of the critical

ratio (C.R) is between the range -1.96 and 1.96 with a significance level of 0,05. With the help of the GSCA program application obtained the estimation results of the critical ratio value of structural model. In summary the results of the calculation of the coefficients are presented in Table 2.

Based on Table 3, we can find out the results of estimation and testing of hypotheses as well as structural models of the analysis result.

It is known that the variable of Community Empowerment has a positive influence on Behavior Change, meaning that the higher Community Empowerment will consequently raise the Behavior Change variable, where the path coefficient obtained is 0,515 with a CR value of 4,42. Because the CR value is greater than the critical value (4,42> 1,96), then statistical hypothesis states that H0 is rejected, meaning that the Community Empowerment variable has a significant influence on the Behavior Change variable.

Behavior change has a positive influence on the Food Independence Level of the Livestock

Subsector, meaning that the higher the Behavior Change, the consequence will be to increase the Livestock Subsector Level of Food Independence variable, where the path coefficient obtained is 0.72 with a CR value of 12.43. Because the CR value is greater than the critical value (12.43> 1.96), the statistical hypothesis states that H0 is rejected, meaning that the Behavior Change variable has a significant effect on the Livestock Subsector Level of Food Independence variable.

It is known that the variable of Food Independence Level of the Livestock Subsector has a positive influence on Food Availability Stability, meaning that the higher the Food Independence Level of the Livestock Subsector, then consequently will raise the Food Availability Stability variable, where the path coefficient obtained is 0,886 with a CR value of 23,37. Because the CR value is greater than the critical value (23.37> 1.96), then statistical hypothesis states that H0 is rejected, meaning that the Food Independence Level of the Livestock Subsector variable has a significant influence on the Stability of Food Availability variable.

Table 2; Evaluation of the Measurement Model (Outer Model)

Variabel Laten	Variabel Teramati	Validitas Konvergen (LF > 0.5=Valid)		Validitas Diskriminan (AVE > 0.5=Valid)		Cronbach Reliability (CR > 0.7)	
		Outer Loading	Ket	AVE	Kesim-pulan	CR	Description
		Participation	Activity intensity	0.775	Valid	0.642	Valid
Quality of participation	0.884		Valid				
Quality of benefits	0.736		Valid				
Community Empowerment	Education	0.949	Valid	0.668	Valid	0.748	Reliable
	Capital / Facility Assistance	0.740	Valid				
	Accompaniment	0.746	Valid				
Behavior Change	Knowledge	0.826	Valid	0.731	Valid	0.810	Reliable
	Attitude	0.902	Valid				
	Skills	0.835	Valid				
Food Independence Level of Livestock Subsector	Food availability	0.651	Valid	0.658	Valid	0.800	Reliable
	Affordability	0.853	Valid				
	Utilization / consumption of food	0.886	Valid				
	Food safety	0.834	Valid				
Stability Availability of Food	Income	0.881	Valid	0.794	Valid	0.864	Reliable
	Availability of protein food	0.867	Valid				
	Household food consumption	0.925	Valid				

Table 3; Results of Estimation and testing of Direct Effects

Influence among Latent variables			Path Coefficient	CR	Conclusion
Cause Variable	-->	Effect Variable			
Participation	-->	Behavior Change	0,435	3,42	Signifikan
Community Empowerment	-->	Behavior Change	0,515	4,42	Significant
Behavior Change	-->	Food Independence Level Of Livestock Subsector	0,720	12,43	Signifikan
Food Independence Level of Livestock Subsector	-->	Food Availability Stability	0,886	23,37	Significant

DISCUSSION

The research results showed that farmer/breeder participation had an effect on changes in farmer's/breeder's behavior. In accordance with Baba's research, et al., (2011), the high participation of farmers in counseling is able to increase the relevance of extension implementation to the needs of farmers. There are many factors that influence farmer participation in counseling. The need for farmer participation is because currently the livestock sub-sector is experiencing problems, one of the problems that arise is the reduced need to work in the livestock sector (Hayes and Kerr, 1997; Hall et al., 20004; McMichael et al., 2007; Thornton et al., 2009), especially for young age groups (Negassa et al., 2012). The lack of involvement of rural youth groups in the livestock sector is caused by the application of livestock technology. The adoption of new technology in the livestock sector is carried out to balance for rapid population growth in order to achieve livestock productivity (Dumaria, 2006).

Farmers who participate in empowerment activities will get knowledge and science about new innovations that can be done by farmers (Sumberg et al., 2003; Hoffmann et al., 2007; Richardson-Ngwenya et al., 2019; Kerr et al., 2019). Adoption of innovation is an effort to increase business productivity (Anuga et al., 2019; Zakaria, 2019; Mondo et al., 2019; Kendiukhov et al., 2019), because the adoption of innovation is expected to improve the quality and quantity of products which will also have an effect on business income and progress. Likewise in livestock business, farmers must be able to conduct the adoption of innovations that can empirically increase livestock productivity. The appropriate strategy of the adoption of innovations enhancement is needed to maximize strengths and opportunities and minimize the weaknesses and threats that exist in people's farms, so that the objectives of dairy farming can be achieved (Mulatmi et al., 2016).

Participation in counseling is very important because it can increase technology adoption. Through participation, farmers will feel more

valued, motivated to collaborate and psychological mobilization occurs before counseling is carried out. Counseling that carried out is oriented on meeting the needs of farmers, in accordance with the conditions of the resources they have, based on the problem, and respecting the diversity of the farmers situation of the counseling target. Counseling becomes more efficient, accountable and becomes something that is needed by farmers. In fact, farmers will be able to finance their own counseling because of the amount of benefits obtained from the implementation of counseling (Baba, 2012).

Yunasaf (2012) states that such breeders' typology is usually inseparable from the need for high achievement, and the existence of trust in science and technology. This will internally relate to the growth of motivation and desire of farmers/breeders to always learn or the existence of desire to increase their capacity as human learners. While externally will be related to the encouragement from the outside, especially from the instructor in facilitating farmers so that they can achieve the best learning activities. By participating, it can develop self-help empowerment and the role of actors or breeders in order to increase the productivity of their livestock business income. In order to improve breeding skills both to farmers and to extension workers so that there is a growth of empowerment and independence (Sajow et al., 2014).

The results of the study show that community empowerment influences changes in farmer's behavior. Community empowerment is an effort to make the community empowered and independent, able to stand on its own feet. In accordance with Astuti's research (2015) which states that community empowerment basically changes people's behavior towards a better direction so that the quality and welfare of their lives can gradually increase. Sofinisa (2015) added that with empowerment, farmers will make business improvements, which are expected to be able to improve the income earned, including family and community income.

In line with the research of Widiyono and Sarmin (2016) which states that community

empowerment has a very strong influence on the behavior of farmers, this is evidenced by farmers willing to work around the cage and residential houses that have not been utilized, namely by utilizing household/livestock waste-based organic fertilizer and planting horticulture plants and feed crops together or personally in their respective environments.

Community empowerment is one of the important activities that need to be carried out in an effort to empower especially those who are considered weak and vulnerable to poverty so that they have the ability and strength and can release themselves from various downturns, and backwardness and thus their desire to become advanced, independent and fulfilled of all their needs groups can be achieved (Haris, 2014).

Farmers and breeders who have an open attitude towards change will easily interact with agricultural extension agents. Experience in managing farming activities will shape the attitudes of farmers and breeders to the integrated farming innovations introduced by agricultural extension agents. Various factors that influence the formation of attitudes are personal experience, culture, other people who are considered important, mass media, institutions or educational institutions and religious institutions, and emotional factors within individuals. Attitudes obtained through experience will cause a direct influence on the next behavior (Indraningsih, 2016).

The findings of the study that changes in behavior influence Subsaector's Food Independence Level of Livestock. Behavior change is measured by knowledge of attitudes and skills. This is in accordance with the results of research by Darmawan and Fadjarajani (2016) which show that knowledge and attitudes strongly influence a person's behavior, especially behavior towards their environment.

Abdullah (2016) argues that with appropriate services and a more persuasive approach, officers can make changes to the first and third elements. The development of knowledge and skills is the main mission of extension agents, if the material and methods can increase the knowledge and skills of farmers in solving their problems, then the breeders' institutions will become the foundation of farmers in developing their businesses.

Developing behavior in the farmer subsector is the first step in improving the quality of human resources as a driver of development. Increased behavioral changes from changes in knowledge

that cover all changes from what farmers know that are disadvantageous are more conducive, changes in thinking skills in managing livestock business and changing attitudes include thoughts and feelings. Breeders' behavior is also influenced by individual characteristics, namely age, education, experience, income, number of families and scale of livestock business (Rahmayanti, 2016).

Building food sovereignty, food independence and food security is also a strategic instrument of agricultural development by utilizing a variety of biological resources, restoring local food diversity, and building agriculture-based industries in the countryside. Community participation in realizing food sovereignty, food independence and food security can be carried out through the implementation of production, distribution, trade and food consumption.

The results of the research show that the level of food independence is significant and positively influences the stability of food availability. Food availability in one area and at certain times can be met from three sources, namely domestic production, food imports, and food reserves. The availability of food to meet food needs is sought through domestic production including food reserves. Food import is the last choice if there is a scarcity of food production. National food security is a pillar for the formation of quality human resources and generation, which is needed to build this nation. Food independence at the household level needs greater attention in the future, because household food independence is the foundation of regional and national food independence (Nainggolan, 2016).

Food security at the national level is defined as the ability of a nation to ensure that all its population obtain adequate food, good quality, safe; based on the optimization of utilization and based on the diversity of local resources, ideally the ability to provide food sourced from within the country itself. Food security, in addition to being a prerequisite for fulfilling people's food rights, is also a pillar for the existence and sovereignty of a nation. Therefore, all components of the nation, namely the government and the community, agreed to jointly develop national food security (Nainggolan, 2016).

The availability, access, absorption and stability of food is one unified sub-system that must be fulfilled in its entirety. If one of these subsystems is not fulfilled, then a nation cannot be said to have good food security (Baladina et al., 2017).

Yulia, et al. (2017) stated that the growth of the livestock subsector is still found several problems, among other in the poultry industry, the supply of feed is still dependent on imports. In the large ruminants industry, relying on people's livestock businesses is unable to meet the increasing demand, and the feed industry has not been well cultivated. The limited infrastructure and trade in live animals without control is likely to spread the disease and the quality and safety of products is not guaranteed.

CONCLUSION

Research findings can conclude that this study found that 1) farmer participation affect the changes in farmer behavior. 2) Community Empowerment affect the changes in farmer behavior 3) Changes in behavior affect the level of food independence of the livestock subsector 4) the level of food independence is significant and positive influences the stability of food availability

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

The article is part of the Dissertation of Doctoral and all the authors have contributed: LHM data collection, data analysis and writing manuscript, Prof. KS, Prof S, and Dr. YY, contributed to review of manuscripts.

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