

畜舎移転モデル地区における肉牛農家特性と革新技術の普及効果

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The Relationship of Beef Cattle Farmer's Characteristics and the Extension Effectiveness of Livestock Innovation in the Two Models of Livestock Resettlement Area

— Based on the Experience of an Extension Method used in Yogyakarta Province, Indonesia —

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畜舎移転モデル地区における肉牛農家特性と革新技術の普及効果

— インドネシア, ジョグジャカルタ州の経験 —

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Résumé

この論文の目的は、2ヶ所の畜舎移転モデル地区のケース・スタディによって、それぞれの地区における、肉牛農家の特性と肉牛経営強化プログラム（革新技術の普及）の効果の相違を明らかにすることにある。このモデル地区は、農家の畜舎を移転させ、そこで家畜を集中的に管理し、飼育全般についての普及活動を効率よく行うために作られた。

分析の結果、肉牛経営強化プログラムの効果、すなわち畜産の革新技術についての普及効果は、ジョグジャカルタ市の市街地に近い場所に設置されたモデル（第1モデル）では高い範囲にあり、市街地から離れた場所に設置されたモデル（第2モデル）では中程度の範囲にあった。人的要因としては、肉牛の育成に関する意欲とリスクに対する挑戦が、両方のモデルとも、最も普及効果に関係している。第1モデルにおいては、経営要因の中では肉牛の肥育期間の長さが、最も普及効果に影響している。家畜移住モデル地区において利用可能な、よりよいサポート手段を提供することが、肉牛経営に関するイノベーションを肉牛農家に認知させ、それを促すための手助けとなるであろう。

I Introduction

More than 90% of beef cattle populations in Indonesia are kept by small farmers, which generally have some characteristics such as they rear beef cattle as a side business (*sambilan*) in a small scale with a traditional management, so that the beef cattle productivity in Indonesia is low^[6] and the role of beef cattle is still small in generating family income^[2]. The research result showed that the productivity of beef cattle in Indonesia was lower than the other countries, which their livestock management had developed^[1]. And the traditional management of rearing beef cattle caused the lower of beef cattle reproduction performance in Yogyakarta Province^[3].

To improve the traditional livestock management, the

Indonesian government through the livestock extension service has transformed the intensifying livestock technology^[7]. The intensifying of livestock technology recommended to beef cattle farmers to improve their beef cattle's productivity generally consists of the seven principles of raising beef cattle including choosing breed, animal feeding, animal housing, managing reproduction, controlling diseases, marketing strategy, and recording management.

II Background

In providing more client-oriented services needed for implementing extension program effectively using training and visit system, there are some constraints

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faced by the livestock extension service. The number of field extension workers, who are experienced and skilled both in technical and field services are limited and do not increase over the last five years since 1995. On the other hand, the large number of beef cattle farmers cause the low ratio of the field extension workers to the farmers. For example, in Bantul, one of regencies in Yogyakarta Province, Indonesia, a potential place to develop beef cattle farming, there are only 15 livestock extension workers actively who have to give livestock extension services to more than 15,000 beef cattle farmers^{a1}. This situation causes the limitation of extension frequency services to the farmers, and finally it can be a constraint of achieving the extension goal that is the change of farmers' behavior in knowledge, attitude, and skill to adopt the technology recommended. By selecting the appropriate of extension method suitable with the local conditions can be one of the solution of this problem.

The model of livestock resettlement area created by Livestock Service (*Dinas Peternakan*) in Yogyakarta Province is one of the extension methods used by the livestock extension workers in giving their extension services to the farmers. *Dinas Peternakan*, Yogyakarta creates this model by relocating the animal housing, which is usually near to the farmers' house even some of them built in the same of farmers' house, to a certain location that is outside from the settlement area. The farmers do all of animal raising activities in this model. Also, the extension workers focus their extension service in this model.

The model, as an extension method, has some advantages and disadvantages. By using this model, it can help the tasks of field extension workers such as disseminating livestock innovation's information, managing a livestock extension meeting, and controlling their clients. This model also makes a close communication among the farmers and between the farmers and their field extension workers, and the important thing is the farmers can get the experience of learning the innovation by observing and studying each other directly and also make cooperating among themselves. This model also has some consequences for the farmers that they have to spend more time for keeping their animals as the consequence of the distance of the model to the farmers' house. Because the farmers cannot control their animal

all day long, they have to make a rule for rotation job among them, especially in the night in order to guard their animal from situation which is not to desire such loss. The farmers also have to spend more cost, because they have to rent a certain square area of the land in the model to place their animal housing.

The success of livestock extension as an adult of education process is determined by the awareness of the client to change his/her behavior by him/herself actively through learning effort. The extension effectiveness achievement is one of the criteria to know the success of this extension effort⁶¹. By measuring the level of extension goal achievement that is the level of farmers in implementing the innovation, we can know the effectiveness of the extension effort. To make an extension effectively, the field extension workers have to know the characteristics of his/her clients⁶². The purpose of this study is to know the level of extension effectiveness of intensifying beef cattle management program in the model of livestock resettlement area and also examines the relationship between personal and situated characteristics of farmers and the extension effectiveness.

^{a1} Yearly reporting by *Dinas Peternakan*, Bantul (2000).

III Methods

The respondents of this study are all of the farmers being members of the model, having and raising their own beef cattle in the model. Personal characteristics include age, formal education, experience with raising beef cattle, motivation of raising beef cattle in the model, and willingness to take risk. Situated characteristics include number of beef cattle ownership, period of raising beef cattle in the model, distance from farmer's house to the model area, and relation intensity among the farmers and between the farmers and their field extension workers. The interview using a questionnaire is the technique to collect these data. Another kind of data is the extension effectiveness that is collected by observing and interviewing the farmers relating with the implementation of the intensifying of beef cattle management program.

The measurement of some variables in this study uses the score achievement. These variables are motivation of

raising beef cattle in the model, willingness to take a risk, relation intensity among the farmers and between the farmers and their extension workers, and the extension effectiveness. Each variable which is measured by the score achievement has at least one indicator (question) in the questionnaire with three alternative choices (A, B, and C). The alternative choices (A, B, and C) have their score values: 3, 2, and 1 respectively. These score values (3, 2, and 1) also reflect the level of an indicator: high, middle, and low respectively. The total score of all indicators determine the level of variable. In this study, we make three standard levels of variable: high, middle, and low based on the minimum and maximum scores. The minimum score is the total number of the alternative choice C (score 1) for all of the indicators in every variable. The maximum score is the total number of the alternative choice A (score 3) for all of the indicators in every variable. We divide into three ranges between the minimum and maximum scores reflecting high, middle, and low categories of every variable.

This study selects the intensifying of beef cattle management program as a livestock innovation. *Dinas Peternakan* in Yogyakarta Province has recommended this innovation to improve the productivity of beef cattle in rural area. Generally, this program has seven principles of raising beef cattle for rural farmers. These seven principles are (1) choosing breed by focusing on the selection of the breed through avoiding inbreeding factor, (2) animal feeding by focusing on the concentrate feeding and kinds of improved grasses such as *King-grass* and *Elephant-grass*, (3) animal housing by focusing on the effort of hardening the housing floor and making a good drainage, (4) managing reproduction by focusing on the implementation of artificial insemination for animal mating system, (5) controlling disease by focusing on the effort of keeping the cleanness of animal housing and around it and washing the beef cattle, (6) marketing strategy by focusing on the implementation of group marketing strategy, and (7) recording management by focusing on the implementation of recording activities for all of raising beef cattle activities including economic and technical aspects.

Data analysis uses Spearman Correlation to know the relationship between farmer's characteristics and the extension effectiveness^[9].

This study is a case study for researching the two models of beef cattle resettlement area in Bantul Regency, Yogyakarta Province. Yogyakarta Province is chosen because this province has an advanced agricultural development and a good organized extension system^{b)} and Bantul Regency is chosen because this regency has the highest density of beef cattle number in Yogyakarta Province by 73 head/km²^{c)}. The first model is chosen, as a model of beef cattle resettlement area that is near to the central city of Yogyakarta and the second model is a model that is far from the central city of Yogyakarta. The purpose of choosing these two models is to get more information from the different condition and situation of the models. For the first model, the distance to the central city is about 7 km. The total land area is about 4000m² for animal housing and is about 800m² for planting kinds of improved grasses such as *King-grass* and *Elephant grass*. This model also has a certain area that can be used for letting loose the animals. Each farmer can manage 60 to 100 m² and they have to pay for renting about 12,000 to 15,000 rupiah/year. The numbers of farmers who are the member of this model are 46 farmers. The second model, the distance to the central city is about 25 km southern part of Yogyakarta. The total land area is 1.6 ha. Because the location is near the beach, this model does not have a certain area for planting kinds of improved grass, but in this model can be planted kind of legum plants such as *Gliricidia-maculata*, which also have a function as a divider among the animal housing. Each farmer can manage about 150 to 200m² and they do not have to pay for renting the land. The numbers of farmers being the member of this model are 73 farmers.

^{b)} New Release from the World Bank group No. 99/031/EAP.

^{c)} Yearly reporting by *Dinas Peternakan*, Yogyakarta Province (2000).

IV Results and Discussions

Respondent's Characteristics

Respondents' characteristics in this study are divided into personal and situated characteristics. Table 1 presents the average of personal characteristics of the beef cattle farmers. The study found that there are

Table 1. The average of respondent's personal characteristics

Personal Characteristics	1 st Model a)	2 nd Model b)	Probability
Age (years old)	53.51	41.25	0.0001***)
Length of formal education (years)	4.54	6.00	0.0141**)
Experience with raising beef cattle (years)	21.47	14.60	0.2748
Motivation of raising beef cattle in the model (score)	8.20	7.64	0.0105**)
Willingness to take a risk (score)	2.11	2.02	0.4048

a): 35 respondents, b): 58 respondents, ***): significant difference ($P \leq 0.01$)

**): significant difference ($P \leq 0.05$).

significant differences between the two models in personal characteristics including age ($P \leq 0.01$), length of formal education ($P \leq 0.05$), and motivation of raising beef cattle in the model ($P \leq 0.05$).

The average age of the respondents in the 1st model is 53.51 years old with the range of 24 to 67 years old, and in the 2nd model is 41.25 years old with the range of 22 to 65 years old. The length of formal education both in the 1st and 2nd models range from zero (0) to 12 years with the average of 4.54 years and 6.00 years respectively. The average of experience with raising beef cattle is relatively very experienced both in the 1st and 2nd models that are 21.74 years (the range: 4 to 50 years) in the 1st model and 14.60 years (the range: 3 to 40 years) in the 2nd model.

Motivation of raising beef cattle in the model is in high category both for farmer in the 1st and 2nd models. There are three indicators (questions) to measure the motivation variable. These indicators are (1) the reason for making decision to rear the beef cattle in the model, (2) the willingness of farmer to invest the capital in raising beef cattle in the model, and (3) the farmer's statement that more benefit will be gotten by raising the beef cattle in the model. Based on the standard level of the variable mentioned in the methods section of this study, the level of high for the variable of motivation is in the range between the total score of 7 to 9. For motivation variable, the average of achievement score both for farmers in the 1st and 2nd models is in the range of 7.00 to 9.00. From the tabulation of the data describing the score achievement for every farmer, 91.43% of the farmers in the 1st model are categorized in high category and also for 82.76% of the farmers in the 2nd model. Most farmers (74.28% in the 1st model and 55.17% in the 2nd model) state that the reason for raising their animal in the model is because of their

willingness, not because of suggestion or compulsion from the other person. 74.28% of farmers in the 1st model and 46.55% of farmers in the 2nd model have a willingness to invest all of the capital in raising beef cattle in the model. The farmers also believe that they can get more benefit in raising beef cattle in the model (88.57% of farmers in the 1st model and 84.48% of farmers in the 2nd model).

The average achievement score of willingness to take a risk both in the 1st and 2nd models is in middle category with the range of 1.67 to 2.33. To measure this variable, this study uses one indicator. This indicator is the farmers will be asked for their attitude toward the implementation of the innovation. Based on the data survey, 54.29% and 74.14% of farmers in the 1st and 2nd models respectively are in high category. More than 50% of farmers both in the 1st and 2nd models state that before implementing the innovation in their own farms, they will look for the information from other farmers who have already implemented the innovation to know their successfulness.

The average of situated characteristics (Table 2) shows that number of beef cattle ownership in the 1st model is 1.98 Animal Unit (AU) with the range of 1.00 to 3.50 AU, and in the 2nd model is 1.35 AU with the range of 0.5 to 2.25 AU. One Animal Unit used in this study is equal to one cattle for more than two years of the age. For heifer with the age range between one year and two years, one heifer is equal to 0.5 AU. For calves with the age less than one year, one calf is equal to 0.25 AU. The average of length period of raising beef cattle in the model is longer in the 1st model than in the 2nd model that is 6.03 years and 5.06 years respectively. The distance of respondent's house to the model is 191.43 meter in the 1st model, and in the 2nd model is 490.52

Table 2. The average of respondent's situated characteristics

Situated Characteristics	1 st Model ^{a)}	2 nd Model ^{b)}	Probability
Number of beef cattle ownership (AU)	1.98	1.35	0.0001***)
Length period of raising beef cattle in the model (year)	5.06	6.03	0.0001***)
Distance of respondent's house to the model (meter)	191.43	490.52	0.0001***)
Relation intensity (score)	6.26	6.52	0.2562

^{a)}: 35 respondents, ^{b)}: 58 respondents, ***): significant difference ($P \leq 0.01$).

meter. The average of achievement score of relation intensity both in the 1st and 2nd models is in low category that is in the range score of 4.00 to 6.66. For measuring the level of relation intensity variable, this study uses four indicators. These indicators are (1) frequency of farmer to be visited by his/her field extension worker in the last month, (2) frequency of farmer to visit his/her field extension worker in the last month, (3) frequency of farmer to ask for the information regarding the beef cattle raising activities to the other farmers in the model in the last month, and (4) frequency of farmer to be asked for the information regarding the beef cattle raising activities by the other farmers in the model in the last month. Based on the data survey, it shows that more than 50% of farmers both in the 1st and 2nd models were not visited by their field extension workers in the last month. Also, more than 50% of farmers both in the 1st and 2nd models state that they did not visit their field extension workers in the last month. More than 50% of farmers both in the 1st and 2nd models state that they

had ever been asked for information by the other farmers in the model during the last month. Also, they had ever asked for the information to the other farmers in the model during the last month. Although most of the farmers make more relation among them, but most of the information do not relate to the beef cattle farming, except the information for another activity such as the situation of their family.

Extension Effectiveness

The extension effectiveness achievement is one of the criteria to know the success of the extension efforts using the model of livestock resettlement area as their extension method. The implementation of the total seven principles of raising beef cattle (Table 3) in the 1st model is in high category (in the range achievement score of 46.68 to 60.00), but in the 2nd model is in middle category (in the range achievement score of 33.34 to 46.67).

Table 3. The average achievement score of the extension effectiveness of intensifying beef cattle management program in the beef cattle resettlement area

No.	The Principles of Raising Beef Cattle	Minimum Score ^{c)}	Maximum score ^{d)}	Achievement Score 1 st Model ^{a)}	Achievement Score 2 nd Model ^{b)}
1.	Choosing breed	2	6	4.51	4.83
2.	Feeding	5	15	12.83	11.09
3.	Housing	3	9	7.14	6.90
4.	Managing reproduction	4	12	9.83	9.86
5.	Controlling disease	3	9	7.69	7.74
6.	Marketing	2	6	3.29	3.24
7.	Recording management	1	3	1.40	1.00
8.	Total principles	20	60	46.69	44.66

^{a)} : 35 respondents, ^{b)} : 58 respondents, ^{c)} : the total number of the alternative choice C (score 1) for all of the indicators in every item, ^{d)} : the total number of the alternative choice A (score 3) for all of the indicators in every item

Source: calculated from primary data.

For the first model, the items of intensifying beef cattle management program that are in the high category include feeding, housing, managing reproduction, and controlling diseases. For the item of feeding, there are five indicators to know the level of implementation category. These indicators are (1) the effort of giving improved grass feeding, (2) frequency of giving improved grass feeding, (3) the way to get improved grass, (4) frequency of giving concentrate feeding, and (5) the way to give water drinking. More than 50% of farmers in the first model state that they give improved grass for their beef cattle every day. They can provide improved grass by themselves without any problem. Most of the farmers also give concentrate feeding every day. All of the farmers make a limitation for water drinking. No farmers give water drinking in ad-libitum way. For the item of housing, there are three indicators used in this study. These indicators are (1) condition of floor housing, (2) feeding and drinking equipments, and (3) frequency of cleaning the animal housing. Although more than 50% of the farmers in the 1st model do not harden the floor housing, but the other farmers in this model (28.57%) have already hardened their floor housing by cement. Most farmers in the first model have used feeding and drinking equipments separately. They also usually clean the animal housing at least once in a week. There are four indicators to know the implementation level of managing reproduction. These are (1) animal mating system, (2) the age of the heifer for mating in the first time, (3) calving interval, and (4) number of calf born alive during the last year. Although 68.57% of the farmers in the 1st model have used artificial insemination for animal mating, but some farmers (11.43%) still use natural mating system using a bull, and the rest (20%) use artificial insemination continued by using a bull. 48.57% of farmers in the 1st model will mate their heifers for the first time when the age of the heifer is between 1.5 years to 2.5 years. But some farmers (28.57%) will mate their heifer for more than 2.5 years of the heifer age. No farmers in the 1st model state that their beef cattle's calving interval are more than 3 years. Most of them (71.43%) state that their beef cattle's calving interval are less than 2 years. 62.86% of farmers in the 1st model state that at least one calf was born from the total female cattle they had

during the last year. There are three indicators to know the implementation level of controlling diseases item, specifically (1) frequency of washing the beef cattle, (2) intensity of any diseases happened during the last month, and (3) intensity of the death happened during the last year. Although only 17.14% of farmers in the first model wash their beef cattle every day, but most farmers (62.86%) state that there were not any diseases happened during the last month. Also, most farmers (88.57%) state that there was not any death happened for their beef cattle during the last year.

For the second model, the items of intensifying beef cattle management program that are in the high category include choosing breed, managing reproduction, and controlling diseases. There are two indicators to know the implementation level of choosing breed, specifically (1) the source of the breed and (2) the way to get the breed. Although most farmers (44.83%) in the 2nd model state that they get their beef cattle breed from beef cattle market, but some farmers (41.38%) in the 2nd model state that their beef cattle breed come from their own farm which have already been known the pedigree of the breed. Most the farmers in the 2nd model also state that they select their breed by themselves without any constraints. The high category of implementing the managing reproduction item indicates that most of farmers in the 2nd model have already implemented the artificial insemination as their animal mating system. Most farmers also state that the age of the heifer is in the range of 1.5 years to 2.5 years when the heifer is mated for the first time with the calving interval is less than two years. 68.97% of farmers in the 2nd model state that they could get at least one calf from the total female cattle they have during the last year. Almost the same with the situation in the 1st model for the implementation level of controlling diseases item, this study also found that although only 15.52% of farmers in the 2nd model wash their beef cattle every day, but most farmers state that there were not any diseases happened during the last month. Also, most farmers state that there was not any death happened for their beef cattle during the last year.

The implementation level of choosing breed item for farmer in the 1st model is in the middle category. This situation can be explained that only few farmers (17.14%) get their breed from their own farm which

Table 4. The relationship between personal characteristics and the extension effectiveness

Personal Characteristics	1 st Model		2 nd Model	
	r	Probability	r	Probability
Age	0.0535	0.7603	-0.0569	0.6716
Length of formal education	0.1315	0.4513	0.0636	0.6354
Experience with raising beef cattle	-0.0084	0.9618	-0.0656	0.6248
Motivation of raising beef cattle in the model	0.7279	0.0001 ^{***})	0.5352	0.0001 ^{***})
Willingness to take a risk	0.6357	0.0001 ^{*)}	0.2209	0.0957 ^{*)}

***): significance ($P \leq 0.01$), *) : significance ($P \leq 0.10$).

have already been known the pedigree of the breed. Most farmers (54.29%) state that the source of their breed is from public animal marketing which is difficult to avoid the inbreeding factors because no information regarding the pedigree of the breed.

The implementation level of feeding and animal housing items for farmers in the 2nd model is in the middle categories. The location of the 2nd model which is near to the beach may cause the difficulties of farmers to find the land for planting kinds of improved grass. Also the economic condition of the farmers in the 2nd model which are relatively poor cause the lack of farmers' ability to buy the improved grass for their beef cattle. But, farmers can provide kinds of legume besides of native grass for feeding of their beef cattle. Only few farmers (6.90%) have already hardened the floor of the animal housing by cement. Most of the floor of animal housing in this model are the natural land without hardening it.

The implementation level of marketing and recording management items is in the low category both for farmers in the 1st and 2nd models. Because of the small-scale size of beef cattle farm and the farmers rear the beef cattle as a side business, they cannot make a plan for selling the beef cattle product regularly. The main function of beef cattle farming for farmers whether in the 1st or 2nd models is a saving which can be sold any time when they need more money. Because lack of marketing information, the farmers are also depended on the person who is specialist in selling the animal product (*belantik*). Only few farmers in the 1st model (8.57%) make a recording for all of aspects including economic and technical in beef cattle farming activities. Most farmers never make a recording for their beef cattle farming activities; even for farmers in the 2nd model all of them do not make this recording. The low

of farmers' education level cause the difficulties of farmers in implementing the recording management.

The Relationship between Personal Characteristics and The Extension Effectiveness

The results of correlation analysis between personal characteristics and the extension effectiveness of intensifying beef cattle management program (Table 4) show that motivation of raising beef cattle in the model and willingness to take a risk are variables which have positive relationship significantly with the extension effectiveness for both the 1st and 2nd models. High motivation of raising beef cattle in the model, the extension effectiveness seems to be high. This result supports the previous study that motivation of the clients to change their behavior is a factor determining the level of extension effectiveness which has the purpose to change the clients behavior^[9]. High willingness to take a risk, the extension effectiveness also tends to be high. This result can be explained that generally small farmers usually will take a risk to implement the innovation if they are sure that the innovation can gain the benefit for their farms.

The Relationship between Situated Characteristics and The Extension Effectiveness

Table 5 shows that only length period of raising beef cattle in the model is a variable of situated characteristics that has positive relationship significantly ($P \leq 0.05$) with the extension effectiveness for farmers in the first model. There are not any situated characteristics that have significant relationship with the extension effectiveness for farmers in the second model. These

Table 5. The relationship between situated characteristics and the extension effectiveness

Situated Characteristics	1 st Model		2 nd Model	
	r	Probability	r	Probability
Number of beef cattle Ownership	0.2060	0.2351	0.1366	0.3066
Length period of raising Beef cattle in the model	0.3842	0.0227**)	0.1988	0.1347
Distance of farmer's house to the model	-0.1196	0.4938	-0.1077	0.4211
Relation intensity	0.2713	0.1150	-0.0760	0.5707

**): significance ($P \leq 0.05$).

results indicate that longer period of raising beef cattle in the model; the farmers in the 1st model are more likely to be easier to get information and to take advantage of some facilities which are available in the model. For farmers in the second model, the situations, which relatively have less facilities and information dealing with the innovation, cause the difficulties of farmers to observe the success of implementing the innovation.

V Conclusions

From the results of the research, we can conclude that the extension effectiveness of intensifying beef cattle management program for the model that is near to the central city of Yogyakarta Province is in high category. The category of extension effectiveness is in the middle for the model that is far from the central city of Yogyakarta.

Motivation of raising beef cattle in the model and willingness to take a risk are the important personal characteristics related to the extension effectiveness of intensifying beef cattle management program in the model of livestock resettlement area.

The length period of raising beef cattle in the model is an important situated characteristics related to the extension effectiveness for the model that is near the central city of Yogyakarta. Providing better support facilities that are available in the model may be able to help the farmers in having an opportunity to observe and try the innovation in their own beef cattle farm.

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