Development of Learning Material for the Livestock Production System at the Beef Cattle Farmers

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Abstract The activity aimed to arrange the learning materials for farmer based on the cattle production system. The learning materials or curriculum is developed based on system theory perspective. In the system theory, there are two approaches which are hard system and soft system. The hard system refers to a quantitative perspective with rigid indicators such as technology implementation, productivity, and efficiency. Meanwhile, the soft system considers problem-solving based on the level of understanding, attitude and participation, teamwork, and motivation. This community services focused on applying soft system approach to arrange learning materials through farmer participation. The Participatory Rural Appraisal (PRA) technique was conducted to stimulate farmers to identify their production problems and to prioritize the problem solving for learning materials. This article concluded that cattle farmers were able to identify and to prioritize the problem better through PRA stages.

1. INTRODUCTION

According to Agricultural Census 2013, the population of beef cattle as meat producer in Indonesia reached 12.3 million with 98% of them was raised by the smallholder farmers with business scale 2 to 3 heads (BPS, 2013). The majority of the livestock were raised by farmers who owned limited land that was less than 0.5 Ha per household. To overcome the limited land ownership, the beef cattle farmers in Indonesia had performed an integration system with crops cultivation. The integration of livestock-crops cultivation had been practiced by the farmers since the beginning of the 19th Century. (Paris, 2002; Tanner, Holden, Owen, Winugroho, & Gill, 2001). Till today, the

livestock production system in Indonesia is dominated by the integration system of livestock farming with crops cultivation.

The biggest challenge in livestock production today is the ability to supply animal products to fulfill the needs of 240 million citizens in Indonesia. Moreover, by the beginning of the ASEAN Economic Community (AEC), it encourages us to see that the competition in the ASEAN level is clearly open. On the other hand, the beef production for instance currently is still supported by smallholder farmers. Even the data from Central Bureau of Statistics showed that this business scale was recorded having a decrease from 3.5 heads/beef cattle farmer's household in 1993. Meanwhile, the national demand for beef had reached 2.6 kg/capita/year in 2016 with an average growth of 10% (KEMENTAN, 2015).

Besides the limited ability to supply domestic meat, the point of view of beef cattle production policy was still very sectoral. The beef cattle production had not been seen systemically from input in the upstream and output in the downstream. The system itself is defined as a complex interaction between components to form wholeness (Bertalanffy, 1951). The system consists of components that function to produce information for other components in the next stages (Checkland, 2012). The system perspective is very multidimensional either related to science or social dimension like policy application (Checkland, 2012; Noe & Alrøe, 2003). Therefore in the system perspective, if we see the meat production as the wholeness in the beef cattle production system, the lack of supply can be definitely influenced by the low productivity of production sub-system, distribution sub-system inefficiency, and the low capacity of farmer human resources.

In the systemic perspective, there are two system approaches namely hard system and soft system, which is usually applied to analyze and elaborate a problem (Checkland, 2012). The hard system emphasizes on elaborating the problem quantitatively through definite indicators like productivity and efficiency. While the soft system refers to the process of solving, the problems itself emphasize on the level of understanding, attitude, and participation. This community service developed farmer's participation as the soft system approach to develop the farmers' capacity. The farmers' participation became an important indicator in a social asset needed to increase prosperity (Putra *et. al.,* 2017). So far, the hard system approach is very dominant by introducing efficient technology that can support livestock productivity. In the soft system approach, farmers participation becomes the main component to analyze the need for relevant information for them.

This community service program aimed to enable the beef cattle farmers to identify the real problems they faced. In addition, the farmers were also able to develop the learning material with participatory approach adjusted with their own needs. The benefit of this activity was the farmers at Pengkok Village, Patuk Sub-district, Gunungkidul Regency was able to improve their capacity through a program that they planned and implemented independently.

2. PROBLEMS

The system approach to elaborate on the problems in food production and distribution is still rarely applied in Indonesia. The supervising implementation using system perspective is more applied to cultivation and production sector such as the integrated farming system, crops-livestock farming integration system, etc. In the livestock

production, the research on ruminants also applied the point of view of the system, especially to look the prospect, challenge, and livestock productivity (Budisatria, Udo, Eilers, & van der Zijpp, 2007; Knipscheer *et al.,* 1984). In addition, the process of technology dissemination also utilizes systemic models to elaborate the challenge in the field (Agunga & Putra, 2015; Kemper *et al.* 2008; Margono & Sugimoto, 2011).

The model of the livestock production system especially beef cattle is principally built based on the interaction between production and distribution sub-systems. Interaction between sub-systems is based on the indicators of industry culture such as productivity, efficiency, and technology intervention. By the existence of two system approaches, on the hard system approach, the industry culture can be seen from how far the productivity and efficiency of beef cattle business are carried out. Meanwhile, on the soft system approach, farmers' participation becomes an important indicator for the level of farmer's quality in that system.

The farmers at Pengkok Village, Patuk Sub-district, Gunungkidul Regency experienced problems to identify problems in the process of their farming practices. The farmers did not have the experience to systematically list the problems based on the priority scale of problem-solving. So far, the supervising and extension activities were not relevant to their needs. The external parties who give provide extensions had materials presented to them without identifying the real problems faced by the farmers.

3. METHOD

The location of community service was at Pengkok Village, Patuk Sub-district, Gunungkidul Regency. There were six farmers groups in this location with a population of beef cattle 767 heads. The participants in this community service activity were

farmers who were grouped into farmers groups at Pengkok Village namely Sedya Rukun, Rukun Makaryo, Pengkok 1, Sumber Usaha, Amrih Makmur, and Kalinampu.

The method of the community service implementation was arranged according to activities stages as Table 1.

Table 1. Activities Implementation Stages and Performance Indicators of Community Service

No	Activities	Performance Indicators
1	Assessment	This activity was organized to identify the potency and resources possessed by the farmers at Pengkok Village. The result expected was data and situation baseline of Pengkok Village
2	Program Socialization	This activity was carried out to give comprehensive information about the community service activities to the farmers.
3	Learning material development	Through the Participatory Rural Appraisal (PRA) approach, farmers were stimulated to be able to identify their condition, problems, and challenges would be faced. Further, the learning material was arranged. The output was learning material based on the problems priority scale.
4	Evaluation	At the end of the activity, farmers were supervised to evaluate the process of learning material arrangement. The result of evaluation can be used as the basis to create the Follow Up Planning of further activities.

Sources: Primary Data (2017)

4. RESULT AND DISCUSSION

4.1. *Assessment and Socialization*

Community Service activities began with an assessment and socialization assisted by Pengkok Village Head. Seventeen (17) farmers were involved in the activity in which they joined the problem identification process at the assessment stage.

4.2. *Preparing Learning Materials*

Learning material was prepared by using the Participatory Rural Appraisal (PRA) approach that emphasizes community participation in identifying problems. There are 4 (four) types of instruments that are usually used in preparing learning material, namely: (1) seasonal calendar; (2) household economy mapping; (3) cattle-based economy mapping; and (4) pairwise mapping.

4.2.1. Seasonal Calendar

The seasonal calendar was used to explore one (1) year production activities in the community. This activity was carried out by digging information about the one (1) year harvesting season as well as its planting season or the purchase period of seeds. In the seasonal calendar, we can find out when a community is in a drought (no harvest) or when there is a high cost in starting production.

Information regarding the crops and livestock production season in the farmer group in Pengkok Village were elaborated in participatory. The result obtained was generally Pengkok Village had several main commodities such as rice, peanut, onion, corn, soybean, green bean, beef cattle, goat, and poultry. In the seasonal calendar shown in Figure 4 shows that Pengkok Village is in drought (no harvest) from November to February and April in every year. This evidence was confirmed by all of the group members who attended the PRA sessions. Furthermore, June to August are times when most of the entire production process begins so that the availability of capital for purchasing inputs is highly needed (Table 2).

Tabel 2. Seasonal calendar in Pengkok Village, Pathuk, Gunungkidul

| ACTIVITIES	CROP / LIVE STOCK	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DEC
HARVEST/SELL	PADDY			X			X						
	PEANUT									X			
	ONION										X		
	MAIZE								X				
	SOYBEAN								X				
	GREEN BEAN								X				
	CATTLE					X		X					
	POULTRY								X				
	GOAT / SHEEP										X		
	DUCK / NATIVE CHICKEN	X	X	X	X	X	X	X	X	X	X	X	X
PLANT / BUY	PADDY			X								X	
	SOYBEAN						X						
	ONION										X		
	GREEN BEAN						X						
	GRASS										X		
	GOAT / SHEEP								X				
	CATTLE			X					X				

Source: Primary Data (2017)

4.2.2. Household Economy Mapping

After knowing the seasonal calendar, all participants were given stimulation in a participatory manner to map the economic conditions of the family. At this stage, participants were invited to link one activity with other activity and describe the linkage. Figure 3 shows that in general the main commodities still dominate the production

process. Among these commodities, there are those that they produce for their own consumption and also those that they produce for sale.

The map shows that farmers/livestock farmers produce important commodities for sale and only leave rice that is used for own consumption. The commodity sales models are varied, among others, intermediary traders, markets and direct consumers. Especially for beef cattle, commodity sales are done through intermediary traders (Figure 1).
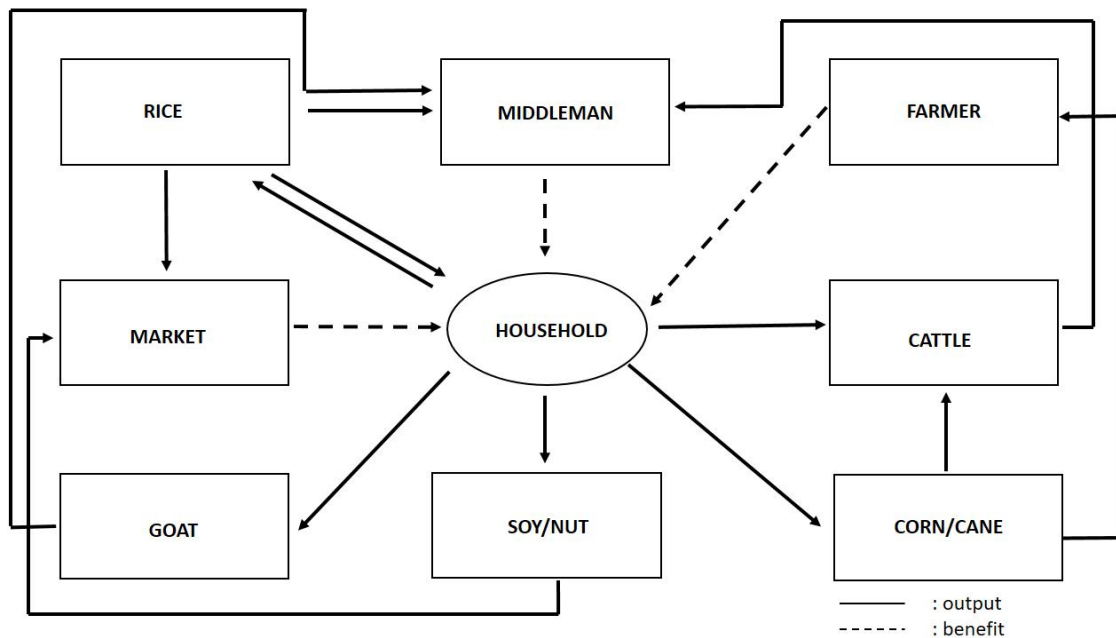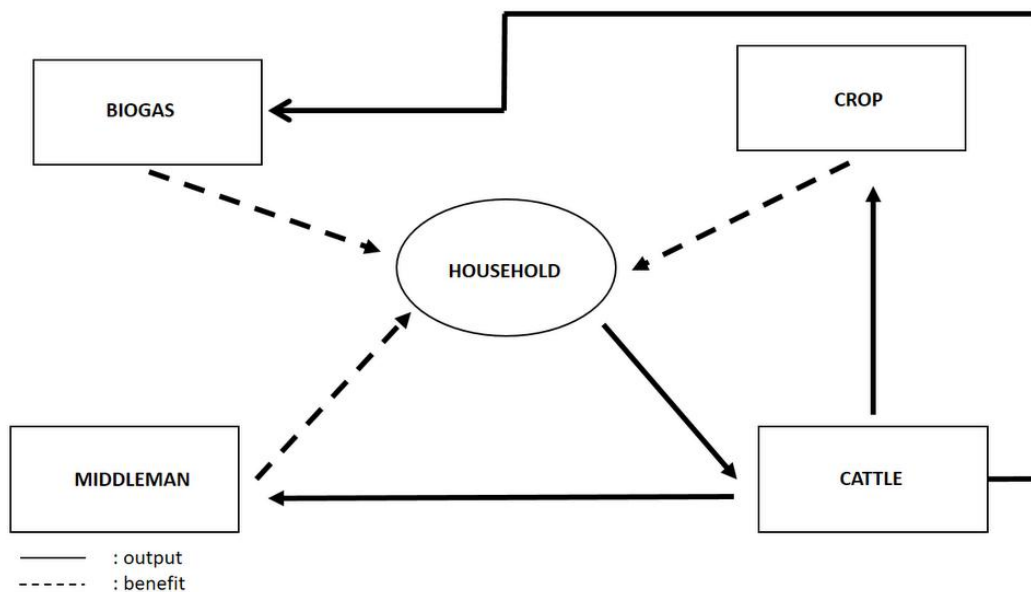

Source: Primary Data (2017)

Figure 1. Household's Economy Mapping

4.2.3. Cattle-Based Economy Mapping

The next step is to carry out household economic mapping based on beef cattle farming. This step aims to determine the flow of beef cattle farming both in inputs and outputs and its relation to the family household. At this stage, it can be seen that beef cattle are

raised on a small scale to utilize the availability of forage in their respective fields. Furthermore, the main production of beef cattle is the manure that can be used for fertilizer and biogas.

The farmers' households usually sell one male beef cattle for Eid Al-Adha or a calf per year. In addition to that, a family usually buys a cow either it is a feeder cattle or breeder cattle per year. It shows that the resource capacity managed by a farmer's household is very limited. This conditions had them ensure that the number of beef cattle they raised remain constant every year. Without the increase of resource in general then there will no improvement in the number of beef cattle they raised.

Source: Primary Data (2017)

Figure 2. Cattle-based Economy Mapping

4.2.4. Pairwise Ranking

In this stage, farmers were facilitated to deliver their problems in beef cattle production. Farmers were then asked to make a priority scale towards those problems. The next step

was to rank those problems based on priority. This rank then became the material learning for training, especially in beef cattle commodities.

Figure 5 shows us the 11 (eleven) problems faced by the farmers every day. From the eleven problems, we performed pairwise ranking to know the priority level of a problem to be solved if compared to other problems. The result was then accumulated to obtain a score. The total score became the basis to create rank and problems grouping. About six (6) priority materials were later used as the learning materials during the counseling program.

No	PROBLEMS OF CATTLE FARMING	FOR	ECO	ANH	HOU	BRD	MRK	SNT	CAP	SKL	REP	BUS	SCORE	Ranking	Grouping
1	FORAGE (SMALL LAND SIZE)		1	3	4	5	1	1	8	9	1	1	**5**	4	6
2	ECONOMY ANALYSIS			3	4	5	2	7	8	9	10	2	**2**	5	1
3	ANIMAL HEALTH				3	5	3	7	8	3	3	3	**7**	3	5
4	HOUSING					4	4	4	8	9	4	4	**7**	2	2
5	BREED						5	5	8	5	5	5	**8**	2	3
6	MARKET FLUCTUATION							7	8	9	6	6	**2**	5	1
7	SANITATION								8	9	7	7	**5**	4	2
8	CAPITAL									9	8	8	**9**	1	1
9	SKILL										9	9	**8**	2	4
10	REPRODUCTION											10	**2**	5	3
11	BUSINESS PLAN												**0**	0	4

Source: Primary Data (2017)

Figure 3. Pairwise Ranking

From all of the PRA stages (Figure 3), the expected result is a learning material based on priority scale of problems that need to be solved. First is Capital and Economic Analysis. This material is expected to provide information to farmers about access to capital, business analysis, and how to deal with price fluctuations. Next, is Housing and Sanitation. This material aims to open up farmers' insights regarding the standard of beef cattle cages and follow the good cage sanitation rules. Issues of housing and sanitation were raised by female participants. This is interesting because women tend to have a bigger concern for housing and prevention of disease through good sanitation rules. The next material is Reproduction and Nurseries. This material aims to open up

farmers' insight about good reproductive management strategies and good seeds, and how to choose one.

Next is Human Resource Skills and Business Development. This material arose from the concerns of farmers about their lack of ability in terms of cultivation. In addition, they feel that their cultivation patterns have not been oriented towards productive enterprises that can always be developed. Next is Animal Health. This material aims to find out tips and tricks in the treatment of diseases in livestock. The last is Forage Feed. This material aims to open up insight into the use of forages and their management in times when the availability of forages decreases.

5. CONCLUSION

From the community service activity, we can conclude that farmers are capable of understanding the role of beef cattle they raised towards the sustainability of the production process in real ways. The role of beef cattle farming also can be seen clearly when they were facilitated in mapping the household economy. It shows that farmers are able to identify beef cattle farming as an active sub-system to encourage a more systemic pattern in raising beef cattle. At the very basic level, the community service model is able to raise systemic awareness for the beef cattle breeders/farmers.

Through this activity, farmers were also capable to develop an identification model as well as create a more structured priority scale. The development of learning materials for problem-solving are based on the needs of farmers. In an agent and client relationship context, this approach favored farmers as a client. The community service analysis report also generated several recommendations, specifically: the learning materials arranged by farmers can be tested for its effectiveness by using action research

approachment. it is to prove that community-based participatory approach (Demand Driven Paradigm) is eligible to become the new approach to balance the so-called dominant paradigm - Training and Visit Paradigm.

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REFERENCES

Agunga, R., & Putra, R. (2015). Training Needs of Indonesian Agricultural Extension Workers for the 21st Century: A Recommendation Based on a Field Study. *Asian Journal of Agriculture and Development*, *12*(2), 45–57. Retrieved from https://www.researchgate.net/profile/Robert_Agunga/publication/286927581_Training_Needs_of_Indonesian_Agricultural_Extension_Workers_for_the_21_st_Century_A_Recommendation_Based_on_a_Field_Study/links/56703e7d08ae5252e6f1d785.pdf

Bertalanffy, L. (1951). General system theory; a new approach to unity of science. 1. Problems of general system theory. *Human Biology*, *23*(4), 302–312. Journal Article.

BPS. (2013). Agricultural Statistic based on Census 2013 [Web Page]. Retrieved from http://st2013.bps.go.id/dev2/index.php/site/index

Budisatria, I. G. S., Udo, H. M. J., Eilers, C. H. A. M., & van der Zijpp, A. J. (2007).

Dynamics of small ruminant production: A case study of Central Java, Indonesia. *Outlook on Agriculture*, *36*(2), 145–152. Journal Article. Retrieved from http://www.ingentaconnect.com/content/ip/ooa/2007/00000036/00000002/art00009

Checkland, P. (2012). Four Conditions for Serious Systems Thinking and Action. *Systems Research and Behavioral Science*, *29*(5), 465–469. http://doi.org/10.1002/sres.2158

KEMENTAN. (2015). *Outlook Komoditas Pertanian Subsektor Peternakan Daging Sapi*. Pusat Data dan Sistem Informasi Pertanian Sekretariat Jenderal Kementerian Pertanian, Jakarta.

Kemper M. Noltze, R. Weber, and H. Faust, D. (2008). The Role of Agricultural "Knowledge" in Rural Communities of Central Sulawesi, Indonesia. *STORMA Discussion Paper Series Sub-Program A on Social and Economics Dynamics in Rain Forest Margins*. Conference Paper, STORMA.

Knipscheer, H. C., Kusnadi, U., & De Boer, A. J. (1984). Some efficiency measures for analysis of the productive potential of Indonesian goats. *Agricultural Systems*, *15*(3), 125–135. http://doi.org/http://dx.doi.org/10.1016/0308-521X(84)90023-4

Margono, T., & Sugimoto, S. (2011). The Barriers of the Indonesian Extension Workers in Disseminate Agricultural Information to Farmers. *International Journal of Basic & Applied Sciences*, *11*(2).

Noe, E., & Alrøe, H. F. (2003). Farm Enterprises as Self-organizing Systems: A New Transdisciplinary Framework for Studying Farm Enterprises? *International Journal of Sociology of Agriculture and Food*, *11*(2003), 3–14.

Paris, T. R. (2002). Crop-animal systems in Asia: socio-economic benefits and impacts

on rural livelihoods. *Agricultural Systems*, *71*(1–2), 147–168. http://doi.org/http://dx.doi.org/10.1016/S0308-521X(01)00041-5

Putra, R.A.R.S, B. Ariyadi, N. Kurniawati, & F.T. Haryadi. (2017). Pengaruh Modal Sosial Terhadap Tingkat Kesejahteraan Rumah Tangga Peternak: Studi Kasus pada Kelompok Peternak Ayam Kampung Ngudi Mulyo, Gunungkidul. *Buletin Peternakan, 41*(3), 349 - 354.

Tanner, J. C., Holden, S. J., Owen, E., Winugroho, M., & Gill, M. (2001). Livestock sustaining intensive smallholder crop production through traditional feeding practices for generating high-quality manure-compost in upland Java. *Agriculture, Ecosystems & Environment*, *84*(1), 21–30. http://doi.org/http://dx.doi.org/10.1016/S0167-8809(00)00177-8.