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Canvassing the Complexity of Beef Cattle Farming; an Entry Point to Qualitative Modelling

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ABSTRACT

In Indonesia, most of the beef farming are embedded in a larger agricultural system. Beef farming becomes one activity among various activities which commonly managed by farmers household. This multifaceted roles makes beef farming a comple7 systems. Studying comple7ity requires an approach which designed to deal with such comple7ity. One of the alternative approach is qualitative modelling using Causal Loop Diagram (CLD). The entry point to develop a model is identifying the everyday flu7 of beef farming activities. However, this often constrained by the hesitance of farmers to engage in the discussion. Researcher need to build an engagement design which should be able to promote discussion and encourage people to start talking. This article aimed to discuss the methods and protocols required to engage people participation as an entry point to develop a qualitative modeling. A series of observation and interviews has been conducted to undertake the study. The research target were beef farmers in Kabupaten Banjarnegara. The study was initiated by undertaking separated preliminary discussion with beef farmers. This step was aimed to engage farmers' participation as well as harnessing their everyday activities related to beef farming and marketing. Then, second discussion was undertaken to identify potential problematic situations i.e. situation considered as uncomfortable. This was conducted by identify the activities, resources, and pressures of the systems. As a result, a Causal Loop Diagram (CLD) was generated describing the beef farming systems. The behavior underneath these CLD was then further discussed to analyze as an effort to tame the comple7ity of beef farming.

Keywords: Qualitative modelling, Causal Loop Diagram, Beef farming, Systems thinking, Systems modelling

INTRODUCTION

Beef farming is one of the focal point of Indonesia's livestock development program. In most part of Indonesia, beef farming is dominated by smallholders. Although it was considered to have a low productivity, yet beef farming is still play a crucial role on farmers' livelihood. For smallholders cattle can be very important social and financial instruments.For many farmers, cattle are not only a source of income but are also a valuable asset(Patrick et al., 2010). Cattle are also have a certain socio5cultural value. It reflects wealth status, as well as family savings and security instrument (Stroebel et al., 2002, Huyen et al., 2010). Cattle have a significant role as a financial buffer for the household during times of drought or crop failure (Dovie et al., 2006) since farmers can easily sell their cattle if they need large amounts of cash (Siegmund5Schultze et al., 2007). These multi roles of cattle

makes the beef farming a comple7 systems. It is not merely focus on technical production aspect, but also on social, economics and even political dimension.

Learning such comple7ity of beef farming requires an approach which able to acknowledge and elaborate its comple7ity. Systems thinking emerges to study the comple7ity. Systems thinking approach has the capability to study the cause and effects, the loops which likely occurred in a real world situation, and even dealing with unavailable data parameter which also often e7perienced in a field study. One of systems instrument which widely used to describe any systems called Causal Loop Diagram (CLD), a qualitative model to describe systems behavior (Sherwood, 2002). However, working with a wide range of variables with all its interconnectivity also had consequences of increasing the comple7ity of the approach. This study aimed to show the method which can be used to help researcher using systems thinking approach to engage participants perspective to visualize the systems.

MATERIALS AND METHODS

This research focused on gaining information of a particular group of farmers, which was smallholderbeef farmer groups. Therefore to deepen the understanding of the cases, purposive sampling (Black, 2002) was used to select the farmer group. Sari Widodo farmers group was then selected as the respondent of this study. Sari Widodo farmer groups was established on the 7th of July, 1972 in Kabupaten Banjarnegara, Central Java Province. The group was initially formed by rice farmer to facilitate access to agricultural innovation. It grew as new members joined, not only from rice farmer but also fish and beef farmers. Currently, Sari Widodo has 22 active members. Therefore, this farmer group plays important role as an e7ample for the surrounding farmer.

The study started with an initial assessment of the beef farming activities. This scoping process was undertaken to gain mutual understanding among researcher and participants regarding the objectives and the approaches of the study. This aimed to improve their sense of being acknowledged, which was e7pected to promote future cooperation(Poppi et al., 2011). The ne7t step was started to structure the problematic situation of their beef farming. This was conducted by asking each and every participants of what situation which they consider as “uncomfortable situation”. Then, the drivers of that uncomfortable situation were e7plored, and their relationships were mapped. To structure the identification, this participants were asked to mention the activities relates to the problem, the resources affected by those activities, and the pressures affecting both activities and resources. Descriptive statistics were used to e7plain and describe the nature and polarity of the connectivity and generate the Causal Loop Diagram (CLD) (Sterman, 2000, Maani and Cavana, 2007). Vensim® software were used to draw the diagram.

RESULTS AND DISCUSSION

Beef cattle are commonly raised in mi7ed crop5livestock farming. Based on the purpose, beef cattle farming can be categorized into two major types, breeding and fattening (8nsminger and Perry, 1997). The main purpose of breeding is to produce calves which will be sold at weaning or at one year old as yearlings(Boykin et al., 1920) whereas fattening refers to fattening up of calves and steers to produce high quality meat. In Indonesia, breeding is conducted mostly on smallholder farms. Although breeding is considered to be a key factor contributing to the development of beef farming and the demand for steers is continually increasing, the industry is not attracted to the idea of establishing breeding farms.

The limited turn5over and the long investment period are two major limiting factors for this (Boediyana, 2007).

Activities. A total of si7 activities were able to be identified during the discussion; fattening, breeding, calving, feeding, cattle purchasing and cattle selling. Participants were then asked to identify any possible direct interaction among activities (Fig 1).

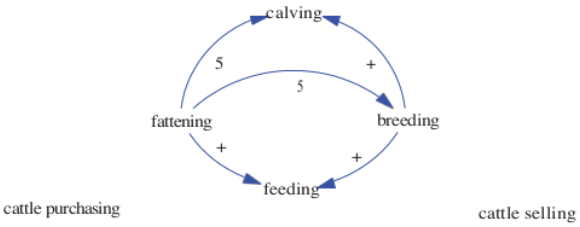

Figure 1. Activities of beef farming

Among those si7 activities, four relations e7isted:

1. As fattening and breeding share the same resource (labour) thus, increasing fattening activities will resulted in decreasing breeding.
2. Fattening will reduce the number of newborn calves. As more cattle were allocated to fattening, less were allocated to produce calves.
3. Breeding will increase the number of newborn calves. As the nature of breeding is to produce offspring, then more cows allocated to breeding will produce more calves
4. Both fattening and breeding requires sufficient feeding. This means that more fattening and breeding will resulted in less forages availability.

Resources. After identifying the activities, participants were then asked to discuss resources which affected by activities in Fig 1. As a results, a total of four resources were able to be identified; cattle for fattening, cattle for breeding, calves, and forages carrying capacity. Ne7t, participants identify the possible direct linkages among resources, followed by direct linkages among resources and activities (Fig 2).

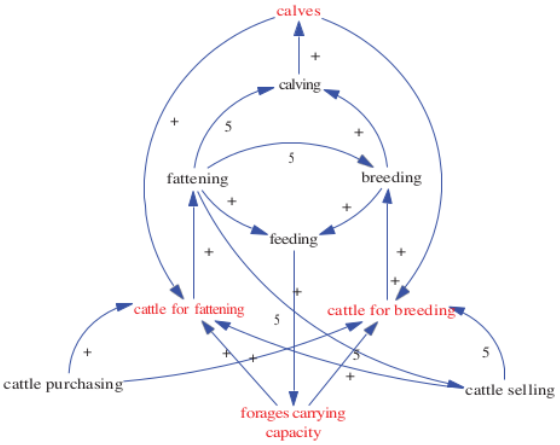

Figure 2. Activities and resources of beef farming

As presented in Fig 2, calving is responsible as engine of growth of total cattle population. It showed as reinforcing loop as follows: more calving – more calves – more cattle for breeding – more breeding – more calving. Fig 2 also showed three balancing loops: First, more cattle for fattening – more fattening – less calving – less calves – less cattle for fattening. Second; more cattle for fattening – more fattening – more selling – less cattle for fattening. Third; more cattle for fattening/breeding – more fattening/breeding – more feeding – less forages carrying capacity – less cattle for fattening/breeding. Based on those one reinforcing loop and three balancing loops, strategies to develop beef farming should not only focused on how to increase beef population, but should also emphasized on how to minimize the limiting factors, i.e. loosen the balancing loops. Also to enrich the structure of the systems, more variables should be added, particularly those which have direct linkages to resources and activities. The model suggest that increasing calving rate will be the fundamental solution to increase the population. However increasing the forages carrying capacity, either through feed technology or e7tensively increase the forage area, should be introduced before it can support more cattle in the systems. Moreover, model also suggest that fattening and breeding should be in balance. Currently farmers tend to lured to shorter fattening cycle to minimize risk.

Pressures. In this study, participants were requested to identify numbers of other variables which affect the resources and/or activities. A total of eight variables have been successfully identified to have direct causal effect to activities and resources (Fig 3).

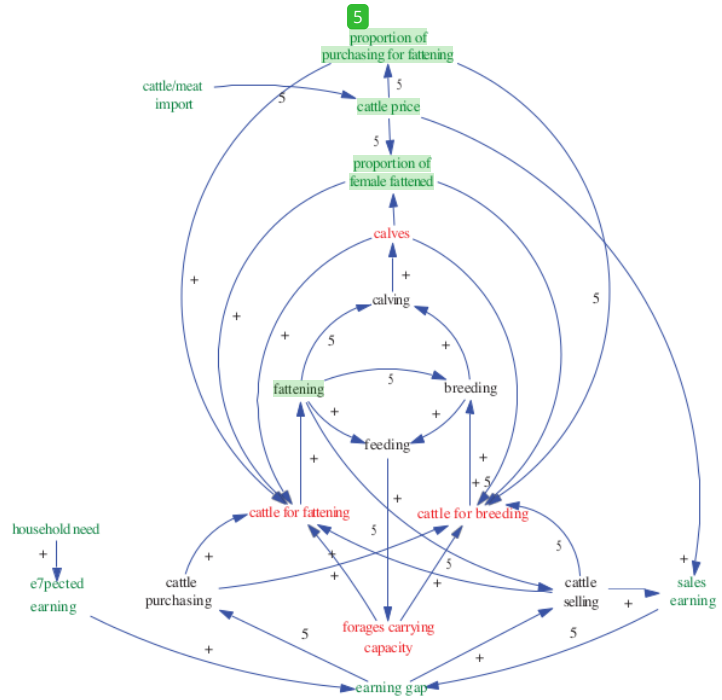

Figure 3. Activities, resources, and pressures of the beef farming system

Figure 3 showed how cattle price and gaps between e7pected and actual earning gap will affect the systems behavior. Farmers argue that any policy which aimed to reduce the cattle price will have significant effect to the systems. Import, as the major driver, will reduce cattle price. Figure 3 describes how imports have effects on the system. On one side, imports

increase farmers' preferences to fatten females and increase the proportion of purchasing for fattening purposes as a response to minimize risk. On the other side, imports decrease sales earning. These effects impact on the official system purposes which are to increase both the cattle population and farmers' incomes. Increasing allocation of females for fattening and slaughter reduces the proportion of cattle for breeding. As this happens, the balancing loop is negatively affected which results in smaller cattle population. Moreover, as sales earning reduce, this will increase gap between e7pected and actual earning which will further reduce the number of cattle purchased and increase the number of cattle sold which results in less cattle population and less earning.

CONCLUSIONS

Study showed that taming the comple7ity of smallholder beef farming could be done by implementing a step by step approach. Requesting participants to identify their daily activities was able to help participants to engage in the discussion as participants. Adding a reasonable number of resources and pressures were proven to be able to provide an ample Causal Loop Diagram (CLD) as a visualization of the systems.

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