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ALTERNATIVE POLICIES FOR SAVING PRODUCTIVE BALINESE COWS FOR CONTROLLING CUTS

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ABSTRACT

One of problems faced in the center of cattle production in Indonesia is the cutting of productive cows. This phenomenon also occurs in the West Timor region of East Nusa Tenggara (ENT) as one of the “Bali” cattle production centers. One of the alternative policy by government to overcome this problem is to save productive cows of “Bali” cattle. A research was conducted to discuss the government policy with applying a dynamics system analysis. The case study approach uses data and mental models from key informants. Data, information, and primary knowledge were collected based on observations, Focus Groups Discussion, and in-depth interviews with key informants. Key informants are determined based on saturation of information and behavioral validation results. Dynamics system modeling is using Ventana Simulation PLE software. The results showed that the actual management and institutions at the farmer level had not played an optimal role in controlling the cutting of productive cows. The policy of saving productive cows by involving the role of Regional Technical Implementation Unit (RTIU) of livestock is able to control the cutting of productive cows of “Bali” cattle. Interaction involving all relevant parties is needed for group strengthening in an effort to increase the production capacity, profits, and cash liquidity of farmers. The implication of the study is that institutions at the farm level must be developed to access various stakeholder services, especially regarding to the role of the RTIU in saving productive cows.

KEY WORDS

Bali cattle, cutting productive females, profits, dynamics system, saving productive females.

One problem that tends to increase in the cattle production centers in Indonesia is the cutting of productive cows in both abattoir and non-abattoirs. The study of Suardana, et al (2013) showed that 99% of the “Bali” cows cut in Pesanggaran slaughterhouses, and 67.49% in Mambal slaughterhouses belong to the category of productive “Bali” cows. According to the research results of Tawaf, et al (2013) in Java and Nusa Tenggara, in the study period of July to August 2013, there were 31.04% of total cattle cut categorized to productive cows. The results of Gebredikan *et al* (2009) showed that the main cause of slaughtering cows in Addis Ababa Abattoir Enterprise is reproductive abnormalities. The study also revealed that reproductive tract abnormalities and mastitis have a considerable impact on the productive and reproductive performance of cows. A study conducted by Bah et al (2010) at the Ngaoundere Municipal Slaughter House showed that the majority (83%) of the cows slaughtered were below 9 years of age. Thirty-three percent of the slaughtered cows were infertile. However, there is need to check for pregnancy in all cows before slaughtering in all national abattoirs to minimise economic losses related to pregnancy losses and to contribute to the growth of the cattle industry.

The phenomenon of slaughtering productive cows is common to East Nusa Tenggara (ENT) but has different causes, especially in largest “Bali” cattle producer in ENT, West Timor. Sales and slaughter of productive cows in Timor occur mainly due to family economic pressures (Nendissa, et al , 2018a and 2018b) and inter-island market demand. Demand for cattle from ENT to be delivered to the island and for increasing local consumption has forced farmers to increase “Bali” cattle sales while the population is declining, (Nendissa, et al 2019). This condition requires an effort to reduce the slaughter of productive cows . This thinking is in line with the statement of Harmini et al (2011), Hegde (2019), Cavallini ET AL (2019), Burgers et al (2019), Roessler (2019) that one of the two important programs for self-sufficiency in meat is to reduce the number of slaughtering productive local cows at the level of community farms aimed at increasing the growth of cattle population. One of the government's efforts is to issue alternative government policies on saving productive cows. This policy of saving productive cows has been launched since the issuance of Law No. 18 of 2009 . In the long run this policy aims to preserve domestic resource cattle such as “Bali” cattle. Although it has been 10 years running, but productive cows slaughter in abattoirs tends to increase .

This study aims to determine the physical structure and decisions of actors involved in the productive female supply chain system. After that, policy interventions will be carried out to increase the effectiveness of controlling productive slaughter cows.

The same phenomenon is thought to occur also in East Nusa Tenggara (NTT) as one of the producer regions. West Timor is one of the centers of Bali cattle production in NTT for inter-island market needs. This condition requires an alternative policy that is able to accommodate the interests of all actors from upstream farmers to slaughterers in abattoir and non-abattoir through a system analysis. One alternative government policy is to save productive cows of Bali cattle. This policy of saving productive cows has been launched since the issuance of Law No. 18 of 2009. In the long run this policy aims to preserve domestic resource cattle such as Bali cattle. Although it has been 10 years running, but productive cows slaughter in abattoirs tends to increase.

This study aims to determine the physical structure and decisions of actors involved in the productive cows supply chain system. After that, policy interventions will be carried out to increase the effectiveness of controlling productive slaughter cows.

METHODS OF RESEARCH

The West Timor region consists of 5 regencies and 1 city, namely: Kupang Regency, Timor Tengah Selatan, Timor Tengah Utara, Belu, Malaka, and Kupang City. Key informant actors were determined through mapping of actors in the “Bali” cattle agribusiness network, both perpetrators and supporters. Determination of the key informant of perpetrators is using the snow ball sampling methods started from the downstream area, i.e., slaughterers and the inter-island traders that are located in each district and city.

The number of key informants depends on the saturation of the information obtained and the results of information validation about the behavior and structure of the real world obtained by structuring the model and understanding its behavior. Data, information, and primary knowledge were collected based on observations, Focuss Group Discussion (FGD), and in-depth interviews with key informants. The type of data collected consists of: numeric data, written data, and mental models. All data is used to build a model of inventory diagrams and stock flow diagram (Figure 1). The results of the model design are further validated in terms of dimensions, structure, behavior and policies. If the model is valid, then a policy change will be proposed in accordance with the problem in the system but if it is not yet valid it will be restructured. Modeling with dynamics system will use PLE Ventana Simulation (Vensim) software. In the inventory and flow diagram, there are several symbols, as follows: a rectangle that states inventory (stock/level), a valve symbol that states the flow (rate or decision point), a name symbol of the flow and a cloud symbol that states the boundary from the model.

Figure 1 – Notation of Making Inventory and Flow Diagram

RESULTS AND DISCUSSION

Purpose of Actors Interaction in Supply Chain Systems of Productive cows of “Bali” Cattle. The survey results show that the interaction between all actors is only for marketing livestock and beef. In general, there are two flows related to the marketing of “Bali” cattle, namely product flow and money flow and market information. The flow of “Bali” cattle product in West Timor has two target markets, namely the flow to the inter-island market (Java and Kalimantan) and the flow to the local market. “Bali” cattle that are sold for the inter-island market is only unflawed bulls. While for the local market the cattle sold can be productive cows, sterile cow, bull and malformed heifer.

The alternative to buy cattle for slaughtering in local abattoir is relatively more so that even without productive cows traders do not lack the required of beef cattle. It's just that the price of a cow is relatively cheaper compared to a defective bull, so if it is available at the local market, the trader will buy it. Even, to be able to sell productive cows, breeders are willing to break the legs of their cows so the cow can't be prevented by market officers to be sold. If the productive cows is defective, the price will be cheaper compared to the non-disabled. The price of productive cow per head ranges from IDR. 7,000,000 to IDR. 8,500,000. depending on the body weight and exterior appearance of livestock. The price difference between productive cows and non productive cows ranges from IDR. 500,000 to IDR. 1,000,000.

As remuneration for “Bali” cattle products and meat supplied, there is a flow of money payments and market information from both inter-island markets and local markets to all actors involved. The flow of money and market information is a reference for all the actors involved to make management decisions both for developing businesses and for households. However, West Timorese farmers as upstream actors are less responsive to the market information. Farmers still attach importance to the flow of money needed today. Market information for business development and future cash flows has not been a priority for farmers. This is also due to the culture of farmers in West Timor who are still present-oriented.

The survey results show that traders only buy productive female of “Bali” cattle if it is offered by farmers. Both farmers and traders know that the cutting of productive cows is prohibited and sanctioned by the government. But sales of productive cows of “Bali” cattle continue to occur because other alternative income sources are not owned by farmers. This condition is the impact of low operating income and the utilization of livestock as savings. As a result, the insistence of offering productive cows of “Bali” cattle is due to farmers must maintain the sustainability of their household consumption activities.

One of the important actors in the “Bali” cattle development system is the government. In marketing “Bali” cattle for both local and inter-island markets, the government collects retribution on cattle sold. The levy is a remuneration for the government that has prepared the cattle market and its infrastructure. The government has also carried out various training programs for farmers groups that are spread throughout the West Timor region. However,

the development program has not yet effectively addressed and has not even touched the problem of selling productive female of “Bali” cattle.

Cutting Behavior of Productive Bali Cows In The System of Beef Availability In The Local Market. To find out the cutting behaviour of productive “Bali” cows in relation to the availability of beef in the local market, two related models are developed, namely the inventory model and cash for abbatoir and non abbatoir traders and local market demand. The inventory sub-model and cash of the abbatoir and non- abbatoir traders illustrate the supply of ready-to-cut “Bali” cattle in the local market, meat production, sales, and abbatoir merchant cash based on local market demand (Figure 2).

Figure 2 – Sub-Model of Inventory and Cash of abbatoir Traders and Non abbatoir Traders

The addition of ready-to-cut cattle stock in abbatoir for local market purposes comes from farmers. The abbatoir traders choice to buy “Bali” cattle that are not male from fattening without defects is caused by the cheaper price of IDR. 500,000 to IDR. 1,000,000. The reduction of “Bali” cattle stock ready for slaughter in abbatoir is caused by slaughter of cattle and depreciation due to death which is accommodated in the depreciation fraction of cattle in abbatoir which is equal to 0.001.

The addition of beef supplies in the slaughterhouse comes from slaughtering of “Bali” cattle from slaughterhouse traders. To obtain carcass stock at the slaughterhouse traders, carcass conversion has been carried out or termed the fraction of meat per head of “Bali” cattle which is 41.25 %. According to Harmini, et al, (2011) the figure was obtained from the carcass per cow on an average of 55 % with a meat content of 75 % from carcass. Not all meat produced by slaughterhouse is sold and therefore, it is accommodated by the depreciation fraction of meat in slaughterhouse which is equal to 0.0595.

The supply of meat in the slaughterhouse is the basis for declining in beef prices in the local market due to supply and demand occurred. The decline in meat prices can be explained through the analysis of availability, perception of availability, and the effect of perception on prices. Prices occurred and the beef sold are the basis for obtaining revenue for the cash of the slaughterhouse traders. The price of local beef is obtained from the multiplication between the average price of beef in the local market (IDR. 90,000 per kg) with the effect of beef availability on beef prices.

The value of the meat sold is the revenue for the cash of the slaughterhouse trader. The cash of the slaughterhouse trader is then used to buy cattle offered by farmers. For this reason, the cash of the slaughterhouse trader will be the basis for slaughterhouse traders in applying for cattle. The more liquid cash owned by slaughterhouse traders, the more they will

approach to their needs. This sub model is related to the inventory and cash sub-model of the farmer as well as local market. Slaughterhouse beef traders get “Bali” cattle from farmers, while the carcasses produced are sold for the local market.

Sub Model of Local Market. The sub model of local market illustrates the growth of the local market in West Timor due to the population and the current population growth rate. In 2014 as a starting point for the model simulation the total population of West Timor was 1,797,415 people and the population growth rate reached of 0.0093 % per year or 0.000775 per month (Figure 3).

Figure 3. Local Market Sub Model

The level of beef consumption per capita of the population of West Timor is 0.3749 kg/person/month (calculated based on BPS NTT, 2018). Furthermore, it can be calculated the total needs of beef needed by the population.

However, the meat needs are not only offered by slaughterhouses but also from non-slaughterhouses. Therefore, the calculation of meat needs is based on the needs of beef from slaughterhouses which amounted to 83.33 % and 16.67% of non-slaughterhouses. This figure is based on the data deduction in 2014 of 1,114 heads/month. The sub-model of local market is related to the meat supply sub-model in the abattoir and also inventory and cash of farmers.

Model Validation. The model that can be believed is a model that describes behavior in accordance with the real world. In order to build a trust in the model, various validation tests have been carried out. Sterman (2000) discusses tests that can be used to assess dynamic models adapted and developed from Forrester and Senge (1980). Model testing can be grouped into 3 tests, namely: structure model test, behavior model test, and policy implications test of the model.

Testing of the model capability built i.e. r , RMSPE, and the Theil test (UM, US, and UC) raises the reproduction of behavior that is in accordance with the system in the real world. The results show that historical data and simulation results have a high correlation. Mean that the existing model can describe the management system and institutional supply chain of productive cows of “Bali” cattle in accordance with the real world. If the RMSPE is relatively below 0.2 indicates that the Theil coefficient (Theil's Inequality Coeficient or U) is useful to determine the ability of a valid model for forecasting. Likewise, if the value of the bias proportion (U^M) and the value of the variance proportion (U^S) is very small (close to zero)

where it ranges from 0.24; 0.086 and 0.43 the model is valid. While the value of the proportion of covariance (UC) is relatively large ranging from (0.679 - 0.919) (Table 1).

Table 1 – Recapitulation of Data Simulation Test

n/n	Cattle Population	West Timor Population	Indonesia Population
R	0,999	0,999	0,999
RMSPE	0,021	0,002	0,0597
U ^M	0,169	0,085	0,036
U ^S	0,243	0,086	0,405
U ^C	0,679	0,774	0,919

Cutting Behavior of Productive Females and the Policy Needed to Control. After the model that has been built is valid then a simulation is performed to determine the behavior of the observed variables. The simulation results in Figure 4, show that the demand for beef is much higher than the supply. The current supply and demand for beef for the next 5 years still has a wide gap. This means that West Timorese farmers still have production opportunities to meet the needs of local and inter-island markets. This opportunity must be fulfilled by producing non-productive ready-to-cut cattle. Production of non-productive ready-made cattle must be supported by a policy of controlling productive cows slaughtered.

The simulation shown in Figure 4 shows that the cutting behavior of productive cows of “Bali” cattle in abattoirs and non-abattoirs tends to increase. This increase in numbers is in line with the increasing population of “Bali” cattle including productive cows. This condition shows that good management and institutions involving various parties above have not played a maximum role in controlling the cutting of productive females. So far the socialization of the prohibition on cutting productive females at the level of abattoir traders has been carried out, but the supply of productive females from farmers continues to cause the purchase and availability at the merchant level to continue.

Figure 4 – Cutting of Bali Cattle in RPH and Non RPH in West Timor

Determination of policies to control the slaughter of productive females is a stage for developing scenarios that will be implemented in the model. Scenarios can be applied in various ways by adding and or removing physical structures and decisions and increasing the parameters needed to change the conditions expected in the real world.

One of the scenarios developed in this study is scenario III to save productive cows. This scenario is carried out by returning productive cows of “Bali” cattle to cows using funds to save productive cows managed by the Regional Technical Implementation Unit (RTIU) in coordination with abattoir officers. This scenario is formulated based on the results of the FGD with abattoir officers. Farmers cannot be prevented from selling productive cows because it is sold to meet household needs. Therefore the government must have funds to hold it in the RTIU for resale or run a rolling program at the farmer level.

In actual conditions there are 25% of productive cows heading to abattoir. Scenario III is done by reducing the flow of productive cows of “Bali” cattle to abattoir gradually, namely:

1) scenario III A, the RTIU buys 0.15% of productive cows cattle sold by farmers to be rolled back to other farmers and only 10% to abbatoir; 2) scenario III B, the RTIU buys 0.20% of productive cows cattle sold by farmers to be rolled out to other farmers so that only 0.05% continues to flow to farmers. This scenario requires a number of funds that must be prepared by the government managed by the RTIU to buy cattle of farmers (Table 2).

Table 2 – Parameters of Actual Condition Simulation Models and Scenario for Save Productive Females

Policy	Actual condition	Scenario		
		III		IV
		A	B	
Save productive females	0,25 To abbatoir	0,15 RTIU 0,1 Abbatoir	0.2 RTIU 0,05 Abbatoir	0,25 to Abbatoir

The results of the FGD with abbatoir officers and some abbatoir traders indicate that anyone cannot prohibit farmers to sell their cattle including productive females. Farmers only sell cattle because there is a large amount of cash needed. This happens because the purpose of the actual cattle business is as savings for farmers. With the management behavior pattern above, it is not possible to implement the results of Madarisa et al (2013) in West Sumatra on the implementation of incentives to save productive cows. According to Madarisa et al (2013), incentive actions are more efficient and effective than rescue. The difficulty of implementing incentives in West Timor is because the amount of incentives currently available of IDR. 500,000 per head of productive cows is not able to cover the needs of farmers. Therefore the scenario developed is to save productive females and return them to farmers through a rolling breeding program and sales to farmers.

Applying scenario III is based on consideration of the existence of a the funds were disbursed to provide incentives to farmers who have pregnant women who produce IB or procure productive females and distribute them to farmers. This scenario is done by adding the structure of “Bali” cattle supply at the RTIU and the RTIU cash as the manager of the fund to save the productive cows. The RTIU cash expenditure is to buy productive cows sold by farmers. Livestock purchased in the supply of productive female of “Bali” cattle at the RTIU D. The expenditure of productive female of “Bali” cattle from RTIU supplies can be in the form of: sales to other cows in need and the RTIU breeding program on a rolling basis to farmers (Figure 5).

Figure 5 – Engineering of cash and inventory structure of RTIU

Scenario III simulation results show that implementing a policy of saving productive females or returning productive cows to breeders causes an increase in productive cows of “Bali” cattle populations at farmers level. The existence of this policy can prevent the sale of productive cows to merchants while at the same time cutting them in abbatoir and non abbatoir.

Figure 6 shows that by applying scenario III the profit decreases but the cash liquidity of farmers increases. This is understandable because all the profits obtained by farmers are all used for various needs, both productive and non-productive activities.

Figure 6 – Simulation Scenario III Results of Breeders' Cash Profit and Liquidity

The simulation results show that scenario III is one of the policies that need to be considered by the government. Scenario III is turned out to be quite effective in controlling the slaughter of productive cows in abbatoir and non-non abbatoir (Figure 7).

Figure 7 – Results of Scenario III Simulation on Cutting of Productive Female of Bali cattle

CONCLUSION

Based on the results and discussion above, several conclusions can be formulated as follows:

1. Management and actual institutions at the farm level do not have a role to control the sale and slaughter of productive cows in the local beef supply system;
2. Policies needed to control productive cows of "Bali" cattle slaughtered, are: increasing calf crop and reducing mortality, saving productive cows by involving the role of RTIU of livestock, and literacy of cash savings in financial institutions both in cooperatives and banks in order to increase the bargaining position of farmers;
3. Interaction involving all parties (researchers, financial institutions, and related agencies) in improving stakeholder services for farmers is needed for group strengthening in an effort to increase farmers' production capacity, profits, and cash liquidity.

SUGGESTIONS

Increasing farmers' understanding and awareness of livestock as a source of income and not as savings as well as banking and cooperative literacy. Developing technological innovations, including: artificial insemination by fixing all its weaknesses, utilizing supplements at the farmer level to increase production capacity and reduce mortality rate. Develop institutions at the farm level to access various stakeholder related services related to the role of the RTIU in saving productive females.

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