The development strategy for sustainable livestock sector in small-islands region: a preliminary study on local cattle farming in Buru Island, Maluku Indonesia

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Abstract. Beef cattle are relevant to farm products for the livelihood of most small-scale farmers in Buru Island in Maluku Province. Other than being a significant source of income for farm households, the presence of cattle farming on that island is also strategic for the Indonesia livestock sector as Buru is one of the areas in the eastern part of Indonesia in which has the most significant population of local cattle. Nevertheless, in recent years, its population has been observed to be stagnant even tends to decline; hence many issues of its sustainability arise. The national government and stakeholders of livestock development positively should respond to this phenomenon. As a contribution to solving these issues, this article reports our preliminary study, which generally aims to propose feasible strategies for sustaining the presence of cattle farming and its population, especially in the context of islands region economic development. Our results show that current cattle farming on the island is in the state of survival; thus the strategy for the development must focus on moving to the better state through ensuring farmers' access to available natural resources and on improving public infrastructures, distributions, and logistics of the farm products. Recommendations for designing such strategies and policies are discussed briefly.

1. Introduction.
Beef is one of the essential food of animal protein in the consumption of Indonesian. In the last four years, the rate of consumption was growing by about 6.3% per year [1]. The consumption growth was projected to continue to increase up to 7.35% per year as a consequence of the population growth, massive urbanisation, an increase in the average level of rural household income, and a shift from carbohydrate-based food consumption into protein-based food in urban areas. At present, the national demand is met by the production of beef from local cattle and imported cattle, as well as imported beef. Although local cattle are still a significant source of beef production, its contribution to meeting demands tends to decrease over time, while in contrast, meat from imported beef and imported meat are increasing. By the dynamics of medium-term beef production (2014-2017), [2] showed the contribution of local production to the total demand for beef had decreased by 0.38% per year, while imported beef and imported beef cumulatively tend to increase by 2.1% per year.

Since Indonesia is struggling with an increasing rate of beef cattle imports from around the world, this eastern part of the nation has enormous potential to play a role as the primary producer of local cattle. Especially in Buru, there still has abundant resources, both natural and human resources, to support population growth. Then it is very reasonable for focussing in this area for any effort to increase
national cattle production in order to substitute the import gradually. However, the facts show that the cattle population does not increase over time, or even slightly decrease, although supported by those various resources [3]. It indicates that there are constraints hampered farmers in improving their farming scale.

Therefore, this study intends to identify factors that might influence the dynamics of cattle farming, especially those related to island characteristics. Revealed factors might be useful in designing strategies related to the sustainable development of beef cattle production on the island of Buru. Thus, the objective of this study was to evaluate the factors that may influence the existence of beef cattle farming by identifying and quantifying weaknesses, strengths, threats, and opportunities for strategic intervention.

2. Materials and Methods

The study is conducted in August 2018, mainly in the Waeapo, Waclata, and Lilialy District of Buru Regency. Data on factors that influence beef cattle farming in Buru Island were collected using semi-structured interviews with key informants, questionnaires, and focus group discussions with farmers, farmers’ groups, and related local government officials. The interviews captured information on stakeholder roles, their interrelationships, and the endogenous and exogenous factors that influence the actual environment of cattle farming. Questionnaires were distributed to farmers chosen by purposeful sampling techniques based on the accessibility of the areas at the time of study and proportionate cattle population.

The questionnaires had open-ended questions that probed farmers for factors that influenced their engagement in on-farm activities. Focus group discussions (FGD) were conducted after the interviews and questionnaire surveys. The aims were to facilitate the active involvement of farmers (use of a participatory approach) in generating group consensus during the weighing of factors that influence animal recording and triangulating the information collected during interviews [4]. A total of 20 farmers’ groups and ten local officers involved in the FGD.

To produce useful insights, then the data are analyzed using the SWOT approach. It is a classic strategic planning tool using a framework of internal strengths and weaknesses and external opportunities and threats to provides a simple way to assess how a strategy can best be implemented [5]. This approach helps planners, or stakeholders, be realistic about what they can achieve, and where they should focus. This approach evaluates internal and external factors on three categories; importance, ratings, and scores. Every value on each category is collected and synthesized from stakeholders who involved in this study. The framework of analysis is presented in Table 1.

### Table 1. The framework of SWOT analysis

| Factor    | Importance | Rating | Score |
|-----------|------------|--------|-------|
| Strength  | It shows how vital every variable corresponding to each factor is for the beef cattle farming. Each variable was assigned a number from 0.01 (not important) to 1.0 (very important). The sum of all weights should equal 1.0. | A score from 1 to 3 is given to each variable to indicate whether it is a major (3) or a minor (1) strength/ weakness for the cattle farming. The score is a result of importance multiplied by rating. It allows prioritizing the strengths and weaknesses in contrast with the opportunities and threats. |
| Weakness  | It is the probability of opportunity or threat that will have any impact on cattle farming. It is rated from 1 (low probability) to 3 (high probability). |
| Opportunities | It shows how vital every variable corresponding to each factor is for the beef cattle farming. Each variable was assigned a number from 0.01 (not important) to 1.0 (very important). The sum of all weights should equal 1.0. | A score from 1 to 3 is given to each variable to indicate whether it is a major (3) or a minor (1) strength/ weakness for the cattle farming. |
| Threats   | It is the probability of opportunity or threat that will have any impact on cattle farming. It is rated from 1 (low probability) to 3 (high probability). |
After the score is calculated, a Cartesian diagram will be used to plot a coordinate formed from the difference between strength and weakness score, and opportunities and threats [6]. Thus, it can show which state is most relevant to the current conditions of the farm. This state will later become the basis for elaborating the strategy for cattle farming development in the Buru island.

3. Results and Discussions

Buru Island is one of the regions in Maluku Province, which has a significant population of beef cattle in the eastern part of Indonesia. Based on the statistic [7], this island is one of the three largest cattle production areas along with Central Maluku and Western Seram. In 2018, the population of beef cattle reached around 22 thousand heads; and evenly distributed throughout its districts. Based on its cattle distribution, Waelata and Waeapo districts in the area with the largest population, which has a number between 3000 and 5000 head of cattle, and the other six districts have a relatively small number.

The scale of the cattle farming carried out by all respondents ranged from four to 80 heads per farmer, and even distributed throughout the study area. The cattle are mostly Bali cattle (*Bos sondaicus.sp*), which raised for breeding and rearing purposes. Some of the farmers also practiced the cattle fattening for a particular market. According to the type of animal feeding, cattle farming varies from extensive to semi-intensive systems wherein the former system the cow spends most of its time in grazing land for whole activities, while the latter housed cattle in a particular time. A small number of respondents also planted forage as supplementary feeding for the cattle that were entirely housed.

Respondents are farmers who are varied in terms of demographic status. In the view of age, respondents are farmers who are between 31-40 years (26.9%) and 41-50 years old (46.2%) while others are between 20-30 years (7.7%) and over 50 years old (19.2%). Of formal education, most respondents only passed the elementary education (57.6%) and middle education (34.6%) while the rest had attended higher education. In general, cattle is a complementary activity for food crops farming that has been run by farmers. As a complement, it has not fully purposed to be a commodity that is fully commercial but only to be a "savings" which can be liquidated at any time when farmers need some cash for their household needs. This condition is manifested in production systems that are not intensive, where activities of rearing cattle are done mostly in free grazing land during the whole production cycle with minimum intervention of proper farming procedures, or technology [8]. Nevertheless, cattle are still a significant source of income for farmers’ livelihood.

Marketing is one of the most apparent factors which hinder beef cattle farming. As an archipelago, business infrastructure, especially logistics, is usually very limited [9]. This is also the case on Buru island which is located far from the center of the country. Although the number of citizens and the size of the island is quite large compared to other islands surrounding area, the level of interconnectedness with other regions or primary market is still low. In the context of cattle marketing, this condition causes farmers to be intensely dependent on buyers who come to the island, which mostly becomes the only marketing channel for them. In turn, buyers can exert their oligopsonistic power to set a relatively low purchase price for farmers.

Both of the above are common characteristics that are possessed or confronted by most farmers in living on islands so that they are not included in the discussion without ruling out their essential position. Other factors that are considered to influence the current conditions of beef cattle are presented in the form of a SWOT matrix as in Table 2 and will be explained in detail afterward.

In internal factors, some variables which become the main strength in beef cattle farms are the existence of extensive grazing land and the number of farm households that still run the farm. Buru Island has a relatively large size, while the number of residents who are still not too much provides ample space for the running cattle farming. Although later, in turn, grazing land utilization is also a source of weakness, it can still be adequately used by farmers until now.
Table 2. The SWOT environment of beef cattle farming in Buru Island

| Factors/ Variables                             | Importance | Rating | Score |
|-----------------------------------------------|------------|--------|-------|
| **Strengths**                                 |            |        |       |
| 1. Relatively large number of farming unit    | 0.05       | 2      | 0.10  |
| 2. Availability of household labour           | 0.30       | 2      | 0.60  |
| 3. Presences of supportive grazing land       | 0.40       | 3      | 1.20  |
| 4. Long farmers’ experience                   | 0.05       | 1      | 0.05  |
| 5. Motivation to improve farm scale           | 0.20       | 2      | 0.40  |
| **Subtotal**                                  | 1.00       |        | 2.35  |
| **Weaknesses**                                |            |        |       |
| 1. Lack of skill or technical know-how        | 0.10       | 3      | 0.30  |
| 2. Uncertain utilisation of customary land    | 0.60       | 3      | 1.80  |
| 3. Low level of coordination and collaboration| 0.30       | 2      | 0.60  |
| **Subtotal**                                  | 1.00       |        | 2.70  |
| **Opportunities**                             |            |        |       |
| 1. Increasing demand for beef in the domestic market | 0.10       | 2      | 0.20  |
| 2. Increasing demand for live cattle outside the island | 0.80       | 2      | 1.60  |
| 3. Local government support is more to intense.| 0.10       | 1      | 0.10  |
| **Subtotal**                                  | 1.00       |        | 1.90  |
| **Threats**                                   |            |        |       |
| 1. Land conversion                            | 0.30       | 3      | 0.90  |
| 2. Grazing related animal diseases            | 0.25       | 2      | 0.50  |
| 3. Flood often occurs in a particular grazing area | 0.05       | 1      | 0.05  |
| 4. Ineffective marketing quota arrangement    | 0.40       | 3      | 1.20  |
| **Subtotal**                                  | 1.00       |        | 2.65  |

Source: own calculation.

In line with the availability of land, the proportion of farm households is still quite high. There are approximately 400 households running cattle farming in the study site, namely Waegeren and Waeapo District. The number of these households is quite large, occupying 30% of the total population in the area. Cattle have been raised for over generations as a complementary activity to other farming. Therefore, there is not a single respondent or informant who considers that beef cattle farming as the primary source of income for their family. The large proportion of farm households and others indeed become a strong factor for sustaining beef cattle farms in this area. It includes family labourers who were fully available to support their family running the farm activities. As compared to Java, the main island of Indonesia, the diminishing rate of family labour availability is significant in reducing the number of farm units [10].

Farmers’ motivation to sustain cattle raising is also a significant variable of strength [8]. Historically, most of the farmers are transmigrants from the western regions of Indonesia, especially Java. Considering its history, as migrants, farmers initially had minimal land when they started farming. Thus the production was only for slightly more than subsistence needs. Therefore, diversification of agricultural activities seems to be a rational solution to increase household income, and cattle are the primary choice for them. In line with regional dynamics, there was a need for adjusting income while expanding arable land does not seem to be pursued, so the only feasible way is to increase the scale of beef cattle farming. This reasonableness can explain the high motivation of farmers to increase the livestock they raise.

The respondents recognise the low ability and skill in managing cattle as being the biggest weakness in increasing production. Even though the farmers have much experience in doing farming, the lack of access to scientific and technological resources is a barrier to increasing their capacity. From the perspective of formal education, most farmers only have elementary and middle education, although some have higher education. The limitation of local extension officials is also one of the causes of the slow increase in the capability of farmers.
As explained earlier, the use of land for cattle grazing is also an obstacle faced by farmers. Although available in large quantities, the existing customary low seem to prohibit extensive grazing land by farmers. Most Maluku people still adhere to adat related to land ownership, where native landowners have full right of land and highly regulate its use. It is somewhat a problem when farmers, most of whom are transmigrants, encounter indigenous communities in the context of sharing arable land. Land-use conflicts often occur when cattle grazed accidentally walk into native community-owned land.

Turning to external factors, increasing demand for beef cattle is the primary variable, which is an opportunity factor for farmers. The main products sold by farmers are veal or finisher cattle. Respondents claimed that over the past five years, the demand for cattle was increasing. It is in line with government policies that open greater access to meeting the needs of beef in western Indonesia. Also, local cattle from Buru and other areas of the Maluku islands are well-preferred by middle-income consumers on annual Islamic holidays due to the price that is more competitive compared to cattle from Java or Madura. The demand for cattle to be daily slaughtering in the urban area of Maluku, such as Ambon city or Ternate, has also proven to be higher over time, thus encouraging more cattle to be exported from the island of Buru. This situation also stimulates the local government to intensify various programs and activities related to increasing the beef cattle population. However, local officials admit that the budget for the livestock sector is still relatively minimal compared to others.

The high level of demand for cattle, although it is an opportunity for farmers, also poses a severe threat to the existence of beef cattle farming. The absence of a livestock conservation scheme opens possibilities for population depletion on the island. Therefore, the local government is trying to implement a marketing quota system to at least hamper the rate of cattle exports. Based on the record, the government allows up to 300 head of cattle that can be exported per month, but this seems only based on estimates. Some livestock traders who were also involved in this study said that the time needed to collect livestock from farmers included in their criteria had increased. It can indicate that there has been an imbalance between the increase in population from production and the reduction due to sales. It is quite alarming in the long term for efforts to maintain and increase beef cattle populations.

Conversion of grazing land in the context of is another threat to beef cattle farming. In general, urbanisation can be characterised by the increasing availability of facilities and infrastructure [11]. Thus, land use will be more biased by infrastructure development and public housing. The concentration of population in areas near urban areas as the implication of economic, social, and government concentrations makes land demands continue to increase over time, including agricultural land, which is then slowly converted or diversified to meet daily needs. Along with the development, the existence of farmer households is increasingly limited. The transition of agricultural land also makes it more difficult for farmers, even urged to shift places and develop farming in locations that are farther away than before. Diversification becomes an interesting phenomenon when farm households and agricultural landowners begin to see the urban process as a condition that favourable at this time.

There are several specific cases informed by respondents that revealed as threats. The first is a case of river water pollution caused by gold mining, and the second is the flooding of rivers that cross most of the grazing land. On the island of Buru, there is a gold reserve located around Mount Botak. For a long time, gold has been mined by the local community, but in recent years there have been more miners, especially those from outside the island. As in traditional mining, it is predicted that the waste, in the form of mercury and cyanide residues, contaminated the river, which is the primary source of water for agriculture and grazing land. Since 2015, many have reported livestock death, both cattle and buffalo, which is suspected of poisoning. Although, since 2018, the mine has been closed by the local government, there are still many people who are sneakily did mining activities. In the second case, flooding occurred several times on the Waegeren river that crossed the grazing fields. Although this flood does not cause cattle to be swept away, waterlogging in grazing land causes grass to die and severely limits the activity of farmers to bring their cattle to find for another grazing land. Even so, the flood disaster does not continue to occur, only if rainfall occurs above normal as in 2019.

After all the variables in internal and external factors are described in detail, the relative position of beef cattle farms in their environment can be understood by linking the interactions between these
factors. As can be observed in the following Figure 1, the position of cattle farmings is in the third quadrant, which can be interpreted as being in a state of survival. This situation can occur when farmers have more weaknesses than their strengths, and the opportunities they have are still lower than the threats. In the figure, the notation "P" shows the current position.

![Figure 1. The current state of cattle farming in Buru](image_url)

In the concept of agricultural development, growth is the primary condition targeted by each development effort or program regardless of its initial state [12]. In the case of Buru Island, cattle development from its initial condition to the state of growth can be achieved in two ways; firstly by eliminating all weaknesses that are owned by animal husbandry activities, both related to human and natural resources, and secondly by maximising the utilisation of existing opportunities. However, the first way seems more rational to be adopted because it is related to variables that can be controlled by farmers. In contrast, the second is an external factor that farmers cannot influence.

Achieving the state of diversification must be the first milestone for livestock sector development. In this context, diversification does not necessarily require existing farmers to look for other businesses since they live in many limited supporting resources. Align with the pathway on increasing the technical capacity, empowerment of farmers’ institutions as an instrument to stimulate collective or collaborative production should become a pivotal step. How farmers run farming currently, as in the form of traditional and informal business, should be reorientated into more "modern" activity that can be legally or formally recognized by the national economy, such as micro and small and medium enterprises (MSMEs) in agriculture. The existence of a formal institution will appear to encourage the formation of a sturdy beef cattle production structure so that the process of planning, implementation, and evaluation of production is very likely to be carried out. It is also self-reinforcing growth where collaboration and collaboration are likely to accelerate the additional capacity of each farmer in achieving best practices in raising cattle. In addition, the bargaining position of the farmer as a producer is also expected to be stronger to deal with the practice of buying and selling cows that seem slightly imbalanced.

On the other hand, the government is expected to be more active in supporting farmers to be able to capture the opportunities that exist today or deal with various threats faced by them. This is very relevant to the domain of the government because it is closely related to other parties beyond the reach of the farmers. As explained earlier there are many elements that can be targeted to support farmers; some of which are compromising the use of indigenous land between natives and farmers, designing proper conservation schemes, and facilitating various events that link producers and consumers. Therefore, active support from all stakeholders is needed to achieve a state of growth in beef cattle farming as an ideal for Buru Island in the near future.
4. Conclusions
As part of the islands’ ecosystem, the beef cattle sector on the island of Buru has its uniqueness, dynamics and problems compared to other mainland regions in Indonesia. All the strengths owned by the sector have been briefly described, as well as their weaknesses. Along with the opportunities and challenges faced, the facts show that farmers are struggling to maintain their existence. Support from all stakeholders, both local and national level, is needed to drive the sector forward to a better state. In that way, all available resources can be utilized more optimally to contribute to the national target in achieving the sufficiency of animal-based protein food.

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