Sustainability Analysis of Beef Cattle Fattening in Ciamis Regency, West Java Province, Indonesia

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Abstract

Demand for livestock products tends to increase so the government issued various policies and programs related to the development of beef cattle enterprises. To get optimum benefit, the development of farm management needs to meet the criteria of sustainable development were associating between the interests of economic, social, cultural, and ecological sustainability.

This research uses MDS (Multi-Dimensional Scale) to analyze the status of beef cattle fattening sustainability. Data collected from 100 beef cattle farmers in Ciamis Regency, West Java Province, Indonesia. The results show that beef cattle fattening simultaneously less sustainable with 37,66 index, but partially the index values of ecology, economy, socio-cultural, technology and infrastructure, and institutional dimensions respectively 69,71%, 63,10%, 43,93%, 11,54% and 00,00%. The dominant attribute of ecology dimension is cowshed cleanliness, while quite dominant is the utilization of agricultural waste to cattle feed and availability of WWTP for waste management. The dominant attribute of economic dimension is place for farmers to sell the cattle. The dominant attribute of socio-cultural dimension is the frequency of extension and training of beef cattle fattening. The dominant attribute of technology and infrastructure dimension is the use of vitamins and probiotics to spur the growth of cattle, while quite dominant is the availability of infrastructure or public facilities, such as slaughterhouses and markets. There is no dominant attribute of institutional dimension, but all of the attributes on the institutional dimension should be the focus of attention to improvement.

Keywords: beef cattle fattening, sustainability, sustainable index

1. Introduction

Demand for livestock products in recent decades tends to increase, and an excellent opportunity to develop animal husbandry (Diwyanto, et al, 2005). Increased demand is addressed with increased government attention to the beef cattle breeding business through various policies and programs related to the development of beef cattle enterprises (Rahmanto, 2004). However, the policy has not been able to meet the demand for beef in the country resulting in an increase in imports, both imported cattle and beef (Winarso, et al, 2005; Muslim, 2006). Yusdja and Ilham (2007) stated that the consumption of meat about 65 percent met from imports and 25 percent of which came from imported cattle.

Some of the potential that exists and can be used for the development of beef cattle farms in Indonesia, among others: (1) the domestic market potential, (2) the carrying capacity of the land to provide fodder is very large and relatively inexpensive, (3) human resources and institutional relatively available, (4) animal genetic resources, and (5) the availability of appropriate technologies (Diwyanto, et al, 2005).

To get optimum benefit, the development of farm management needs to meet the criteria of sustainable development were associating between the interests of economic, social, cultural, and ecological sustainability (Saragih and Sipayung 2002 quoted in Suyitman, et al, 2009). According to the model put forth by Adamowicz and Dresler, the approach should increase the quality of life of present and future generations through integration and cultivating appropriate proportions between the five basic dimensions: economic, ecological, social, institutional and spatial. Only the integration of environmental, economic and social policies can meet the challenges of sustainable development. It involves reconsidering the natural resources as limited economic resources and such use of natural capital that enables the conservation of the ecosystems' functioning in a long-term perspective (Szymanska, 2012). In livestock production systems, the concept of sustainability in one of the main issue of the last years, including environmental protection, animal welfare, biodiversity, food safety and quality, social issues and economic competitiveness (Gamborg and Sandøe, 2005).

The aim of this study was to determine the status of the sustainability of beef cattle fattening, seen from the five dimensions (ecological, economic, social, cultural, technology and infrastructure, and institutional), making it easier to carry out improvements to the attributes that are sensitive or dominant which determine the sustainability index of each dimension.

2. Theoretical Framework

Sustainable development is a long term continuous development of society, aimed at satisfaction of humanity's need at present and in the future via rational usage and replenishment of natural resources, and preserving the earth for future generations. Three interdependent and mutually reinforcing pillars of sustainable development are recognized world-wide in the transition towards a sustainable society. These are economic sustainability, environmental sustainability and social sustainability (Erhun, 2015).

Sustainability of agriculture is often described as consisting of three overall thematic areas, environment, economics and social sustainability and a number of attributes for each area are then presented for consideration (Halberg, 2012). Sustainable development refers to that process of economic development which meets the needs of present generation without compromising the ability of future generation to meets their needs (Patil and Kadam, 2014; Ejumudo and Nwador, 2014; Brenya and Warden, 2014). Developing countries around the world are promoting sustainable development through sustainable agricultural practices which will help them in addressing socioeconomic as well as environmental issues simultaneously (Walia and Kaur, 2013).

Although the concept of sustainable rural development has no clearly accepted definition, it fundamentally refers to a process of change and multidimensional evolution that depends on the interaction of the social, cultural, environmental, economic, and political subsystems. Its objective is to improve both the quality of life and the economic well-being of the residents of relatively isolated and depopulated areas, and their institutional, physical, and cultural environment by means of the active participation of the people themselves, the administration, and other external agents (Escribano, et al, 2015). There are many kinds of sustainability, which most of them are formulated from the relationship between human and natural resources system. This covers ecological, economic, social and institutional aspects (Alhabsi and Mustapha, 2011). A primary goal of sustainable development is to achieve a reasonable and equitable distributed level of economic well being that can be perpetuated continually for next generation (Ramsundar, 2011). In short, the sustainability of agricultural and livestock systems will also be dependent upon its economic performance and competitiveness factors, which now are spread through the supply chain. The combination of competitiveness and environmental sustainability issues will give the capacity of conserving the natural environment whilst producing food at reasonable prices and increasing profitability of the farms (Nunez, et al, 2014).

Some research on sustainable development at the livestock farming involves several dimensions of sustainability, among other things: ecological, economic, social and cultural, infrastructure and technology, and legal and institutional (Suyitman, et al, 2009), social (Ruiz, et al, 2009), social, environmental and economic (Tra, et al, 2010; Ismail and Wahab, 2014), economic, social, environmental and quality (Castellini, et al, 2012), economic, internal social, external social and ecological sustainability (Van Calker, et al, 2005), ecology, economy, social, technology and institution (Arofa, et al, 2015).

3. Research Methodology

The research was conducted in the Ciamis regency which is one of the centers of beef cattle fattening in West Java Province with a total sample of 100 farmers were taken at random. Sustainability status of beef cattle fattening was analyzed by looking for the sustainability index which is calculated by using the Multi Dimensional Scaling (MDS) (Kavanagh and Pitcher, 2004).

This study analyzed 19 attributes, respectively: 5 attributes of the ecology dimension, 2 attributes of the economy dimension, 4 attributes of the socio-cultural dimension, 5 attributes of technology and infrastructure, and 3 attribute of institutional dimension. The attributes in each dimension as follows.

The ecology dimension has the following attributes:

a. Beef cattle waste utilization for organic fertilizers
b. Utilization of agricultural waste for cattle feed
c. Cowshed cleanliness

d. The distance between the location of the cowshed with settlement

e. Availability of wastewater treatment plant (WWTP)

The economy dimension has the following attributes:

a. Contribution of beef cattle fattening income to household farming income

b. Place to sell beef cattle

The socio-cultural dimension has the following attributes:

a. Frequency of conflicts related to the fattening of beef cattle

b. Frequency of beef cattle extension and training

c. Alternative business other than beef cattle fattening

d. Time allocation used for beef cattle fattening

The technology and infrastructure dimension has the following attributes:

a. The use of vitamins and probiotics to spur the growth of beef cattle

b. Feed technology

c. Cattle waste treatment technology

d. The availability of facilities and infrastructure of beef cattle fattening

e. The availability of infrastructure or public facilities

The institutional dimension has the following attributes:

a. Training and consultancy center owned by farmers

b. Group of farmers

c. Agricultural extension agencies

All attributes assessed by a score in the range of 0 to 3 scales, where a score of 0 indicates a bad situation and a score of 3 indicates a good situation. Sustainability status of beef cattle fattening analyzed by looking for the sustainability index which is calculated by using the Multi Dimensional Scaling (MDS) using Microsoft Office Excel Add-Ins RAPFISH called RAP-PALM OIL (Rapid Appraisal for Palm Oil) (Kavanagh and Pitcher, 2004). The results of scoring are analyzed to determine the position of integration sustainability status of beef cattle fattening in each dimension and multidimensional stated in the sustainability index scale. The sustainability index scale is in around 0-100% as presented ini in Table 1 (Arofi, et al, 2015).

Attributes are dominant in determining the sustainability index of each dimension of the ecological, economic, social, cultural, technology and infrastructure, and institutional analyzed using MDS also but based on other outputs of the analyzer, the leverage of attributes (LA). LA is the percentage change or a reduction in the sustainability index if the attribute in question is removed. If the value is greater the more sensitive or dominant attribute concerned in determining the sustainability index of a dimension, and vice versa.

Table 1. Categories of Index and Sustainability Status

Index Scale	Category
00,00-25,00	Poor (unsustainable)
25,01-50,00	Less (less sustainable)
50,01-75,00	Quite (fairly sustainable)
75,01-100,00	Good (sustainable)

The dominant attribute is determined by first making 4 categories, that is not dominant, less dominant, quite dominant and dominant, so it has been known interval class 4 (k) and range (r) which is the difference between the maximum and minimum LA. Associated with this calculation, to determine the class intervals used formula (i) = r / k (Nazir, 2005).

4. Result and Discussion

4.1. Ecology Dimension

The analysis shows that the sustainability index value of ecology dimension is 69,71%, which is the index interval between 50,01-75,00%, it is mean that sustainability status is quite (fairly sustainable). The dominant attribute is cowshed cleanliness, while quite dominant is the utilization of agricultural waste to cattle feed and availability of WWTP for waste management. It means that if all three of these attributes is removed, there will

be a reduction in the ecological dimensions of sustainability index of 29,29%. In this case, the need to improve the cleanliness of the cowshed, the utilization of agricultural waste to cattle feed and availability of WWTP for waste management.

4.2. Economic Dimension

The analysis shows that the sustainability index value of economic dimension is 63,10%, which is the index interval between 50,01-75,00%, it is mean that sustainability status is quite (fairly sustainable). The dominant attribute is place for farmers to sell the cattle. That is, if the attribute is removed, there will be a reduction in the economic dimension of sustainability index by 2,80%. In this case, it is necessary procurement efforts where farmers sell their livestock.

4.3. Socio-Cultural Dimension

The analysis shows that the sustainability index value of socio-cultural dimension is 43,93%, which is the index interval between 25,01-50,00%, it is mean that sustainability status is less (less sustainable). The dominant attribute is the frequency of extension and training of beef cattle fattening. It means that if the attribute is removed, there will be a reduction in the socio-cultural dimensions of sustainability index by 7,80%. In this case, it is necessary efforts to increase the frequency of extension and training of beef cattle fattening.

4.4. Technology and Infrastructure Dimension

The analysis shows that the sustainability index value of technology and infrastructure dimension is 11,54%, which is the index interval between 00,00-25,00%, it is mean that sustainability status is poor (unsustainable). The dominant attribute is the use of vitamins and probiotics to spur the growth of cattle, while quite dominant is the availability of infrastructure or public facilities, such as slaughterhouses and markets. It means that if two attributes are removed, there will be a reduction in the technology and infrastructure dimension of sustainability index by 19,86%. In this case, note the use of vitamins and probiotics to spur the growth of beef cattle, and the availability of infrastructure or public facilities.

4.5. Institutional Dimension

The analysis shows that the sustainability index value of institutional dimension is 00,00%, which is the index interval between 00,00-25,00%, it is mean that sustainability status is poor (unsustainable). There is no dominant attribute, but all of the attributes on the institutional dimension should be the focus of attention to improvement. If seen from the improvement of priority, then allegedly dominant efforts is the need for the agricultural extension institutions that accompanied the establishment of a training and consultancy center owned by farmers, as well as the empowerment of local group of farmer.

4.6. The Combination of Five Dimension

The results of simultaneous or combined analysis shows that beef cattle fattening sustainability index value is 37,66% which is the index interval between 25,01-50,00%, it is mean that the sustainability have a less (less sustainable). Indeks and sustainability status of each dimension of ecology, economic, socio-cultural, technology and infrastructure, institutional, and the combined are presented in Table 1.

Table 1. Index and sustainability status of ecology, economic, socio-cultural, technology and infrastructure, institutional and combined five dimensions

Dimension	Sustainability Index (%)	Range of Sustainability Index (%)	Sustainability Status
Ecology	69,71	50,01-75,00	Quite (fairly sustainable)
Economic	63,10	50,01-75,00	Quite (fairly sustainable)
Socio-cultural	43,93	25,01-50,00	Less (less sustainable)
Technology and Infrastructure	11,54	00,00-25,00	Poor (unsustainable)
Institutional	00,00	00,00-25,00	Poor (unsustainable)
The combine of five dimensions	37,66	25,01-50,00	Less (less sustainable)

The sustainability index of each dimension of ecology, economic, socio-cultural, technology and infrastructure, and institutional can be depicted in form of pancagonal diagram as presented in Figure 1.
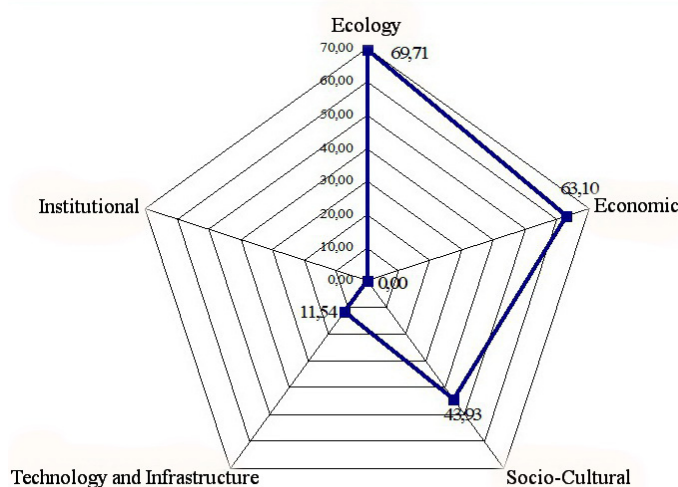
Figure 1. Pancagonal Diagram of Beef Cattle Fattening Sustainability
in Ciamis Regency, West Java Province

5. Conclusion

Beef cattle fattening in Ciamis Regency, West Java Province, have less sustainable status with 37,66% index simultaneously. Ecology and Economic dimensions have quite (fairly sustainable) status with 69,71% and 63,10% index partially. Socio-cultural dimensions have less sustainable status with 43,93% index partially, while the the dimensions of technology and infrastructure and institutional are poor (unsustainable) respectively 11,54% and 0,00%.

The dominant attribute of ecology dimension is cowshed cleanliness, while quite dominant is the utilization of agricultural waste to cattle feed and availability of WWTP for waste management. The dominant attribute of economic dimension is place for farmers to sell the cattle. The dominant attribute of socio-cultural dimension is the frequency of extension and training of beef cattle fattening. The dominant attribute of technology and infrastructure dimension is the use of vitamins and probiotics to spur the growth of cattle, while quite dominant is the availability of infrastructure or public facilities, such as slaughterhouses and markets. There is no dominant attribute of institutional dimension, but all of the attributes on the institutional dimension should be the focus of attention to improvement.

6. Recommendations

It is necessary to improve the cleanliness of the cowshed, the utilization of agricultural waste to cattle feed and availability of WWTP for waste management, procurement efforts where farmers sell their livestock, to increase the frequency of extension and training of beef cattle fattening, the use of vitamins and probiotics to spur the growth of beef cattle, and the availability of infrastructure or public facilities, and the need for the agricultural extension institutions that accompanied the establishment of a training and consultancy center owned by farmers, as well as the empowerment of local group of farmer.

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