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Contents

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Environmentally Friendly and Sustainable Local Cattle Development Model in Dumoga Barat Subdistrict of Bolaang Mangondow Regency

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Abstract

Dumoga Barat has the highest local cattle population in Bolaang Mongondow Regency, equal to 3853 head of cattle. Local cattle have potential to be developed as a profitable business. The problem is that this potential has not been utilized optimally. This study aims to find the environmentally friendly and sustainable local cattle development model in Dumoga Barat Subdistrict. Werdhi Agung, Kinomaligan, and Duloduo villages were chosen by purposive sampling i.e. the villages that had the highest cattle population. Livestock farmers in each village sample were restricted to farmers who had a minimum 2 (two) local cattle and had already sold cattle, as many as 66 respondents. The results show that the total revenue is Rp 11,345,543.67 per year per farmer earned from the sale and lease of cattle. The value of R/C ratio is 1.88, but the value of π/C ratio is only 0.88. The revenue can be increased by integration approach of local cattle-food crops. Utilization of cattle dung for compost and biogas can suppress the increase of greenhouse gas emissions. Based on the research results, it can be concluded that the environmentally friendly development of local cattle in Dumoga Barat subdistrict can be carried out by integration model approach of local cattle-food crops. Integration development model can provide good benefits for livestock farmers on welfare increase, as well as being environmentally friendly and sustainable.

Keywords: local cattle, food crop, environmentally friendly

1. Introduction

Dumoga Barat is a subdistrict in Bolaang Mongondow Regency consisting of 14 villages with an area of 375.44 km2 (10.71 percent of the regency area). Dumoga Barat subdistrict agroecosystem consists of rice field and dry land. Rice field agroecosystem develops paddy rice with 7704 ha harvested area. Dry land agroecosystem consists of food crops and plantations-based dry land. Most of the food crops developed in dry land is corn with 4344 ha harvested area. In general, corn crop can be cultivated on dry land agroecosystems (65-75 percent), irrigated land (10-15 percent) and rainfed area (20-30 percent) (Sariubang and Pasambe, 2005). This condition strongly supports the development of local cattle. Dumoga Barat has the highest local cattle population in Bolaang Mongondow Regency equal to 3853 head of cattle (Central Agency on Statistics of Bolaang Mongondow, 2012).

Local cattle have potential to be developed as a profitable business. They can be relied upon by farmers in supporting farmers'needs and their families. Livestock farmers feel that local cattle can provide added value in the existing farming system. In general, cattle business reviewed from its operators can be classified into three categories, namely: (1) managed by farmers traditionally, (2) commercialized by large companies, and (3) commercialized by the nucleus-plasma system (Soedjana, 2005). Local cattle business in Dumoga Barat Subdistrict is still managed traditionally. The cattle are commercialized by farmers in dry land by utilizing food crops waste such as corn waste and rice waste. The problem is that the dry land utilization is facing the challenges of high land degradation. According to Hermawan and Utomo (2012), the indication can be seen from the emergence of critical or unproductive lands.

The dry land in the Subdistrict of Dumoga Barat has potential for agriculture development of both food crops and plantation crops. The development of various agricultural commodities in dry land according to Mulyani *et al* (2006) is one of strategic options to increase production and support the national food security. Corn is a leading commodity and locally specific to this area because most farmers utilize dry land by corn crop. The problem is that the potentials existing in Dumoga Barat Subdistrict has not been explored optimally. The problems of dry land faced by farmers require optimal and sustainable management. Sustainable and ongoing dry land management requires professional handling and has to follow rules of the environment.

Based on the above conditions, the research problem is dealing with how the environmentally friendly and sustainable local cattle development model in the Subdistrict of Dumoga Barat is. The objective of this research is to find environmentally friendly and sustainable local cattle development model in the Subdistrict of Dumoga Barat.

2. Research Methods

The research was conducted in Dumoga Barat Subdistrict using survey method. Some villages in Dumoga Barat Subdistrict was choosen by purposive sampling, i.e. the villages that had the largest cattle population. They were Werdhi Agung, Kinomaligan and Duloduo villages. Livestock farmers in each village sample was restricted to cattle farmers who had a minimum 2 (two) cattle and had already sold cattle previously. There were 66 people chosen as respondents; 30 respondents were from Werdhi Agung village, 20 respondents were from Kinomaligan village, and 16 respondents were from Duloduo village. The data used were cross section and time series data, and they were collected through interviews with livestock farmers and direct observation in the field. The analysis was performed using descriptive analysis, profit analysis and R/C ratio analysis.

3. Results and Discussion

The success rate of local cattle farmers is determined by their characteristics. Characteristics of livestock farmers are seen from the level of age, education level and family size. The results show that most of the livestock farmers of local cattle (86.37 percent) in Dumoga Barat Subdistrict are categorized having productive age (ranging 25-64 years). The age of respondents over 65 years old are equal to 13.63 percent of the total livestock farmers as respondents. According to Wibowo and Haryadi (2006), the age of livestock farmers significantly affect the tendency of farmers to be positive on the success of their business.

Elementary education level ranges around 40.91 percent, junior high school 27.27 percent, senior high school 25.76 percent and higher education 6.06 percent. These education levels are still categorized low so that these conditions can affect the success of local cattle business.This is supported by Hartono (2012) stating that the higher level of education of farmers is expected to be able to adopt new technologies. The family size ranges from 2-10 people, so as to support the utilization of family labor.

Dry land area of 0.5 ha was occupied by 6 respondents (9.09 percent), 0.5-1 ha was occupied by 27 respondents (40.91 percent) and land area > 1 ha was occupied by 33 respondents (50 percent). This land tenure strongly supports crops agriculture business in the research area. It is indicated by the local cattle livestock that can be developed by utilizing the available feed. Hartono (2012) suggests that the development of beef cattle cannot be separated from the development of agriculture. Local cattle is a strategic commodity with multiple functions for dry land farmers (Hermawan and Utomo, 2012).

The research results show that the ownership of local cattle in the study area are 223 head or the average ownership ranges from 2-16 head. Ownerships of male cattle are 55 head (24.66 percent), while the female cattle are 68 head (75.34 percent). Cattle with age < 1 year are equal to 11 head (4.93 percent), age 1-< 2 years old are 25 head (11,21 percent), age > 2 years old are 187 head (83.86 percent). Local cattle ownership greatly influences the benefits obtained by the cattle livestock farmers in the research area. Hoddi *et al* (2011) suggests that the beef cattle business is successful when it has contributed income for subsistence farmers. This success can be seen from the number of local cattle ownership.

Ability to provide feed can determine the number of cattle that can be maintained (Hutasoit, 2005). Development of paddy rice and corn crop in Dumoga Barat Subdistrict can support the needs of local cattle feed. However, paddy rice and corn waste as food source in the research area has not been optimally exploited by most cattle livestock farmers. Utilization of food resources can optimally determine the achievement of maximum productivity of livestock (Literal, 2007). The average consumption of grass/ agricultural waste by local cattle in the Subdistrict of Dumoga Barat is 12.93 per cattle per day. This grass consumption is still lower than recommended. The Ministry of Agriculture (2010) set need standards/norms of forage fodder based on animal unit (AU) of cattle, forage requirement for adult cattle (1 AU) by 35 kg/cattle/day, young cattle (0.5 AU) 15-17.5 kg/cattle/day and calves (0.25 AU) 7.5-9 kg/cattle/day. Types of grass/ agricultural waste consumed are such as Australian grass (8.89 percent), bulrush (25.99 percent), field grass (3.48 percent), corn straw (18.64 percent) and rice straw (43.00 percent). The protein content of field grass is 6-7 percent and cutting grass (bulrush and Australian grass) is 8-10 percent (Kushartono and Iriani, 2004).

The number of cattle sold during one year prior to the study was equal to 108 head. Local cattle sales occurred at the research area. It could be concluded that traders who acted as buyers came to livestock farmers then bought the farmers' cattle. Sales of local cattle by livestock farmers were conducted when they needed money for school of their children, building houses even buying seeds and fertilizer for corn or rice crop.

Receipt from the sale of local cattle was allocated for consumption of farmers and their families. The higher receipt indicated the farmers' needs that could be met. Cattle business income was derived from cattle sales revenue subtracted by cost of production and receipts from renting cattle. Average cattle sales revenue was Rp 9,848,484.85 per year per farmer. Average cattle rent receipt was Rp 1,497,058.82 per year per farmer. The total revenue was Rp 11,345,543.67 per year per farmer. Profits obtained by livestock farmers are in accordance with the research conducted by Hoddi *et al* (2011) stating that for cattle equal to 7-10 head have Rp 3.705.159 per year profit. Local cattle in the study area are utilized as labor to cultivate the land and transport agricultural products. The research shows that 34 farmers (51.52 percent) rent cows as livestock labors, and 32 farmers (48.48 percent) do not rent out their animals. The research by Elly *et al* (2008) and Hoddi *et al* (2011) shows that local cattle are generally utilized their power to help people managing agricultural land (rice field).

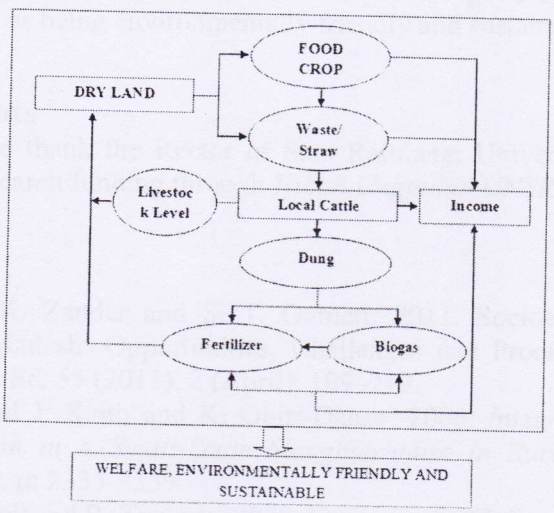
Production costs incurred by livestock farmers in the cattle production process were in form of the feed costs, labor costs and the cost of medicines. Average feed cost was amounted to Rp 2,360,954, labor cost was Rp 3,659,505 and the cost of medicine was Rp 19,621.21 per year per farmer. The total production cost was Rp 6,040,080 per year per farmer. The earned income was Rp 5,305,463 per year per farmer. From this study, the income earned was an advantage according to Hoddi *et al* (2011). Value of R/C ratio obtained was 1.88, but the value of π/C ratio was only 0.88. The value of R/C ratio was still higher than with the results of research by Wibowo and Sumanto (2012) that was equal to 1.10.

The income of local cattle business in the Subdistrict of Dumoga Barat can still be improved if it is carried out with an integration approach to food crops. Rota and Sperandini (2010) suggest that high integration of livestock and crops are frequently considered as a step forward. Integrated farming patterns according to Ahmed *et al* (2011) is the best farming system in terms of resources, efficiency, productivity, production and supply of food. Wibowo and Sumanto (2012), Salendu *et al* (2012) suggest that the management of cattle crop integration system in some areas can increase farmers' income. Integration of cattle corn provides many benefits for farmers (increased income and food security), local cattle (feed sustainability) and land (land conservation) (Baba *et al*, 2012). Purpose aspects of other livestock-corn integration are the utilization of corn crop forage waste as the main source of feed of livestock (Elisabeth, 2007). Nevertheless, from the reality in the research area, farmers always try to eliminate agricultural waste (corn and rice straw) through burning. The straw burning may have provided impacts on environmental damage. It is similar with what is stated by Makka (2004) that the burning of straw can eliminate major nutrients such as N and P, kill organisms in the soil and produce environmentally damaging CO2 gases.

Integration synergism of cattle and crop uses agricultural waste as animal feed and utilizes cattle dung for composted manure. Local cattle produce waste with negative potential to the environment effects. Livestock waste is a potential source of CH4 emissions (Moss, 1993 in Masse et al, 2003). In large quantities, the waste according to Harlia *et al* (2012) will cause environmental pollution because nature is not able to decompose, absorb and neutralize such waste. This local cattle waste has become a pollutant because the decomposition is in form of BOD and COD (Biological/Chemical Oxygen Demand), a bacterial pathogen that causes water, air (dust) and odor pollution.

Dry land management for the purpose of development of environmentally-friendly agricultural construction needs the concept of integration among various components of technology through the integration of local cattle and crops as well as modification of the supporting factors. It is required to carry out due to low productivity of dry land type (Sham, 2003). Development model of local cattle in the research area is outlined in Figure 1 below.

Figure 1: Local Cattle Development Model in Dumoga Barat Subdistrict



The model shown in Figure 1 is to strengthen food security in dry land ecosystems. Muslim and Nurasa (2008) suggest that the key of utilization of various agricultural wastes for animal feed is not to replace conventional feed but to strengthen food security in dry land ecosystem. Local cattle dung can be used as useful manure for crops and improve physical and chemical structures of soil on land that

has been suffering degradation. According to Herrick *et al* (2010), land degradation is a problem faced by many countries. The use of composted manure on agricultural land will support the environmental sustainability and embody organic farming that is highly competitive. Profits from composting efforts are Rp 2.972.450 per month (Wibowo and Sumanto, 2012).

Cattle livestock farmers in Kinomaligan village have been trained to utilize cattle dung for biogas and compost manure. This training is important to improve the knowledge of farmers to minimize environmental pollution originating from cattle dung. However, this training has not been implemented optimally by livestock farmers. Nurlina *et al* (2011) suggests that the level of knowledge and skill/ psychomotor of farmers on the use of solid organic fertilizer *(POP)* has not been optimal yet, but the attitude aspect sufficiently supports the manufacture and use of POP.

The research results show that farmers utilize artificial fertilizers in crop development that in fact provide impacts to environment. Asche *et al* (2008) states that the inefficient use of inputs can exacerbate environmental impacts. Each manufacturer must collect and treat waste related to the products (Fleckinger and Glachant, 2011) including local cattle waste.

According to Hambali *et al* (2007), cattle waste can be used as bioenergy raw materials. Putro (2007) suggests that the processing of cattle dung into environmentally friendly biogas alternative energy becomes a very beneficial way, because it is able to exploit nature without destroying it, thus, the ecological cycle is maintained. Biogas production leads to a reduction of flies and mosquito reproductive cycle (Simpson, 1979). Aklaku *et al* (2006) explains that the presence of biogas as energy source will free farmers from dependence on wood fuel, reduce odor and presence of animal pests such as flies. Biogas is a clean fuel and renewable energy (Schievano *et al*, 2009). Bond and Templeton (2011) explain that biogas contains 50-70 % CH4 and 30-50 % CO2. Biogas process can reduce the ratio of carbon to nitrogen (C/N) 21.82-14.19 (Chen *et al*, 2010). According Biyatmoko and Wijokongko (2011), the important benefits of biogas as an alternative fuel are because it is cheap, abundant available raw materials, and being environmentally friendly.

4. Conclusions and Suggestions

Based on the research results, it can be concluded that the environmentally friendly local cattle development in Dumoga Barat Subdistrict can be carried out by food crop-local cattle integration model approach. Integrated development model can provide good benefits for livestock farmers on welfare increase, as well as being environmentally friendly and sustainable.

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