

Sustainability Indicators for Cattle Production System in Kitadin Embalut Post Mining Land, East Kalimantan, Indonesia

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ABSTRACT

Growing demand for meat in developing countries is expected to double by 2050. In Indonesia, national beef production only satisfy about 45% of demand. Cattle production is limited by availability of land, particularly in Java Island. Post mining land, mostly located in outside Java, become one of potential areas to raise cattle. In this study we identify stakeholders and determine sustainability issues and indicators for beef cattle production system in Kitadin Embalut post mining land in East Kalimantan. Through literature review, discussion with experts and focus group discussion among stakeholders, the procedures were conducted in three stages, consisting of defining the problem, identifying and analysing relevant stakeholders, then determining Economic, Ecological, and Societal (EES) relevant issues. The EES issues then were translated into sustainability indicators. As a result, by considering the importance role at stake, we revealed farmers, mining company, policy maker and local government as primary stakeholders, while inseminators/veterinarians, butchers and traders were identified as secondary stakeholders. Each stakeholder has different importance to system and interest. Through SW-analysis and considering the criteria of sustainability indicators should be met, a set of economic, environmental and social possible indicators were selected. The conceptual framework and sustainability indicators selection described in this paper are precursors to the assessment of the sustainability indicators contribution to overall sustainability development of cattle system on post mining land.

Keywords: Stakeholders, sustainability indicators, beef cattle, production system, post mining land

1. INTRODUCTION

Indonesia is an emerging economy with an increasing demand for beef. The government with the program of Accelerating the Achievement of Beef Self-sufficiency is a priority agenda for national livestock development [1] and is aimed at realizing animal food security from livestock. The beef self-sufficiency program is a momentum that has considerable potential and opportunity to be developed so that these potentials and opportunities need to be managed optimally. Beef cattle production is limited by the availability of land, especially in Java, pushing the idea that its development must be optimized outside Java Island [1].

One of the lands using opportunities for the development of beef cattle is post-coal mining land which is widely available in Kutai Kartanegara Regency, East Kalimantan. Mining is a temporary land use, halting when the valuable extractable materials resource is exhausted [2]. The eventual goal of mining rehabilitation is to achieve an acceptable and sustainable post-mining land use [2]. To guarantee that local communities truly benefit from economic development in the long run, a sustainability perspective should be taken [3].

The post-coal mining land in this study area have exhausted its natural resources and is considered non-renewable is expected to be productive lands with the development of beef cattle farming system. Stakeholder

participation in establishing post-mining land cover and land use options is critical for long-term success. This paper focuses on 1). Identifying problem regarding to utilisation of coal post mining for beef cattle production, 2). Identifying relevant stakeholders, and 3). Determining Economic, Ecological and Societal (EES) relevant issues and sustainability indicators.

2. METHODOLOGY

Kitadin Embalut is a coal mine company in Kutai Kertanegara District, East Kalimantan Province, covers 2,973,6 hectares which consists of sites, namely Embalut, Bangun Rejo, Embalut, Kerta Buana and Separi. Kitadin Embalut has been operating since 1983 and holds a mining concession until 2022. Since 2012, some areas (800 ha) of Kitadin Embalut site have been reclaimed and re-vegetated. Under corporate social responsibility (CSR) program, Kitadin Embalut company contributes to community livelihood by farming whose activities including crop and cattle farming. Bali cattle (*Bos Javanicus*), an indigenous and very adapted breed, is the one that used in this system. To date, the population of Bali cattle in Kitadin Embalut site is around 1,100 heads. Most of the farmers keep their cattle semi intensively, which means cattle are allowed to grazing in pasture on reclaimed

post-mining lands during the day and kept in the small barn/shelters during the night. The company built the small barns and fencing around the shelters.

Sustainability assessment is a key step in supporting the development of sustainable farming systems [4]. Indicator-based monitoring tools are frequently applied for sustainability assessments [5], also in farming system and in this study, when integrated on reclaimed post mining land. Relevance (appropriate for the context and objectives), realism (data are available and easy to measure) and end user value (easy for the users to interpret) are often used as selection criteria for indicators [6].

3. RESULTS

We identified different stakeholders from prior literature review process, continued by discussions with experts, and focus group discussion with stakeholders, involved in beef cattle production system on reclaimed post - coal mining in Kitadin Embalut. By considering their importance role at stake, we categorised them as primary or secondary stakeholders. The key primary stakeholders are smallholder farmers, mining company, central government as policy maker, and local government (**Table 1**).

Table 1. Primary and secondary stakeholders in Kitadin Embalut post-coal mining cattle system

Stakeholders	Importance to system	Interest
Primary stakeholders		
Farmers	Primary producer	High capital needed, social status
Mining company	Provider of land for community use Maintain social image	Helping to improve human resources as farmers CSR program
Central Government (policy maker)	Policy and regulation about post mining reclamation and determine the land use	Support national programs Cooperation between government and company
Local Government	Policy of land use and extension delivery for farmers	Increasing of cattle population and economic
Secondary stakeholders		
Inseminator/Veterinarians	Improving livestock health and reproduction	Livestock health and reproduction
Butchers	Selection to slaughter	Profit
Traders	Cattle trading	Profit
	Cattle movements inter areas	

Table 2. Selected sustainability indicators for post-mining cattle system

Economic, Environmental and Issues Sustainability Indicators Social (EES)	Issues	Sustainability indicators
Economic	Economically benefit	Farmer's income; Gross margin (GM) Cattle performances (growth and reproduction rate)
Environmental	Land use and quality	Total land use Soil fertility Feed availability (carrying capacity; botanical composition)
Social	Cattle management	Farm size, feeding system, mating system, housing recording, time allocated for cattle keeping
	Human well-being	Farmer educational level, social status
	Additional functions of cattle	Social status, saving, insurance, manure, draught power, culture Health and diseases Cattle diseases or health problems

Each stakeholder has different importance to system and interests regarding the livestock system in post – coal mining. Farmers have important role in the system to produce the beef cattle and concern to high capital need and increase their social status. On other side, mining company provides lands for cattle farming, as its responsibility to return post-mining areas into productive lands through reclamation and rehabilitation. Cattle farming is one of good options to mitigate the environmental impacts of mining activities and satisfy the societal expectation.

The farmers considered low production cost due to no rent cost for land and the cattle are raised semi intensively, without additional feeds and maintenance costs. One of the advantages of Bali cattle is its adaptability to harsh condition and poor management [7]. Selected defined indicator for economic benefit was represented by gross margin rather than farmer's income, which is based on financial revenues minus variable cost. Calf crop was determined for cattle performance indicator. Growth performance is not selected, due to technical circumstance in the extensive system to measure the cattle. To monitor the impact of cattle system on post mining land and to measure productivity of post mining land, the land use, soil fertility, carrying capacity and botanical composition were selected as environmental indicators. (Table 2).

Societal issues relevant with respect to cattle production system on post mining land are, among others, cattle management which represented by farm size, feeding system, mating system, housing and time allocated for keeping cattle; educational level of the farmers; additional functions of cattle; and health and diseases. The important components to monitor sustainability are, 1.) participatory approaches to

identify and select issues and corresponding indicators and 2). the availability of data to empirically assess the indicators for evaluating the introduction of cattle system on post mining land [8]. This study was intended to focus on the first component and was done very carefully to prepare for the second component and next phase, namely assessing the contribution of sustainable indicators to overall sustainability development. A lack of robust procedures for selecting indicators makes it difficult to validate information provided by those indicators [9].

The challenge, then, is to select a set of indicators able to comprehensively and reliably represent the complexity of the system, its current environmental, economic, and social state, and its transition towards sustainability.

4. CONCLUSIONS

Introduction of cattle production system on post mining land seems to be beneficial option for responding the satisfying the demand of beef cattle and to mitigate the environmental impact of mining activity. The conceptual framework and sustainability indicators selection described in this paper are precursors to the assessment of the sustainability indicators contribution to overall sustainability development of cattle system on post mining land.

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