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Sustainability Analysis of Palm Oil Plantation in Central Kalimantan Province, Indonesia

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Abstract

Palm oil plantation in Central Kalimantan has started since 1994 until the end of 2011 and it reached 1.256.444 ha areas. However, it has been a lot of criticism from non-governmental organizations, both domestically and abroad because the palm oil plantation alleged negative impact on the economic, social and environment dimensions. This research uses MDS (Multi-Dimensional Scaling) to analyze the status of palm oil sustainability. Data collected from several agencies, 6 private plantations and interview with relevant experts, village officials, community leaders and 134 households around the private plantation in West Kotawaringin Regency, Central Kalimantan Province.

The results show that palm oil plantation simultaneously sustainable with 82.64% index, but partially the index values of economic, social, environment, technology and legality dimensions respectively 68.77%, 85.19%, 94.70 %, 79.59% and 94.36%. The low index partially caused by palm oil plantation has not apply all of the principles and criterias of the Roundtable on Sustainable Palm Oil (RSPO), such as the low productivity, planted area of palm oil for society not appropriate yet with the regulation, the community right of land has not resolved yet properly, the poor follow-up on the monitoring results of waste and integrated pest management, standard operating procedures of planted area and mill not fully implemented yet, and the planted area exceed the Land Use Permit that determined by government. Therefore, palm oil plantation in Central Kalimantan needs to apply the principles and criterias of the RSPO continously.

Key words: palm oil, sustainable index

1. Introduction

Palm oil plantation in Central Kalimantan has started since 1994 until the end of 2011 and it reached 1.256.444 ha areas (BPS, 2012). However, it has been a lot of criticism from various parties, especially non-governmental organizations, both domestically and abroad because the palm oil plantation alleged interfere the stability of the region's economic growth (Effendi, 2005), reduce the income of local society (Nordin, 2009), build up the social conflict between company and local society (Butler, 2009), especially the matter that related to land rights and natural resources through the expansion of plantation (Greenpeace, 2010) and damage to the environment (Saragih, 2009), that is indicate that the palm oil plantation not qualify yet to sustainable palm oil as stipulated in the national interpretation of Roundtable on Sustainable Palm Oil (RSPO), so it is doubtful sustainability.

National Interpretation of RSPO is a generic document of principle and criteria as the guide of implementation and certification of sustainable palm oil production that adapted to the Indonesian National Laws and Regulations and stakeholder agreement and also the palm oil industry in Indonesia (INA-NIWG, 2008). The principle and criteria of RSPO is the addition of three main dimensions to the concept of development and sustainable agriculture into five dimensions, consists of economic, social, environment, technology and legality. And now, the problem is how the sustainability status of palm oil plantation in the terms of national interpretation of RSPO, so that the purpose of this research is to analyze the status of sustainability dimensions which consists of economic, social, environment, technology and legality and also identify the attributes that sensitive or dominant.

2. Theoretical Framework

The sustainable development debate is based on the assumption that societies need to manage three types of capital: economic, social, and natural (Dyllick & Hockerts, 2002), which it fulfill three dimensions, consists of efficient and feasible economically, equitable socially and sustainable environmentally (Munasinghe, 1993), where those dimensions are integrated (Kay & Alder, 1999) and also an integral that reinforcing mutually (UNEP, 2006). The definition of sustainable development converted to the business sector, such as sustainable development in the business world, that is the business world is not only concern with the company's financial

records alone (single bottom line), but also it has responsibility towards social and environment or triple bottom line (Hasna, 2007). Sustainable development in the agricultural sector is the management of natural resources with orientation of technological change and institutional to guarantee the satisfisfaction of the human needs both present and future generation ((FAO, 1989), especially focus on the conservation of soil and natural resources (Mustadjab, 1988), and integrating ecological components, economic and social to achieve sustainable land use (Fox, et al., 2009) in order to achieve a strong agricultural, where agriculture dynamically and resilient and able to utilize optimally the natural resources, labor, capital and technology that exist in the physical and social environment where it on, that is able to improve the welfare of farmers in the broadest sense (Anindita, 2009).

The research of sustainable development in the agricultural sector involves three main dimensions consists of economic, social and environment, although in different commodity, such as the analysis of the sustainability of coffee plantation in Latin America (Giovannucci & Potts, 2008) and assess the sustainability of crops in the Veneto region, Italy (Longhitano, et al., 2012). Several other researchers also analyze the sustainability of commodity with the principle on those three-dimensional but it is developed in accordance with the objectives, the assessment method and procedur and also the expected performance (Binder & Feola, 2010). According to that matter, several researchers develop it based on the objectives and expected outcomes of the research, so they have different reasons.

Sustainable analysis of food crops uses four dimensions: technical, economic, social and environmental. The addition of dimensional technique based on the reason of high crop production requires good farming technique (Praneetvatakul, et al., 2001). The analysis of fisheries sustainability uses five dimensions: ecological, economic, social, technology and legal-institutional. The addition of the technology dimension based on the need of technology selectivity in the use of fishing gear in order to obtain fish size according to market needs and reduce the risk of unsold fish on the market and to avoid the decline of fishery resources dramatically, whereas the addition of legal-institutional dimension because of the need for supervisory personnel and local law enforcement and an institution as vessel of fishery involvement and the role of local society leaders to support the government's policy to manage fishery resources (Nababan, et al., 2007).

Sustainability analysis of agropolitan areas in the border of West Kalimantan uses five dimensions: ecological, economic, socio-culture, technology-infrastructure and legal-institutional. The addition of technology-infrastructure dimension because it needed on development of sustainable agropolitan, whereas the addition of legal-institutional dimension because of the development of sustainable agropolitan that supported by the strong farmers and legal factors in order to address conflicts (Thamrin, et al., 2007).

Analysis of sustainability livestock uses five dimensions: ecological, economic, socio-cultural, infrastructure-technology and legal-institutional. The addition of the infrastructure- technology dimension due to the availability of infrastructure and the use of technology can improve productivity and value-added business and minimize adverse impacts to natural resources and the environment, whereas the addition of legal-institutional dimension because of the availability of legal instruments, such as the law enforcement and adherence toward the law and the institutions to promote the sustainability of livestock farming system (Suyitman, et al., 2007).

The activity of company in developing palm oil plantation besides aiming to maximize profit (economic parameters) also it has impact on social and the environment (Butler, 2009) so that to carry out the activity of palm oil plantation and palm oil mill requires "the use of the best practice and appropriate by plantation and mill (INA-NIWG, 2008), meaning associated with "technology". Efficient technology is important on agriculture (Banani, et al., 2013) because it can increase the productivity (Hidayah, et al., 2013). Productivity is one of the priorities on the development of the agricultural product industry, in addition to quality (Anindita, 2009). In addition, the company must also fulfill the "legality" (Nelson, et al., 2010). Therefore, the development of sustainable palm oil plantation uses five dimensions, consists of economic, social, environment, technology and legality, the most important is that the fifth dimension realistic in expressing or figure out the sustainable of agricultural activity (Van Passel, et al., 2007), consistently and it can be addressed or understood by all parties and the result can reproduced and used as an agreement for many people to monitor the system changes over time. The selection of indicators related to the normative aspects (in accordance with the concept of sustainability, the goals and the type of assessment) and systemic (representing complexity as appropriate). Size indicators related to the quantification of each indicator based on the statistical data and survey or qualitative data (Binder & Feola, 2010).

Furthermore, the five dimensions analyzed by using Multi Dimensional Scaling (MDS) approach. The results of this analysis are the index of sustainability (in percentage), so it can present the each status of sustainability from

the five dimensions and the atributes of sensitive dimension. The dimensions that have low index of sustainability, and sensitive atributes, it can become the attention focus of the relevant parties to conduct improvements, so that palm oil plantation can increase revenues (both corporate income, local society both regional and national), it can acceptable socially and friendly or sustainable environmentally.

3. Research Methodology

The research conducted in West Kotawaringin Regency, Central Kalimantan Province with sample survey method (Nazir, 2005), consists of 6 private plantation samples were determined intentionally by its position in the watershed, respectively two on the upstream, midstream and downstream, so that the data obtained from multiple agencies, six private estates and interview with relevant experts, village officials, society leaders were chosen deliberately, while 134 households in nearby private plantation selected randomly.

Analytical method use MDS method. MDS is a classical approach toward the problem of basic assessment attributes or dimension that influence subject to evaluate certain object. MDS introduced firstly by Togerson in 1952 as the method for estimate coordinate distances between several objects in the space dimension (Wickelmaier, 2003). The same object or point mapped close to each other and different object or point is mapped far apart. The technique of determine the distance in MDS based on coordinates x, y on the Euclidean distance between a and b, with the equation:

$$d_{ab} = \sqrt{(x_a - x_b)^2 + (y_a - y_b)^2}$$

The next development in MDS methods computationally implemented into Microsoft Excel Software for Rapfish (Kavanagh & Pitcher, 2004).

The attributes which exsist in the national interpretation RSPO can not be applied all in this research, but adjusted to the condition of object study, so the attributes used around 54 attributes, respectively: 9 attributes of the economic dimension, 18 attributes of the social dimension, 10 attributes of the environment dimension, attributes 9 of technology dimension and 8 attribute of legal dimension. Those total atributes are considered to be sufficient to describe the complexity of the evaluation in the exixting condition and it is not too difficult to interpret visually. The attributes in each dimension as follows.

The economic dimension has the following attributes:

a. Economic feasibility

b. The contribution toward Regional Gross Domestic Product

c. The contribution toward Regional Gross Domestic Product of agriculture sector

d. The difference of income before or without and after the company of palm oil plantation

e. The average relative income of society toward Regional Minimun Wage

f. The average relative income of business toward the average income of society

g. Plant project = trend or productivity of Fresh Fruit Bunches (FFB) yield

h. Level of mill extraction = trend of Oil Extraction Rate (OER)

i. Level of mill extraction= trend of Kernel Extraction Rate (KER)

The social dimension has the following attributes:

a. Absorb level of local employment

b. Rule and safety equipment works

c. Social security of labor

d. Effective time work

e. Break time/to worship

f. Granting leave

g. Wage/salary

h. Payments that already agreed to be done on time

i. In conditions where public facilities are not available and it can not be accessed by employees, then the company provides shelter, education, clean water, health care, and adequate public facilities

j. Recording facility, handling complaints /objections

k. Evidence that all parties understand to their contract, and they know that contracts are fair, legal and transparent

l. The recording implementation of company policy regarding employee age requirements

m. The procedures to identify and calculate the fair compensation for loss of legal or traditional to land rights, that includes representatives of local communities and institutions, and it also available to the public

n. Turnaround time of land community rights

o. Record of identification of the parties to receive compensation

p. Records of negotiations and/or the results of indemnity agreement which available generally

q. The construction of the palm oil plantation for society

r. Partnerships with community

The environment dimension has the following attributes:

a. Records of implementation of water management program

b. Monitoring record of water use for mill per fresh fruit bunches tonne

c. Monitoring record of Biological Oxygen Demand (BOD) for mill effluent

d. The posters, warning signs regarding species that protected, publicated, distributed and disseminated to all employees and society, along with handle information

e. Specialized and trained staff in corporate structure to organize the plan and activity of conservations

f. Plan to manage hazardous waste and instructions for agro-chemicals disposal and its containers in accordance with the existing reference in the require package and regulation

g. Monitoring record/analysis of waste

h. Monitoring records for use of fossil fuels and electricity to operational sense and efficiency analysis

i. Facility and infrastructure for land fire prevention

j. Monitoring record for emission quality from pollution sources and emission

The technology dimension has the following attributes:

a. Standard Operating Procedure (SOP) for plantation from land clearing (LC) to harvest

b. SOP of mill

c. Activities record of soil, leaf and visual analyses periodically

d. Activities record to maintain and improve soil fertility (through fertilizer, beans plant, application of empty bunch and land application) based on the result of soil analysis

e. Availability of road maintenance program

f. Monitoring record of extensive and training of Integrated Pest Management

g. The evidences only use agro-chemical registered and authorized by the competent authority

h. Record of pesticide use (including active ingredients, the applied area, the amount of use per ha and the amount of application times)

i. Documentation evidences explain about the use of agro-chemicals in accordance with species target, appropriate dose, and applied by trained personnel in accordance with the operating instructions on the product label and storage instruction.

The legality dimension has the following attributes:

a. Availability of major permit

b. Availability of support permit

c. Availability of document analysis of environmental impact

d. Availability of Management Plan-Monitoring Environment reports

e. Availability of social activities document and society relationship

f. Availability of health and safety program document

g. The copy of agreements that already complete negotiated with approval processes

h. Percentage of total acreage toward Land Use Permit

The attributes for each dimension has been assessed by scoring. The range of scores between 0 to 3 were interpreted from bad to good. The result is analyzed with MDS using Microsoft Office Excel Add-Ins Rapfish called RAP-PALM OIL (Rapid Appraisal for Palm Oil), where the approach modified from RAPFISH (Rapid Appraisal for Fisheries) approach, developed by University of British Columbia, Canada to assess fishery sustainability (Kavanagh & Pitcher, 2004). The output of this analysis is sustainability index of each dimension. The accuracy of dimension and attribute are examined from the value of stress, S and determination coefficient, R2 (Hidayanto, et al., 2009). The low value of S indicates that model is good fit, whereas high value of S is the opposite (Fauzi & Anna, 2005). The good model have value of S less than 0.25 (S <0.25) and R2 value close to 1 or 100% (Kavanagh & Pitcher, 2004). Furthermore, through leverage of attributes analysis known the change of Root Mean Square (RMS) in the ordination on the X axis, when one of attribute is omitted, the greater change in RMS value, the more sensitive or dominant attribute. The category of sustainability status is presented in Table 1 (Suyitman, et al., 2009):

Table 1. The category of sustainability status

The range of sustainability index	The category of sustainability status
0 – 25	bad (not sustainable)
26 – 50	poor (poor sustainable)
51 – 75	adequate (adequate sustainable)
76 – 100	good (sustainable)

4. Result and Discussion

4.1. Economic Dimension

The analysis shows that the sustainability index value of economic dimension is 68.77%, which is the index interval between 51-75%, it is mean that sustainability status is adequate sustainable. Then the leverage analysis of attributes indicates that the economic dimension shows the sensitive or dominant attribute are the low productivity atribute or FFB yield, OER and KER trend. This attribute is associated with technology dimension, where the SOP of plantation or mill not fully implemented yet.

4.2. Social Dimension

The analysis shows that the sustainability index value of social dimension is 85.19%, which is the index interval between 76-100%, it is mean that the sustainability have a good status or sustainable. Then the leverage analysis of attributes indicates that the social dimension shows the sensitive or dominant attribute are plantation contruction atribute for the society who has area less than 20% toward the extensive concession right. Even, there is company that do not build plantation for society as the determination in Regulation of Agriculture Ministry No.. 26/2007 was reinforced by Regulation of Central Kalimantan Province No. 5/2011, ie at least 20% of the concession right. The other dominant attribute is society rights to the land that not resolved yet.

4.3. Environment Dimension

The analysis shows that the sustainability index value of environment dimension is 94.70%, which is the index interval between 76-100%, it is mean that the sustainability have a good status or sustainable. Then the leverage analysis of attributes indicates that the social dimension shows the sensitive or dominant attribute are monitoring record or waste analysis that has not been fully followed up, so it causes air pollution to the surrounding society.

4.4. Technology Dimension

The analysis shows that the sustainability index value of technology dimension is 79.59%, which is the index interval between 76-100%, it is mean that the sustainability have a good status or sustainable. Then the leverage analysis of attributes indicates that the social dimension shows the sensitive or dominant attribute are monitoring record of integrated pest control (including its training) and the standard operational procedure (SOP) of plantation or mill that have not been fully implemented yet.

4.5. Legality Dimension

The analysis shows that the sustainability index value of legalitydimension is 94.36%, which is the index interval between 76-100%, it is mean that the sustainability have a good status or sustainable. Then the leverage analysis

of attributes indicates that the social dimension shows the sensitive or dominant attribute are extensive acreage exceeds the Land Use Permit that has been established by government, so that the excess planted area is not legal.

4.6. The Combination of Five Dimensions

The results of simultaneous or combined analysis shows that palm oil sustainability index value is 82.64% which is the index interval between 76-100%, it is mean that the sustainability have a good status or sustainable. Index and sustainability status of each dimension of economic, social, environment, technology, legality and the combine are presented in Table 2.

Table 2. Index and sustainability status of economic, social, environment, technology, legality and combined five dimensions

	Sustainability Index (%)	Range of Sustainability Index (%)	Sustainability status
Economic	68,77 *)	51- 75	Adequate (adequate sustainable)
Social	85,19**)	76-100	Good (sustainable)
Environment	94,70 *)	76-100	Good (sustainable)
Technology	79,59 *)	76-100	Good (sustainable)
Legality	94,36 *)	76-100	Good (sustainable)
The combine of five dimensions	82,64**)	76-100	Good (sustainable)

Note: *) 95% validity; **) 96% validity

Furthermore, the sustainability index can be depicted in the spider form (Giovannucci & Potts, 2008) or kite diagram (Suyitman, et al., 2009) or polygon (Urutyan & Thalmann, 2011) or pancagonal diagram as in the Figure 1.

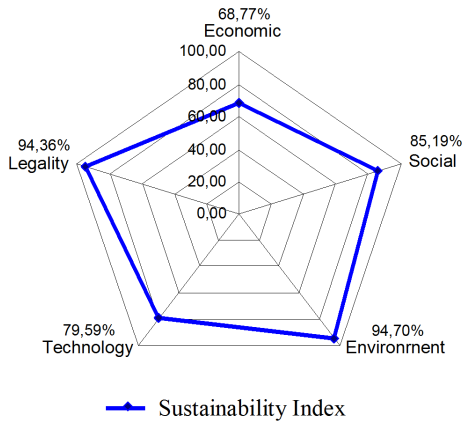

Figure 1. Pancagonal Diagram of Palm Oil Plantation Sustainability in West Kotawaringin Regency, Central Kalimantan Province

5. Conclusions

The plantation of palm oil in West Kotawaringin Regency, Central Kalimantan Province have sustainable status with 82.64% index simultaneously, however economic dimension have adequate sustainable status with 68.77% index partially, while the dimensions of social, environment, technology and legality are sustainable respectively 85.19%, 94.70%, 79.59% and 94.36%.

The dominant economic dimension index is determined by the trend or productivity of Fresh Fruit Bunches (FFB) yield, level of mill extraction (OER and KER). The dominant social dimension index is determined by construction of the palm oil plantation for the society who has area less than 20% toward the concession right

and turnaround time of land community rights. The dominant environment dimension index is determined by monitoring record/analysis of waste and monitoring record for emission quality from pollution sources and emission, that not fully followed up yet. The dominant technology index is determined by monitoring record of extensive and training of Integrated Pest Management and SOP of plantation/mill that not fully implemented yet. The dominant legality dimension index is determined by percentage of total acreage toward Land Use Permit. Therefore, the low index partially caused by palm oil plantation has not apply all of the principles and criterias of the Roundtable on Sustainable Palm Oil (RSPO).

6. Recommendations

The standart operating procedure of plantation and mill must be fully implemented in technology dimension for productivity or trend of FFB yield and OER can increase and achieve the standard. Extensive plantation for society should be according to the rules, and society rights on the land must be solved properly. Monitoring/waste analysis record should be followed up completely, so it does not cause air pollution to the surrounding society. Similarly, planted area do not exceed the Land Use Permit that determined by the government. If this matter is not followed by the companies, the government acts decisively to impose sanction such as revocation of Plantation Operation Licence.

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