Obstacles in Developing Biomass from Social Forestry (HKm) Case of HKm in KPH West Rinjani

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ABSTRACT

In the development of new and renewable energy (EBT), biomass is one alternative energy source that will be developed. Apart from the industrial plantation program (HTI), the development of energy forestry has the opportunity to be developed through forest farmer groups and other schemes, such cooperative. Energy forestry can be defined as a forest producing biomass for energy. At present, the forest land managed by the community in the form of HKm (community forest) has reached 244.434,67 ha in 2018, and will continue to increase in the following years. Energy forestry development on HKm land in West Lombok's Forest Stakeholder Unit (KPH) is a supposition, which is an effort to extent the development of energy forestry. Interpretative Structural Model identifies problems in developing energy forestry in HKm land. Energy forestry on HKm land in West Lombok's KPH can basically be developed by reducing obstacles encountered. These obstacles include the strict SKAU, lengthy to harvest, uneasy marketing, agricultural land competition, disrupted daily needs, and lack knowledge of conservation. The results of ISM processing show that the obstacles needed firstly to be addressed are strict SKAU and Lack knowledge of conservation, which are followed by agriculture land competition, subsequently disrupted daily needs, uneasy marketing, and lengthy to harvest. In order to conquer the initial obstacles, there is a need to facilitate issuing SKAU without reducing supervision for security. At the same time, it is important to transfer knowledge of conservation with a pilot project.

Keywords: Energy forestry, KPH West Rinjani, Sequence obstacle solution

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INTRODUCTION

Indonesian government needs to intensify the development of New and Renewable Energy (NRE) by searching further possibilities and involving more stakeholders. Developing NRE mix is to reduce fossil energy use which is increasingly scarce, more expensive, while creates a cleaner atmosphere to meet the approval of the Paris Agreement to reduce emissions of 29 percent by 2030.

In the development of NRE, biomass is one of the alternative energy sources which will be developed more extensive and intensively. This is in accordance with the potential of forests that are still large to be developed into a source of biomass production through energy forestry. Biomass is an energy source coming from organism. To produce energy, biomass must be processed into biofuels, in the form of solids (fuelwood /woodwood, wood pellets, charcoal), liquids (biodiesel, bioethanol), and gas (biogas).

The use of biomass as one of the renewable energy sources is supported by the Indonesian Energy and Mineral Resource Regulation No.12 of 2017 concerning the utilization of renewable energy sources for electricity supply. According to the regulation, the meaning of renewable energy sources includes sunlight, wind, hydropower, biomass, biogas, municipal waste, and geothermal energy. In order to reach the energy mix of 23 percent in 2025 and 31 percent in 2050, biomass is expected to have contributed 8,4 million tons and 22,7 million tons, respectively. Although the contribution percentage has decreased from 1,5 percent to 0,1 percent in the span of the year, but biomass is still needed to apply in the areas with large biomass potential.

Apart from the industrial plantation forest program (HTI), the development of energy forestry has the opportunity to be developed through farmer groups and other schemes, such as Gapoktan (association of farmer group). At present the forest land managed by the community in the form of HKm has reached 244.434,67 Ha, and will continue to increase in the following years. West Nusa Tenggara (NTB) in Lombok region is the place of initial birth of the Community Forest (HKm) in Indonesia (KPSHK, 2017). In NTB, HKm is more directed at efforts to overcome poverty, because impoverishment in the region is dominating. The poor population reaches 793.776 people or 7,78 percent of the poor population around the forest. Community Forestry (HKm) in NTB dominates with an area of 13.475,81 Ha (66 percent), the rest is Partnership Forest of 3.822,1 Ha (18,42 percent), and Community Plantation Forest (HTR) of 3.112,55 Ha (15 percent).

Participants in the HKm program consist of those with HKm land ownership who already have a Plantation Business Permit (IUP), an official area management permit from the government (IUPHKm), and an HKm owner farmer without IUP. Nevertheless, there are several obstacles to develop energy forestry in HKm land. Efforts to deal with the problem are required so that the development of energy forestry on HKm land can be performed further. This paper aims to identify obstacles in developing energy forestry in HKm land. Using an appropriate tool, the obstacles will be presented in a sequence resolution.

METHODOLOGY

The following obstacles in developing energy forestry are considered a complex situation which will needs structured assessment and goal-oriented achievement for effective purpose (Jackson, 2003). For that reason, in order to construct appropriate sequential steps so as to resolve obstacles in the development of energy forestry in HKm land, Interpretive Structural Modeling (ISM), developed by J. Warfield in 1997, is employed. The modeling is to analyze complex socioeconomic systems through computer-assisted learning process.

It enables individuals or groups to develop maps of complex relationships between various elements, involved in complex situations (KLHK, 2018). The steps in using the ISM method have been discussed in some journals (Eriyatno, 1998; Sohani & Sohani, 2012).
1) Identifying and defining elements
2) Determine the contextual relationship

3) Develop a Structural Self Interaction Matrix (SSIM). Developing a Single Structured Interaction Matrix (SSIM) represents the respondent's perception of the element of the intended relationship by using the following symbols:

V: the relationship of the element Ei to Ej, not vice versa

A: Ej to Ei relation, not vice versa

X: the interrelation of the relationship between Ei and Ej (maybe vice versa)

O: indicates that Ei and Ej are not related

4) Develop a Reachability Matrix (RM). Change the SSIM symbol into a binary matrix with the following rules:

- If the relationship Ei for Ej = V in SSIM, elements Eij = 1 and Eji = 0 in RM

- If the relationship Ei for Ej = A at SSIM, elements Eij = 0 and Eji = 1 at RM

- If the relationship Ei to EJ = X in SSIM, elements Eij = 1 and Eji = 1 in RM

- If the relationship Ei for Ej = O in SSIM, elements Eij = 0 and Eji = 0 in RM

The initial RM is modified to display the entire direct and indirect Reachability, i.e. if Eij = 1 and Ejk = 1 then Eik = 1.

5) Classifying Elements at different ISM structure levels. For this purpose, the following two sets are related to each element of Ei from the system: Reachability Set (Ri) is the set of all elements that can be achieved from the element Ei, and the Antecedent Set (Ai) is the set of all elements where the Ei element can be achieved. In the first iteration of all elements, Ri = Ri∩Ai is a level 1 element. In the next iteration, the elements identified in the previous iteration are deleted, and the other elements selected for the next level use the same rules. All elements of the system will eventually be grouped into different levels.

6) Developing the Canonical Matrix. The canonical matrix is developed by grouping factors at the same level across rows and columns of the final reachibility matrix.

7) Developing a Diagram. Develop a diagram which is a graph of the elements that interact directly, and the level of the hierarchy. the initial diagram is arranged on the basis of the canonical matrix which is then cut by moving all the components to form a transitive final diagram.

8) Bring up the ISM by removing all the sums of the elements with the actual element description. The ISM methodology and technique is divided into two parts, namely the preparation of the hierarchy and the classification of sub-elements. The sub-element classification refers to the processed product from the Reachability Matrix (RM) which meets the transitivity rules to get the value of Control Power / Driver Power (DP) and Dependency value (D).

Classification of sub elements is classified into four sectors, where Sector 1: Weak Driver - Weak Dependent Variable (OTONOMOUS) is a sub-element with a DP value <0,5 X and a D value <0,5 X where X is the number of sub-elements. Sub-elements in this sector are generally not related to the system, and may have few relationships even though they can have a strong relationship. Sector 2: Weak Driver Variable - Highly Dependent (DEPENDENT) is a sub-element with a DP value <0,5 X and a D value> 0,5 X. Sub-elements in this sector are not free.

Sector 3: Strong Driver-Strongly Dependent Variable (LINKAGE) is a sub-element with a DP value> 0,5 X and a D value> 0,5 X. Sub-elements in this sector must be examined because the relationship between sub elements is unstable. Every action on sub-element will have an impact on other sub-elements and the effect of feedback can magnify the impact. Sector 4: Strong Driver - Weak Dependent (INDEPENDENT) Variable is a sub-element with values DP> 0,5 X and D value <0,5 X. Sub-elements in this sector are the remaining parts of the system and are called independent variables .

Collecting data and information, as well as consultation with various experts were carried out at the research location (KPH West Rinjani). Experts came from the Forest Service, KPH, Resort, village officials, farmer groups, and researchers.

RESULT AND DISCUSSION

Framework of the study

In the context of developing NRE, besides sunlight, hydropower, solar, wind, biogas, municipal solid waste, and geothermal energy, as one of the largest forest-holding countries in the world, Indonesia has great potential in providing biomass as a source of NRE (DEN, 2019). In total, the forest land granted for timber concessions is 30,4 million hectares, which are expected to supply biomass for energy. In fact, only Industrial Plantation Forests (HTI) that can be expected to be biomass providers (MAPEBHI, 2017). HTI has 293 businesses with a total area of around 11 million hectares.

Up to now there are at least 31 Business Permit for Forest Timber Product Utilization under Industrial Plantation Forest (IUPHHK-HTI) units covering ± 1,2 million hectares and State-owned Forest Company (Perum Perhutani) which supports Energy Plantation Forest (HTE) development (MAPEBHI, 2017):
• 13 units of IUPHHK-HTI whose allocation for energy crops have been accommodated in the Business Plan for Timber Forest Product Utilization in Industrial Plantation Forest (RKUPHHK-HTI) document and the area of allocation from the start for energy is ± 200.282 Ha.
• 18 units of IUPHHK-HTI that have committed to be HTE are 18 units with a permit area of ± 699.747 thousand Ha.

As an effort to increase the area of biomass providers for energy, HKm can be an alternative. Until 2017, forest management permits in Indonesia through the HKm scheme reached 244 thousand hectares, or 23 percent of the total area of social forestry schemes. The area is likely to increase, with the planned issuance of additional permits.

Actually, Community Forest (HKm) is a state-owned forest whose primary use is to empower communities in and around forest areas. In this case, community empowerment is seen as an effort to increase the ability and independence of the community so that they get the benefits of forest resources optimally, with the main objective of improving the welfare of the community.

HKm is only applied in protected forest and production forests areas that are not encumbered with rights or permits in the utilization of forest products. Business Permit of HKm for Plantation (IUPHKm) is given for a period of 35 years and is extended in accordance with the evaluation results every five years. HKm is intended for the poor who live within and around forest areas and depend on their livelihoods to utilize forest resources.

HKm is considered suitable as forest land to become an energy forestry, considering the development of energy forestry is related to the development of standing trees, as forest vegetation. Thus, the HKm scheme can be more in line with the objectives of the scheme, which is to reduce the rate of deforestation in Indonesia by involving the community, in addition to the Village Forest and Community Forest Plantation.

There are several obstacles to directing HKm land into an energy forestry, which is a source of wood production for energy. This is related to obstacles that must be overcome first. Efforts to resolve obstacles can be made by simplifying or structuring these impediments (see Figure 1.
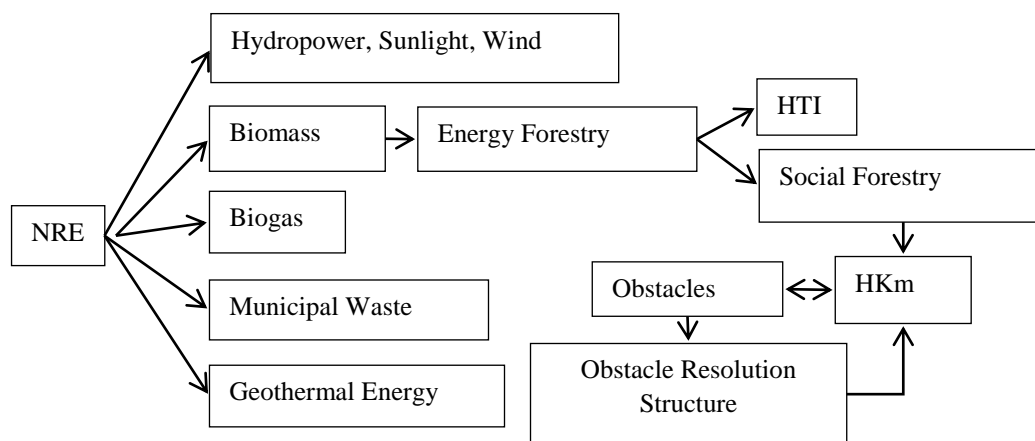
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Figure 1. Diagram showing the framework of the study

Literature Review of HKm

According to Ministry of Forestry Regulation Number: P.88/Menhut-II/2014, community forestry (HKm) is defined as a state forest whose use is primarily for local communities. The aim of HKm is improving the welfare of local communities through the utilization of forest resources optimally, fairly and sustainably while maintaining the preservation of forest functions and the environment.

There are nine principles of HKm should be applied by the right owners, namely (Sahide, 2009):

(1) Does not change the status and function of the forest area; (2) Utilization of wood forest products can only be done from the results of planting activities; (3) Considering biodiversity and cultural diversity; (4) Fostering diversity of commodities and services; (5) Improving sustainable community welfare; (6) Portraying the community as the main actor; (7) Legal certainty; (8) Transparency and public accountability; and (9) Participatory in decision making.

In the implementation of HKm management by community, the right owners have to get a Community Forest Utilization Business License (IUPHKm). Business license for utilization of HKm (IUPHKm) is business license granted to utilize forest resources in protected forest areas and/or production forest areas, to which HKm is given.

Activities that can be done at HKm are different between HKm in protected forest and HKm in production forest. The differences are as follows (Hariyanto, 2010):

a. HKm in protected forests, including activities:
  - Use of the area (cultivation of medicinal plants, ornamental plant cultivation, mushroom cultivation, bee cultivation, multipurpose tree cultivation, swallow bird cultivation, wild animal breeding, forage rehabilitation, forage);
  - Utilization of environmental services (utilization of water flow services, nature tourism, biodiversity protection, saving and protecting the environment, carbon sequestration and/or storage);
  - Collection of non-timber forest products (rattan, bamboo, honey, latex, fruit, mushrooms)

b. HKm in production forests includes the following activities (Forestry Ministry Regulation No P.88/Menhut-II/2014 on Community Forest):
  - Utilization of the area; (a. cultivation of medicinal plants; b. cultivation of ornamental plants; c. mushroom cultivation; d. beekeeping; e. animal breeding; and f. swallow's nest culture)
  - Planting of woody forest plants
  - Utilization of environmental services; (a. utilization of water flow services; b. water utilization; c. nature tourism; d. biodiversity protection; e. rescue and environmental protection; and f. carbon sequestration and / or storage)

- Utilization of non-timber forest products; (a. rattan, sago, nipa palm, bamboo, which covers planting, harvesting, enrichment, maintenance, safeguarding, and marketing of products; b. sap, bark, leaves, fruit or seeds, agarwood which includes harvesting, enrichment, maintenance activities, security and marketing of results)
- Collection of timber forest products; and
- Collection of non-timber forest products. (terms and Conditions apply)

Result and Discussion

Determination of HKm Working Areas (PAK) in West Nusatenggara Province has been issued since 2014 covering an area of 24.602 Ha, and it will be expanded in 2015 to reach 30.000 Ha. Compared to other schemes, community forest management through HKm is the largest of the total schemes.

Obstacles to developing energy forestry on HKm land

Based on the identification of obstacles on the development of energy forestry on HKm land, there are six main obstacles that prevent HKm from becoming energy forestry. The six obstacles are strict SKAU, lengthy to harvest, uneasy marketing, agricultural land competition, disrupted daily needs, and lack knowledge of conservation.

1) Strict SKAU

Timber tree owner in the private forest and community land who want to carry out timber harvesting has to report the logging plan to the Village Head and the Technical Implementation Unit (UPT) by completing the evidence of the right forest products, namely (Ikhsan, 2011):

a. Certificate of Ownership, or Leter C, or Girik, or other certificate recognized by the National Land Agency as a basis for land ownership; or

b. Certificate of Use Rights; or

c. Letters or other documents recognized as evidence of land tenure or other proof of ownership.

Complete requirement made in the application includes:

a. Details of wood species, number of stems and volume

b. Documents of origin as valid evidence.

The Head of the Village as the Issuing Officer and Head of the Technical Implementation Unit (UPT) who receives an application for the issuance of SKAU documents immediately conducts an examination of the forest products to be harvested. The Village head and officer will soon measure and test the timber forest products after the timber fell out. The measurement is to get the volume of wood to be transported. Determination of the type of wood is important to do whether the transportation follow the procedures or not. According to the Minister of Forestry Regulation Number P.33/ Menhut-II/2007 there are 21 types of community round wood or community processed woods whose transportation uses SKAU.

The difficulty of removing wood from the land where it grows is one of the obstacles in the development of energy forestry on HKm land. The trouble in removing wood is due to the hardship in obtaining wood origin certificates (SKAU). For this reason, farmers prefer to plant HKm land with non-timber crops. It is mentioned in Permen No. P.51/ Menhut-II 2006 concerning Use of Certificate of Origin (SKAU) for Transporting Timber Forest Products Originating from Private Forests. SKAU is applied to control wood tree thievery in forest. Therefore, tightness of such permission will reduce the criminal. The identity of the felled tree can be recognized. Forest managing rights are evidenced by certificates of Leter C or Girik for owned land, or certificates of *Hak Guna Usaha* (Use Rights).

SKAU requirements applied on transporting wood from forest could prevent illegal logging. In issuing SKAU, the Village Head is obliged to examine the accuracy of the origin of timber forest products and their ownership, by checking and ensuring that the timber forest products originating from the correct location, proven by the existence of land rights. However, such regulation is still weak, since illegal loggers can make fake SKAU or use one SKAU for many times timber transports. It is suspected that the illegal loggers involve officials. Therefore, in order to prevent such criminal practice, SKAU permit is tightened.

However, such strict SKAU makes impact to the farmers who really want to transport wood originating from their land rights. There is a slogan among farmers that farmers are allowed to plant, but not allowed to harvest it. Basically, farmers are interested in planting timber trees. Timber trees are considered important both for their own needs and for sale. Self-planted wood is much cheaper than buying from a building material store.

2) Lengthy to harvest

Timber trees need long time before they can be harvested (Sudrajat *et al.*, 2016). The price of log will depend on its size, which is the larger the size the higher the price. Lengthy to harvest is not suitable for small-land farmers who fully depend their income on farming. The small-land farmers tend to fully plant their land with food crops or cash crops, which can give income immediately. On the other hand, growing timber trees may be more appropriate for large-land farmers, because they are still able to set a piece of land apart to grow food crops while waiting for harvesting timber trees.

Although planting timber trees is considered important to farmers, especially for small-land farmers, the main consideration in cultivating crops is a fast-producing commodity. Timber plants like *Paraserianthes falcataria* takes at least seven years for wood purpose, but it can be harvested earlier for pulp or fuel (wood energy), about 2,5 - 3 years. However, it is still considered too long to provide income for farmers. Based on the types of plants cultivated by farmers, it appears that the wood plants cultivated by farmers have only little diversity. Rather than wood plants, farmers prefer non Multi Purpose Tree Species (MPTS) or food crops. Non MPTS types are mainly cocoa, coffee and banana plants (Table 1).

Table 1. Composition of forest plants, MPTS and non MPTS on community arable land in forest areas

No	Village/Resort	Size (Ha)	Forest Plants (plant)	MPTS (plant)	Non MPTS Plant*)
1	Bukit Tinggi/Meninting	1	800	120	-
2	Sesaot/Sesaot	0,9	200	69	150
3	Senggigi/Malimbu	0,25	10	154	400
4	Langko/Jangkok	0,9	200	118	170
5	Bayan/Senaru	0,5	20	1	70
6	Rempek/Santong	0,9	85	40	43
		0,5	150	1	350
7	Bentek/Monggal	0,6	37	33	245
		1	-	30	350
Number		6,55	702	446	1.178.
Composition per Hectare			11	68	180
Percentage per Hectare			4,2	26,3	69,5

*) Especially cacao, coffee and banana
Source: Ministry of Environment and Forestry, RI (2018)

3) Uneasy marketing

Although wood is increasingly scarce on the market, marketing wood is not necessarily easy and gets the price as expected (Pratama *et al.*, 2015). The main obstacle of timber marketing is the absence of price protection from the government. Problems faced by the farmers in Batudulang Village in marketing wood forest products include (Muktasam & Amiruddin, 2014) the price of wood is too cheap, which ranges from Rp. 100.000,00 – Rp. 200.000,00 per tree or around Rp. 1.000.000,00 – Rp. 1.500.000,00 per m^3, depending type of wood. As a comparison, the price of wood originating from Kalimantan or Sulawesi has a much higher price, which is Rp. 3.500.000,00 in Mataram, and reaches Rp. 3.000.000,00 per m^3 in Sumbawa City.

The low price of wood from farmers can come from the supply of illegal wood. According to information coming from the community, illegal logging in the forest still happen to date. Transporting wood from the forest seems to be easier because the loggers have the skills to transport wood using even motorbikes. Efforts to prevent illegal logging by the Forestry Service through the Forest Management Unit (KPH) in large volumes have been drastically

prevented, through the recruitment of forest guards from community elements in large numbers. This can be seen from frequent arrest of trucks transporting illegal timber, which were previously difficult to accomplish.

Therefore the attention of the government both in preventing more intensive illegal logging, as well as providing marketing guarantees at better prices, will stimulate farmers to plant wood trees. Marketing guarantees, among others, can be developed through contracts with processing entrepreneurs, especially in relation to the development of energy forestry.

4) Agricultural land competition

Villages around the forest area are the places of poverty on the island of Lombok. Therefore HKm issuance is specifically aimed at empowering and alleviating poverty. Poverty in the villages is mainly caused by small land ownership, due to over populated area. For example, population density has reached $1.007 - 1.730$ people / km^2. According to the guidelines issued by the Ministry of Forestry, this density is a very dense criterion. According to Badan Pusat Statistik (2017), the density of Lombok Island itself is only 609 people / km^2, far below the density of the villages.

With the issuance of the HKm scheme, farmers planted the land with various plants. With an average land area of HKm obtained by each family of around 0,5 Ha, as occurred in Bukit Tinggi Village, Gunung Sari District, Meninting Resort, farmers have filled the land with various types of plants. Therefore, it is difficult for farmers to plant other crops, including timber. In addition, woody plants are broad-crowned plants which shade the existing plants and will interfere their growth and productivity of food crops or cash crops. It is in fact a common situation in Indonesia that developing crops will face competition of land exploitation (Iswanto, 2018).

5) Disrupted daily needs

Use of HKm land by farmers is directed to meet their daily needs. These include food crops that can be harvested every day (vegetables) and monthly (bananas, cocoa), and several months a year (coffee and Multi-Purpose Tree Species/MPTS). From observations in some villages in KPH West Rinjani it was found that the source of community income came from these plants, plus palm trees that grow naturally in the forest (Table 2).

Table 2. Dominant plants contributing to income in cultivation of forest land

Example of Cultivator in Each Resort	Farm Size (Ha)	Type of Land	Income/ Year (Rp)	Main Producing Plants	
				Type of Plant	% from Total Income
Meninting	1,0	HKm	32.900.000	Sugar palm	91
Sesaot	0,25	Non HKm	71.609.000	Cacao	55
				Banana, candlenut	34
	0,9	Non HKm	6.990.000	sugar palm	74
Malimbu	0,9	HKm	7.041.000	sugar palm	68
	0,9	HKm	3.805.000	herbs and spices	79
Jangkok	0,5	HKm	16.747.500	sugar palm	82
Senaru	0,6	HKm	23.800.000	Banana	76
				Kapok, Jack fruit	21
	5,0	Hkm	19.600.000	Coffee, Banana	88
Santong	0,5	HKm	19.682.000	Coffee, Cacao	75
Monggal	1,0	HKm	52.125.000	Cacao	78
Tanjung	1,0	HKm	n.a.	n.a	n.a

Source: Ministry of LHK RI (2018)

Developing HKm into energy forestry, by planting timber trees, will disrupt daily needs of the right owners. Cultivation on HKm by the right owners shows that they accentuate to grow plants that can meet their daily income (KLHK, 2018). They are not interested in growing woody trees. Although not shown, they tend to refuse timber seedlings provided by the KPH or other institutions. Timber tree seedlings will be left unplanted or planted without maintenance,

so the seeds will dry out and perish. In more extreme cases in some villages, woody plants that have grown previously are destroyed slowly by putting poison on the peeled stems.

6) Lack knowledge of conservation

Concern to conservation is important to apply in HKm for sustainable forest function ensuring farmers can get benefit from the forest for long time (Siadari *et al.*, 2013). The forest office of West Nusa Tenggara Province determines that forest must consist of at least 400 trees per hectare. If the rule is obeyed then the forest will be functioning optimally. The functions include water catchment, erosion prevention, provision of water to river, etc.

In fact, the practice of exploitation to the forest is still far from ideal condition, in which the number of trees per hectare are far below the standard number determined by province forest office. This condition makes the forest cannot function as it should be. Diversion of management to community in the kind of HKm will potentially harm the function of forests. It is not aware by the communities that such actions will make the soil poorer and the production of crops drops. In turn, the function of forest to dispel poverty is only an imagination.

Results of ISM Processing

The results of the structuring expert opinion regarding the constraints of energy forestry development can be seen from a Power-Dependence matrix, which is set up from reachability matrix (RM). The sub-element classification is described in the following four sectors (Marimin, 2004): Sector 1: Weak driver-weak dependent variables (AUTONOMOUS). Changes in this sector are generally unrelated to the system, and may have a small relationship, although relationships can be strong. Sector 2: Weak driver-strongly dependent variables (DEPENDENT). Generally, changes here are not free. Sector 3: Strong driver-strongly dependent variables (LINKAGE). The variables in this sector must be carefully examined because the relationship between variables is unstable. Every action on the variable will give an impact on the others and the feedback on the effect can magnify the impact. Sector 4: Strong drive weak dependent variables (INDEPENDENT). The variables in this sector are the remainder of the system and are called free variables.

Figure 2. Four sectors of Power-Dependence matrix

In sector 4 (independent variable), there are two obstacle variables namely Lack knowledge of conservation (obstacle 6) and Strict SKAU (obstacle 1). Both of these obstacles have high thrust and low dependence on other obstacles. Obstacle 1 tightness of obtaining a certificate of wood origin discourages farmers to plant timber plants. It is futile to grow timber tree if it is not able to harvest and sell. Therefore, resolution of the obstacle will give farmers a certainty that they can harvest the plant that they grow. Such resolution will also help to resolve other obstacles.

The solution by simplifying the process of issuing SKAU does not mean that the KPH loosens supervision. Conversely, providing simplifying SKAU issuance implicitly encourage all involved institutions to increase supervision in the application of the rules. This is to encourage

right owners to grow certain timber trees which give advantage to farming as well as forest function.

Likewise, resolution of lack knowledge of conservation will potentially resolve other obstacles. Conservation at sloping land is a must since it will avoid water run-off from rain drop which cleanse soil nutrients. Without any efforts, such condition will make soil to be poorer, reduce crop productivity, and subsequently drop farmers' incomes. Strong extension program is expected to avoid further damage of soil. At certain achievement where soil get maintained and more fertile, the farmer will get more benefit from their farming. This condition will facilitate to solve other obstacles, such as agriculture land competition, lengthy to harvest, uneasy marketing, and disrupted daily needs. Such sequence of obstacle resolution can be seen at Figure 3 below.
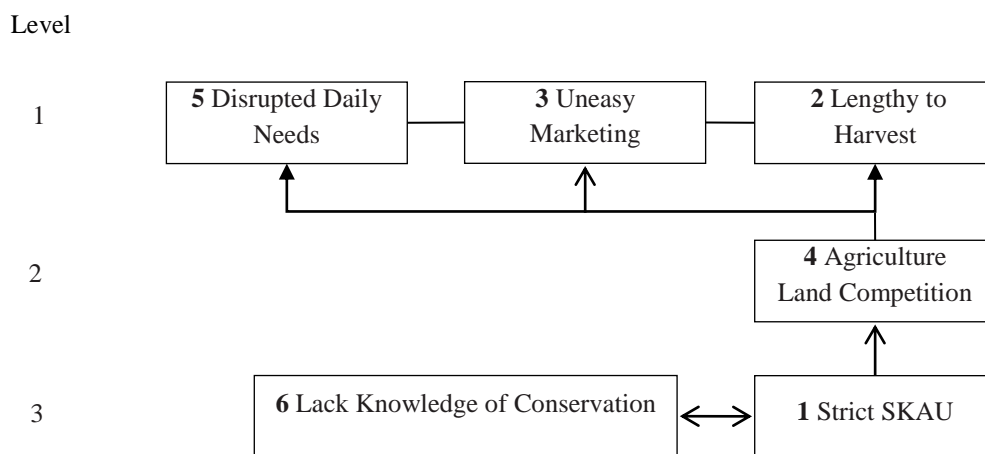
Level

Figure 3. Diagram showing the sequence of handling obstacles

The solution of agriculture land competition obstacle is by choosing the right species of timber trees such as upright growing habit. Such species compromise to timber trees and food crops choice dilemma. The upright growing species will not shade too much other plants around the trees including food crops grown by the farmers. The diagram above shows that through the resolution of agriculture land competition will support other obstacles to get resolved.

It is above mentioned that lengthy to harvest can make trouble the farmers because they cannot wait too long to get income. There is a need to choose early-harvested timber tree species. Such species will fulfil the requirements of economic and environmental purposes. However, it is important to further explore whether such species can fulfil energy biomass standard or not.

Uneasy marketing seems contradictive sound with the high price at building material store. This condition may happen when illegal logging is on the rise. Successful illegal logging control will reduce supply of log which in turn rise the price. Therefore, it is necessary to manage such criminal practice in order to overcome farmer's log marketing.

Disrupted daily needs is triggered by unfulfilled short-term income, which come from cash crops or plants that are giving immediate yields. Immediate yield plant will get interfered by tree growing. MPTS is actually the trees designed to serve economic and environmental purposes, however such trees cannot assure the farmers as steady source of income. Fruits from MPTS is often not valuable or the price will easily drop when supply increase. For example, durian is a high price fruit, but the price will go down or even worthless within harvest time when the fruit is abundant.

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CONCLUSION AND POLICY IMPLICATION

Conclusion

In the development of new and renewable energy (NRE), biomass is one of alternative energy sources that will be developed. Biomass development mainly from the development of energy forestry. Besides through HTI, HKm land is expected to be developed for this purpose. To utilize the HKm land, there are several obstacles that must be overcome, namely the strict SKAU, lengthy to harvest, uneasy marketing, agricultural land competition, disrupted daily needs, and lack knowledge of conservation.

The results of structuring expert opinions regarding the obstacles to developing energy forestry are only divided into two sectors. The first sector is the Strong Driver-Strongly Dependent Variable (LINKAGE) and the second sector is the Strong Driver - Weak Dependent Variable (INDEPENDENT). In the independent sector, there are two obstacles, namely obstacle strict SKAU (obstacle 1) and strict licensing in the form of a Certificate of Origin of wood (obstacle 6).

Policy Implications

In an effort to resolve the constraints of the difficulty in obtaining SKAU and lack knowledge of conservation, there are several steps need to be taken, namely: 1) Increasing conservation knowledge of farmers, supported by developing a pilot project on the development of wood cultivation; 2) Recruiting more additional field workers to help record inventory timber plantations; 3) Developing a database of wood planting with the type and age, preventing farmer's timber plants from that of government's.

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