

# ENHANCING AGROFORESTRY KNOWLEDGE AND SKILLS OF LOCAL COMMUNITIES IN LAMPUNG, INDONESIA FOR CLIMATE CHANGE ADAPTATION

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## Abstract

Deforestation remains as an environmental problem in Lampung, Indonesia. *Hutan Kemasyarakatan* (HKM or Community Forestry) program is one of the government strategies to address the problem of deforestation and environmental degradation in Indonesia. This program mentions agroforestry as one of the technologies that would enhance the welfare of the communities. Likewise, agroforestry offers potentials for climate change adaptation compared to monoculture plantations.

The research conducted in in West Lampung District in 2009 indicated that generally, agroforestry is being practiced by the communities around the forest in a conventional manner. This paper argues that there is a need to enhance the skills of the local communities as regards the practice of agroforestry for climate change adaptation. This paper further suggests that the local communities should have an understanding about climate change, including the mitigation and adaptation strategies.

Key words: Agroforestry, Climate Change Adaptation, Community

## Introduction

Indonesia is one of the most densely populated countries in the world. Moreover, this archipelagic nation's population problems are compounded by an uneven distribution of people. For instance, the island of Java, which comprises only 7% of Indonesia's total land area, is inhabited by approximately 60% of the total population (BPS, 2010). To solve this problem the government has instituted its Transmigration Program, which seeks to encourage the migration of people from densely populated

areas like Java to thinly populated ones. The first province chosen as destination of participants in the transmigration program is Lampung province. In fact, there are already growing signs of population-induced difficulties in Lampung. As an impact of the high density and the rapid increase in population, household land ownership in Lampung province has become progressively smaller. Consequently, population expansion has exerted tremendous pressure on Lampung's forestlands resulting in the conversion of some forest areas into agricultural lands.

Based on the last data (Forestry Provincial Office, 2006), 80% of protected forests in Lampung have been damaged, 43% of national parks, 71% of production forests and almost 100% conversion-production forests. Lampung province is thus confronted with a gigantic challenge to solve these problems. Data on Lampung forests and its damaging shown as Table 1.

Table 1. Forest Areas and Its Damaging based on Forest Function in Lampung Province year 2006

No	Form and Function Forest	Area (Ha)	Damaging		Remarks
			Ha	%	
<b>I</b>	<b>Nature Preservation Area (<i>Kawasan Pelestarian Alam</i>)</b>				
	Bukit Barisan Selatan National Park	58.258	9.321,28	16 %	Settlements, coffee, pepper, Cacao, Shorea
	Way Kambas National Park	44.733	16.103,88	36 %	Settlement, Cassava, Banana
	<i>Taman Hutan Raya (Tahura)</i> Wan Abdul Rahman Forest	15.574	10.901,8	70 %	Settlement, Coffee, mix crops
	<b>Total</b>	<b>118.565</b>	-	-	

<b>II</b>	<b>Natural Protection Forest (Kawasan Suaka Alam)</b>				
	Bukit Barisan Selatan National Park	21.600	-NA-	-NA-	Coral
	Krakatau – Sea Preservation Area ( <i>Cagar Alam Laut</i> )	13.735	-NA-	-NA-	Coral
	<b>Total</b>	<b>35.335</b>	-	-	
<b>III</b>	<b>Protection Forest</b>	<b>253.647</b>	202.917,6	80 %	Settlement, Coffee, Cacao, Pepper, Mix Crops
<b>IV</b>	<b>Limited Production Forest</b>	<b>23.714</b>	16.836,94	71 %	Coffee, Pepper, Shorea
<b>V</b>	<b>Permanent Production Forest</b>	<b>146.176</b>	111.093,76	76 %	Settlement and Mix Crops
	<b>Grand Total I + II + III + IV + V</b>	<b>577.437</b>			

Sources: Compilation of Forestry Provincial Office Data, 2006

An intensive management of areas designated or being used as pekarangan (homegarden) on private land and HKm on state forest have been considered as one of the best alternatives to solve the forest encroachment problem. In certain circumstances, homegardens management and HKm have proved to be an efficient strategy for capital-poor farmers wishing to intensify land use as land-holding size decreases. Aside from filling the household's subsistence needs, the pekarangan and HKm program provide a variety of economic, biophysical and sociocultural functions for the community while contributing directly and indirectly to the sustainability of the forests.

Erskin (1997) distinguished sustainability based on economic, ecological and sociological perspectives. Sustainability must simultaneously embrace the economic,

ecologic and socio-cultural requirements of the system. One of land use system that involves socially and ecologically acceptable integration of trees with agricultural crops and or animals, simultaneously or sequentially is agroforestry (Nair, 1993). Meanwhile agroforestry has also been defined as a sustainable land-management system that increases the overall yield of the land, combines the production of crops (including tree crops) and forest plants and or animals simultaneously or sequentially, on the same unit of land, and applies management practices that are compatible with the cultural practices of the local population (King and Chandler, 1978 and Zabala, 1990).

Some references and previous study by Verchot *et al.* (2007) describe that agroforestry has the potential to promote the climate change adaptation program. The climate change will certainly impact on the macro-ecosystem and, on a small scale, several locations especially mountain and upland areas. Climate change adaptation (CCA) includes any efforts both to reduce the negatives and to increase the positives of climate change. For example, WWF's (World Wildlife for Nature Indonesia) and ITB (Institut Teknologi Bandung or Bandung Technology Institute) Climate Change Risk and Adaptation study (2010) in Lombok suggests that CCA through vulnerability assessment can help the food security program, particularly at a regional level. It means agroforestry is socio-economically advantageous in terms of increasing community nutritive value. Besides, Minister of Forestry Regulation No.37/Menhut-II/2007, article 2, point (1) states: "HKm as a *Community-based Forest (CF) scheme is developed in accordance with the principles of (a) ecological, economic, social and cultural use and sustainability*". And actually agroforestry-based land management is applicable not only to community forests but also to state forests.

Applied HKm can be managed through an agroforestry scheme, or a pattern commonly known as mixed garden. This scheme applies the combination of plants with high/medium/low canopies, including wood and fruit trees. For certain models/areas, plant cultivation is also combined with animal husbandry and fishery also honey bee cultivation. Thus, its implementation can help people meet their needs, at least on a household scale.

Verchoct *et al.* (2007) stated that smallholder farmer do not have adequate resources to adapt to climate change. As agroforestry is implemented on HKm and within climate change adaptation in particular and Indonesia's sustainable forest development in general, it will necessary to increase people's skill and knowledge of agroforestry (capacity building).

### **Methods**

This studi was carried out in 2009 in Lampung Barat district, in villages where HKm program has been implemented since 1999. In 2006 this district was awarded the best Farmer Group of HKm in Indonesia by the Minister of Forestry. The quota sampling included 36 people (respondents) and were devided proportionally to each village.

Information needed in this study was primary and secondary data. Data was collected through observation of agroforestry-based practices around the study area, besides interviews. Next, there was *triangulation method* applied (Moleong, 2005), i.e. verification of data by comparing data from different sources, phases and time. Furthermore, date was analyzed (Miles and Huberman, 1992), through the following steps:

1. Data reduction, to further analyze, classify, eliminate (unnecessary) data and draw conclusions;
2. Data description, to easily view data in parts and overall, data was arranged by describing the HKm policy impementation process in Lampung Barat.

3. Conclusion-making/verification, from the beginning of the study and during the data collection (continual verification).

### **Discussion and Recommendations**

The majority of the respondents (72%) practice agroforestry-based land cultivation and land conversion, including:

1. Loosening the soil so the plants can grow optimally;
2. Fertilizing the field;
3. Building a drainage system;
4. Rotation of plants planted, particularly seasonal crops
5. Pest/disease control.

The other respondents (28%) practiced only some of steps mentioned above or none of them.

The existing forest generally comprises some tree species and few kinds of crops (e.g. vegetables, sweet potato, cassava, corn, peanut, and medicinal plants). Around 68% of the respondents do subsistence farming, covering only 25% of the forest area. There are wood/fruit trees, e.g. durian, 'petai' (*Parkia speciosa*), cocoa, rambutan, 'jengkol' (*Pithecellobium lobatum*), oil-palm, sugar-palm, banana, *Eugenia*, mango, salacca, jackfruit, coconut, hybrid coconut and papaya, and also shady trees, e.g. mahogany, acacia, mangium, white teak, dadap, gamal, capok-tree, and sengon. The shady trees are also used for pepper plants to climb on. 61% of the respondents believe these plants are cool and watery. This calls for giving them more information and skills on what plants suitable for climbers (as commodities) to grow up on.

The shady trees (according to 69% of the respondents) ecologically shelter the seedlings and main crops from the sun's light and raindrops, keep moisture in the air, avoid the erosion of the soil and increase nutrients (from organic materials). They are needed until the main crops (e.g. coffee) adapt to the environment. Knowledge of these land management or conversion techniques and plants' interactions is gained from farming experiences. As mentioned by 83% of the respondents, ex-forest soil has high fertility due to the abundant organic materials (dead leaves/twigs/grass) to form

humus. However, there should be an increase in their knowledge of suitable shady trees and plant combination and, if necessary, the *bokashi* fertilizer-making.

One of the activities when sowing the seeds is weeding (84% of the respondents). Only 47% of these respondents could explain their reasons for doing the weeding, i.e. less competition with weeds for water, fertilizers and nutrients will enable the seedlings to grow optimally. Since the geographical and climatic conditions in Lampung Barat are different from one region to another, improved weeding techniques relevant to adaptation strategies are also necessary.

According to Agus (2002), vegetables and other crops do not grow well in too much shade, and they produce smaller fruit. On the other hand, seedlings should be protected from the sun. Direct sunlight will make them withered, yellowed and then die. In the case of increasing coffee production, the shady trees should be planted at intervals (providing about 30% shade), besides cuttingsome branches away.

The shady are usually acacia (*Acacia auriculiformis*), mangium (*Acacia mangium*), mahogany (*Swietenia macrophylla*), and ‘sengon’ (*Paraserianthes falcataria*). They are useful for increasing nutrients (from their dead leaves) and stopping the erosion of the soil, while twigs and branches are used as firewood (78% of the respondents). As for vegetables, the soil is mixed with manures before the planting. Total 79% of local farmers actually manage their lands conventionally regarding CCA-related land cultivation.

In relation to their ethnic groups, they all have sufficient and similar knowledge of forest management/conversion. However, most of them do not apply teir knowledge completely. Some involve in intensive forest management by combining trees as long-term production and agricultural plants as short-term production. They generally have gardes/fields in the community-based forest<sup>1</sup>. They cultivate forestry plants (*multi-purpose trees species/MPTS*, e.g. durian, duku, oil-palm, rambutan, cocoa, sugar-palm) in combination with crops such as dry-field rice, vegetables, peanut and corn.

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<sup>1</sup> *Hutan Kemasyarakatan* (HKm) or Community Forest scheme is a government scheme, providing local people opportunity to manage state lands/forests without rights and without changing their main functions.

Those of Javanese stock go to the forest every day. Many of them even stay there for months since it is far from their homes. They seriously consider plant combinations (e.g. coffee, rambutan, banana and other crops such as eggplant and 'rampai'), planting time and also production costs. Crops can be harvested after 3 – 4 months, and once a year for banana and rambutan. Thus, they can earn some income while waiting for coffee production. In addition to pesticides, they spread cinders around tree trunks to get rid of pests (ants).

The Sundanese farmers typically have ponds for keeping catfish, *gurame*, *patin*, and goldfish. They principally work in dry/irrigated rice field (mostly not in HKm). They choose the beginning of the rainy season as the right time for planting (*mangsa 4*). Conducting tree-based forest management, they do not grow crops to be combined with. Thus, they tend their field only when necessary. For instance, they cut some leaves when the trees are too leafy or deal with pests/diseases only if the trees are attacked or infected.

As for the Semendo farmers, they (84%) usually have mixed gardens of coconuts, banana, pepper, gamal, dadap, and vegetables (e.g. papaya, cassava) and medicinal plants. They leave the village due to the low incomes since a drop in the price of coffee.

Slightly behind the Javanese and Sundanese farmers, their knowledge is good enough. Due to a lack of money, they do not fertilize their gardens nor control pests/diseases control. Very occasionally do they weed their gardens and cut some leaves. The planting is carried out only when seeds are available. As they do not take care of their gardens well enough or make management planning, the harvest is usually unsatisfactory.

Viewed from the matters discussed above, it can be said that local farmers of the 3 ethnic groups are not aware of the climate change issue. Agricultural information and training programs in 2010 given to them are far from answering their need (70% of the respondents), being well-organized (72%), being relevant to climate change (79%). Besides lacking in practices, according to 66% of the respondents, the information on



agroforestry has not been related to A/R, climate change and its adaptation/mitigation strategies.

### **Conclusion and Recommendation**

In general, local farmers of the existing ethnic groups show a strong preference for the combination of trees and (seasonal) crops to ensure continually good income. And each ethnic group has its own ecological knowledge and steps/practices in forest management and conservation.

In the study area most of the agroforestry management is managed traditionally, and this will not be of much help for CCA program. Local people's skill and knowledge of agroforestry relevant to CCA need to be increased step by step in a clear, good structure, and simple both on format and language.

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