

Restoration of Degraded Forest through Establishment of Agroforestry System at Bogor Agricultural University Forest, Indonesia : an Action Research

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1. Introduction

The Bogor Agricultural University Forest (BAUF) located at Gunung Walat, Sukabumi District, West Java, Indonesia is facing rapid degradation due to illegal cutting and encroachment by local people since 1997. About 80 ha of 359 ha area of BAUF has been encroached by people from surrounding villages. Disturbance in the forest could be divided into three types, i.e. 1) farmers clear cut trees and cultivated agricultural crops on the site, 2) farmers cut some trees then grew agricultural crops, and 3) farmers cultivated area with agricultural crops without disturbing trees.

Sharing land for the production of forest trees and agricultural crops in agroforestry systems would be expected to be the most promising solution for the above problem. Javanese farmers have long traditionally practiced the basic concept of agroforestry. Development of agroforestry has been done by the Ministry of Forestry, which developed taungya system (called “tumpang sari”) to establish teak (*Tectona grandis*) plantations in the state forests in Java for over a century (Kartasubrata, 1991).

A concept of Community Based Forest Management (CBFM) is currently promoted in Indonesia and become a major program of Indonesian Ministry of Forestry to solve many conflicts involving the forest areas, people surrounding the forest and the foresters. In the CBFM farmers are involved in the forest management since the planning until harvesting and there is a profit sharing from the harvesting of tree species.

An action research funded by Korean Government under the ASEAN-Korea Environmental Cooperation Project (AKECOP) has been conducting since 2001 at the BAUF. The project is planned to carry out for five years. The aim of project is to obtain a model of forest restoration through establishment of sustainable agroforestry systems involving local people.

2. Methods

How to encourage the poorest farmers or peasants to participate in a forest restoration project is not an easy task. Researchers and community development workers to identify the land-management problems and to plan as well as design their solutions together with the local people use a recent approach called Participatory Rural Appraisal (PRA). This approach is used to identify and explore the initial social, economic and ecological conditions and to design the agroforestry project, which will be conducted in Gunung Walat.

This project is an action research, which is going to be run for five years. Survey, observation, literature review and actions are methods used in the implementation of the research project planning. The concept of CBFM is adopted to implement the research project.

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3. Results and Discussion

a. Development of Agroforestry System

The forest area is situated at Gunung Walat, Sukabumi District, West Java Province. Approximately 120-km from Jakarta (the capital of Indonesia) to the South or about 60-km from Bogor (the university base of Indonesian research team) to the South.

The total area of the BAUF is 359 ha laid at 500 to 700-m a.s.l. The topographical condition of the area is hilly, where the Northern area has very steep slopes. The soil types are Latosol, Litosol and red yellow Podzol. Its climate can be classified as type B of Schmidt and Ferguson with mean annual rainfall is about 2966 mm and minimum/maximum temperatures are about 19°/29°C.

There are three type of cultivations in the BAUF conducted traditionally by local people, i.e. planting upland rice in the relatively open forest stand, planting cassava and banana in a relatively dense forest stands, planting coffee, cardamom and banana in the dense forest stands after cutting several branches to get more light (Tab. 1 and Fig. 1).

Table 1. Species and Standing Stock of Traditional Cultivation at BAUF according to Height Stratum per 1000 m²

Stratum	Height (m)	Species	Number
I	< 3	Cardamom (<i>Amomum cardamomum</i>)	40
		Cassava (<i>Manihot esculenta</i>)	20
		Coffee (<i>Coffea robusta</i>)	15
		Mahogany (<i>Swietenia macrophylla</i>)	20
		Taro (<i>Colocasia esculentum</i>)	25
II	3 - 6	Banana (<i>Musa</i> sp.)	10
III	> 10	Damar (<i>Agathis loranthifolia</i>)	15
		Total	145

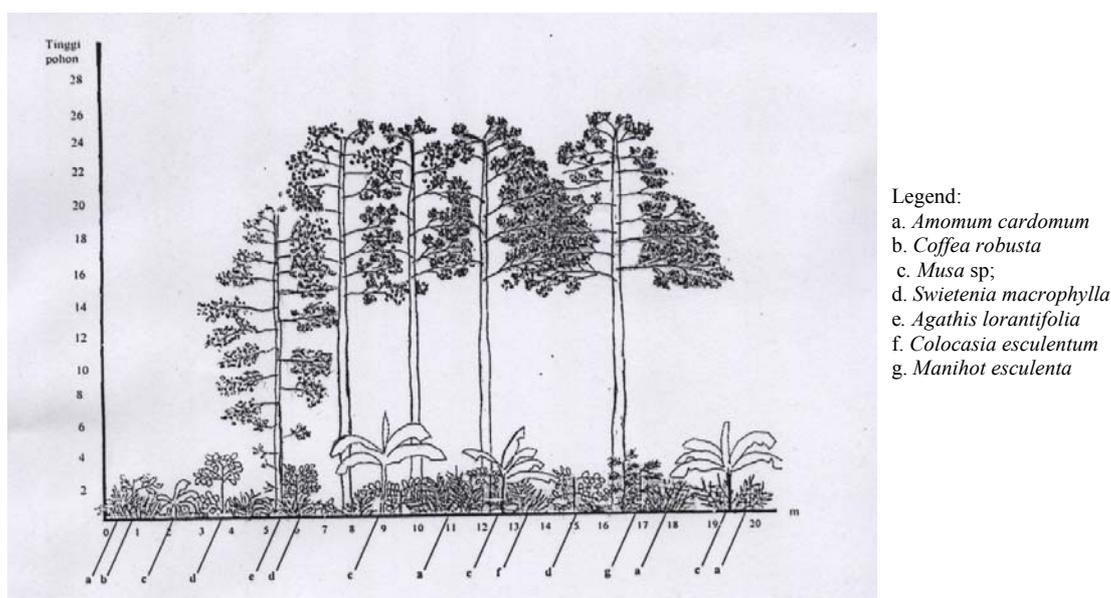


Figure 1. Profile of Typical Traditional Cultivation at BAUF

Agroforestry is the promising technique to restore the encroached forest area and at the same time fulfilling the needs of the local community. At the site with generally low soil fertility such as Gunung Walat a carefull design of agroforsetry system should be made.

To increase the productivity and to reduce soil erosion the project designed improved agroforestry models. The recommended forest tree species are *Agathis loranthifolia* and *Paraserianthes falcataria*, while the agricultural crops are rice, corn, banana, taro, cardamom and coffee. The selection of tree and agricultural plant species for the model is also based on the result of plant preferences rank matrix, which was conducted by local people during PRA (See Appendix 1).

Three types of agroforestry model were designed according to the present condition of forest stands. First design of agroforestry system will be established to restore the forest area of BAUF where almost no trees are present (Figure 2). Second design is a modification of the first design. The second design will be established in the forest area where about 25 until 100 trees per hectare are present (Figure 2). The third design will be established in the forest area where more than 100 trees per hectare are present (Figure 3).

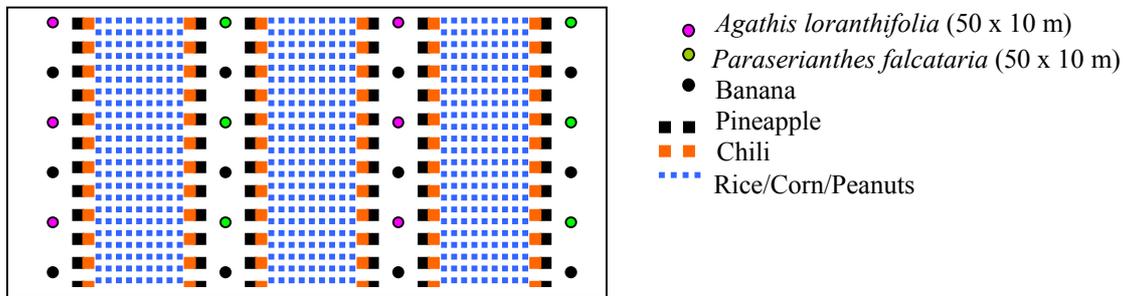


Figure 2: First and Second Design of Agroforestry System

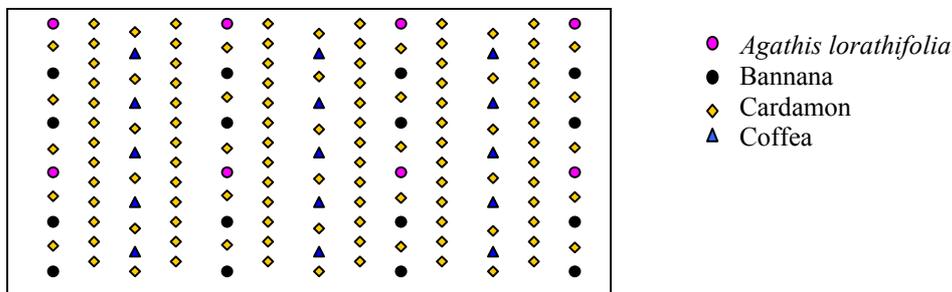


Figure 3: Third Design of Agroforestry System

Generally, farmers want to plant cassava, upland rice, maize, chili, groundnuts, and cardamom (Table 1). In Fig. 2, the space allocated for upland rice can be used to plants maize, groundnuts or chili monoculturally or intermixed of these four species of crops. Cardamom (*Amomum cardomum*) is suitable for growing only under shade; therefore, this plant can be used to develop agroforestry system under the existing tree stand with stocking more than 100 trees per ha. Cardamom is commonly used for medicinal purposes.

b. Development of Community Participation

Encroachment problems faced by the BAUF should be solved wisely. Surveys and participatory rural appraisal showed that local people encroached the forest are poor farmers or peasants who have low education and low access to the market. However both the forest and the surrounding villages have biophysical and socio economical potentials which could be combined and developed for the benefit of the forest management and the local people.

Result of careful field overview and stakeholders' identification showed that there were 311 peasants who encroach the BAUF. They live in six hamlets of Hegarmanah village, which are bordered with the forest. The 311 peasants are involved in the project as participants and grouped according to the location of their cultivated land (forest block) into 24 peasant groups.

Participatory rural appraisal has resulted among any others the proposed problem solving from the local peasants to maintain the BAUF in form of Tumpang Sari or Taungya System. They want to be allowed to cultivate legally a piece of forestland for agriculture crops. Even though the BAUF is not a production forest area, the part of forest area where already encroached could be managed together with the local community. The management of Gunung Walat and the local community could share the management and the benefit from the forest ecologically, economically and socially. To fulfill this objective, a legal contract between peasants and the Director of BAUF, on behalf of the Bogor Agricultural University, has been signed up.

According to the contract the peasants will be able to cultivate the forestland according to the planned agroforestry design for 10 years. The peasants are allowed to get all the agricultural crops from their cultivated land and 50 % of yield from *Paraserianthes falcataria*. The 10 years duration of contract is given to the peasants based on the two times of cutting cycle of *Paraserianthes falcataria* as the agroforestry component which its yield will be divided between the management of Gunung Walat and the peasants. The existed Agathis stands as well as the new-planted Agathis could not be cut by local people as well as by the management of BAUF.

A legal contract, which allows the local peasants to cultivate the forest area, is also a kind of incentive for the peasant to participate in a forest restoration project. The formulation of legal contract has been done through discussion with the peasant as well as consultation with the Senate of Forestry Faculty and finally with a legal advisor (lawyer).

Forest restoration project could success with participation of the local people provided that the project participants have a sense of belonging to the forest. Because of that an intensive extension and support are needed to strengthen local institution and enhance the income generating activities. For that purpose an extension worker has been appointed in the research site. But the number of project participants is too large for one extension worker. It has resulted in the slow peasant's understanding about the objective of the project and the content of legal contracts. To increase the peasant participation the extension worker is assisted by local worker who know well the attitudes and tradition of the peasants.

Development of people's participation and knowledge has been conducted through:

1. Intensive extension to the peasants groups as well as individual by an extension worker
2. Meeting with research team
3. Publication of newsletter as a communication media among project participants
4. Training and Study tour for the participants
5. Involvement of peasants in all project activities, such as boundary measurement, marking and mapping of project area, nursery establishment, etc.

Income generating is also one of important focus of this research project. Because strengthening household income especially from outside the forest area could reduce the dependence of the local people to the forest resources, thus it will enhance the restoration of forest. Strengthening of income generating is conducted through development of household industry such as processing of cassava and banana into cassava and banana chips, etc.

4. References

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Appendix 1. Rank Matrix of Plant Preferences of the Local People

Consideration Factor	Plant Species																				
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Seedling availability	4	4	2	3	3	2	4	3	1	2	4	3	3	1	1	1	3	3	2	2	4
Marketing	4	3	4	4	4	4	3	3	3	4	4	4	4	4	4	4	4	3	1	4	4
Technology	4	4	3	3	3	2	4	2	1	4	3	4	4	2	2	3	3	3	4	2	1
Capital	4	4	2	2	2	2	4	3	2	2	4	3	3	1	2	3	3	3	4	2	1
Labor	3	3	3	3	3	3	4	3	2	4	3	4	3	2	2	2	3	4	3	2	1
Plant health	2	3	2	1	2	3	4	2	2	4	3	4	4	1	3	4	2	3	4	4	1
Price / production	2	2	3	4	3	4	2	3	2	4	2	3	3	4	3	2	4	3	2	3	4
Ability to reduce erosion	1	1	3	3	3	3	3	3	3	3	1	2	4	3	2	4	3	3	4	2	1
Utilities	4	4	1	1	1	1	3	3	1	3	4	2	2	1	2	2	4	3	1	3	4
Adaptability	4	3	4	4	3	4	3	2	2	3	4	4	4	2	2	3	4	4	3	3	2
Production time	2	2	1	1	1	1	0	1	0	0	4	4	3	2	2	1	2	2	3	3	4
Total	34	33	28	29	28	29	34	28	19	33	36	37	37	25	25	29	35	34	31	30	27

Note :

A = Banana (<i>Musa</i> sp)	H = Damar (<i>Agathis loranthifolia</i>)	O = Nut meg (<i>Myristica fragrans</i>)
B = Cassava (<i>Manihot esculenta</i>)	I = Pinus (<i>Pinus merkusii</i>)	P = Salak (<i>Salaca edulis</i>)
C = Rambutan (<i>Nephelium lappaceum</i>)	J = Mahogany (<i>Swietenia macrophylla</i>)	Q = Sengon (<i>Paraserianthes falcataria</i>)
D = Durian (<i>Durio zibethinus</i>)	K = Taro (<i>Colocasia esculentum</i>)	R = Deris (lokal name)
E = Dukuh (<i>Lansium domesticum</i>)	L = Cardamom (<i>Amomum cardomum</i>)	S = Songket (lokal name)
F = Mangosten (<i>Garcinia mangostana</i>)	M = Caffee (<i>Coffea robusta</i>)	T = Melinjo (<i>Gnetum gnemon</i>)
G = Puspa (<i>Schima walicii</i>)	N = Clove (<i>Zyzigium aromaticum</i>)	U = Rice (<i>Oryza sativa</i>)

Most suitable : *Amomum cardomum* and *Coffea robusta*Least suitable : *Pinus merkusii*, *Zyzigium aromatica*