

The Knowledge of Local Silviculture Agroforestry Mindi (*Melia azedarach*) in Selaawi Village, Talegong Sub District, West Java Province

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Abstract: Selaawi Village farmers have local knowledge in managing land with agroforestry patterns. Agroforestry land management is one form of sustainable natural resource management. The forest development trilogy considers economic, social and ecological sustainability. The collection of local knowledge exploration data will be conducted through in-depth interviews, questionnaires, and Focus Group Discussion (FGD). The data obtained through the interview results are then compiled into statements based on the formula (grammar) that have been applied to the Agroecological Knowledge Toolkit 5 (AKT 5) program and analyzed descriptively. Local knowledge of Selaawi villagers consists of (a) plant propagation, (b) soil treatment and drainage system, (c) planting and crop rotation, (d) plant maintenance (4) pest and disease control and (e) timber harvesting.

1 INTRODUCTION

The recognition of the importance of Local Ecological Knowledge (LEK) in development according with the growing uncertainty of modern agricultural systems, can or will provide a way out of poverty is widespread in some countries (Nimmo, 2007). The research on local knowledge has done by Sitompul (2011) the incense agroforestry of Humbang Hasundutan Regency of North Sumatera.

The result of research showed that local culture of society in cultivation of incense is financially feasible to cultivate. In addition, incense forests also have ecological functions for surrounding communities. The studied by Cao (1997) on the management of silviculture of local farmers in Sichuan in the selection of farmers' crops is very careful to avoid losses. The selection of plant species for timber producing takes precedence over focused the fruit-producing crops. Similarly, the selection of mindi wood in Salawi village that has farmer's decision to defend their farm.

The objectives of this study were to determine local knowledge in managing mindi agroforestry in

Selaawi Village consisting of: (a) plant propagation, (b) soil treatment and drainage system, (c) planting and crop rotation, (d) crop maintenance (4) pest control and diseases and (e) timber harvesting.

2 METHODOLOGY

This research was conducted on agroforestry land located in Selaawi Village, administratively located in Talegong District, Garut regency, West Java Province. The place selection of research was conducted purposively on agroforestry land developed by farmers.

2.1 Exploration of Local Knowledge of Agroforestry Systems

The data collection of this research by local knowledge exploration will be conducted through in-depth interviews, questionnaires, and Focus Group Discussion (FGD). The population will be taken from some key informants who are followed in mindi agroforestry directly. The total of respondents to be

determined in accordance with the population that followed in this activity. The technique of the sample will be interviewed is by snowball sampling. The first initial in sample is small and then, enlarges, like a rolling snowball that grew bigger for a long time. For the first sample will be chosen one or two persons, because of these two people the data have not completed. the researcher seeks others who are considered more know and can complement the data provided by the two previous people. And so on, till the data of this research more in samples (Sugiyono, 2009). The collected data are silvicultural system, seed technique, plant propagation and land management technique.

2.2 Depiction of Local Ecological Knowledge Models

Local Ecological Knowledge (LEK) is derived from indepth interviews and field observations on land management techniques in agroforestry system, components in land management techniques in agroforestry systems, and interaction between components in land management techniques in agroforestry systems. The data result taken from interviewing and then completed into a statement based on the structural of language (grammar) that has been applied to the Agroecological Knowledge Toolkit 5 (AKT 5) program (Harja and Vincent, 2008). Finally, the data processed by using AKT 5 application program and analyzed descriptively.

3 RESULT AND DISSCUSSION

3.1 Plant Propagation

a. Local knowledge of plant propagation
Plant propagation activities consist of: (1) selection of mother trees, (2) fruit harvesting, (3) the extraction of fruit, (4) to propagation of generative and vegetative crops. The Local ecological knowledge of plant propagation can be seen in Figure 1.

3.1.1 Selection of Parent Tree

The selected parent tree is a straight-stemmed tree, 40 to 60 cm in diameter. the height of tree 17 to 25 meters. Tree age reaches 15 to 20 years. Healthy plants are not affected by pests and diseases. The parent tree growed in Selaawi Village is about 150 trees spread in farmer's garden. Physiologically, the

fruit will be mature in late August to September each year.

3.1.2 Harvesting Fruit

Harvesting fruit is usually done in August each year. The feature of fruit mature that is physiologically with a yellowish color. The study of the criteria of mindi mature physiological has done by Suita *et al.* (2008) stated that the high seed germination is obtained from yellowish green fruit (34.5%) and yellow (35%). Usually, in period of mindi mature, will begins to drop the leaves until all the fruit falls from the tree. Harvesting of fruit is done by climbing a tree. Before the parent tree is climbed arounding the tree is cleaned. Firstly, it is intended that the fallen fruit is easy to collect. One parent tree usually produces one to two bags of fruit and usually one parent tree climber is only able to produce 2 bags of fruit (sack of rice with 30 kg size).

3.1.3 Fruit Extraction

The shells are so hard mind that in splitting the seeds they usually use machetes. There are two ways in which to take the seeds from the shells of mindi, the first is by cutting straight across and then, the visible seeds in the shell are removed by tweezers. The second way is fruit extraction process. The extraction process is done by using a hammer or machete. The process is done by eliminating the flesh of fruits and after the flesh is off, resulting in mindi shell. The shells are dried for 3 days. After 3 days, mindi shells begin to crack, from the sidelines of the crack is gouged using machete and pruning knife. The breaking technique using this machete must be careful because the mindi seed is very soft and easily damaged.

According to the farmer, the method of taking good mindi seed is the second way. The reason is the seeds are not damaged or deformed compared to being split directly. Disabled seeds from knives can not be used as seeds in a nursery because if they are planted they will die in the nursery phase. In the activities of seed expenditure from the one person is able to collect one glass in a day. One glass is equivalent to 200 grams.

Selection of seeds into good form is done by soaking the seeds in the water. Good quality seeds will be drowned and black. The seeds are then dried for one to three days and ready to be seeded. Minds that have been removed from the shell only lasted for 3 months. After 3 months usually mindi seeds are not good anymore. The longer the seeds kept,

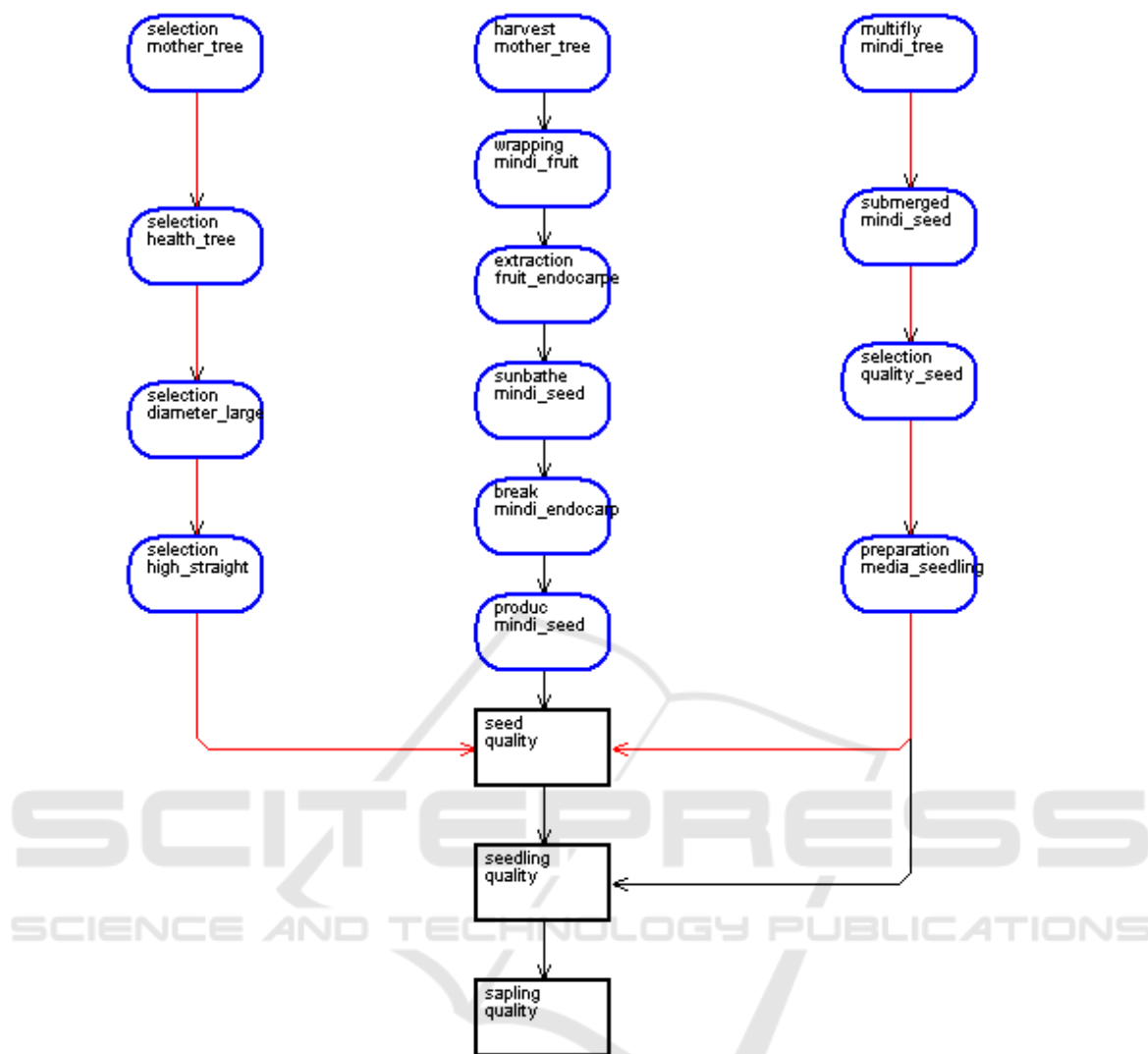


Figure 1: Local Ecological Knowledge planting of propagation.

the lowerits growing percentage in the nursery.

3.2 Propagation of generative and vegetative plants

Before 2007 the mindi seeds were obtained from the natural wrappings that grew beneath the old mindi stands. Another technique is by burning, this technique is used to facilitate the breaking of the mindi skin before sowing. The technique by burning is less effective and the germination percent is very low.

Actually the technique of nursery in mindi is not difficult, but there are greatest difficulty in terms of removing the seeds from the shell. The preparation of beds and seed media can be done after collecting the seeds. making size of bed 50

cm x 20 m. Seedlings media composed of soil mixed with rice husk with comparing 1:1. Rice sekam is aimed to soil, so the removal of seedlings will not be difficult. After that, the seeds are sown until evenly and covered with a mixture of soil and rice husk. Furthermore, seedlings are sprayed by using chemical pesticides to protect the seedlings from pests. Lastly, seedlings are covered with plastic until 10 days. Usually the weaning process will be held for 2.5 months (10 liters of seed sowing). Buharman *et al.* (2002) states that the media of seedlings for mindi consists a mixture of soil, sands, compost (7: 2: 1).

According to Hani (2009) the quality of seedlings in the nursery is influenced by genetic and environmental factors. Environmental factors that can affect the quality of seeds, among others,

the quality of media grow as well as the intensity of light received. Each type of plant requires different types of media and treatments such as meranti requires a growing medium of topsoil containing mycorrhiza.

In vegetative propagation is also performed, but the growth rate is very low. The technique in vegetative propagation is by cutting. The growth percentage is very low, which is only about 25%. Cuttings are usually taken from seeds that are 30 cm high. The shoots are planted in the polybag directly and covered with a leaf roof. The maintenance is done from shoot is produced from the cutting until the seedlings of the cuttings can be planted in the field.

3.3 Soil Processing

Selaawi village has a slope above 15%, if not managed with local biophysical condition is very

vulnerable to landslide. The society manage their land by making the terrace direction contour line. At the beginning of soil management, terrace is made then sprayed to loose soil with the goal of nutrients and optimal water absorbption. Making the terrace is aimed to hold the soil to avoid landslides and hold soil nutrients during the rainy season so it does not get washed. Well-treated soil will increase the porosity of the soil. High porosity of soil according to Hardjowigeno (2007) the number of soil pores characterized by organic matter is influenced by texture and soil structure. Diagram of local knowledge of soil management can be seen in Figure 2.

Land clearing is done during the dry season, usually in July. Cutting gras that grow in soil with the aim of compost as a fertilizer. After the soil processing, the land is usually planted with seasonal crops.

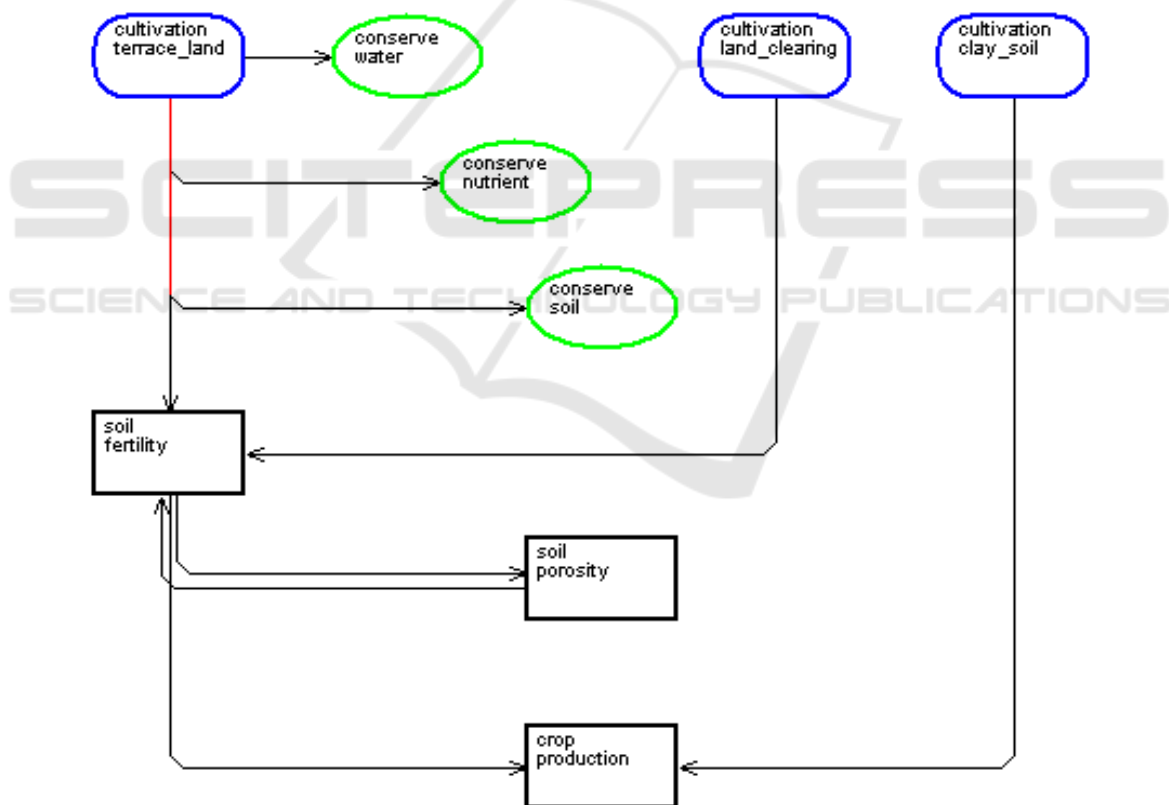


Figure 2: Local Ecological Knowledge Soil treatment.

3.4 Planting and Crop rotation

Selaawi farmers plant the planting during the rainy season in October every year. For mindi, the planting in Selaawi Village was done considerably starting in 2007. Since 2007 until now the number of mindi that has been planted is as many as 65,000 seeds. This number showed that people's has high interest in mindi wood. Previously, Sengon became the mainstay of farmers. However, because of many attacks of pests and diseases of sengon such as stem cancer cause the selection exchange to other. African wood grow naturally in the farmer's garden, and then maintenance to the wood is done until wood can be harvested.

There are several stages of planting: (1) 1 to 3 years: under tree is planted with palawija because the seasonal plants still get full sun, (2) 3 year Mindi: under tree planted with coffee. (3) At the age of 3 years the closure of the canopy has started to meet each other. Therefore it needed the right combination of plant species.

Spacing is generally 3 m x 3 m and the planting is done quite tightly. This is aimed that tree does not collapse by the wind. Besides, the wood results are straight and high free branch. The edge of the plant used is usually aren (*Arenga pinnata*) and

lemongrass (*Cymbopogen nardus*). Lemongrass planting is done to remove pests and diseases and the function as soil reinforcement to avoid erosion during rainfall. According to Departement of forestry (2001) mindi can be planted with size 2 m x 2 m or 2 m x 3 m, but in Paraguay mindi planted with distance 4 m x 4 m for wood production. Mindi tree inThailand closely with cassava, corns, shorgum, coffees, cashews, bananas, pineapples and others.

One of the advantages of mindi wood on the field, the mindi wood rarely attacked by pests because the leaves that has typical smell. In addition, mindi who have been cut down will usually grow again fertile. The existence of such fertilization, causing logging mindi can be done as much as two to three times.

Mindi seed is usually obtained by buying or barter. Breeding is very difficult to do, only a few people who can do their own nursery. Before 2007 the source of plant material was obtained from the under old mindi tree and the other technique was the hatching of the mindi by burning and then it was seeded. Germination of the mindi by burning is less effective and percentage is very low.

Local knowledge of planting and crop rotation can be seen in Figure 3.

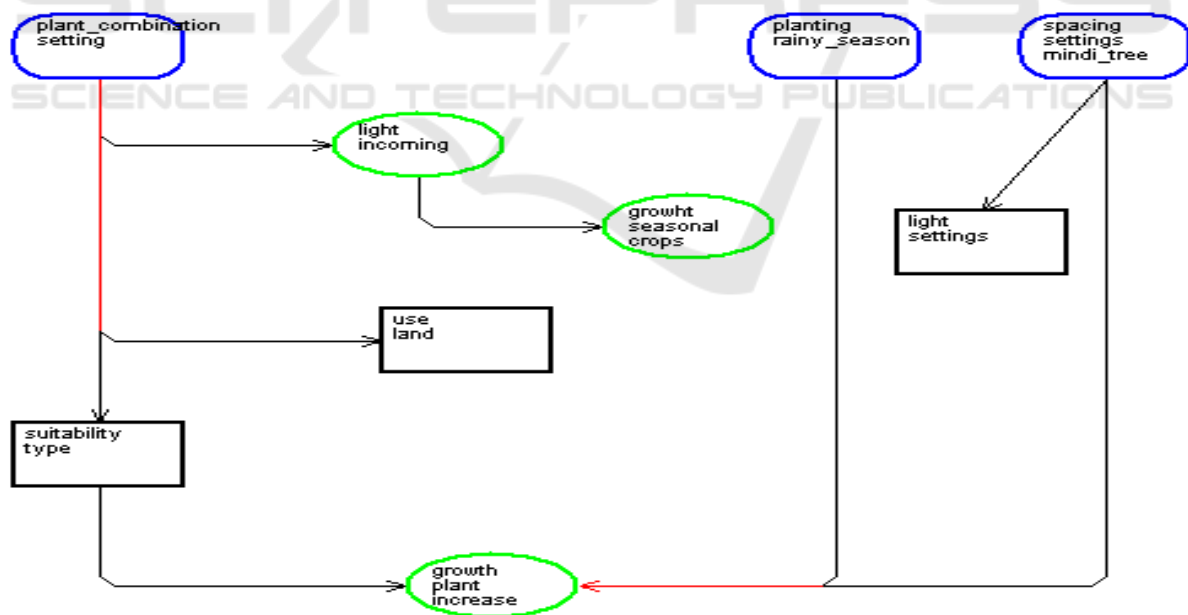


Figure 3: Local Ecological Knowledge planting and crops rotation.

3.5 Plant Maintenance

Plant maintenance activities consist of: (1) fertilization, (2) watering, (3) crop rotation, (4) pest and disease control. Local Ecological Knowledge is presented in Figure 4.

3.5.1 Fertilization

Fertilization is done with organic or chemical fertilizer. Organic fertilizer used is derived from chicken manure and cow dung. Chemical fertilizers consists urea and TSP. Fertilization is done during the rainy season, it is intended that the fertilizer can seep into the pores of the soil. Usually the fertilization mindi plants will be done every three months in year. And after one year the fertilization is stopped. Usually the fertilization for 1-3 mindi need 2 kg of animal waste per stem at the beginning of planting.

3.5.2 Sprinkling

Watering activities are only for seasonal crops whereas in woody plants, no watering is need. Water spraying is done in the afternoon during the dry season. LEK watering plants can be seen in Figure 4.

3.5.3 Weeding

Weeding is done to clean the trees from weeds. Kanggai weeding activities are done every four

months. The remnants of weeding are then stockpiled in soil. The weeding is done in the dry season.

3.5.4 Pruning

Generally, people in Selaawi Village doesn't do prunning because usually mindi plants have their own prunning system. Usually the old branches of the mindi plant will fall on its own so it does not need pruning. In sengon trees, if pruning is done, it will result in injuries that are easily attacked by pests and diseases.

3.5.5 Controlling of Pests and Diseases

Mindi is a type of wood that is resistant to pests and diseases because it has a distinctive odor that is not favored by pests. Chiffelle *et al.* (2009) showed that mindi has polyphenol substances (such as flavonoids, catechins and kaempherols) that can be made into vegetable insecticides. The test was performed on *D. melanogaster*, the mortality rate was reached 90% (125,000 mg kg-1) with young leaves and 73.3% (10.700 mg kg-1) with green fruit. The pest attacks on seasonal plants such as ginger (ginger experience decay caused by caterpillars that attack the bulb). Usually, the attack rate is up to 30%. Many pest found in most woody plants is attacking sengon plants.

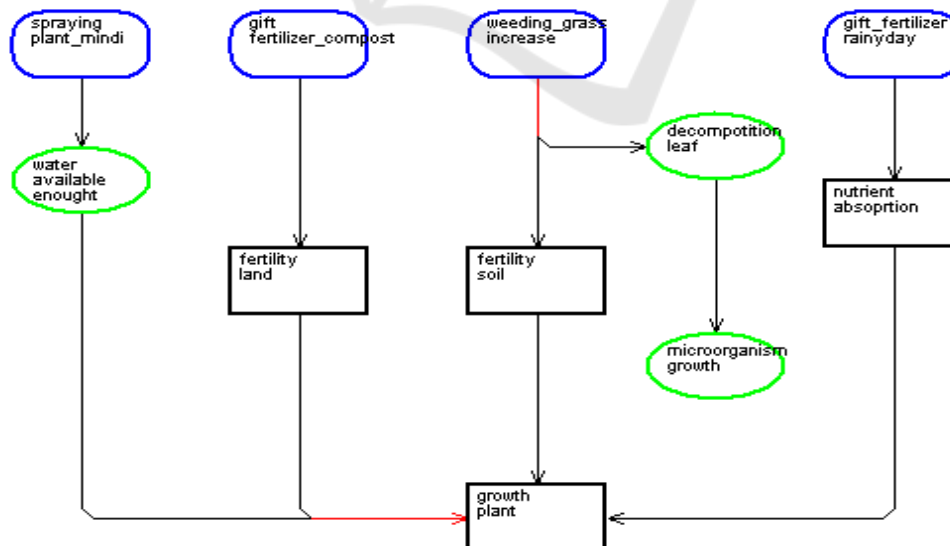


Figure 4: Local Ecological Knowledge plant maintenance.

Common pests that attack the sengan tree are stem borer and stem cancer. The plant grow until one year old until it has begun to be attacked so that if handling is slowly, the plant will dead. Pest attacks on seasonal plants such as patek or fruit peston chillies. Pests attacking the chili will cause the color exchange with black spots so the fruit can not be produced anymore.

3.5.6 Wood Harvesting.

Mindi can be harvested at the age of 5 years, as well as with African and sengan wood. Wooden logs are usually cut with a length of 4 meters. Harvesting is done using a chainsaw. Wood harvesting can be sold or can also be used for your own needs such as for the manufacture of houses, such as cattle, pens, etc. The type of wood favored by the community in the manufacture of a house is a type of wood derived from the mindi wood because it has a distinctive odor as an anti-termite substance. The wood for selfuse is usually is dried first after being cut to avoid weathering and then stored around the house for several days to avoid the rain, in order to prevent the wood from being damaged.

4 CONCLUSION

Local knowledge of Selaawi villagers consists of (a) plant propagation, (b) soil treatment and drainage system, (c) planting and crop rotation, (d) plant maintenance (4) pest and disease control and (e) Wood harvesting .

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