HEALTH STATUS OF COMMUNITY FORESTS PLANTING THROUGH AGROFORESTRY SYSTEM IN LAMPUNG PROVINCE[1)]

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ABSTRACT

The health condition of forest ecosystems will be very important in the world, when global issues, such as climate change, air pollution, acid rain, forest fires, the quality and quantity of water, and the increase in human population has affected to sustainable forest management. Therefore, valid data and reliable information about the health condition of community forests planting by agroforestry system absolutely be necessary to obtain the right decision towards sustainable forest management. Forest health study conducted in February 2013 at 3 sub districts i.e. Pringsewu, Pesawaran, and Tanggamus. Objective of this study is analyzing status of community forest health that planted by agroforestry system. The case study of analyzes of forest health status was assessing through 8 cluster-plots (32 plot units) of Forest Health Monitoring (FHM) tools. Parameters of community forest health namely agroforestry planting system are tree growth, tree damage, crown condition, and soil fertility. The research results showed that the status of community forest health planting by agroforestry system in Lampung is mostly good (score 5,79 – 7,07) due to 4 cluster-plots has proven that forests on good condition. Then agroforestry planting system is recommend to be implemented in all community forests in Lampung province.

Key words: forest health, community forests, agroforestry planting system

INTRODUCTION

Forests for agroforestry planting systems are community forests that combine forestry crops with plantations, agriculture, food, livestock, and others. Kusumedi and Jariyah (2010) stated that community forests with agroforestry planting system provide short-term community income and long-term income as savings. In addition, community forests with agroforestry planting system have significant ecological impacts (Mahendra 2009), such as: clean air, controlled erosion, carbon uptake, water regulation, ecosystem buffers, ecological stability guards, and environmental protection (Darusman 2002). Therefore, in the management of community forests, the present and future agroforestry planting system must be able to pay attention to environmental principles. To achieve this, the forest of the people agroforestry planting system must be healthy.

The health condition of forest ecosystems is very important throughout the world, when global issues such as global climate change, air pollution, acid rain, forest fires, quality and water issues, and human population increase have affected the sustainable management of forests. Information on the health condition of forest ecosystems, in many countries has become the goal of sustainable forest management management by conducting periodic forest health monitoring so that forest health assessments are conducted thoroughly. In Indonesia,

especially in Lampung Province, awareness about the importance of forest health in achieving community forest management sustainable agroforestry planting system is still lacking, so forest health issues have not received serious attention (Permadi et al., 2012). Therefore, reliable data and information on the state of health status of forests of the people of agroforestry is absolutely required by the community forest managers agroforestry planting system to obtain the right decision for the implementation of community forest management system agroforestry planting system that supports the principles of sustainability. This study aims to obtain the health status of community forests of agroforestry planting system in Lampung Province.

METHODS

The location of the research on cluster-plots Forest Health Monitoring (FHM) for community forest agroforestry planting system in Pringsewu, Pesawaran, and Tanggamus Lampung Province. Number of cluster-plot FHM made by eight cluster-plot (32 plot). This research was conducted in February 2013.

Stages of the study consisted of determination of plot FHM establishment in community forest agroforestry planting system, plot FHM establishment, community forest health agroforestry planting system measures, and community forest health agroforestry planting system assessment techniques.

1. Determination of FHM plot establishment to conduct the evaluation and monitoring of bio-physical condition of community forest agroforestry planting system. Determination of plot FHM establishment is based forest management prescriptions. Prescription of forest management in the determination of FHM plot establishment is age classes (1, 2, 3, and 4 year) and planting distance (2 m x 2 m and 2 m x 3 m).
2. Measuring community forest health agroforestry planting system based method FHM. Community forest health agroforestry planting system measures ecological indicators by Supriyanto *et al*. (2001), those are: production (tree growth), biodiversity (species diversity), vitality (damage and crown conditions) and site quality (KTK), as follows:
    a. Tree Growth; Tree growth measurements performed on trees that were in the subplot. Tree growth is measured from the addition of tree diameter; tree growth by LBDS growth ($B = 14{,}872 * ¼ * \pi * d^2$).
    b. Damage and Crown Conditions; Damage and crown condition measurements performed on trees that were in the subplot. Damage signs and symptoms are

prioritized according to location on the tree in the following order: roots, root and lower bole, lower bole, lower and upper bole, upper bole, crown stem, branches, buds and shoots, and foliage in FHM method; the measurement parameters are then collected in a damage index; damage index calculated in two different levels, as follows at tree level (TLI) and plot level (PLI). Crown condition in the FHM method measured the following parameters (Nuhamara and Kasno 2001): Live Crown Ratio (LCR), Crown density (Cden), Foliage Transparency (FT), Crown diameter (*Crown Diameter Width dan Crown Diameter at* 90^0), and Crown Dieback (CDB); measurement of the parameters of the fifth crown are collected into the Visual Crown Rating (VCR).

c. Site quality; Measurement of site quality is focused on soil fertility (KTK). Soil sampling will be located 3 (three) points between 2 (two) subplot with each circle diameter 15 cm. Sampling point of soil will be on the mineral surface layer, with a depth of 0-10 cm.

3. Community forest health agroforestry planting system assessment techniques. Community forest health agroforestry planting system assessment obtained from the final value (NA) of forest health conditions, which is the result of multiplying the weighted value and value score parameters of indicators on production (growth tree), vitality (damage and crown conditions) and site quality (KTK).

RESULTS AND DISCUSSION

Results

Measuring Community Forest Health

Based on the measurement of tree growth, tree damage condition, crown condition, and soil fertility with FHM method on eight clusters of FHM plots of community forest of agroforestry planting system, LBDS, CLI, VCR, and CEC. The values of LBDS, CLI, VCR, and CEC in each cluster FHM plots of community forest of agroforestry planting system are as follows:

Value LBDS in cluster-plots FHM of community forest agroforestry planting system are presented in Table 1. The highest LBDS value is 18.96 m2 / ha (a) and the lowest is 3.06 m2 / ha (b).

Table 1. Value LBDS in cluster-plot FHM community forest Agroforestry planting system

Cluster-plot FHM	LBDS (m^2/ha)
1	3,35
2	3,06 (b)
3	3,47
4	4,93
5	9,62
6	8,72
7	13,77
8	18,96 (a)

Value CLI in cluster-plots FHM of community forest agroforestry planting system are presented in Table 2. The highest CLI value is 5.44 (a) and the lowest is 1.51 (b).

Table 2. Value CLI in cluster-plot FHM community forest Agroforestry planting system

Cluster-plot FHM	CLI
1	2,43
2	2,25
3	5,44 (a)
4	1,82
5	3,37
6	1,96
7	1,78
8	1,51 (b)

Value VCR in cluster-plots FHM of community forest agroforestry planting system are presented in Table 3. The highest VCR value is 3.00 (a) and the lowest is 1.50 (b).

Table 3. Value VCR in cluster-plot FHM community forest Agroforestry planting system

Cluster-plot FHM	VCR
1	2,00
2	2,00
3	1,50 (b)
4	2,00
5	2,00
6	2,00
7	1,98
8	3,00 (a)

Value CEC in cluster-plots FHM of community forest agroforestry planting system are presented in Table 4. The highest CEC value is 17.77 (a) and the lowest is 5.71 (b).

Table 4. Values CEC in cluster-plot FHM community forest Agroforestry planting system

Cluster-plot FHM	CEC (me/100 g)
1	14,65
2	15,89
3	5,71 (b)
4	7,84
5	15,76
6	15,59
7	15,97
8	17,77 (a)

Source: Analysis result of Balittan Laboratory, 2013

Community Forest Health Assessment
Weighted Value and Score Value

The weighted value of ecological indicator parameters of community forest health agroforestry planting system using ANP techniques, namely: tree growth (0.30), damage conditions of trees (0.23), crown condition (0.23), and soil fertility (0.24)). The scores of ecological indicator parameters of community forest health agroforestry planting system on each of the FHM clusters of community forest agroforestry planting system are presented in Table 5 below.

Table 5. Value score on cluster-plot FHM community forest Agroforestry planting system

Cluster-plot FHM	LBDS	CLI	VCR	CEC
1	1	8	4	8
2	1	7	4	10
3	1	1	1	3
4	5	9	4	2
5	4	9	4	9
6	4	10	4	9
7	6	9	4	9
8	9	9	4	9

Final Value of Community Forest Health

Value Threshold of community forest health agroforestry planting system methods are obtained based on the highest and lowest values of the final value of community forest health agroforestry planting system category presented in Table 6 below.

Table 1. Treshold value of community forest health agroforestry planting system

Final value class	Community forest health agroforestry planting system category
5,79-7,07	Good
4,52-5,78	Moderate
3,24-4,51	Poor

Category of forest community health agroforestry planting system consists of 3 (three) categories, namely: good, moderat, and poor. Category of community forest health agroforestry planting system based on threshold value or final value class of community forest health agroforestry planting system. Category of forest community health agroforestry planting system is presented in Table 7 below.

Tabel 2 Final value and category forest community health agroforestry planting system

Cluster-plot FHM	Final value of forest community health agroforestry planting system	Category of forest community health agroforestry planting system
1	4,98	Moderate
2	5,68	Moderate
3	3,32	Poor
4	4,97	Moderate
5	5,79	Good
6	5,84	Good
7	5,82	Good
8	6,01	Good

DISCUSSION

Table 7 shows that most categories of community forest health agroforestry planting system are in good condition. Value status of community forest agroforestry planting system is good (60%), moderator (30%), and poor (10%).

The status of community forests health agroforestry panting system in Lampung Province is mostly good (5,79-7,07) indicating that community forest with agroforestry planting system will result in healthy health level of community forest. The level of community forest health agroforestry palnting system in Lampung Province can explain that community forest planted with agroforestry system has an advantage. Some of the advantages of agroforestry palnting system include: strong resistance to pests, tree crops will have a role to increase soil fertility, reduce erosion rate (Andayani 2003, Sudiana et al. 2009) and can be economically earned by double profit sustainable so that indirectly lead to better tree growth. Thus, agroforestry

planting system can increase production and income (Diniyati et al., 2004) and regional economies (Irawanti et al., 2012).

There are several indicators as to why the forests of agroforestry planting systems have a good forest health status of 60%, among others are increased tree growth, small tree damage, healthy crown condition, and high soil fertility. The health condition of the community forest in the agroforestry planting system in FHM clusters is supported by the increase of LBDS, small CLI values, high VCR values, and large CEC value. The increase in LBDS shows the high productivity of trees. Small CLI values indicate that low levels of tree damage due to pest attack. VCR values are high enough to impact the capture of sunlight needed by the process of photosynthesis. The photosynthesis process will work well under good crown conditions (Agrios 1996) which will ultimately support optimal tree growth. A large CEC value can indicate that the soil is capable of trapping and providing better nutrients and is able to retain nutrients. Therefore, the action / management decision that must still be done by the community forest managers agroforestry planting system so that the health condition of the community forest agroforestry planting system remains healthy is to keep the trees of the stands must remain healthy by conducting regular fertilization activities, pest control disease, And crop maintenance, as tree damage will affect tree growth rates and crown conditions.

The health condition of community forest of "poor" agroforestry planting system occurs on three FHM plots with age two years and spacing of 2 m x 2 m. This indicates that in the plant age of two years and spacing of 2 mx 2 m, in the community forest planting system of agroforestry "poor" health condition, so it is necessary to do some management action / decision, such as thinning with the intention to give room to grow to plant Which will be preserved and set spacing to prevent intermediate tree competition in young plants; Because according to Sudomo et al. (2007) by adjusting spacing to give direct influence of three parameters of quality of wood, namely: straightness of stem, size of young timber, and size of eye wood; and according to Husaeni (2010) with wider planting arrangements, will reduce the supply of food for pests and cause damage to trees can be controlled. In addition, the community forest of unhealthy agroforestry planting system is influenced by several parameters of ecological health indicator of community forest of poor agroforestry planting system. Parameters of ecological indicators of poor people's forest health are, among others, damage to trees, crown conditions, and soil fertility. Indications of the condition are high CLI values, low VCR values, and low CEC values. The high CLI values are due to the

fact that there are many types of damage to tree plants that cause poor tree plant growth, such as open wounds. Types of damage are found in the lower stem area with a severity> 40%. The type of open wound damage to tree crops will result in disruption of the nutrient and water translocation process resulting in an imbalance of nutrient and water supply for the parts of the tree above. Criteria for soil fertility in community forests low agroforestry planting system. The indication is that the value of CEC in the community forest agroforestry planting system in the three plots is 5.71 me / 100 g which is low. Low soil fertility indicates that soil nutrients are low so that they affect plant growth and production.

CONCLUSION

The results showed status of community forests health of agroforestry planting system in Lampung Province was good (5.79-7.07) of 60%, thus indicating that community forest with agroforestry planting system will result in healthy community health forest level. Thus, the development of community forests in Lampung Province is directed by agroforestry planting system.

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