The role of land management in increasing the income of Private Forest farmers in Central Lombok Regency

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Abstract. One of the success indicator of private forest farming is an increase in farmers' income, which is indicated by the large contribution of income from private forests. The size of the income is influenced by several factors, including the pattern of private forest management which will determine the quality products of private forests. However, currently, most of the private forest farmers have not placed the aspect of land management as the main factor determining the success of farming in private forests. This research is conducted to determine the role of land management on the income of private forest farmers in Central Lombok Regency. The research was conducted in three private forests in Central Lombok Regency, namely Pemepek, Setiling, and Sepakek Villages. The method used is interviews using questionnaire to 45 respondents who are selected purposively. The object of observation is land management which include plant maintenance, and harvesting; and farmers' income from private forest and non-private forest. The data analysis was carried out in a descriptive qualitative manner. The results showed that in general, land management carried out by private forest farmers had not been able to increase income from private forests. However, farmers who carry out crop maintenance in the form replanting are able to produce a higher income than when farmers applied other land management activity. The combination of land management activity will improve their income. The more intensive land management, the higher the income will be obtained.

1. Introduction
The private forest has already succeeded to improve the quality of the environment. Many scientific studies show that the development of private forest farming have been enhanced the condition of ecology and economy [1]; [2]; [3]. Recently, private forest is more developed and more preferable along with more success in the development of it in several locations. Until 2012, the total of private forest that have expanded in West Nusa Tenggara is 3.186 ha and 36% of it is in Central Lombok Regency [4]. Central Lombok is one of regency that the success of some community forests is as samples for other areas for developing their private forests. Three factors that use to indicate a success of community forest development i.e., ecology, social, and economy [5]. In an ecological aspect, the community forest can repair land covers; however, in social and economic aspects, it plays a role to increase the farmer’s income and their welfare [2]; [5]; [6].

Although private forest farming can improve the income of farmers, the contribution to total income is not significant [7], and one of the factors that affect the amount of income from private forest farming
is land management systems [8]. The land management systems are related to a quality of products and the costs that have been spent related to product quality [9]. Some studies have been proven that private forest which is managed concerning sustainability and complexity inland-using improved the income of farmers than unsustainable private forest farming [7]; [8].

One of the land management systems that is used to enhance plant productivity is intensive silviculture techniques (SILIN) [9]; [10]; [11]. The main activities of silviculture techniques are controlling (structure, composition, density, growth and rotation of plants), protecting (grow site and plants), and serving (harvesting, managing, and utilization). Moreover, intensive silviculture techniques combined three components i.e., use of high-quality seedlings, environmental manipulation, and integrated pest management [10]. However, the SILIN technique have not been applied by the forest farmers to manage their private forest. It is caused by the low of understanding, skills, and information about SILIN, and also the role of it in increasing the productivity of the private forest [12].

Several private forest which has adopted SILIN technique, the productivity had improved if it is compared to the others that have not adopted its technique [11]; [13]; [14]; [15]. However, the farmer’s income has not always increased because it relates to the maintenance costs [16], but it is still in the feasible category to be carried out [17]. Therefore, this study had been done to evaluate the role of land management towards the income of private forest farmers in Central Lombok Regency.

2. Methods
The study conducted in three private forests at Central Lombok Regency, i.e. Pamepek Village and Sepakek Village, Pringgarata District, and Setiling Village, North Batukliang District (figure 1). The study method was an interview using questionnaire that involves 45 respondents. The questionnaire was validated before it was used by giving it to stakeholders who have directly known about the development of private forest in the location of the study. The stakeholders consisted of facilitator of farmer groups, leader of farmer groups, and public figures. It was done to evaluate the questionnaire about the understanding of farmers to the questions and the data that was needed for this study. The object parameter of this observation was the land management system which includes silviculture techniques (plant maintenance and harvesting) and farmer’s income from private forest and others. The plant maintenance consisted of controlling and protecting activities, while harvesting was a serving activity. Data analysis was carried out by descriptive qualitative. The income of farmers was calculated by using the formula [18]:

\[
\text{Income} = TR - TC
\]

\[
TR = \sum_{i=1}^{n} QP_i
\]

\[
TC = \text{fix cost} + \text{variabel cost}
\]

Keterangan :
- \(TR\) = total revenue
- \(TC\) = total costs
- \(n\) = quantity of plant species
- \(Q\) = quantity of physical production
- \(P_Q\) = product price
3. Results and discussion

3.1. Management of private forests in Central Lombok

Private forests are very potential to develop in Central Lombok. The land area that is potential for private forest in Central Lombok is 36,202.4 ha, which includes dry land farming (tegalan and ladang), empty land, shrubland, and orchard [19]. Unfortunately, most of the private forest area has not joined in farmer group institutions. This situation leads to no latest data on actual private forest farming. Most of the private forest in Central Lombok have been planted by mahoni (Swietenia mahagoni) and sengon (Paraserianthes falcataria). Those species are more likely to be planted in this region because of the suitability of biophysics characteristic of the land. Furthermore, the species have a high value of economic and high demand from forest farmers [19]; [20]. Cropping pattern that has been used, i.e. monoculture (one tree species), mixed cropping (more than one tree species), and agroforestry (forest tree, MPTS and crop species) [20].
Private forest management system in the location of study has been done by the conventional method which has not applied intensive land management. However, private forest farmers have run three silviculture activities such as controlling, protecting and serving (figure 2). Controlling activities by farmers i.e. replanting, thinning and pruning. Protecting is the activity that includes weeding, fertilization, and pest eradication. Serving activity is harvesting which is done when the farmer’s needed (tebang butuh) by using a wholesale system.

The result of the study showed that the percentage of private forest farmers who control their land, i.e. replanting, thinning, and pruning was low that only accounted for 28.89%, 11.33% and 37.78%, respectively. Some respondents said that the reason most farmers did not control their land was to keep the all trees even though they grew in poor condition (crooked, small/dwarf). They still considered that each tree has economic values with that appearance.

The previous study showed that thinning for sengon at an age of 3-5 years was not significant increased the tree diameter so it was not need to be conducted [21].

![Figure 2](image)

**Figure 2.** The percentage of land management activities applied by private forest farmers.

Most of the respondent did not protect their private forest land from weeds and creeping plants (68.89%). Weeds and creeping plants would compete with cultivated trees for taking the soil nutrient, so it is needed to be controlled, by manual or chemical techniques [22]. On the other hand, those plants might have the advantage to improve the physical condition of the soil, i.e. humidity and porosity as a mulch. The mulch support to supply water for the plant during the dry season [23]; [24]; [25]. Moreover, creeping plants are also useful for decreasing surface runoff that leads to erosion [26]; [27]. Manual and chemical spraying of weeding controlling was usually used by forest farmers in the study location, which was used sickle and herbicide (Roundup). Around 31.11% of farmers used manual way, while 6.67% of them used chemical way. The weeds also can be used as fodder.

Urea fertilizer was regularly used by 60% of forest farmers started from 1-3 years after planting with intensity 2-3 times/year. Pest controlling was only applied by 4.44% of the respondent with intensity once a year by spraying pesticide only on the attacked plants. Urea fertilizer is used to correct and keep the level of nitrogen in plant tissue and maintain plant growth [28]. The increase of nitrogen by fertilization improve the number of protein contents in crop plants [29]. The forest farmers in the study location not only use urea for their private forest farming but also applied it for their crops such as corn and peanut.

Harvesting in private forests has been done using wholesale system, which accounted for 88.89% of farmers. The term “tebang butuh” system was used by forest farmers in the location of the study. Tebang butuh which represent as the system which harvests their limited timber to fulfil their specific needs that
spent a great money such as marriage, schooling children and death) [30]. They usually sold their timber to timber middlemen. They were tended to not consider the timber quality so they got a low price from them. The middlemen usually only estimate the number of timbers, not the quality. For example, in the wholesale system, *sengon* timber from a 0.25 ha area with the age of 3-4 years was only valued 10 million/7m³, whereas in the market would be valued approximately 3 million/m³. This harvesting system was not only used in the location of study, but most the private forests in Indonesia also used it [31].

3.2. Income of private forests farmers

Private forests farmers in the study location do not depend on income from their private forests. Their forest land has a role as savings that can be used when they have a sudden live necessity. They usually harvest the trees at the average age of 3-4 years when there is an interested buyer. Based on interviews, the farmers rarely sold their timber from trees more than 4 years old. This is caused by the high demand for timber and the needs of the farmers, so they did not consider the timber quality and the price. The average income from private forests was large enough to be around 20,996,683 IDR year⁻¹. It contributed about 45.3% of total farmer’s income (table 1). Among three locations of study, the highest contribution of private forest for farmer’s income was in Sepakek, while in Pemepek, it shows the lowest contribution of it. It showed that the correlation between farmer’s income and the average size of the land area was opposite. The larger land area that is owned by farmers, the lower income that they have, and vice versa [32]. It more depends on the management of land than the size of their land area.

### Table 1. The average income of private forest farmers per year and the contribution of private forest in the location of study (IDR. Year⁻¹).

| Location | Farmers average Land area (ha) | Total revenue from Private forest (Year⁻¹) | Total cost (Year⁻¹) | Total income (Year⁻¹) | Private forest’s income contribution (%) |
|----------|-------------------------------|------------------------------------------|--------------------|----------------------|------------------------------------------|
| Pemepek  | 0.74                          | 35,395,933                               | 10,634,858         | 20,218,067           | 23,047,661                               | 15,177,867              | 34.1 |
| Sepakek  | 0.37                          | 22,693,433                               | 32,442,541         | 15,010,133           | 19,687,040                               | 7,683,300               | 61.0 |
| Setiling | 0.46                          | 27,307,333                               | 11,448,620         | 15,713,733           | 16,859,965                               | 11,593,600              | 31.2 |
| Average  | 0.52                          | 28,465,567                               | 18,175,339         | 16,980,644           | 20,996,683                               | 11,484,922              | 45.3 |

Based on the average income of private forest farmers in table 1, with the average number of dependents of farmers in the location of study are 4, the average income per capita is 459,424 IDR capita⁻¹.month⁻¹, whereas without private forest is 257,055 IDR capita⁻¹.month⁻¹ (table 2).

### Table 2. The average income of private forest farmers per month per capita (IDR. capita⁻¹.month⁻¹).

| Location | Number of dependents of family members (person) | Total income (capita⁻¹.year⁻¹) | Total income (capita⁻¹.month⁻¹) |
|----------|-----------------------------------------------|-------------------------------|-------------------------------|
|          |                                               | Include private forest | Without Private forest | Include private forest | Without Private forest |
| Pemepek  | 4                                             | 5,761,915                  | 3,794,467                   | 480,160               | 316,206                  |
| Sepakek  | 3                                             | 6,562,347                  | 2,561,100                   | 546,862               | 213,425                  |
| Setiling | 4                                             | 4,214,991                  | 2,898,400                   | 351,249               | 241,533                  |
| Average  | 4                                             | 5,513,084                  | 3,084,656                   | 459,424               | 257,055                  |

According to [33] the criteria of the poverty line for Central Lombok Regency was 404,633 IDR capita⁻¹.month⁻¹. Based on table 2, the total average income of farmers in the location of the study was
over the poverty line. This represents that private forest is a success to improve the welfare of farmers and lift out of poverty as stated by [34]; [35]; [36].

### 3.3 The role of land management and farmer’s income

The land management that have been done by private forest farmers in the location of the study was carried out with a combination of some activities. The result of the analysis shows 21 combinations of land management activities that have been used by farmers. All those activities gave the difference of the amount of income from private forest (revenue) as represented in figure 3.

![Figure 3](image-url)

**Figure 3.** The average farmer’s income from private forests based on combination of land management activities.

Figure 3 shows private forest farmers who have a higher average income from private forest than others and who have applied more than two activities on their land management. It can be seen from the land management combination no. 12 (chemical spray weeding – fertilization – pruning - wholesale harvesting) with the highest average income from private forest was 52,022,000 IDR ha⁻¹.year⁻¹.
Whereas, the land management combination no.18 made the lowest average income 2,726,032 IDR ha\(^{-1}\).year\(^{-1}\).

On the other hand, the land management that only applied one activity did not influence the increase of farmer’s income from their private forests (figure 4).

![Figure 4. The average farmer’s income from private forests based on each land management activities.](image)

Based on each land management activity, the highest average income from private forest of farmers can be seen from replanting 24,521,417 IDR ha\(^{-1}\).year\(^{-1}\). Replanting is conducted to replace the dead plant with the new one. More plants can survive until harvesting time, it would expect to enhance the income of farmers. The lowest average income was showed in no.3, no weeding activity 14,889,443 IDR ha\(^{-1}\).year\(^{-1}\). The weeds that grow without any controlling activities would affect the growth of the main plant. It can lead to the reduction of quality and quantity of main plants in private forests and would end up decreasing farmer’s income [22].

4. Conclusion
In general, land management carried out by private forest farmers is not sufficient to increase their income. However, replanting is able to produce a higher income than when farmers applied other land management activity. The farmer’s income from the private forest would improve if they combined land management activity to manage their land. A combination of chemical spray weeding-fertilization-pruning-wholesale harvesting is allowing the farmers to get the highest income from private forest about 52 million IDR ha\(^{-1}\).year\(^{-1}\).

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