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The Analysis of Potency and Timber Forest Products Benefit Value in Production Forest Management Unit Awota in Wajo Regency South Sulawesi Province

Hasanuddin[1]*, Yusran[2], Supratman[2] and Daud Malamassam[2]

[1]Doctoral Student, Faculty of Agriculture Hasanuddin University, Makassar Indonesia/ Department of Forestry, Makassar Muhammadiyah University
[2]Faculty of Forestry, Hasanuddin University, Makassar Indonesia

Corresponding author

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A B S T R A C T

This study aims to analyze potency and benefits value of timber forest products in Production Forest management Unit (PFMU) Awota In Wajo Regency South Sulawesi Province. The method was used stratification sampling. Plots were made rectangular 100 m x 100 m and wee divided into 16 units of recording (Record Unit, RU) with the size of each 25 m x 25 m. In each RU there were three circular sub plots, the subplots to the observation level of seedling of radius 1 m, subplots to the observation level sapling of radius 2 m and subplots to the observation level of the pole radius of 5 m. The forest inventories in the region CFMU Awota refer to Appendix Regulation of Director General of Forestry Planning Number: P.5 / VII - WP3H / 2012 Date: May 14, 2012 on Technical Guidelines for Forest Inventory Planning and Management Planning Protected Forest (Protected FMU) and Production Forest Management Unit (PFMU. The area PFMU Awota scattered in five districts and the vast majority (60.45 %) located in the Kera District and Gilireng District. In terms of forest land, areas of PFMU Awota in the Maniangpajo district and Gilireng District entirely a forest area were the production forest, while the Model PFMU area in District Pitumpanua are all forest areas were protection forest. The dominant species of trees scattered on the third plot is the total area PFMU Awota such as Belalang, Bitti, Leasa, Betao, Jalapao, Uru - Wella, Bakkenase, Jambu - and Dama - Dama. Important value index in tree stratum was contained in the Belalang (IVI 47.973 %), Bitti (IVI 31.891 %), Leasa (IVI 28.85 %), and Betao (IVI 22.54 %). Conditions regeneration structure illustrated that forest stands on the observation plot is relatively safe from human interference. Timber Forest Products Benefit Value of PFMU Awota varies on some ditrict. Keera District has timber forest products potency reach to 25,002.70 m^3, Sajoanging District reach to 12,529.19 m^3, Pitumpanua District have not potency of timber, Maniangpajo District reach to 38,282.21 m^3, Gilireng District reach to 50,773.54 m^3 and the total potency of timber in PFMU Awota reach to 126,587.65 m^3. Timber forest products benefit value in Keera District was Rp.23,827,575,291.90 Sajoanging District was Rp.11,940,322,549.10, Pitumpanua District was Rp.0 district, Maniangpajo District was Rp 36,482,948,703.10 and Gilireng district was 48,387,187,622.60. The total Timber forest products benefit value of PFMU Awota was Rp.120,638.034,166.70. This value has the potency to be used to improve the welfare of forest communities while conserving the forest.

Introduction

Indonesia is endowed with some of the most extensive and biologically diverse tropical forests in the world. Tens of millions of Indonesians depend directly on these forests for their livelihoods, whether gathering forest products for their daily needs or working in the wood-processing sectors of the economy. The forests are home to an abundance of flora and fauna unmatched in any country of comparable size (FWI/GFW. 2002). The total degraded forest area in Indonesia is around 33.4 million hectares excluding Convertible Forest. These degraded lands are a high priority for intervention because of the vast land area involved, the rapid rate of change of land status from forested to other uses, and because of the relatively unmanaged status of much of this land. This is also a high priority because it is one of the most obvious and logical places to begin to think about rationalizing the forest estate and allowing more equitable and pro-poor access and activities. Given the reduction of services, non-wood forest products (NWFPs) and timber supplies from natural forests, forest rehabilitation and plantation development become of central importance to the forestry sector in Indonesia (FAO, 2009).

Extensive clearing of Indonesian primary forests results in increased greenhouse gas emissions and biodiversity loss. However, there is no consensus on the areal extent and temporal trends of primary forest clearing in Indonesia. Here we report a spatially and temporally explicit quantification of Indonesian primary forest loss, which totaled over 6.02 Mha from 2000 to 2012 and increased on average by 47,600 ha per year. By 2012, annual primary forest loss in Indonesia was estimated to be higher than in Brazil (0.84 million ha and 0.46 million ha, respectively). Proportional loss of primary forests in wetland landforms increased and almost all clearing of primary forests occurred within degraded types, meaning logging preceded conversion processes. Loss within o-cial forest land uses that restrict or prohibit clearing totaled 40% of all loss within national forest land. The increasing loss of Indonesian primary forests has significant implications for climate change mitigation and biodiversity conservation efforts (Margono et al., 2014).

Illegal logging, forest fires, forest and land conflicts are a major problem in the Indonesian forestry sector. With regard to certainty over rights to forest areas there are tenurial conflicts or potential conflicts related to forest utilization in both managed and unmanaged areas. It is estimated that there are conflicts in 17.6 – 24.4 million ha of forest taking the form of overlapping claims between state forest claims and claims from customary communities (*adat*) other local communities, village/hamlet developments and the presence of other sectoral permits that are actually located in forest areas. In addition to conflicts over forest area rights, forestry problems have become increasingly complex with the presence of institutional problems, including poor central-local government relations and prioritization of forest protection and rehabilitation over resolving root problems such as overlapping claims. Despite being mandated by Law No. 41/1999, there has been no strong and directed policy to establish a government organization that functions to manage forests in the field. Forests are de facto controlled by permit holders. When permits expire or are inactive, the relevant forests become open access, enabling anyone to utilize them without control, resulting in large-scale destruction. Moreover, the focus on forest management by permit holders created a situation where the government both at

central and local levels did not have sufficient information over the resource potential, had no control mechanism or real basis for determining forest utilization allocations. Forest Management Unit (FMU) development is a strategic solution to address this situation (Kartodihardjo, 2011).

Forest Management Unit (FMU) is the smallest management unit which is feasible to maintain efficiently and sustainably. Some principles applied in FMU Designation are ecology, socio culture and economy policies. In 2012, the Ministry of Forestry had designated Model FMU in 27 provinces and established FMU (Production FMUs and Protection FMUs) in 23 provinces FMUs in 8 provinces (Indonesia Ministry of Forestry, 2013). The government of Indonesia as public policy maker in forestry has released PP No 6 2007 containing regulation of forest management according to sustainable forest principles. One of section in PP No 6 2007 stimulates the development of Forest Management Unit (FMU). Forest Management Unit as a public policy requires support from all stakeholders in its implementation. This is because the success of public policy mainly determined by the effectiveness of its implementation.

Forest Management Units consist of Conservation Forest Management Unit (CFMU), Protected Forest Management Unit (Protected FMU), and Production Forest Management Unit (PFMU) depending on the dominant forest functions contained in the region. At each Forest Management Unit established management institution. Minister of Forestry set Conservation Forest Management Unit organization, while for Production Forest Management Unit and Protected Forest Management Unit stipulated by the Regulation of the Minister of the Interior No. 61 Year 2010. For Production Forest Management Unit and Protected Forest Management Unit the establishment of cross- district area designated by Provincial Regulation and is responsible to the Governor, while for Production Forest Management Unit and Protected Forest Management Unit that are within the district determined by District Regulation and responsible to the Regent. Development of Production Forest Management Unit as a public policy requires a full support of all parties in implementing it. This is because in general the success of a public policy is largely determined by the effectiveness of public policy implementation as well as the potential of Forest Management Unit itself.

One of the Production Forest Management Unit in Indonesia is Awota Production Forest Management Unit located in Wajo, Sulawesi Provensi selatan. Commintment of Wajo Government to address these issues and to carry out the maintenance and forest management activities at the site level, among others, embodied by forming a Technical Implementation Unit Production Forest Management Unit (PFMU) Awota through Decree No. 21 of 2010 and was replaced again by decree No. 14 of 2014. The area PFMU Awota determined by the Minister of Forestry as PFMU Model Awota based Mail Forestry Ministerial Decree No. 979/Menhut-II/ 2013 on Zoning PFMU Model Awota. In determining the effective management model and efficiency of PFMU Awota is determined by the potential of PFMU. Therefore this study aims to analyze potency and benefits value of Timber Forest Products in PFMU Awota In Wajo Regency South Sulawesi Province.

Methods

Study area

Based on the Ministry of Forestry Republic of Indonesia Number SK.979 / Menhut - II / 2013, the area PFMU Awota model is ±

19,071 ha, consists of forest production 13,532 ha and protected forest area covering an area of 5539 ha. Based on the results of the analysis of the map, the work area PFMU Awota is geographically located 3°39'45"up to 4°16'15 " south latitude and 119° 53'00" and 120° 7'45 " east longitude, with limits administrative area made up, the north with Sidrap, the south with District of Gilireng and Maniangpajo, the west by District Keera, and the east with the District Maniangpajo.

Method of survey

The method were used stratification improve the accuracy of prediction and representation of the region. Forest cover stratified by class closure of the following: a) forests dry land primer, b) Forest dry land secondary, c) swamp forests primary, d) Forest secondary swamp, e) The mangrove forests of primary, f) Mangrove forests are secondary, and g) Forests plant. Plots were made rectangular measuring 100 m x 100 m and were divided into 16 units of recording (Record Unit, RU) with the size of each 25 m x 25 m. In each RU there were three circular subplots, the subplots to the observation level of seedling of radius 1 m, subplots to the observation level stake of radius 2 m and subplots to the observation level of the pole radius of 5 m.

Placement plot measuring carried out systematically on the lattice 5 km x 5 km. Sample plots placed on UTM coordinates multiple of 5 km either in easting and northing. Plots sample is placed on all of the existing forest cover stratification with proportional to the vast number of plots strata. If on the FMU areas Permanent Sample Plot (PSP) were made in the framework of the national forest inventory in the lattice need not be made again and the sample plots as observation data can utilize the data of the PSP. If there is a small area of forest strata that cannot be netted systematically on the lattice 5 km x 5 km, then it needs to be made on a lattice plot of 2.5 km x 2.5 km, or 1.25 km x 1.25 km, or until 625 m x 625 m in order that the forest cover strata can be represented.

The location of the plot should be depicted on a map working with a scale of 1 : 50,000. Map work is based on working area FMU maps, land cover maps, the map permits utilization (IUPHHK) and topographic maps.

Determination fastening point (T1) on the map in the form of permanent physical forms such as branching rive, branching roads, bridges or other physical signs.

Considerations in determining the connective point is the point closest to the measuring path and easy to find in the field. The position of the center point of the plot (T2) of the fastening point is illustrated by mentioning the azimuth (direction of the plot) and the distance of the center point of the plot from point belt. Position fastening point and the center point of the plot should be measured by GPS (Global Positioning System).

Implementation of forest inventories in the region CFMU Awota refer to Appendix Regulation of Director General of Forestry Planning Number: P.5 / VII - WP3H / 2012 Date: May 14, 2012 on Technical Guidelines for Forest Inventory Planning and Management Planning Protected Forest (Protected FMU) and Production Forest Management Unit (PFMU). Forest inventory activity consists of the distribution of blocks and plots, the boundaries of the FMU and mapping. In general, forest inventory activities are descriptions or technical implementation of a set of rules that apply.

Data processing and analysis stands

Grouping type trees

The tree species are recorded in the local names are converted into the trading name and botanical name.

The types are then divided into groups of species: Commercial First Level (group meranti), Commercial Second Level (groups of forest wood species mix), A beautiful wooden First Level (group type of ebony), A beautiful wooden Second Level, A group of protected species and Other types

Calculation of potential of stands per plot

Potential stands include the number of trees per hectare and volume of trees per hectare. Stages standing stock calculation are as follows: The calculation of the volume of each tree contained in each sample unit.

The volume of trees per hectare obtained on the total volume of all the trees in each plot divided by the area of the plot, the number of stems per hectare obtained from the sum of all the trees in each plot divided by the area of the plot. The formula used was:

$$\frac{\sum_{i=0}^{nj} V_i}{P}$$

$$N_j = \frac{nj}{P}$$

Description:

Vj = Volume of trees per hectare in the plot to j (m^3/ha)
Vi = Volume of trees to i (m^3)
P = Area of plot (ha)
nj = number of trees in the plot to j
Nj = number of trees per hectare in the plot to j

Calculation of tree volume

Tree volume calculated using the formula:
V = ¼ x π x (d / 100) 2 x t x f

Description:

V = volume of the tree bole (m^3)
d = diameter at breast height (cm)
t = bole height (m)
f = form factor (0.7)
π = 22/7 = 3.14

Calculation of Importance Value Index (IVI) for each level of growth

Calculation of Importance Value Index (IVI) for each level/strata. The formula used in calculating IVI was the quadrat method (Mueller-Dombois and Ellenberg, 1974):

$$\text{Density (D)} = \frac{\text{Number of individuals of a species}}{\text{Area of all sample units}}$$

$$\text{Relative Density (RDe)} = \frac{\text{Frequency of a certain species}}{\text{Total number of species}} \text{ x } 100\%$$

$$\text{Frequency (F)} = \frac{\text{Number of quadrats containing a certain species}}{\text{Frequency of a certain species}}$$

$$\text{Relative Frequency (RF)} = \frac{\text{Frequency of a certain species}}{\text{Total number of species}} \text{ x } 100\%$$

$$\text{Dominance (D)} = \frac{\text{Basal area of a species}}{\text{Area of all sample units}}$$

$$\text{Relative Dominance (RDo)} = \frac{\text{FRelative Dominance (RD)}}{\text{Dominance of all species}} \text{ x } 100\%$$

The Importance Value Index for trees was calculated based on the formula:

Importance Value Index (IVI) = RD + RF + RD

For seedling and sapling levels, the species importance value index was calculated using the formula:

Importance value index (IVI) = RD + RF

Timber forest product benefits value calculation

Timber forest product benefits value calculation is done with the true market price approach. On this approach, the valuation was done to give the price value of the benefits of wood as much as possible using actual market prices. Stages of implementation: 1) Preparing the data and information on the quantity of wood 2) Conduct a simple survey to help obtain the necessary information regarding the quantity and price of wood are not yet available 3) Multiplying the number of quantity SDA with its market price. The equation is:

Value = Potential Benefits of Timber x price

Benefits of Wood tota value = (Potential Benefits of Timber 1x price 1) + (Potential Benefits of Timber x price 2) + ... + (Potential Benefits of Timber n x price n)

Results and Discussion

Region area of PFMU

Distribution of areas PFMU Model Awota According to the District Administration and Regional Functions were presented in table 1. Table 1 showed that the area PFMU Awota scattered in five districts and the vast majority (60.45 %) located in the Kera District and Gilireng District. In terms of forest land, areas of PFMU Awota in the Maniangpajo district and Gilireng District entirely a forest area were the production forest, while the Model PFMU area in District Pitumpanua are all forest areas were protection forest.

Physical state in this area is indicated by there are several diverse soil types, namely, alluvial, latosol, grumosol, litosol and red-yellow podzolic. Besides, the rainfall is quite high with the highest intensity of the rainy season in September until May and after the dry season. The dry season was dry, which according to Climate Map of South Sulawesi, which is mapped by climate classification Oldeman (Oldeman and Sjarifuddin, 1977), are included in climate class E2, E1, D3, D2 and D1 (majority) which means dry. Model Awota PFMU region includes 9 basin that Gilireng Watershed, Walanae Watershed, Keera Watershed, Awo Watershed, Kulampu Watershed, Laminangae Watershed, Babana Watershed, Sapawalie Watershed and Siwa Watershed. All of these watersheds drain several rivers in PFMU Model Awota.

The forest area in the region PFMU Awota has a strategic position because it is part of the headwaters of three irrigation dams namely Kalola dam Awo I dam and Awo II dam which irrigate the rice cultivation area of 12,000 ha. Hydrological conditions PFMU Awota is affected by the presence of Lake Tempe and type of existing climate. Besides, the surface hydrological conditions, it is also affected by the rivers.

PFMU Awota area at an altitude that varies between 0-500 meters above sea level. Shape of the surface area of PFMU Awota varies from flat, undulating to hilly. Part hilly area located on the north side or the District Keera. The slope ofPFMU Awota varies from 0-8%, 8- 15% up to 15-25%. PFMU Awota have several types of soil: alluvial, latosol, grumosol, litosol and red-yellow podzolic. Alluvial soil is fertile land suitable for intensive agriculture systems. Alluvial soils are young in the process of soil formation is still visible mixture of organic material and mineral materials. Forest cover area PFMU Model Awota majority (60.77%) in the form of dry land farming mixed shrubs and amounted 21.22% has been converted by the community as

ponds. Forest cover in the form of very small primary forest is only around 20.68 hectares or 0.14% of the total area PFMU Awota. The rest (17.87%) berpenutupan form of shrubs, wetland, savannah and mangrove secondary forests.

Forest type

Results show that the inventory of tree species making up the stand in this area are members of type formation lowland tropical rain forest, where this forest type is a place that provides a tree of any size. Tropical rain forests in PFMU Awota can be characterized as follows:

The trees grow up to 50 meters high, There are various types of vegetation, Rod large and bole straight, Canopy meeting so that sunlight cannot penetrate into the soil, Plant epiphytes clinging to tree, There is a plant ferns, lianas, saprophytic, parasitic and moss, Its leaves are green all year round.

For this type of forest that has a very high diversity of plants, or forests with height trees, has a humid climate and high rainfall. Soil hilly / mountain (altitude of 25 to 100 meters above sea level area of 7378 Ha) lined up from the south of the start of the Northern District of Tempe to enter the Territory Maniangpajo districts, Gilireng, keera, and Pitumpanua, which is a vast expanse of forest resources and conservation functions as securing sustainable water use planning.

Lower mainland (0-25 meters from the sea surface area of 205.58 ha) is an expanse of rice fields, plantations / moor on the eastern, central and western. With an average of rainy days and rainfall ranging between 1147.8–1652.9 mm / year and a rainy day around 167–199 days / year. The highest rainfall occurs in Awo District

Vegetation analysis

From the results of the inventory, the condition of vegetation at each point of observation is still relatively good. This can be seen with the stands that consist of several strata and still relatively undisturbed.

Vegetation results for level trees

In the first plot point vegetation is quite good there are 38 trees and only 2 RU there are no trees. The first plot is dominated by tree stands and Jalapao Baranang 66 individual. In the second plot tree vegetation progressively less only 29 individual and there are 2 RU no individual.

The second plot is dominated by individual of trees namely Baranang 8. In the third plot vegetation very worrying because there were only 2 trees namely Dengen and there were14 RU no individual. The condition of Tree vegetation showed in table 2. Important value index in tree stratum was contained in the Belalang (IVI 47.973 %), Bitti (IVI 31.891 %), Leasa (IVI 28.85 %), and Betao (IVI 22.54 %).

Vegetation results for the level of Poles

In the first plot point vegetation is quite good there are 51 poles and there is a RU no individual. The first plot is dominated by Nilu-nilu. In the second plot vegetation pole slightly decreased by 48 poles and there are 2 RU no individual.

The second plot is dominated by Dao 10 individual. In the third plot vegetation has the most number of poles is 63 and there is a 1 RU stands no individual. The third plot is dominated Cappigi 17 individual. The condition of pole vegetation showed in table 3.

Vegetation results for level sapling

In the first plot point vegetation is quite good there are 58 sapling 2 RU there are no sapling individual. The first plot is dominated by Nilu - nilu 15 individual and the remaining seedlings and shrubs. In the second plot vegetation sapling are 56 individual and 2 RU no sapling. The second plot is dominated by Daba 17 individual remaining seedlings and shrubs. In the third plot vegetation have 65 sapling and there is a RU no sapling. The third plot dominated Cappigi 24 saplings and other seedlings and shrubs. The condition of the vegetation to stake the results can be seen in table 4.

Vegetation results for seedling level

In the first plot point vegetation is quite good there were 35 seedling 4 RU there no seedling. The first plot is dominated by Nilu - nilu 21 individual. In the second plot vegetation, there were 32 individual and 5 RU no seedlings. The second plot is dominated by Bitti 7 individual. In the third plot vegetation has the most number of seedlings with 23 individual and there were 7 RU no seedling. The third plot is dominated Duajeng 5 seedling. The condition of the seedling vegetation showed in table 5.

Potency of PFMU Awota

The data of forest inventory results at three sample points made in PFMU Awota Wajo showed in table 6. Volume number of trees per hectare and the number of stands per ha for seedlings, saplings and poles and tree level. Based on table 5, volume of trees / ha in plot 1 = 16.731 m^3 / ha, Plot 2 = 12,741 m^3 / ha, and plot 3 = 0,731 m^3 / ha, respectively. The average of potency of the three plots was 10.07 m^3 / ha. It showed that the tree vegetation density of the third plot hardly at or relatively uniform.

Regeneration

For the conditions for regeneration of the results of the inventory in PFMU Awota based on three sample plot, which for poles with a plot of radius 5 m to 2 m saplings and seedlings with a plot of radius 1 m. Potency of Regeneration showed table 7.

In table showed that strata of the pole where the number of stems per hectare in Plot 1 = 50 individual / ha, Plot 2 = 49 individual / ha, Plot 3 = 42 individual / ha with the estimated average = 47 individual / ha. Strata sapling for each of the number of individual per hectare in Plot 1 = 49 individual / ha, Plot 2 = 48 individual/ ha, Plot 3 = 41 individual / ha with the estimated average = 47 individual / ha. While the strata seedling number of stems per hectare respectively Plot 1 = 47 individual / ha, Plot 2 = 45 individual / ha, Plot 3 = 39 individual / ha with the estimated average = 44 individual / ha. This showed the structure of the regeneration following the model of inverted J curve that describes the amount of stem regeneration levels pole more than saplings, and the number of stems regeneration saplings more than the amount of regeneration at the seedling stage. Conditions regeneration structure like this illustrate that forest stands on the observation plot is relatively safe from human interference.

Timber forest products benefit value

Economic value is the various benefits which may be obtained from a natural resource. These benefits include the direct use value of a resource as an input to production or as consumption good, its indirect use value through protecting or sustaining. economic activity, and its non-use value to people who derive satisfaction the mere existence of a resource, even

though they may never see it or consume any product obtained from it (Pearce et al 1989). Examples of direct use values in forestry include timber and non-timber products, but also no commodity benefits such as forest recreation. Indirect use values include the role of forests in protecting watersheds and fisheries, and the storage of carbon in trees (to offset the atmospheric accumulation of "greenhouse" gases implicated in global warming). Non-use values in forestry comprise such intangible benefits as the continued existence of certain species of wildlife, which the general public wishes to protect for posterity. In general, direct use values are most likely to be reflected in market prices. Indirect use values may be reflected in the prices of certain goods and services which depend heavily on the underlying environmental benefit, while non-use values are rarely reflected in market prices or decision-making. Clearly, however, the absence of a market price does not mean that a thing has no economic value. Potency of timber forest products in PFMU Awota calculated based on the economic benefits that can be obtained by the public directly.

Table.1 Distribution of areas PFMU Model Awota according to the District Administration and Regional Functions

No.	Districts	Areas According to the broad function Forest (ha)		Total (ha)
		Production Forest	Protected Forest	
1.	Keera	2,482.89	3,241.07	5,723.96
2.	Sajoanging	1.,244.21	800.98	2,045.19
3.	Pitumpanua	0.0	1,196.19	1,196.19
4.	Maniangpajo	3,801.61	0.0	3,801.61
5.	Gilireng	5,042.06	0.0	5,042.06
Total		12.570,77	5,238.24	17,809.01

Source: BPKH Region VII, Makassar, 2014

Table.2 Vegetation condition of trees level in PFMU Awota

Species	Total of Species	De	RDe	F	RF	Do	RDo	INP
Maranang	6	2	8.6957	0.3333	4.1667	0.4479	9.4652	22.3275
Baranang	10	3.3333	14.4928	0.6667	8.3333	1.4894	31.4755	54.3016
Siretong	5	1.6667	7.2464	0.3333	4.1667	0.2912	6.155	17.568
Dana-dana	7	2.3333	10.1449	0.6667	8.3333	0.5014	10.5955	29.0737
Nilu-nilu	3	1	4.3478	0.6667	8.3333	0.0912	1.9266	14.6077
Bitao	1	0.3333	1.4493	0.3333	4.1667	0.0117	0.2473	5.8632
Anyurung	4	1.3333	5.7971	0.3333	4.1667	0.1679	3.5474	13.5112
Polong-polong	1	0.3333	1.4493	0.3333	4.1667	0.0141	0.2986	5.9146
Lebani	1	0.3333	1.4493	0.3333	4.1667	0.0073	0.1548	5.7707
Jalapao	9	3	13.0435	0.6667	8.3333	1.0145	21.4399	42.8167
Tarra	2	0.6667	2.8986	0.3333	4.1667	0.0571	1.2064	8.2717
Bajo	3	1	4.3478	0.3333	4.1667	0.0871	1.8416	10.356
Amrelli	1	0.3333	1.4493	0.3333	4.1667	0.0141	0.2986	5.9146
Cantungang	1	0.3333	1.4493	0.3333	4.1667	0.0142	0.3006	5.9166
Jama	1	0.3333	1.4493	0.3333	4.1667	0.0099	0.209	5.825
Bitti	3	1	4.3478	0.3333	4.1667	0.1167	2.4654	10.9799
Dengen	6	2	8.6957	0.6667	8.3333	0.1976	4.1769	21.2059
Ipi (merbau)	4	1.3333	5.7971	0.3333	4.1667	0.1791	3.7845	13.7483
Kaili	1	0.3333	1.4493	0.3333	4.1667	0.0195	0.4111	6.0271
Total	69	23	100	8	50	4.7318	100	300

Table.3 Vegetation condition of pole level in PFMU Awota

Species	Total of Species	De	RDe	F	RF	Do	RDo	IVI
Maranang	1.00	0.33	0.79	1.00	3.03	0.00	0.14	3.96
Baranang	5.00	1.67	3.94	1.00	3.03	0.04	2.24	9.21
Siretong	2.00	0.67	1.57	1.00	3.03	0.01	0.32	4.93
Dana-dana	5.00	1.67	3.94	3.00	9.09	0.05	2.55	15.58
Nilu-nilu	10.00	3.33	7.87	2.00	6.06	0.15	8.19	22.13
Bitao	6.00	2.00	4.72	2.00	6.06	0.10	5.36	16.14
Anyurung	11.00	3.67	8.66	2.00	6.06	0.23	12.62	27.35
Polong-polong	6.00	2.00	4.72	2.00	6.06	0.10	5.44	16.22
Lebani	11.00	3.67	8.66	3.00	9.09	0.08	4.16	21.92
Jalapao	15.00	5.00	11.81	3.00	9.09	0.48	26.17	47.07
Tarra	10.00	3.33	7.87	2.00	6.06	0.18	9.55	23.48
Bajo	9.00	3.00	7.09	3.00	9.09	0.07	3.75	19.92
Amrelli	5.00	1.67	3.94	1.00	3.03	0.04	2.37	9.34
Cantungang	7.00	2.33	5.51	1.00	3.03	0.07	3.85	12.39
Jama	2.00	0.67	1.57	1.00	3.03	0.01	0.47	5.08
Bitti	5.00	1.67	3.94	2.00	6.06	0.04	2.06	12.06
Dengen	10.00	3.33	7.87	1.00	3.03	0.17	9.08	19.99
Ipi (merbau)	4.00	1.33	3.15	1.00	3.03	0.02	1.33	7.51
Kaili	3.00	1.00	2.36	1.00	3.03	0.01	0.34	5.74
Total	127.00	42.33	100.00	33.00	100.00	1.85	100.00	300.00

Table.4 Vegetation condition of Sapling in PFMU Awota

Species	Total of Species	De	RDe	F	RF	IVI
Lebani	15.00	5.00	8.38	0.67	4.88	13.26
Marrang	6.00	2.00	3.35	0.67	4.88	8.23
Nilu-nilu	28.00	9.33	15.64	1.00	7.32	22.96
Siretong	8.00	2.67	4.47	1.00	7.32	11.79
Dama-dama	25.00	8.33	13.97	1.00	7.32	21.28
Tallang2	2.00	0.67	1.12	0.67	4.88	6.00
Polong2	10.00	3.33	5.59	1.00	7.32	12.90
Jalapao	10.00	3.33	5.59	1.00	7.32	12.90
Bajo	5.00	1.67	2.79	1.00	7.32	10.11
Klangi	2.00	0.67	1.12	0.33	2.44	3.56
Rovi	2.00	0.67	1.12	0.33	2.44	3.56
Anyurung	2.00	0.67	1.12	0.33	2.44	3.56
Bitao	5.00	1.67	2.79	0.67	4.88	7.67
Kaili	4.00	1.33	2.23	0.33	2.44	4.67
Dao	2.00	0.67	1.12	0.33	2.44	3.56
Bedda2	4.00	1.33	2.23	0.33	2.44	4.67
Bitti	6.00	2.00	3.35	0.67	4.88	8.23
Baranang	1.00	0.33	0.56	0.33	2.44	3.00
Banga	2.00	0.67	1.12	0.33	2.44	3.56
Ipi(merbau)	1.00	0.33	0.56	0.33	2.44	3.00
Duajeng	6.00	2.00	3.35	0.33	2.44	5.79
Dengen	2.00	0.67	1.12	0.33	2.44	3.56
Tarra	7.00	2.33	3.91	0.33	2.44	6.35
Cuppigi	24.00	8.00	13.41	0.33	2.44	15.85
Total	179.00	59.67	100.00	13.67	100.00	200.00

Table.5 Vegetation condition of Seedlings in PFMU Awota

Species	Total of Species	De	RDe	F	RF	IVI
Jalapao	9.00	3.00	10.00	1.00	12.00	22.00
Lebani	4.00	1.33	4.44	0.67	8.00	12.44
Bitao	4.00	1.33	4.44	0.67	8.00	12.44
Amrelli	2.00	0.67	2.22	0.67	8.00	10.22
Tarra	4.00	1.33	4.44	0.67	8.00	12.44
Dana2	3.00	1.00	3.33	0.67	8.00	11.33
Marrung	2.00	0.67	2.22	0.33	4.00	6.22
Nilu2	30.00	10.00	33.33	1.00	12.00	45.33
Bitti	7.00	2.33	7.78	0.33	4.00	11.78
Kaili	3.00	1.00	3.33	0.33	4.00	7.33
Dao	4.00	1.33	4.44	0.33	4.00	8.44
Baranang	5.00	1.67	5.56	0.33	4.00	9.56
Talise	3.00	1.00	3.33	0.33	4.00	7.33
Polong2	2.00	0.67	2.22	0.33	4.00	6.22
Cappigi	3.00	1.00	3.33	0.33	4.00	7.33
Duajeng	5.00	1.67	5.56	0.33	4.00	9.56
Total	90.00	30.00	100.00	8.33	100.00	200.00

Table.6 Potency of PFMU Awota

No. Plots	Average				Volume Of Tree (m^3/Ha)
	Seedling	Sapling	Bole	Tree	
	Total of Individual/Ha	Total of Individual/Ha	Total of Individual/Ha	Total of Individual/Ha	
1	35	58	51	38	16.73
2	32	56	48	29	12.74
3	23	68	63	2	0.73
Total	90	182	162	69	30.20
Average	30	60.67	54	23	10.07

Table.7 Potency of regeneration of PFMU Awota

No. plot	Potency of Regeneration		
	Seedling	Sapling	Pole
	Total of Individual/Ha	Total of Individual/Ha	Total of Individual/Ha
1	47	49	50
2	45	48	49
3	39	41	42
Total	131	138	141
Average	44	46	47

Table.8 Timber forest products benefit value of PFMU Awota

No.	District	Production Forest Area (ha)	Average of Timber Potency (m^3/ha)	Potency of Forest Production (m^3)	Timber Benefit Value (Rp.)
1	Keera	2,482.89	10.07	25,002.70	23,827,575,291.90
2	Sajoanging	1,244.21	10.07	12,529.19	11,940,322,549.10
3	Pitumpanua	0	10.07	-	-
4	Maniangpajo	3,801.61	10.07	38,282.21	36,482,948,703.10
5	Gilireng	5,042.06	10.07	50,773.54	48,387,187,622.60
Total		12,570.77	50.35	126,587.65	120,638,034,166.70

Timber forest products benefit value of PFMU Awota showed in table 8. Based on table 8, Timber Forest Products Benefit Value of PFMU Awota varies on some district. Keera District has timber forest products potency reach to 25,002.70 m^3, Sajoanging District reach to 12,529.19 m^3, Pitumpanua District have not potency of timber, Maniangpajo District reach to 38,282.21 m^3, Gilireng District reach to 50,773.54 m^3 and the total potency of timber in PFMU Awota reach to 126,587.65 m^3. Timber forest products benefit value in Keera District was Rp.23,827,575,291.90 Sajoanging District was Rp.11,940,322,549.10, Pitumpanua District was Rp.0 district, Maniangpajo District was Rp 36,482,948,703.10 and Gilireng district was 48,387,187,622.60. The total Timber forest products benefit value of PFMU Awota was Rp.120,638.034,166.70. This value has the potency to be used to improve the welfare of forest communities while conserving the forest. Based on the value of the benefits of a large wooden PFMU awota the potential to be developed to get the economic value of forests greater. Nevertheless, PFMU Awota development should be perceived in terms of strategy, policy, programmes and activities that are not physical site activities, but efforts to implement FMU institutionalisation so that it becomes the agenda of related parties. FMU development is about developing an institution, in terms of both the rules of the game and the organization. Developing an institution is about developing a public good, so the issues lie in the authority, capacity and political will of the related public institutions, either alone or in terms of its capacity to organise with others

Conclusions

The area PFMU Awota scattered in five districts and the vast majority (60.45 %) located in the Kera District and Gilireng District. In terms of forest land, areas of PFMU Awota in the Maniangpajo district and Gilireng District entirely a forest area were the production forest, while the Model PFMU area in District Pitumpanua are all forest areas were protection forest. The dominant species of trees scattered on the third plot is the total area PFMU Awota such as Belalang, Bitti, Leasa, Betao, Jalapao, Uru - Wella, Bakkenase, Jambu - and Dama - Dama. Important value index in tree stratum was contained in the Belalang (IVI 47.973 %), Bitti (IVI 31.891 %), Leasa (IVI 28.85 %), and Betao (IVI 22.54 %). The structure of the regeneration following the model of inverted J curve that describes the amount of stem regeneration levels pole more than saplings, and the number of stems regeneration saplings more than the amount of regeneration at the seedling stage. Conditions regeneration structure like this illustrate that forest stands on the observation plot is relatively safe from human interference. Timber Forest Products

Benefit value of PFMU Awota varies on some ditrict. Keera District has timber forest products potency reach to 25,002.70 m^3, Sajoanging District reach to 12,529.19 m^3, Pitumpanua District have not potency of timber, Maniangpajo District reach to 38,282.21 m^3, Gilireng District reach to 50,773.54 m^3 and the total potency of timber in PFMU Awota reach to 126,587.65 m^3. Timber forest products benefit value in Keera District was Rp.23,827,575,291.90 Sajoanging District was Rp.11,940,322, 549.10, Pitumpanua District was Rp.0 district, Maniangpajo District was Rp 36,482,948,703.10 and Gilireng district was 48,387,187,622.60. The total timber forest products benefit value of PFMU Awota was Rp.120,638.034,166.70. This value has the potency to be used to improve the welfare of forest communities while conserving the forest.

Suggestion

PFMU Awota development should be perceived in terms of strategy, policy, programmes and activities that are not physical site activities, but efforts to implement FMU institutionalisation so that it becomes the agenda of related parties. FMU development is about developing an institution, in terms of both the rules of the game and the organization. Developing an institution is about developing a public good, so the issues lie in the authority, capacity and political will of the related public institutions, either alone or in terms of its capacity to organise with others.

References

Arnoldo Contreras-Hermosilla, Forest Trends, and Chip Fay, World Agroforestry Centre. 2005. Strengthening Forest Management in Indonesia through Land Tenure Reform: Issues and Framework for Action. Forest Trends, Washington.

Bishop, J. T. 1998. The Economics of Non-Timber Forest Benefits: An Overview. Environmental Economics Programme, London.

Food And Agriculture Organization Of The United Nations, [FAO] 2009. Indonesia Forestry Outlook Study. FAO, Bangkok Thailand

FWI/GFW. 2002. The State of the Forest: Indonesia. Forest Watch Indonesia, Bogor, Indonesia and Global Forest Watch, Washington DC.

Indonesia's Legal Timber Supply Gap and Implications for Expansion of Milling Capacity: A Review of the Road Map for the Revitalization of the Forest Industry, Phase 1. Forest Trends, Washington.

ITS Global, 2011. The Economic Contribution of Indonesia's Forest-Based Industries. ITS Global Melbourne, Australia.

Kartodihardjo, H., Nugroho, B., Putro, H.R. 2011. Forest Management Unit Development – Concept, Legislation and Implementation. Ministry of Forestry of Government of Indonesia.

Margono, B.A., Potapov, P.V., Turubanova, S., Stolle, F., Hansen, M.C. 2014. Primary forest cover loss in Indonesia over 2000–2012. Nature Climate Change, Pp. 1–6.

Mueller-Dombois, D., Ellenberg, H. 1974. Aims and Methods of Vegetation Ecology. John Wiley & Sons, New York.

Olderman, L.R., Sjarifuddin, D. 1977. An Agroclimatic map of Sulawesi. Contributions Central Research Institute for Agriculture Bogor, Bogor

Pearce, D.W., Markandya, A. and Barbier, E.B. 1989. Blueprint for a Green Economy. Earthscan.London

Sidiyasa, K., Zakaria, Iwan, R. 2006. The forests of Setulang and Sengayan in Malinau, East Kalimantan: their potential and the identifi cation of steps for their protection and sustainable management. Center for International Forestry Research (CIFOR), Bogor.

Transparency International Indonesia, 2011. Forest governance Integrity report Indonesia. Transparency International Indonesia, Jakarta.