FORESTRY IDEAS, 2019, vol. 25, No 2 (58): 314–328

ECONOMIC VALUE ANALYSIS OF COMMUNITY FOREST FOOD PRODUCTS IN NGARIP VILLAGE, ULU BELU SUBDISTRICT, TANGGAMUS REGENCY (A CASE FROM INDONESIA)

Susni Herwanti[1*], Indra Gumay Febryano[1], and Dini Zulfiani[2]

[1]Department of Forestry, Faculty of Agriculture, University of Lampung. Jl Soemantri Brodjonegoro, Gedung Meneng, Bandar Lampung, 35145, Lampung, Indonesia.
[*]E-mail: sh4nt@yahoo.com
[2]Department of Public Administration, Faculty of Social and Political Science, University of Mulawarman. Jl. Muara Muntai, Kampus Gunung Kelua, Samarinda 75114, East Kalimantan, Indonesia.

Received: 08 August 2018 Accepted: 12 September 2019

Abstract

The cultivation of community forestry (Hutan Kemasyarakatan/HKm) land by planting some crops had increased its economic value. Therefore, this study aims to identify the types of food crop products and analyze the economic value of HKm food products. The data was obtained through in-depth interviews and field observations. Data analysis was done by qualitative and quantitative methods. The results showed that the products utilized in HKm consist of 28 species dominated by coffee products. These products are mixed from agricultural crops, plantations, and forestry planted in agroforestry on HKm land with coffee plants as the main crop. Other food products that are also found in HKm are chili, pepper, spring onions, cocoa, cloves, avocado and so on. Crops products other than coffee are planted spread among coffee plants with an average number of coffee plants of 2000 to 2500 stems per ha. The economic value of HKm food products reached 5 billion Rp. with the highest economic value being the coffee product as the main plant (60 %). The highest economic benefit of HKm land occurs in August while the economic benefits are low enough in December, January, February, March, and April. Farmers need to diversify food products and take into account the harvest period in order to obtain the optimum benefits from HKm land at all times. Therefore, farmers are advised to plant commercial crops such as bananas, papaya, eggplant, chayote, tomatoes, spring onions, avocados, jackfruit, sugar palm, pepper, ginger and chili with an agroforestry system because these species have high economic value and are able to provide sustainable economic and ecological benefits, while for coffee, cacao and cloves, although the economic value is high, it is not recommended to develop on HKm land because it is related to the policy which only allows maintaining coffee and cocoa plants in the forest. In this regard, the Government's support is very much needed related to HKm's policy based on the economic value in order to reconcile the interests of the community and forest sustainability.

Key words: agroforestry, HKm food product, HKm land.

Introduction

Community forestry (Hutan Kemasyarakatan/HKm) is one of the community forestry schemes that aims to bring together the two conflicting interests of community and forest's sustainability. The community around the forest is very dependent on it,

and the forest with all its functions has a strategic existence for life. Many research results in various countries, especially developing ones have proved people's dependence on forests existence, especially those from the poor category such as Koshi Tappu Wildlife Reserve, Nepal (Chaudhary et al. 2016), Kenya (Langat et al. 2016), Indonesia (Qurniati et al. 2017, Widianingsih et al. 2016), etc. Furthermore, according to the research results of Herwanti (2012), the income from the HKm land contributes 53 % annually of total income in Pekon Ngarip community. It is also proved that the Ngarip Village community had a high dependence on forest land. High forest dependency if left without a win-win solution from the government will cause higher forest damage, especially in Lampung Province, Indonesia.

The HKm scheme provided solutions to sustainable forest management based on sustainable economic, ecological and social principles by applying agroforestry practices that are seen as contributing to food security (Kiptot et al. 2013, Mbow et al. 2014, Salampessy 2019, Susanto and Triyono 2016, Coulibaly et al. 2017), nutrition (Vira et al. 2015, Jamnadass et al. 2013, Noordwijk et al. 2014), soil quality improvements, sustainable production systems (Alao and Shuaibu 2013) food, medicine, animal feed and microclimate modification (Oino and Mugure 2013, El-Tantawi et al. 2017). Agroforestry in Ngarip Village is a land use system that integrates agricultural crops and forestry simultaneously in a single land so that through agroforestry practices in the HKm area expected food needs for Ngarip villagers can be fulfilled through long-term food sources, medium, and short term. According to Herwanti (2016), Ngarip Village community had a level of food security with sufficient category. The more plant species present and already in production, the more diverse types of food are available. These types of crops are not all food for farmers because some species are commercial crops which yields could be profitable so that only the abundant or non-commercial species become food for farmers.

Many economic assessment studies have been carried out by researchers including studies of the economic value of non-timber forest products in the Kapuas-Kahayan protected forest (Hastari and Yulianti 2018), the economic value of fruit, fuel-wood, and water in protected forests. Other examples are Wosi Rendani West Papua (Nurapriyanto et al. 2018), economic assessment for the Tembawang ecosystem in Sanggau District, West Kalimantan Province, Indonesia (Roslinda et al. 2017), economic value of ecosystem services in the Mazandaran Forest Reserve (Jahanifar et al. 2017), the total economic value of agroforestry in the Krueng Aceh watershed area (Kadir 2014) and so on. Naidoo (2008) states that economic assessment studies can be used to show that conservation can produce tangible economic benefits for the community. Furthermore, Jilkova et al. (2010) state that the economic assessment of environmental resources is considered an important theoretical tool for making decisions about the allocation of scarce natural resources. If natural resources and the environment have no economic value then these resources can be economically undervalued even considered worthless and therefore it can be exploited by the community (Tegenie 2015). The need to identify the economic value of food products in this HKm area is important in addressing economic and conservation issues. In an economic perspective, the contribution of food products HKm become benchmark in

improving the welfare of community and in an ecological perspective, agroforestry crops become benchmarks in the improvement of forest land conditions. According to Mayrowani and Ashari (2011), poor consumption patterns are closely related to community access to food sources due to poverty. In this case, HKm as part of the forestry sector can contribute to providing non-rice food through food diversification so that public access to food can be increased, and indirectly increases the welfare of the community. Economic assessment of food products on HKm land is an important thing to do because it involves the availability of data that can be used for policymakers in planning HKm programs to bring together economic (food) and ecological needs, especially in Ngarip Village. Therefore, this study was conducted with the aim to identify the types of food products from HKm land and estimate their economic value. The economic value of food products was calculated based on the prevailing market price at the study site.

Materials and Methods

Study area

This research was conducted in Ngarip Village, Ulu Belu Subdistrict, Tanggamus Regency, Lampung Province, Indonesia for 2 months (April and May 2017). Site selection was done purposively based on consideration of efficiency and obtaining HKm permit. It is one of the villages in the district which borders protected forest area and has the most population. The majority of the villagers are farmers (Ngar-

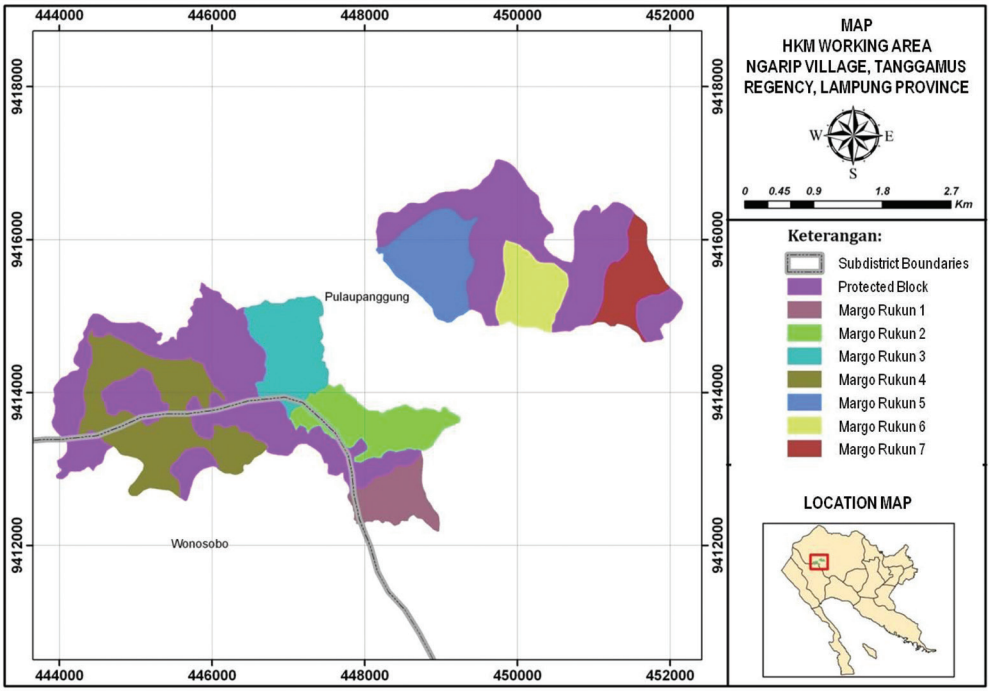

Fig. 1. Research location in HKm land, Ngarip Village, Tanggamus Regency.

ip HKm 79 %) who use the land of protected forest area for agroforestry, while the rest work as farm labourers, construction workers, traders, civil servants, and so on. The total area of HKm land is 1446.85 ha consisting of protected blocks of 39 and 32. The area of HKm land managed by the community is 1 ha in average. Ngarip Village has been granted HKm license since 1999 but this permit was renewed in 2004 and never extended after. Ngarip Village has only been granted a definitive permit for 35 years in 2007. Figure 1 presents research location.

Data type

The type of data in this research was primary and secondary. Primary data were: HKm products already in production, the selling price of the product, the frequency of product utilization and the number of products utilized. Secondary data in the form of data supporting research derived from literature studies, sub-districts and various other supporting data. Data collection was conducted through the method of depth interview to HKm farmers by using a questionnaire and observation in the field. Several variables used in this study are presented in Table 1.

Table 1. Research variable.

No	Question
1	Area of HKm
2	Types of HKm food products
3	Frequency of utilization per year
4	Perfection time per year
5	Amount in one utilization (kilogram / bundle / nut / trailer / liter)
6	Total utilization per year (kilogram / bundle / nut / trailer / liter)
7	Price per unit of product (Rp.)
8	Total economic value per year (Rp./year)

Note: 1000 Rp. = 0.06014 euro.

Selected respondents

Respondents were members of the HKm group randomly selected. Samples were taken randomly because respondents had homogeneous characteristics as HKm farmers. The number of respondents chosen based on the Slovin formula (Arikunto 2010) is 73 people with a total population of 282 farmers. The calculation was done by the formula (1):

$$n = \frac{N}{N(e)^2 + 1} = \frac{282}{282(0.1)^2 + 1} = 73, \quad (1)$$

where: n is number of respondents, N is population number of HKm farmer, e is Error limit (10 %).

Data analysis

The analysis of economic value was done by using the prevailing market price at the research location. The market price method was used to analyze the economic value of HKm food products is done on all commercial and subsistence HKm food products. Stages of economic assessment are carried out as follows:

1. Assessment of products for commercial use and subsistence (self-consumption) on HKm land is done directly based on market price applicable in the research location.

2. Calculation of economic value per product type is done by the formula (2):

$$NE \text{ HKm} = TU \cdot P, \quad (2)$$

where: NE HKm – the economic value of HKm products; TU – total utilization (unit·year^{-1}); P – price per type (Rp.).

3. Calculation of the total economic value of HKm products by summing up all economic values per product type (formula 3):

$$NT \text{ HKm} = NE \text{ HKm}_1 + NE \text{ HKm}_2 + \ldots + NE \text{ HKm}_i, \quad (3)$$

where: *NT* HKm – total value of the product; *NE* HKm_i – economic value of product type *i*.

Results and Discussion

HKm in Ngarip Village

HKm licensing has changed land management practices in Ngarip Village from monoculture coffee plantations to coffee agroforestry management. In the 1970s, people utilized forest areas with monoculture coffee gardening. This system had devastating impact on the environment especially the community's forest utilization at that time and did not meet the conservation rules. The results of Ramos-Scharrón and Figueroa-Sánchez (2017) research found that coffee farming systems were estimated to produce sediments of -11 $mg \cdot ha^{-1} \cdot year^{-1}$, decreasing soil fertility, increasing biodiversity and soil loss compared to traditional agroforestry systems (Kassa et al. 2016). Furthermore, according to Deng et al. (2016), the impacts of forest cover change may lead to decrease in soil carbon stocks, increase surface temperatures (Youneszadeh et al. 2015), decline in soil quality (Bonilla-Bedoya et al. 2017), increase soil erosion (Sharma et al. 2011), etc.

The HKm program is launched in order to improve and maintain functioning forests that have undergone functional changes such as those occurring in protected forest areas in Regions 39 and 32 in Ngarip Village. HKm program seeks to improve the condition of forests through their use in accordance with the status of forest areas and local wisdom owned by Ngarip Village community.

As in a protected forest area, Ngarip villagers are prohibited from taking timber or logging trees on HKm land. The permissible utilization is the utilization of non-timber forest products such as fruits, seeds, yams, leaves and so forth that are believed to have greater economic value than the one of a monoculture plantation system. Agroforestry practice undertaken was expected to provide economic services such as sustainable food sources and other economic benefits meanwhile improving forest conditions. The 12th North American agroforestry conference highlights that agroforestry is a profitable land use from biophysical and socioeconomic aspects (Moorhead and Dickens 2012). According to Vaast et al. (2016), coffee and cocoa agroforestry systems are more stable over time, resistant to climate change and price fluctuations by combining ecological services with diversified production. Trees as one component of agroforestry crops in an appropriate natural resource management strategy have the potential to nurture and in some cases increase yield compared to monoculture management. Furthermore, tree and agricultural integration provide livelihood benefits, provide additional income sources, and provide greater survival strategies to adapt to the markets and climate change (Reed et al. 2017).

The granting of HKm permit for 35 years gives peace and security to the community because it has gained the right to manage the forest. According to Legesse et al. (2018), property rights are one of the major factors affecting Ethiopian farmers' decisions to invest in land management. Farmers in Ethiopia feel secure so they have the courage to make a decision to reforest. According to Krishna et al. (2017), the protection of property rights under customary law provides security for rural communities. The sense of external ownership security is low when

the land cannot be given an official title. The agroforestry system applied to HKm land with various ecological and economic benefits is a form of farmer´s decision to manage the forest because it is based on security and trust. For 35 years, agroforestry practices implemented are expected to improve soil conditions while providing food for farmers.

The kinds of food products in HKm land

Ngarip Village has various types of food products from HKm agroforestry land utilized by villagers both for subsistence since 1970s and commercially. Food products that are used regularly for commercial needs are coffee, cocoa, cloves, pepper and banana while the rest are used for their own needs. The production of 28 species consists of agroforestry tree products, grains, and products such as intercropping vegetables and tubers. This is similar to research outcome of Teketay and Tegineh (1991) who showed that coffee (*Coffea arabica* L.) is found to grow under the shade of 16 tree species and 15 types of inter-cropping plants such as grains, fruits, vegetables, stimulants, oilseeds and spices. According to Abebe (2013), species richness is an important indicator of diversity, however in terms of usefulness, not only species richness is considered important, but having an appropriate mix of various functional groups of plants is also considered very important (Abebe et al. 2010) to meet balanced nutrition and household nutritional needs. The coffee agroforestry system that produces food products in Ngarip Village is an appropriate mixture of various functional groups of plants. The diversity of food products serves to meet the needs of family food while improving and maintaining the environment. Among the various food products, there is one product that provides 2 benefits at once, namely chayote product. This product is used by fruit and leaves as a vegetable and both have market prices. However, the use of leaves isn't as much as the use of its fruit. This is because harvesting leaves takes longer than fruit harvesting while selling price is the same. In addition, people are more familiar with the fruit than the leaves. Table 2 presents the types of food products in HKm land.

Table 2. Food products of HKm Ngarip Village.

Number	Type of HKm product	Scientific name	Number of respondent	Share of respondents, %
1	Coffee	*Coffea robusta* L.Linden	73	100
2	Cacao	*Theobroma cacao* L.	13	17.8
3	Clove	*Eugenia aromatica* (L.) Baill.	7	9.6
4	Pepper	*Piper nigrum* L.	33	45.2
5	Sugar palm	*Sugar palmga pinnata* (Wurmb) Merr.	10	13.7
6	Chili	*Capsicum frutescens* L.	46	63.0
7	Spring onion	*Allium fistulosum* L.	14	19.2
8	Leaves of chayote	*Sechium edule**	1	1.4

Number	Type of HKm product	Scientific name	Number of respondent	Share of respondents, %
9	Chayote	*Sechium edule***	8	11.0
10	Cassava leaves	*Manihot esculenta* Crantz	2	2.7
11	Long beans	*Vigna sinensis* L.	3	4.1
12	Rampai	*Solanum lycopersicum* L. syn.	7	9.6
13	Eggplant	*Solanum melongena* L.	11	15.1
14	Tomato	*Lycopersicon esculentum* Mill.	5	6.8
15	Avocado	*Persea americana* Mill.	22	30.1
16	Mango	*Mangifera indica* L.	1	1.4
17	Jackfruit	*Artocarpus heterophyllus* Lam.	25	34.2
18	Papaya	*Carica papaya* L.	7	9.6
19	Banana	*Musa* L. sp.	27	37.0
20	Water apple	*Psidium guajava* L.	1	1.4
21	Areca Nut	*Areca catechu* L.	1	1.4
22	Breadfruit	*Artocarpus altilis* (Park.) Fosberg	3	4.1
23	Durian	*Durio zibethinus* L.	1	1.4
24	Ginger	*Zingiber officinale* Rosc.	16	21.9
25	Turmeric	*Curcuma domestica* Valet	5	6.8
26	Sweet potato	*Ipomoea batatas* (L.) Lam.	1	1.4
27	Cassava	*Manihot* Mill. Sp	11	15.1
28	Taro	*Colocasia esculenta* (L.) Schott	12	16.4

Note: * – leaves, ** – fruit.

Economic value of HKm food product

The result of research showed that all food products in Ngarip Village have high economic value. The economic value is derived from the market price of commercial products or the market price approach of subsistence products. The total economic value of the product reaches Rp. 5,000,000,000 or Rp. 72,900,000 per household per year. The largest economic value was obtained from coffee products (60 %) which is the main product while the remaining 40 % in agroforestry products other than coffee the greatest value comes from pepper products. According to the results of the study, the number of coffee plants on HKm ranged from 2000 to 2500 stems per ha while other types of plants were planted scattered between and under coffee plants. These results indicated that other agroforestry products have substantial economic value. It is in accordance to El Tahir and Vishwanath's (2015) research outcome who found that the agroforestry economic value contributed significantly to the lives of local communities in Eastern Sudan, which is about 7,346,000 SDG (1,335,636.36 USD) per household per year. Table 3 presents the economic value of agroforestry food products on HKm land.

Table 3. The economic value of each type of HKm product.

No	Type of product	Average product utilization, unit·year^{-1}	Price, Rp.·unit^{-1}	Average product economic value, Rp.·year^{-1}	Total value of economy product, Rp.·year^{-1}
1	Coffee	2197.00	Rp. 20.000 kg^{-1}	43,946,236.56	3,208,075,269
2	Chili	476.38	Rp. 20.000 kg^{-1}	9,527,671.23	695,520,000
3	Pepper	145.56	Rp. 90.000 kg^{-1}	13,100,547.95	956,340,000
4	Banana	710.14	Rp. 1.300 kg^{-1}	923,178.08	67,392,000
5	Avocado	42.19	Rp. 5000 kg^{-1}	210,958.90	15,400,000
6	Ginger	38.36	Rp. 13.750 kg^{-1}	527,397.26	38,500,000
7	Spring onion	43.73	Rp. 15.000 kg^{-1}	655,890.41	47,880,000
8	Chayote leave	157.81	Rp 2.000 bndl^{-1}	315,616.44	23,040,000
9	Chayote	105.21	Rp. 2.000 kg^{-1}	210,410.96	15,360,000
10	Cassava leave	13.15	Rp. 2.000 bndl^{-1}	26,301.37	1,920,000
11	Long beans	11.10	Rp. 2.000 bndl^{-1}	22,191.78	1,620,000
12	Cacao	70.18	Rp. 25.000 kg^{-1}	1,754,480.53	128,077,079
13	Mango	0.79	Rp. 3.500 kg^{-1}	2,756.85	201,250
14	Jackfruit	30.82	Rp. 3.500 kg^{-1}	107,876.71	7,875,000
15	Rampai	8.28	Rp. 7.000 kg^{-1}	57,994.52	4,233,600
16	Eggplant	18.71	Rp. 5.000 kg^{-1}	93,561.64	6,830,000
17	Tomato	54.11	Rp. 7.700 kg^{-1}	416,661.99	30,416,325
18	Papaya	109.08	Rp. 2.000 kg^{-1}	218,150.68	15,925,000
19	Clove	6.52	Rp 85.000 kg^{-1}	554,246.58	40,460,000
20	Durian	0.82	Rp. 15.000 nut^{-1}	12,328.77	900,000
21	Turmeric	3.63	Rp. 10.000 kg^{-1}	36,301.37	2,650,000
22	Cassava	27.03	Rp. 515 kg^{-1}	13,919.22	1,016,103
23	Sweet potato	4.11	Rp. 4.000 kg^{-1}	16,438.36	1,200,000
24	Taro	40.44	Rp. 2.000 kg^{-1}	80,876.71	5,904,000
25	Breadfruit	11.67	Rp. 3.100 kg^{-1}	36,180.82	2,641,200
26	Sugar palm	6.16	Rp. 15.000 kg^{-1}	92,465.75	6,750,000
27	Areca nut	0.18	Rp. 15.000 kg^{-1}	2,671.23	195,000
28	Water apple	0.21	Rp. 2.000 kg^{-1}	410.96	30,000
Total economic value of HKm product, Rp.·year^{-1}					5,326,351,826
Average economic value of HKm products, Rp.·household^{-1}·year^{-1}					72,963,724

Note: bndl – bundle; 1000 Rp. = 0.06014 euro.

Agroforestry products in the study area have different harvest periods so farmers get results and income in each period. Based on the results of the research, farmers benefit from HKm land throughout the year and the amount is fluctuating. The highest economic benefits were obtained by farmers in August when coffee was harvested, while the low economic benefits occurred in December,

January, February, March, and April when commercial crops had not yet produced or commercial crops had been produced but not much. In December, the economic value derived mainly from avocado, cocoa, and tomatoes. In January and February, high economic values were obtained from banana, jackfruit, durian, areca nut, and tomato. In March and April, the economic value comes from rampai (a type of small tomato), spring onions, eggplant, sugar palm, breadfruit, and water apple which at that time began to produce. In May to August, there was an increase in economic value strongly influenced by the production of cocoa and coffee which were undergoing a harvest period. In September, the economic value declined slightly because coffee products were at the end of the harvest period but this month the clove began production. In October and November, the economic value experienced an increase again because pepper entered the harvest period. Based on the results of the study, the fluctuations in the economic value of food products were caused by several factors, namely: i) the product is a commercial type, such as coffee, pepper, cocoa, ginger, avocado, sugar palm, jackfruit, chili, and cloves, ii) the product has a high level of harvest frequencies in the year such as cacao, durian, avocado, tomatoes, jackfruit, spring onion, pepper, clove which produce more than a year and bananas, papaya, cassava leaves, chayote leaves and chayote which produce every month, and iii) total production of commercial crops. If commercial products often produce in the year with an abundant amount, then the economic value of the product is high. And vice versa, if commercial products rarely produce and the amount of production is low, the economic value of these food products is low. This occurs in several types of plants on HKm lands such as avocados, jackfruit, and sugar palm. This type has the potential to be developed on HKm land, but because there are not many plants and crops found on HKm land, the economic value of the product decreases. Harvest frequencies of each type of product and the economic benefits resulting from each product are presented in Table 4 and Figure 2.

The HKm permit granted to the Ngarip Village community has created an agroforestry management model that is able to provide more economic value than monoculture management at that time. This economic value is obtained from commercial and subsistence product usage. Many people have benefited from agroforestry products for their own consumption such as fruits and vegetables that are quite expensive to buy in the market. In addition to the high and varied nutritional content, consumption of agroforestry products also reduces household expenses so that people can allocate their income to buy other necessities. Unfortunately, the community is not fully aware of the condition because there are still many people who rely only on coffee sales, while agroforestry products besides coffee also provide a fairly high economic contribution.

Therefore, the research on the economic value of food products attempts to show the people of Ngarip Village that the agroforestry food products grown on HKm land can provide economic benefits very significant in value. Farmers need to diversify the types of crops for the community to get more food and income variations so that during peak season farmers do not rely solely on income from one product. In addition, diversification of plant species should consider the harvest period so that farmers do not suffer from food shortages, especially in December, January, February, March and April by multiplying

the types of commercial crops that allow harvest in those months such as bananas, chayote, tomatoes, spring onions and so forth. According to Fouladbash and Currie (2015), agroforestry households in Liberia are more food resistant than monoculture households. Households that practice agroforestry consume more food per day through diversified sources of income, improve crop yields and additional food products than households that practice monoculture farming.

Table 4. Harvesting frequencies.

Kind of plant	Month											
	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
Coffee						V	V	V	V			
Chili					V	V						
Pepper										V	V	
Banana	V	V	V	V	V	V	V	V	V	V	V	V
Avocado											V	V
Ginger								V				
Spring onion				V				V				V
Chayote leave	V	V	V	V	V	V	V	V	V	V	V	V
Chayote	V	V	V	V	V	V	V	V	V	V	V	V
Cassava leave	V	V	V	V	V	V	V	V	V	V	V	V
Long beans						V	V	V	V	V		
Cacao	V	V	V	V	V	V	V				V	V
Mango			V	V								
Jack fruit		V	V									
Rampai			V	V	V							
Eggplant			V	V	V							
Tomato	V	V										V
Papaya	V	V	V	V	V	V	V	V	V	V	V	V
Clove									V	V		
Durian	V	V										
Turmeric											V	
Cassava									V			
Sweet potato										V		
Taro											V	
Bread fruit			V	V								
Sugar palm			V	V	V	V						
Areca nut		V										
Water apple			V									
Number of type of crops	8	10	13	12	10	10	8	9	9	9	10	9

The estimation of the economic value of HKm food products obtained in this study indicates that the management model of agroforestry in Ngarip Village has contributed to improving the economy through increasing non-rice food availability, increasing income, increasing employment opportunities, increasing market access and so on. According to Menurut El Tahir and Vishwanath (2015), economic value can be an indication of how the capability of agroforestry management model in

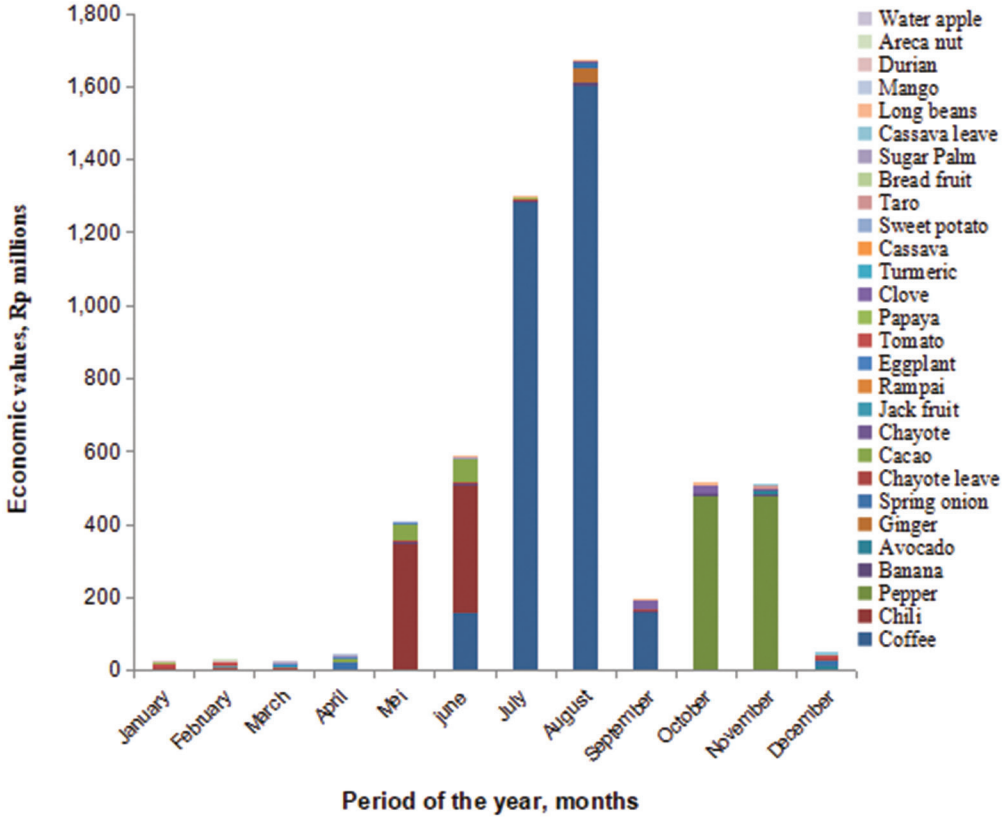

Fig. 2. Economic value of each product type.

HKm land applied by community has a role in improving the economy. In addition, the results of this economic assessment can play a role in providing input regarding HKm land management policies (Ndebele and Forgie 2017). Protection Forest Management Unit (KPHL) North Kotaagung as policy holder at local level need to apply win-win solution related to land management of HKm by community in Ngarip Village, such as policy on seed, selection of superior seeds and selection of crop type in accordance with the knowledge of local communities for successful forestry development. According to Salampessy et al. (2017), communities in the management of traditional agroforestry have their own decisions in choosing tree species based on community's ecological knowledge and they need the government to support. Meinzen-Dick (2014) states that interventions in land management require well-defined policy and property ownership support. Therefore, HKm's 35 year license should be supported by a flexible HKm policy by taking into account the economic value of food products so that the management of the land can be more efficient and optimal according to the needs of both the forest and the community.

Conclusion

Food products on the land of HKm Ngarip Village consists of 28 species and 60 % is dominated by coffee products while the rest were chili, pepper, spring onions, cocoa, cloves, avocado, etc. Farmers benefit from HKm land in every month since the land is capable of producing various types of food products every month. The economic value of food products in HKm land reach Rp. 3,000,000,000 or Rp. 72,900,000 per household per year from 28 types of food crops. The highest economic value came from coffee, which amounted to Rp. 3,208,075,269 per year and the lowest economic value came from water apple about Rp. 30,000 per year. The highest economic benefits occurred in August when coffee was harvested. While the low economic benefits occurred in December, January, February, March, and April when coffee and other commercial crops have not produced. However, In October and November, the economic value increased again due to pepper and other crops experienced a harvest period. Most types of crops are harvested more than once a year and some even produce every month such as bananas, chayote, chayote leaves, papaya and cassava leaves but the economic value is very low compared to the five main commercial products, such as coffee, chili, pepper, cocoa, and cloves. This fluctuation in economic value was due to several cases, such as the type of commercial crops, harvest frequency and quantity of crop production per month.

Acknowledgment

The authors thank to protection forest management unit (KPHL) of Kotaagung Utara and Lampung University for facilitating the field research works.

References

Abebe T. 2013. Determinants of crop diversity and composition in Enset-coffee agroforestry homegardens of Southern Ethiopia. Journal of Agriculture and Rural Development in the Tropics and Subtropics 114(1): 29–38.

Abebe T., Wiersum K.F., Bongers F. 2010. Spatial and temporal variation in crop diversity in agroforestry home gardens of Southern Ethiopia. Agroforestry Systems 78: 309–322.

Alao J.S., Shuaibu R.B. 2013. Agroforestry practices and concepts in sustainable land use systems in Nigeria. Journal of Horticulture and Forestry 5(10): 156–159.

Arikunto S. 2010. Prosedur Penelitian: Suatu Pendekatan Praktek [Research Procedure: A Practical Approach]. Rineka Cipta, Jakarta. 198 p. (in Indonesian).

Bonilla-Bedoya S., López-Ulloa M., Tom V., Herrera-Machuca M.A. 2017. Effects of land use change on soil quality indicators in forest landscapes of the Western Amazon. Soil Science 182: 128–136.

Chaudhary S., Chettri N., Uddin K., Khatri T.B., Dhakal M., Bajracharya B., Ning W. 2016. Implications of land cover change on ecosystems services and people's dependency: A case study from the Koshi Tappu Wildlife Reserve, Nepal. Ecological Complexity 28: 200–211.

Coulibaly J.Y., Chiputwa B., Nakelse T., Kundhlande G. 2017. Adoption of agroforestry and the impact on household food security among farmers in Malawi. Agricultural Systems 155: 52–69.

Deng L., Zhu G.Y., Tang Z.S., Shangguan Z.P. 2016. Global patterns of the effects of land-use changes on soil carbon stocks. Global Ecology and Conservation 5: 127–138.

El Tahir B.A., Vishwanath A. 2015. Estimation of economic value of agroforestry systems at the local scale in Eastern Sudan. Journal

of Geoscience and Environment Protection 3: 38–56.

El-Tantawi A.M., Badr A.M., Daura U.S. 2017. Benefits of agroforestry on smallholder farms in Jigawa State, Nigeria. Journal of Environmental Science, Toxicology and Food Technology 11: 31–38.

Fouladbash L., Currie W.S. 2015. Agroforestry in Liberia: Household practices, perceptions and livelihood benefits. Agroforestry Systems 89: 247–266.

Hastari B., Yulianti R. 2018. Pemanfaatan dan nilai ekonomi hasil hutan bukan kayu di KPHL Kapuas-Kahayan [Utilization and economy value of non-timber forest product in KPHL Kapuas-Kahayan]. Jurnal Hutan Tropis 6(2): 145–153 (in Indonesian).

Herwanti S. 2012. Optimalisasi Pemanfaatan Lahan Hutan Kemasyarakatan di Desa Ngarip, Kecamatan Ulu Belu, Tanggamus [Optimization of Land Utilization of Community Forestry in Ngarip Village, Ulu Belu Sub District, Tanggamus]. Tesis. Sekolah Pascasarjana, Institut Pertanian Bogor, Bogor. 97 p. (in Indonesian).

Herwanti S. 2016. Kontribusi agroforestri terhadap ketahanan pangan rumah tangga petani di Desa Ngarip, Kecamatan Ulu Belu Kabupaten Tanggamus [Agroforestry contribution to farmer household food security in Ngarip Village, Ulu Belu Sub-district Tanggamus Regency]. Jurnal Hutan Pulau-Pulau Kecil 1(2): 105–110 (in Indonesian).

Jahanifar K., Amirnejad H., Abedi Z., Vafaeinejad A. 2017. Estimation of the value of forest ecosystem services to develop conservational strategy management (strengths, weaknesses, opportunities and threats). Journal of Forest Science 63(7): 300–312.

Jamnadass R., Place F., Torquebiau E., Malézieux E., Iiyama M., Sileshi G.W. 2013. Agroforestry for food and nutritional security. Unasylva 64: 23–29.

Jilkova J., Hollander R., Kochmann L., Slavik J., Slavikova L. 2010. Economic valuation of environmental resources and its use in local policy decision-making – A comparative Czech-German border study. Journal of Comparative Policy Analysis 1–13.

Kadir Z.A. 2014. Penilaian Ekonomi Lanskap Agroforestri sebagai Jasa Lingkungan di Daerah Aliran Sungai Krueng Aceh [Agroforestry Landscape Economic Valuation as An Environmental Service in The Krueng Aceh River Basin]. Tesis. Sekolah Pascasarjana, Institut Pertanian Bogor, Bogor. 91 p. (in Indonesian).

Kassa H., Dondeyne S., Poesen J., Frankl A., Nyssen J. 2016. Transition from Forest based to Cereal based Agricultural Systems: A review of the drivers of land use change and degradation in Southwest Ethiopia. Land Degradation & Development 28(2): 1–19.

Kiptot E., Franzel S., Degrande A. 2013. Gender, agroforestry and food security in Africa. Current Opinion in Environmental Sustainability 6: 104–109.

Krishna V.V., Kubitza C., Pascual U., Qaim M. 2017. Land markets, property rights, and deforestation: Insights from Indonesia. World Development 99: 335–349.

Langat D., Maranga E.K., Aboud A.A., Cheboiwo J.K. 2016. Role of forest resources to local livelihoods: The case of East Mau forest ecosystem, Kenya. International Journal of Forestry Research vol. 2016: 1–10.

Legesse B.A., Jefferson-Moore K., Thomas T. 2018. Impacts of land tenure and property rights on reforestation intervention in Ethiopia. Land Use Policy 70: 494–499.

Mayrowani H., Ashari. 2011. Pengembangan agroforestri untuk mendukung ketahanan pangan dan pemberdayaan petani sekitar hutan [Agroforestry development to support food security and farmer's empowerment nearby the forest]. Forum Penelitian Agro Ekonomi 29(2): 83–98 (in Indonesian).

Mbow C., Noordwijk M.V., Luedeling E., Neufeldt H., Minang P.A., Kowero G. 2014. Agroforestry solutions to address food security and climate change challenges in Africa. Current Opinion in Environmental Sustainability 6: 61–67.

Meinzen-Dick R. 2014. Property rights and sustainable irrigation: A developing country perspective. Agricultural Water Management 145: 23–31.

Moorhead D.J., Dickens E.D. 2012. Agroforestry: A profitable land use. An overview of the 12th North American Agroforestry Conference. Agroforestry Systems 86: 299–302.

Naidoo R. 2008. Economics and conservation in the tropics: A strategic dialogue. The role of economic valuation in the conservation of tropical nature. Conference Paper. Conservation Science Program, Gordon and Betty Moore Foundation, Resources for the future: 1–6.

Ndebele T., Forgie V. 2017. Estimating the economic benefits of a wetland restoration programme in New Zealand: A contingent valuation approach. Economic Analysis and Policy 55: 75–89.

Noordwijk M.V., Bizard V., Wangpakapattanawong P., Tata H.L., Villamor G.B., Leimona B. 2014. Tree cover transitions and food security in Southeast Asia. Global Food Security 3: 200–208.

Nurapriyanto I., Bahruni, Basuni S. 2018. Nilai ekonomi buah, kayu bakar dan air di Hutan Lindung Wosi Rendani [Economic value of fruit, firewood and water in Wosi Rendani's Protected Forest]. Jurnal Faloak 2(2): 115–126 (in Indonesian).

Oino P., Mugure A. 2013. Farmer-oriented factors that influence adoption of agroforestry practices in Kenya: Experiences from Nambale District, Busia County. International Journal of Science and Research 2(4): 442–449.

Qurniati R., Febryano I.G., Zulfiani D. 2017. How trust influence social capital to support collective action in agroforestry development? Biodiversitas 18(3): 1201–1206.

Ramos-Scharrón C.E., Figueroa-Sánchez Y. 2017. Plot-, farm-, and watershed-scale effects of coffee cultivation in runoff and sediment production in Western Puerto Rico. Journal of Environmental Management 202(1): 126–136.

Reed J., Vianen J., Foli S., Clendenning J., Yang K., Donald M.M., Petrokofsky G., Padoch C., Sunderland T. 2017. Trees for life: The ecosystem service contribution of trees to food production and livelihoods in the tropics. Forest Policy and Economics 84: 62–71.

Roslinda E., Kartikawati S.M., Rabudin. 2017. Economic valuation for Tembawang ecosystem, in Sanggau District, West Kalimantan, Indonesia. Biodiversitas 18(4): 1506–1516.

Salampessy M.L., Febryano I.G., Bone I. 2017. Pengetahuan ekologi masyarakat loakal dalam pemilihan pohon pelindung pada sistem agroforestri tradisional "Dusung" pala di Ambon. [Local community ecological knowledge in the selection of shading trees for traditional agroforestry system nutmeg "Dusung" in Ambon]. Jurnal Penelitian Sosial dan Ekonomi Kehutanan 14(2): 135–142 (in Indonesian).

Salampessy M.L., Febryano I.G., Zulfiani D. 2019. Principal agent in tree mortgage system on traditional agroforestry management in Moluccas Indonesia. IOP Conference Series: Earth and Environmental Science 285 (012013): 1–5.

Sharma A., Tiwari K.N., Bhadoria P.B.S. 2011. Effect of land use land cover change on soil erosion potential in an agricultural watershed. Environmental Monitoring and Assessment 173: 789–801.

Susanto A., Triyono J. 2016. Cluster model of agroforestry land use to support food sustainability. Current Agriculture Research Journal 4(2): 143–147.

Tegenie Y.A. 2015. Economic Valuation and Sustainable Natural Resources Management: Review Paper. Journal of Economics and Sustainable Development 6(7): 199–204.

Teketay D., Tegineh A. 1991. Traditional tree crop based agroforestry in coffee producing areas of Harerge, Eastern Ethiopia. Agroforestry Systems 16(3): 257–267.

Vaast P., Harman J.M., Rapidel B., Jagoret P., Deheuvels O. 2016. Coffee and Cocoa Production in Agroforestry – A Climate-smart Agriculture Model. In: Climate Change and Agriculture Worldwide. Torquebiau E. (Ed.), Heibelberg: Springer: 197–208.

Vira B., Wildburger C., Mansourian S. 2015. Forests and Food: Addressing Hunger and Nutrition across Sustainable Landscapes. Open Book Publishers, Cambridge. 280 p.

Widianingsih N.N., Theilade I., Pouliot M. 2016. Contribution of forest restoration to rural livelihoods and household income in Indonesia. Sustainability 8: 1–22.

Youneszadeh S., Amiri N., Pilesjo P. 2015. The effect of land use change on land surface temperature in the Netherlands. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences XL-1/W5: 745–748.