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PROFITABILITY OF AGROFORESTRY IN TUMPANGSARI-GUNUNG FOREST RESERVE ARJUNA-LALIJIWO, EAST JAVA, INDONESIA

Abstract. Tumpangsari or agroforestry is a land that uses a management system in which trees are mixed in the same land with food crops or pasture for domestic animals. This study aimed to determine the impact of the tumpangsari system on the local community in Gunung Arjuna-Lalijiwo Forest Reserve, East Java Indonesia, specifically UB Forest, in terms of socioeconomic status. In addition, the monetary value of products produced from tumpangsari agroforestry system from the UB forest has been evaluated. Primary data consists of the questionnaire distributed to 90 selected respondents, in-depth interviews and site observations. Secondary data was collected through literature review through journals, articles and government official documents. Data collected has been analyzed by using the Chi-square test and SPSS. This study revealed that more than half of the respondents were involved in tumpangsari agroforestry activity (73.3%). The highest income is from the respondents who cultivated coffee and vegetables using tumpangsari method in Dusun Sumbersari and Sumberwangi at RM1000-RM1,200.00 (Rp3.33M-Rp4.00M) or 27.7%, which shows that the local community at UB Forest highly depends on tumpangsari related activities as their primary income.

Key words: agroforestry community, socioeconomic, tumpangsari, profitability, monetary value.

Introduction. As population and human aspirations increase, the land becomes an increasingly scarce resource, calling for land-use planning. Land-use planning is important to mitigate the negative effects of land use and enhance the efficient use of resources with minimal impact on future generations [1]. Land use planning is the systematic assessment of land potential and alternatives for optimal land uses and improved economic and social conditions through participatory processes that are multi-sectoral, multi-stakeholder and scale-dependent [2]. The purpose of land-use planning is to support decision-makers and land users in selecting and putting into practise those land use that will best meet the needs of people while safeguarding natural resources and ecosystem services for current and future generations. Tools and methods for land-use planning at appropriate scales should encourage and assist the diverse and often competing users of land resources in selecting land-use and management options that increase their productivity, support sustainable agriculture and food systems, promote governance over land and water resources and meet the needs of society [1]. In addition, land-use planning aims to achieve a balance among these goals through information on trade-offs, appropriate technology, and consensus-based decision-making. Effective land-use planning often involves local communities, scientific information on land resources, appropriate technologies, and integrated evaluation of resource use.

Forest play an important role in reducing poverty around the world in two ways. First, the forest serves as a vital safety net, helping rural people get out of poverty or helping poor people reduce their suffering. Secondly, forests have several potentials that are still untapped to assist some people living in the rural to live out of poverty [3]; [4]. In agroforestry, land-use planning involves the systematic assessment of forestland and its potential for various land uses. Land-use planning is driven by the need

for improved management and a different pattern of land use, as dictated by changing circumstances. To avoid the deeper pressure of tropical forests, the various aspect of sustainable management may be applied as the solution [1]. Implementation of agroforestry as a technique is considered as a sustainable management system for land that increases production and ecological stability and supports sustainable development [5]. This system can assist in various short, medium and long term benefits both for local farmers and government. This system provides cash income to the farmers and a diverse range of products. The environmental benefit of agroforestry is the protection of soils and water resources, microclimate, sequestration of carbon, and the high degree of spontaneous regeneration, which allow conservation of a proportion of the original forest biodiversity [6].

Sustainable Land Use of Land. In 2015, governments worldwide took bold and decisive action by adopting the 2030 Agenda for Sustainable Development [7], or the 2030 Agenda as it is often called. Since then, the 2030 Agenda and its 17 Sustainable Development Goals (SDGs) have become the overarching framework for sustainable development. The universal and inclusive nature of the 2030 Agenda commits the international community to act together to overcome the multiple and complex challenges facing the world in the twenty-first century [1]. It will guide development policies worldwide during the next decade and beyond. Sustainable land use is that which meets the needs of the present while, at the same time, conserving resources for future generations. This requires a combination of production and conservation: the production of goods needed by people, combined with the natural resources. Production depends on ensuring continued production in the future.

The use of land resources, including soils, water, animals, and plants for the production of goods, meets changing human needs while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions [8]. Sustainable land use is that which meets the needs of the present while, at the same time, conserving resources for future generations. This requires a combination of production and conservation: the production of goods needed by people, combined with the natural resources. Production depends on ensuring continued production in the future. The rural populations living surrounding the forests are usually large, impoverished and growing. In particular, the population growth has led to an increase while straining the earth's natural resources at the same time [1]. Food security is intricately linked to energy consumption, and it is a major driving factor in natural resources consumption [9].

Therefore, the pressure on natural resources is the most acute because almost 70% of the poorest are heavily dependent on forests for their livelihoods [10]. According to Mayers and Vermeulen [11], forestry has many advantages compared to other sectors offering the potential means out of rural poverty. It can also provide resource safety nets. In more specific, forest ecosystems offer several services, including supplies of timber, wood fuel (charcoal and firewood) and non-wood forest product, water purification, stabilization of local climate and preservation of biodiversity [12].

Agroforestry Management System. Agroforestry is a land that uses a management system in which trees are mixed in the same land with food crops or pasture for domestic animals. Woody perennial-based with mixed-species production systems or agroforestry has the very potential to avoid land from degradation. Site productivity will improve through interactions with all surrounding trees, soil, agricultural crops, and livestock in that area. It will restore a part of the lands that have been degraded. Agroforestry also can improve rural livelihood and enhance the integrated management of the natural resource base [8].

Figure 1 shows the emergence of the concept of agroforestry in response to the special needs and conditions of tropical developing countries. A few significant factors need to be considered in developing these land management systems namely; (i) subsistence farming, degraded soil, low capital, efficient utilization of labor, fuelwood, and small timber. Agroforestry is a land-use that involves the deliberate

combination of trees and/or shrubs with crops and/or animals to benefits from resultant ecological and economic interaction [13]. It is the simultaneous management of land in terms of the production of crops and trees. Many farmers follow this system to utilize their limited land efficiently. In general, there are commonly three basic sets of components that consist of an agroforestry system; (i) tree, (woody perennial), (ii) herbs (agricultural crops including pasture aspects); and (iii) animals. In fact, agroforestry has been developed as an interface between agriculture and forestry in order to respond to special needs and conditions.

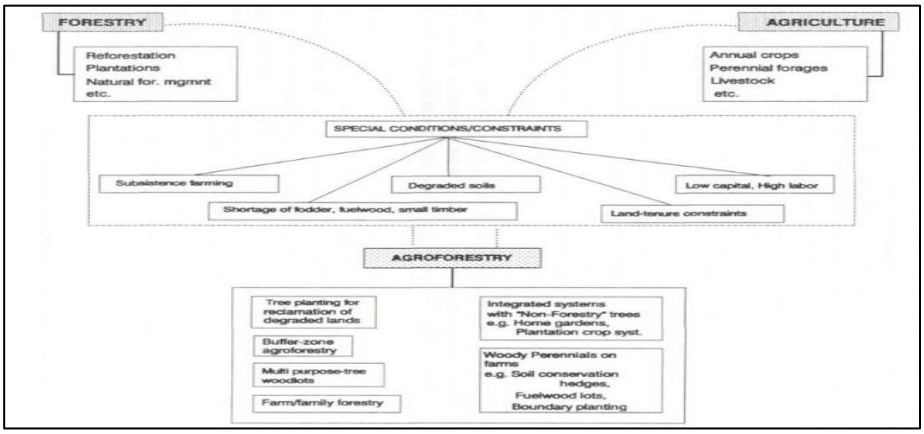

Figure 1. The concept of agroforestry through an interface between agriculture and forestry (Source: Nair [13])

Concept and Components of Agroforestry. According to Nair [13], agroforestry systems be classified into four categories which based on their structure and its functions; namely (i) agrisilvicultural systems, includes all practices in which trees and crops are integrated, namely, alley cropping, shifting cultivation, multipurpose trees, multi-layer tree gardens, and or shrubs on farmland, home gardens, windbreaks and shelterbelts, live-hedges, fuelwood production and integrated multi-storey mixtures of plantation crops; (ii) silvopastoral system, includes protein banks which is multipurpose fodder trees on/or around farmland live fences on fodder edges and shrub trees and shrub on pastures as well as integrated production of animal and wood; (iii) agrosilvopastoral systems, includes home garden practice with breed animals, multipurpose woody hedgerows and integrated production of all crops, animals and wood; (iv) others, includes multipurpose woodlots, apiculture with trees, and aquaculture in mangrove areas.

***Tumpangsari* as Agroforestry Practices in Indonesia.** The application of *tumpangsari* in Indonesia agrarian community has a long tradition. Consequently, there is an extensive body of empirical knowledge on using and managing the trees and associated crops. In addition, the economic productivity of the product is relatively well documented, but more tree studies should be undertaken [14]. The commonly used method in Indonesia for reforestation of both clear-felled and degraded areas is the *taungya* (locally called the *tumpangsari*) system [15]. *Tumpangsari* is an agroforestry system adopted in Indonesia to establish forest plantations. *Tumpangsari* means co-occupation for a limited period, and the occupants are agricultural crops in the forest area [14]. In this system, landless farmers receive 0.25 hectares of forest land on which they have to plant trees and cash crops until the third year, and the labour wage is paid in-kind with the yields of the cash crops.

The results of the *tumpangsari* system are not always optimal for both the harvest of crops and forest trees when pressure on land is high. To increase forest land productivity, Perhutani, the State Forest

Enterprise in Indonesia, initiated a social forestry programme in 1991 in cooperation with the Faculty of Forestry Gadjah Mada University. This programme aimed to improve forest management to increase forest productivity and local people's income under the intensive *tumpangsari* system [16]. To encourage farmer involvement, the farmers get the opportunity to plant cash crops on the forestland, subsidies to buy agricultural devices, fees for land preparation, and fertilizers (both chemical and manure) in the newly established *tumpangsari* sites. This study aimed to determine the impact of the *tumpangsari* system on the local community in Gunung Arjuna-Lalijiwo Forest Reserve, East Java Indonesia, specifically UB Forest, in terms of socioeconomic status [17].

Material and methods of research. The study was conducted in Universitas Brawijaya Forest (UBF) at Karangploso (Figure 2). This sub-district consists of nine villages: Ampeldento, Bocek, Donowarih, Girimoyo, Kepuharjo, Ngenep, Ngijo, and Tawangargo and Tegalgondo [18]. Karangploso is directly adjacent to Singosari district in the north, and to the east is Malang City. To the south, the village is bordered by Dau and Junrejo districts. In the west, this sub-district is bordered by Bumiaji district, Batu City. The Universitas Brawijaya (UB) management, through their corporate social responsibility, supports the economic enhancement and welfare of the community in their educational forest at Karangploso. On promoting their economic distribution, technical and financial support has been given to ensure that the community could utilize the fertile land and collected non-timber forest products (NTFPs) to sustain their livelihood.

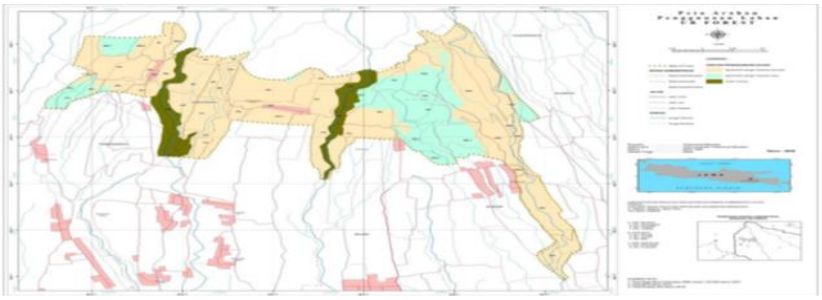

Figure 2. UB Forest Map. Source: Perhutani (https://www.perhutani.co.id/)

The total area of the area (UBF) according to Decree of the Minister of Environment and Forestry of the Republic of Indonesia Number: 676 / MenLHK-Setjen / 2015 covering an area of ± 514 (Five Hundred and Fourteen) hectares as Education and Training Forest (Forest Training). UB Forest's topography/slope conditions are divided based on three classes, namely 0-8% covering an area of 40.97 Ha, > 8-15% covering an area of 484.89 ha, and > 15% covering an area of 23.81 ha [19]. The average rainfall per year is 250 mm, with an average temperature of 270^{C}. There are three soil types in the UB Forest area: brown alluvial soil, brown latosol, and grey regosol.

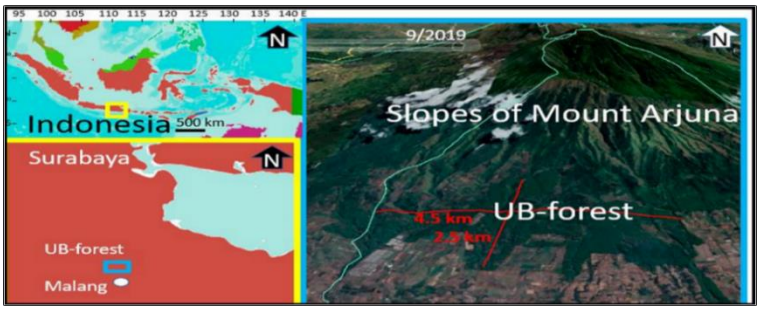

Figure 3: Study location at UB Forest in East Java, Indonesia

Data collection was carried out from 8 February 2020 to 19 February 2020. Four techniques of data collection were applied, which are questionnaire survey, interviews and site observations. Primary data consists of a questionnaire distributed to selected 90 respondents. In-depth interviews and site observations were conducted to gather additional and details information. Secondary data were collected from literature review through the journal, articles and government official documents. The questionnaire has three parts, namely part A, part B and part C. For part A, it was about respondent examples like family members, age, status, education background, occupation, and monthly income. In part B, it was about respondents' involvement as village community activity related to the forest. Lastly, part C was about forest product or socio-economic activities by that particular village community income dependency on forestland and agriculture. Data collections have been analyzed by using the Chi-square test and SPSS [20].

Results and their discussion. Forest Area with Special Purpose (KHDTK) UBF was inaugurated on 19th September 2016. UBF was a forest area located on Mount Arjuna, Malang, East Java, Indonesia. This forest has functions such as protected areas, research areas and production areas. As area production, this forest has many agriculture commodities that have been developed, such as coffee, mustard, carrot and cabbage with pine and mahogany stands. Based on a land area of about 544.74 ha, it was expected that this forest could become a place of education and a place for agricultural production for the community [15]. Furthermore, based on the existing diversity in this forest was expected to keep the sustainability of the ecological aspects of this forest. However, over time this land must play a role functioning other than as a forest by applying appropriate agricultural cultivation on this land and without damaging from this forest diversity.

UBF had two stands: pine and mahogany but mostly filled with pine by 90%, and mahogany trees amount 10%. The land area of this forest was located at an altitude of 1,200 meters above sea level, resulting in a suitable climate for the use of crops or agricultural commodities such as vegetables and annual crops that require a cold environment. Most of the agricultural commodities in this forest area are mustard greens, cabbage, chilli and carrots, and agroforestry with wood crops such as pine and coffee. In addition, non-timber forest products are allowed to be extracted in protected forest areas, such as collecting the vegetation products (trees, shrubs and/or thicket) at the existence of forest ecosystems in the area, for example, leaves, bark, wildlife in the form of lianas (forest orchids), wildlife conservation, honey beekeeping, potential for natural medicines, food sources, genetic resources/germplasm, and natural beauty (ecotourism). Potential vegetation in the protected forest of KHDTK UB in the form of trees, shrubs, and thickets include gintungan (*Bischoffia javanica*), dadap (*Erythirma lithosperma*), anggrung (Trema orientalis), ringin (Ficus benjamina), kesek (Muntingia calabura), gondang (*Ficus variegata*), bamboo (*Bambusa spp*.), tepus (*Etlingera solaris*), ferns (*Cycas spp*.), puspa (*Schimawallicii*), eucalyptus (*Eucalyptus spp)*, calliandra (Calliandracallothyrsus), and others.

The conservation of protected forest for coffee plantations highly contributed and utilizing space for non-forest needs by planting coffee plants in the production forest area [Ministry of Forestry, Indonesia]. Traditionally, coffee has a reputation of being of lower quality, with farmers picking both ripe and unripe beans, which were then sold to intermediary buyers in the area. In addition, a lack of market infrastructure meant that farmers often had to sell their entire crop for a low price and could not invest back into their smallholdings. However, with the technical know-how of UB agriculture expertise, the local farmer today could earn a much better income with high-quality coffee marketed by UB. By equipping farmers with current best agricultural practices and the proper infrastructure, they can breathe new life into these industries and communities, fostering crucial economic development.

Based on socioeconomic perspectives, communities around the forest can enjoy the forest products that they are managed in the hope that there will be stable economic growth and create jobs for future

generations with improved patterns of forest management. From a social perspective, it can strengthen the community around the forest and avoid social inequality among the community groups. Through environmental aspect, UB Forest functions as conservation, ecological temperature regulator, humidity regulator, water reservoir, a breeding place for wildlife, oxygen provider, and procedure for our life inhibits wind, prevents erosion, fruit and wood producers, and lungs of the earth. Participation of farmers group in Dusun Sumbersari and Dusun Sumberwangi in the management of UB Forest is (a) social aspect is in the form of personnel to participate in contributing in the meeting and socialization activities held, responses and suggestions expressed during the meeting and socialization. In addition, it helps provide information, residence, and water requirements to students conducting research or practicum; (b) economic aspects, which are profit from agroforestry activities mostly for coffee cultivation and other crops cultivation.

Community and the Forest. The current interaction between the community and the forest area is UB Forest area has been established for a long time. The people who live around the UB Forest area are dominant as farmers who depend on their resources economy in the surrounding forest, including the UB Forest area. UB Forest has very fertile land supported by alternating air, rain and heat, causing everything planted in this regency to thrive and produce dollars. The community cultivates forest land used for cultivation or planting annual and seasonal crops. Previously the UB Forest area was a forest area managed by Perhutani, one of the Indonesians Government agencies under the Ministry of Forestry. The UB Forest surrounding community focused on the planted plants, but the community also tapped pine trees. The proceeds from the tapping of the pine sap were transferred to Perhutani. Some of the community said that the tapping could increase their income and fill the vacancies for farmers while waiting for the crops to be harvested. However, some people are happy with the elimination of tapping on pine trees. This is because the community does not have to look for pine sap or buy it elsewhere if the target set by Perhutani for tapping results is not met. Currently, people who have cultivated land in an area that has become the UB Forest area are asked to stop tapping and focus on coffee plants. Coffee plants become plants that are expected to produce continuously and can be marketed as well known by the wider community.

Practically, the people who live in Dusun Sumbersari and Dusun Sumberwangi have arable land in the forest area, which is currently the UBF, but also owns land outside the UB Forest area and cultivates it. The crop product by the community is usually sold directly to the middleman but not to the coffee planted in the UB Forest area. Instead, the yields of the coffee plants grown in the UB Forest area is transferred to UB Forest. The formation of a farmer group and one of the activities for women in Dusun Sumbersari and Dusun Sumberwangi, namely Posdaya, illustrates that the people living in the village have good relations with each other and can accept a change for the progress of the community's economy. This is evidenced by the socialization activities that are often carried out in the village.

***Tumpangsari* and Cultivated Crops.** Pine *(pinus)* and mahogany *(swietenia macrophylla)* are the most common species planted in the UB Forest area [1]. Other plants are annual and seasonal crops, such as coffee, ginger, turmeric, carrots, green beans, mustard greens, cabbage, chillies, eggplant, banana, and corn.

From the data, the crops cultivated using *tumpangsari* agroforestry system, home garden agroforestry system and forest product collected are for their own consumption or sale to the middleman. Table 1 shows the species cultivated and managed by the respondent in the UB forest. *Coffea Arabica, Coffea canephora* and *Persea americanaMill* are examples of cultivated species for food, medicinal and cosmetic value while *Zingiber officinaleRoxb.* and *Piper betle L.* is cultivated for food and its therapeutic value. For handicraft and building material, the community at UB forest are most likely collected

Bambusa sp. Meanwhile, Musa paradisiaca L., Manihot esculenta, *Solanum lycopersicum* and *Capsicum frutescens* are cultivated for sale, and plenty of them are for personal consumption.

Table 1. Crops and forest products cultivated through *tumpangsari* and home garden agroforestry farming

Species cultivated / forest product collected	Local name	Own consumption	Sale	Utilization
Coffea arabica	Kopi arabika		√	For food/cosmetic /medicine
Coffea canephora	Kopi robusta		√	For food/cosmetic /medicine
Persea americanaMill	Alvokat/Apoka'		√	Food/cosmetic & Medicine
Musa paradisiaca L.	Pisang/Punti	√	√	Food & Medicine
Zingiber officinaleRoxb.	Jahe/ Laiya	√	√	Food & Medicine
Manihot esculenta	Pucuk ubi	√	√	For food
Solanum lycopersicum	tomat	√	√	Food
Allium sativum	garlic	√	√	Food & Medicine
Dimocarpus longan	mata kucing / longan		√	For food
Pometia pinnata	matoa/Longan		√	For food
Annona muricata Linn	Sirsak/ Sarikaya balanda	√	√	Food & Medicine
Carica papaya L.	Pepaya/Kaliki	√	√	Food & Medicine
Capsicum frutescens	Cabe/cili	√	√	For food
Brassica oleracea var.capitata	kubis	√	√	For food
Brassica	sawi	√	√	For food
Daucus carota subsp.sativus	wortel/lobak	√	√	For food
Pomelo citrus maxima	Jeruk		√	For food
Citrus aurantifolia (Chrism) Swing	Jeruk nipis/ Lemo tadi		√	Food & Medicine
Durio	durian	√	√	For food
Piper betle L.	Sirih/Bolu		√	Food & Medicine
Bambusa sp	Bambu	√	√	Handicraft, Furniture & Building material

There are also seasonal crops such as canned fruit and vegetables such as tomatoes, garlic, ginger, cabbage, mustard greens, slada, beans, bloom cabbage, leek and others, and as partners of seasonal plants, also open farms and fisheries. The plantation sector in Sumbersari and Sumberwangi village is still dominated by smallholder plantations whose production is still traditional. Whereas there is UB Forest Management, which cooperates with local people in 250 ha and is spread in UB Forest with coffee commodities (arabica and robusta). Those still in the development stage are garlic, passion fruit macadamia (*Macadamia integrifolia L*). vetiver (*vertiveria zizanioides*) and patchouli (*pongostemon cablin*). These crops are mainly managed on smallholdings rather than large-scale.

Monetary Value From Homegarden Agroforestry Farming. Distribution monthly income from home garden agroforestry farming is shown in Table 2. The highest range of income from home garden agroforestry farming in Dusun Sumbersari and Dusun Sumberwangi at UB Forest is RM 601-RM 800 (Rp 2.01M – Rp 2.67M), which is 12.5% while the lowest range of income is RM 201-RM400 (Rp 670,000 – Rp 1.3M) which is 62.5%.

Table 2. Percentage of income from home garden agroforestry farming

Income(RM)	Frequency	Percentage (%)
> 1000	0	0.00
801-1000	0	0.00
601-800	2	12.50
401-600	4	25.00
201-400	10	62.50
0-200	0	0.00
Total	**16**	100.00

The distribution of monthly income from *tumpangsari* agroforestry farming is shown in Table 2. The highest income range for the respondent who is cultivated coffee and vegetables using *tumpangsari* agroforestry method in Dusun Sumbersari and Dusun Sumberwangi at UB Forest is RM1000-RM1,200.00 (Rp3.33M-Rp4.00M), which is twenty-seven point twenty-seven percent. In comparison, the lowest range of income is RM401-RM600 (Rp660,000 – Rp2.0M) which is six point zero six percent followed by nine-point zero nine percent of respondents in range of income between RM601 - RM800 (Rp2,0M – Rp2,75M) and fifty-seven point fifty-eight per cent of respondents in range of income between RM801 – RM1,000 (Rp2.67M – Rp3.33M).

Table 3. Percentage of income from *tumpangsari* agroforestry farming

Income(RM)	Frequency	Percentage (%)
> 1200	0	0.00
1000-1200	18	27.27
801-1000	38	57.58
601-800	6	9.09
401-600	4	6.06
201-400	0	0.00
0-200	0	0.00
Total	**66**	100.00

Satisfaction Towards Involvement Of Socio-Economic Activity at UBF. Table 4 shows the Chi-Square test on the dependency between two variables: satisfaction and socio-economic activity at UB Forest. It is significant by getting 0.030 of a p-value. This sign shows that the satisfaction of respondents depends on the socio-economic they are involved with. The highest percentage of satisfaction is Forty-two percent in the *tumpangsari* agroforestry sector while the lowest is on forest product collector which is two percent only. The second-highest percent of satisfaction is in the home garden agroforestry sector, followed by perhutani labour, three percent.

Table 4. Satisfaction towards the involvement of socio-economic activity at UBF

Socioeconomic Activity at KHDTK UB Forest									
		Tumpangsari Agroforestry Farming	Forest Product Collector	Home garden Agroforestry Farming	Sale	Perhutani Labour	Total	x^2	
Satisfied	Yes	43	2	12	0	3	60		

	No	23	1	4	1	1	30	5.73	0.016
Total		66	3	16	1		90		
*significant level at 0.05									

Conclusion.

There is a groundswell of interest in agroforestry, both domestically and globally. That interest is expected to escalate as increasing emphasis is placed on land stewardship and environmental protection in the agroecosystems. The potential of agroforestry to simultaneously provide economic, environmental, conservation, and social benefits to agroecosystems are rapidly being recognized by federal and state agencies, universities, and conservation organizations. The need for and interest in agroforestry are national, but specific needs and priorities vary by region and institution.

This study revealed that the community in UBF, specifically Sumbersari and Sumberwangi villa ge at Karangploso, applied *tumpangsari* agroforestry system, home garden agroforestry system in farming sectors. The UBF area consists of four areas covering pine forests, pine-coffee agroforestry, pine-vegetable agroforestry and mahogany-coffee agroforestry. The agroforestry activities and forest product collectors, the village community, sell to other parties such as UB forest management for coffee and middleman for other crops cultivated. At the same time, some use the crops and forest products collected as own consumption. From the findings also, the income dependency on agroforestry activities has been determined where in Sumbersari village and Sumberwangi village at UB Forest, the mean income is between RM801 – RM1,000 (Rp2.67M – Rp3.33M). More than half of the respondents were involved in tumpangsari agroforestry activity in Sumbersari village and Sumberwangi village at UB Forest(73.3%) and the highest income range RM1000-RM1,200.00 (Rp3.33M-Rp4.00M), which is twenty-seven point twenty-seven percent. Overall, this study revealed that the community in the UB forest depends mostly on *tumpangsari* agroforestry activities as their major income.

The results suggest a proper management in all land use systems within UB forest for minimizing soil loss (e.g. clay) through soil erosion for maintaining soil C and N storages and sustainable production of coffee and crops.

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ТУМПАНГСАРИ-ГУНУНГ АРДЖУНА-ЛАЛИДЖИВО ШЫҒЫС ЯВА, ИНДОНЕЗИЯ ОРМАН ҚОРЫҒЫНДАҒЫ АГРООРМАН ТАБЫСТЫЛЫҒЫ

Андатпа. Тумпангсари немесе агроорман шаруашылығы - бұл ағаштар бір жерде азық-түлік дақылдарымен немесе үй жануарларына арналған жайылыммен араласатын басқару жүйесін пайдаланатын жер. Бұл зерттеу тумпангсари жүйесінің әлеуметтік-экономикалық жағдайы тұрғысынан Индонезияның Шығыс Ява штатындағы Гунунг Арджуна-Лалидживо орман қорығында, атап айтқанда UB Forest аймағындағы жергілікті қауымдастыққа әсерін анықтауға бағытталған. Сонымен қатар, УБ орманынан тумпангсари агроорман шаруашылығы жүйесінен өндірілген өнімнің ақшалай құны бағаланды. Бастапқы деректер таңдалған 90 респондентке таратылған сауалнамадан, тереңдетілген сұхбаттардан және сайттағы бақылаулардан тұрады. Қосымша деректер журналдар,

мақалалар және мемлекеттік ресми құжаттар арқылы әдебиеттерді шолу арқылы жиналды. Жиналған деректер Хи-квадрат тесті және SPSS көмегімен талданды. Бұл зерттеу респонденттердің жартысынан көбі тумпангсари агроорман шаруашылығымен айналысатыны анықталды (73,3%). Ең жоғары табыс Дусун Сумберсари мен Сумбервангиде кофе мен көкөністерді тумпангсари әдісімен өсірген респонденттерден 1000-1200,00 RM (3,33M-4,00M) немесе 27,7% құрайды, бұл УБ орманындағы жергілікті қауымдастықтың жоғары тәуелді екенін көрсетеді. Тумпангсариге байланысты қызмет бойынша олардың негізгі кірісі.

Негізгі сөздер: агроорман қауымдастығы, әлеуметтік-экономикалық, тумпангсари, табыстылық, ақшалай құн.

ДОХОДНОСТЬ АГРОЛЕСОВОДСТВА В ЛЕСНОМ ЗАПОВЕДНИКЕ ТУМПАНГСАРИ-ГУНУНГ АРДЖУНА-ЛАЛИДЖИВО, ВОСТОЧНАЯ ЯВА, ИНДОНЕЗИЯ

Аннотация. Тумпангсари или агролесоводство - это земля, на которой используется система управления, при которой деревья смешиваются на одной земле с продовольственными культурами или пастбищами для домашних животных. Это исследование было направлено на определение воздействия системы тампангсари на местное сообщество в лесном заповеднике Гунунг Арджуна-Лалидживо, Восточная Ява, Индонезия, в частности, на лес UB, с точки зрения социально-экономического статуса. Кроме того, была оценена денежная стоимость продуктов, произведенных в системе агролесоводства тампангсари из леса УБ. Первичные данные состоят из анкеты, распространенной среди 90 выбранных респондентов, глубинных интервью и наблюдений на местах. Вторичные данные были собраны путем обзора литературы в журналах, статьях и официальных государственных документах. Собранные данные были проанализированы с помощью теста хи-квадрат и SPSS. Это исследование показало, что более половины респондентов занимались агролесоводством тампангсари (73,3%). Самый высокий доход получают респонденты, выращивающие кофе и овощи методом тумпангсари в Дусун Самберсари и Сумберванги, в размере от 1000 до 1200 ринггитов (от 3,33 до 4,00 млн рупий), или 27,7%, что показывает, что местное сообщество в UB Forest сильно зависит на деятельность, связанную с тампангсари, в качестве основного дохода.

Ключевые слова: агролесоводческое сообщество, социально-экономический, тампангсари, доходность, денежное выражение.

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