

A STUDY ON AGROFORESTRY ACTIVITIES IN TANA TORAJA, INDONESIA

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ABSTRACT

The basic human needs of food, shelter and fuel are often supplied by separate systems of land management. Building material and fuelwood are harvested from forests and food is produced from fields of herbaceous crops, fruit orchards and livestock grazing in pastures. Agroforestry is a land use management system in which trees are mixed in the same land with food crops or pasture for domestic animals. This study was conducted to examine the agroforestry activities and to examine monetary values of goods collected by selected village communities in Tana Toraja, South Sulawesi, Indonesia. The local government seat of Tana Toraja is in Makale, which comprises 47 sub-districts with 112 villages adjacent to Toraja Utara District and West Sulawesi Province in the north, Enrekang and Pinrang District in the south, Luwu District in the east, and West Sulawesi Province in the west. Monetary value of various agriculture and non-timber forest products (NTFPs) collected from the forest and the product cultivated and harvested from forestlands have been evaluated. Primary and secondary data were collected. Primary data consists of in-depth interviews, questionnaires distributed to selected 250 respondents, and site observations. Secondary data was collected through literature review through journals, articles and official government documents. Data collection was analyzed using Chi square test and SPSS. The multiple regression analysis was applied to develop agroforestry dependency model for the selected villages. This study revealed that more than half of the respondents were involved in agricultural and forest related activities, which is eighty-one percent. The highest income range is RM 901.00- RM1,200.00 (Rp 3,0M – Rp 4,0M). The Tana Toraja community heavily depends on agricultural and agroforestry related activities as their major source of income.

Key terms: agroforestry, community, agriculture land

INTRODUCTION

Background Information

The basic human needs of food, shelter and fuel are often supplied by separate systems of land management. Building material and fuelwood are harvested from forests and food is produced from fields of herbaceous crops, fruit orchards and livestock grazing in pastures. Agroforestry is a land use management system in which trees are grown in the same land as food crops or pasture for domestic animals. Woody perennial-based with mixed species production systems or agroforestry has the potential to prevent land from degradation and site productivity will basically

improve through interactions with all surrounding trees, soil, agricultural crops, and livestock in that area, and it will restore a part of the land that has been degraded. Agroforestry also has the potential to improve rural livelihood and enhance integrated management of the natural resource base. In general, agroforestry uses land that include both agricultural production and forests/trees on the same piece of land, which involves a mixture of woody perennials or trees in crop or breed animal production fields to benefit from the ecological and also economic interaction (Nair, 1993a). The aim of agroforestry science and practices is to produce and maximize positive interaction between trees and crops.

Fig. 1 shows the emergence of the concept of agroforestry in response to the special needs and conditions of tropical developing countries. There are a few major factors that need to be considered in developing these land management systems namely; (i) subsistence farming, degraded soil, low capital, efficient utilization of labor, fuel wood and small timber. Agroforestry is defined by Nair (1993a) as land-use that involves deliberate combination of trees and/or shrubs with crops and/or animals to benefit from resultant ecological and economy interaction. Agroforestry 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 an agroforestry system; (i) trees, (woody Perennial); (ii) herbs, (agricultural crops including pasture aspects); and (iii) animals.

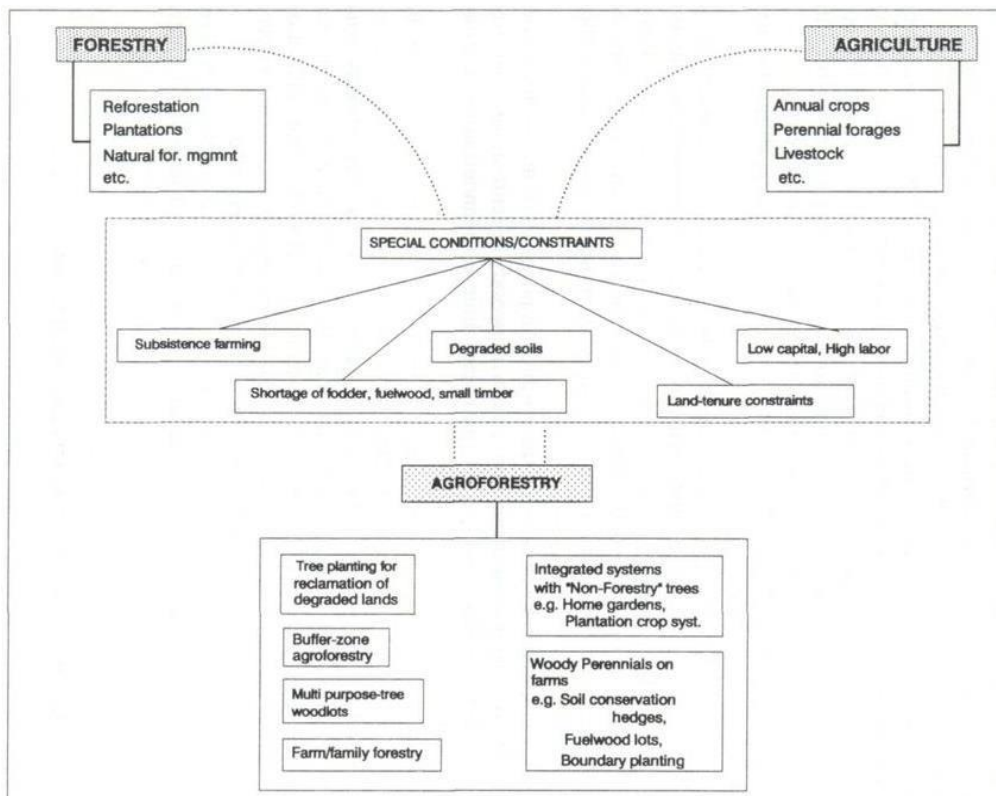


Figure 1: The concept of agroforestry through an interface between agriculture and forestry (Source: Nair, 1993a)

Components of Agroforestry

Agroforestry system may be classified into four categories which is based on their structure and functions (Nair, 1993a) as shown in table 1; (i) agrisilvicultural systems, which 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, fuel wood production and integrated multi-storey mixtures of plantation crops; (ii) silvopastoral system, which includes protein banks which are multipurpose fodder trees in/or around farmland live fences on fodder edges, shrub trees and shrub on pastures as well as integrated production of animal and wood; (iii) agrosilvopastoral systems, which includes home garden practice with breed animals, multipurpose woody hedgerows and integrated production of all crops, animals and wood; (iv) others, including multipurpose woodlots, apiculture with trees, and aquaculture in mangrove areas.

CATEGORIZATION OF SYSTEMS Based on their structure and function		GROUPING OF SYSTEMS According to their spread and management		
STRUCTURE Nature and arrangement of components especially woody ones		FUNCTION Role and/or output of components, especially woody ones	AGRO-ECOLOGICAL/ ENVIRONMENTAL	SOCIO-ECONOMIC AND MANAGEMENT LEVEL
Nature of components	Arrangement of components			
Agrisilviculture (crops and trees incl. shrubs/trees and trees)	<u>In Space</u> (Spatial) Mixed dense (e.g.: Home garden)	<u>Productive Function</u> Food	Systems in/for Lowland humid tropics	<u>Based on level of technology input</u>
Silvipastoral (pasture/animals and trees)	Mixed sparse (e.g.: Most systems of trees in pastures)	Fodder	Highland humid tropics (above 1,200 m a.s.l.; e.g.: Andes, India, Malaysia)	Low input (Marginal)
Agrosilvopastoral (crops, pasture/ animals, and trees)	Strip (width of strip to be more than one tree)	Fuelwood	Lowland subhumid tropics (e.g.: savanna zone of Africa, Cerrado of South America)	Medium input
Others (multipurpose tree lots, apiculture with trees, aquaculture with trees, etc).	Boundary (trees on edges of plots/fields)	Other woods		High input
	<u>In time</u> (Temporal) Coincident Concomitant Overlapping Sequential (separate) Interpolated	Other products	Highland subhumid tropics (Tropical highlands) (e.g.: in Kenya, Ethiopia)	<u>Based on cost/benefit relations</u>
		<u>Protective Function</u> Windbreak Shelterbelt Soil conservation Moisture conservation Soil improvement		Commercial Intermediate Subsistence
		Shade (for crop, animal, and man)		

Table 1: Major approaches to classification of agroforestry systems and practices (Source: Nair, 1993a)

Study Site

Tana Toraja District, situated in South Sulawesi Province, consists of 20 districts and three municipalities with a total area of 45,764 km². One of the selected villages which has been chosen as a study site in Tana Toraja is Palipu' which is a southern Torajan village located in a broad valley at the foot of Kandora Mountain. The valley floor of Palipu' is dominated by rice fields on the borders of which are houses that stand under canopies of bamboo and coconut trees. The rocky soil at the foot of the mountain is covered by clumps of trees bearing marketable fruits. The majority of the population is involved in the cultivation of a variety of cash crops, such as coffee, cacao, vanilla and cloves. The other village which has been selected as a study site in Tana Toraja was Kondo' village which stretches out from the banks of the Rangri River toward the mountain ridge of the same name, Nonongan, Ke'te Kesu' and Ma'Kale village as shown in Fig 3.

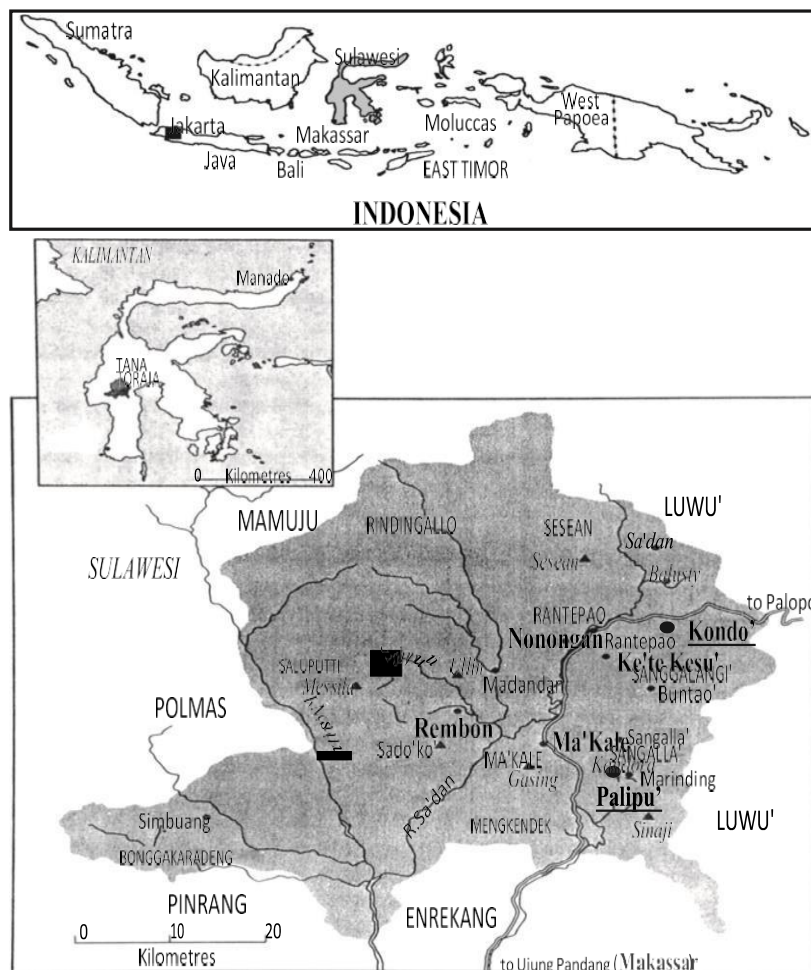


Figure 3: Indonesia, Sulawesi island, Makassar, Tana Toraja and the research villages of Palipu', Ma'kale, Rembon, Ke'te Kesu', Nonongan and Kondo'.
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METHODOLOGY

Primary data consists of questionnaires distributed to selected 250 respondents, in- depth interviews and site observations. Secondary data was collected through literature reviews through journals, articles and official government documents. Data collection was analyzed using Chi square test and SPSS. The multiple regression analysis was applied to develop agroforestry dependency model for the selected villages.

FINDINGS

This study revealed that more than half of the respondents are involved in agricultural and forest related activity which is eighty-one percent. The highest income range is RM 901.00- RM1,200.00 (Rp 3,0M – Rp 4,0M) which shows that the Tana Toraja community highly depends on agricultural and agroforestry related activities as their major income.

DISCUSSION

The study was conducted at Tana Toraja, South Sulawesi, Indonesia with 250 respondents from five villages at the study site. Tana Toraja has very fertile land supported by alternating air, rain and heat, causing everything that is planted in this regency to thrive and prosper. For perennials such as cloves, cacao, vahili, pepper, coffee and others. The types of food crops cultivated in Tana Toraja include rice, sweet potatoes, peanuts, corn, soybeans, and cassava, all of which use an area of 20,913 ha. Planted land area each year for rice plants 31,736 ha, corn 3,136.27 ha, peanuts 632.96 ha, soybeans 190.73 ha, cassava 2,108.9 ha and sweet potatoes 1,803, 46 ha.

There are also seasonal crops such as canned fruit and vegetables such as asparagus, tomatoes, garlic, ginger and others. Vegetables include cabbage, mustard greens, slada, beans, bloom cabbage, leek and others, as partners of seasonal plants also open farms and fisheries. The plantation sector in Tana Toraja is dominated by smallholder plantations whose production still utilizes traditional means whereas there are 14 private large plantations in Tana Toraja which utilizes an area of 6,968 ha and are spread in four sub-districts with coffee commodities (arabica and robusta) and those still in the development stage which are garlic, passion fruit, macadamia (*Macadamia integrifolia* L). vetiver (*vertiveria zizanioides*) and patchouli (*pongostemon cablin*).

The area of arable cultivation reached 20.302 ha with the cultivators numbering 61,517 inhabitants. As for production results achieved on average, arabica coffee is at 272 kg/ ha, vanilla 431 kg / ha, pepper 110 kg / ha, cocoa 540 kg / ha and cloves 120 kg / ha. The types of livestock are divided into 3 parts, namely: large livestock, small livestock (cattle, buffalo, pig, cattle, goat and horse) and poultry (chicken and duck). The type of poultry is to meet the community needs of meat and eggs; and also the by-products are for manure.

With forested areas of more than 57%, wet paddy system 9%, wetland (swampy area) more than 10%, and agriculture nearly 10%, the province is famous for being the first producer of paddy and other food crops including maize, cassava, sweet potato and peanut in the eastern part of Indonesia. Plantation crops common in

South Sulawesi are cacao, coconut, clove and coffee. These crops are mainly managed on small holdings rather than large-scale.

From survey and interviews, the village community is involved in five major works which are forest product collectors, logging sector, farmers, working in government sector and working in private sector.

The forest product that has been collected are used in two ways, which are for their own consumption and for sale to middlemen. Plant species collected are *Labisia pumila* and *Euricoma longifolia* for medicinal value, which is especially good for post-natal treatment. Meanwhile, *Aquilaria malaccensis* (karas) is collected for the sale of scented oil. Through in-depth interviews with some of respondents, they claimed that the grade A of Karas can be sold for up to RM 1,000.00 (Rp 3.3M) per kilogram. Other than that, collectors at Gua Musang most likely collected *Bambusa* sp. and *Calamus* sp. for their handicraft value. They use all the different parts of the plant for, example the roots, bark, leaves and shoot from which they make baskets, pouches and mats. Meanwhile, other species such as *Musa acuminata*, *Manihot esculenta*, *Piper betle* L. and *Parkia sepiciosa* are collected either for sale and or for their own consumption.

In the logging sector, there are three types of work that the village community is involved in, such as lorry driver, bulldozer driver and chainsaw worker. Respondents claimed that compared to other occupations, they are more satisfied working in the logging sector because the income is more lucrative.

CONCLUSION

This study revealed that more than half of the respondents are involved in agricultural and forest related activities which is eighty-one percent. The highest income range is RM 901.00- RM1,200.00 (Rp 3,0M – Rp 4,0M). The Tana Toraja community heavily depends on agricultural and agroforestry related activities as their major source of income.

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REFERENCES

- Awang, G. (1991). Socio-Economic Study of Forest Workers. Research Report. Selangor: Universiti Pertanian Malaysia.
- Bartlett, M.S. (1954). A Note on the Multiplying Factors for Various Chi Square Approximations. *Journal of the Royal Statistical Society*, 16 (series B), (pp 296-298).
- Benneth, E. (1992). Sustainable Utilisation Forest Product. Issue and Prospect. Cambridge: Harvard University.
- Bugayong, L.A. and Carandang, W.M., (2003). Agroforestry Practices a Community Based Forest Management Site. X11 World Forest Congress, 2003, Quebec City, Canada.
- Coakes, S.J. and Steel, L.G. (2004). SPSS Version 12.0 for Windows: Analysis without Anguish. John Wiley & Sons Australia, Ltd.
- Colfer, C.J.P. and Dudley, R.J. (1992). Shifting Cultivators in Indonesia, FAO, Rome.
- Dudung, D. (1992). Economic rent from forest utilisation. Paper presented at the Seminar on Economic Rent, Jakarta, 6–7 October 1992, Forestry Department/APHI, Jakarta.
- FAO (1990). Situation and Outlook of the Forestry Sector in Indonesia, Vol. 2. Forest Resource Base, Ministry of Forestry/FAO, Jakarta.
- George, D. and Mallery, P. (2001). SPSS for Windows Step by Step: A Simple Guide and Reference, 10.0 update. 3rd edition. P 217.
- Hall, J.C. (1993). Managing the Tropical Rainforests: Swiddens, Housegardens and Trade in Central Kalimantan, Oxford Brookes University, Oxford.
- Hugo, G.J., Hull, T.H., Hull, V.J. and Jones, G.W. (1987). The Demographic Dimension in Indonesian Development. East Asian Social Science Monograph, Oxford University Press: Singapore.
- LATIN (1994). Sustainable Production of the Diversity of Medicinal Drugs from Indonesia's Tropical Forest, Forestry Faculty, IPB and Lembaga Alam Tropika Indonesia (LATIN), Bogor.
- Lee, G. (1993). Forest and Man: An Ecological Appraisal. Kuala Lumpur: University of Malaya.
- Nair, P.K.R. (1993). An Introduction to Agroforestry, Kluwer, Netherlands.
- Ramli, R. and Mubarrig, A. (1993). Forest Utilisation Economic Rent in Indonesia, WAHLI, Jakarta.
- Repetto, R. and Gillis, M. (1988). Public Policies and the Misuse of Forest Resources, Cambridge University Press, Cambridge.
- Silitonga, T. (1994). Non-wood Forest Products of Indonesia, In: P.B. Durst, W. Ulrich and M. Kashio (eds.), Non-wood Forest Products in Asia, FAO, Bangkok.
- Sutter, H. (1989). Forest Resources and Land-use in Indonesia, Ministry of Forestry/FAO, Jakarta.
- Tuanakotta, H. and Mustofa (1992). Wood Economic Rent for Commercial Logs; data for the year 1991, Association of Forest Concession Holders of Indonesia, Jakarta.
- Zomer RJ, Trabucco A, Coe R, Place F, van Noordwijk M, Xu JC. 2014. Trees on farms: an update and reanalysis of agroforestry's global extent and socio-ecological characteristics. Working Paper 179. Bogor, Indonesia: