Working Paper

Agroforestry and Forestry in Sulawesi series:

Livelihood strategies and land-use system dynamics in Southeast Sulawesi

Janudianto, Noviana Khususiyah, Isnurdiansyah, S Suyanto and James M Roshetko

World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

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Working paper no. 156

World Agroforestry Centre
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Correct citation:
Janudianto, Khususiyah N, Isnurdiansyah, Suyanto and Roshetko JM. 2012. *Agroforestry and Forestry in Sulawesi series: Livelihood strategies and land use system dynamics in Southeast Sulawesi.* Working paper 156. Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Regional Program. 53p. DOI: 10.5716/WP12055.PDF.

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Published by the World Agroforestry Centre
Southeast Asia Regional Program
PO Box 161, Bogor 16001
Indonesia

Tel: +62 251 8625415
Fax: +62 251 8625416
Email: icraf-indonesia@cgiar.org
Website: http://www.worldagroforestry.org/sea

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About the authors

Janudianto obtained a Bachelor's Degree in Agriculture, with a strong focus on soil science, from the Faculty of Agriculture, Bogor Agricultural University. He joined ICRAF's Southeast Asia Regional Office in 2005. He works closely on developing strategies concerning farmers and community livelihoods, management of traditional agroforestry systems-in particular improving rubber agroforestry systems-and agrobiodiversity assessments in Sumatra, Kalimantan and Sulawesi. Currently, he is an agroforestry management specialist at ICRAF's Southeast Asia Regional Office.

Noviana Khususiyah is a socioeconomic and livelihood specialist at ICRAF's Southeast Asia Regional Office. She has considerable professional experience in household surveys, participatory rural appraisals and rapid rural appraisals. Her main focus is on acquiring data related to the enhancement of community livelihoods, environmental and gender issues. She obtained a Master's Degree in Economics (Regional and Rural Development Planning, concentrating on Environmental Economics) from Bogor Agricultural University, Indonesia.

Isnurdiansyah gained his Bachelor's Degree in Agribusiness Economics from Bogor Agricultural University in 2010. He has been involved in several studies as a consultant in the field of socioeconomics. He worked at the Ministry of Agriculture from 2009 to 2011. He joined ICRAF in 2012 as a research assistant in the Economic and Policy Analysis Unit to support research on socioeconomics and livelihood development.

S Suyanto has a Ph.D. in Economics from Tokyo Metropolitan University, Japan. He is currently the Principal Scientist for Poverty, Environmental Services and Property Rights at ICRAF's Southeast Asia Regional Office, Bogor, Indonesia. Dr. Suyanto has more than 15 years' experience in natural resource management and institutional analysis. He has worked in ICRAF's Southeast Asian Regional Research Programme based in Indonesia since 1994, during which time he has developed a range of

skills in socioeconomics, natural resource economics, econometrics and institutional analysis. For the last 5 years, he has managed several research projects related to climate change and payments for ecosystem services. He is currently leading the Economic and Policy Analysis Unit at ICRAF's Indonesian office.

James M Roshetko is a Senior Integrated Natural Resource Management Scientist with The World Agroforestry Centre (ICRAF) and Winrock International. He is the Leader of ICRAF's Southeast Asia Trees and Market Unit with 33 years of experience, including 16 years in Indonesia and 27 years in South and Southeast Asia. Jim currently serves as the Senior Team Leader of the CIDA-funded Agroforestry and Forestry in Sulawesi: linking knowledge to action project. His research and development interests focus on smallholder tree-based systems as viable agricultural and natural resources management systems that contribute significantly to local economic objectives and global environmental goals.

Abstract

The project, Agroforestry and Forestry in Sulawesi: Linking Knowledge with Action (the 'AgFor Sulawesi Project') has been developed for implementation in 3 provinces of the island of Sulawesi, Indonesia (South Sulawesi, Southeast Sulawesi and Gorontalo) from 2011 until 2016 to enhance the agroforestry and forestry livelihood systems of rural communities in Sulawesi. This baseline survey was conducted to support the project. The main objectives of the survey were to study the general characteristics of community livelihoods in Southeast Sulawesi, local farming systems and current land-use systems based on community perspectives. Assessment of land-use dynamics, farming systems and livelihood strategies within 2 districts in Southeast Sulawesi is very important for developing the next phase of the project. Two unit analyses were used in the livelihood baseline study— community and household levels.

The group discussion results in the 4 village typologies showed that there were small differences in livelihood options within the villages, which mainly earned income from cacao cultivation. However, in terms of tree crops and farm management, differences were clear. In typology 1 (local villages), the main crops were cacao, paddy, patchouli and sago. Typology 2 (local and migrant villages) opted for cacao, maize and paddy rice, while typology 3 (long-established transmigrant villages) farmed cacao and pepper. Typology 4 (recent-established transmigrant villages) inhabited was different as charcoal, timber and fruits were preferred besides cacao. The farm management systems of immigrants from South Sulawesi were more intense than the indigenous population. The cacao system used by locals in typology 1 was not intense compared to those managed by immigrants from South Sulawesi in Typology 2. In all 4 villages, the cacao agroforestry area has increased tremendously during the last 40 years, accompanied by a significant decrease in forested area generally.

The household survey concluded that the average total income per year per household in typology 1 villages was lower than their counterparts from elsewhere. The daily per capita income of farmers in typology 1 villages was also lower than other farmers who were earning considerably more from other sources.

Keywords: AgFor Sulawesi Project, Southeast Sulawesi, land-use dynamics, livelihoods, income, local farmers, migrant farmers, cacao agroforestry

Acknowledgements

This study was conducted as part of the project 'Agroforestry and Forestry in Sulawesi: Linking Knowledge with Action' (the 'AgFor Sulawesi Project') implemented by the World Agroforestry Centre (ICRAF) and funded principally by the Canadian International Development Agency (CIDA).

The authors would like to thank Adriyanto Pratama, M Erik Kurniawan, Laode Ali Said, Heru T Maulana, Syamsidar and Rahma R Talui for their contributions in the household interviews and facilitating group discussions. Thanks go to Elok Mulyoutami, Endri Martini, Jusupta Tarigan and Anang Setiawan for fruitful discussion during field activities. The authors also highly appreciate the excellent support from the Kendari Team of the AgFor Sulawesi Project and heads of villages in Konawe and Kolaka districts. Most of all, thanks to all of the villagers and farmers in Southeast Sulawesi who participated in discussions, interviews and field observations.

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1. Introduction

The project 'Agroforestry and Forestry in Sulawesi: Linking Knowledge with Action' (the 'AgFor Sulawesi project') is being implemented in 3 provinces of the island of Sulawesi, Indonesia (South Sulawesi, Southeast Sulawesi and Gorontalo) from 2011 until 2016. The ultimate outcome is to improve the agroforestry and forestry livelihood systems of targeted rural communities (Roshetko et al 2012).

The primary challenge is the low diversity of rural livelihoods systems, their high dependence on exotic commodity crops and the concomitant exposure to risk (biological and market). Diverse agroforestry systems in well-managed landscapes with gradients of intensity from intensive rice fields to natural forest are widely seen as more robust and risk adverse and the project sets out to establish them in the 3 provinces. Furthermore, suboptimal watershed management is leading to increased soil erosion, sedimentation, landslides and floods. Secondly, analyses indicate that Sulawesi will experience substantial variation in current atmospheric conditions, further exacerbating watershed problems. Enhanced watershed management and adaptation strategies for local farmers are needed to safeguard livelihoods and protect the environment. Incentives that help the development of environmental service programmes also need to be created. Thirdly, marginalized people lack titles to their land and have little awareness of, or access to, channels for certification or clarification of land status. This exacerbates vulnerability and suppresses investment. Similarly, women's rights are often sidelined or ignored, indicating a special need for awareness raising and empowerment. Continued encroachment into forest areas is a major driver of deforestation and is symptomatic of the wider conflict between communities and the government. Fourthly, local governance capacity is weak. Decentralization coupled with democratization has caught many districts off guard. After 10 years, a great deal of local capacity has been built, but self-government is still understood more as entitlement rather than responsibility. Development efforts still lack the long-term vision necessary to achieve sustainability. Community participation in government land-use planning remains rare, as do relevant incentives and benefits for those communities (Roshetko et al 2012).

A baseline survey was conducted to support the project. It aimed to study livelihood characteristics, local farming systems and current land-use systems based on community perspectives. Assessment of land-use dynamics, farming systems and livelihood strategies in the selected districts is very important for developing the next phase of the project; it is also important for providing an overview on preferred strategies and their appropriateness under local conditions. Two unit analyses were used in the livelihood baseline study—community and household levels. This study presents community perspectives on land-use dynamics, farming systems, livelihood strategies and more detailed data on various aspects related to households in Southeast Sulawesi.

2. Methodology

2.1 Study objectives

The main objectives of the study were:

- To identify general characteristics of livelihoods, local farming systems and land-use systems based on community perspectives.
- To do likewise using household surveys.

2.2 Data collection and analysis

Focus group discussions (FGDs) were employed in each sample village in 2 districts of Southeast Sulawesi Province to acquire the data. The FGDs ran throughout the day with 8 farmers participating in each group on average. The participants comprised the village members who were most knowledgeable about local conditions. Topics for discussion revolved around village demographics, history, land-use systems, livelihood sources and land management practices.

Household-level information was collected from 30 households using random stratification from 6 sampled villages in Southeast Sulawesi (Table 1). Whenever possible, the husband and wife from each household were interviewed together. Details are elaborated in the following sections.

3. General overview of the site

3.1 Site characteristics and typologies

Southeast Sulawesi Province lies in the southeastern peninsula of Sulawesi and consists of several small islands including Buton and Muna, and islets including Wowoni and Kabaena. The mainland of Southeast Sulawesi covers approximately 38 140 km^2 and the small island area is estimated to encompass 114 876 km^2. Konawe, Kolaka and Bombana are the chief mainland districts and Kendari is the capital city. The AgFor Sulawesi Project is focusing on Konawe and Kolaka districts (Figure 1).

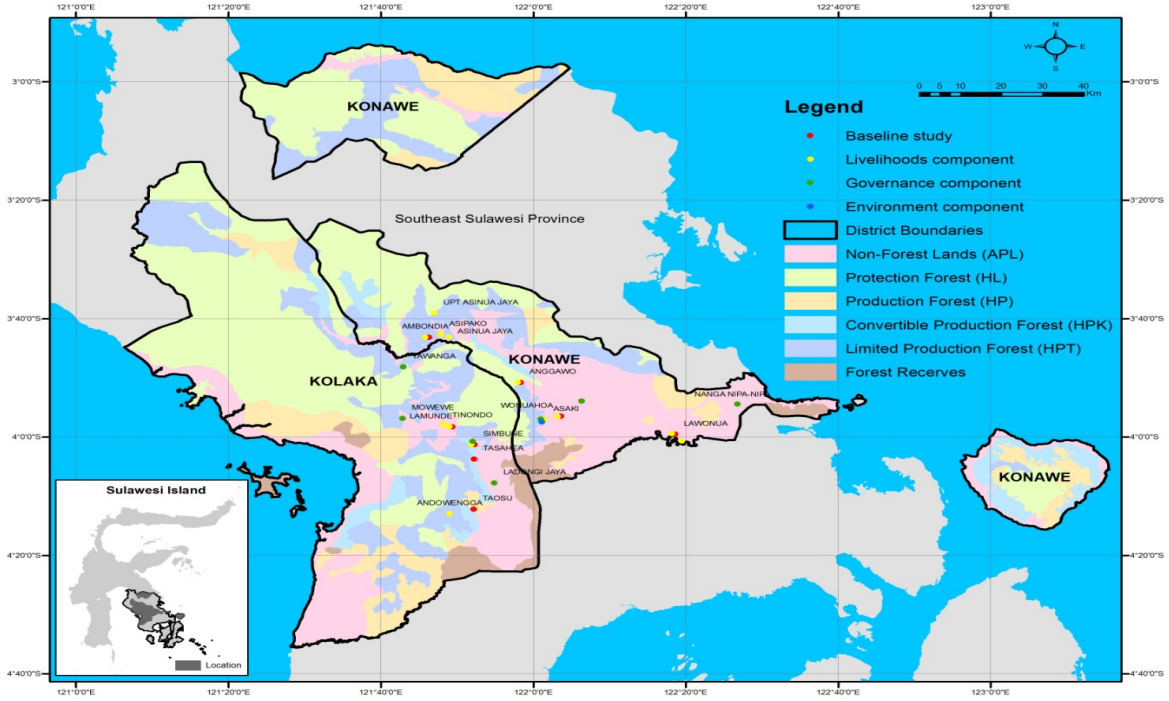

Figure 1. Study site in Southeast Sulawesi

In 2007, the agriculture sector of Southeast Sulawesi contributed to 38% of the region's economic growth (from cassava and maize crops and commodities such as cocoa, coffee, coconut, cloves, cashew nut, pepper and oil palm). Data from the same year showed that almost 240 000 tonnes of cassava were produced from the cultivated area of 15 000 ha and 97 037 tonnes of maize from 40 975 ha. Of the total cassava production, Konawe district contributed nearly 5%, while Kolaka contributed 3.3%. Buton produced the highest amount of cassava, with approximately 76 709 tonnes from 4795

ha. The highest maize producer in Southeast Sulawesi was Buton (13 990 tonnes), followed by Kolaka (6454 tonnes), Buton Utara (5863 tonnes), Kendari (3569 tonnes) and Konawe (3297 tonnes) (BPS Sulawesi Tenggara 2008).

Oil palm production in Southeast Sulawesi is concentrated in Kolaka, from an area covering approximately 21 033 ha with production of approximately 7220 tonnes. Cacao productivity in Southeast Sulawesi in 2010 was approximately 137 833 tonnes, with the largest area of cacao production in Kolaka (91 259 ha), and Kolaka Utara (82 206 ha). Other districts also produced cacao but from land of less than 10 000 ha. The highest production was in Kolaka Utara which produced 63 101 tonnes in 2009 and Kolaka which produced 29 297 tonnes in 2009. In 2010, pepper production in Southeast Sulawesi accounted for 5371 tonnes, from a total area of 11 775 ha, with approximately 99% being produced by smallholders. Konawe contributed 1317 tonnes (24.5%) from 3661 ha and Konawe contributed nearly 40% of the total production of Southeast Sulawesi.

The livelihoods of people in Southeast Sulawesi are closely related to history, demography and migration. People from different ethnic backgrounds, indigenous groups and immigrants pursue different livelihood strategies and sources. In order to define community typologies in this province, migration issues were considered, as shown in Table 1.

Table 1. Village typologies and details of FGDs and household surveys held in Southeast Sulawesi

Village typologies	Local villages	Local and migrant	(long-established) Transmigrant	(recent-established) Migrant	Total group/ household respondent
	1	2	3	4	
Districts	Konawe, Kolaka	Konawe	Kolaka	Konawe	
FGD and number of discussions	Ambondiaa, Lamunde, Simbune, Taosu, Wonua Hoa (5)	Anggawo, Lawonua (2)	Tasahea (1)	Lalobite, UPT Asinua Jaya (2)	10 discussions in 9 villages
Household interviews and sample number	Ambondiaa (30) Simbune (30) Wonua Hoa (30)	Lawonua (30)	Tasahea (30)	Lalobite (30)	180 households

3.2 Households status

3.2.1 House condition

The condition of farmers' houses can be used to estimate their welfare. House condition was assessed using 4 variables: type of house wall, roof, floor and lighting (Figures 2−5). The condition of houses in local villages (hereafter referred to as typology 1) was poorer than other farmers. The condition of the houses was relatively similar in local and migrant villages, transmigrant villages, and migrant villages (typologies 2, 3 and 4, respectively).

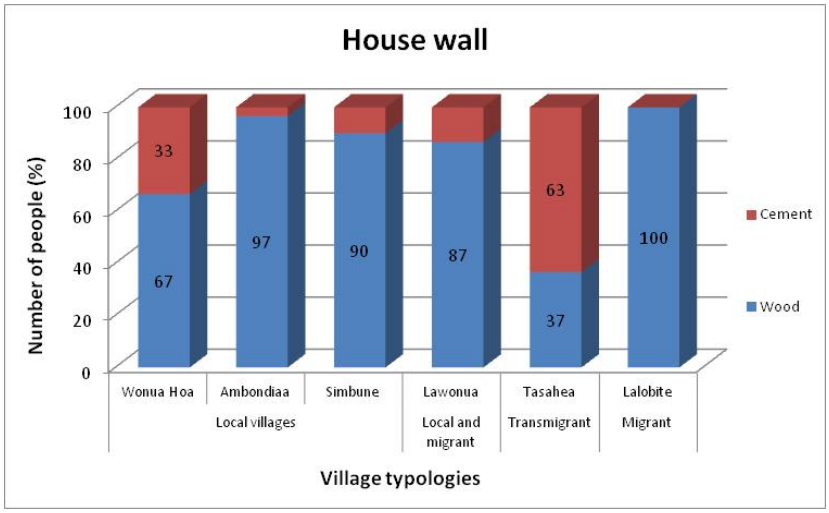

Figure 2. Constitution of house walls in Southeast Sulawesi

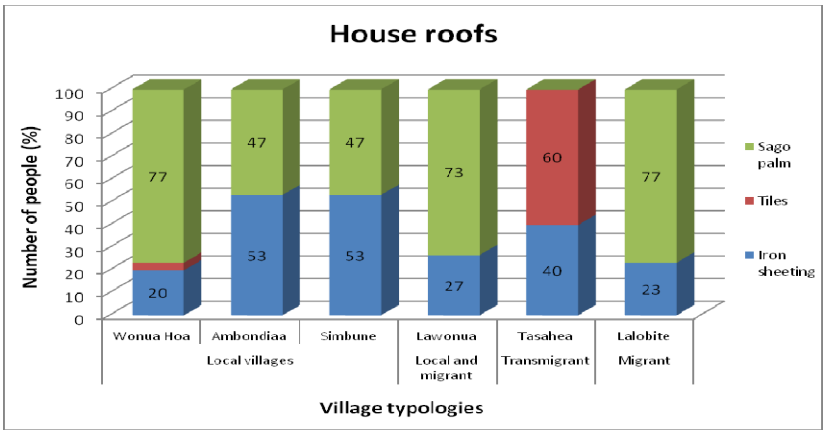

Figure 3. House roofing in Southeast Sulawesi

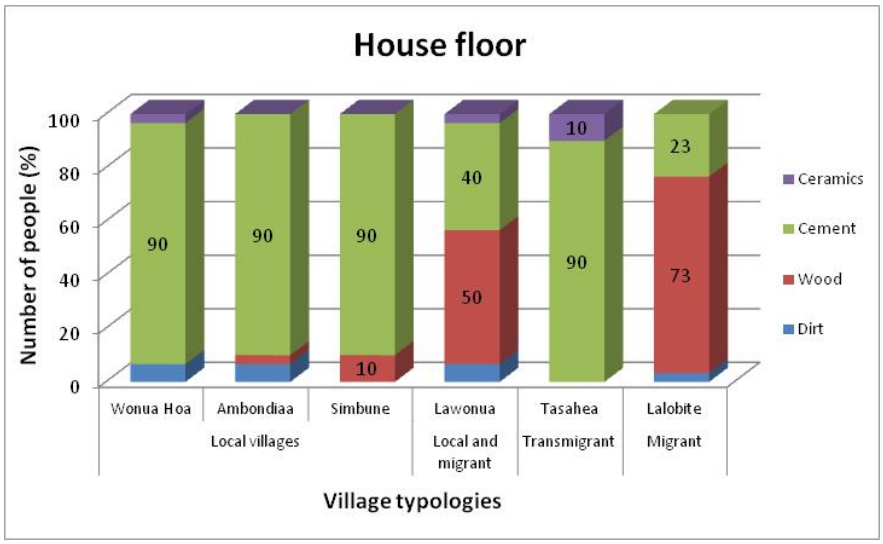

Figure 4. House flooring in Southeast Sulawesi

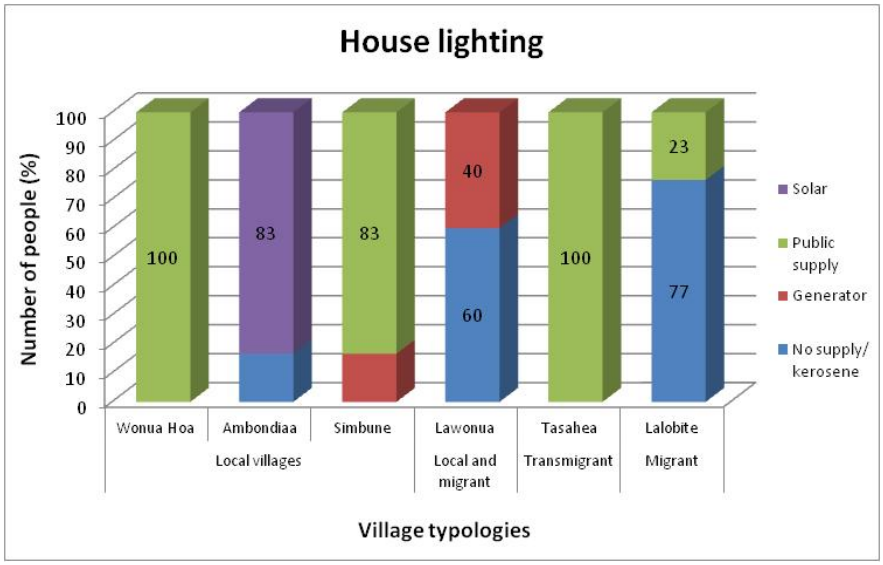

Figure 5. House lighting in Southeast Sulawesi

3.2.2 Education

The levels of education in typology 4 were the lowest compared with the other respondents. Education levels were relatively similar in the other typologies. The educational level of women was slightly lower than men. However, statistical analysis indicated there was no significant difference in

education levels between men and women in all villages (only male and female children in typology 4).

Most respondents in Southeast Sulawesi, including husbands and wives, had medium education levels (Table 2). The mean length of schooling in typology 1 was 8.2–9.1 years for men and 7.0–9.1 years for women. In typology 2, the average length of schooling was 6.4 years for men and 5.7 years for women. In typology 3 it was 4.8 and 4.5 years for men and women respectively. Typology 4 was higher—6.8 and 6.7 years for men and women respectively. The highest illiteracy rate was in typology 3 (14% for men and 17% for women). However, results from data analysis using the 't test' showed that there was no significant difference in educational levels between men and women.

Table 2. Distribution of years of schooling among married couples in Southeast Sulawesi

Village typologies	Village	n	Years of schooling										Mean years of schooling	t test
			Illiteracy		Primary school		Junior high school		Senior high school		Pass senior high school			
			n	%	n	%	n	%	n	%	n	%		
Local village (typology 1)	**Wonua Hoa**													
	Male	28	0	0	10	36	7	25	7	25	4	14	9.11	t stat = -0.025 (P>|t|= 0.584)
	Female	30	0	0	10	33	7	23	9	30	4	13	9.13	
	Ambondiaa													
	Male	29	1	3	11	38	8	28	6	21	3	10	8.24	t stat = 1.408 (P>|t|= 0.201)
	Female	28	1	4	16	57	8	29	2	7	1	4	6.96	
	Simbune													
	Male	28	0	0	12	43	9	32	7	25	0	0	8.25	t stat = 0.927 (P>|t|= 0.359)
	Female	28	0	0	15	54	11	39	1	4	1	4	7.68	
Local and migrant (typology 2)	**Lawonua**													
	Male	29	2	7	12	41	9	31	6	21	0	0	6.41	t stat = 0.723 (P>|t|=0.022)
	Female	28	4	14	14	50	9	32	1	4	0	0	5.71	
Long-established Transmigrant (typology 3)	**Tasahea**													
	Male	29	4	14	24	83	1	3	0	0	0	0	4.79	t stat = 0.496 (P>|t|= 1.000)
	Female	29	5	17	23	79	1	3	0	0	0	0	4.48	
Recent-established Migrant (typology 4)	**Lalobite**													
	Male	29	3	10	14	48	9	31	3	10	0	0	6.76	t stat = 0.018 (P>|t|= 0.191)
	Female	27	3	11	12	44	9	33	3	11	0	0	6.74	

The distribution of child population by years of schooling in Southeast Sulawesi was also calculated (Table 3). Results from data analysis using the t test, showed the only significant difference was in typology 4.

Table 3. Distribution of child population by years of schooling in Southeast Sulawesi

Village typologies	Village	n	Years of schooling (children)										Mean years of schooling	t test
			Illiteracy		Primary school		Junior high school		Senior high school		Pass senior high school			
			n	%	n	%	n	%	n	%	n	%		
Local village (typology 1)	Wonua Hoa													
	Male	25	0	0	14	56	4	16	6	24	1	4	6.76	t stat = -0.852 (P>|t|= 0.408)
	Female	27	0	0	11	41	5	19	10	37	1	4	7.67	
	Ambondiaa													
	Male	33	0	0	11	33	5	15	15	45	2	6	8.55	t stat = 0.801 (P>|t|= 0.779)
	Female	16	0	0	8	50	3	19	3	19	2	13	7.56	
	Simbune													
	Male	54	0	0	23	43	14	26	12	22	5	9	8.20	t stat = 0.709 (P>|t|= 0.136)
	Female	28	0	0	13	46	7	25	3	11	5	18	7.54	
Local and migrant (typology 2)	Lawonua													
	Male	35	0	0	16	46	7	20	12	34	0	0	6.97	t stat = -0.183 (P>|t|=0.309)
	Female	24	0	0	11	46	8	33	4	17	1	4	7.17	
Long-established Transmigrant (typology 3)	Tasahea													
	Male	30	0	0	5	17	8	27	14	47	3	10	10.03	t test = 0.081 (P>|t|= 0.080)
	Female	16	0	0	6	38	2	13	4	25	4	25	9.94	
Recent-established Migrant (typology 4)	Lalobite													
	Male	25	0	0	17	68	7	28	1	4	0	0	5.28	t test = -2.206 (P>|t|= 0.017)
	Female	13	0	0	6	46	3	23	0	0	4	31	8.15	

3.2.3 Household gender distribution

The number of male and female household members in the local villages was relatively similar in all typologies. In all villages, there were slightly more men than women, except in Wonua Hoa village (typology 1), where this was reversed (Figure 6).

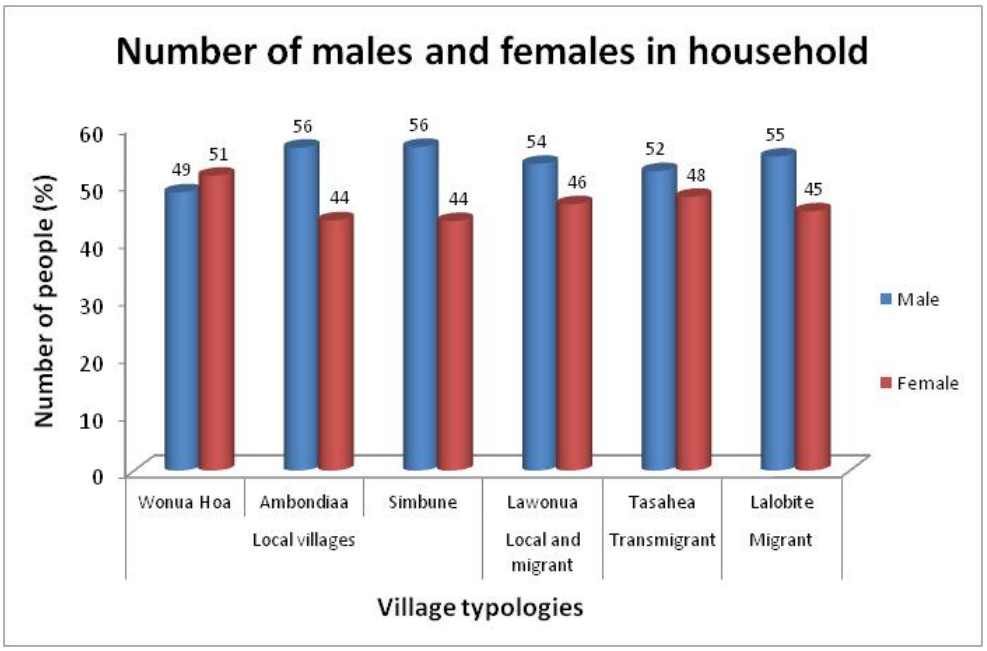

Figure 6. Number of men and women in households in Southeast Sulawesi

3.2.4 Ethnicity of household heads

Most household heads were Tolaki in typology 1, Tolaki and Bugis in typology 2, Balinese in typology 3 and Bugis in typology 4. Data on the ethnicity of household heads are summarized in Figure 7.

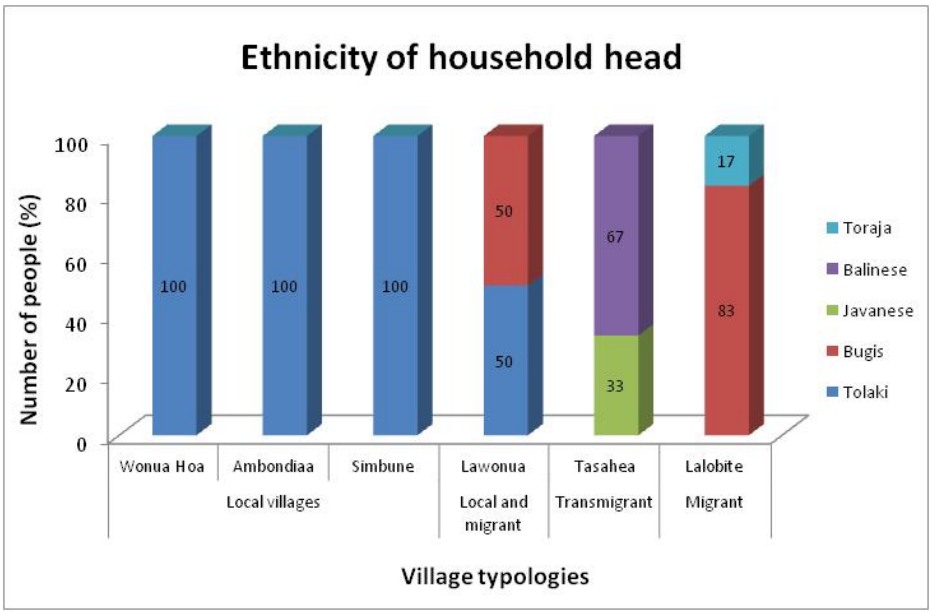

Figure 7. Ethnicity of household heads in Southeast Sulawesi

4. History of the villages and land-use dynamics in Southeast Sulawesi

This chapter discusses the general history of the villages and main land-use systems. Cacao agroforests predominated in most villages although paddy rice was an important crop in typology 1. Forest cover was also plentiful in most typologies except for Lawonua village. Although sago was an important crop for food security in typologies 1 and 2 it was not identified as a principal land-use system because it was only cultivated intermittently, for example on riverbanks.

4.1 Community perspectives on village history and land-use dynamics in Southeast Sulawesi

4.1.1 Typology 1 (local villages)

These villages (Ambondiaa, Lamunde, Simbune, Taosu and Wonua Hoa) were identified as 'local' villages in terms of dominant population and migrant influence. The indigenous Tolaki ethnic group predominated. In 5 villages in this typology a small influx of settlers from outside communities was noted.

Currently, forest cover is still high in these villages. 'Adat', a strong customary law for forest protection, plays an important role in rural livelihoods and is likely to continue to lead to substantial changes in the ways forests are managed; it ensures safeguarding and provision of multiple benefits from forest and inhibits encroachment. The social security component of community forest management may thus be significant (Arnold 2001).

Ambondiaa

Ambondiaa was established in the 1900s by the Tolaki people. Sago and swidden paddy were the main crops and staple food for the community (Figure 8). During the 1950s until the 1960s a separatist movement forced local people to move to Unaaha.

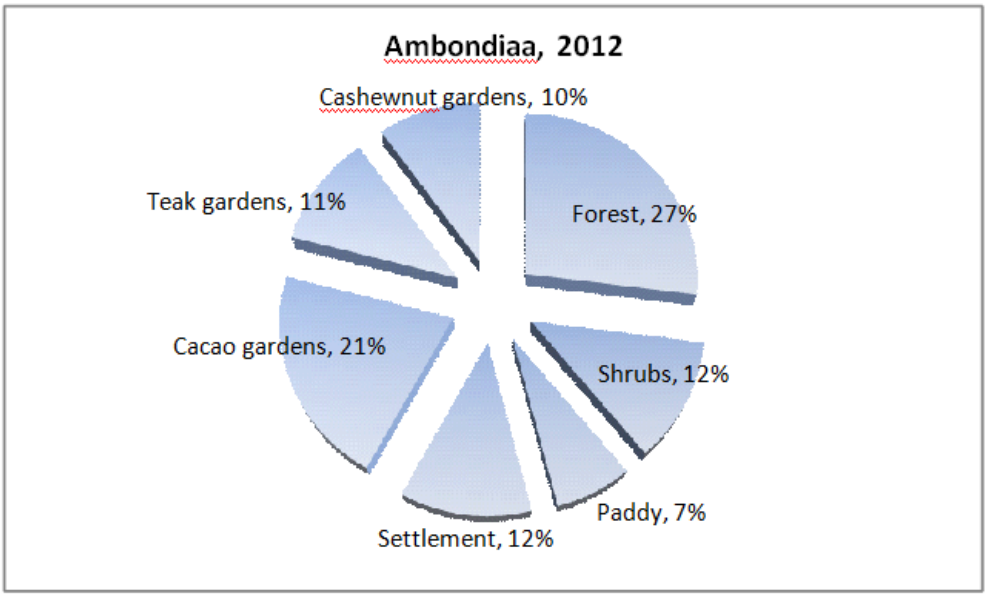

Figure 8. Current land use in Ambondiaa village based on community perspectives

In the 1980s, farmers started to plant cacao with seedlings from North Kolaka. Subsequently the number of cacao gardens started to increase. The government through the Plantation Agency also provided 1000 cacao seedlings per household in 2000. In 1997 Ambondiaa was used to prepare for the division of Asinua Jaya village. At that time farmers relied on cacao, sago processing and pepper to support their livelihoods. Currently, forest cover and smallholder cacao dominate the village area.

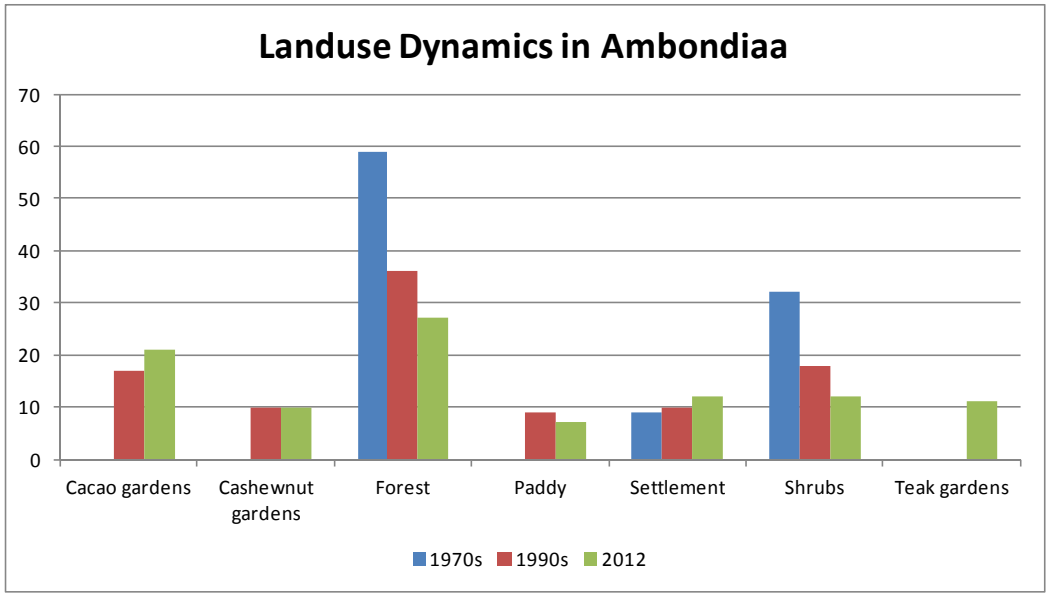

Figure 9. Land-use dynamics in Ambondiaa based on community perspectives

Lamunde

Lamunde was established before the 1940s by the Tolaki people who subsisted on shifting cultivation with paddy rice. In the 1970s and 1980s, a few migrants from South Sulawesi and Tana Toraja arrived who cultivated cacao and cloves. The Tolaki began to learn how use cattle for ploughing paddy fields. Local farmers stopped shifting cultivation and began to cultivate paddy rice and plant cacao.

In 1990 community livelihoods diversified into a mixture of paddy rice, pepper, cloves, rattan and honey. In this particular year the price of cloves reached IDR 7000 per kilogram.[1] More recently land use has been dominated by paddy rice, swampland conversion to paddy rice cultivation and cacao agroforests (as the major cash crop in Lamunde).

[1] US$ 1.00 = IDR 9608 (December 2012).

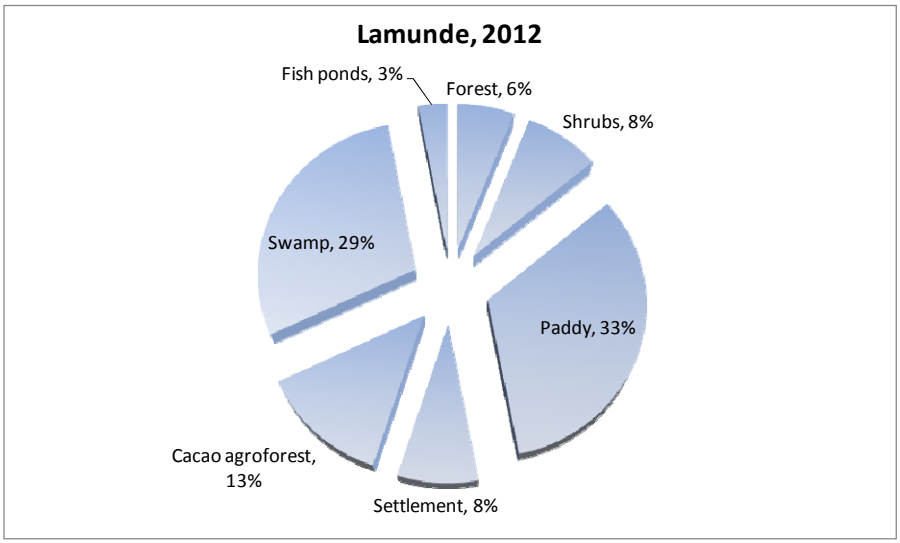

Figure 10. Current land use in Lamunde village based on community perspectives

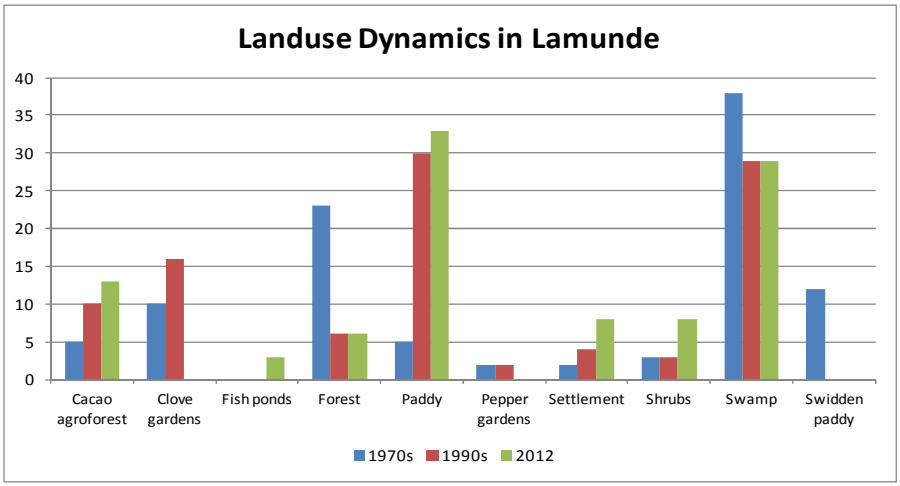

Figure 11. Land-use dynamics in Lamunde based on community perspectives

Simbune

Simbune was established in the 1930s by the Tolaki people who subsisted on shifting cultivation with paddy rice until the end of the 1950s. In the 1970s, they started to plant coffee and cloves; in 1993, the Organisation for Economic Co-operation and Development, the Japanese Government and PT Hasfarm provided F1 cacao seedlings in a joint support programme. The programme also supplied extension services and production support for farmers.

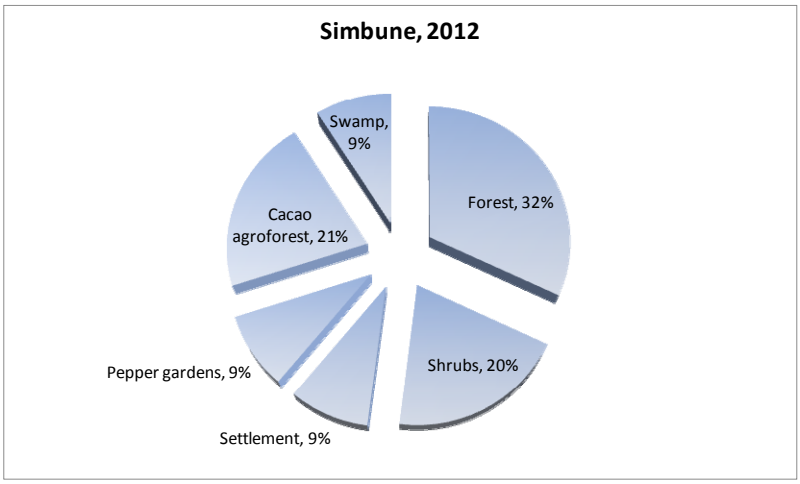

Figure 12. Current land use in Simbune village based on community perspectives

In 2009 the National Movement of Cacao Production and Quality Improvement (Gernas programme) focused on rejuvenating cacao cultivation through fertilizer application and side-grafting techniques. All village households participated in the Gernas programme which established 30 ha of cacao rejuvenation area, 19 ha with fertilizer application and 25 ha with side-grafting activities. This programme remains ongoing. Forest area still dominates land use in this village and cacao is the major plantation crop.

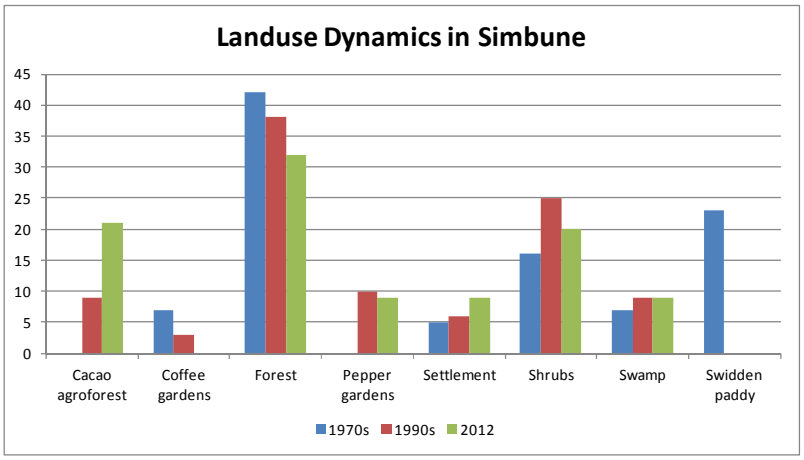

Figure 13. Land-use dynamics in Simbune based on community perspectives

Taosu

Taosu was established in the 1990s when Tolaki people from Aiure and Rate-rate settled in the area. They subsisted mainly on shifting cultivation using paddy rice, maize, coffee and coconut. In 1995,

many farmers began to plant cacao and at the same time, PT Ladongi and PT Hasfarm established 250 ha of nurseries in Poli Polia village to support the Gernas programme. Shifting cultivation with paddy rice ceased in 1995 when many people switched to cacao and pepper.

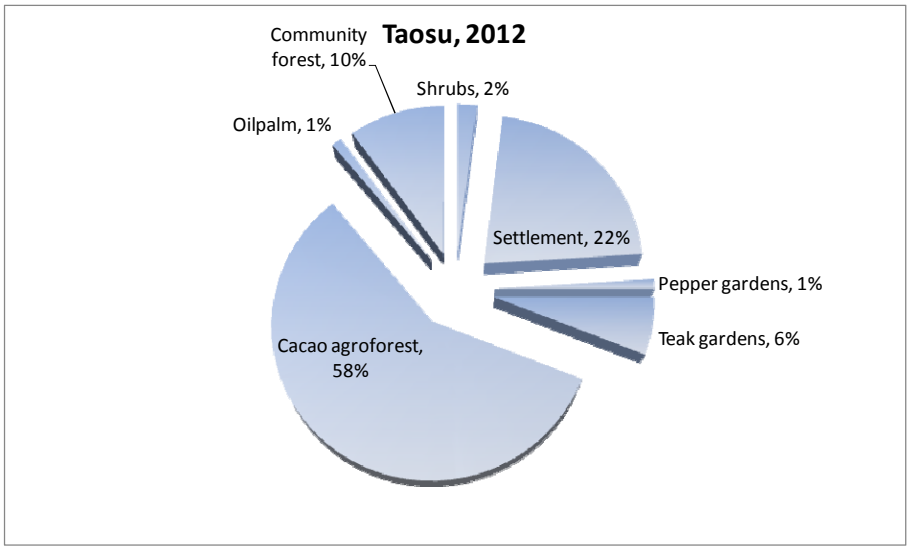

Figure 14. Current land use in Taosu village based on community perspectives

In 1999, villagers became involved in measuring the boundaries of community forest followed by nursery establishment of teak and sengon. In the 2000s, they participated in timber planting inside 1000 ha of community forest in 4 villages. Recently, patchouli has been integrated in cacao agroforests and teak gardens and is a popular introduction. However cacao agroforestry is the main land use in Taosu.

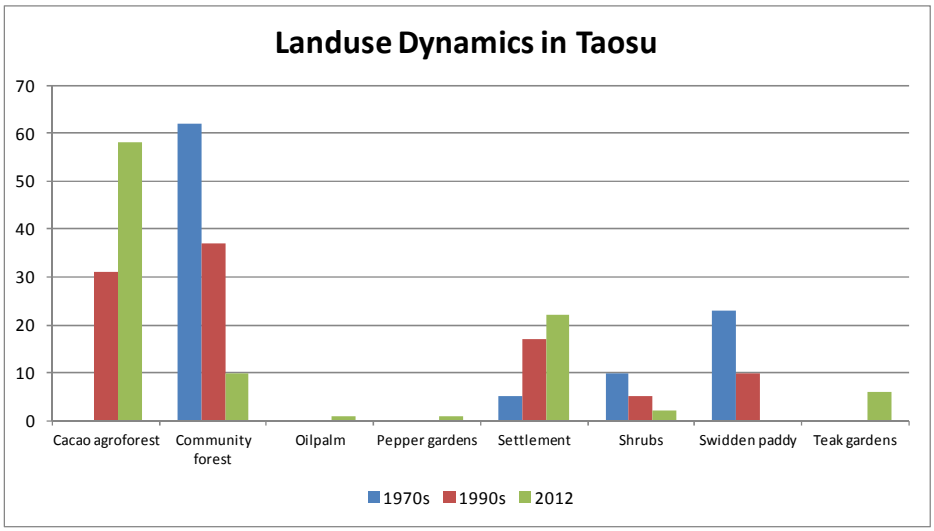

Figure 15. Land-use dynamics in Taosu based on community perspectives

Wonua Hoa

Tolaki communities who lived in this village before independence in 1945 relied on shifting cultivation, vegetables, coffee and sago. In 1968, they started to cultivate paddy fields, but to a limited extent. In the 1980s people began planting teak with seedlings purchased from the Forest Agency. Some villagers tried to plant cacao and cashew nuts. The number of swidden paddy fields diminished owing to conversion to rain-fed paddy rice.

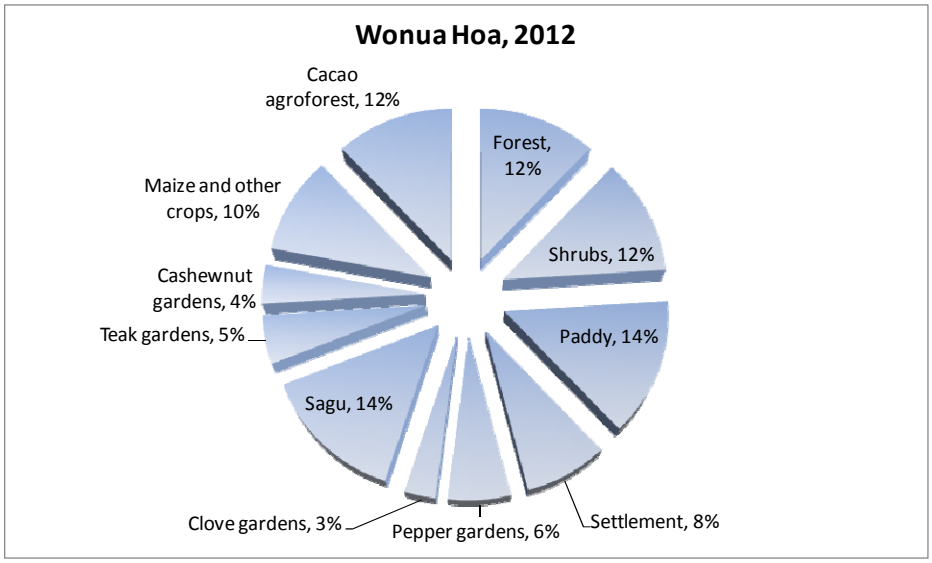

Figure 16. Current land use in Wonua Hoa village based on local community perspectives

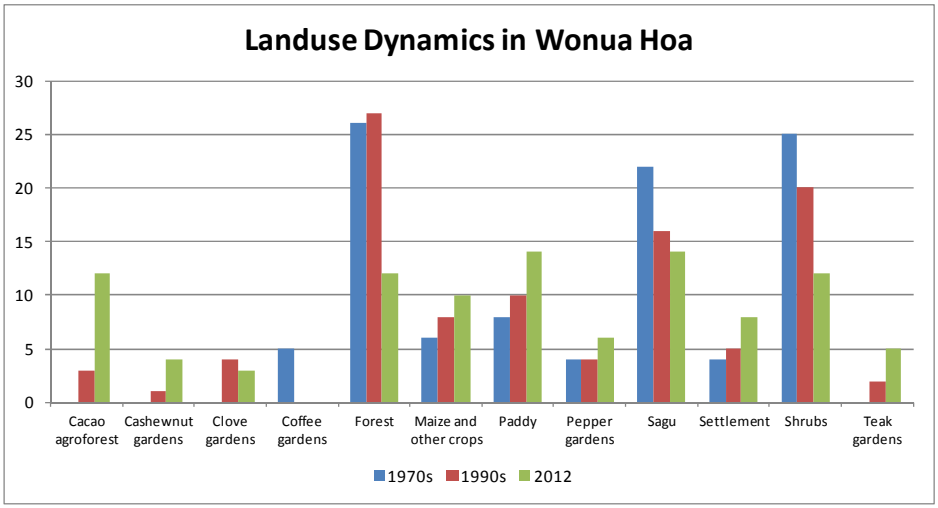

Figure 17. Land-use dynamics in Wonua Hoa based on community perspectives

Wonua Hoa village comprises 3 hamlets. In the 1990s many migrants from South Sulawesi began arriving, joining the local communities living in hamlets I and II. By the 2000s a growing number of migrants from South Sulawesi (34 families) had settled permanently in hamlet III namely Lalobite to farm cacao and pepper. Most local people in hamlets I and II were planting paddy rice, cacao, pepper and patchouli in mixed systems. In 2010 the Agriculture Agency of Southeast Sulawesi provided training on side-grafting. The National Forest Rehabilitation Movement (Gerhan programme) also provided 45 000 teak seedlings and 10 000 sengon seedlings.

4.1.2 Typology 2 (local and migrant villages)

This typology comprised indigenous Tolaki villagers and migrants (mostly Bugis and some Javanese).

Anggawo

Anggawo was founded during the Dutch era (before 1945). The indigenous Tolaki practised shifting cultivation using paddy rice, coconut, maize and sago. The villagers became familiar with teak cultivation after 1955. In the 1990s community interest was sparked in planting cacao and villagers started to obtain cacao seedlings from Kolaka.

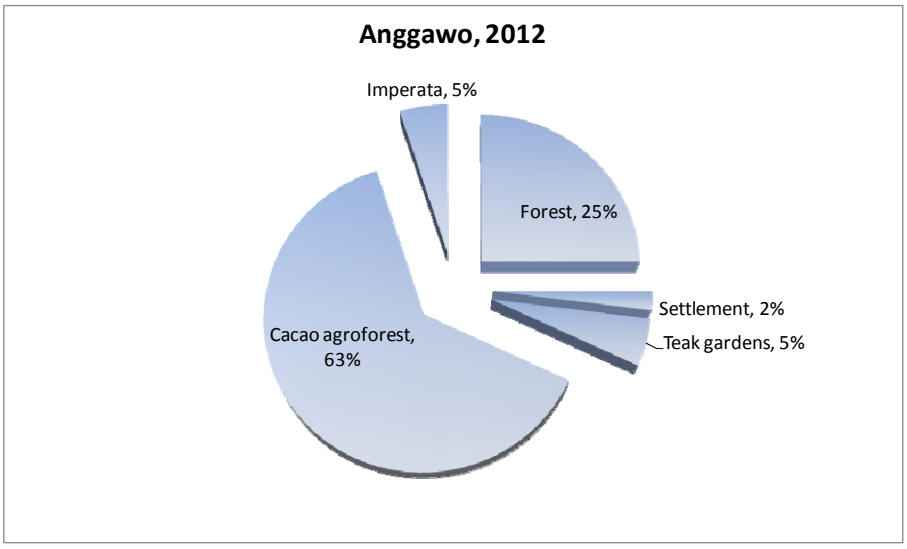

Figure 18. Current land use in Anggawo village based on community perspectives

In the 2000s cacao seedlings were supplied via government support projects. Local people who had 0.5 ha of land received fertilizer, herbicides ('Tamaris') and 1000 cacao seeds or 450 cacao seedlings. In the same year, extensionists advised plant spacing of 3 x 3 m. Also in that year Javanese and Bugis migrants arrived from Java Island and South Sulawesi to settle and plant cacao in this village. Currently, cacao agroforest and forest cover predominate. Cacao was intercropped with pepper, citrus, durian, pineapple, grass ('rumput gajah' or *Pennisetum purpureum*) and maize.

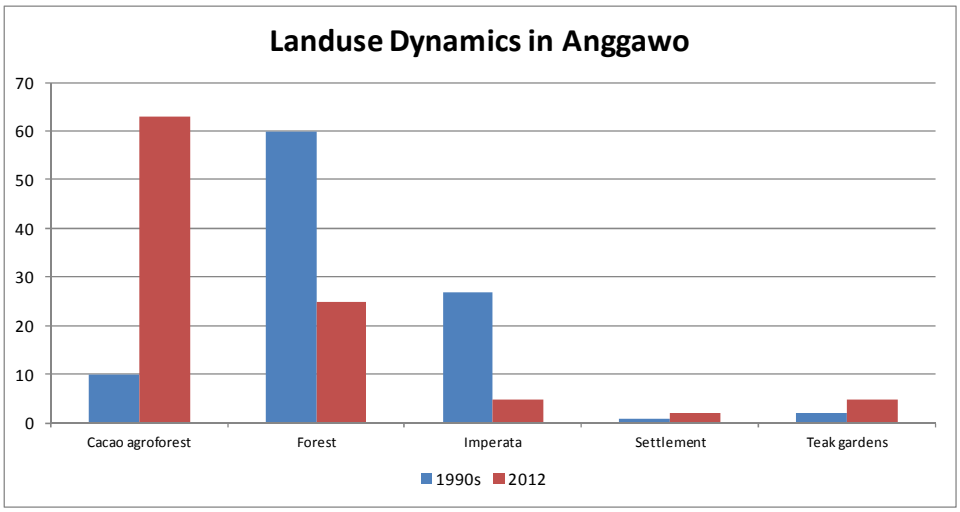

Figure 19. Land-use dynamics in Anggawo based on community perspectives

Lawonua

This village sprang up in the 1930s, when people were still living on the banks of the Konawe-Eha River and planting maize and crops to fulfil their daily needs. The first households were of Tolaki origin from Amosilu village; later Bugis migrants arrived from Bone who took local partners. The community gradually cleared forest for shifting cultivation with paddy rice, local coffee, sago, coconut and maize.

In 1959 the Konawe-Eha River broke its banks after heavy rainfall with disastrous impacts on most riparian villages. In 1978 the government somewhat belatedly offered disaster assistance for those affected, including a house of 4 x 6 m in flood-free areas and the cost of living needs and equipment for one year.

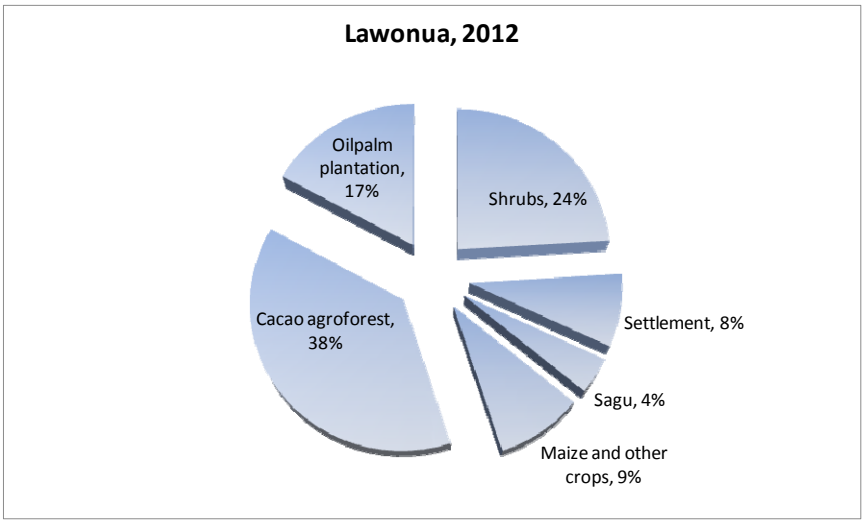

Figure 20. Current land use in Anggawo village based on community perspectives

In the early 1980s people were unacquainted with cacao but in 1987 they started to plant cacao with seedlings from South Sumatra provided by the government. In the 1990s, many migrants from Sinjai, Sopeng, Bulukumba, as well as people from other villages around Lawonua came and settled in this village. Another group of migrants from South Sulawesi (Wajo, Sopeng and Sinjai) also arrived and planted cacao in 1997. From 1999 to 2000, villagers were provided with as many as 1200 cacao seedlings per hectare, as well as rambutan and durian seedlings, fertilizers, agricultural equipment and herbicides/pesticides through the Southern Regional Agricultural Development Project (SRADP). The

Plantation Agency also supported a farmers' field school in 2004; the main topics were pest management and how to increase production. Thirty people participated in the programme for 6 months, twice a week.

In 2009, again around 100 households (50 stems each) received teak seedlings as well as breadfruit, durian, rambutan, citrus and clove inputs. Currently, most people plant cacao, pepper, rambutan, durian and teak. A palm oil company, PT Agrindo Utama Mas, has begun to establish 1000 ha of oil palm in the village.

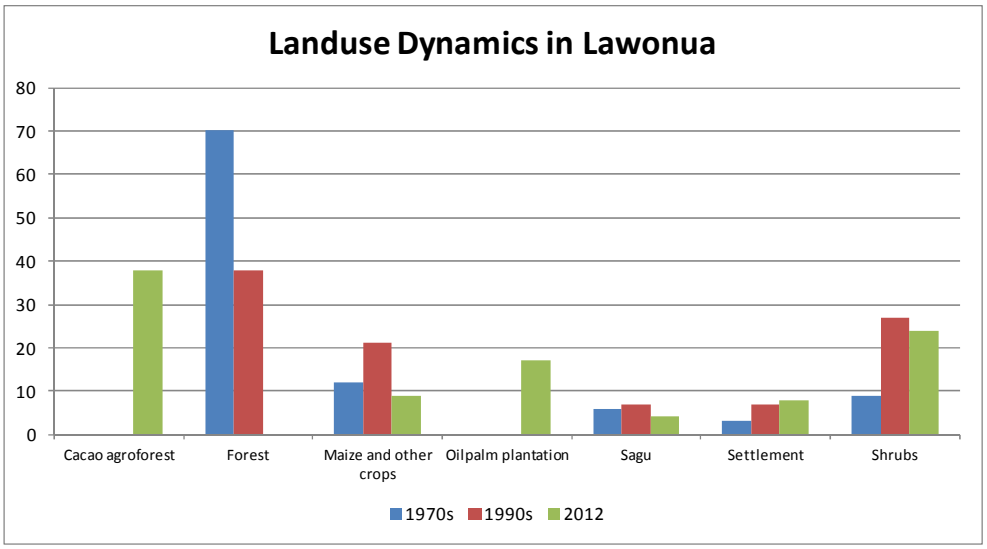

Figure 21. Land-use dynamics in Lawonua based on community perspectives

4.1.3 Typology 3 (long-established transmigrant villages)

This village typology comprised transmigrants mostly from Bali and Java islands. They came during the transmigrant boom periods in the 1970s.

Tasahea

In 1940, the people who already lived around Tasahea depended on shifting cultivation for a living. The population in the area was sparse until the 1960s. In the 1970s, transmigrants from Bali and Java

began to occupy transmigrant sites in Ladongi I and Ladongi II. Some of them settled around Tasahea, using shifting cultivation to meet their needs and foraged for 'wikoro' or wild sweet potato for food.

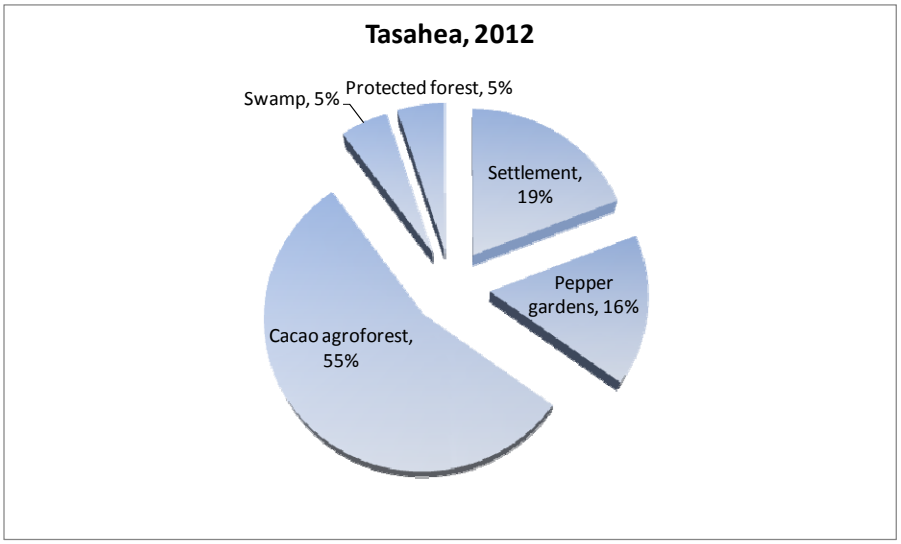

Figure 22. Current land use in Tasahea village based on community perspectives

From 1970 to 1975, people living along the main road started to plant cloves. At that time, Tasahea, Tababu, Benggi and Megaloma were still subvillages consisting of 20 households. They cultivated sago and swidden paddy. In 1986, the government supplied each household with 200 cacao seedlings. By the 2000s, many people had planted cacao with seedlings from North Kolaka.

This continued up to 2008 when people became interested in pepper; but unfortunately, much of the pepper crop died due to fungal disease. At the same time, smallholder cacao was attacked by cacao pod borers. Currently, cacao agroforest predominates in the village, followed by black pod disease (*Phytophthora palmivora*) and pepper gardens.

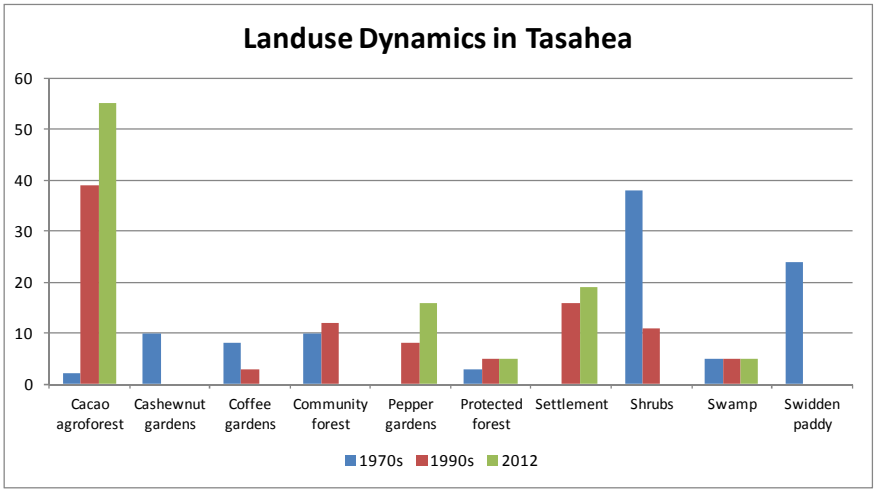

Figure 23. Land-use dynamics in Tasahea based on community perspectives

4.1.4 Typology 4 (recent-established transmigrant villages)

This village typology comprised migrants from South Sulawesi and transmigrants from Nusa Tenggara Timur and Java who live together with local Tolaki people.

Lalobite

Lalobite is part of Wonua Hoa village which was established more than 10 years ago by migrants from Bugis. Lalobite is one of *dusun* (subvillage/hamlet) of Wonua Hoa. In 1998, Lalobite remained forested but after 2004 land acquisition was carried out for smallholder farmers. Currently, land use in Lalobite is dominated by forests, cacao agroforests, shrubs and clove gardens; while general land use in Wonua Hoa is characterized by paddy rice, sago and cacao agroforests.

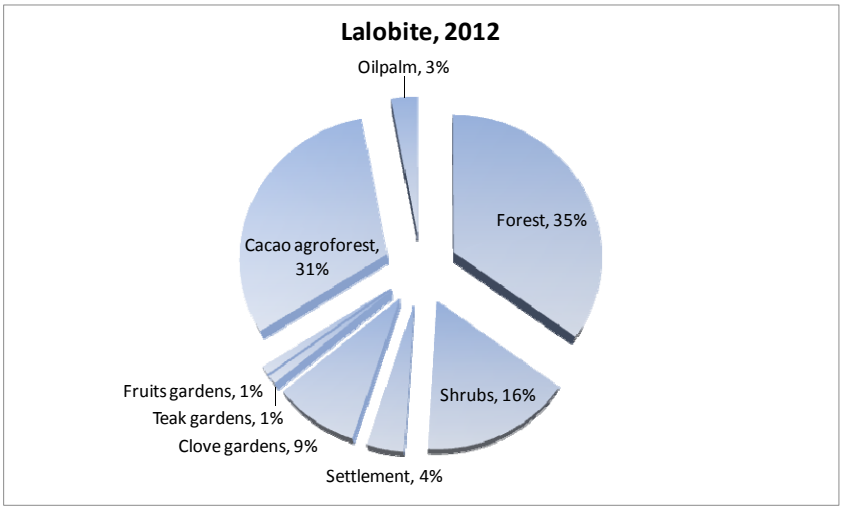

Figure 24. Current land use in Lalobite based on migrant community perspectives

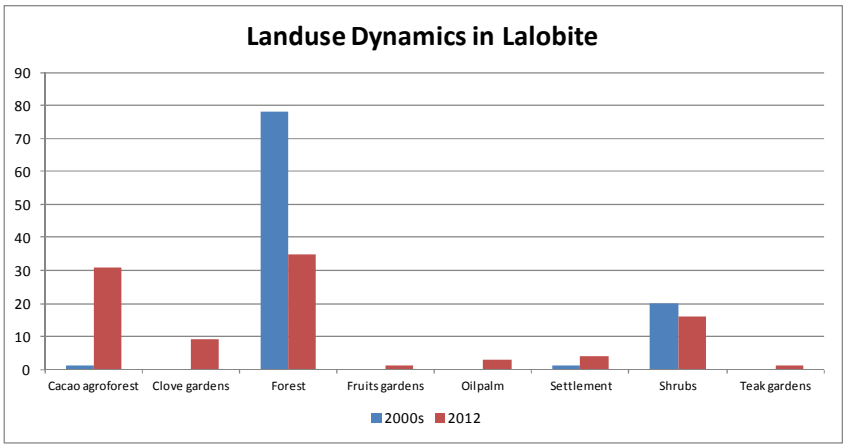

Figure 25. Land-use dynamics in Lalobite based on community perspectives

UPT Asinua Jaya

UPT Asinua Jaya was recently established as requested by Asinua Jaya village for accelerating the development process and as part of an assimilation strategy into this area. UPT Asinua Jaya village was originally grassland when it was proposed as a transmigration site in 1982. The new proposal was realized in 2007 when housing for transmigrants was constructed. The first 200 families were relocated in 2008; 100 from Nusa Tenggara Timur and Java, and 100 Asinua Jaya villagers.

During the first year, the transmigrants were supported with rice, kerosene, salt and agricultural tools as they began to farm the land. Unfortunately, many of the tree crops that they planted died due to

prolonged drought. All the wells in the village dried up and water from the river became the last resort.

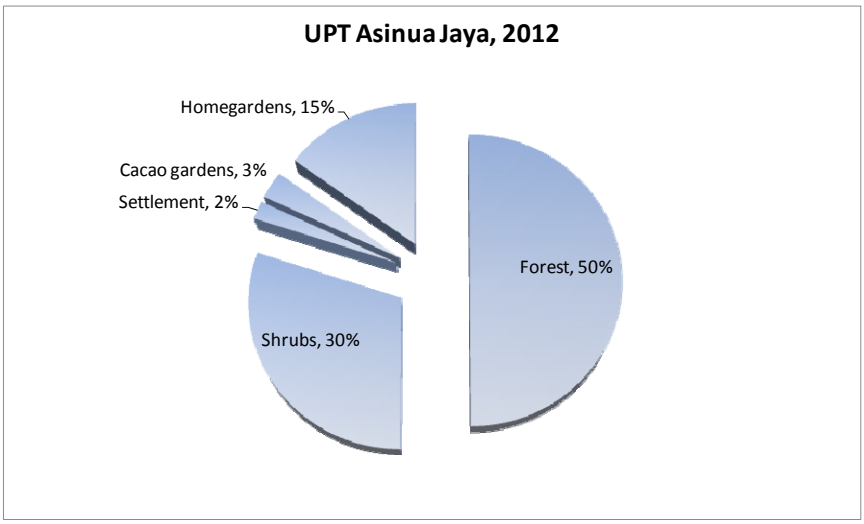

Figure 26. Current land use in UPT Asinua Jaya village based on community perspectives

In 2009, the government arranged to pipe water from Amate spring. A hydropower proposal was rolled out in 2010, but has not been realized yet. Owing to these circumstances many people left the village to seek income from gold mining in Bombana or from wage labour in oil palm plantations in the Asera region. The latest livelihood opportunities for communities are logging, charcoal, pepper, sago and gathering honey. Half the village area remains forested and shrubland is widespread.

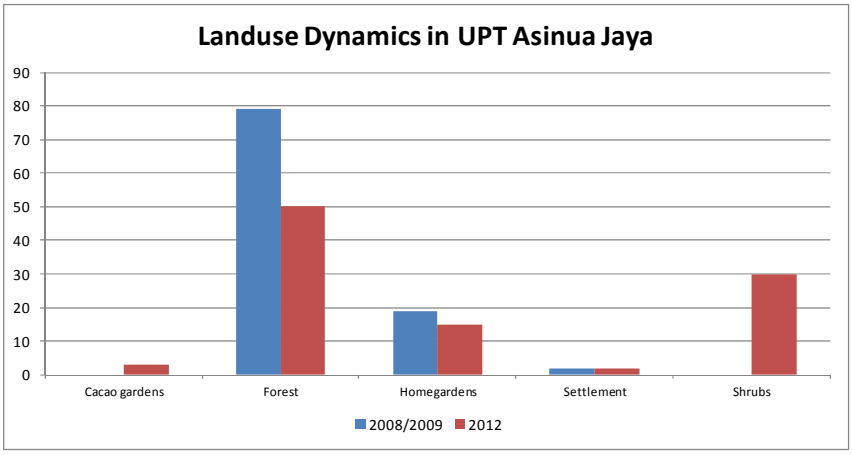

Figure 27. Land-use change dynamics in UPT Asinua Jaya based on community perspectives

4.2 Household perspectives on land characteristics and land use

4.2.1 Land characteristics

Accessibility to land

Location of land

The location of farmed land in all typologies was relatively similar (Figure 28).

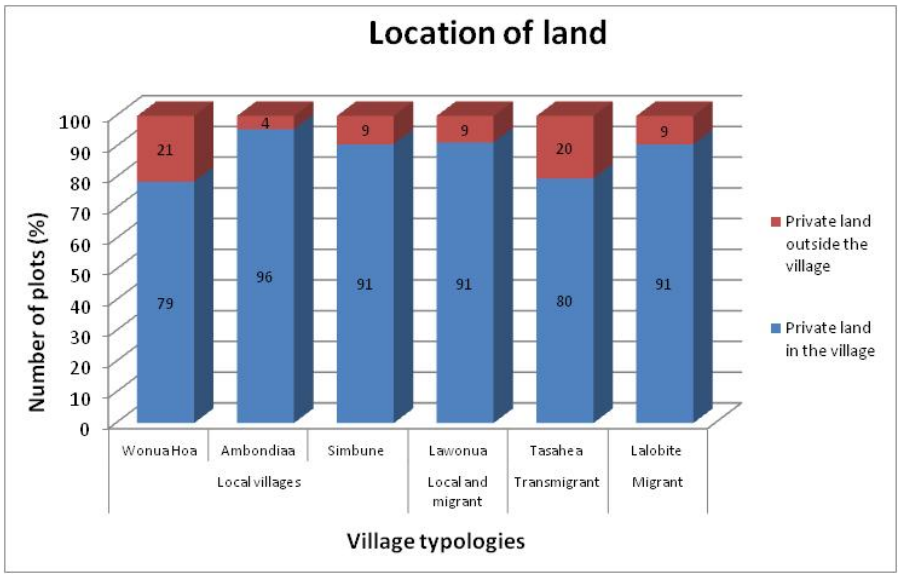

Figure 28. Location of farmed land in Southeast Sulawesi

Field proximity to households

The average walking time from home to the field in typology 1 was longer than in the other villages. Otherwise it was relatively similar (Figure 29).

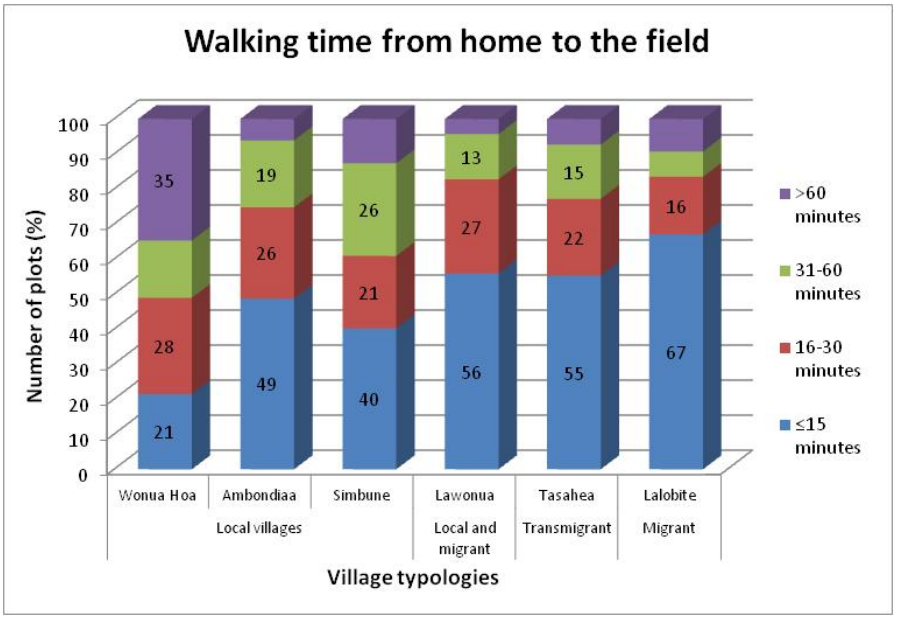

Figure 29. Walking time from home to the field in Southeast Sulawesi

Land level

Most of the physiography in all typologies differed (Figure 30).

Figure 30 shows land levels in Southeast Sulawesi. In typology 1 it was either flat (59–74%) or sloping (26–41%). In typology 2 sloping land prevailed (72%) although some areas were flat (28%). In typologies 3 and 4 levels were equally flat (49%) or sloping (51%).

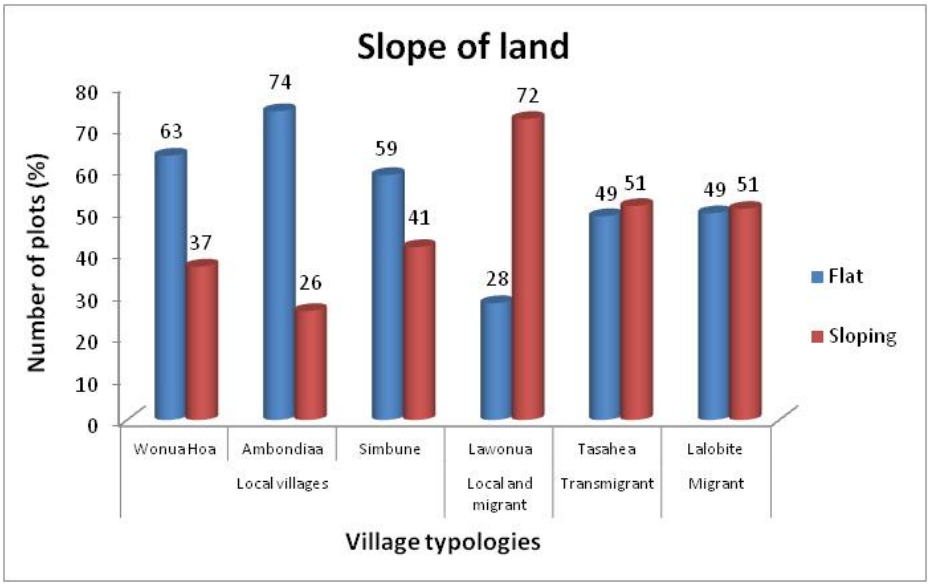

Figure 30. Land levels in Southeast Sulawesi

Current land management status

Most of the land in all typologies was owned and share-cropped. A smaller percentage remained untilled (Figure 31).

Figure 32 indicates that land in Southeast Sulawesi was mostly inherited or purchased (Figure 32). In typology 1 it was either inherited (66–70%) or purchased (9–32%). In typology 2 it was purchased (59%) or inherited (33%). Typology 3 received land was from government programmes (62%) and by purchase (37%); in typology 4 it was mostly purchased (80%).

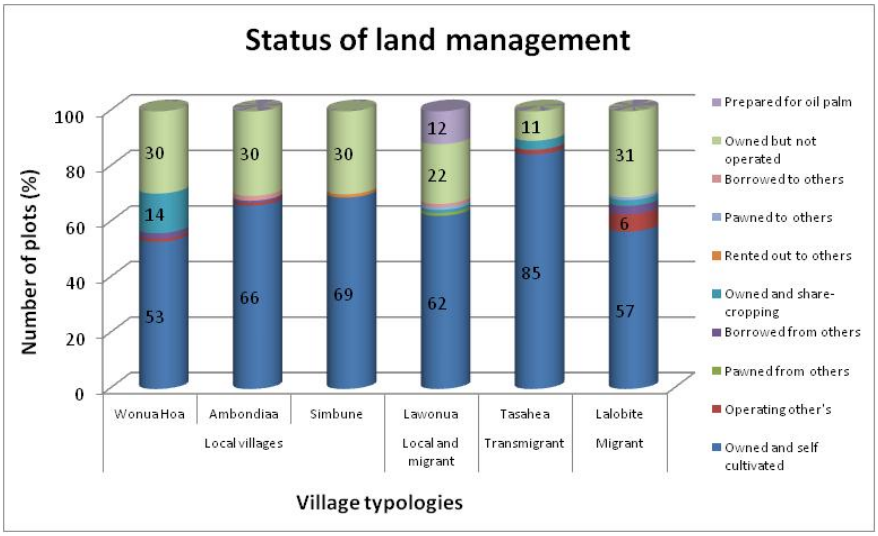

Figure 31. Status of land management in Southeast Sulawesi

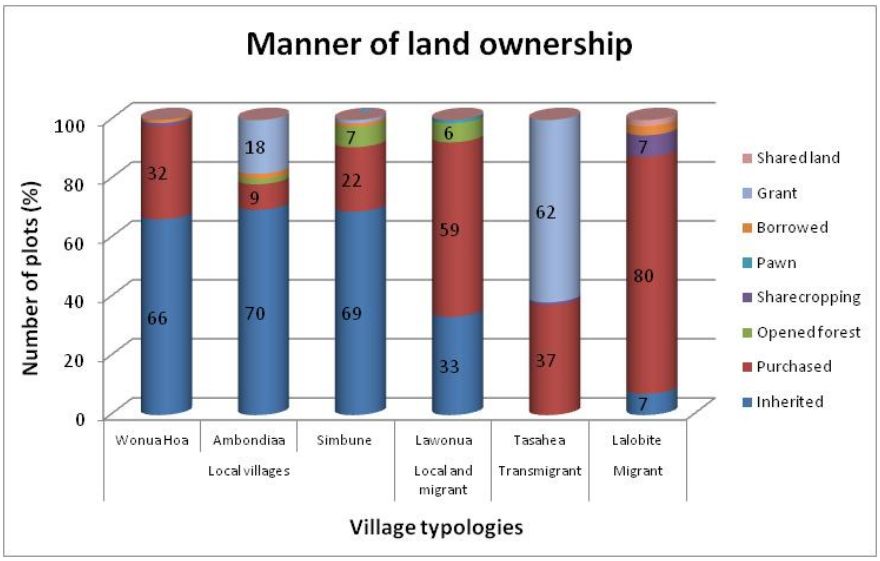

Figure 32. Type of land tenure in Southeast Sulawesi

Source of land

Figure 33 clearly illustrates sourcing of land for villagers in all typologies. There is a considerable distinction between the first 3 typologies and the migrants in typology 4.

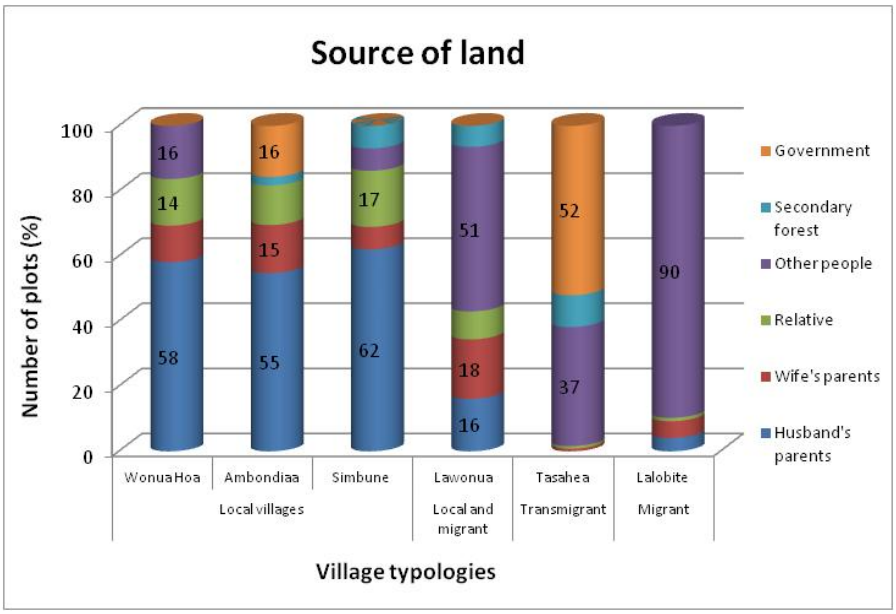

Figure 33. Source of land in Southeast Sulawesi

Timeline of land acquisition

The distribution of plot holdings by year of land acquisition differed among all typologies (Figure 34) but most of the plots in typologies 1, 2 and 4 were obtained after 1990. In the transmigrant village (typology 3) the bulk of the land was obtained before 1980.

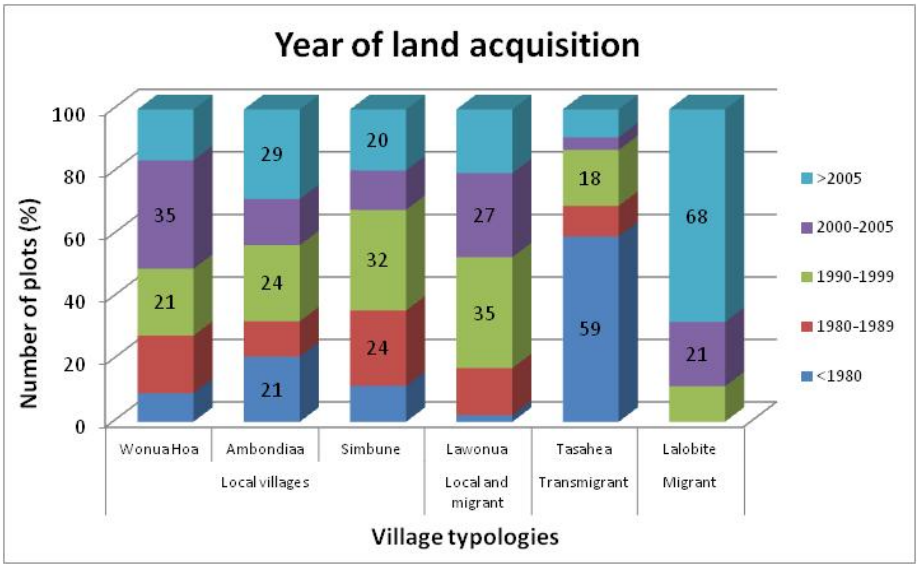

Figure 34. Timeline of land acquisition in Southeast Sulawesi

4.2.2 Land-use and tenure status in Southeast Sulawesi

Current land tenure status

In this context there was considerable difference between typology 1 and the other 3 typologies in which it was relatively similar (Figure 35). In typology 1 the husband was by far the responsible party. Elsewhere land was more often owned by married couples.

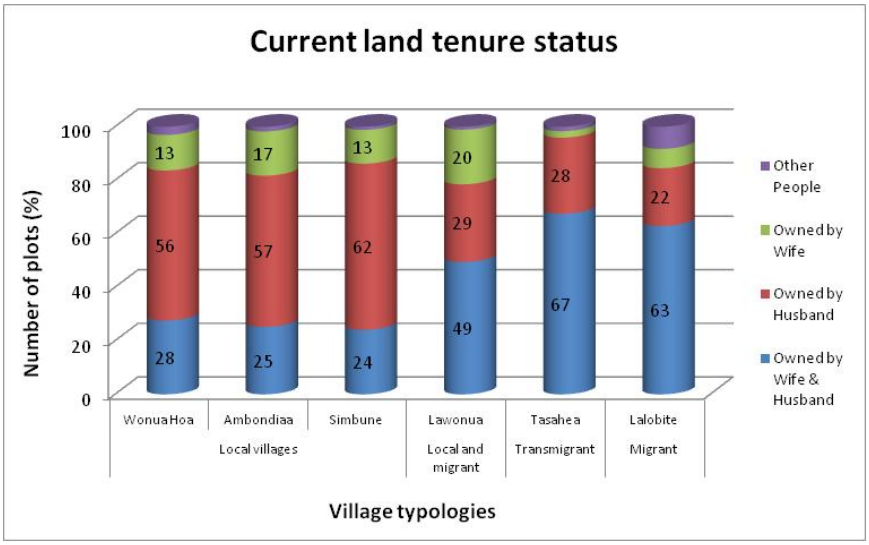

Figure 35. Current land tenure status in Southeast Sulawesi

Previous and current land use

Figures 36 and 37 explain previous and current land use by villagers respectively. In the past bush fallow systems had been a common trend in all typologies except for typology 3 in which vegetable cultivation had been a popular choice.

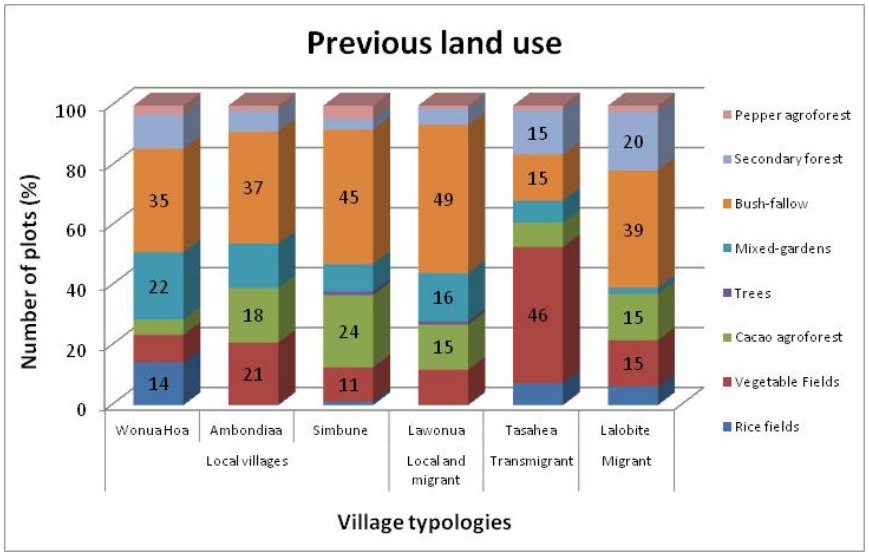

Figure 36. Previous land use in Southeast Sulawesi

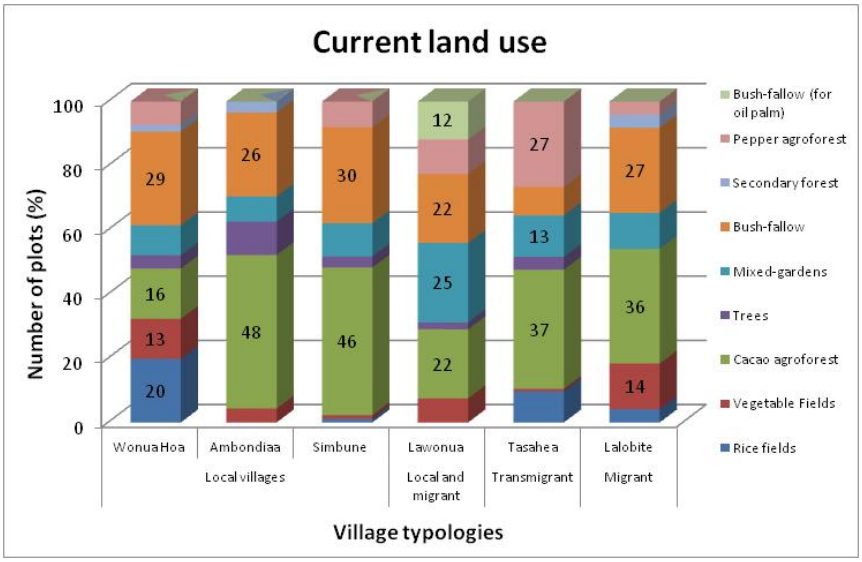

Figure 37. Current land use in Southeast Sulawesi

Current land use by all typologies in Southeast Sulawesi is heterogeneous and quite complex as illustrated in Figure 37. However, except for Wonua Hoa and Lawonua cacao agroforestry is expanding. Bush fallow systems remain common barring Tasahea in which only a small percentage of the land is used for this purpose.

Land use before and after 1 year of formal acquisition

Land use before and after 1 year of formal acquisition in all typologies is detailed in Figure 38 and Figure 39.

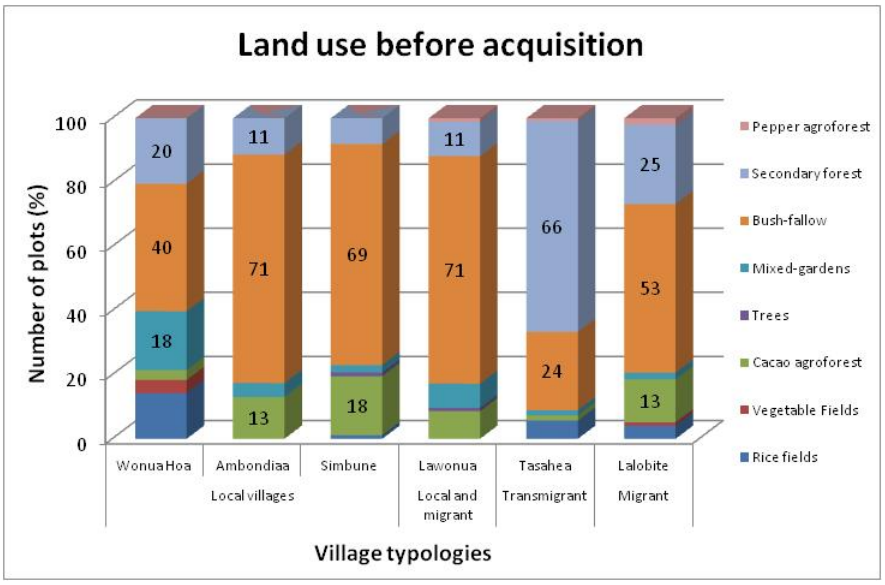

Figure 38. Land use before formal acquisition in Southeast Sulawesi

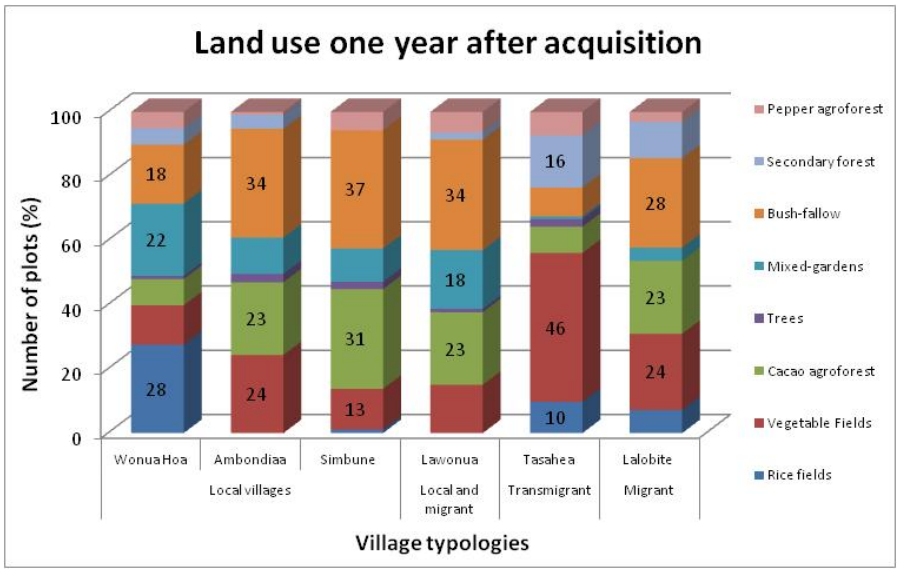

Figure 39. Land use 1 year after formal acquisition in Southeast Sulawesi

Tree distribution in current land use

Five types of tree species were planted by farmers under different conditions in each village. The average total of trees per hectare in Southeast Sulawesi is summarized in Table 4. In Southeast Sulawesi, all gardens were planted with perennial crops, multipurpose trees (MPTs) such as fruit, timber, banana and shade trees (others). Crop-wise, perennial crops (cacao and coffee) predominated in all villages.

Table 4. Average total of trees per hectare in Southeast Sulawesi

Village typologies	Villages	n	Average total of trees per hectare									
			Perennial crop		MPTs		Timber		Banana		Others (shade trees)	
			n	%	n	%	n	%	n	%	n	%
Local village (Typology 1)	Wonua Hoa	1072	643	60	49	5	108	10	6	1	266	25
	Ambondiaa	1156	737	64	83	7	172	15	25	2	140	12
	Simbune	1088	735	68	30	3	55	5	7	1	262	24
Local and migrant (Typology 2)	Lawonua	1457	788	54	382	26	13	1	9	1	265	18
Transmigrant (Typology 3)	Tasahea	1090	642	59	75	7	46	4	7	1	319	29
Migrant (Typology 4)	Lalobite	818	628	77	48	6	11	1	19	2	113	14

Others: Gamal, bamboo

5. Community livelihood options

5.1 Typology 1 (local villages)

Cacao, paddy, patchouli and sago were the dominant crops in Ambondiaa, Simbune, Lamunde, Taosu and Wonua Hoa. However the traditional farming systems employed led to low productivity.

Cacao

Cacao was a dominant crop in Ambondiaa, Simbune, Lamunde, Taosu and Wonua Hoa. As cacao was considered more profitable, shrubs, forests and swidden fields were converted to cacao gardens. Land clearing was done using the slash-and-burn technique. Cacao planting began at the beginning of the rainy season but farmers planted vegetables, maize, watermelons and generally short-term crops before planting the cacao. Spacing employed 3 x 3 m with a 15-cm planting hole. Cacao seedlings were generally obtained from existing cacao gardens surrounding farmers' plots which had healthy trees and good productivity.

Cacao maintenance activities included weeding, fertilizer application and pruning as well as pest and disease control. Weeding was done twice a year while fertilizer application was conducted 2 or 3 times per season, or even not at all, depending on the farmer. Urea, triple superphosphate (TSP), KCL, Phonska, nitrogen, phosphorus and potassium (NPK) were used in various doses, such as 2−10 sacks per application. Cacao stems were pruned twice a year, while pest and disease control was carried out by spraying pesticide twice a month throughout the year, depending on crop conditions.

Cacao gardens in Taosu had an average age of 15−20 years and could produce an average of 1 tonne per hectare per year. Generally, farmers sell the harvest to an intermediary in the village at IDR 15 000 per kilogram (after 3 days of drying).

Constraints to cacao planting are:

- Pests and diseases, such as black pod disease (*Phytophthora palmivora*), cacao pod borers, stem cancer, rotten fruit and mushroom stems
- Price fluctuations, likely influenced by intermediaries
- Lack of appropriate technology in the post-harvest phase

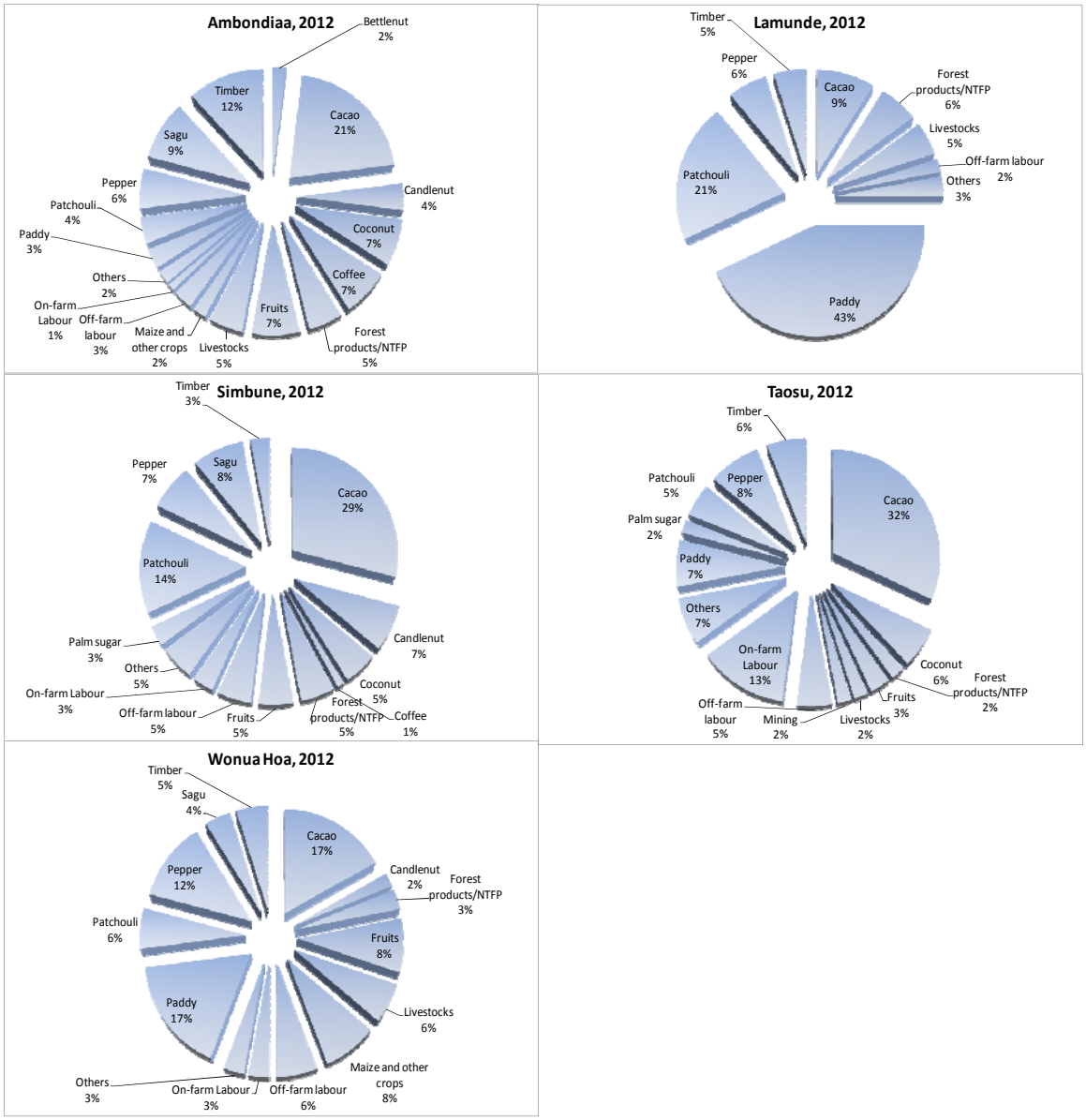

Figure 40. Recent livelihood options in Ambondiaa, Lamunde, Simbune, Taosu and Wonua Hoa based on community perspectives

Paddy

Wetland paddy was the most popular livelihood option in Lamunde and Wonua Hoa. The area of wetland paddy in this village comprised 300 ha with average landownership of 0.5 ha per household. Local and hybrid rice varieties were Elis, Mekongga, Luparin, Padi 66, Padi Kuda, Lampari, Konawe, Ciliwung and IR 36. Land preparation was done using a tractor, especially on quite hard soil, and using a low tillage system in the swamp area (only spraying the weeds with herbicide before planting. Planting started in May, usually by hand-scattering of seed or direct seeding.

Common maintenance techniques in Lamunde were:

- Weeding 13 times during a season—hand pulling or spraying with herbicide in the first weeks after planting
- Paddy replanting was maintained during 10 to 30 days after planting. Replanting process usually using the same age of paddy saplings;
- Fertilizer application twice in a season, when the paddy was 1 month and 2 months old. Urea, TSP, NPK, SP36 and Za were used with a 1:2 composition of urea and TSP, 3 sacks of the mixture for a one-time application, or depending on the level of soil fertility.
- Pest control was done 3 times in a season, to avoid attacks by 'walang sangit' (*Leptocorisa oratorius*), rats and golden snails.

Harvesting was done at the age of 120 days. Paddy production was approximately 40−70 sacks of fresh paddy (1 sack equivalent to 100 kg) and harvesting was often done by communal labour ('pasangki'). Most farmers used paddy for self-consumption; a small amount was reserved for sale in the market. Currently, the price of a sack of rice (50 kg) is approximately IDR 350 000 or IDR 7000 per kilogram of rice.

The main constraints were: 1) pests such as rodents, wild boar and foraging cows; 2) considerable capital needed; 3) insufficient extension support and 4) water shortages.

Patchouli

Patchouli was quite popular in the community, especially in Lamunde. Patchouli seedlings were obtained from inside the village, the Ambopai village of Tinondo subdistrict and even North Kolaka. Farmers planted and mixed patchouli with cacao or timber trees, using 3 x 3 m spacing for cacao and 50 x 50 cm for patchouli.

Patchouli shoots were planted directly in the field throughout the day at approximately 500 per day. Liquid fertilizer was applied to accelerate budding.

Patchouli harvesting could be done up to 3 times:

- First harvest at 6 months
- Second harvest at 4 months
- Third harvest according to crop conditions

The first harvesting of 400 patchouli trees could produce 125 kg of fresh patchouli fetching IDR 3000 per kilogram. The products were marketed in the village after all dried leaves and stems had been chopped and sun-dried for 2 days. The main constraints were low prices, complex treatment methods and marketing issues.

Sago

Sago trees were common in Ambondiaa, being mostly inherited and family owned. Sago harvesting was carried out by cutting down 7-year-old trees, reducing them to small pieces and using a grater to extract the sago starch. Harvesting was done by groups of 3 to 4 people who could process 1 tree per day. Harvesting was not conducted during the rainy season due to turbid water conditions which can lead to ‘black sago’.

A sago tree could produce about 25 bags selling at IDR 40 000 per sack (1 sack equivalent to 20 kg). A sago tree can be sold directly to buyers at IDR 75 000 per stem. The sago starch was mainly used for self-consumption but some was sold to markets in Unaaha. Currently, sago trees are diminishing due to overexploitation.

5.2 Typology 2 (local and migrant villages)

Cacao, paddy rice and fruits were the dominant crops in this typology. In these villages, traditional systems became intermeshed with innovative practices introduced by Bugis and Javanese migrants. This led to greater productivity in the area.

Cacao

Shifting cultivation was used by farmers in the land-clearing phase for cacao gardens usually from September to December. Planting was conducted at the beginning of the rainy season, in January and February. Commonly, farmers planted cacao directly once the land was ready, but some farmers also cultivated vegetables before the cacao. Cacao plant spacing employed 3.5 x 3.5 m, 3 x 3 m, 3 x 4 m or 2 x 4 m. Farmers obtained the best local cacao seedlings from healthy and productive mother trees. Some of these trees were derivatives of F2 seedlings taken from the Sulawesi Rain-fed Area Development Project (SRADP) project.

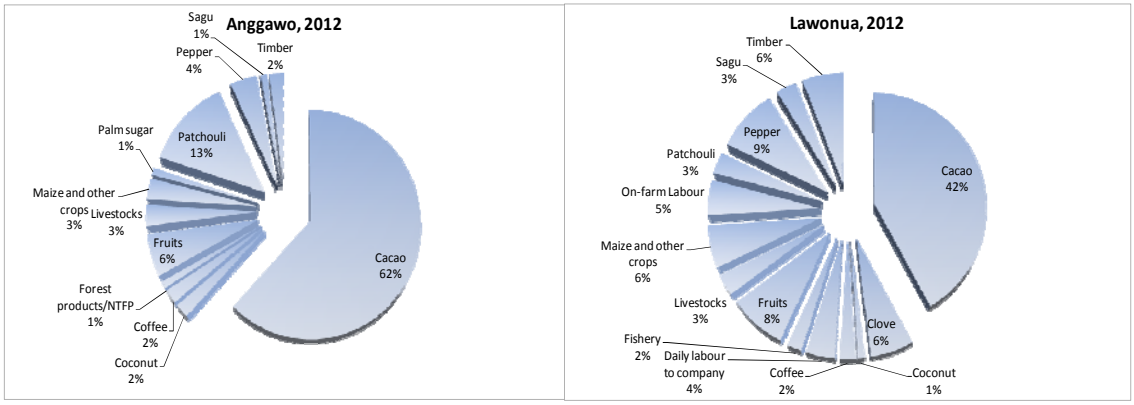

Figure 41. Recent livelihood options in Anggawo, and Lawonua based on community perspectives

Fruits

Banana and rambutan were productive fruits that yielded quick results in the villages. Banana gardens could produce up to 8 bunches in a month for retail at IDR 25 000 per bunch in the market. Rambutan (23−30 trees) could generate up to IDR 1 million per season. The rambutan retail price was around IDR 30 000 per sack (50 kg sacks).

5.3 Typology 3 (long-established transmigrant villages)

Cacao and pepper were the dominant crops in this typology besides other commodities. In these villages, farming was more intensive than elsewhere.

Cacao

Cacao cultivation in Tasahea continued to use shifting cultivation. Cacao planting employed spacing of 3 x 3 m, with 40 X 40 X 40 cm planting holes. Initially, F1 seedlings were used from which derivatives were extracted subsequently or side grafting was practised.

Cacao maintenance activities undertaken were:

- Fertilizer application twice a year (every 6 months) at the beginning of flowering and after harvesting. Fertilizers used were TSP, KCl and urea, depending on the age of the cacao. Cacao trees in many gardens in Tasahea were up to 12-years old; farmers believed that using fertilizer was able to increase yield by several hundred kilograms
- Sanitary cleaning twice a year (pruning branches and weed spraying)
- Insecticide spraying, from flowering to harvesting, every 3 to 4 months
- Drainage once a year

Cacao productivity in the village was quite high compared to other villages—1.5 tonnes per hectare per year for 7-year-old cacao trees fertilized once a year. Even at 10 years, the trees could still produce 800 kilograms per hectare per year. Most cacao in the village was sold to intermediaries at IDR 15 000 per kilogram.

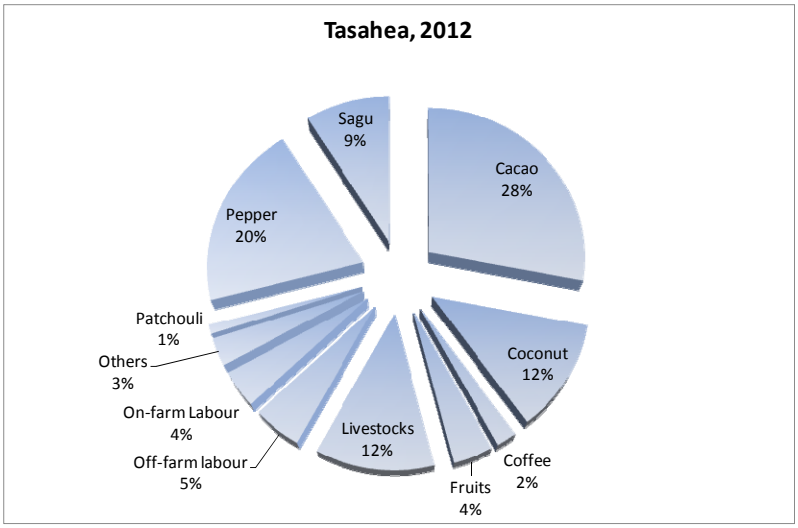

Figure 42. Recent livelihood options in Tasahea based on community perspectives

Pepper

Much of the pepper grown in Tasahea was intercropped with cacao using spacing of 3 x 3 m; monoculture spacing used 2 x 3 m. Several farmers integrated pepper in home gardens with coconut. Pepper maintenance included:

- Pruning of the propagation poles once a year
- Fertilizing once a year or according to the farmers' practice
- Weeding 2 to 4 times a year
- Pest and disease control via spraying 3 times a year (spray mixed with fertilizer)

Based on farmers' experience, 0.5 ha of pepper (6 years of age) could produce more than 750 kg per harvest. If the price of pepper was IDR 65 000, then farmers could earn up to IDR 50 million.

5.4 Typology 4 (recent-established transmigrant villages)

Cacao, charcoal and timber production predominated in this typology. Fruit was a minor source of income. Other tree-based commodities such as cacao were still at the immature stage. Arnold and Bird

(1999) indicated that trees and forests provide a range of benefits in the form of goods and services that arise from direct and indirect use.

Cacao

Likewise in other typologies, shifting cultivation was used by farmers in the land-clearing phase for cacao gardens usually from September to December. Planting was conducted at the beginning of the rainy season, in January and February. Commonly, farmers in Lalobite planted cacao directly once the land was ready, but some farmers also cultivated vegetables before the cacao. Cacao plant spacing employed 3.5 x 3.5 m, 3 x 3 m, 3 x 4 m or 2 x 4 m. Farmers obtained the best local cacao seedlings from healthy and productive mother trees.

The degree of maintenance varied in intensity depending on the management skills of the farmers. Maintenance by migrant farmers in Lalobite was relatively intensive as described below:

- Pest control using pesticides and leaf fertilizers; as much as 2 to 3 times in 1 month in the first months or the first year; subsequent treatment depended on the prevalence of crop pests
- Weeding by spraying with herbicides: 'Rambo' once a month and a contact pesticide twice a month
- Removing the water shoots of cacao which was conducted once in a month
- Fertilizer application at least twice a year, using TSP, KCl and urea

The main constraints were:

- Pests: wild boar and monkeys, cacao pod borers, black pod disease (*Phytophthora palmivora*), and fruit rot
- High price of fertilizer and agricultural supplies
- Falling prices and suboptimal market quality

Charcoal

Charcoal production was an important livelihood for inhabitants of UPT Asinua Jaya. This transmigrant settlement was built only 4 years ago so many planted crops remained immature. Ironwood ('kayu nona') was the best timber for making charcoal.

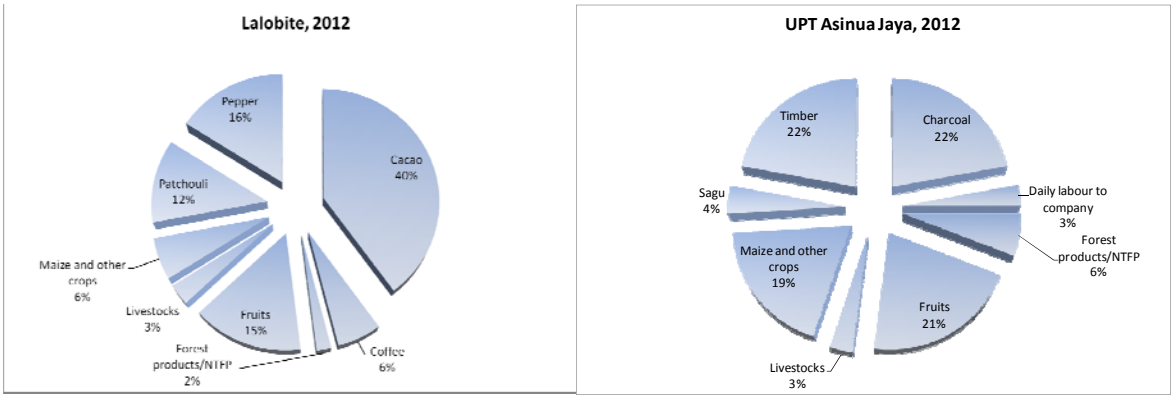

Figure 43. Recent livelihood options in Lalobite and UPT Asianua Jaya based on community perspectives

Burning of 1 m^3 of timber would produce 10 sacks of charcoal that could be sold for IDR 20 000−23 000 per sack to intermediaries from Kolaka, Unaaha and Kendari who visited the village. In 1 month, a charcoal maker can produce 70−100 sacks of charcoal. The main operational cost was for a chainsaw to cut timber.

It is estimated that in the next 2 years the charcoal business will be obsolete owing to the expense and heavy work involved.

Timber

Villagers in UPT Asinua Jaya earned income from logging. 'Kolapi', 'ponto', 'kayu merah' and 'kayu biti' were in high demand. Timber processing was mainly commissioned from outside the village such as Unaaha.

At the moment, the logging sites are quite far from the village—10 km or more. Production costs such as petrol, oil, transport and labour mean that large orders are needed for operations to be profitable, i.e. 5 to 10 m^3 of timber for processing.

Fruits

Bananas were the only fruit that produced rapidly in the village. The farmers planted bananas in their home gardens or not too far from home. Buyers generally came to the village (when buying charcoal they also purchased bananas). The main constraints were marketing, road conditions and limited modes of transport.

5.5 Important indicators of livelihoods based on household surveys

Source of income

The basic income equation for income from self-employment (in agriculture or business) is:

$$I = \sum_{i=i}^{n} p_i y_i - \sum_{j=1}^{m} q_j v_j$$

Income (I) is gross value (price times quantities of all n products) minus total costs (price times quantities of all m purchased inputs), for example, fertilizers, seeds, tools, hired labour (Angelsen and Lund 2011).

The average total income per year per household in typology 1 was lower than the other typologies (Table 5 and Figure 44). The major sources of income for farmers in all villages were also different:

Typology 1: cacao agroforest, wage labour and entrepreneurial work
Typology 2: cacao agroforest, wage labour and mixed gardens
Typology 3: pepper agroforest, cacao agroforest and mixed gardens
Typology 4: cacao agroforest, charcoal and timber

The calculation of income included the value of consumed commodities. However, most of the income came from cash crops (Table 5 and Figure 44).

Table 5. Sources of income in Southeast Sulawesi in 2012

Sources of income	Average income per household											
	Typology 1						Typology 2		Typology 3		Typology 4	
	Wonua Hoa		Ambondiaa		Simbune		Lawonua		Tasahea		Lalobite	
	IDR	%	IDR	%	IDR	%	IDR	%	IDR	%	IDR	%
1. On farm/agriculture	17 560 932	**56**	19 509 985	**61**	18 772 872	**59**	16 972 342	**54**	29 248 054	**67**	19 472 576	**69**
Rice fields	2 154 492	**6.8**	-	**0**	0	**-**	0	**-**	2 265 185	**5.2**	503 117	**1.8**
Vegetable fields	2 971 033	**9.4**	503 783	**1.6**	59 533	**0.2**	1 666 283	**5.3**	57 667	**0.1**	2 590 450	**9.2**
Cacao agroforest	7 527 733	**23.9**	16 711 943	**52.7**	12 060 172	**38**	6 297 482	**19.9**	9 587 333	**22.1**	14 561 926	**51.6**
Mixed gardens (agroforest)	1 702 474	**5.4**	881 250	**2.8**	2 134 367	**6.7**	5 844 607	**18.4**	4 947 548	**11.4**	323 950	**1.1**
Trees	411 733	**1.3**	142 242	**0.4**	17 000	**0.1**	2286	**0**	148 033	**0.3**	0	**-**
Pepper agroforest	2 042 367	**6.5**	-	**0**	3 824 400	**12**	2 152 100	**6.8**	10 443 005	**24.1**	780 433	**2.8**
Other agriculture	751 100	**2.4**	1 270 767	**4**	677 400	**2.1**	1 009 583	**3.2**	1 799 283	**4.1**	712 700	**2.5**
2. Off-farm/non-agriculture	13 918 983	**44.2**	12 215 933	**39**	13 003 042	**40.9**	14 714 153	**46.4**	14 137 150	**32.6**	8 757 117	**31**
Forest products	28 800	**0.1**	2 822 733	**8.9**	71 733	**0.2**	70 667	**0.2**	157 533	**0.4**	86 167	**0.3**
Fuelwood	804 350	**2.6**	913 367	**2.9**	848 800	**2.7**	977 667	**3.1**	844 133	**1.9**	1 012 350	**3.6**
Wage labour	2 690 667	**8.5**	3 684 767	**11.6**	3 854 333	**12.1**	6 232 853	**19.7**	4 614 833	**10.6**	2 480 667	**8.8**
Entrepreneurial	5 863 600	**18.6**	1 523 067	**4.8**	4 115 508	**13**	2 147 000	**6.8**	1 755 233	**4**	3 970 800	**14.1**
Professional	1 929 400	**6.1**	2 045 333	**6.4**	2 884 000	**9.1**	1 821 467	**5.7**	1 680 000	**3.9**	120 000	**0.4**
Other	1 622 700	**5.2**	916 667	**2.9**	150 000	**0.5**	3 019 500	**9.5**	3 468 750	**8**	472 000	**1.7**
Remittances	979 467	**3.1**	310 000	**1**	1 078 667	**3.4**	445 000	**1.4**	1 616 667	**3.7**	615 133	**2.2**
3. Total income per year	31 479 915	**100**	31 725 918	**100**	31 775 914	**100**	31 686 495	**100**	43 385 204	**100**	28 229 693	**100**

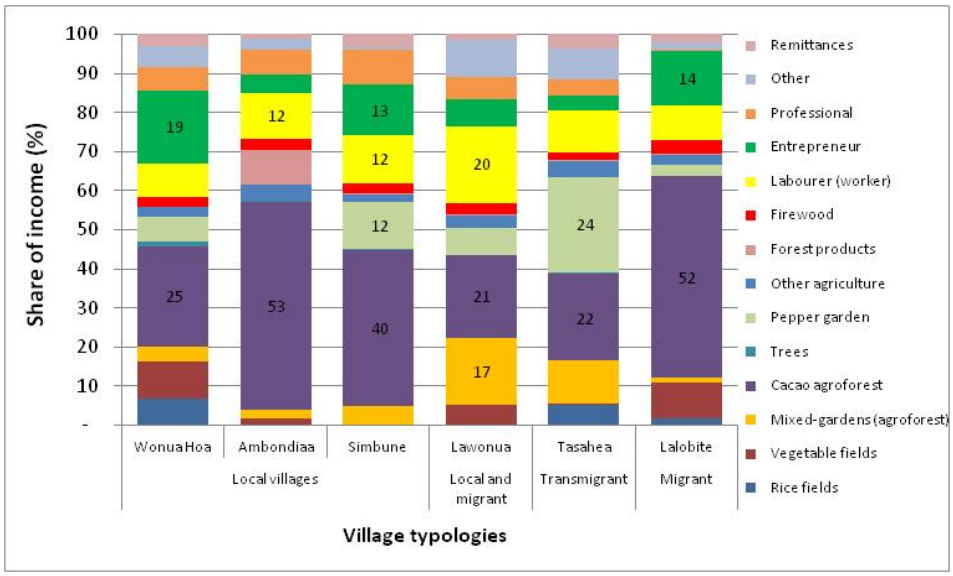

Figure 44. Sources of income by activity type in Southeast Sulawesi in 2012

Figure 45 shows general sources of income from on- and off-farm activities and agriculture in all of the typologies.

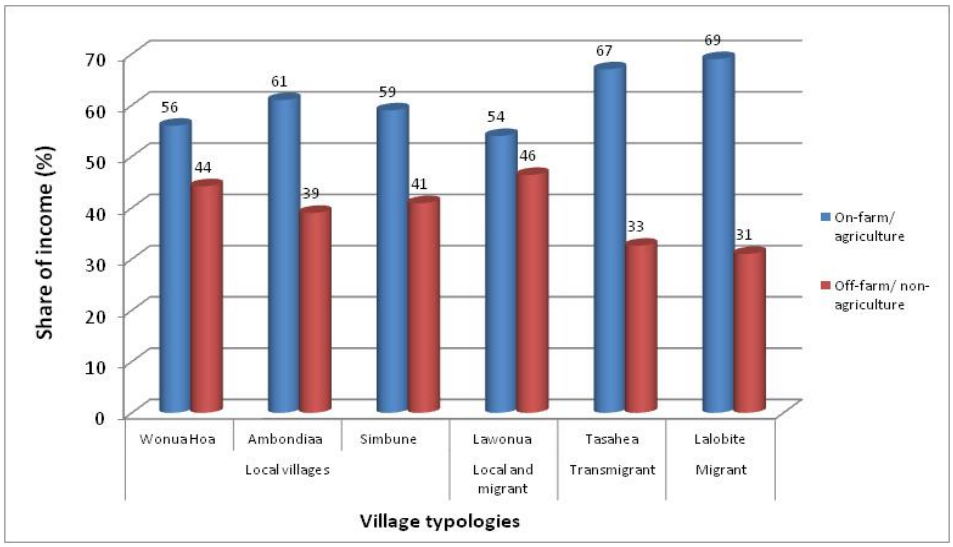

Figure 45. Sources of income in Southeast Sulawesi in 2012

5.5.2 Daily per capita income

The daily per capita income of farmers in typology 1 was lower than the other typologies. Farmers in typology 3 were richer than farmers elsewhere. The daily per capita income of transmigrant farmers was almost twice that of farmers in typology 1 (Figure 46).

The daily per capita income of farmers in Southeast Sulawesi is presented in Figure 46. Using the international poverty line standard of US$ 1 per day, the percentage of farmers' income was above the international poverty line in Southeast Sulawesi.

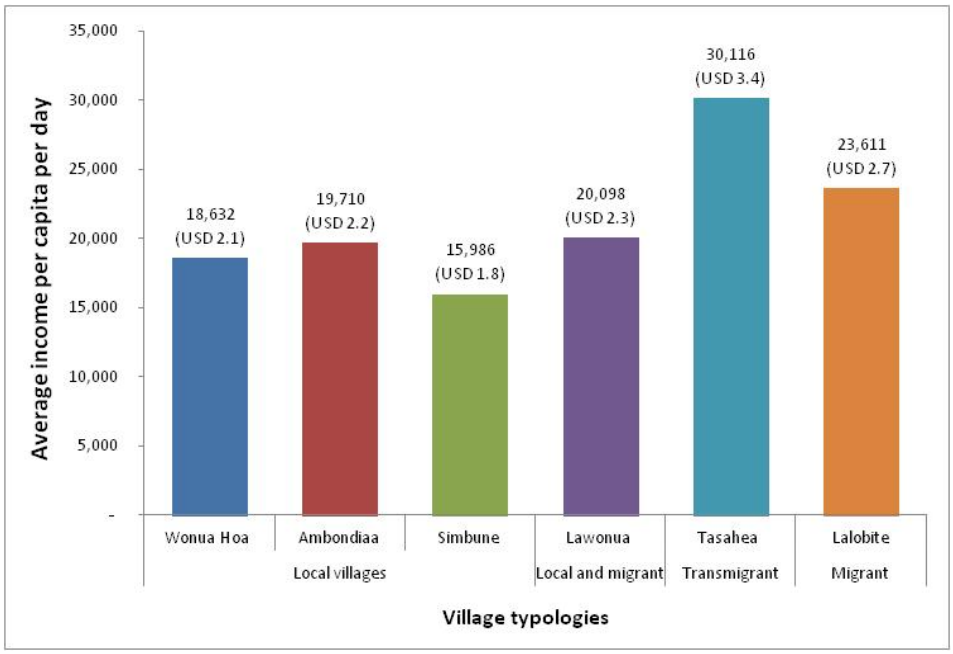

Figure 46. Daily per capita income in Southeast Sulawesi in 2012

5.5.3 Land holdings

The average land holding per household in typology 1 (3.65 ha) was larger than typology 4 (3.47 ha), typology 2 (3.10 ha) and typology 3 (2.80 ha), (Figure 47). The compositions of land holdings by land-use types were different across the sites (Table 6).

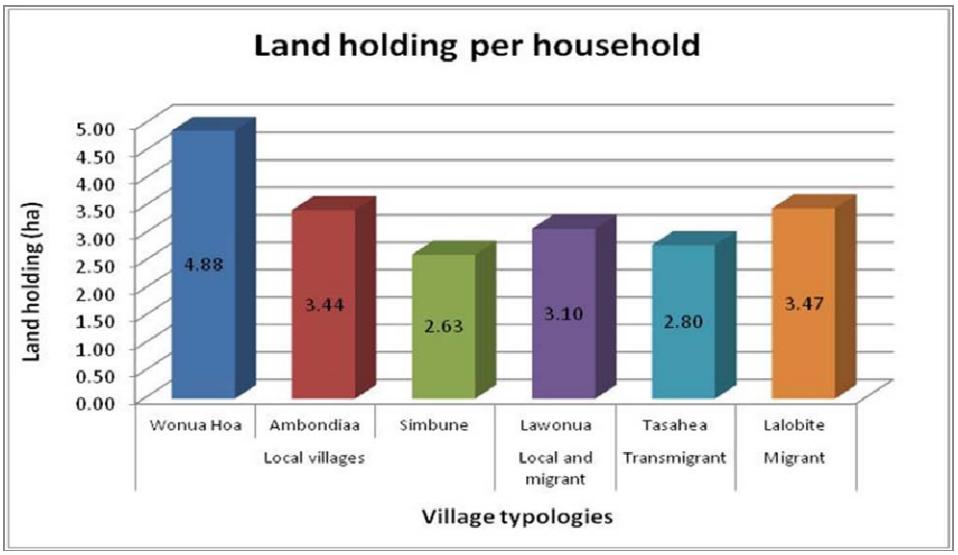

Figure 47. Land holding per household in Southeast Sulawesi

Table 6. Average land holding by land use in Southeast Sulawesi

Group	Villages	Average land holding by land use (ha)							
		Rice fields	Vegetable fields	Cacao agroforest	Mixed-gardens	Trees	Pepper agroforest	Bush fallow	Bush fallow (oil palm)
Local village (Typology 1)	Wonua Hoa	1.01	0.22	0.71	0.80	0.09	0.19	1.86	0.00
	Ambondiaa	0.00	0.04	1.21	0.33	0.22	0.00	1.64	0.00
	Simbune	0.02	0.02	1.11	0.27	0.03	0.09	1.09	0.00
Local and migrant (Typology 2)	Lawonua	0.00	0.13	0.79	0.93	0.09	0.18	0.75	0.23
Long-established Transmigrant (Typology 3)	Tasahea	0.23	0.00	1.07	0.32	0.11	0.69	0.38	0.00
Recent-established Migrant (Typology 4)	Lalobite	0.09	0.33	1.45	0.29	0.00	0.11	1.20	0.00

The major land use in a number of the villages in Southeast Sulawesi was bush fallow. The major reason for not cultivating this land in typology 1 was lack of capital (50–88%) and lack of labour (8–37%). In typology 2 the farmers were waiting to use the land for palm oil plantation (35%) and also were constrained by lack of labour (29%). In typology 3 the reasons were lack of capital (69%) and unproductive land (15%). Sixty percent of the respondents in typology 4 cited lack of labour and 33% lack of capital (Figure 48).

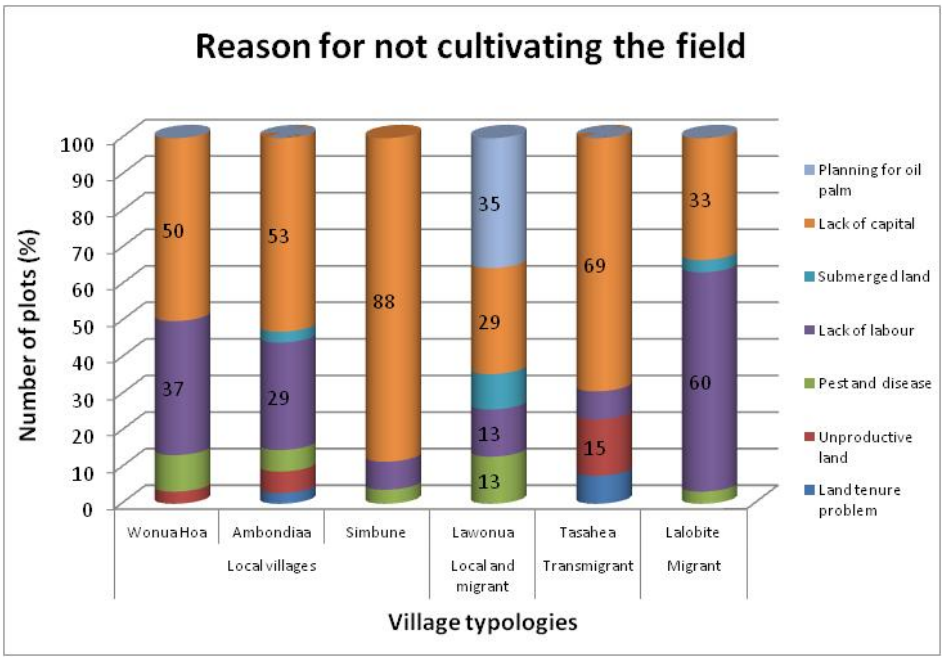

Figure 48. Reasons for not cultivating the fields in Southeast Sulawesi

Generally the length of bush fallow cultivation across all villages was less than 15 years (27–37%), more than 15 years (20–47%) and 6–10 years (15–23%), (Figure 49). In typology 2 it was less than 15 years (61%) and 11–15 years (26%). In typology 4, 67% of the fallow area was less than 15 years old and 20% was 6–10 years old. Whereas in typology 3, 38% of the fallow was less than 15 years old, 38% was more than 15 years old and 23% was 11–15 years old.

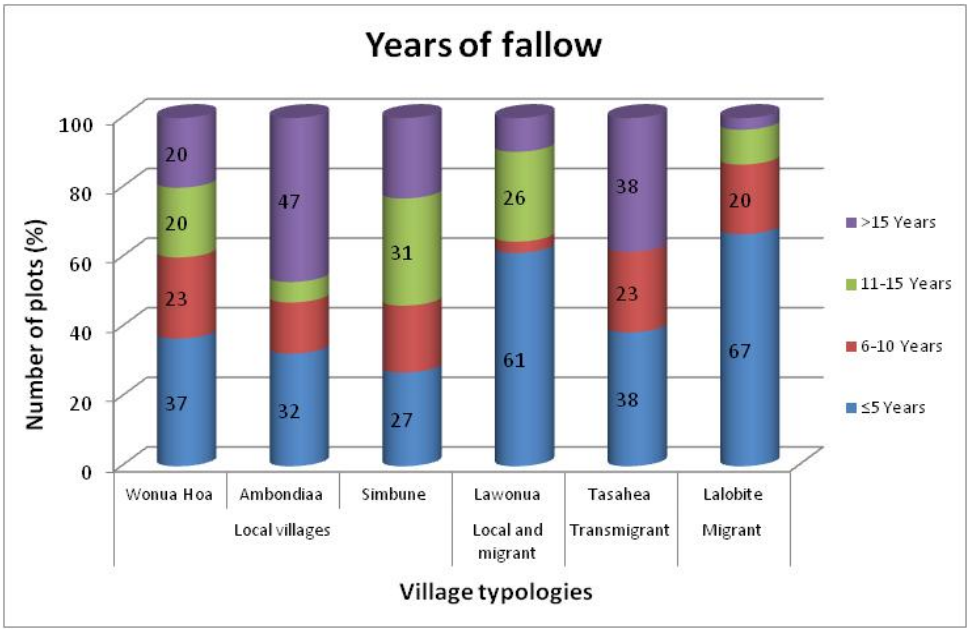

Figure 49. Years of fallow cultivation in Southeast Sulawesi

Conclusion

The 4 typologies all had differences in terms of livelihood options, tree crops and farm management systems. These variations were attributable to traditional land management patterns and farmers' management systems, market access and the considerable influence of migrants in the villages.

In typology 1, the land-use dynamics showed that cacao agroforestry had increased considerably during the last 40 years accompanied by a significant decrease in forest cover in the villages. In Wonua Hoa, besides cacao agroforestry, maize and paddy rice cultivation was significantly on the rise in the same period. In Taosu oil palm plantation was expanding. Other crops in this typology were paddy rice, patchouli and sago (the staple food for the indigenous Tolaki people in this area). Cacao agroforestry was not so intense as the systems used in typology 2.

Similar land-use dynamics were also found in Anggawo and Lawonua (typology 2) with regard to the increase in cacao agroforestry and decrease in forest cover. In Lawonua, several oil palm plantations and cacao agroforests have been undergoing development recently. This typology showed the strong influence of migrants from South Sulawesi who employed quite intensive cacao farming systems that had a strong impact on local farmers. The migrants also introduced buffalo for paddy field ploughing which the locals had never done before.

In Tasahea, the long-established transmigrant village (typology 3), cacao agroforestry had similarly blossomed during the last 40 years. The same trend occurred in typology 4 which also experienced loss of forest cover. The migrants from South Sulawesi in Lalobite village only focused on cacao development as their main source of income. In the more recent village (UPT Asinua Jaya) forest cover had been depleted very badly during the last 4 years owing to conversion to shrubland and small cacao gardens. As newly established transmigrant village, UPT Asinua Jaya had strong dependence on earning a living from forest products this became their main source of income. Within these 2 typologies it was clear that the long-established transmigrant village (typology 3) had diverse livelihood options depending on cacao, pepper and also livestock. The reverse was the case in UPT

Asinua Jaya, newly established transmigrant village (typology 4) where most people relied on forest products as their major source of income (charcoal and timber) and less on plantation crops.

The condition of houses for farmers in typology 4 was poorer compared with the other typologies where it was relatively similar. Typology 4 also had lower levels of education than the other typologies where again educational attainment was more or less the same but the level of education of women was slightly lower.

The main crops and sources of income that remain in place today were:

Typology 1: cacao agroforest, wage labour and entrepreneurial work

Typology 2: cacao agroforest, wage labour and mixed gardens

Typology 3: pepper agroforest, cacao agroforest and mixed gardens

Typology 4: cacao agroforest, charcoal and timber

Typology 1 again figured prominently regarding total annual income per year per household which was lower than the other typologies as was daily per capita income. The daily per capita income of farmers in typology 3 was almost twice that of the farmers in typology 1.

The average land holding per household in typology 1 (3.65 ha) was larger than typology 4 (3.47 ha), typology 2 (3.10 ha) and typology 3 (2.80 ha). The major land uses were bush fallow in typology 1 (1.09–1.86 ha), agroforestry in typology 2 (0.93 ha), cacao agroforests in typology 3 (1.07 ha) and cacao agroforests (1.45 ha) with bush fallow (1.20 ha) in typology 4.

Recommendations

- Conduct comprehensive agricultural extension, ranging from applied farming techniques to pest and disease management
- Increase access to and knowledge of improved/better seedlings for all potential crops
- Establish micro-economic enterprises to boost the local economy and reduce dependency on intermediaries in marketing agricultural products

- Diversify plantation crops (e.g. rubber)
- Transfer appropriate technology for post-harvesting such as drying techniques for cacao; enhance capacity building for cacao farmers
- Conduct cross-visits for farmers to exchange experience
- Establish demonstration trials at plot levels for cacao and various plantation crops

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53. Biofuels in China: An Analysis of the Opportunities and Challenges of Jatropha curcas in Southwest China.
54. Jatropha curcas biodiesel production in Kenya: Economics and potential value chain development for smallholder farmers
55. Livelihoods and Forest Resources in Aceh and Nias for a Sustainable Forest Resource Management and Economic Progress
56. Agroforestry on the interface of Orangutan Conservation and Sustainable Livelihoods in Batang Toru, North Sumatra.
57. Assessing Hydrological Situation of Kapuas Hulu Basin, Kapuas Hulu Regency, West Kalimantan.
58. Assessing the Hydrological Situation of Talau Watershed, Belu Regency, East Nusa Tenggara.
59. Kajian Kondisi Hidrologis DAS Talau, Kabupaten Belu, Nusa Tenggara Timur.
60. Kajian Kondisi Hidrologis DAS Kapuas Hulu, Kabupaten Kapuas Hulu, Kalimantan Barat.
61. Lessons learned from community capacity building activities to support agroforest as sustainable economic alternatives in Batang Toru orang utan habitat conservation program (Martini, Endri et al.)
62. Mainstreaming Climate Change in the Philippines.
63. A Conjoint Analysis of Farmer Preferences for Community Forestry Contracts in the Sumber Jaya Watershed, Indonesia.
64. The highlands: a shared water tower in a changing climate and changing Asia
65. Eco-Certification: Can It Deliver Conservation and Development in the Tropics.
66. Designing ecological and biodiversity sampling strategies. Towards mainstreaming climate change in grassland management.
67. Towards mainstreaming climate change in grassland management policies and practices on the Tibetan Plateau
68. An Assessment of the Potential for Carbon Finance in Rangelands
69 ECA Trade-offs Among Ecosystem Services in the Lake Victoria Basin.
69. The last remnants of mega biodiversity in West Java and Banten: an in-depth exploration of RaTA (Rapid Land Tenure Assessment) in Mount Halimun-Salak National Park Indonesia
70. Le business plan d'une petite entreprise rurale de production et de commercialisation des plants des arbres locaux. Cas de quatre pépinières rurales au Cameroun.

71. Les unités de transformation des produits forestiers non ligneux alimentaires au Cameroun. Diagnostic technique et stratégie de développement Honoré Tabuna et Ingratia Kayitavu.
72. Les exportateurs camerounais de safou (Dacryodes edulis) sur le marché sous régional et international. Profil, fonctionnement et stratégies de développement.
73. Impact of the Southeast Asian Network for Agroforestry Education (SEANAFE) on agroforestry education capacity.
74. Setting landscape conservation targets and promoting them through compatible land use in the Philippines.
75. Review of methods for researching multistrata systems.
76. Study on economic viability of *Jatropha curcas* L. plantations in Northern Tanzania assessing farmers' prospects via cost-benefit analysis
77. Cooperation in Agroforestry between Ministry of Forestry of Indonesia and International Center for Research in Agroforestry
78. "China's bioenergy future. an analysis through the Lens if Yunnan Province
79. Land tenure and agricultural productivity in Africa: A comparative analysis of the economics literature and recent policy strategies and reforms
80. Boundary organizations, objects and agents: linking knowledge with action in agroforestry watersheds
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82. Mainstreaming climate change into agricultural education: challenges and perspectives
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93. A pro-growth pathway for reducing net GHG emissions in China
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103. Landscape dynamics over time and space from ecological perspective

104. Komoditisasi atau koinvestasi jasa lingkungan: skema imbal jasa lingkungan program peduli sungai di DAS Way Besai, Lampung, Indonesia
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106. Rapid Carbon Stock Appraisal (RACSA) in Kalahan, Nueva Vizcaya, Philippines
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108. Memorias del Taller Nacional: "Iniciativas para Reducir la Deforestación en la region Andino - Amazónica", 09 de Abril del 2010. Proyecto REALU Peru
109. Percepciones sobre la Equidad y Eficiencia en la cadena de valor de REDD en Perú – Reporte de Talleres en Ucayali, San Martín y Loreto, 2009. Proyecto REALU-Perú.
110. Reducción de emisiones de todos los Usos del Suelo. Reporte del Proyecto REALU Perú Fase 1
111. Programa Alternativas a la Tumba-y-Quema (ASB) en el Perú. Informe Resumen y Síntesis de la Fase II. 2da. versión revisada
112. Estudio de las cadenas de abastecimiento de germoplasma forestal en la amazonía Boliviana
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121. Implementasi Kaji Cepat Hidrologi (RHA) di Hulu DAS Brantas, Jawa Timur.
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123. A Study of Rapid Hydrological Appraisal in the Krueng Peusangan Watershed, NAD, Sumatra.

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United Nations Avenue, Gigiri • PO Box 30677 • Nairobi, 00100 • Kenya
Telephone: +254 20 7224000 or via USA +1 650 833 6645
Fax: +254 20 7224001 or via USA +1 650 833 6646
Southeast Asia Regional Program - Sindang Barang, Bogor 16115
PO Box 161 Bogor 16001, Indonesia
Ph: +62 251 8625415 - Fax: +62 251 8625416
www.worldagroforestry.org/sea