The Tompobulu Cluster, Gowa District, South Sulawesi Province

This profile of the Tompobulu Cluster is intended to provide a comprehensive overview of a group of villages/wards (kelurahan) *consisting of the villages of Rappoala and Rappolemba and the ward of Cikoro in Gowa District, South Sulawesi Province, Indonesia. This profile was formulated from participatory research conducted with members of local communities and with representatives of local government institutions through focus-group discussions involving both male and female participants. This profile includes a demographic profile and a description of general conditions; of land use and changes to land use; of biodiversity; of sources of water and issues affecting these sources; and of farming systems. It also includes a Strengths, Weaknesses, Opportunities and Threats analysis. This information is intended to serve as input for planning measures to achieve environmental conservation and to improve community livelihoods on the basis of the sustainable use of forest resources and agroforestry systems.*

General conditions and demographic profile

The Tompobulu Cluster consists of two villages, Rappoala and Rappolemba, and one ward (kelurahan), Cikoro, all of which are located in the sub-district of Tompobulu, with the sub-district capital located in the ward ofMalakaji (Figure 1). Most of this region consists of hilly terrain at altitudes between 800 to 1400 metres above sea level (masl).The average annual number of rainy days ranges from 135 to 160, with average temperatures ranging from 10 to 25 °C. The distance from the villages/ward in the cluster to the sub-district capital ranges from 5 to 27 km, with the village of Rappoala the most distant. The distances to the district capital range from 78 to 134 km, with Cikoro being the most distant.

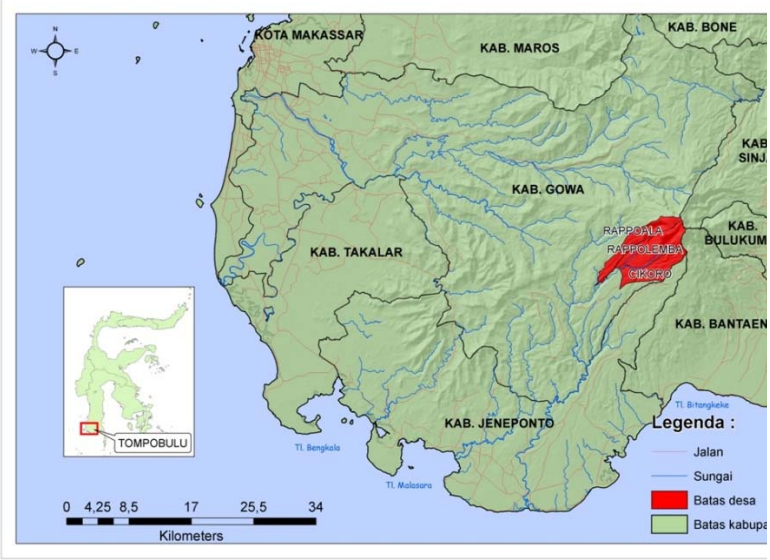

Figure 1. Map of the Tompobulu cluster region

The total area covered by the cluster is 73.56 km², with Rappoala covering 20.96 km², Rappolemba covering 27.38 km² and Cikoro covering 25.41 km². Land cover consists predominantly of pine forest, most of which has the status of protected forest (hutan lindung) and, in the area surrounding the village of Rappoala, of customary forest (hutan adat) covering a total area of 386.87 ha. Community coffee plantations cover 11.3% of the total area of the cluster. Other types of land cover include agriculture, rice fields, pasture and settlements.

Within the cluster, at least ten rivers constitute potential sources of water, these being the Salampang, Teteatu and Barasi rivers, which flow through Rappoala; the Karengese River, which flows through Rappolemba; the Dandole River, which forms the boundary between the villages of Rappoala and Rappolemba; the Batang Uluere River, which forms the boundary between the village of Rappolemba and ward of Cikoro; and the Batang Balangkang, Magalo, Salu Compo and the Patungle rivers, which flow through Cikoro.

In this cluster, villages are connected by roads with asphalt surfaces, with most of these roads in poor condition. Roads within villages and secondary roads leading to farm land mostly have dirt or stone surfaces, with only a few having asphalt surfaces. Formal and informal educational facilities range from early education (PAUD) to senior high schools (SMA). Each village has a range of health facilities, including community health sub-centres (Puskesmas Pembantu), community health posts (Posyandu), and village health posts (Poskesdes).

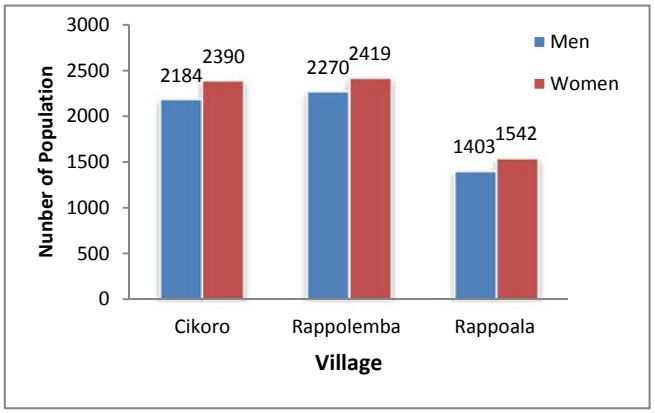

Figure 2. Total number of male and female inhabitants in each village within the Tompobulu Cluster (Source: RPJMDES Kelurahan Cikoro, Desa Rappolemba dan Rappoala, 2011-2015)

In 2011, the population of the Tompobulu Cluster consists of 12,213 individuals, of whom 5857 are male and 6,351 are female. The male-to-female ratio in each village is approximately the same, around 1:1 (Figure 2). The highest population density is found in Cikoro with 180 inhabitants/km^2, followed by Rappolemba with 171 inhabitants/km^2 and then by Rappoala with 140 inhabitants/km^2. The proportion of the population that either has not attended school or which has only graduated from primary school stands at 20% in each case, while the proportion of those that have graduated from junior or senior high schools stands at 15%. A number of inhabitants have completed tertiary education. In 2011, approximately 25% of the total population is enrolled in educational facilities, ranging from primary school to higher educational facilities (Figure 3).

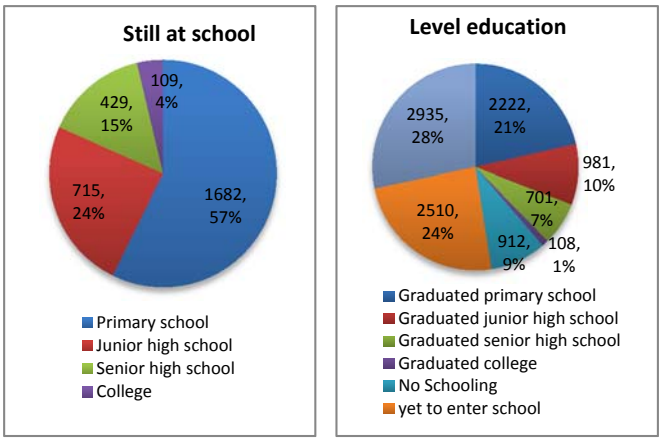

Figure3. Proportion of the population in terms of levels of educational attainment (left) and proportion of the school-aged population in terms of current level of education (right) (Source : RPJMDES Kelurahan Cikoro, Desa Rappolemba dan Rappoala, 2011-2015)

The main source of livelihoods for members of the communities within the cluster is in the agricultural sector, with most inhabitants involved in the cultivation of coffee and vegetables, corn, rice, cocoa and timber trees. A smaller proportion of the population derive their livelihoods as traders of agricultural products, general traders, drivers, motorcycle taxi operators, artisans, entrepreneurs, agricultural labourers, or employees of workshops. A small number of community members are employed as government officials or teaching staff. Access to credit is facilitated through village and sub-district-level revolving-loan funds and through Bank Rakyat Indonesia (BRI).

Land uses, changes and driving factors

More than 50% of the area of the Tompobulu Cluster is covered by multi-crop (agroforestry) systems for the cultivation of cloves, cocoa, coffee and 'randu' (*Ceiba pentandra*, kapok tree), while 10% is used for the cultivation of rice and horticultural products (figures 4 and 5). Significant changes to land use and land cover occurred from 1999 to 2005, with these changes affecting 32% of the total area of the cluster and with a significant proportion (9%) involving the

degradation of forests. From 2005 to 2009, changes to land use and land cover affected 49% of the total area of the cluster, with 8% of this change resulting from the expansion area of clove agroforests (Figure 6).

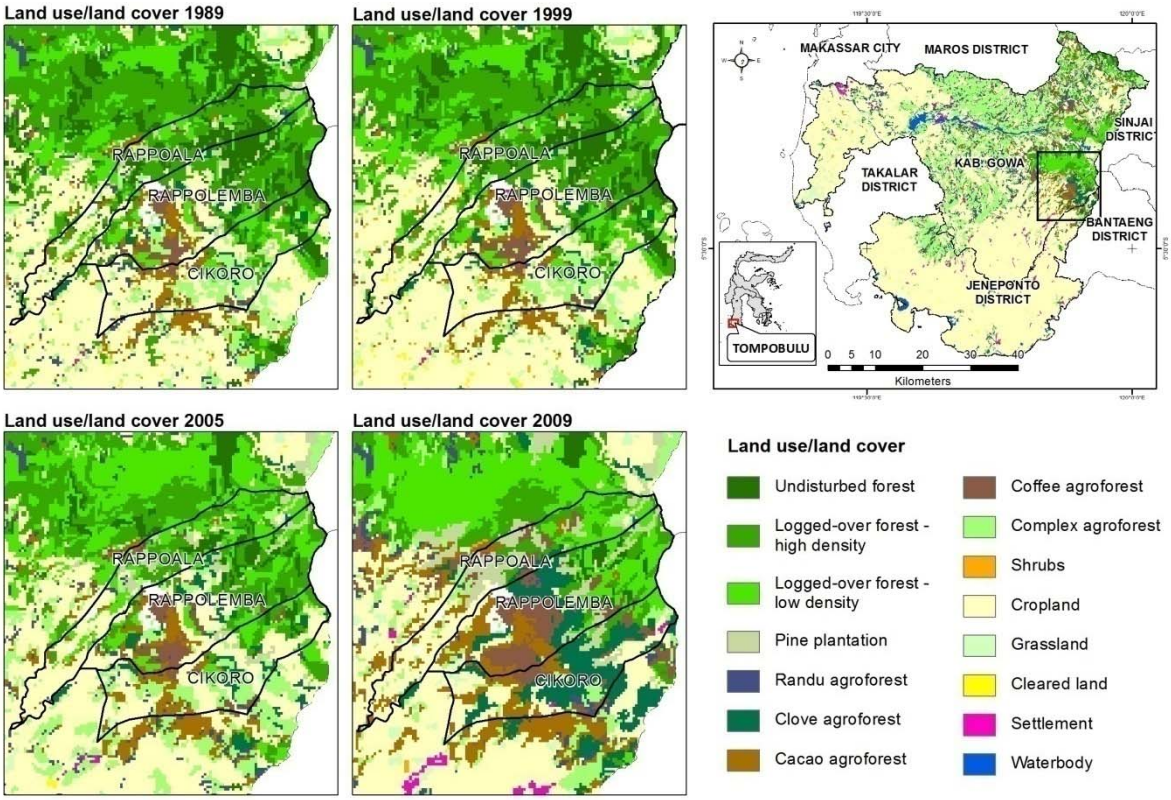

Figure 4. Map of changes to land cover (1989–2009)

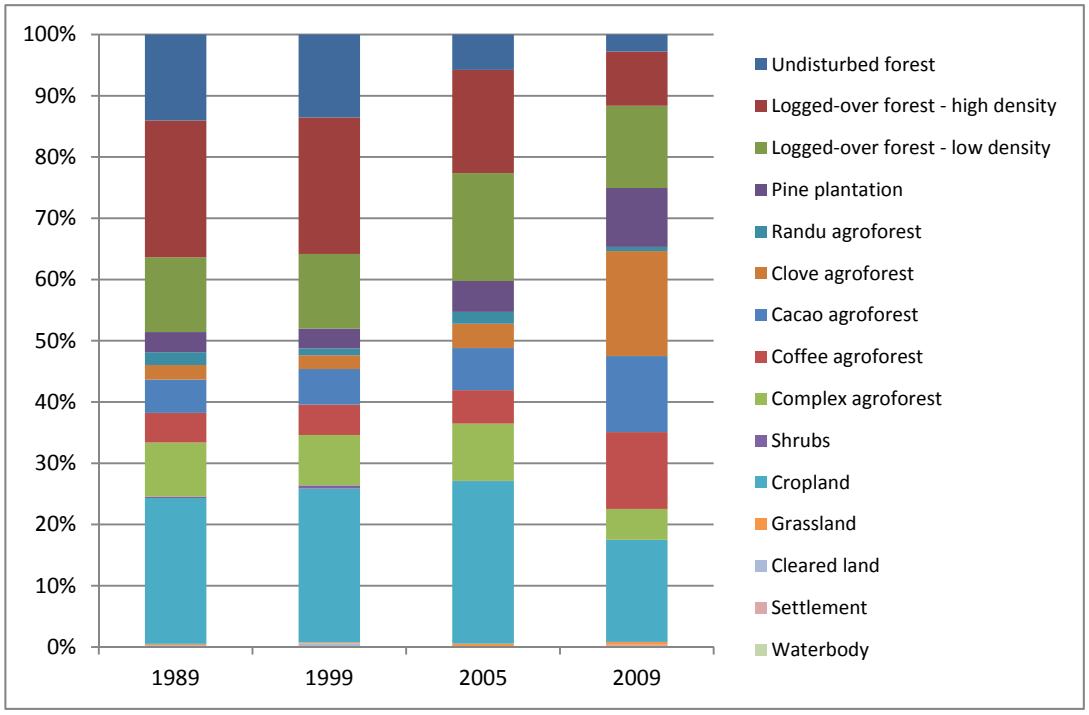

Figure 5. Changes in land cover (1989–2009)

Changes to land use and land cover over the past several decades have occurred as a result of the following factors: 1) an increase in the population of the area; 2) economic needs; 3) an increase in the extent of infrastructure; and 4) the cultivation of high-value crops. Members of communities in the cluster tend to use an agroforestry (multi-crop) system, mainly involving the cultivation of cloves and arange of timber-tree species, as the sale prices for these commodities are relatively high. Community members prefer to clear forestland for these purposes rather than to convert land currently used for other agricultural purposes.

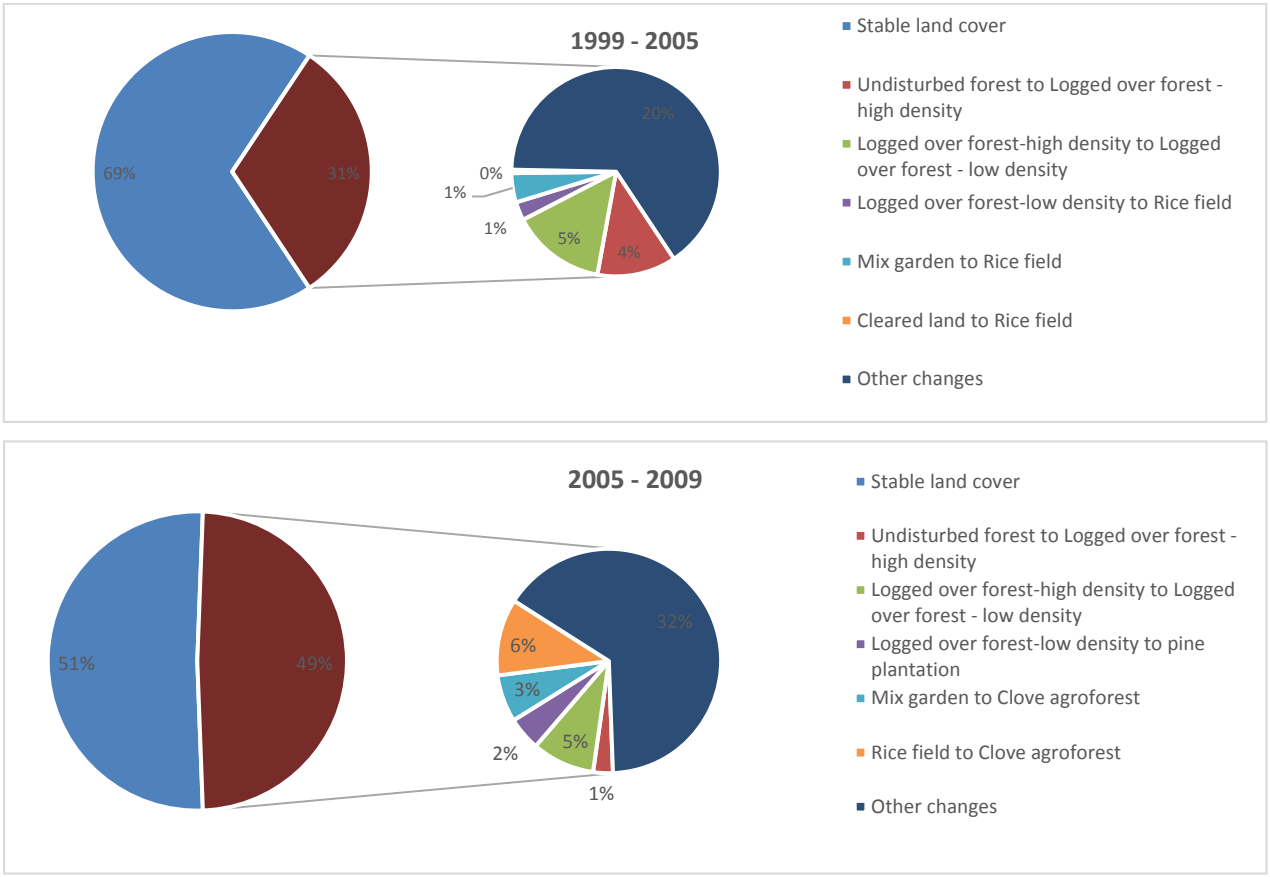

Figure 6. Changes to land use and land cover , 1989–2005 and 2005–2009

Water sources and related issues

Water sources

Springs are the primary source of water for daily activities, such as cooking, drinking, laundering, bathing and household cleaning, both in the rainy and dry seasons. For other uses, such as irrigating gardens and rice fields, rice milling, spraying pesticides, fisheries and micro-hydropower, the primary water source is rivers, although, in the rainy season the irrigation of rice fields and gardens depends to a greater extent on rainwater. Male informants in focus-group discussions tended to use river water for other uses in the dry season while female informants never used spring water for other uses in the dry season (Figure 7).

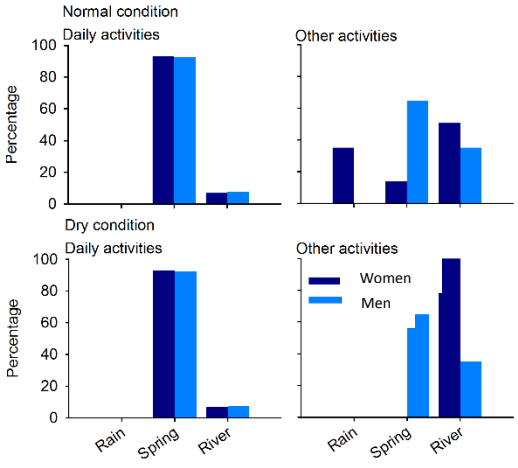

Figure 7. Sources of water for domestic and other uses according to male and female informants

Issues affecting water sources

The increasing levels of turbidity of water sources is a recognized problem, particularly in the rainy season. This turbidity is the result of high rainfall, landslides, contamination from rice fields and from livestock near springs. On the other hand, problems related to the quantity of water occurred during the dry season due to the low levels of rainfall and technical issues related to blockages or leaks inpipes or to pump engine failures thatprevented the flow of water. For female informants, problems related to the quantity of water were considered the most importantissue while males considered the poor quality of water due to high levels of turbidity to be more important.

Table 1. Issues affecting water sources in terms of quality, quantity and technical issues according to male and female participants

Issue		Issue ranking	
		Female	Male
Quality	Cloudy	2	1
Quantity	Limited availability	1	-
Technical	-	-	-

The high degree of variation in the level of rainfall between the rainy and dry seasons and the frequency of landslides werethe primary causes of issues affecting both the quantity and quality of water. Changes in land use involving the conversion of forests to other land uses has resulted in the decline of the area of forest and tree cover, thereby reducing its ability to support the quality and quantity of water.

Consequences of water-related issues

The most significant consequence of water-related issues, particularly for female members of the community, wasthat the high level of turbidity negatively impacted access to clean water required for drinking, cooking and washing. In the dry season, the limited availability of water had a negative impact on the electricity produced through micro-hydroelectricity facilities, which had a severe impact on the activities of the male members of the community.

Table 2. Consequences of water related issues (quality, quantity and technical) according to female and male perceptions

Consequences	Score[1)]	
	Female	Male
Water not usable for drinking and cooking		1
Disturbances to domestic activities	5	1
Disturbances to electricity supply		5
Material losses	√	
Non-material losses	√	

1) 1= very mild, 2=-mild, 3= average, 4= significant, 5= very significant

Efforts to address water-related issues and their causes and to manage the consequences of these issues

Table 3. Effort needed to address water-related issues and their causes and to manage their consequences

Capital	Effort	Female	Male
Financial	Savings	√	
Human	-		
Infrastructure	A reservoir or dam construction to irrigate rice fields		√
	Clean water infrastructure improvements	√	√
	Installation of filtration tanks and reservoirs		√
Natural	Identification and use of alternative sources of water		√
Social	-		

The necessary long-term effort required to address the decline in the quality and quantity of water involves the construction of a reservoir or dam to irrigate rice fields; improvements to infrastructure that supports the provision of clean water; and the construction of tanks and water filtration systems. In addition, women's saving groups could improve their level of fiscal resilience to enable them to improve water facilities while men could be involved in the identification of alternative sources of water (Table 3).

Biodiversity and its impact on livelihoods

For the purposes of this analysis, when using the term 'biodiversity' a distinction is drawn between biodiversity in the context of community-cultivated land (agro-biodiversity) and biodiversity in the context of the natural ecosystem (natural biodiversity).

The use of biodiversity

Members of the communities within the Tompobulu Cluster, most of whom work inthe agricultural sector as farmers, are particularly dependent on products of agro-biodiversity—such as coffee, cloves and cocoa—for their livelihoods, with these crops being planted both in forested areas (pine and mixed forests) and in multi-crop gardens. They also cultivate fruit trees and annual vegetable crops in mixed forests and in multi-crop gardens. Annual vegetable crops were generally planted on cleared fields while rice was cultivated in paddy fields.

Products of natural biodiversity were collected from natural forests, pine forests and multi-crop gardens but generally were only a relatively minor secondary source of income. Products of natural biodiversity collected from these sources included rattan, ferns, honey, butterflies, beetles, pine resin and passion fruit (*Passiflora* sp). From both natural and pine forests, ferns were collected for use in planting orchid sand butterflies and beetles for the production of handicrafts to meet the demand from markets in Makassar.

Issues affecting biodiversity

While there is a strong existing market for ferns, butterflies and beetles, it depends heavily on the availability of these products from natural sources, with the risk of depletion if their collection continues intensively. Gum resin, pine and rattan were collected from both natural and mixed forests but markets for these products were under-developed because of the low sale prices of these commodities. Passion fruit wasa popular product of natural biodiversity in the region because this fruit grows readily on a range of different types of land without requiring much maintenance. Despite the sour flavor, there is strong market potential for this product, with a high sale price. However, the type of passion fruit originally found in the area is increasingly difficult to find, with a sweeter, introduced species being more frequently cultivated despite its lower sale price and susceptibility to disease.

Mitigation measures

Incidents that have had a particularly important impact on community livelihoods include the financial crisis of 1998, droughts and forest fires. Two mitigation measures have been adopted by members of the communities within the cluster: 1) migrating to Malaysia or Kalimantan to seek employment as agricultural labourers on oil-palm plantations or as traders in Makassar or Merauke, with many members of the community adopting this strategy following the advent of the financial crisis; 2) engaging in planting activities, particularly the planting of coffee and cocoa in pine forests. These measures wereintended to improve community welfare through the increased useof land, prevent the reoccurrence of forest fires and improve the cover of vegetation on land affected by thefires.

Farming systems and preferences in alternative crops

Within the Tompobulu Cluster, coffee cultivated in multi-crop gardens and fields formed the primary source of income, with forest products such as pine and rattan forming secondary sources of income. Over the long term, coffee and cloves werethe commodities that provided the greatest contribution to community incomes. Informants from the women's groups stated that the commodity providing the greatest contribution to incomes was cocoa, 'suren'(*Toona sureni*) and 'langsat' (*Lansium parasiticum*) while the men's groups expressed a preference for the cultivation of timber trees, such as suren, 'bayangjawa' (*Maesopsis emini*), 'sengon' (*Paraserianthes falcataria*) and 'jabon' (*Anthocephalus cadamba* Miq), to generate incomes to support their families. Female farmers' groups expressed a preference for clove as the primary long-term crop (Figure 8), followed in descending order of preference by coffee, suren, jackfruit and cocoa, while male farmers' groups expressed a preference for coffee as the primary commodity, followed in descending order of preference by cloves, suren, jackfruit and durian.

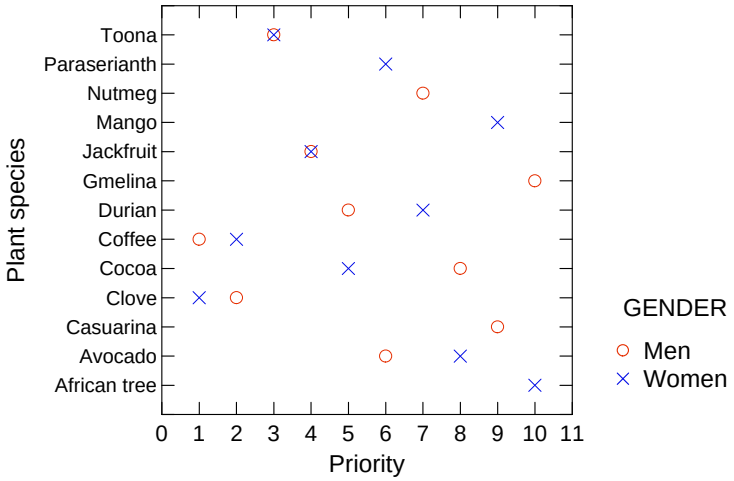

Figure 8. Tree species' priorities in communities in the Tompobulu cluster, Gowa District, South Sulawesi

The degree of resistance of these commodities to the impacts of climate change and to volatility in market prices over the past 15 years was an important consideration for farmers in their prioritization of the commodities, with awareness of these two factors being particularly importantin their development of multi-crop gardens. Mixing different crops with varying levels of resilience to the impacts of climate change and to market price volatility within a multi-crop garden can reduce the level of vulnerability. However, the level of farmers' knowledge ofthe degree of resilience of the various commodities to the impact of climate change and to market volatility was found to be extremely limited owing to a lack of information available within the cluster. Informational programs would assist in raising the level of awareness of farmers and, thereby, in their ability to face the risk of crop failure or a decline in market prices of the commodities if they implement a multi-crop system. In addition to informational campaigns, farmers within the Tompobulu Cluster also could require other forms of facilitation and intervention, particularly, in the face of adverse incidents affecting agricultural enterprises (Table 4).

Table 4. Forms of facilitation or intervention proposed by communities to address the risk of crop failure resulting from climate change in the Tompobulu Cluster, Gowa District, South Sulawesi

Extraordinary events caused by climate change	Required form of facilitation or intervention
Extended rains (2009 and 2011)	• Establishment of village loans-and-savings institutions • Field extension facilitation (2–3 facilitators per village) to teach methods of maintaining gardens and general agricultural techniques • Facilitation to improve the ability of housewives' saleable handicrafts to contributeto household incomes
Hurricanes (Angin ribut) (2012)	• Creation of non-agricultural job opportunities • Improved agricultural commodity sale prices through improved marketing • Establishment of village banks (with the support of BRI) to facilitate loans and savings • Facilitation to enable farmers to engage in employment in Malaysia through the Social Agency or Labour Agency.

Strengths, weaknesses, opportunities and threats (SWOT)

Focus-group discussions were held with community members in the Tompobulu Cluster to identify strengths, weaknesses, opportunities and threats within the cluster. The identified strengths and weaknesses related to five forms of capital in community life, these being natural, infrastructure, economy, human and social. The analysis of opportunities and threats was conducted to identify livelihoods' strategies that could be implemented by the communities to address the strengths and weaknesses.

The most significant strength in terms of natural resources within the Tompobulu Cluster was the extensive agroforestry gardens supported by fertile soils and a river in excellent condition. The well-maintained condition of the secondary forest that serves as a buffer zone to ensure environmental balance was also identified as an important source of strength in terms of natural resources. The relatively high incomes derived from the sale of agricultural commodities and the relative ease of access to loans from non-bank financial institutions and pawn shops was identified as a source of strength in terms of the economy of the cluster. The availability of religious facilities in all the villages within the cluster and the adequate supply and quality of educational facilities was identified as a source of strength in terms of the infrastructure of the cluster. The primary identified source of strength in terms of social capital

was the presence of formal and customary institutions to organize community life within the cluster. In terms of human resources, the relatively high levels of health and educational attainment within the community were identified as sources of strength.

Table 5. Strengths, weaknesses, opportunities and threats in relation to the five primary forms of capital impacting community livelihoods

Capital	Strengths	Weaknesses	Opportunities	Threats
Natural	High level of natural biodiversity (flora and fauna) (1.67)	Steep surfaces causing natural disasters such as landslides (2)	Opportunities for tourism and eco-tourism, with beautiful natural forests (1)	High level of required collateral threatens debtors in cases where they are unable to repay loans (1)
	Availability of materials to produce compost, animal fodder etc (2)	Swine infestations resulting in destruction of gardens and farm land (4)	Opportunities to sell compost, manure and animal cages (2)	Interest rates, at double the standard level, from loan sharks threaten debtors (2)
	Homogenous pine forests in good condition (2.67)		Opportunities to construct reservoirs due to the good condition of springs and rivers (2.5)	Forest fires and illegal logging threaten the condition of the forests (decline in extent and quality of forests) (3)
	Springs in good condition (2.67)		Opportunities to produce packaged coffee (3)	Sub optimal levels of agricultural production because of lack of facilitation (3)
	High-value agricultural crops (coffee and horticultural products) with good potential (2.67)		High-quality agricultural produce creates market opportunities involving purchasers from outside the area (4)	Purchasers and coffee traders manipulate prices at harvest time, threatening the economic conditions of farmers (4)
	Secondary forests (mixed) in good condition (3)			Issues related to underage marriage (4)
	Fertile soils (3)			Security issues resulting from dysfunctional state of community security system (4)
	Rice fields in good condition (3)			
	Rivers in good condition (3.67)			
	Many large multi-crop gardens (4)			
Infrastructure	Adequate health facilities (2)	Sub-optimal health services (2.5)		
	Community empowerement programactively improving infrastructure (2)	Limited availability of washing and bathing facilities, poor sanitation (3)		
	Banking facilities in the sub-district capital (2)	Inadequate village infrastructure (village office, water tanks) (3)		
	Stateelectricity supply is available (2.5)	Size of the region is not proportional to the number of inhabitants (3)		
	Educational facilities from primary to senior secondary levels are available (3.3)	Electricity supply facilities are poorly maintained (3)		
	Large number of religious facilities (4)	Limited irrigation channels (3.33)		
		Poor state of main village roads (3.67)		
		Reservoirs in poor condition (damaged) (4)		

Economic	Access to credit from banks (3) Easy access to credit from non-bank institutions (4) Easy access to pawnshops (4) Good income from the sale of agricultural produce (4)	High interest rates from savings-and-loans groups (1) Large number of loan sharks (3) Limited number of village markets (3) Limited effectiveness of cooperatives (limited capital)(3) Inactive village cooperatives (3.5) Limited access to agricultural markets (4)
Human	Facilitation provided to groups by AgFor project (1) Active community empowerment groups (PKK and majelistaklim) (2.3) Industrious, productive community members (2.5) High level of community skills (2.5) High proportion of community with higher education (undergraduate level) (2.67) Good community health (3)	Burden created by residents of a non-productive age (2) Underage marriage (free association between the sexes) (2.5) Limited sustainable facilitation in the area of agricultural and other skills (3.5)
Social	Group facilitation provided by AgFor project (1) Active community empowerment groups (2.33) High level of mutual aid (3.33) Active women's empowerment groups (savings-and-loans groups) (4) Strong system of traditional law and institutions (6)	Inactive farmers groups (2.67) Dysfunctional community security system (3) Inactive youth groups (4) Traditional institutions declining as a result of modernization (4)

**) : Scores within brackets ( ) are derived from focus-group discussions: 4= highest; 1= lowest.*

The most important identified weakness in terms of natural resources was the limited ability to control incursions by wild swine that resulted in destruction ofgardens and agricultural land. In terms of infrastructure, identified weaknesses included damage to dams and two principal village roads. In terms of economic capital, identified weaknesses included limited access to agricultural markets. In terms of human resources, identified weaknesses included a lack of continuing guidance and mentoring to develop agricultural and other skills. In terms of social capital, the principal weakness related to the impact of modernization, which is displacing local cultures.

The wide availability of land for the development of agroforestry gardens and the high level of fertility of the soil, together with well-maintained forest resources, represented the greatest opportunity for communities within the Tompobulu Cluster. These opportunities couldbe developed through facilitating access to markets for high-value agricultural commodities and the production of packaged coffee. However, communities within the Tompobulu Cluster also faced three significant threats, these being manipulation of coffee prices by traders and middlemen, the tendency for marriage at an early age, and poor security resulting from an ineffective community security system.

Summary of findings

- Multi-crop (agroforestry) systems used for the cultivation of commodities, including cloves, cocoa, coffee and 'randu' (kapok) cover 50% of the total land area of the Tompobulu Cluster.
- The high variation between rainfall in the dry and rainy seasons and the frequent occurrence of landslides werethe most importantissues affecting the quality and availability of water. Changes to land cover involving the conversion of forests to other uses have resulted in a deterioration in the extent of forest cover, which has resulted in a decline in the ability of the forest to protect water quality and availability.
- The majority of members of communities within the TompobuluCluster derived their livelihoods fromfarming, with these livelihoods being heavily dependent on products of agroforestry, including coffee, clove and cocoa, with these crops being cultivated in forested areas (pine and mixed forests) and agroforestry gardens.
- Within the Tompobulu Cluster, agroforestry systems used for the cultivation of coffee provided the main source of livelihoods, with products derived from forests, including pine and rattan, providing a secondary source of livelihoods. In the long term, coffee and clove werethe commodities that provided the greatest contribution to community incomes. Female members of the community considered that the most important crops in terms of their contribution to income werecocoa, 'suren' and 'langsat', while male members of the community considered timber trees, such as suren, 'bayangjawa', 'sengon' and 'jabon' to be more important.
- The most importantidentified strengths in terms of community livelihoods were1) agroforestry systems, rivers and forests in good condition; 2) high-value agricultural commodities; 3) fertile soil.Community livelihoods couldbe developed and improved by building on the most important opportunity, which is the potential for the development of markets for agricultural projects.

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