Working Paper

Gender perspectives in smallholder farming practices in Lantapan, Philippines

Joan U. Ureta, Kharmina Paola A. Evangelista, Christine Marie D. Habito and Rodel D. Lasco

World Agroforestry Centre

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Abstract

Tree-based farming systems are beneficial both for poverty alleviation and environmental conservation. Despite the growing body of literature supporting the benefits of integrating trees on farm, local perceptions play a larger role in the decision-making of smallholder farmers, especially those who have limited access to scientific studies. This paper explores the priority farming systems and tree species of female and male smallholder farmers in Lantapan, Bukidnon, as well as the reasons for their preferences. Using the Analytical Hierarchical Process (AHP), their criteria for crop selection were compared and generated weights were used to assess their priority species. Findings showed that financial benefits of farming systems and tree species were the main consideration of both male and female farmers. Although profit maximization and supply of building materials were their main criteria for tree species selection, women and men also considered different aspects of well-being (i.e. regulatory services, food security). Results indicated that both female and male farmers preferred crop-based farms over tree-based farms. In terms of tree species, female farmers highly preferred plantation crops and timber trees, while male farmers favored fruit trees. The findings of the study could be used in crafting a gender-sensitive co-investment scheme that would support the promotion of climate-smart, tree-based agriculture in the area.

Keywords: agroforestry, tree-based farming, farmers' preferences, analytical hierarchical process

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Introduction

Over the last few decades, the value of integrating trees into agricultural landscapes has been receiving much attention. The need for more sustainable agricultural production systems is especially pronounced in developing countries, where the growing demand for food drives the intensification of agricultural production, further resulting in deforestation and land degradation (CCAFS 2014). This is particularly relevant in the context of Southeast Asian developing countries like the Philippines, where poor families dependent on agriculture and natural resources face the rising costs of production and marketing (Balisacan et al. 2005), together with the negative impacts of climate change (Lasco et al. 2011). Agroforestry – the practice of deliberately incorporating trees with crops and livestock to achieve a range of benefits from their interaction (Nair 2013) – is among the land use strategies being employed in diverse settings to address rural poverty and at the same time, contribute toward environmental conservation and rehabilitation (Garrity 2004).

Years of research have established the scientific basis for promoting agroforestry adoption on a wider scale (Jose 2009). There is an increasing body of knowledge on the environmental functions of agroforestry (Guillerme et al. 2011), including biodiversity conservation, regulation of physical and chemical fluxes in ecosystems and mitigation of pollution (Nair 2008; Lasco et al. 2014). Trees on farm provide different ecosystem services such as favorable micro-climate, permanent cover, improved soil structure and organic carbon content, increased infiltration, reduced erosion and enhanced soil fertility, all of which contribute toward improving the overall productivity of the land (Branca et al. 2013). They also enhance the resilience of poor farming households to risks and external shocks by serving as sources of livelihood and income, and facilitating higher and more stable crop yields, leading to increased system resilience, improved livelihood and food security (Branca et al. 2013). Kalaba et al. (2010) argued that compared to subsistence agriculture, agroforestry systems offer more value-added benefits through cash-income generation from marketing of diverse products.

Smallholder farmers recognize the range of benefits they derive from ecosystems, including those provided by trees and agroforestry systems (Cerdán et al. 2012, Lasco et al. 2015, Muhamad et al. 2014). In spite of these benefits, barriers to adoption and sustainability of tree-based farming still remain. Owing to their resource constraints, smallholder farmers usually choose to plant crops with high economic benefits to ensure a steady flow of income.

On the other hand, those who have ample food sources and are more willing to make investment risks are usually more likely to incorporate trees into their agricultural production systems compared to food-insecure, risk-averse farmers (Jerneck and Olsson 2013). The farmers' awareness of the ecosystem services farms provide affects their management decisions, the productivity of their farms and the quantity and quality of ecosystem services from the surrounding landscape (Cerdán et al. 2012).

In the Philippines, many upland development programs (e.g. Community-Based Forest Management, Upland Agroforestry Program, National Greening Program) adopted agroforestry as the primary production technology because of its potential to provide socio-economic opportunities while ensuring environmental stability (Visco 2011). Moreover, various organizations including government agencies, non-government organizations (NGOs) and academic institutions are actively pursuing research and development programs in agroforestry (Visco et al. 2011, Tolentino and Landicho 2011).

For instance, Magcale-Macandog et al. (2010) explored the contribution of agroforestry to household food security in the municipality of Claveria, Misamis Oriental, and found that fruit trees supplemented farming families' food supply during lean periods in the cropping calendar. Like Claveria, the municipality of Lantapan in the province of Bukidnon is one of the areas in the Philippines where agroforestry has been promoted for a long time. However, despite consistent efforts to encourage farmers to integrate trees on their farm, agroforestry areas in the municipality shrunk by 60% from 1990-2007, while the area of crop-based farms has continued to rise (Pillerin et al. 2010).

It is important to expose the underlying reasons for the slow (and sometimes declining) application of agroforestry among smallholder farmers, especially within the combined context of food insecurity, agricultural intensification, and climate change. Through the understanding of smallholders' preference on their agricultural practices, such as on the selection of farming system and tree species, the development agency can formulate the proper program that address the local needs provided with the local knowledge as the basis. This paper explores the selection criteria and the priority farming systems and tree species of smallholder farmers in Lantapan, Bukidnon. More specifically, it examines the major considerations of female and male farmers in their selection of farming systems (i.e. primary crops/crop combinations), and identifies their priority farming systems based on their own criteria. In addition, it also studies the priority tree species of the farmers and their criteria for selection trees for tree-based farming and/or agroforestry.

This study is part of the three-year project of the World Agroforestry Centre (ICRAF) entitled *Climate-smart, tree-based, co-investment in adaptation and mitigation in Asia* (Smart Tree-Invest) which aims to improve the livelihoods and resilience of smallholder farmers through the promotion of climate-smart, tree-based agriculture.

Materials and Methods

Study site

The study site is located in the municipality of Lantapan, a first class municipality in the mid-portions of the province of Bukidnon in the southern Philippines. It is approximately 65

kilometers (aerial distance) southeast of Cagayan de Oro City and is situated between the cities of Valencia and Malaybalay. It lies at the foot of Mt. Kitanglad, a Key Biodiversity Area (KBA), an Important Bird Area (IBA) and an ASEAN Heritage Park of the country.

Based on the Modified Corona's Classification of Climate, the municipality has Type IV climate that is characterized by more or less evenly distributed rainfall throughout the year and indistinct dry and wet seasons. Its elevation ranges from 320 to 2,938 meters above sea level (masl), wherein most parts of the area have the topography of slight to moderate terrain and hills. It has a volcanic soil belonging to the Adtuyon and Kidapawan clay, which are highly suitable for agriculture.

The study was focused on the three largest sub-watersheds of the municipality of Lantapan, namely, Tugasan, Alanib and Kulasihan. They were referred to as "cluster sites" in this project, representing landscapes with interrelated ecological processes. The sub-watersheds drain into the Manupali River, and consequently into the Pulangui River (Pulangui IV Reservoir) — an important source of irrigation and electric hydropower in Bukidnon (Rola et al. 2004). Aside from watershed services, these clusters contribute to the food security of the entire region. Farming is the primary source of income of majority of the residents. In addition, large agricultural companies operate in the municipality, particularly in the Alanib and Kulasihan clusters. Hence, Alienable and Disposable (A&D) lands[1] of the clusters are usually devoted to agricultural activities. Table 1 shows the biophysical and physical characteristics of the clusters.

Table 1. Characteristics of the cluster sites

Characteristics	Tugasan	Alanib	Kulasihan
Biophysical			
Area (hectares)	4,879.29	6,595.83	10,075.52
% timberland	84.54	48.00	27.00
% A&D lands	15.46	52.00	73.00
Elevation (masl)	1,000- 2,700	500-2,900	300-2700
Villages covered	Kibangay, Basac	Songco, Alanib, Kaatuan, Baclayon, Poblacion, Balila	Alanib, Poblacion, Bugcaon, Kaatuan, Bantuanon, Capt. Juan, Kulasihan

[1]Alienable and Disposable (A&D) lands refers to those lands of the public domain which have been the subject of the present system of classification and declared as not needed for forest purposes

Characteristics	Tugasan	Alanib	Kulasihan
Socio-economic			
Livelihood	80% of the households are involved in farming	60% of the households are involved in farming	Majority are involved in farming while others work as labourers in agricultural companies
Dominant commodities	vegetables, maize, coffee and sugarcane	vegetables, maize, banana	maize, rice, coffee, sugarcane and root crops

Sampled villages (*barangays*) were chosen in each cluster to represent the upland, midland, and lowland areas. The Alanib cluster is represented by barangays Songco, Alanib, and Balila while barangays Kaatuan, Bantuanon, and Kulasihan represent the Kulasihan cluster. Meanwhile, the Tugasan cluster is composed of only one village — barangay Kibangay. **Figure 1** shows the land cover map of the study site.

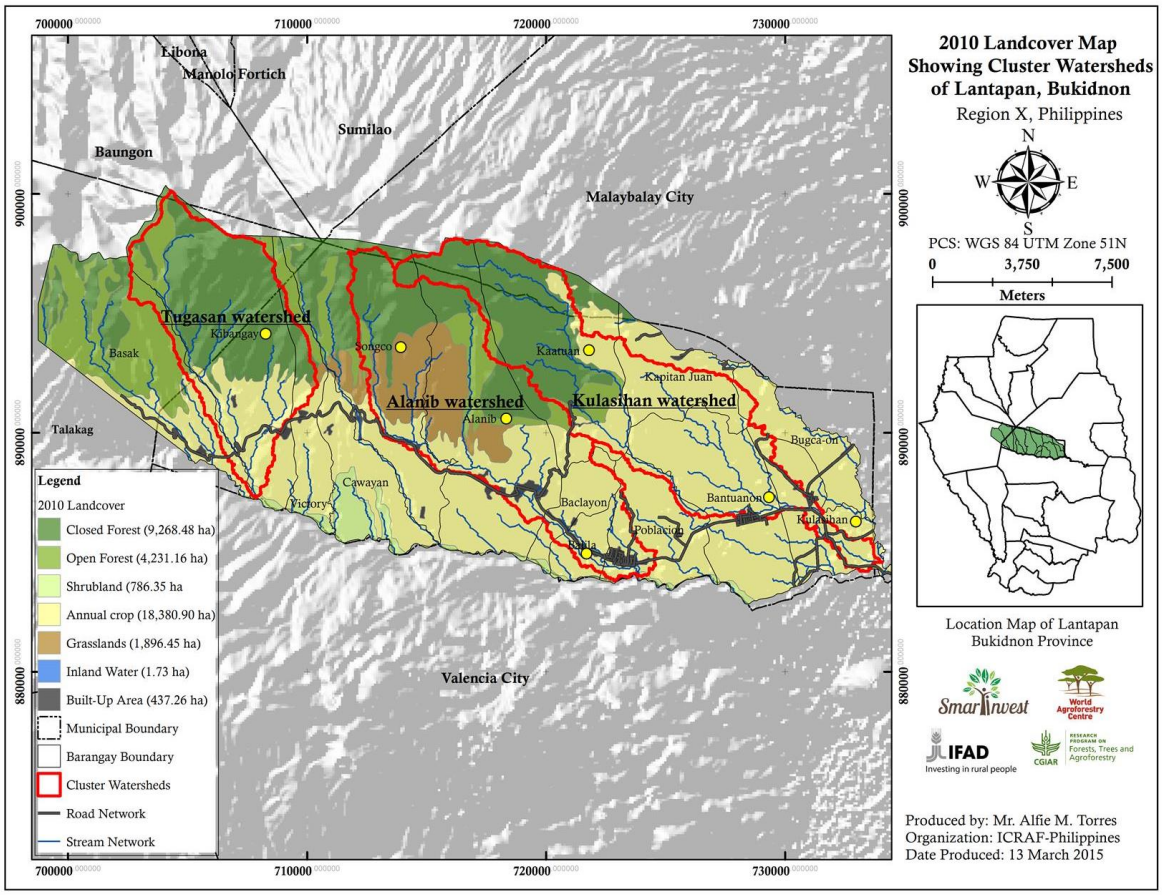

Figure 1. Land cover map of the study site in Lantapan, Bukidnon, Philippines

Data collection

The data collection followed the Capacity Strengthening Approach to Vulnerability Assessment (CaSAVA) method, which uses a participatory approach to collect gender-disaggregated information, while strengthening the awareness and capacity of the respondents to think about and articulate latent problems in the community (Dewi et al. 2013). Focus

group discussions (FGDs) on tree and farming systems (TFS) were conducted in each cluster to assess the crop and tree species preferences of smallholder farmers. Two groups of participants were invited, of which one group was composed of male smallholder farmers, while the other of female smallholder farmers, with the participants ranging from seven to 17 persons in each group.

The FGD on TFS was patterned from two tools namely, gender perspectives in selecting tree species (G-TreeFarm) and tree and farming system resilience to climate change and market fluctuations (Treesilience) (van Noordwijk et al. 2013). The tools aim to assess the resilience of the most dominant tree species and farming systems to extraordinary climate- and market-related events. During the discussion, the participants also discussed how these species and systems will be used for environmental conservation planning and in coping with any shock that may occur in the cluster.

Data analysis

To understand how farm decisions on crop selection were made, we applied the Analytical Hierarchical Process (AHP) tool to rank the main criteria of female and male farmers in selecting farming systems and tree species. This tool for decision-making uses pairwise comparisons and relies on expert judgment to derive priority scales (Saaty 2008). The farmers' knowledge of the benefits and constraints of growing certain crop species was valuable in identifying the best alternative (farming systems and tree species) for the cluster.

For this study, AHP was done on two levels. The first level focused on assigning weights to the criteria: participants were asked to enumerate their top three to four major considerations in selecting farming systems. An AHP matrix was used to compare these criteria depending on their importance to the farmers. Table 2 shows the comparison scale which was adopted in the study. The second level of analysis involved determining the most preferred farming systems. In order to derive the overall score and ranking of farming systems, an AHP matrix was used per criterion then the results of the per criterion analysis were combined. A similar process was followed in determining the priority tree species of smallholder farmers.

Table 2. Analytical hierarchical process (AHP) comparison scale used in the study

Intensity of importance	Definition
1	Two options have equal importance
3	Moderate importance of one over another
5	Strong importance of one over another
Reciprocals of above	If factor *i* has one of the above numbers assigned to it when compared to factor *j*, then *j* has the reciprocal value when compared with *i*

Source: Saaty 2008

Results

Socioeconomic characteristics of FGD participants

A total of 63 smallholder farmers participated in the six FGDs in the three clusters, with roughly 40-60 representation of male versus female respondents. Majority of them were members of the *Talaandig* tribe, one of the seven tribes of Bukidnon. Participants' ages ranged from 20 to 84 years old and most of them reached secondary education (Table 3). On the average, male participants owned larger land parcels, and also earned more than double the gross annual income of female participants. Almost all participants derived income from on-farm activities, although others also had off- and non-farm livelihood sources. Compared to male participants, the female participants had a lower mean percentage of on-farm income in relation to total household income. This indicates that though women have lower gross annual incomes, they tend to diversify their sources of income (i.e., off- and non-farm) more than men.

Table 3. Descriptive statistics of FGD participants in Lantapan, Bukidnon, Philippines, 2015

Characteristics	Male n=26	Female n=37
Cluster (count)		
Tugasan	7	12
Alanib	10	17
Kulasihan	9	8
Age (yrs)		
Mean	47.1	43.6
Range	21-84	20-65
Highest education attainment (%)		
Elementary level/graduate	30.8	28.1
High school level/graduate	42.3	50.0
College level/graduate	26.9	21.9
Land holdings (hectare)		
Mean	1.5	0.9
Range	0.0-5.0	0.0-2.5
Gross annual income, in PhP (USD)		
Mean	34,192.31 (744)	16,419.35 (357)
Has on-farm income (%)	96.2	96.9
Has off-farm income (%)	23.1	59.4
Has non-farm income (%)	19.2	40.6
Percentage of on-farm income in relation to the total household income (%)		
Mean	76.0	60.4
Range	0-100	0-100

Note: Official exchange rate is 1PHP= USD 45.98 as of 15 October 2015, available at http://www.bsp.gov.ph/statistics/sdds/exchrate.htm

Benefits of dominant farming systems and tree species in the clusters

Trees and farming systems provide diverse benefits to smallholder farmers in Lantapan, Bukidnon. Aside from their importance to livelihood, some of the systems also contribute to household food security and could be sources of medicine, building material and fuelwood, among others.

Benefits of farming systems. Smallholder farmers in the three clusters usually managed crop-based farming systems. Majority of them planted corn, sugarcane, vegetables and other short-term yielding crops. On the other hand, trees were usually planted along the boundaries of the farm and were only considered as secondary commodities. Due to unstable prices of tree products and longer return-on-investment, the participants considered tree plantations as less attractive compared to crop-based farming systems, wherein commodities already have established markets. As presented in Table 4, monoculture plantations of timber trees were only prevalent in the Tugasan cluster. In the other two clusters, trees were usually planted with other crops.

Table 4. List of most dominant farming systems in the project clusters as perceived by smallholder farmers

Types of Farming System	Cluster			
	Tugasan	**Alanib**	**Kulasihan**	**All**
A. Crop-based				
1. Monoculture				
• beans, bell pepper, cabbage, carrots, Chinese cabbage, lettuce, potato, squash, sweet potato, tomato, white beans	x			
• papaya, rice, vegetables, purple yam			x	
• Banana	x	x		
• Cassava	x		x	
• corn, sugarcane				x
2. Multiple cropping				
• banana-vegetables, broccoli-cauliflower, cabbage-Chinese cabbage, lettuce-pechay, corn-squash, sweet peas- corn	x			
• cabbage-carrots-tomato-broccoli, cabbage-Chinese pechay-broccoli, sweet peas-beans-bell pepper		x		
• banana-corn		x	x	
• corn-vegetables, squash-banana, banana-purple yam			x	
B. Tree-based				
1. Monoculture				
• coffee, eucalyptus, falcata, gmelina	x			
2. Multiple cropping				
• corn-eucalyptus-gmelina-banana	x			
• Brazilian fire tree-corn, coffee-abaca-root crops, lanzones-durian-mangosteen-coffee		x		
• coffee-banana			x	

The smallholder farmers acknowledged the importance of both crop-based and tree-based farming systems as sources of cash. However, they cited that crop-based farming systems were a more common source of income than tree-based systems. In terms of non-cash benefits, smallholder farmers perceived that crop-based farming systems outweigh those of the tree-based. Table 5 shows that crop-based farming systems are sources of food, medicine, building material, raw material for crafts and accessories and feeds for the animals. Some of the crops were also planted for their aesthetic and cultural values. Although some of the tree-based farming systems were also sources of food and medicine, farmers pointed out that they were less dependent on them. They mentioned that tree-based farming systems were more useful in providing building material and fuelwood.

Table 5. Benefits of the most common farming systems in the clusters as perceived by smallholder farmers

Benefits of Farming Systems	Proportion of crop-based farming systems (%)			Proportionof tree-based farming systems (%)		
	Tugasan n=22	Alanib n=7	Kulasihan n=11	Tugasan n=5	Alanib n=3	Kulasihan n=1
Source of cash	100.00	100.00	100.00	100.00	100.00	100.00
Source of food	100.00	85.71	100.00	40.00	100.00	100.00
Medicine		57.14	18.18		66.67	
Building material			18.18	60.00	33.34	
Energy/ fuel				20.00		
Raw material crafts/ accessories		14.29	9.09			
Aesthetic and cultural			27.27			
Food for the animals	14.27		27.27			

Benefits of tree species. Smallholder farmers derived several benefits from dominant trees species in the clusters. For this study, the dominant trees species are those which collectively occupy at least one hectare of land in the cluster. The FGD results showed that most of the dominant trees are timber trees. As presented in Table 6, common to all clusters were eucalyptus, falcata, gmelina and mahogany. The planting of timber trees was advocated for watershed rehabilitation by the LGU and other NGOs back in the 1990s.

Many farmers planted Brazilian fire tree because it has the shortest growing period among the timber trees common in the area. Some farmers were also given free seedlings which they planted in their own lands. In terms of plantation crops, rubber is the only species abundant in the whole study site. Recently, rubber plantations were gaining popularity in Lantapan, especially in Kulasihan Cluster, since they could provide a regular source of monthly income, unlike timber and fruit trees. Although fruit trees were common in the Tugasan and Kulasihan clusters, fruit tree plantations can hardly be found across the clusters. They were usually integrated in crop-based farms and considered as secondary commodities.

Table 6. List of most dominant tree species in the project clusters as perceived by smallholder farmers

Types of Trees	Cluster			
	Tugasan	Alanib	Kulasihan	All
A. Timber trees				
• acacia mangium	x			
• african tulip, giant falcata, musizi		x		
• Brazilian fire tree		x	x	
• eucalyptus, falcata, gmelina, mahogany				x
B. Fruit trees				
• orange	x			
• mango	x		x	
• avocado, durian, jackfruit, lanzones, marang, rambutan			x	
C. Plantation crops				
• coffee	x		x	
• cacao (grafted)			x	
• rubber				x

As shown in Table 7, all on-farm trees were identified as sources of cash. Moreover, many tree species in the clusters were sources of building materials and medicine. For instance, gmelina was believed to be useful for curing fractures and stomachache. Participants from the three clusters also identified mahogany as beneficial in treating diabetes and stomachache. Several trees were also used in Tugasan and Kulasihan clusters as sources of food and firewood. Although trees in the Alanib cluster could also be utilized as firewood, farmers opted not to use them for the said purpose. Lastly, only one falcata was being used as raw material for making paper and boxes.

Table 7. Benefits of dominant farm trees species in the clusters as perceived by smallholder farmers

Benefits of trees	Proportion of tree species (%)		
	Tugasan n=9	Alanib n=9	Kulasihan n=15
Source of cash	100.00	100.00	100.00
Source of food	33.34		73.34
Medicine	55.56	33.34	46.67
Building material	55.56	100.00	60.00
Energy/ fuel	77.78		80.00
Raw material crafts/ accessories			6.67

Criteria for the selection of farming systems

In selecting farming systems, smallholder farmers considered several factors, although seven criteria were identified as most important (**Figure 2**). The combined results of AHP for the

six FGDs indicate that most of the main considerations of smallholder farmers had to do with profit maximization, with the exception of 'food consumption'. The first priority – early maturity of crops (i.e. 'shorter growing period') – was essential to ensure faster return-on-investment. Following this, respondents also preferred to plant crops with reliable marketing channels (i.e. 'easy to market') to lessen the risk of financial loss. They argued that it was not wise to invest in high-value crops unless they could easily access the market for these products. The third priority, 'high income', is consistent with the first and second criteria, because ultimately the desired end-result of the first two priorities is to generate the highest possible income from on-farm activities. Although farmers also valued the contribution of crops to household food supply (i.e. 'food consumption'), profitability indicators once again emerged as the fifth ('low capital requirement') and sixth ('high selling price') priorities. Last among their main considerations was 'high frequency of harvest', which was said to be important for ensuring a continuous flow of income during each harvest season.

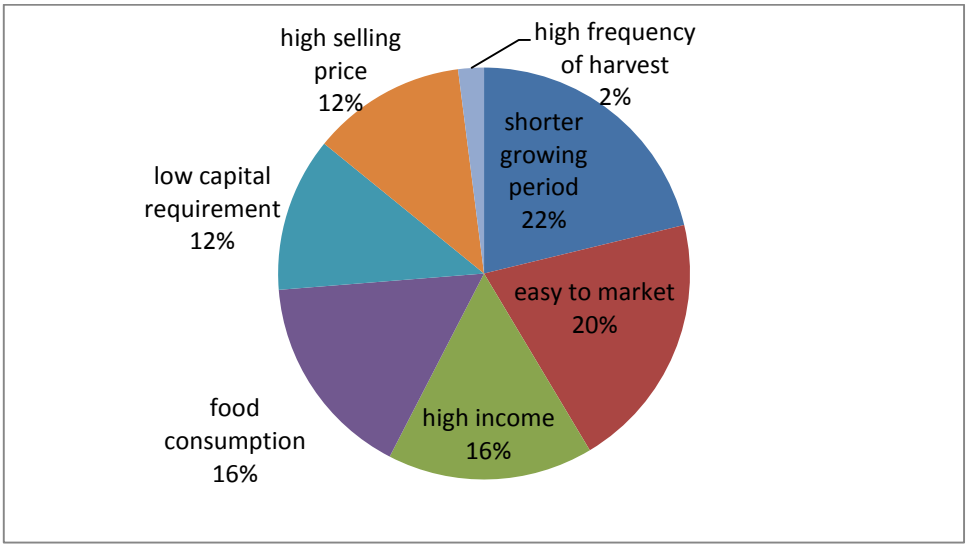

Figure 2. Male and female smallholder farmers' criteria for selecting farming systems (with computed weights for all three clusters), Lantapan, Bukidnon, Philippines, 2015

Women's criteria for selecting farming systems. Table 8 presents the criteria used by female farmers in their selection of farming systems. Results show that economic factors and food supply are both important to women. In the Tugasan cluster, equal weights were computed for 'high selling price' and 'low capital'. Women also preferred to plant crops with 'shorter growing periods' to ensure a steady flow of income for the family through faster return-on-investment.

Meanwhile, majority of female farmers in Alanib cluster preferred farming systems which could be reliable sources of food for the household. They reported that the entry of multinational companies in the area resulted in a shift of livelihood among male farmers – some of whom decided to work in the companies and pass the responsibility of managing their farms to their wives. Since farming became only a secondary source of income for the family, women prioritized its contribution for augmenting more the household food supply

rather than the household income. Nevertheless, they still considered ‘high income’ and ‘high frequency of harvest’ as important selection criteria.

Similarly, female farmers in the Kulasihan cluster also highly preferred farming systems that could generate ‘high income’. These included commodities with ‘high selling prices’ yet with ‘low input costs’. Ease of marketing of the farm products and contribution to household food security were also important to women from this cluster.

Table 8. Female groups’ criteria ftor the selection of farming systems, Lantapan, Bukidnon, Philippines, 2015

Criteria (female)	Tugasan	Alanib	Kulasihan	All clusters	Rank
high income		0.22	0.58	0.27	**1.0**
food consumption		0.65	0.14	0.26	**2.0**
low capital requirement	0.45			0.15	**3.5**
high selling price	0.45			0.15	**3.5**
easy to market			0.28	0.09	5.0
high frequency of harvest		0.13		0.04	6.0
shorter growing period	0.10			0.03	7.0
Total	**1.00**	**1.00**	**1.00**	**1.00**	

Men’s criteria for selecting farming systems. Among male farmers, the set of criteria for selecting farming systems varied across the clusters. As shown in Table 9, men were more concerned about factors that directly and indirectly affect farm production and on-farm income. For farmers in Tugasan, the main criterion was access to market of their products. The farmers pointed out that even though some crops have ‘high selling prices’ and ‘low input costs’, they could still suffer financial loss if the products could not be sold immediately. Since there are no post-harvest facilities in the village, delays in selling of products could damage the quality of crops, and thus reduce their income.

In the Alanib and Kulasihan clusters, some men preferred producing commodities that had ‘shorter growing periods’. As the providers of their families, they wanted to plant crops which could generate regular income, and be harvested within the span of a year. Only male farmers from the Kulasihan cluster identified household ‘food consumption’ considerations among their selection criteria.

Table 9. Male groups' criteria for selection of farming systems, Lantapan, Bukidnon, Philippines, 2015

Criteria (male)	Tugasan	Alanib	Kulasihan	All clusters	Rank
shorter growing period		0.66	0.52	0.39	**1.0**
easy to market	0.64		0.30	0.31	**2.0**
low capital requirement	0.10	0.16		0.09	**3.5**
high selling price	0.26			0.09	**3.5**
high income		0.18		0.06	5.5
food consumption			0.18	0.06	5.5
high frequency of harvest				0.00	7.0
Total	**1.00**	**1.00**	**1.00**	**1.00**	

Priority farming systems of smallholder farmers

Using the weights generated through AHP, the preferred farming systems across the clusters were compared and prioritized. Results show that most of the preferred farming systems are crop-based, with multiple cropping systems of corn and banana given the highest priority (**Table 10**). Monocrop farms of rice and corn are likewise important, while most of the other primary commodities are vegetables. Meanwhile, only nine farming systems are tree-based, out of the 25 priority farming systems.

Table 10. Most preferred farming systems of smallholder farmers in Lantapan, Bukidnon, Philippines, 2015

Rank	Farming system	Overall weight	Rank	Farming system	Overall weight
1.0	corn-banana	0.171	14.0	cabbage	0.021
2.0	rice	0.142	15.5	banana-cassava	0.018
3.0	corn	0.133	15.5	coffee- root crops	0.018
5.0	cauliflower-broccoli	0.054	17.5	coffee-Brazilian fire tree	0.017
5.0	cacao-banana	0.054	17.5	cassava-Brazilian fire tree	0.017
5.0	sweet peas	0.054	19.0	cabbage-Chinese cabbage	0.016
7.0	vegetables-corn-peanut	0.039	20.0	cacao-purple yam	0.015
8.5	vegetables	0.035	21.0	squash	0.013
8.5	coffee-banana	0.035	22.0	tomato	0.011
10.0	lettuce	0.034	23.0	coffee-falcata	0.008
11.0	purple yam	0.033	24.0	lanzones-coffee	0.007
12.0	coffee-abaca-root crops	0.026	25.0	sugarcane	0.006
13.0	turnip	0.023			
				Total	**1.000**

Women's preferred farming systems. AHP results showed that crop-based farms were highly preferred by female farmers in the three clusters. **Figure 3** presents the ranking of the most preferred farming systems of female farmers; with 1 being the most preferred while 7 the

least. It indicates that in the Tugasan and Kulasihan clusters, all preferred farming systems are crop-based farms. It was only in Alanib cluster that different types of tree-based farms were identified. This could be partly attributed to the presence of successful agroforestry farms within the Alanib cluster. ICRAF, together with other organizations such as the Landcare Foundation of the Philippines, has been promoting agroforestry in the area for more than a decade. Female farmers, especially those who are residing in Barangay Songco, have been actively participating in these programs for years. The Binahon Agroforestry Farm, a demonstration site for agroforestry practices, is likewise located in the said cluster. Also, there have been several beneficiaries of the National Power Corporation (NAPOCOR)'s Family Approach to Reforestation and Agroforestry Development Project in the area.

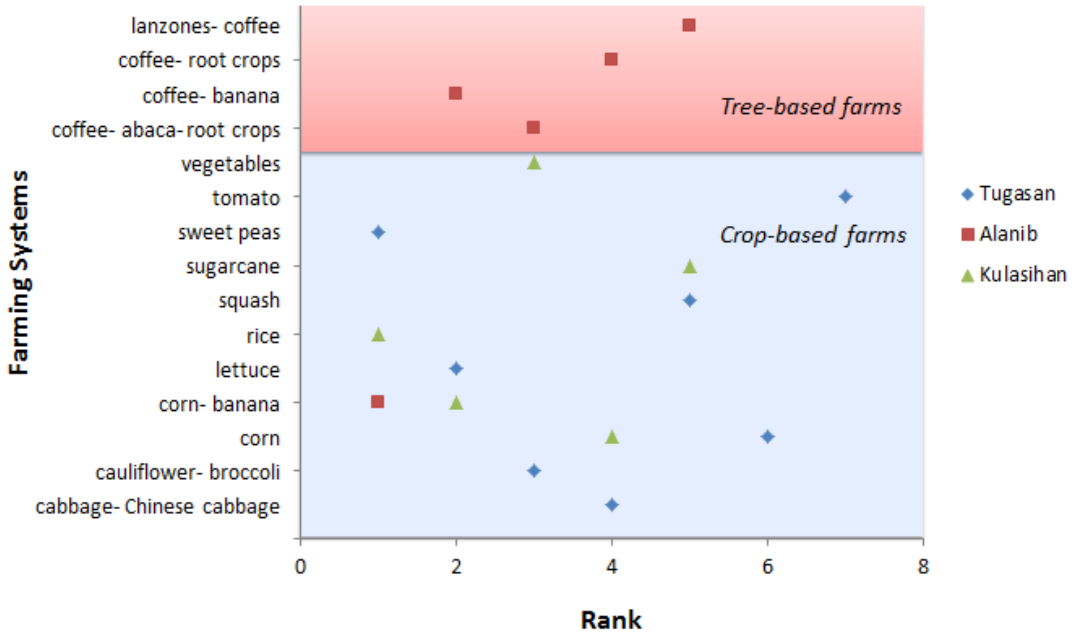

Figure 3. Farming systems ranking of female farmers in Lantapan, Bukidnon, Philippines

Female farmers in the three clusters had different priority commodities. Most of the favored farming systems of women in Tugasan were monoculture plantations of vegetables, with sweet peas given the highest priority. This is because relative to other priority commodities, sweet peas were said to have the highest selling price, shortest growing period, and had the second lowest capital requirement (next to lettuce), as ranked by the participants.

In the Alanib cluster, female farmers generally preferred multiple cropping of perennial crops, including coffee as a common commodity. Respondents explained that coffee is easier to maintain, and requires less labor compared to other crop types. In spite of this, multiple cropping of corn and banana is still the most preferred farming system, mainly because it ranked highest for the criteria of 'food consumption' and 'high income', and second highest for 'high frequency of harvest' (next to banana-abaca-root crop systems).

Meanwhile in the Kulasihan cluster, rice was the most preferred commodity because respondents believed that it generated the highest income, could be easily sold, and also contributed to household food security. The staple crop corn was also important, whether intercropped with banana, or planted on its own. Vegetables and sugarcane were likewise important commodities in this cluster. Only Kulasihan cluster produces rice in the entire municipality of Lantapan.

Men's preferred farming systems. Majority of the preferred farming systems identified by male farmers were crop-based (**Figure 4**). Among 14 types of farming systems that were enumerated, only four had trees as the main commodity. In the Alanib and Kulasihan clusters, crop-based farms were preferred, yet they also favored some tree-based systems. However, in the Tugasan cluster, all of the preferred farming systems were purely crop-based. This indicates that male farmers belonging to this cluster perceived crop-based farming systems as having greater overall benefits (i.e. high selling price, easy to market, low capital) than tree-based combinations.

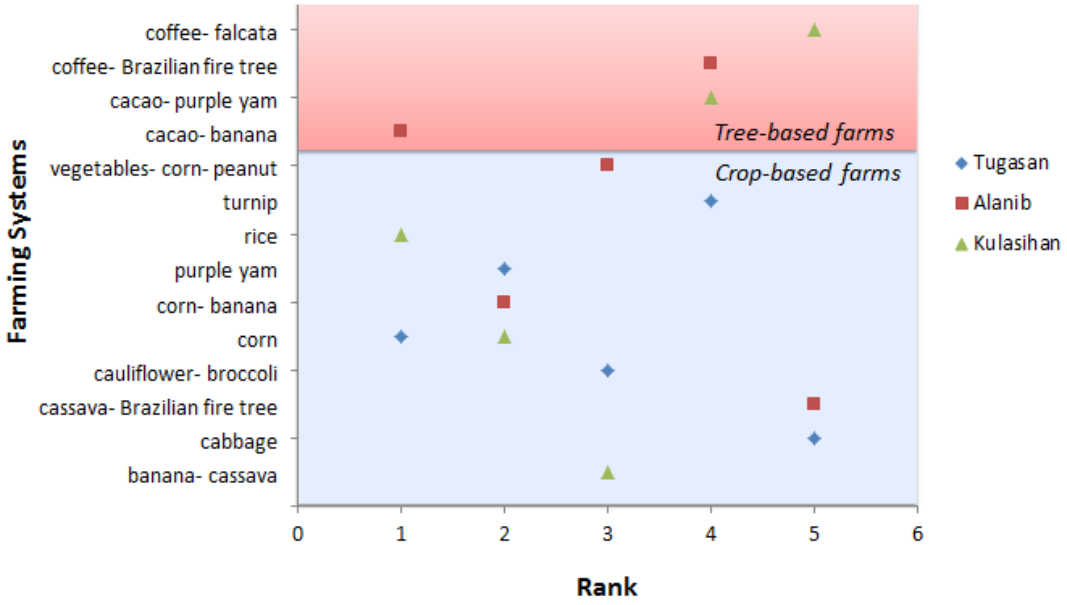

Figure 4. Farming systems ranking of male farmers in Lantapan, Bukidnon, 2015

Corn production was the most desirable farming system for male farmers belonging to the Tugasan cluster, largely because corn was ranked first in terms of ease of marketing. This was not surprising, since corn, along with rice, is the staple food in these communities (Rola et.al 2007). Hence, there is already a stable market for corn within the clusters and even in the whole province. Although corn has a low selling price relative to other farm commodities, it was still preferred by the majority of male farmers because it has low capital requirements. On the other hand, multiple cropping of cauliflower and broccoli offered the highest selling price.

Male farmers in the Kulasihan cluster also preferred crop-based plantations, particularly monoculture plantations of rice and corn, since they have the shortest growing periods. Moreover, they said that these commodities contributed to household food supply, and at the same time, were easy to sell. The opposite was true for tree-based farms – participants reported that access to markets has been one of the major challenges among those with tree-based farming systems.

In the Alanib cluster, respondents highly preferred multiple cropping of vegetables-corn-peanut, followed by mixed cropping of banana and corn. These types of farming systems were favored over tree-based farming systems because respondents believed that the former generated relatively higher incomes, and could be grown over shorter time spans than the latter. On the other hand, farmers perceived that maintenance of tree-based farming systems have lower input costs because they require less fertilizers and pesticides than crop-based systems. However, they generate relatively low incomes because of unstable prices of tree products and lack of buyers. Hence, to make tree-based farming profitable, farmers belonging to the Alanib cluster planted trees alongside other higher-value crops, such as banana and cassava.

Comparing women's and men's priority farming systems. **Table 11** shows that among female farmers, corn-banana and pure corn are the only farming systems identified as high priority in two clusters. The rest of the priority farming systems identified in the women's groups are quite diverse. Among the male farmers, corn and rice farming systems are commonly important across the clusters, while multicropped banana is also considered highly important in the Alanib and Kulasihan clusters, in corn-banana and banana-cassava systems respectively.

Table 11. Priority farming systems of female and male farmers, by cluster, Lantapan, Bukidnon, 2015

Farming system	Main commodities	Women			Men			Overall weight	Rank
		TUG	ALA	KUL	TUG	ALA	KUL		
CB	corn-banana		0.489	0.294		0.243		0.171	1.0
CB	rice			0.340			0.514	0.142	2.0
CB	corn	0.075		0.116	0.365		0.243	0.133	3.0
CB	cauliflower-broccoli	0.156			0.171			0.054	5.0
CB	sweet peas	0.323						0.054	5.0
TB	cacao-banana					0.324		0.054	5.0
CB	vegetables-corn-peanut					0.232		0.039	7.0
CB	vegetables			0.213				0.035	8.5
TB	coffee-banana		0.208					0.035	8.5
CB	lettuce	0.205						0.034	10.0
CB	purple yam				0.198			0.033	11.0
TB	coffee-abaca-root crops		0.155					0.026	12.0
CB	turnip				0.138			0.023	13.0
CB	cabbage				0.128			0.021	14.0

Farming system	Main commodities	Women			Men			Overall weight	Rank
		TUG	ALA	KUL	TUG	ALA	KUL		
CB	banana-cassava						0.107	0.018	15.5
TB	coffee-root crops		0.016					0.018	15.5
CB	cassava-Brazilian fire tree					0.099		0.017	17.5
TB	coffee-Brazilian fire tree					0.010		0.017	17.5
CB	cabbage-Chinese cabbage	0.098						0.016	19.0
TB	cacao-purple yam						0.090	0.015	20.0
CB	squash	0.078						0.013	21.0
CB	tomato	0.065						0.011	22.0
TB	coffee-falcata						0.046	0.008	23.0
TB	lanzones-coffee		0.043					0.007	24.0
CB	sugarcane			0.037				0.006	25.0

Key: TUG – Tugasan, ALA – Alanib, KUL – Kulasihan, CB – Crop-based, TB – Tree-based

In addition, Table 12 illustrates the priority farming systems in each cluster and the common priorities of women and men. In the Tugasan cluster, although different weights were assigned, female and male farmers both identified corn and cauliflower-broccoli farming systems among their priorities. Alternatively, corn-banana farming systems are highly important to both women and men from the Alanib cluster, as are multicropping of cacao-banana (for the women) and coffee-banana (for the men) systems. In the Kulasihan cluster, rice farming is the highest priority of both women and men. Pure corn and corn-banana farming systems are also considered highly important. In general, only among women and men from the Alanib cluster and men from the Kulasihan cluster was there a distinctive preference for tree-based farms.

Table 12. Priority farming systems in the three clusters, by gender, Lantapan, Bukidnon, 2015

Farming Systems	Main commodities	Tugasan		Alanib		Kulasihan		Overall weight	Rank
		Women	Men	Women	Men	Women	Men		
CB	corn-banana			0.489	0.243	0.294		0.171	1.0
CB	rice					0.340	0.514	0.142	2.0
CB	corn	0.075	0.365			0.116	0.243	0.133	3.0
CB	cauliflower-broccoli	0.156	0.171					0.054	5.0
CB	sweet peas	0.323						0.054	5.0
TB	cacao-banana				0.324			0.054	5.0
CB	vegetables-corn-peanut				0.232			0.039	7.0
CB	vegetables					0.213		0.035	8.5
TB	coffee-banana			0.208				0.035	8.5
CB	lettuce	0.205						0.034	10.0
CB	purple yam		0.198					0.033	11.0
TB	coffee-abaca-root crops			0.155				0.026	12.0

Farming Systems	Main commodities	Tugasan		Alanib		Kulasihan		Overall weight	Rank
		Women	Men	Women	Men	Women	Men		
CB	turnip		0.138					0.023	13.0
CB	cabbage		0.128					0.021	14.0
CB	banana-cassava						0.107	0.018	15.5
TB	coffee-root crops			0.016				0.018	15.5
CB	cassava-Brazilian fire tree				0.099			0.017	17.5
TB	coffee-Brazilian fire tree				0.010			0.017	17.5
CB	cabbage-Chinese cabbage	0.098						0.016	19.0
TB	cacao-purple yam						0.090	0.015	20.0
CB	squash	0.078						0.013	21.0
CB	tomato	0.065						0.011	22.0
TB	coffee-falcata						0.046	0.008	23.0
TB	lanzones-coffee			0.043				0.007	24.0
CB	sugarcane					0.037		0.006	25.0

Key: TUG – Tugasan, ALA – Alanib, KUL – Kulasihan, CB – Crop-based, TB – Tree-based

Criteria for selection of tree species for agroforestry

Combining the results of six FGDs, nine major criteria were identified in selecting tree species to be incorporated in their farms. In general, most of the criteria were of economic nature, with 'high income' given the highest priority (Figure 5). Aside from the direct benefits that could be derived from trees, farmers also considered some regulatory services important, such as flood control, soil erosion prevention and environmental protection.

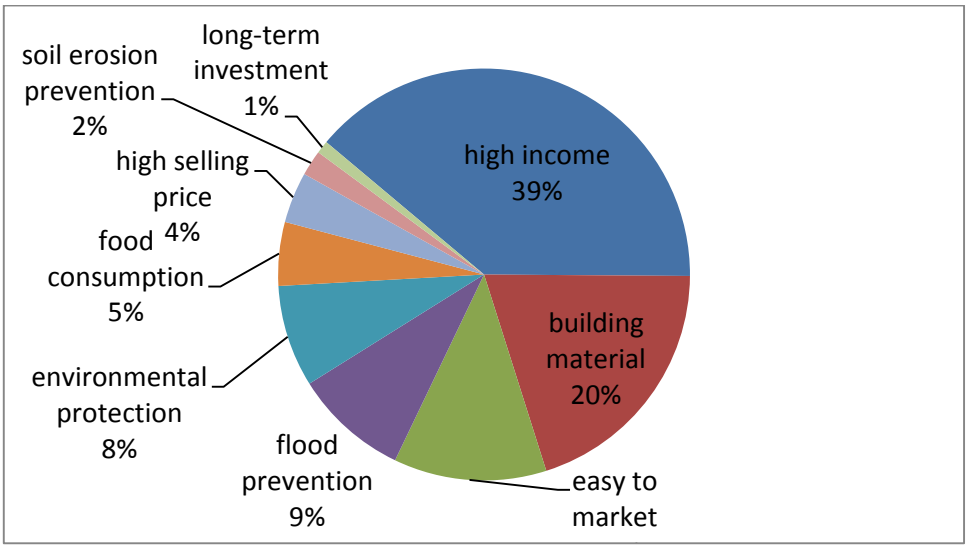

Figure 5. Smallholder farmers' criteria for selection of tree species for agroforestry (with computed weights), Lantapan, Bukidnon, 2015

Women's criteria for selection of tree species. Across the clusters, female farmers considered both the economic benefits and regulatory services of trees in selection of species (Table 13). Female farmers in Tugasan cluster highly preferred trees with high economic value, and could prevent soil erosion at the same time. Since most of their farms were located on sloping lands, trees were usually planted along farm boundaries to hold the soil and increase infiltration, especially during heavy rains.

Meanwhile, regulatory services were more valuable for female farmers in Alanib and Kulasihan clusters. In these areas, trees were also planted on farm boundaries to serve as windbreaks and to prevent flooding. Female participants from the Kulasihan cluster reported that unlike for vegetables, there is no steady market for tree products. As such, they stressed that access to market was a very important consideration in deciding whether or not to plant a particular type of tree species. Both groups from the Tugasan and Alanib clusters preferred to plant trees which could be used as building materials.

Table 13. Female groups' criteria for selection of tree species, Lantapan, Bukidnon, 2015

Criteria (female)	Tugasan	Alanib	Kulasihan	All clusters	Rank
high income	0.68	0.18	0.29	0.38	**1**
building material	0.24	0.31		0.18	**2**
flood prevention		0.51		0.17	**3**
environmental protection			0.47	0.16	4
easy to market			0.17	0.06	5
soil erosion prevention	0.08			0.03	6
long-term investment			0.07	0.02	7
Total	**1.00**	**1.00**	**1.00**	**1.00**	

Men's criteria for selection of tree species. Unlike female farmers, the major considerations of male farmers in selecting tree species for agroforestry are all economic attributes. Table 14 shows that the criterion 'high income' is the most important for the male farmers in the Tugasan and Kulasihan clusters, while in the Alanib cluster, usefulness as building material is the most important consideration. Access to market is another important consideration for participants from the Alanib and Kulasihan clusters, while both groups from Tugasan and Kulasihan also prefer planting trees which could be sources of food.

Table 14. Male groups' criteria for selection of tree species, Lantapan, Bukidnon, 2015

Criteria (male)	Tugasan	Alanib	Kulasihan	All clusters	Rank
high income	0.53		0.69	0.41	**1.0**
building material	0.22	0.46		0.23	**2.0**
easy to market		0.33	0.23	0.19	**3.0**
food consumption	0.25		0.08	0.11	4.0
high selling price		0.21		0.07	5.0
Total	1.00	1.00	1.00	1.00	

Priority tree species for agroforestry

A total of 13 priority tree species for agroforestry were identified for the three clusters. The combined results of FGDs with male and female respondents show that in general, most of the preferred tree species are fruit trees. Table 15 shows that rambutan and durian obtained the highest weighted average scores. Several timber trees were also favored by the farmers, and these dominated the list of top ten priority species. Meanwhile, some farmers preferred plantation crops such as coffee and rubber.

Table 15. Priority tree species for agroforestry of smallholder farmers in Lantapan, Bukidnon, 2015

Rank	Tree species	Overall weight	Rank	Tree species	Overall weight
1.0	Rambutan (*Nephelium lappaceum*)	0.14	8.0	Lanzones (*Lansium domesticum*)	0.06
2.0	Durian (*Durio zibethinus*)	0.13	9.5	Mahogany (*Swietenia macrophylla)*	0.05
3.0	Falcata (*Paraserianthes falcataria*)	0.12	9.5	Rubber (*Hevea brasiliensis)*	0.05
5.0	Gmelina (*Gmelina arborea*)	0.11	11.0	Santol *(Sandoricum koetjape)*	0.03
5.0	Eucalyptus (*Eucalyptus robusta*)	0.11	12.0	Musizi (*Maesopsis emenii*)	0.02
5.0	Coffee (*Coffea arabica*)	0.11	13.0	Mango (*Mangifera indica*)	0.01
7.0	Brazilian fire tree (*Schizolobium parahyba)*	0.07			
		Total			1.00

Women's preferred tree species. Female farmers assigned higher weights to timber trees (0.523) and plantation crops (0.305) compared to fruit trees (0.172) (**Figure 6**). In the Tugasan cluster, timber trees were given higher priority by female farmers because they perceived that such trees were more profitable, better sources of building material, and better in preventing soil erosion than fruit trees. Meanwhile, female farmers in Alanib cluster gave

highest weight to coffee, followed by timber trees. They argued that although coffee generated the lowest income among their preferred tree species, it is still the best for flood control. They also said it is second to Brazilian fire tree as a source of building material. On the other hand, female farmers from the Kulasihan cluster gave the highest weights to plantation crops, such as rubber and coffee. Rubber ranked first in terms of the criteria 'environmental protection' and 'high income', and it was also ranked second (next to coffee) as a 'long-term investment'. On the contrary, rubber obtained the lowest rank for the criterion 'easy to market', because respondents observed that access to market was easier for fruit trees and coffee relative to rubber.

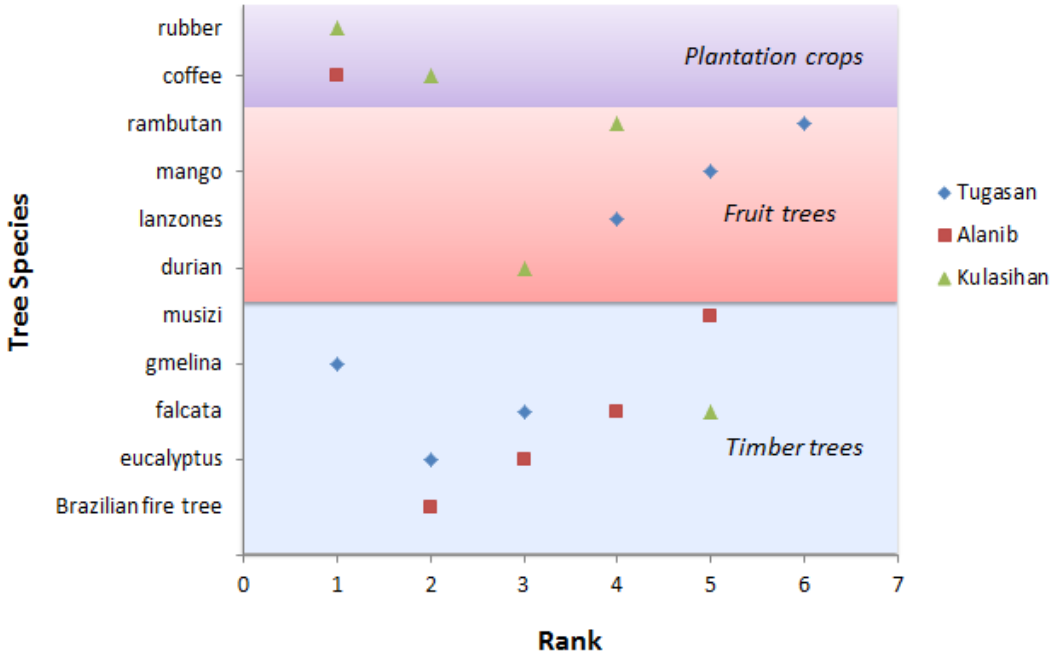

Figure 6. Ranking of female farmers for tree species for agroforestry, Lantapan, Bukidnon, 2015

Men's preferred tree species. Male farmers generally preferred certain fruit trees over timber trees. The combined weights for fruit trees were 0.56 while timber trees only scored 0.44. **Figure 7** illustrates that the top two priority species in the Tugasan and Kulasihan clusters are fruit trees. Male farmers in the Tugasan cluster perceive that fruit trees are more profitable than timber trees. Lanzones is the most preferred tree species, mainly because it is considered the most profitable, and also contributes to household food supply. However, it also obtained the lowest weight as a source of building material. In the case of Kulasihan cluster, rambutan is the most preferred tree species because it is considered the most profitable, easiest to market, and as having the highest contribution to household food security. Alternatively, male participants from the Alanib cluster preferred to plant timber over fruit trees, of which mahogany had the highest priority largely for its use as building material and its high selling price. However, it also scored the lowest in terms of ease of marketing, which was considered easiest for fruit trees like durian.

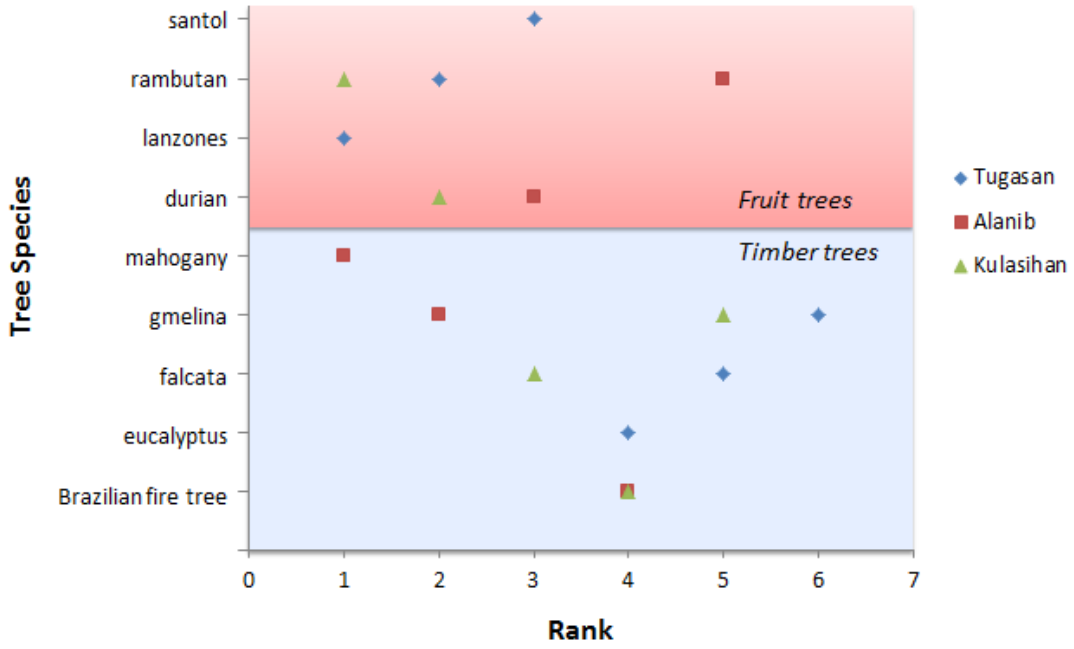

Figure 7. Ranking of male farmers for tree species for agroforestry, Lantapan, Bukidnon, Philippines, 2015

Comparing women and men's priority tree species. Table 16 illustrates that among women, falcata is a priority species across the three clusters, while coffee, rambutan and eucalyptus were identified as important in two common clusters. Among the men, rambutan and gmelina are priority species in all three clusters, while durian, falcata and Brazilian fire tree emerged in two clusters.

Table 16. Priority tree species for agroforestry of female and male farmers, by cluster, Lantapan, Bukidnon, 2015

Type of trees	Tree species	Women			Men			Overall weight	Rank
		TUG	ALA	KUL	TUG	ALA	KUL		
FT	rambutan	0.040		0.147	0.218	0.129	0.413	0.14	1.0
FT	santol				0.181			0.03	1.0
FT	durian			0.190		0.213	0.361	0.13	2.0
TT	musizi		0.107					0.02	2.0
TT	falcata	0.141	0.145	0.116	0.118		0.095	0.12	3.0
TT	gmelina	0.350			0.071	0.216	0.050	0.11	5.0
TT	eucalyptus	0.331	0.189		0.125			0.11	5.0
PC	coffee		0.367	0.271				0.11	5.0
TT	Brazilian fire tree		0.191			0.133	0.082	0.07	7.0
FT	lanzones	0.077			0.287			0.06	8.0
PC	rubber			0.276				0.05	9.5

Type of trees	Tree species	Women			Men			Overall weight	Rank
		TUG	ALA	KUL	TUG	ALA	KUL		
TT	mahogany					0.309		0.05	9.5
FT	mango	0.061						0.01	7.0

Key: TUG – Tugasan, ALA – Alanib, KUL – Kulasihan, FT – Fruit trees, TT – Timber trees, PC – Plantation crops

Table 17 shows that in the Tugasan cluster, women and men's priority tree species were quite similar (with the exception of mango and santol), whereas in the other two clusters, they were quite varied. In the Alanib cluster, male farmers seemed impartial to both non-timber and timber trees, although women highly preferred timber trees, with the exception of coffee. Meanwhile, in the Kulasihan cluster, rambutan, durian and falcata were identified as priority species in both the male and female farmers' groups. However, in general, it seemed that women in Kulasihan favored non-timber tree species, while men from the same cluster showed no distinctive preference between non-timber and timber trees.

Table 17. Priority tree species for agroforestry in the three clusters, by gender, Lantapan, Bukidnon, 2015

Type of trees	Tree species	Tugasan		Alanib		Kulasihan		Overall weight	Rank
		Women	Men	Women	Men	Women	Men		
FT	rambutan	0.040	0.218		0.129	0.147	0.413	0.14	1
FT	durian				0.213	0.190	0.361	0.13	2
TT	falcata	0.141	0.118	0.145		0.116	0.095	0.12	3
TT	gmelina	0.350	0.071		0.216		0.050	0.11	4
TT	eucalyptus	0.331	0.125	0.189				0.11	4
PC	coffee			0.367		0.271		0.11	4
TT	Brazilian fire tree			0.191	0.133		0.082	0.07	7
FT	lanzones	0.077	0.287					0.06	8
TT	mahogany				0.309			0.05	9
PC	rubber					0.276		0.05	9
FT	santol		0.181					0.03	11
TT	musizi			0.107				0.02	12
FT	mango	0.061						0.01	13

Key: TUG – Tugasan, ALA – Alanib, KUL – Kulasihan, FT – Fruit trees, TT – Timber trees, PC – Plantation crops

Discussion

Economic benefits of farming systems were major considerations of both female and male farmers.

Results of the AHP showed that the main considerations of both male and female smallholder farmers in selecting farming systems were largely economic/profit-related factors. This was not surprising since the average male smallholder farmer was earning roughly only USD 2 a day, while their female counterparts were earning short of USD 1 a day. Furthermore, farmers in the study site only had average landholdings of 1.5 and 0.9 hectares, for the male and female farmers respectively. As such, they valued the profitability of crops/trees (i.e. all factors that directly or indirectly affected income) more than their non-cash benefits (i.e. contribution to household food supply), although these were still considered important.

This observation is in line with the results of Guillerme et al. (2011), who found that the farmers' main objective was to maximize profit in the shortest possible time, especially given limited farm areas. In Lantapan, the priority given to profit maximization in the selection of farming systems could partly be attributed to the farmer's high dependence on on-farm income and lack of alternative livelihoods. Since most farmers from the area obtained at least 60% of their household income from on-farm activities, profit is usually maximized by investing in crops with shorter growing periods.

Aside from this, the sources of income chosen by household members also seemed to be associated with farming system preference. During the FGDs, farmers reported that those who relied solely on on-farm income tended to invest in crops that could generate income quickly, to meet the day-to-day needs of their families. On the contrary, farmers who earned most of their income from off- or non-farm sources preferred to plant crops for subsistence.

For example, the female farmers from the Alanib cluster usually plant crops to contribute to their household food supply. Since their husbands have other occupations, the women are more concerned with the non-cash benefits of their farms, particularly food provision. Again, this is congruent with the findings of Guillerme et al. (2011), that the lack of resources and the nature of livelihoods of the household members influence their choices of farming practices.

Contribution of farming systems to household food supply was also highly important to female farmers.

While profitability of farming systems was the foremost consideration of women and men, meeting the nutritional needs of the family also remained a key concern among female respondents. Although female farmers assigned the highest weight to crops/crop combinations that could generate high income, their secondary consideration was the contribution of those crops to household food supply.

In Lantapan, female farmers either assist their husbands in farm activities, or in the case their husbands may have other occupations, take charge of managing their farms. In either case women were still charged with the nutrition and care of household members, which might explain the priority women to give contribution of farming systems to both household income and food supply.

Male farmers, on the other hand, give more weight to purely production-related farming system attributes, and prefer crops with shorter growing periods and reliable marketing channels. Their preference for productivity criteria could be attributed to their primary roles as the providers of their families. In general, male farmers are responsible for providing the monetary needs (e.g. purchasing food and paying for children's education) of their households. Women and men both agree on their preference for crops with low capital requirements and high selling prices.

These findings provide some insight into the prevailing gendered division of household labor, where men are mainly in-charge of the public (productive) sphere, while women are responsible for the private/domestic (reproductive) sphere, but can also simultaneously be engaged in productive work (ILO 1998, Luxton 1983).

Also, the results of the FGDs show that men are much more concerned about the marketability of crops than women. Male respondents emphasized that it is essential to have an established market for their commodities to lessen the risk of financial loss. In Bukidnon, it is usually the task of male farmers to transport and sell their products to nearby provinces, such as Cagayan de Oro, Davao, and Cotabato. It is them as well who are more aware of the challenges related to accessing the market for their produce. For instance, male farmers said that they transported their crops to Cotabato rather than in Cagayan de Oro, because prices in Cagayan de Oro were more prone to fluctuation. Thus, men regarded marketability higher in their farming system selection criteria than did women.

Both female and male farmers preferred crop-based farms over tree-based farms.

Smallholder farmers perceive that crop-based farms would generate higher economic benefits than tree-based farms or agroforestry. Although literature suggests that tree-based farming is more profitable in the long-run (e.g. Snelder et al. 2007), the lack of access to markets, unstable prices of tree products and restrictive government policies discourage farmers from incorporating trees in their farms.

Lasco and colleagues (2014) highlight that the promotion of annual cropping and/or intensive monocultures on the basis of perceived higher economic gains, and at the expense of agroforestry systems may yield more negative than positive outcomes (see also Ziegler et al. 2009). However, markets for vegetables and other annual crops have long been established in

the municipality, which is considered the 'vegetable basket of the south' (Catacutan and Duque 2006), making crop-based farming more attractive to smallholder farmers.

As argued by Garrity (2004), the lack of enterprise development and marketing support mechanisms for tree products hinders the realization of what ought to be significant returns from tree-based production systems. This is relevant particularly in Lantapan, where farmers struggle to sell their tree products at reasonable prices. For example, male participants from the Alanib cluster expressed that incorporating trees on their farms seemed impractical, because the prices of products from certain tree species (e.g. Brazilian fire tree, falcata) they planted a decade ago have dropped significantly. They also highlighted that the tedious process of securing tree-cutting permits from Department of Environment and Natural Resources (DENR) discourages many of them from planting more timber trees on their farms. This was also observed in India, where some government policies acted as deterrents for farmers to adopt farming systems that incorporated forest trees (Guillerme et al. 2011).

The inclination of smallholder farmers for crop-based farming is also evident in the land use change in the municipality – agroforestry areas have been shrinking, while crop-based farm areas have been expanding (Pillerin et al. 2010). A key informant reported that indigenous people from Luzon migrated to Lantapan in the 1980s and introduced vegetable farming to the local farmers. During that time, abaca and coffee were the most common commodities in the municipality, but more than two decades later vegetable farms now take up most of the agricultural areas. At present, plantations of vegetables, corn, banana and sugarcane are the most dominant farming systems in the area.

This is also the case in other parts of the country, particularly in northern Luzon, where adoption of seasonal cops (e.g. high-yielding rice and corn varieties) has been rapidly increasing despite the efforts of the government to promote integration of fruit trees in upland farming systems (Snelder et al. 2007). In the province of Bohol, a recent study found that farmers feared integrating trees on their farms would have negative effects on soil quality and crop productivity (Lasco et al. 2015). On the contrary, evidence from upland areas in Claveria, Misamis Oriental shows that integration of trees as hedgerows with certain annual crops (like corn) can actually increase and stabilize yields (Magcale-Macandog et al. 2010).

Lack of resources also hindered farmers from investing in agroforestry. Farmers opted to maximize their profits by investing in high-value crops that could be harvested in the shortest possible amount of time. As such, they tended to invest in annual crops and other perennial crops – such as banana and sugarcane – which had shorter growing periods and faster return-on-investment. Respondents perceived that planting trees entailed high opportunity costs, since trees would take up land area that could otherwise be allotted for production of crops with shorter growing periods.

This concern for the tradeoffs in farm area allocation was also observed among farmers in a much earlier study in Indonesia and the Philippines (Belsky 1993). In addition, profits from

trees also took time to materialize, since the trees took years to grow, mature and yield marketable products. A study in Vietnam also found that poor farming households considered agroforestry impractical because investment in forest or timber trees, like eucalyptus and acacia, would not yield financial benefits until several years after establishment (Nguyen et al. 2013).

The criteria for the selection of tree species reflect women's and men's common interests in profit maximization and supply of building materials. However, women and men also consider different aspects of well-being.

Women and men share a common goal of maximizing income from investment in on-farm trees. In addition, both value the utility of trees as sources of building material. However, they differ in their specific considerations of profitability – particularly in reference to timing/frequency of income from the sale of tree products.

In the selection of farming system, the tendency of female and male farmers to value some attributes of tree species over others appear to be influenced by the gendered roles they assumed within their homes, as well as their knowledge of the benefits of on-farm trees. For example, it was established that female farmers usually assist their husbands in farm activities, and at the same time are responsible for domestic tasks, including the daily nutrition and care of family members. Female farmers are thus concerned with multiple facets of the farming family's well-being, which may explain why women deemed both the economic benefits and ecosystem services of trees as important.

Additionally, one of the key informants highlighted that female famers are the usual beneficiaries of programs promoting environmental conservation. Since their husbands are often busy managing their farms, the women participated in such programs on their behalf. This was also observed during the FGDs for this study – despite inviting a similar number of female and male farmers, more female farmers were able to participate than males. Some male farmers were not able to attend because they attended to their farms on the day of the FGDs. For this reason, it seems that female farmers possess more information on the ecosystem services of trees, and which could thus be linked to the values they associated with the trees, although this could warrant further study.

It was also established that male farmers are usually primarily responsible for providing for their families. As such, it was not surprising that in their tree species selection criteria, men were most concerned about ensuring maximum returns on investment in trees (i.e. high income). However, unlike the criteria in farming system selection, in tree species selection, the men's responsibility for addressing household needs was not limited to providing income, but also extended to housing (i.e. building material) and contribution to household food supply.

Interestingly, female farmers did not identify '[contribution to] food consumption' among their criteria for tree species selection, although it was their second most important consideration for farming system selection. This implies that women may not appreciate trees as secondary food sources as much as men do, and that women and men share responsibility for ensuring that the household had sufficient food production and supply (see also Magcale-Macandog et al. 2010).

Female farmers highly preferred plantation crops and timber trees, while male farmers favored fruit trees.

The women perceive that plantation crops and timber trees, such as gmelina, coffee and rubber, yielded greater economic benefits since their products could be sold at higher prices. Female farmers gave higher scores to gmelina, eucalyptus, Brazilian fire tree and falcata, compared to fruit trees, because they were perceived to generate relatively higher income, and to be better in providing regulatory services, such as flood control, soil erosion prevention, and environmental protection. Female farmers argued that they could generate higher profit from planting timber trees as the production cost was cheaper, largely because the application of fertilizers and pesticides is not necessary. This affirmed the results of Snelder et al. (2007), who found that the costs of establishing and maintaining gmelina plantations in Luzon were lower compared to those for fruit trees like mandarin and mango.

Men, on the other hand, said they preferred fruit trees, like rambutan, durian and lanzones, which provided income more regularly, implying that male farmers in the area linked profitability with sustainability of income. The priority timber tree species of male farmers were falcata, gmelina, and mahogany, which were valued mostly for their usefulness as building material and profit generation.

In terms of regulatory services, female farmers perceived coffee to be the most appropriate for flood control, and eucalyptus for preventing soil erosion. On the other hand, participants in Kulasihan gave the highest score to rubber when it comes to environmental protection.

Furthermore, it was interesting to note that only female farmers preferred plantation crops such as coffee and rubber. Female farmers from the Alanib cluster argued that most of them (especially those of old age) preferred to plant coffee since its maintenance required less labor compared to other high-value crops. Aside from coffee, rubber had also been gaining popularity in the municipality in recent years. However, only those with access to ample capital and/or alternative sources of income were able to shift from planting annual crops to rubber. As was also observed by Guillerme et al. (2011) access to off- and non-farm income is important to sustain the needs of the family while waiting for the rubber trees to become productive (which typically took three to five years).

All in all, this study found that smallholder farmers in Lantapan recognized the range of benefits that could be derived from different tree types (see also Lasco et al. 2015), but the

women's and men's varied perceptions and capabilities seemed to affect which species they ultimately prioritized.

Conclusion

Local perceptions of smallholder farmers influence their farm decision-making, particularly regarding crop and tree species selection. This study showed that economic benefits were the main consideration of farmers in selecting farming systems, but the contribution of those systems to household food supply is also important. In general, male and female farmers preferred farming systems that maximized economic benefits, such as crops with shorter growing periods and established marketing channels. Contribution of farming systems to household food supply was also highly important to female farmers.

These preferences seemed to arise from their economic condition, and in some cases, were also influenced by the varied roles of women and men in the family. Profit maximization also appeared to be the most distinct reason why the areas devoted to crop-based farms are rapidly increasing, at the expense of tree-based systems. This remains a challenge in conservation efforts, where agricultural intensification resulted to further degradation of Philippine watersheds. This study also found that both female and male farmers prefer crop-based farms over tree-based farms.

In defining selection criteria for priority tree species, women's and men's common interests in profit maximization and supply of building materials emerged. However, it was also apparent that beyond household income considerations, women and men were also concerned with the contribution of trees to different aspects of their families' well-being. Female farmers recognized the regulatory functions of trees, such as flood prevention, soil erosion prevention and environmental protection, while male farmers valued trees as secondary food sources for their families. Finally, results showed that although tree species selection criteria were similar for women and men, the differences in perceptions and capabilities became apparent in their choice of priority tree species. Female farmers highly preferred plantation crops and timber trees, while male farmers assigned higher importance to fruit trees.

Based on the results of the study, it is important to ensure that promoting the incorporation of trees into agricultural production systems translates to tangible economic benefits for the smallholder farmers. This could encourage farmers to adopt tree-based farming systems which will not only benefit them in the long run but will also contribute to sustainable provision of environmental services to current and future generations.

These findings can serve as inputs to the development of a co-investment scheme in Lantapan, Bukidnon, where the farmers and those who benefit from the ecosystem services from the watersheds (i.e., large agro-plantations, hydroelectric companies, irrigators association) will co-invest in the conservation of the environment. In order to encourage

farmers to adopt tree-based farming and sustainable farming practices, it is vital to consider their preferences in choosing the combination of crops to be planted. For instance, since the smallholders' main considerations include profit maximization and supply of building materials, species to be recommended for the co-investment scheme shall be determined accordingly. Funds from the scheme may be used in the acquisition of seedlings and other inputs required.

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