

# The Role of Gender and Kinship Structure in Household Decision-Making for Agriculture and Tree Planting in Malawi

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## Abstract

This study examines household decision-making on various agricultural activities—including tree planting and management—among farming families in Malawi. A mixed-method approach consisting of a household survey (containing 135 married respondents and 16 focus group discussions) was used to analyze the gender dimensions of decision-making and the role of kinship structure. The study found that most decisions in relation to agricultural activities are made either by the husband or by the husband and wife together. However, decisions regarding tree planting and tree management are more often made by the household head alone, and are considered mainly the domain of men. These results were reinforced by the focus group discussions, which also revealed that women do play a role in the implementation of these activities. In patrilineal households decisions were made more often by the husband alone compared to matrilineal families where there was more joint decision-making by husbands and wives together. Decision-making on tree planting by the wife and joint decision-making on tree management resulted in higher densities of trees planted on farms compared to situations where decisions were made by the husband alone.

**Keywords:** *Agroforestry; Gender; Headship; Household Decision-making; Malawi; Matrilineal Kinship.*

## Introduction

Much of southern Africa is faced with increasing population densities that result in land degradation and deforestation. Agroforestry, in which trees are incorporated into farming systems, has the potential to lead to diversified farming systems and improve food security while achieving agricultural productivity (Izac and Sanchez, 2001). Agroforestry has the potential to make a substantial contribution to food security; however, women's participation in Africa is constrained and needs to be increased (Kiptot *et al.*, 2014). It is

important to understand how decisions are being made with regards to agricultural activities and sustaining food security. Interventions that take into consideration household level decision-making may well achieve their goals of providing sustained agricultural development, food security, and environmental sustainability. There has been widening recognition of the importance of better understanding how agricultural decisions are being made within households and, in particular, the role women play. Since there is a high degree of variation in time and space in patterns of intra-household decision-making and allocation of resources, there is a need for more context-specific information on how decisions are being made at the household level.

When it comes to tree planting on farms in Malawi, intra-household decision-making has not been well documented. It is often assumed that the head of the household is the chief decision-maker in farming households, and this role is regularly attributed to the male spouse or husband. Increasingly, the assumption that the senior male of the household functions as the household head and primary decision-maker is being questioned; likewise, the need to better understand household decision-making is being recognized (Rosenhouse, 1989; Hedman *et al.*, 1996; Varley, 1996; Posel, 2001; Budlender, 2003; Budlender, 2005; Deere *et al.*, 2012; Rogan, 2013). An improved understanding of household level decision-making in relation to tree planting activities is needed to increase the effectiveness of agroforestry policies and other agricultural development interventions.

Previous studies have shown how difficult it can be to capture gender differences when it comes to agroforestry decisions; these studies also highlight the dangers of gender stereotypes in agroforestry programs and research (Bonnard and Scherr, 1994). Analyses of the gender dimensions of trees in agrarian landscapes have suggested a high level of complexity; such complexity stems from power and tenure aspects related to trees and forests and the social and ecological diversity of landscapes (Rocheleau and Edmunds, 1997).

Assignment of decision authority in households may be influenced by variables including age, gender, education level, and access to and control over resources. In addition, tenure and land titling have been shown to affect agricultural decision-making and have the potential to empower women (Wiig, 2013). When it comes to tree planting, societal norms of inheritance and residence affect decision-making processes within households, especially in relation to agriculture and agroforestry (given that issues related to tenure affect farmers' motivation to plant trees) (Place and Otsuka, 2001). This is particularly relevant in a context like Malawi's, where household structure is influenced by both matrilineal and patrilineal kinship rules (Takane, 2008).

This paper investigates household level decision-making for farming households in two rural districts in Malawi. It examines a range of agricultural activities, including tree planting and maintenance. Specifically, the study aims to identify: (i) Which household members are involved in the decision-making on, as well as the implementation of, various agricultural activities; and (ii) the implications of different household decision-making roles for tree planting and management by the farming household. Intra-household decision-making was analyzed using three household decision-making roles: Decision-making dominated by husband, by the wife, or joint decision-making by the husband and wife together. In

addition, we hypothesize that the household head does not dominate household decision-making in agricultural activities such as tree planting and management.

### Literature review

A brief review of the literature explores the concept of household headship (and some of its limitations), models of household decision-making, and the matrilineal and patrilineal kinship structures that exist in different parts of the country.

#### *Household Headship*

The concept of household head is widely used in the literature on household decision-making. There is a long history of identifying a household head in development studies; however, its definition is ambiguous and contested. As Hedman *et al.* (1996) state: “The term head of household is used to cover a number of different concepts referring to the chief economic provider, the chief decision maker, the person designated by other members as the head, etc. The focus changes depending on the specific circumstances of the country. Generally, the definition of head of household reflects the stereotype of the man in the household as the person in authority and the bread winner. And even where the definition is adequate, criteria used by interviewers are often vague and leave room for subjective interpretation. As a result, women are only counted as heads of household when there is no adult male in the household” (Hedman *et al.*, 1996).

The use of the term “household head” has been subject to increasing criticism, as it is often not well defined and justified for the context in which it is used (Rosenhouse, 1989; Varley, 1996; Posel, 2001; Budlender, 2003). According to Rosenhouse (1989), the most serious problem with the term is that it assumes that, “a hierarchical relationship exists between household members and that the head is the most important member; that the head is a regular presence in the home; has overriding authority in important household decision matters; and, provides a consistent and central economic support”. This notion is reinforced by Varley (1996), who states that, “the concept of the head of household—a single decision maker representing members’ shared interests—is regarded as particularly inadequate and inappropriate, especially when this role is automatically ascribed to the senior male”. A further operational problem for household surveys is that headship is often not defined by objective criteria but is self-identified by respondents (Posel, 2001; Budlender, 2005). As respondents are usually not asked to explain their understanding of the term headship, the meaning is unclear and one might wonder if the head is the key decision-maker in the household or simply the oldest person in the household (Posel, 2001). Moreover, the understanding of headship might vary across different cultures, contexts, or even among members of the same household (Posel, 2001; Budlender, 2003).

When looking at the role of gender within households, many studies have focused on the sex of the household head in the analysis. There is a wide range of literature looking at gender and poverty, mostly conceptualizing the gender aspect as an issue of headship (Buvinić and Gupta, 1997; Budlender, 2005; Chant, 2006; Finley, 2007; Chant, 2008; Deere *et al.*, 2012). However, reducing the gender dimension to an issue of headship is problematic, as it gives only a partial view of gender relationships within households and overlooks the

position of women in male-headed households (Budlender, 2005; Deere *et al.*, 2012). Buvinić and Gupta (1997) examine the relationship between female headship and poverty in over 60 studies in less developed countries and conclude that most studies found female-headed households poorer than male-headed households. They identify the limitations of focusing on the gender of the household head, and note that the term “household head” is ambiguous, loaded with meanings of a patriarchal system of governance, and difficult to compare among different countries and cultures (Buvinić and Gupta, 1997). Furthermore, female-headed households constitute a diverse category and many studies fail to differentiate between different types of female-headed households (Chant, 2006; Finley, 2007).

In addition to the self-defined headship by household members, alternative definitions of headship have been proposed in the development literature (Fuwa, 2000; Rogan, 2013). One alternative definition is based on economic classifications and defines the household head as the household member with the largest contribution to income. Furthermore, there is a demographic classification, which appoints headship to the oldest member in the household. In addition, there are hybrid designations which use a combination of economic and demographic considerations in defining the household head. Rogan (2013) compares these alternative definitions of female headship in post-Apartheid South Africa and finds an association between self-reported female headship and a female being identified as the main contributor to income. Self-defined headship might be problematic in poverty studies aiming to understand the gender dimensions of poverty and economic inequality, as it could underestimate the growing risk of income poverty in female-headed households (Rogan, 2013). Although it has been suggested that alternative definitions of headship might be more appropriate in poverty studies—especially those with a gender focus—there is less of a need to look at economic and demographic factors in defining headship when trying to understand household decision-making. Therefore, this study uses the conventional method of self-defined headship to identify household heads in the survey and to explore how self-defined headship affects decision-making over several agricultural activities, including tree planting and tree management.

### *Household Decision-Making Models*

There is a large body of literature on household behavior and the development of models to predict this behavior and its outcomes. Doss (1996) recognizes five types of models of household decision-making: Common preferences model, unified household model, collective model, cooperative bargaining model, and non-cooperative bargaining models. Early studies assumed that households behaved as if they were single individuals, which is the idea behind the common preferences model and the unified household model. The collective model is based on the idea that households reach a Pareto efficient outcome, which means that no individual can be made better off without making someone else worse off. The cooperative bargaining model assumes that household decisions are made through a cooperative game in which bargaining power is a function of the outside options of the two bargaining individuals. Cooperative bargaining models are a subset of collective models (Doss, 2013). Non-cooperative models assume that households do not pool their income and allow for individuals to make consumption and production decisions based on their labor and access to resources. Doss (1996) provides a detailed review of the different

models of intra-household decision-making and examines the assumptions, predictions, and empirical implications of these different models.

A lot of studies have tested these models and the assumptions associated with them for rural households in developing countries. There has been increasing evidence against the common preferences model and the unified household model. Although the concept of a “unitary household” is convenient, the empirical evidence to support these simplistic models is scarce (Strauss and Thomas, 1995). Alderman *et al.* (1995) suggest that there was sufficient evidence against the unitary model of the household. However, the unitary model is not always rejected completely (Doss, 2013). For example, Quisumbing and Maluccio (2003) test the unitary versus collective model of the household for Bangladesh, Ethiopia, Indonesia, and South Africa and reject the unitary model as a description of household behavior, but fail to reject the hypothesis that households are Pareto-efficient. On the other hand, Udry (1996) tests the concept of Pareto efficiency for farming households in Burkina Faso and finds that plots controlled by women have significantly lower yields than similar plots controlled by men, thus contradicting the Pareto efficiency of resource allocation within the household.

There is a large body of literature on the models of household decision-making, and some of the findings have been inconsistent with each other and have encouraged the further development of new and alternative models of intra-household resource allocation and decision-making. The recently developed Women’s Empowerment in Agriculture Index (WEAI) is a new tool that measures the empowerment, agency, and inclusion of women in the agricultural sector and can serve as a diagnostic tool to signal key areas for interventions to increase empowerment and gender parity (Alkire *et al.*, 2013). Alkire *et al.* (2013) document the development of the WEAI and present findings of a pilot in Bangladesh, Guatemala, and Uganda. Although the authors caution that the results are not representative of the whole countries, the study finds that in Bangladesh women are empowered in 43.2 percent of households sampled (WEAI = 0.762), compared to 27.3 percent in Guatemala (WEAI = 0.702) and 41.2 percent in Uganda (WEAI = 0.800). In Malawi, the WEAI score is 0.84 and nearly 52 percent of women have achieved adequate empowerment, making Malawi perform better than Bangladesh, Guatemala, and Uganda (Malapit *et al.*, 2014). However, the study was conducted on the boundary of the Central and Southern regions of the country, and ideally information would be collected across all three regions to understand differences within the country. The WEAI is a promising new tool; larger surveys in more contexts can help identify key decision-makers in different types of production.

Levels of involvement in decision-making can range from no involvement to sole decision-making, with various levels of input falling between. For example, Nosheen *et al.* (2008) look at men and women’s participation levels in different agricultural practices using three categories of involvement: Never, sometimes, or often. This paper employs a binary approach to assess decision-making by husbands and wives, as this approach is the simplest to understand and explain to respondents.

### *Kinship Structure*

Two marriage structures exist in Malawi, with associated rules for inheritance and residence (the structures are referred to here as “matrilineal” or “patrilineal”). In a matrilineal society, land is transferred along matrilineal lines, which usually involves inheritance going from the wife to her daughters or nieces. In addition, it is common for the married couple to take up residence in the wife’s village, which is referred to as uxorilocal residence (Takane, 2008). The husband will cultivate land together with his wife, but he has no decision-making power over the transfer of his wife’s land rights. In case of divorce or death of the wife, the husband loses the user rights over his wife’s land and is expected to return to his original village, leaving the children with the wife or her family (as they belong to the matrilineal kin). In patrilineal societies, on the other hand, land rights belong to men and are usually transferred from fathers to sons. The residence rules are virilocal and a wife lives in her husband’s village after marriage (Takane, 2008). Upon divorce, a woman must return to her original village while the children remain in the husband’s village. A widow may sometimes remain in the husband’s village if bride wealth was paid and if the relatives of the husband give permission for her to do so.

Studies have observed changes in the inheritance and residence rules in different regions of Malawi over the past few decades (Hansen *et al.*, 2005; Vaughan, 1985). For example, Phiri (1983) described how influences—such as the intrusion of patrilineal immigrants, Christian missionary activities, colonialism, and the modern capitalist economy—have affected matrilineal societies in central Malawi since the mid-nineteenth century and found that uxorilocality in particular has diminished. Similarly, Takane (2008) studied customary land tenure and inheritance rules in diverse regions of Malawi and concluded that, despite the fact that most of the land transactions followed customary land tenure and inheritance rules, land transactions differed from the basic rules in a good number of cases. Reasons behind these deviations include the unique personal relationships between landholders and heirs, the increase of wives returning to patrilineal villages after divorce or widowhood, and the increasing scarcity of land (Takane, 2008).

In a detailed account of changes in gender relations in Malawian households, Vaughan (1985) describes the effects of commodity production on gender relations within rural households in southern Malawi during the colonial period, using two case studies with similar matrilineal inheritance rules and uxorilocal marriage. The first case study describes the effects of the collapse of the cotton industry in the 1930s—in which men and women played an equal role—which was then replaced by labor migration and cattle-raising. As these new activities were restricted to able-bodied men, this resulted in the marginalization of women in the economy (Vaughan, 1985). The second case study focused on the tenants of a privately-owned estate where residents had to pay a local rent (*thangata*) to be allowed to stay on the land. In the 1930s, the system was modified, and instead of paying rent in the form of labor, men paid in the form of tobacco grown on their land. The men now had a direct interest in land allocation and land rights slowly became invested in men; and, as a result, women lost their bargaining power (Vaughan, 1985). “In both cases, the ultimate decline in the position of women came about in part through the particular interventions of the state in molding the nature of economic relations. By placing fiscal responsibility on men, for instance, the state made central the economic activities of male household members and placed greater emphasis on the household (and hence on marriage) as the

basic economic unit of society. The price women paid for their exemption from taxation (and, in the case of the estates, their exemption from *thangata*) was the ultimate marginalization of their economic activities” (Vaughan, 1985).

In contrast, others have argued that the matrilineal societies in Malawi have been remarkably stable in the face of external change and pressure to conform to patrilineal rules (Peters, 1997; Peters, 2010). Peters (2010) examined the matrilineal land tenure in southern Malawi and found that traditional matrilineal inheritance rules have prevailed despite a long and continuing history of prejudice against matriliney and attempts by the government to discourage matrilineal inheritance (Mkandawire, 1983; Hansen *et al.*, 2005). Changes in gender relations and matrilineal and patrilineal residence and inheritance traditions will affect household decision-making, and hence it is important to take note of these studies.

## Methods

### *Biophysical Context and Selection of Study Areas*

Malawi is a small landlocked country in southern Africa, occupying an area of 11.9 million hectares, of which 22 percent is comprised of inland waters (lakes Malawi, Malombe, Chilwa, and Chiuta). The climate is tropical and rainfall is concentrated in a single wet season between November and April, with average rainfall varying from 800 mm in the low-lying areas along the Lake to 1,000 to 1,500 mm in the high-altitude plateaus. Almost all households involved in farming cultivate maize, making it the most important staple food. Other important food crops are pulses, groundnuts, and cassava. In addition, cash crops grown for export include tobacco, tea, sugar, coffee, and macadamia. The population of Malawi was estimated to be 14.9 million in 2010, with an average annual growth rate of 3.1 percent (World Bank, 2013). The population is concentrated in the south of the country, where the population density is 184 persons per square kilometer, compared to 63 in the Northern Region (NSO, 2008).

This study focused on two study sites in Malawi: the northern district Mzimba and the southern district Chiradzulu. Mzimba district is characterized by relatively low population densities and is inhabited mainly by the Tumbuka and Ngoni ethnic groups. The population density in Chiradzulu is relatively high, and the predominant ethnic groups are the Chewa, Lomwe, and Yao. In both districts, 10 villages were randomly selected from a list of villages provided by the extension planning area (EPA). In Mzimba, 10 villages were selected in Zombwe EPA: Chinombo Jere, Kenani Shaba, Maquiko Mbizi, Yesaya Juba, Simoni Tembo, Samani Mkandawire, Mathambo Mtete, Samuel Jere, Chabwa, and Palango Mhango. In Chiradzulu, 10 villages were selected in Mbulumbuzi EPA: Luna, Nchenao, Lumeta, Nsungwi, Jonathan 1, Chiwinja, Makawa, Nyasa, Sasu, and Mbunda.

In Malawi, matrilineal succession is mainly practiced by the major ethnic groups found in the central and southern regions—such as the Chewa, Yao, and Lomwe—whereas patrilineal kinship structure is mostly associated with the Tumbuka and Ngoni ethnic groups in the north (Place and Otsuka, 2001; Takane, 2008). In matrilineal households, either the husband or the wife can be considered the household head, whereas in patrilineal households it will generally be the husband.

### *Household Survey*

A household survey was used to elicit information on intra-household decision-making. The survey contained questions on personal and household characteristics, farming activities, and decision-making roles within the household. For 11 agricultural activities—including tree planting and tree management—the respondent was asked if the main decision-maker in their household was the husband, the wife, or if the decisions were made jointly by the husband and wife together. The same question was asked for the implementation of these 11 activities.

The questionnaire was administered between October and November 2012 to 135 married household heads who were randomly selected from the lists of village inhabitants provided by the local EPA. In Chiradzulu, the household survey was administered to 41 male-headed households and 27 female-headed households, whereas 65 male-headed households and 2 female-headed households were included in the survey in Mzimba. This study reports the findings of the households comprised of a husband and wife, and it excluded household heads who were single, separated, widowed, or in a polygamous marriage. In all cases, the head of the household was interviewed, as identified by the household after selection. If the head of the household was not available to be interviewed, another household was selected from the list using a random sampling procedure. To complement the data collected in the household survey, handheld GPS units were used to measure the area of the land belonging to each respondent to establish land size and calculate the density of trees planted on a respondent's land.

### *Focus Group Discussions*

Focus group discussions were carried out according to the methodology described by Hennink (2007). The groups were stratified according to district (Chiradzulu and Mzimba) and gender (male and female). In both districts, separate groups were formed of male and female respondents. In each district, four focus group discussions were carried out with female participants and four with male participants, resulting in a total of 16 focus groups. After the villages had been selected, respondents were selected randomly from the list of farming households provided by the EPA. Each focus group discussion consisted of seven to nine participants. A discussion guide was developed and translated into both Chichewa and Tumbuka and the focus group discussions were conducted in the local language of each district. The group discussions lasted approximately two hours. The focus group discussions included a group exercise on household decision-making in relation to agricultural activities. The participants in the focus groups were asked to discuss which household members are generally responsible for the decision-making for 11 agriculturally-related household activities. For each activity, the participants discussed who the most common decision-maker for the activity was, and consequently which household members were involved in the implementation of the decision. The focus group discussions were carried out in April 2013.

### *Data Analysis*

Respondents were divided into two kinship groups based on their ethnicity. Respondents from the Chewa, Lomwe, and Yao ethnic groups were classified as belonging to the

matrilineal kinship group, and the other ethnicities to the patrilineal kinship group. Descriptive statistics were used to describe the characteristics of the sample population.

Multinomial regression analyses were used to test the association of gender and kinship with the household decision-making roles for the various agricultural activities. The model consisted of gender and kinship as control variables. This relationship was expressed as  $D_i = f(G, K)$  where  $D_i$  is household decision-making role (decision-making by the husband, the wife, or joint) regarding the various agricultural activities ( $i$ ); and  $G$  represents the gender (male vs. female) and  $K$  is the household kinship (matrilineal vs. patrilineal). Differences in the odds of decision making roles were estimated and their significance indicated by the Wald  $\chi^2$ .

Chi-square tests and Kruskal-Wallis tests were used to test the association between the decision-making role for tree planting and explanatory variables (including district, age, education level, household size, size of the landholding, and membership of a farmer's group).

Negative binomial regression analyses were used to test whether the density of planted trees was associated with the decision-making role for tree planting and tree management across kinship and gender. This relationship was expressed  $T = f(D_{tp}, D_{tm})$  where  $T$  is the number of trees planted per hectare and  $D_{tp}$  and  $D_{tm}$  are the decision-making roles for tree planting and tree management, respectively.

The outcomes of the group exercises conducted during the focus group discussions were analyzed using descriptive statistics, including frequency tables. Chi-square tests were used to test for differences in decision-making between Mzimba and Chiradzulu and between groups of male and female respondents. Statistical analyses were supplemented by the qualitative information collected during the focus group discussions.

The data were analyzed using SPSS and SAS.

## Results

### *Household Characteristics of the Study Group*

Our sample included 135 married households, of which 68 were based in Chiradzulu and 67 in Mzimba (Table 1). The main ethnic groups in Chiradzulu were the Lomwe (51 percent), Yao (16 percent) and Ngoni (16 percent), whereas the most common ethnicities in Mzimba were Tumbuka (48 percent) and Ngoni (33 percent). The average household size was five people (with a Standard Deviation (SD) of  $\pm 2$ ) in both areas. Nearly all (99 percent) households owned land, and some respondents (21 percent) reported they rented additional land for farming. The average total farm size of the respondents was 0.63 hectares ( $\pm 0.37$  ha) in Chiradzulu and 2.00 hectares ( $\pm 1.68$  ha) in Mzimba, although the actual acreage under cultivation was lower in both areas.

Table 1: Characteristics of the respondents in the two study sites

		<b>Mzimba (% out of N = 67)</b>	<b>Chiradzulu (% out of N = 68)</b>
Gender	Male	97	60
	Female	3	40
Kinship	Patrilineal	88	28
	Matrilineal	12	72
Tribe	Lomwe	0	51
	Chewa	9	4
	Yao	3	16
	Ngoni	33	16
	Tumbuka	48	0
Education level	None	1	4
	Primary school	64	66
	Secondary school	34	30
Average age of household head		46 years	45 years
Average farm size		2.00 ha ( $\pm 1.68$ )	0.63 ha ( $\pm 0.37$ )
Percentage of households that own land		99	100
Percentage of households that rent plots		13	28
Percentage of households using mineral fertilizer		99	99
Percentage of households using organic fertilizer		51	74
Main food crop		Maize (99%)	Maize (100 %)
Main cash crop		Tobacco (21%)	Pigeon pea (54%)
Percentage of households that planted trees in the past 5 years		71	81

The main food crop planted in both districts was maize, while the main cash crops were pigeon pea (*Cajanus cajan*) in Chiradzulu (planted by 54 percent of households) and tobacco (*Nicotiana tabacum*) in Mzimba (planted by 21 percent of households). Almost all households (99 percent) applied mineral fertilizer on their farm, while 62 percent of the respondents also used some form of organic fertilizer. The main source of energy for cooking was firewood (reported by 99 percent of the respondents).

#### *Decision-Making Roles for Agricultural Activities*

For the various agricultural activities, most decisions were being made either by the husband or jointly by the husband and wife together (Table 2). Decision-making by the wife alone also occurred but was less common. An exception is firewood collection, which was nearly always decided upon by the wife and which is related to the fact that it is often considered the domain of women in Malawi. Tree planting and tree management appeared different from the other agricultural activities in that the percentage of cases where the husband decides independently was higher—and consequently decision-making by the wife and joint decision-making were lower—compared to the other agricultural activities. These trends were significant for all activities except the selling of farm products, in which the

proportion of decision-making by the husband, wife, and joint decision making was equal (Table 2).

Table 2: Percentage of survey respondents identifying the husband, the wife, or joint decision-making as the main decision-maker for various agricultural activities

Activities	Husband (%)	Wife (%)	Joint (%)	N	P
Crops to plant	42.5	17.9	39.6	134	0.001
Sowing crops	39.3	17.8	43.0	135	0.001
Weeding	36.1	18.8	45.1	133	0.001
Fertilizer	32.8	20.1	47.0	134	0.001
Trees to plant	62.2	11.9	25.9	135	<0.001
Tree management	57.5	13.4	29.1	134	<0.001
Rearing animals	45.2	19.3	35.6	135	0.001
Selling farm products	29.6	27.4	43.0	135	0.057
Accessing credit	40.7	23.0	36.3	135	0.031
Participation in meetings	43.7	11.1	45.2	135	<0.001
Firewood collection	7.4	81.5	11.1	135	<0.001

The *P*-values represent the outcome of a chi-square test testing for a 0.33-0.33-0.33 distribution of proportions.

The decision-making roles varied for male and female household heads as well as for matrilineal and patrilineal households (Table 3). The multinomial regression analyses showed that gender and kinship structure were not significantly associated with the decisions to plant crops, apply fertilizer, or access credit. The regression outcomes for the decisions related to other agricultural activities were significant and all outcomes are presented in Table 4. Kinship structure was significantly associated with the decision-making roles for sowing and weeding of crops, rearing animals, participating in meetings, firewood collection, tree planting, and tree management (Table 4).

Table 3: Percentage of survey respondents identifying the husband, the wife, or joint decision-making as the main decision-maker by gender of the head of the household and kinship.

Activities			Husband (%)	Wife (%)	Joint (%)
Crops to plant	Gender	Male	<b>50.5</b>	9.5	40.0
		Female	13.8	<b>48.3</b>	37.9
	Kinship	Patrilineal	51.9	11.7	36.4
		Matrilineal	29.8	26.3	43.9
Sowing crops	Gender	Male	<b>49.1</b>	7.5	43.4
		Female	3.4	<b>55.2</b>	41.4
	Kinship	Patrilineal	52.6	14.1	33.3
		Matrilineal	21.1	22.8	56.1
Weeding	Gender	Male	<b>45.2</b>	8.7	46.2
		Female	3.4	<b>55.2</b>	41.4
	Kinship	Patrilineal	48.7	17.1	34.2
		Matrilineal	19.3	21.1	59.6
Fertilizer	Gender	Male	<b>37.1</b>	13.3	49.5

Activities			Husband (%)	Wife (%)	Joint (%)
Trees to plant	Kinship	Female	17.2	<b>44.8</b>	37.9
		Patrilineal	37.7	18.2	44.2
		Matrilineal	26.3	22.8	50.9
Tree management	Gender	Male	<b>74.5</b>	4.7	20.8
		Female	17.2	<b>37.9</b>	44.8
		Kinship	Patrilineal	75.6	10.3
Rearing animals	Gender	Male	<b>68.6</b>	5.7	25.7
		Female	17.2	<b>41.4</b>	41.4
		Kinship	Patrilineal	71.4	9.1
Selling farm products	Gender	Male	<b>53.8</b>	12.3	34.0
		Female	13.8	<b>44.8</b>	41.4
		Kinship	Patrilineal	59.0	15.4
Accessing credit	Gender	Male	<b>53.8</b>	12.3	34.0
		Female	13.8	<b>44.8</b>	41.4
		Kinship	Patrilineal	59.0	15.4
Participation in meetings	Gender	Male	<b>53.8</b>	12.3	34.0
		Female	13.8	<b>44.8</b>	41.4
		Kinship	Patrilineal	59.0	15.4
Firewood collection	Gender	Male	<b>53.8</b>	12.3	34.0
		Female	13.8	<b>44.8</b>	41.4
		Kinship	Patrilineal	59.0	15.4

\*Decisions by head of household are indicated in bold.

For sowing and weeding of crops, rearing animals, and participating in meetings, decisions were more often made by the husband in patrilineal households, whereas matrilineal households were characterized by more joint decision-making (Table 3). For firewood collection, most decisions were made by the wife in both patrilineal and matrilineal households, but the proportion was higher in patrilineal households (Table 3).

For tree planting and tree management, decisions were more often made by the husband in patrilineal households, while the proportion of decisions made by husbands and joint decision-making were about equal in matrilineal households (Table 3). Gender of the household head was significantly associated with the decision-making role for tree planting and tree management (Table 4). For both activities, decisions were dominated by the husband in male-headed households, whereas most of the decisions in female-headed households were made by either the wife or jointly.

Table 3 also provides interesting insights into the proportion of households where the household head is the main decision-maker. For decisions on activities such as planting, sowing, and weeding of crops, the main decision-maker is the household head in about half of the households sampled (this does not seem to differ between male- and female-headed households. -). For tree planting and tree management, however, the household head is more often the main decision-maker in male-headed households and less often in female-headed households compared to the other activities (Table 3). Selling farm produce also involves less decision-making by the household head in male-headed households, whereas nearly all decisions are made by the household head in female-headed households (Table 4).

Table 4: Differences in decision-making roles between genders (husbands vs. wives) and kinship (matrilineal vs. patrilineal) for various agricultural activities.

Decision	Gender			Kinship		
	Odds ratio	Wald $\chi^2$	P-value	Odds ratio	Wald $\chi^2$	P-value
Crops to plant	1.59	1.23	0.2681	0.62	1.95	0.1624
Sowing crops	1.50	0.89	0.3460	0.36	8.47	0.0040
Weeding	1.25	0.27	0.6006	0.33	9.51	0.0020
Fertilizer	0.94	0.02	0.8870	0.68	1.24	0.2660
Tree planting	4.70	12.16	0.0005	0.33	8.31	0.0039
Tree management	3.05	6.64	0.0099	0.37	7.19	0.0073
Rearing animals	1.82	2.00	0.1569	0.34	9.13	0.0025
Selling farm products	1.02	0.003	0.9579	0.82	0.35	0.5557
Accessing credit	0.94	0.02	0.8880	0.78	0.54	0.4640
Participation in meetings	2.01	2.36	0.1248	0.27	12.47	0.0004
Firewood collection	0.86	0.07	0.7918	0.38	3.86	0.0496

### *Implementation of Agricultural Activities*

For most agricultural activities, implementation was usually carried out jointly by the husband and wife together (Table 5).

Table 5: Percentage of survey respondents identifying the husband, the wife, or joint implementation as the main implementers of various agricultural activities

Activities	Husband (%)	Wife (%)	Joint (%)	N	P
Planting crops	3.0	9.0	88.0	133	<0.001
Sowing crops	18.7	11.2	70.1	134	<0.001
Weeding	6.1	10.6	83.3	132	<0.001
Fertilizer	1.5	9.8	88.7	133	<0.001
Planting trees	43.6	9.0	47.4	133	<0.001
Tree management	39.8	9.0	51.1	133	<0.001
Rearing animals	30.8	23.8	45.4	130	0.009
Selling farm products	10.7	46.6	42.7	131	<0.001
Accessing credit	34.8	35.6	29.6	135	0.656
Participation in meetings	21.8	12.8	65.4	133	<0.001
Firewood collection	3.8	78.0	18.2	132	<0.001

The *P*-values in the table represent the outcome of a chi-square test testing for a 0.33-0.33-0.33 distribution of proportions.

As in decision-making, there was less joint implementation and more implementation by the husband alone for tree planting and tree management compared to other agricultural activities. Selling farm products and firewood collection are mostly done by the wife. These trends were significant for all activities except accessing credit, in which the proportion of implementation by the husband, wife, and joint decision-making was equal (Table 5).

### *Tree Planting and Management*

In this study, only a few variables were associated with the decision-making roles for tree planting within the household. A larger size of the landholding was associated with decision-making by the husband, whereas joint decision-makers were linked with smaller landholdings ( $K = 23.254$ ,  $P = < 0.001$ ). Decision-making in relation to tree planting is different between the two districts, with more joint decision-making in Chiradzulu (in Mzimba it is mostly the husband who makes the decision alone) ( $X^2 = 25.892$ ,  $P < 0.001$ ). There was no association between education level ( $X^2 = 1.517$ ,  $P = 0.824$ ), age ( $K = 1.097$ ,  $P = 0.578$ ), household size ( $K = 1.147$ ,  $P = 0.564$ ), and membership of a farmers group ( $X^2 = 4.702$ ,  $P = 0.095$ ) on the one hand and household decision-making on tree planting on the other.

The household decision-making roles regarding tree planting were associated with different outcomes with regards to actual tree planting behavior. A negative binomial regression analysis showed that both decision-making for tree planting and tree management had a significant influence on realized tree densities (Table 6). Densities were significantly ( $P = 0.0026$ ) higher (136 trees per ha) when the wife makes the decision to plant trees compared to when the husband decides (34 trees per ha). However, for decisions on tree management a different pattern was found (Table 6). Densities of planted trees were significantly ( $P = 0.0135$ ) lower (32.7 trees per ha) when the wife makes the decision on tree management compared to joint decision-making, which realized the highest tree density (111 trees per ha). As the 95% CI do not overlap, we can confidently state that joint decision-making on tree management is more favorable than when the wife is the decision-maker.

Table 6: Predicted tree densities (number of trees per ha) depending on who makes decisions on tree planting and tree management

Decision type	Decision-maker	Predicted tree density
Tree planting	Husband	34.1 (23.3 - 49.9)
	Wife	136.0 (69.6 - 265.5)
	Joint	47.8 (30.3 - 75.4)
Tree management	Husband	61.1 (40.4 - 92.3)
	Wife	32.7 (18.2 - 58.7)
	Joint	111.1 (69.7 - 177.1)

Figures in brackets are 95% confidence intervals

*Perspectives from the Focus Group Discussions*

The results of the focus group discussions were similar to the outcomes of the household survey. For most agricultural activities, the decision-making pattern was a mix of decision-making by the husband, the wife, or by both (Table 7). Decisions in relation to fertilizer application, rearing animals, and selling of farm products were more often made by the husband and wife jointly compared to other activities. However, tree planting and tree management seem to be considered mostly the domain of the husband. In contrast, firewood collection was seen as a task for the wife. Although most activities were implemented by the husband and wife jointly, again tree planting and tree management were more often implemented by the husband alone in comparison to the other activities, reinforcing the notion that they are tasks for men (Table 8). There was no difference between the groups in Mzimba and Chiradzulu, nor between the male and female groups, in the household decision-making roles; the exception was decision-making on participation in meetings, which was seen as a task for the husband in Mzimba and for the wife in Chiradzulu ( $\chi^2 = 6.667, P = 0.036$ ).

Table 7: Identification of decision-maker for household decisions regarding various agricultural activities

Activities	Husband	Wife	Joint	Other
Crops to plant	5	3	8	0
Sowing crops	6	2	8	0
Weeding	4	2	9	1
Fertilizer	2	2	11	1
Trees to plant	12	1	3	0
Tree management	14	2	0	0
Rearing animals	4	1	10	1
Selling farm products	4	2	10	0
Accessing credit	5	7	4	0
Participation in meetings	4	6	6	0
Firewood collection	0	16	0	0

Data from 16 focus group discussions

During the focus group discussions, there was a lot of debate over who makes the final decision on various agricultural activities. This shows that there was considerable variation between households in how decisions are being made and undermines the notion that there are clear patterns for the roles of the husband and wife. The focus group participants also provided more details and background on gender-specific tasks when it comes to tree planting. Although tree planting and tree management were generally seen as activities for men, there was also participation by women. Participants explained that husbands generally dig the holes, prepare the planting stations and firebreaks, and take care of the pruning and weeding, whereas the wives help with getting seedlings to the planting stations, watering the seedlings, and applying manure and sweeping the leaves around the planted trees. One participant also reported that there are gender differences for planting and managing different types of trees; for example, men generally take care of trees planted in the fields (such as fertilizer trees) whereas women look after the trees around the homestead (such as fruit trees). However, this was not mentioned during the other focus group discussions.

Table 8: Identification of implementer of household decisions regarding various agricultural activities

Activities	Husband	Wife	Joint
Planting crops	0	2	14
Sowing crops	0	0	16
Weeding	0	1	15
Fertilizer	0	0	16
Planting trees	6	0	10
Tree management	9	0	7
Rearing animals	4	3	9
Selling farm products	0	6	10
Accessing credit	1	10	5
Participation in meetings	0	6	10
Firewood collection	0	15	1

Data from 16 focus group discussions

## Discussion

The results revealed that households vary in who makes agricultural decisions. It was common for the husband to be the main decision-maker or for decisions to be made jointly by the husband and the wife together. Decision-making by the wife was less common, except for firewood collection (which is considered a task for women). In patrilineal households, decision-making was dominated by the husband, whereas there was more joint decision-making in matrilineal households. Implementation of these activities was mostly done by the husband and the wife together. The results also suggest that for most agricultural activities, the household head was the primary decision-maker in about half of the households sampled. These results do not agree with the traditional belief that the household head is the chief decision-maker within rural households in Africa. In contrast, Posel (2001) examined the concept of headship for self-reported household heads in South Africa and found that the concept is still valid, as heads are in fact the key decision makers in the households studied. However, our results are more in line with recent findings by Mbweza *et al.* (2008), who examined the decision-making process of husbands and wives in matrilineal and patrilineal families in Malawi covering various areas of decisions (including money, food, family planning, and sexual relations). They found that most couples used a mix of decision-making approaches. These conclusions reinforce our finding that the household head is not always the chief decision-maker and show that alternative decision-making approaches are also being employed.

Interestingly, decisions regarding tree planting and tree management seem to differ somewhat from other agricultural activities. The survey results indicate that decisions regarding tree planting and tree management were more often made by the husband alone, as compared to other agricultural activities. In addition, both gender and kinship significantly affect decision-making on tree planting and tree management. Decisions were more often made by the husband alone in male-headed households as well as in patrilineal households, whereas there was more joint decision-making in matrilineal households and female-headed households. The fact that the effects of kinship and gender on decision-

making were similar is related to the fact that these two factors are related, as most patrilineal households are male-headed whereas most matrilineal households are headed by a female.

The findings of the survey were reinforced by the outcomes of the focus group discussions, which also found that tree planting and tree management are seen mostly as a task for husbands. However, the focus group discussions revealed that women still participated in the implementation of tree planting and there were some gender-specific roles for women, which is in agreement with previous studies (German *et al.*, 2009; Kiptot and Franzel, 2012). It is remarkable that women's decision-making power is limited when it comes to tree planting and management, as women are responsible for firewood collection—one of the main uses of trees—and as women are often at the center of agricultural production. Female farmers' participation in agroforestry practices has been demonstrated throughout Africa (Kiptot and Franzel, 2012; Kiptot *et al.*, 2014). Nevertheless, it has also been suggested that women's participation is low in commercial enterprises often considered the domain of men. And given women's proportionally high involvement in agroforestry technologies—such as soil fertility management, fodder production, and woodlots—their participation is low in terms of the amount of land they allocate to these technologies and in terms of the numbers of trees planted (Kiptot and Franzel, 2012). Although women are actively involved in agroforestry, their level of participation is constrained by cultural norms and lack of resources (Kiptot *et al.*, 2014).

The results of this study also demonstrated that the decision-making roles within the household have implications for the number of trees planted. Relatively more trees were planted in households where decisions on tree planting were made by the wife, and when decisions on tree management are made jointly by the husband and wife together. This finding has important implications, as it demonstrates the need to better understand how decisions are being made about tree planting and management (a need that should be taken into consideration during the design of agroforestry interventions). There is a broad range of literature focusing on the factors affecting tree planting on farms (Franzel *et al.*, 2001; Pattanayak *et al.*, 2003; Franzel *et al.*, 2004; Mercer, 2004), and various variables (such as farmer or household characteristics) have been found to influence agroforestry adoption and the numbers of trees planted on farms (Meijer *et al.*, 2015). However, the role of household decision-making on agroforestry adoption and the numbers of trees planted on farms has received relatively little attention thus far; our findings suggest it is significant and should not be overlooked.

This study indicates that kinship structure affects the decision-making roles within rural households when it comes to agricultural decisions. In patrilineal households participating in this study, decisions were made more often by the husband alone compared to in matrilineal families, where there was more joint decision-making by the husband and wife together as well as more decision-making by the wife. Consequently, more trees were planted per hectare by matrilineal households compared to patrilineal households. This finding is somewhat surprising, as men in uxori-local households are often believed to have little incentive to plant trees on the farm as they do not have ownership over land in their wives' villages (Hansen *et al.*, 2005; German *et al.*, 2009). In a study on the effects of marriage and inheritance patterns on tree planting among households belonging to the Chewa tribe in Central Malawi, Hansen *et al.* (2005) found that tree planting by men is

dissuaded by uxori-local marriage patterns. Our results differ from these findings; however, they seem to be in agreement with their observation that on average, men planted more trees than women (Hansen *et al.*, 2005). If males are the primary decision-makers about tree planting and tree management, more tree planting is to be expected in patrilineal rather than matrilineal societies (Place and Otsuka, 2001). Interestingly, the opposite was observed in this study. It is important to note that other factors (such as geographical influences) might play a role here as well. Differences in population density and forest cover between the north and south are likely to affect the availability of wood resources from surrounding forests and will influence farmers' need to grow their own trees.

The findings of this study contribute to the existing literature aimed at understanding farmers' preferences, motivations, and choices in relation to tree planting in Malawi (Deweese, 1995; Place and Otsuka, 2001; Thangata *et al.*, 2002; Walker, 2004; Sirrine *et al.*, 2010), and challenge some conventional assumptions about agricultural gender roles. The complexity of gender dimensions of intra-household decision-making need to be recognized and taken into consideration by policy makers and researchers. The gendered aspects of agricultural-based development remain poorly understood, and gender gaps in income from farming still exist in poor countries such as Malawi (Djurfeldt *et al.*, 2013). Similarly, a recent analysis by Sunderland *et al.* (2014) using a global dataset, questioned assumptions about gender differentiation of forest product use and challenged some of the commonly-held perceptions on the role of men and women. Although the study found evidence for distinctive gender roles associated with the collection of forest products, it also found that men play a more important and diverse role in the contribution of forest products to rural livelihoods than often reported.

While this study provides useful insights into household decision-making, it does have limitations. First, this study used self-identified headship in the household survey, a concept that has been associated with methodological problems in the past (Posel, 2001). However, as the aim of this study was to understand how the various household members—including the self-identified household head—contribute to agricultural decisions, it seemed an appropriate method to use. Second, the survey only included household heads, and it would be very interesting to get the perspective of both the husband and the wife within the same household on household decision-making, similar to Mbweza *et al.* (2008). This would provide a deeper understanding of the role of the household head as well as their spouse and would identify issues where there might be disagreements. Finally, time and resource limitations precluded the splitting of tree planting and management activities into sub-activities, which could have improved our insights into gender-specific tasks in tree planting.

We recommend that future research on intra-household decision-making includes both the husband and the wife of the same household. This will shed more light on how decisions are made and will reveal potential differences in the perceptions of both partners. In addition, it would be interesting to study the various agricultural activities in more detail, particularly the activities related to tree planting and tree management. Rather than study tree planting and management as general activities, we could break each down into several sub-activities (such as caring for seedlings in the nursery, preparing the planting stations, watering the seedlings, pruning the seedling and tree, harvesting tree products, marketing and selling, etc.). Furthermore, it would also be interesting to look at gender differences in relation to the different tree types (e.g. fodder, fruit, firewood, and fertilizer trees). This could reveal

gender dimensions for the different activities related to tree planting and help us to understand which household members are responsible for the various sub-activities.

## Conclusion

This study has demonstrated that households employ a mix of decision-making by the husband, the wife, or by the husband and wife together. For most activities, decisions were made either by the husband or by the husband and wife together. Tree planting and management seem to be considered mainly the responsibility of men in our study areas; however, it was also clear that decision-making by the wife or shared decision-making resulted in a higher density of trees planted. We also found the assumption that the household head is the primary decision-maker is an oversimplification of reality. Our findings have important practical implications. Research, policy development and extension efforts should not merely target the household head but should take into consideration how decision-making around farming and tree planting is gendered, with variations based on kinship structures and other intrinsic and extrinsic factors. Assumptions about headship and gender roles need to be locally checked and validated in order for agricultural policies and development activities to be effective.

## Acknowledgements

The authors would like to thank Irish Aid for providing financial assistance for the research on which this paper is based. We thank Wezzie Chisenga for his valuable assistance with data collection while in the field, and we are also sincerely grateful to the extension workers and farmers in Malawi who donated their time to this work and contributed their views. We also acknowledge two anonymous reviewers who provided useful comments on our manuscript.

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