

# Socio-Economic Factors Influencing Woodlot Farming Adoption from Crop Farming in Tanzania: A Case of Mufindi District

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## Abstract

The study stressed to examine socio – economic factors influencing woodlot farming adoption in Mufindi district, Tanzania. The study used questionnaire to collect data from 40 woodlot owners (sample size). The collected data were analyzed using multinomial logistic model. Findings show that the high income generating expectation, land size, and assets acquisitions both influence woodlot farming adoption positively and significantly while education level influence woodlot farming adoption negatively and significantly. Basing on the findings, the study concluded that socio-economic factors that influence woodlot farming positively and significantly are income generation expectation, land size, and assets acquisitions meanwhile education level influence woodlot farming adoption negatively and significantly. Based on the findings, this study recommends that there is a need for government to support the woodlot owners by providing subsidies including inputs such as land, fertilizers, and quality seeds through Mufindi district officials so as to create employment opportunities among majority of rural households and raise their standard of living. If all these recommendations are implemented, then improvement in the income from woodlot farming would ultimately be realized.

**Keywords:** socio-economic factors, woodlot farming adoption, woodlot owners

## 1. Introduction

In early 1960s and 1970s, the subsistence farming was a main economic activity by majority of households in Mufindi district for food and cash crops production. Farmers received a great financial, material and technical support from the government in terms of subsidies, agro-machines, fertilizers and quality seeds (Ngailo *et al.*, 2011).

Due to the cut down of government's support to farmers and decline of agricultural market in 1990s for food and cash crops, the majority of households started to think for alternative economic activities such as woodlot farming to generate income which resulted to the massive conversion of agricultural land to woodlot farms (Deweese and Saxen, 1997).

However, the introduction of Structural Adjustment Programs (SAPs) in 1980s and 1990s discouraged the smallholder farmers because it required the privatization of agricultural enterprises which increased the prices of fertilizers and other agricultural inputs, and reduced access to subsidies which made the smallholder farmers to adapt woodlots farming as an alternative economic activity to generate households' income (Reed, 1992; Haule, 2003). Woodlot farming is considered for household income generation because it is cultivated mainly for timber production, paper production, landline telephone poles and electricity transmission poles (Nyadzi *et al.*, 2003) for exchanging.

The majority of households in Mufindi grow different species of trees for different purposes. The most dominant tree species are pines (*Pinus patula*) these are coniferous resinous trees growing 3-80m tall and long lived and typically reach ages of 100-1000 years. They are most useful in timber industry, construction industry, paper miller, saw millers, carpentry, manufacture of plywood and fiberboards. Another tree species grown in the study area is cypress (*Cupressus lusitanica*) which is used in extraction of oil for medicinal benefits such as curing coughs, colds and bronchitis, hemorrhoids and varicose veins. Furthermore, it is used for decoration during Christmas festival in many families across world. Lastly, eucalyptus species (*Eucalyptus myrtaceae*) is mostly

used for transmission and telephone poles in the country (Barnes and Wagner, 2004).

However, there are two major landholding woodlot farming systems in practice in the study area which are small-scale and large-scale trees farming. The small scale farming encompasses the farmers with 1-5 acres while above 20 acres are categorized as large scale woodlot farming. The advantages of small-scale is that it is cheap to manage the land in case of diseases, pests and animals control but its major disadvantage is that it may cause low supply of timbers against the demand. (The advantage of woodlot farming in large-scale) is generation of huge income for the households but it is difficult to control fire in case of emergency (FDT Report, 2014).

In Mufindi district, woodlot farming is done in 24,000 hectares (Edwin, 1990). Woodlot farming is growing very high in Mufindi district due to an increase of demand for timbers for building and construction activities in the country. For example, according to Edwin (1990) woodlot farming is done over 24,000 hectares in the district. Another example, the trees harvested are sold to timber traders, saw millers and paper millers which contribute significantly to the households' income (National Bureau of Statistics, 2013).

Despite that the woodlot farming adoption is growing rapidly in the district, currently there are no studies stressed to find out socio- economic factors that influence adaptation of woodlot farming by majority of rural households in Mufindi district yet (Akida and Blomley, 2006). In this view, the reasons caused majority of rural households to adapt woodlot farming as an alternative economic activity to generate households' income (Reed, 1992; Haule, 2003) has not yet been researched. Thus, this study was done to assess socio-economic factors which influence woodlot farming adoption among many rural household farmers especially in Mufindi district, Tanzania.

## 2. Conceptual Framework

The conceptual framework is governed by the theory of transaction costs. Transaction cost economics, unlike traditional neoclassical economic theory, recognizes that commercial activities do not occur in frictionless economic environment (Williamson, 2000). Instead, it posits that there is costs top carrying out any exchange. However, the theory insists that exchanging costs must be reduced for traders to earn lucrative profit.

In this view, the study applied the Transaction Cost Theory to see if the study would support or divert the theory. According to Institutional Analysis and Development (IAD) framework, socio-economic factor is one of the institutional factors associated with marketing or exchanging costs. According to Kirsten *et al.*, (2012), economic actors who have unfavorable socio-economic factors in term of business, also chances of such actors to incur high transaction costs is high and consequently may fetch low income.

Based on the aforementioned factors, this study illustrates that there is existing relationship between woodlot farming adoption as a source of income growth and socio-economic factors of woodlot owners as shown in conceptual framework in Figure-1. The conceptual framework further shows that the woodlot farming adoption depends on socio-economic factors and other factors as can be seen in the Figure-1 below:

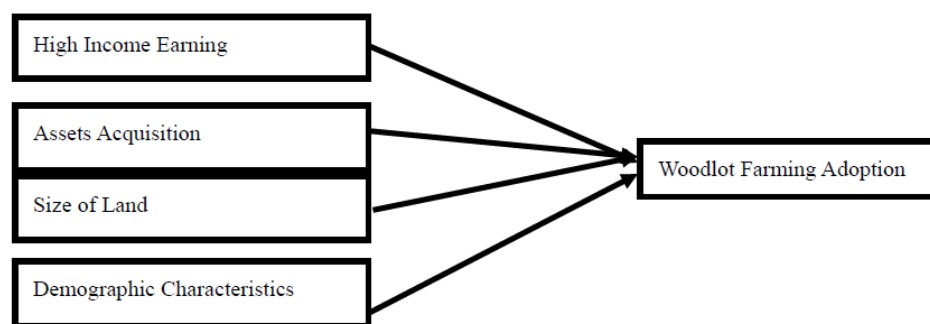


Figure 1. Conceptual framework

According to conceptual framework (Figure-1) socio-economic factors is one of the intrinsic factors that influence woodlot farming adoption (Kirsten *et al.*, 2012; Mnyawi and Benedict, 2014). Based on the socio-economic factors, woodlot farming adoption is directly related with gender, age, education level, amount of wealth. In another words, this is to say that, figure-1 shows that socio – economic factors such as demographic characteristics (gender, age, education level), expectation of high income earning (which is measured in amount of money in Tanzanian Shillings earned by woodlot farmers in a year), assets acquisitions (e.g. types of assets acquired such as motor vehicles, houses, saw mills, chain saws and generators) and size of land (which is

measured in acres of land with trees owned by woodlot farmers) directly relate with woodlot farming adoption. According to literature review, this means that high income earning expectation, assets acquisition, size of land, and demographic characteristics of household heads both have influence on woodlot farming adaptation (Singunda, 2010; FDT, 2014). Despite all these studies, however, still little is known on the socio-economic factors influencing woodlot farming adoption especially in Tanzania. In this view, it is therefore important to understand socio-economic factors influencing woodlot farming adoption using Transaction Cost Theory and Institutional Analysis and Development(IAD) framework approach.

### 3. Research Methodology

#### 3.1 Study Area

This study was conducted in Mufindi district particularly in three divisions Ifwagi, Kibengu, and Kasanga which comprises of the villages such as Nyololo, Igeleke, Igowelo, Ihefu, and Isalavanu where the data were collected. This district was selected because frequency of farmers to transform farm uses from crop farming to woodlot farming is high in Mufindi district. As noted by Forest Development Trust Survey Report (2014) that, there is high rate of shifting from crop farming to woodlot farming in Southern Highlands of Tanzania including Mufindi district in Iringa region. In Mufindi district, 37% of tree growers transformed crop farms to woodlot farms while 13% of tree growers converted their woodlot farms to crops farms (Singunda, 2010; Chikoko, 2002). This led the researcher to study socio – economic factors that influence woodlot farming adaptation in Mufindi district.

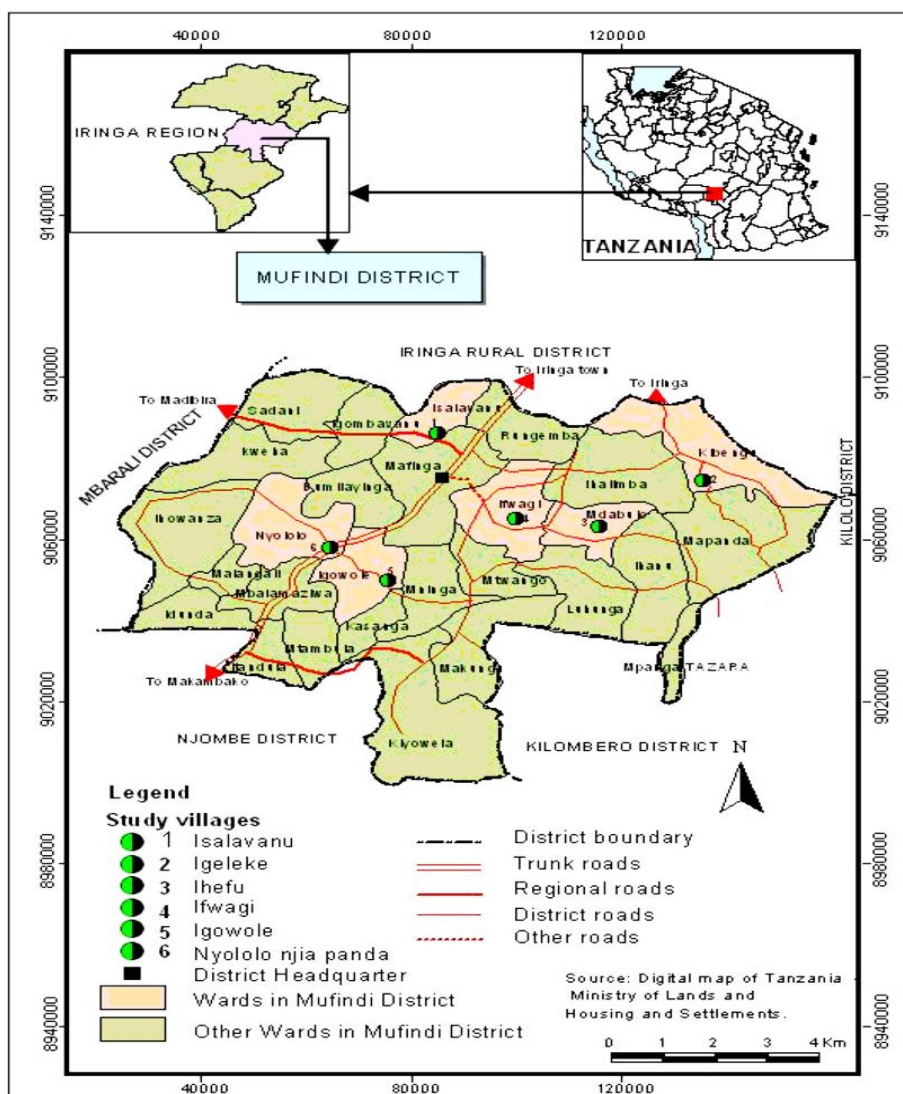


Figure 2. The map of Mufindi district showing the villages where the study was conducted

### 3.2 Sampling and Data Collection Method

The target population of the study involved woodlot farm owners in Mufindi district in Iringa region. The study selected woodlot farm owners for providing firsthand information on the matter under study including reasons for transform crop farming to woodlot farming. In this study, simple random sampling procedure was used to get representative sample of 110 woodlot farmers for this study. The sampling procedure used is that, the selection procedure was as follows; woodlot farmers were visited at their household or working places and were informed the purpose of the study so as to get their consent of participating in the study before being selected. After getting their consent, woodlot farmers were requested to participate in this study. However, the selection was basing on the list of woodlot farmers obtained from Village Executive Officers (VEOs). By using rotary approach, woodlot farmers were selected from the list for this study.

Through this selection procedure, the researcher managed to select a sample size of 40 woodlot owners for inclusion in this study. However, the criterion the researcher used to arrive at this number is borrowed from Bailey (1994), that a sample or sub-sample of 30 respondents is bare minimum for studies in which statistical data analysis is to be done for a study like this regardless of population size, hence the study fulfilled Bailey's (1994) requirement.

The data collection process comes after the sampling stage in the research process (Churchill and Lacobucci, 2002). In this particular study, a survey method involving administered questionnaires was used for data collection. Self-administered questionnaire as an approach of data collection was used for guaranteeing a high response rate from the respondents (woodlot farmers).

One set of a questionnaire was prepared and pre-tested as the main data collection instrument to woodlot farmers. Technically, the researcher asked the consent of the sampled woodlot farmers to participate in the study and afterwards the sampled woodlot farmers (respondents) were informed about the objectives of the study and were then required to confirm their willingness and availability to participate in the study. Eligible woodlot farmers included in this particular study are those woodlot farmers who are heads of household.

The study measured validity of data collected to testify authenticity of the data collected to verify that the findings are safe for consumption. Pilot study was carried out before field survey to measure data collection instruments. During pilot study, the study tested the ability of the instrument to measure the constructs as validity measurement. Based on the outcome of the pilot study, some questions were restructured while others were dropped out. This procedure was done to the questions which were seen to be vague and not practical in the questionnaire. Moreover observation method was used in this study. Materials used for house construction (wall, roof and floor), the size of land with woodlots, and other available assets (motor vehicles, motor cycles, generator, and milling machines) were observed during the survey.

Nevertheless, reliability was not tested during pilot study, but was taken care during data collection phase since validity (Note 1) is a precondition of reliability (Gujarati, 2006; Pindyck and Rubinfeld, 2010; Creswell, 2011); Tatham *et al.*, 2007). Moreover, everything that is valid is reliable, but not everything that is reliable is valid (Creswell, 2011; Tatham *et al.*, 2006).

During the field survey, the study took some measures to control validity during data collection phase as stated earlier. *First*, "training" was conducted to the research assistant before starting the field survey. The training was intended to make the enumerator more familiar with the constructs used in the questions in the questionnaires. This helped the researcher to address the problem of validity in the study. *Second* every day after field survey, the researcher and the research assistant "cross-checked" the filled questionnaires to see if the constructs were clearly understood and measured. *Three*, the study used "administered questionnaire procedure to control misinterpretation of questions that might have occurred among the woodlot farmers (respondents).

### 3.4 Analytical Technique

This particular study applied logistic regression method to analyze the socio-economic factors that influence woodlot farming adoption from crop farming in Tanzania particularly Mufindi district. The selection of this method in this study was influenced by the fact that logistic regression proved success in assessing socio-economic factors influencing woodlot farming adoption in many other previous studies. The variables for inclusion in this study were also selected from the past experience of studies based on their relevance in influencing woodlot farming adoption.

Therefore, logistic model was used to assess socio-economic factors that influence woodlot farming adoption among crop farmers in Tanzania. The model was employed to predict the power of predictors in explaining the dependent variable (woodlot farming adoption). The study assumed that crop farmers may transform part or all

of his/her land to woodlot farming or not. However, before carrying out regression analysis, the study assessed collinearity of independent variables before conducting regression analyses.

**Therefore, the specification of respective logistic regression model is presented below:**

$$\text{Logit}(Y_i) = \text{Exp}(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + e)$$

Whereby;

$Y_i$  = Woodlot Farming Adoption (Dependent variable)

$X_1$  = Gender of a farmer

$X_2$  = Age of a farmer

$X_3$  = Education level of a farmer,

$X_4$  = Annual income earned by a farmer from woodlot farming

$X_5$  = Land size own by a farmer

$X_6$  = Assets acquisition by a farmer

$e$  = Standard Error

$\beta_0$  = Intercept

$\beta_1$  .....  $\beta_6$  = Coefficient of determinant

Based on the aforementioned logistic regression model above, the study generally assumed that woodlot farming adoption is influenced by certain intrinsic factors which include gender of a farmer, age of a farmer, education level of a farmer, annual income of a farmer, size of land owned by a farmer, and assets acquisition by a farmer.

- (a) **Measurement of dependent variable:** Dependent variable (DV) is woodlot farming adoption in the study. In this study, the dependent variable (woodlot farming adoption) was measured by asking the respondents whether they adopted woodlot farming from crop cultivation or not. The unit of measurement used was “Yes” if Adapt, “No” if Not Adapt.
- (b) **Measurement of the Independent Variables:** In this study, six independent variables were measured. Table-1 presents the summary of independent variables which influence woodlot farming adaptation among majority of rural households in Mufindi district.

Table 1. Summary of Independent Variables Influencing Woodlot Farming Adaptation in Mufindi district (n=110)

Variable Symbol	Variable Description	Nature of Variable	Unit of Measurement	Expected Sign
$X_1$	Gender of a farmer	Binary	Dummy: (0 for Male and 1 for Female)	-
$X_2$	Age of a farmer	Continuous	Years of woodlot farmer	+
$X_3$	Education level of a farmer	Continuous	Years of respondent in school	+
$X_4$	Average income of a farmer	Continuous	Total income per year from woodlot farming	+
$X_5$	Land size own by a farmer	Continuous	Hectares of woodlot farm	+
$X_6$	Assets acquisition by a farmer	Continuous	Type(s) of asset(s) owned	+

### 3.5 Technical Considerations

At the outset, this study assessed technical issues related to multicollinearity and regression results validity. Meeting the assumptions of regression analysis is essential in ensuring that the results obtained are (Katani, 1994) truly representative for the researcher to be able to generalize the results. Therefore, the following examination of basic assumption of regression analysis was done, namely multicollinearity; and further testing of the overall relationship after model estimation.

## 4. Findings and Discussion

The paper aimed to assess the socio-economic factors influencing shifting from crop farming to woodlot farming in Mufindi district. Empirical evidences have been showing that majority of rural households own by crop farmers experience income poverty due to unfavorable socio-economic factors surrounding them compared with those farmers who had woodlot farms. As noted by Bailey (1994), unfavorable socio-economic factors are associated with high transaction costs, which would reduce income from exchanging. Therefore, socio-economic

characteristics of woodlot farmers were reviewed prior the study applied logistic regression method to explain socio-economic factors that influence woodlot farming adoption as can be seen in the next sub-section below:

#### 4.1 Socio-economic Characteristics of Respondents

The paper sees it is relevant to examine socio-economic characteristics of woodlot farmers to determine features of the respondents included in the study. Empirical evidences have been showing that socio-economic factor is one of the major factors influence income growth of any economic actors (Mnyawi and Benedict, 2014; Kirsten *et. al.*, 2008; Hobbs and Young, 2001). In this view, the following are the intrinsic socio-economic characteristics assessed in the paper:

Table 2. Socio-economic characteristics of respondents (n=110)

Characteristics	Category	Frequency	Percent
Gender of respondents	Male	59	54
	Female	51	46
Age of respondents	Less than 40 Years (Youth Age)	18	16
	41-54 Years (Adult Age)	25	23
	55+ Years (Old Age)	67	61
Education level	Never gone to school	19	17
	Primary level	41	37
	Secondary level	26	24
	Non-degree level	11	10
	Degree level	13	12
Woodlots size	Less than 9 Acres	74	68
	10 – 19 Acres	21	19
	20 – 29 Acres	8	7
	30+ Acres	7	6
Tree species	Pines	64	58
	Eucalyptus	35	32
	Cypress	11	10
Average Income	Less than Tshs. 5 Million	59	54
	Tshs. 6 - 10Million	35	32
	Tshs. 11 - 20 Million	8	7
	Tshs. 21 and above Million	8	7

##### 4.1.1 Gender of Respondents

Table-2 shows that the study was not biased because gender balance i.e. male and female was seriously considered. For instance, the Table-2 shows that male were 59(54%) and female were 51(46%) participated in this study. However, empirical evidence shows that most of the woodlot farm owners were male; if you based to the African tradition, normally female are staying home to take care of the family, fetch firewood and water while head of the house (male) is fetching bread for the family.

##### 4.1.2 Age of Respondents

In Mufindi district, it was observed that both youths and elders are actively engaging in woodlot farming as main business activities in their villages. In this study, the age of respondents was categorized into the following groups as can be seen in Table-2 above: less than 40 years, 41 to 54 years, and 55 years and above. According to Table-2, the highest age group is 55+ years which is equivalent to 67 (61%) and the lowest age group less than 40 years which is equivalent to 18 (16%). The implication here is that majority of people who converted crop farms to woodlot farms are older people due to their long time experience in crop farming and woodlot farming than any other age group in the study area.

Considering that empirical evidence shows that age has a significant relationship with the growth of income in business (Makauki, 1999). Theoretically it is believed that person who has higher age is someone with high business experience and knowledge, and consequently can generate more money using his/her business experience and knowledge.

##### 4.1.3 Education Level

The findings in Table-2 shows that 41(37%) respondents had primary education while 26(24%) had secondary

education. Based on these findings, majority of respondents (woodlot farm owners) had primary education. Theoretically, this implies that these woodlot owners have limited entrepreneurial skills and business education. Consequently, the level of illiteracy is very high. Therefore, level of influencing big deals is very minimal and hence getting low business income. Literature shows that low level of education might have affected growth of income of woodlot owners in the study area.

#### 4.1.4 Woodlot Size

Based on the findings, the study shows that the land size owned by the respondents differs in term of hectares as Table-2 shows. The findings show that 74(68%) respondents interviewed were owning land less than 9 acres, 21 (19%) respondents interviewed were owning land between 10 – 19 acres, 8 (7%) respondents interviewed were owning land between 20-29 acres, and 7(6%) respondents interviewed were owning land more than 30 acres. This implies that majority of the rural people in Mufindi district have started to convert their crop farms to woodlot farms as 74(68%) respondents interviewed have converted their crop farms to woodlot farms.

#### 4.1.5 Tree Species

Based on the findings in this study, the main tree species grown in Mufindi district are pines, eucalyptus and cypress. For instance, the findings shown that 64(58%) respondents were farming pines, 35(32%) respondents were farming eucalyptus and 11(10%) were farming cypress as shown in Table-2. This means that woodlot farmers have been farming different tree species to meet demand of the markets and for their economic improvement; since each tree species has different selling price. Based on the respondents' responses, pines have high demand in markets than other species. This is because pines are used more in constructions and paper millers. Furthermore, pines are often grouped together in a landscape and they are highly demanded for construction projects across the country.

#### 4.1.6 Average Income per year from Woodlot farming

Based on the findings, one of the reasons why majority of respondents in Mufindi district adapted woodlot farming is to improve their income. As Table-2 shows that, 59(54%) respondents earned less than TZS 5 Million, 35(32%) respondents earned between TZS 6 – 10 Million, 8(7%) respondents earned between TZS 11 – 20 Million, and 8(7) respondents earned TZS 21 Million and above. The findings imply that majority of woodlot farmers earn less than Tshs. 5 Million per annum.

### 4.2 Regression Analysis Results

In this study, logistic regression model specified socio-economic factors that influence woodlot farming adoption. The regression output is shown in Table-3. The findings indicate that three out of six independent variables [i.e., petty traders' education level (PTEDUC), petty traders' business experience (PTBEXP), and petty traders' business assets (PTBASS)] had significant effect on the household petty traders' income growth as shown in Table-3.

Table 3. Results of logistic Regression Analysis on the Socio-Economic Factors Influence woodlot farming adoption ( $n = 110$ )

Variable	$\beta$	SE	Sig.	Exp ( $\beta$ )
Gender of respondents( $X_1$ )	-1.734	1.344	0.197	0.177
Age of respondent( $X_2$ )	0.31	0.752	0.967	1.031
Education level of the respondents ( $X_3$ )	-1.170	0.634	0.045**	0.311
High income expected by respondents ( $X_4$ )	3.313	1.334	0.014**	0.713
Land size owned by respondents( $X_5$ )	0.500	0.465	0.023**	1.051
Assets Acquisition by respondents( $X_6$ )	0.017	0.176	0.019**	1.017
Constant	1.440	1.868	0.070**	1.220
Cox & Snell $R^2 = 0.754$				

Note: \*\* Significant at 5%

Nagelkerke  $R^2 = 0.905$

-2Log Likelihood (-2LL) = 24.846

#### 4.2.1 Gender of the Respondents

Survey results in Table-3 indicate that coefficient of gender was insignificant but positively influenced woodlot farming adoption decision; this result is in contrast with the prior expectation. But however, this result is in line

with the result shown in the study done by Foy and Pitcher (1999) and Katani (1994) that, gender has negative sign and is insignificant as woodlot farming does not increase with more participation of women. Since the empowerment of women seems to be fundamental in achieving rural household income poverty reduction.

On the other hands, gender is important as it reflects the traditional biasness in relation to land ownership and rights. Normally household has right to inherit land or trees; in most cases women have no right to inherit land or trees. As a result, gender ends up having a negative effect on performance of woodlot farming because women are the main users of waste forestry products such as charcoals and firewood.

#### 4.2.2 Age of the Respondents

Based on the survey results, the findings of this study in Table-3 shows that the coefficient of age of the woodlot owner was insignificant but positively influenced woodlot farming adoption decision; this result concur with the prior expectation. This implies that woodlot farming adoption is positively influenced by age of the head of household. The notion here is that the older the age of householder' head is, the less productive s/he gets and hence the lower the income generated thus needs to convert crop farm to woodlot farm for more income generation. This result agrees with theoretical view that older have more personal contacts, allowing trading opportunities to be discovered at low cost, and are likely to experience lower transaction costs and use more marketing channels (Lyne, 2002), and get higher income from woodlot farming.

#### 4.2.3 Education Level

Based on the findings, education is one of the strongest determinants of woodlot farming adaptation in Mufindi district. This is because respondents with higher education were found to have more annual income earning from woodlot farming compared to respondents who have below higher education level. This implies that woodlot farmers with at least higher education level have great chance to perform well in woodlot farming and earned more income.

Education plays an interesting role as a determinant of activity income. The coefficient of education level of respondents was significant and negatively influence woodlot farming adoption decision as noted in Table-3. This result does not conform to a prior expectation that the higher the level of education of the household head is, the higher the household income in the woodlot trade exchange activities. This finding agreed with the finding in a study done by Ugwumba *et al.*, (2010) who observed that household heads who have higher education can combine many viable enterprises and can be more efficient in woodlot farming adoption and consequently realize more income.

In addition, the low level of education of household heads, coupled with their inability to communicate in the business language (*e.g.* lack of bargaining skills or inability to identify poor contract), also contribute to high transaction costs among household heads who engage into woodlot farming. High transaction costs in marketing of commodities often exclude poor woodlot farmers from participating in growth opportunities (Lyne, 2002).

#### 4.2.4 High Income Expected

Based on the survey results, the findings of this study in Table-3 show that the coefficient of income growth aspiration was significant and positively affected by woodlot farming adoption decision; this result concur with the prior expectation. This implies that an increase of woodlot farm size goes together with an increase of woodlot owners' income per year.

#### 4.2.5 Land Size Owned

Based on the findings, the coefficient of land size owned by respondents was significant and positively influenced woodlot farming adoption decision as noted in Table-3. This result conforms with a prior expectation that the higher the amount of land size owned by farmers, the higher the chances of converting crop farms to woodlot farms. This is to say, the bigger the size of land owned, the more the space would be available for woodlot farming adaptation, and tree planting by the household. Here, the study assumed that, size of land determines the extent to which the majority of rural household in Mufindi district would adapt the woodlot farming.

#### 4.2.6 Assets Acquisition

Based on the findings, the coefficient of assets acquisition owned by respondents was significant and positively influenced woodlot farming adoption decision as noted in Table-3. This result conforms also with a prior expectation that the higher the amount of assets acquisition expectations owned by respondents is, the higher the convention rate of crop farms to woodlot farms.

The study however revealed that machineries and equipment (assets) had influenced respondents to convent crop



farms to woodlot farms. For instance, respondents who owned saw mills and paper mills invested in woodlots so as to obtain logs and timbers and exchange at high value.

#### 4.3 Another Reasons Influencing Woodlot Farming Adaptation

Woodlot farming plays an important role in majority of rural households in Mufindi district. This is because of poor and declining market of cultivated crops over the past 5 years (Singunda, 2010). However, there are reasons which entail why majority of rural households adapted woodlot farming and consider them as an alternative socio-economic activity for satisfying their subsistence and secondary needs as shown in Table 4.

Table 4. Other reasons that influence woodlot farming in the district (n=110)

Reasons lead to woodlot adoption decision	Frequency	Percent
Poverty reduction	33	30
Supply of timbers, logs, and transmission poles	19	17
Environment protection	5	5
Self-employment	10	9
Government policy	8	7

##### 4.3.1 Poverty Reduction

Based on the findings in Table-4 above, woodlots provided a wide range of resources and benefits to poor people, from providing land for agricultural conversion, to timber, agro forestry and non-timber forest products and ecosystem services. The woodlot owners draw substantial parts of their subsistence needs from forest produces. Furthermore, woodlot farming generates the so-called forest environmental income which refers to income (cash and non-cash income) derived from extraction from non-cultivated forest sources. The non-cash income includes food, fodder, energy, house-building materials, and medicine. Based on the findings, 30% of respondents interviewed adapted woodlot farming because of poverty reduction. This will be achieved by selling of logs, timbers and transmission poles.

##### 4.3.2 Supply of Timbers, Logs and Transmission Poles

Findings depicted that 17.3% of respondents adapted woodlot farming for the purpose of supplying timbers for construction industry, logs for saw millers and paper millers as well as transmission pole for national grid electrical service lines as shown in Table 4.9. The eucalyptus is the best used tree species for transmission poles. A study by Singunda (2010) showed that 35% of family tree growers in Mufindi district are new (less than 8 years of engagement in tree planting), most of whom have been attracted by the growing demand for wood raw materials.

Woodlot farming is reportedly ranked as the first economic activity by most of the participant farmers in Mufindi district. However, during the recent past, income generated from selling tree products has shown a considerable increase thereby motivating other farmers to join woodlot farming as a financially attractive activity. Woodlot farming activities in most villages in Tanzania is carried out on the individual farmers' initiatives and species grown for commercial purposes include pines, eucalyptus and cypress.

##### 4.3.3 Environment Protection

The findings in Table 4.9 above, findings showed that 4.5% of respondents adapted woodlot farming for environment protection. This is the smallest percentage compared to other reasons. This implies many woodlot farmers in Mufindi lack awareness on the contribution of woodlots to environment protection education. Furthermore, the diversity of goods and services provided by woodlots serve as a significant safety net source or a gap-filler for the rural poor in times of instability, scarcity. The research in developing nations shows that forests provide "natural insurance" in the form of alternative sources of income and subsistence to help cope with shocks (Kajembe and Luoga, 1996). In particular, forest income diversifies the income portfolio for all groups, but is particularly important for poor, rural households. The woodlots also provide safety nets in the sense that they can reduce environmental impacts of events such as floods and landslides (i.e. regulating ecosystem services).

##### 4.3.4 Self Employment

As noted in this study, the woodlot farming served as a self-employment for majority of rural household. Due to the problems in labor market and illiteracy of majority of rural household in Mufindi district, it is quite very difficult for them to engage in professional jobs but rather the woodlot farming adaptation becomes significant as self-employment for them. The Table 4.9 indicated that 9.1 % of respondents adapted woodlot farming for

self-employment. The woodlot owners used household labor for planting and weeding the trees in their woodlot farms.

#### 4.3.5 Government Initiatives under the National Forest Initiative Schemes

The results in Table 4.9 above show that 7.3% of the respondents embarked woodlot farming as the result of national forest initiatives pressure insisting on the importance of trees planting. Also, the government has declared a national day for tree planting (the First of April each year) which is earmarked by each region, district, institution and organization.

It is not clear how many trees have been planted through this campaign and what the survival is, but the contribution is significant. Tanzania's government first launched tree planting campaign in the 1970s and later in the 2000s to ensure every district council plant at least 1.5 million trees annually. Also the government established Tanzania National Forest Policy 1998 and Tanzania National Forest Act 2002 to enforce the importance of trees planting in the country for environment protection and adaptation and mitigation of climate change.

### 5. Conclusion and Policy Recommendations

Basing on the findings, the study concluded that socio-economic factors that influence woodlot farming positively and significantly are income generation expectation, land size, and assets acquisitions meanwhile education level influence woodlot farming adoption negatively and significantly. Based on the findings, this study recommends the following; *first*, the government should provide proper education to woodlot owners on trees planting (species, weeding, seeds, seedling and spacing) and fire control (establishment of fire lines) in woodlots to protect the destruction during wild fire outbreaks. The woodlot farming should be carried out professionally as it contributes to the district revenues through the issuance of forest produce harvesting licenses and transit pass from one area to another. *Second*, the rural transport infrastructures especially roads should be improved and maintained timely to enable easy transportation of goods to the market. *Third*, the government with other development partners should develop and provide capital, technical and technological support to woodlot owners in the district to accelerate the national poverty alleviation efforts which can be achieved through woodlots investment. *Fourth*, the government should look upon solving the problems facing woodlot owners like regulating prices for timbers, logs and transmission poles to enable woodlot owners to earn more income to improve their rural life. *Sixth*, proper harvesting methods, equipment as well as modern sawmilling technology should be used so as to reduce trees waste. *Seventh*, there is a need for government to support the woodlot owners by providing subsidies including inputs such as land, fertilizers, and quality seeds through Mufindi district officials so as to create employment opportunities among majority of rural households and raise their standard of living. If all these recommendations are implemented, then improvement in the income from woodlot farming would ultimately be realized.

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## Notes

Note 1. Validity is a precondition of reliability (Mwaipopo, 2006), but reliability is not a precondition of validity. This argument implies that reliability is a necessary condition of validity, but it is not sufficient to establish validity (Gujarati, 2006; Pindyck and Rubinfeld, 2010).

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