Journal of the Geographical Association of Tanzania, Vol. 41, No. 1: 150–168

Factors Influencing Farmers to Convert Productive Croplands into Woodlots in Mbeya Rural District, Tanzania

***Saumu Jumanne*[*] *Cosmas H. Sokoni*[†] *& Elizabeth Palela-Makawa*[‡]**

Abstract

Recently, the Mbeya Rural district has experienced land fragmentation and scarcity due to population increase. However, it is paradoxical to see that farmers have been converting productive croplands into woodlots instead of practicing agricultural intensification on their already scarce croplands. This paper contributes to the understanding of changes that are experienced by farmers in Uporoto Highlands by analysing factors that influence them to convert productive croplands into woodlots. The selection of the research area was based on the rate of conversion of croplands into woodlots, and easy accessibility from main roads. A simple random sampling technique was used in selecting 366 farmers for household interviews, while purposive sampling was used to select the research area, key informants, and participant of focus group discussions (FGDs). Field observation and documentary review were also used to complement the collection of data. The paper employed a mixed method approach to capture both quantitative and qualitative data. Quantitative data were analysed with the aid of the IBM SPSS Statistics software, version 21, to allow the generation of descriptive statistics, cross-tabulation functions, and multinomial regression analysis results. Qualitative data were analysed using content analysis. The results suggest that the conversion of productive croplands into woodlots is influenced by market conditions, social/peer influence, institutional factors, nature and characteristics of trees, holding land for future use, farmers' characteristics and urban to peri-urban expansion. The study recommends that agricultural institutions in the country should create enabling conditions that help farmers convert their productive croplands in a manner that does not threaten food security.

Key words: *conversion, productive cropland, woodlots, intensification*

1. Introduction

In meeting the food demand of an increasing world population, the availability of cropland is of significant importance. The United Nations (UN) estimates the world population is to be 9.6bn people by 2050 (FAO, 2011). Thus, to meet the food demands of this population, the availability of croplands is paramount. However, the availability of cropland is affected by the conversion of croplands

[*]Geography Department, Dar es Salaam University College of Education (DUCE):saumu.j@gmail.com (Corresponding author)
[†]Geography Department, University of Dar es Salaam
[‡] Geography Department, University of Dar es Salaam

into non-agricultural uses. For instance, cropland area in developed countries has been decreasing after having been converted into urban areas, and into forests (Sali, 2012). In the long term, this reduction of the land available for crop production may lead to food insecurity.

Studies show that conversion of croplands into woodlots is common in China since 1999 (Fei et al., 2005). This conversion was a government-based conservation project aimed to restore eroded soil and improve ecology (Fei et al., 2005). In Costa Rica, conversion of non-productive croplands into woodlots has been reported by Thacher et al. (1997) who have characterized it as one of the large-scale conservation programmes to have occurred in America and the United Kingdom. Other studies have focused on conversion of productive croplands into other land uses, other than woodlots, but provide the basis of understanding the conversion of croplands into woodlots (Govindaprasad and Manikandari, 2014; Islam et al., 2019; Kallio, 2013; Tsani et al., 2018).

In Africa, the conversion of productive croplands into eucalyptus woodlots is reported by Gizachew (2017) and Yitaferu et al. (2013) to have occurred in parts of Ethiopia, and the purpose was to earn more income. High market demand of eucalyptus tree products, failure to afford buying fertilizers and the influence of neighbours who had woodlots influenced the conversion of croplands into eucalyptus woodlots (Gizachew, 2017). In Ghana, productive croplands were converted into residential and commercial lands (Appiah et al., 2019), and similarly in Kenya (Kiita, 2013; Wanjira, 2019).

The majority of countries in Sub-Saharan African (SSA), including Tanzania, depend on agriculture for their people's livelihoods (IAASTD, 2009). Agriculture contributes about 32% of the Gross Domestic Product (GDP), and employs about 65% of the labour force (AGRA, 2013). Thus, the availability of croplands contributes to the region's economy and livelihoods. At times, crop production decreases due to unreliable rainfall, land degradation (FAO, 2009), poor technology, increased population, and pests and diseases (URT, 2013a). Such a decline may also be associated with agricultural land use changes.

In Mbeya Rural District, crop cultivation is the major economic activity (URT, 2012). Predominantly, about 85% of the people depend on crop production for their livelihoods, while few depend on both crop production and animal husbandry (URT, 2007). The district has recently experiencing land scarcity and land fragmentation (FDT, 2015) due to population increase, which has negatively affected food crop production (DED, 2012 cited by Nzilano, 2013). Likewise, in 2015, URT (2018) reported that the district had the highest percentage of households that experienced food insecurity by 7 percent. Within this background, therefore, it is paradoxical to see that farmers are converting

their productive croplands into woodlots instead of practicing agriculture intensification. The conversion of a productive cropland into a woodlot[1] is an issue considering that cropland is the source of food for the people. This conversion causes reduction of croplands, and may eventually cause decline in crop yields, which is likely to have effect on people's livelihoods and threaten the agricultural sector as a whole.

In the context of Tanzania in general, and specifically in Mbeya rural district, there is scant information on the conversion of productive croplands into woodlots and the factors influencing it, hence a call for investigating this phenomenon. The district experiences land scarcity, land fragmentation and food insecurity (Sokoni, 2001), yet farmers convert their productive croplands into woodlots instead of intensifying agriculture in the remaining croplands. Normally, woodlots are commonly developed from non-productive croplands or from extra lands (Francis, 2012). Contrary to that, Tilumanywa (2013) shows that even some productive croplands in Mount Rungwe ecosystem have been converted into woodlots; and a similar practice has also been observed in Uporoto Highlands. This conversion reduces croplands that could be used for crop production, thereby threatening food security.

This paper, therefore, examined the trend of the conversion of croplands into woodlots from 1980s to 2015 based on farmers' views, and the factors that influenced the conversion. The paper contributes to the understanding of changes that are experienced by farmers in Uporoto Highlands by analysing factors that influence them to convert productive croplands into woodlots. The generated knowledge has the potential of creating a space for agricultural institutions in the country to create enabling conditions that may help the target farmers to convert their productive croplands in manner that does not threaten food security in the target villages.

2. Theoretical Framework

The research for this paper was guided by Boserup's theory of agricultural change (Boserup, 1965). The theory served as a useful tool in unveiling why agricultural intensification is not applied in the research area, despite the population increase and land fragmentation. It offered explanations that are key to understanding conditions and situations that trigger farmers to convert their cropland into woodlots.

Boserup's theory was complemented by the market demand theory (Garb, 1971). The latter provided support in examining whether high market demand

[1]A woodlot is a plot of land on which trees are planted (Francis, 2012). Similarly, Buyinza et al. (2008) defines a woodlot as a set of trees which are planted on an individual or community land for the purpose of producing fuel wood, construction materials, or for sale.

and prices of tree products created opportunities for tree producers to increase the rate of production. This is because farmers' decisions on land uses depend on market demand of a particular product at a given time (Olson et al., 2004). The theory also served as a descriptive tool for alternative causal factors that might have influenced Uporoto Highlands' farmers to opt for the conversion of their cropland into woodlots.

3. Context and Methods

3.1 Study Area

The research for this paper was conducted in Mbeya rural district (Figure 1), which lies between latitudes 7° and 9° South of Equator, and between longitudes 33° and 35° East of Greenwich. It has a total area of 2,432km^2 (243,200 hectares) (URT, 2013b). In 2012, the district has a total population of 305,319 people, of which 161,540 are females and 143,779 are males (URT, 2013b). The annual mean rainfall ranges between 650mm and 2700mm, while annual mean temperature ranges between 12^{0}C and 30^{0}C (URT, 1997a).

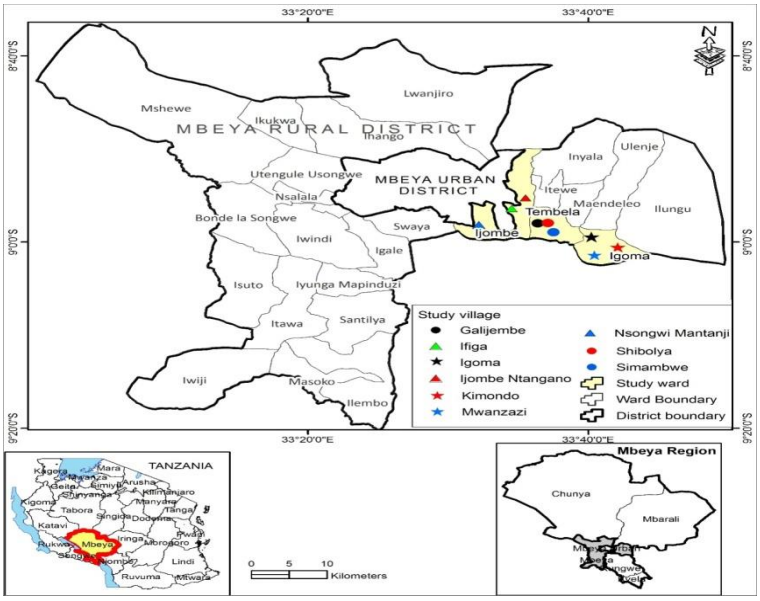

Figure 1: Location of Study Villages in Mbeya Rural District

Source: GIS Lab, IRA, University of Dar es Salaam

The research for this paper was conducted in nine villages in Ijombe, Tembela, and Igoma wards. These wards were purposively selected based on their accessibility and the relative importance of the conversion of productive croplands into woodlots. Simple random sampling was used to sample both households and heads of households for the survey. A total of 366 heads of households (Table 1) were selected.

Table 1: The Study Sample Size

Ward Name	Village Name	Village's Population	Number of Households	Sample size
Ijombe	Nsongwi Mantanji	1,694	446	37
	Ijombe Ntangano	1,044	275	23
	Ifiga	1,475	388	33
	Galijembe	2,663	666	56
Tembela	Shibolya	1,459	365	31
	Simambwe	2,196	549	46
	Mwanzazi	1,155	304	26
Igoma	Igoma	3,573	940	79
	Kimondo	1,582	416	35
		16,841	**4,349**	**366**

Source: URT (2013b)

3.2 Data Collection Methods and Data Analysis

Data were collected at household level using structured interview (face to face), aided by questionnaires which were administered to heads of household. The data collected include sex, age, education, fields owned, fields converted, year of conversion and the factors influencing the conversion. The data were entered into the IBM SPSS software version 21, and analysed using descriptive statistics, cross-tabulation and multinomial regression analysis.

Research for this paper also employed in-depth interview to collect data from key informants (elders and leaders) on cropland conversion, and the factors influencing the conversion. This method helped to collect historical knowledge and experience of a person (Creswell, 2008). The collected data were analysed using a content analysis approach.

Furthermore, focus group discussions (FGDs) were employed to collect qualitative data. Nine FGDs were conducted, each having 8 to 10 members. This number was in line with Khan et al. (1991) who proposed that 8 to 12 members are sufficient for FGDs. The participants were selected based on leadership, sex, and involvement in tree planting. This method helped to capture rich and diverse viewpoints from different people in a short period of time (ibid.). The discussion was guided by a checklist of questions on trends of conversion, and the factors influencing conversion. The data collected were analysed using a content analysis approach.

Field observation was also used to collect data on land use activities, socio-economic status of villagers and tree species grown, which were captured using a digital camera. This was used to complement what respondents said. The photographs were processed into a more meaningful and understandable form. Moreover, documentary review was used to collect data on the factors

influencing conversion of productive croplands into woodlots (empirical and theoretical literature), and information about the research area. The data collected were analysed using a content analysis approach.

4. Results

4.1 Trend of Conversion of Productive Croplands into Woodlots

The results in Table 3 show that about 644 fields (50.4%) were converted into woodlots. This is out of the 1,277 total fields owned by all interviewed respondents in the three wards. The converted croplands started in 1980s up to 2015. Respondents have converted between 1 to 4 fields, but more than half of them had converted 2 fields.

Table 3: Year of Cropland Conversion into Woodlots Uporoto Highlands

Year of conversion	Field 1 (Freq.)	Field 2 (Freq.)	Field 3 (Freq.)	Field 4 (Freq.)	Total Freq	% of Total Freq.
1980-1989	1	0	0	0	1	**0.2**
1990-1999	34	1	0	0	35	**5.4**
2000-2009	254	140	25	3	422	**65.5**
2010-2015	77	66	38	5	186	**28.9**
Total	**366**	**207**	**63**	**8**	**644**	**100**
Percent	100	56.6	17.2	2.2		

Note: Field 1-4 represent total number of fields each respondent owned
Source: Field Survey (2016)

From the results in Table 3, the trend of conversion of croplands has indicated to vary from time to time. Despite of such variation over time, the results in figure 2 show that a majority of respondents (96.2%) reported the trend to increase from time to time.

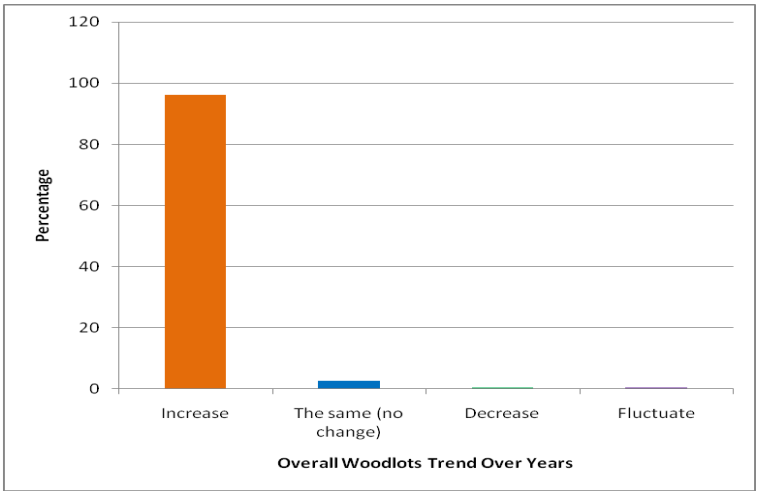

Figure 2: Trends of Woodlots over Years

Such an increase in cropland conversion was supported by key informants and FGD's participants in all the three wards. For instance, Box 1 shows the perceptions of a key informant on the trend of the conversion of productive croplands into woodlots.

BOX 1

Sometimes back, we used to have fewer woodlots in our areas than we do today. However, the situation of conversion of croplands into woodlots has been increasing year after year, and we are worried about what will happen in the near future. Based on this trend, our children and grandchildren will no longer have croplands to cultivate since the area will be dominated by woodlots only….

Male interviewee at Galijembe village, 2016

4.2 Factors Influencing Conversion of Croplands into Woodlots in Uporoto Highlands

The results show that respondents' decisions to convert productive croplands into woodlots were caused by a set of interacting factors. The factors in Table 4 are market conditions (70.1%), social/peer influence (54.4%), institutional factors (9.3%), nature and characteristics of trees (3.8%), holding land for future use (3.8%), farmers' characteristics (7.4%), and urban to peri-urban expansion (5.2%).

Table 4: Factors Influencing Conversion of Croplands into Woodlots(N=366)

Factors	Ward						Total Freq.	% of Total freq.
	Ijombe		Tembela		Igoma			
	Freq	%	Freq	%	Freq	%		
Farmers' characteristics	9	9.7	10	7.5	8	5.7	27	7.4
Social/Peer Influence	43	46.2	72	54.1	84	60.0	199	54.4
Market conditions	56	60.2	97	72.9	105	15.0	228	70.5
Urban to peri-urban expansion	19	20.4	0	0	0	0	19	5.2
Nature and characteristics of trees	2	2.2	4	3.0	8	5.7	14	3.8
Holding land for future use	2	2.2	6	4.5	6	4.3	14	3.8
Institutional factors	5	5.4	16	12.0	13	9.3	34	9.3
Total	**93**	**100**	**133**	**100**	**140**	**100**	**366**	

Note:*Based on multiple response analysis. Freq= Frequency

Source: Field Survey (2016)

4.2.1 Market Conditions

Planting trees for the purpose of selling so as to earn income depends on the availability of a good and functional market (Kallio, 2013). The market

assures farmers of the likelihood of selling their tree products at some expected prices. A good market is determined by its market system which is associated with two major factors; firstly, accessibility and availability of good market (Oladele, 2005). This means the presence of buyers or places where trees products would be sold after harvest. Accessibility of a market is determined by the presence of good means of transport like roads, which facilitate transportation of tree products from farm to the market. Mbeya Rural District is well connected to trunk roads, making it accessible to the various market centres of Kiwira, Uyole, Tunduma, Morogoro and Dar es Salaam (Sokoni, 2001). Secondly, a good market is also associated with good prices, where one can estimate the profit of the tree products to be sold, and the increase in market demands. Key informants and FGDs participants noted that the proximity to the Tanzania-Zambia Railway Authority (TAZARA) railway has enhanced access to distant urban centres such as Dar es Salaam.

In this paper, market conditions entail the availability and accessibility of market and price. The result shows that about 70.5% (Table 4) of the respondents indicated that market conditions for commercial trees like pines have influenced them to convert croplands into woodlots. However, the multinomial regression analysis results indicate that market conditions were more likely to influence farmers to convert croplands into woodlots than any other factor. Statistically, market condition is the leading factor for this conversion. However, this observation is not significant. Therefore, apart from market conditions, other factors in Table 4 influenced this conversion. The market factor was also supported by key informants and FGDs participants (Box 2).

BOX 2

The idea of growing tree woodlots to the extent of converting my croplands into woodlots came after I saw a good market; high price and high demand of timber and poles.…tree business people had been visiting our area looking for people owning mature woodlot trees…the price offered was very promising"

Male respondent in Igoma village, 2016

The results also show that the increase in market demand was associated with the growth of towns, accompanied by increasing demand for timber and poles used in building activities. This was also supported by FGD participants in all the three wards studied.

4.2.2 Social/Peer Influence

A farmer, like any other human being, does not live in isolation from the society, as it influences one's behaviour, attitude, perception and decisions. Thus, through social interactions/networking, farmers' behaviours are shaped by the members of society they interact with (Rogers, 2003). In this paper, social/peer influence refers to farmer's observations, learning, imitating, accepting advice or experience of his/her peer or neighbours farmers. The results show that 54.4% of respondents were influenced by neighbouring farmers who had grown woodlots (Table 4). This result was echoed in the FGDs and key informants who suggested that farmers tend to learn from their neighbours and thus become influenced to convert their croplands into woodlots(Photo 1).

Photo 1: Eucalyptus woodlot established after the neighbour had done so in Ifiga village
Source: Field Survey (2016)

A multinomial regression analysis results show that social/peer influence were more likely to influence farmers to convert croplands into woodlots than any other factor, although the observation was not significant. . This result indicates that member of the society influences farmers' behaviour/decisions on land uses. This result is supported by Rogers (2003) who stated that the social system has a great influence in the adoption of an innovation.

The conversion of a cropland into woodlots seems not to be not only out of a farmer's free will, but also a kind of response to pressure from neighbouring farmers' decision to create woodlots adjacent to their crop fields. Some farmers converted their croplands because their crops were affected by tree shades from neighbours' woodlots, which led to low or no crop production at all. This result was echoed by key informants and FGDs participants in all the three wards. One of them said (Box 3):

BOX 3

"I had never planned to grow woodlots, but since my neighbour has grown pine woodlots on his farm, the woodlot tree shade has affected the crop growth in my farm by making them so weak and thus affected crop yields, thus I had no more option other than growing woodlots as well"

Male key informant in Kimondo village, 2016

4.2.3 Institutional Influence

The government of any nation has a direct and indirect role in governing its own resources like land, especially when it greatly depends on agriculture for its economic development. The government of the United Republic of Tanzania officially owns all land in the country and the citizens remain the sole implementers of decision made on land (URT, 2013a; URT, 1997b). The National Land Policy (URT, 1997b) clarifies that any investment over the land can either be introduced directly by the government or indirectly through institutions that collaborate with the government on developmental projects. However, project adoption depends on its acceptance by, and perception of, the local community. The results show that 9.3% (Table 4) of the respondents converted croplands into woodlots due to the influence of government/ institutions. A multinomial regression analysis result indicated that the government/ institutions are more likely to influence famers to convert their croplands into woodlots than merely holding land for future use. However, the observation was not significant.

The study findings show that the government influenced the conversion of croplands into woodlots in several ways. For instance, in Shibolya village, it was observed that the District Council directed farmers to plant trees on their fields for the purpose of conserving the environment and attracting rainfall. Likewise, the government enforced a regulation to farmers not to cultivate 60 metres from water sources and, as a result, croplands that were near water sources were replaced with woodlots. In Kimondo village, all 35 heads of households interviewed indicated that they previously depended on Kiwira Government Forest Plantation for firewood, but after they were prevented and fined, they decided to plant trees on their farms as a means of solving the problem of firewood. These results were also supported by key informants and FGDs participants interviewed in Kimondo village.

Furthermore, some NGOs in Uporoto Highlands were reported to have influenced farmers to convert croplands into woodlots. These NGOs include the Isangati Agricultural Development Organizations (IADO), which encouraged

the planting of '*mipogoro*' other than eucalyptus; and the MKUHUMI (Mpango/Mkakati wa Kupunguza Uzalishaji wa Hewa Ukaa Itokanayo na Ukataji Miti Ovyo na Uharibifu wa Misitu). From these observations, it shows that the government either directly or indirectly influences land use decisions, including the conversion of croplands into woodlots.

4.2.4 Holding Land for Future Use

The results show that 3.8% of the respondents converted croplands into woodlots for the purpose of holding land for future use. For instance, old people aimed to protect their land for future family use. Furthermore, FGDs participants revealed that some people who had migrated to other areas and thus could cultivate their croplands, together with prosperous farmers who had recently acquired land but were not yet ready to use it for cultivation, planted trees on such land as a means of holding it for future use. Also, the woodlots could be used as collateral (security) in accessing loans from financial institutions like banks or savings and credit cooperatives (SACCOs). Key informants and FGD participants supported this (Box 4).

Box 4

I have decided to convert some of my plots that I have as a means of holding them so that they can benefit my children in the future. I believe when my children grow up and reach the level of going to secondary school, they will be benefitting from those trees because selling tree products such as timber will enable them to pay their schools fees and other school needs

Male respondent in Galijembe village, 2016.

4.2.5 Nature and Characteristics of Trees

The nature and characteristics of plant types/species influence their adoption (Rogers, 2003). About 3.8% of the respondents indicated that the nature and characteristics of trees influenced croplands conversion. The multinomial regression analysis results indicated that this factor was more likely to influence the conversion of croplands into woodlots. However, the observation was not significant. The nature and characteristics of the trees include low capital, low labour demand, high profitability, resistance to diseases and pests, ability to regenerate (eucalyptus), and ability of mixing with food crops (pines) at the early stages of growth. The key informants and FGDs' participants supported this result, and added that woodlots were preferred by farmers because they are less demanding in terms of time, labour and capital.

4.2.6 Farmers' Characteristics

The results in Table 4 show that about 7.4% of the respondents were influenced by their personal characteristics to convert farmland into woodlots. The multinomial regression analysis results show that farmers' characteristics were more likely to influence the conversion of croplands into woodlots than any other factor. However, the observation was not significant. Key informants and FGDs participants supported this result by indicating that farmers' age, education, knowledge and experience on tree farming, influenced people's decisions to convert their croplands into woodlots.

1. Educational level

Studies have shown that farmers' education and knowledge influence the conversion of one land use into another (Islam et al., 2019; Kamilah, 2013; Tilumanywa, 2013). In this study, the results in Table 5 show that 82.5% of the respondents that has primary school education had converted a maximum of 4 fields; and 12.0% that had not attended school had converted a maximum of 3 fields. The educated could have acquired the knowledge and skills from school or professional people who were interested in tree planting, while those who had not attended school had some informal education that could be acquired through training workshops/seminars, or from neighbours who had knowledge on trees. So, the more a farmer is educated or possess indigenous knowledge, skills and experience on tree farming, the higher the rate of practicing it, which consequently influences cropland conversion. This result was supported by key informants and FGD participants in all the three wards studied.

Table 5: The Influence of Education Level in Converting Croplands

Educational Level	**Total Number of croplands converted**				**Total freq.**	**% total freq.**
	Field 1	***Field 2***	***Field 3***	***Field 4***		
None	25	14	5	0	44	12.0
Primary	128	119	47	8	302	82.5
Secondary	4	11	2	0	17	4.7
Tertiary	2	0	1	0	3	0.8
Total	159	144	55	8	366	100
%	43.4	39.3	15.0	2.3	100	

NB: Field 1 to 4 represent the total number of fields (plots) each respondent owned

Source: Field Survey (2016)

2. Sex Composition

The results show that a maximum of 4 and 3 fields were converted by males and females, respectively. This is one of the cultural practices (patriarchy system) in many societies in Tanzania where males have the right to own land and make all land use decisions, unlike females who are not entitled to own land. With the exception of few tribes like the Safwa in Mbeya rural district,

few women were reported by Sokoni (2001) to be entitled to own land. However, women in households headed by females were in a position to have access to land and convert croplands into woodlots.

4.2.7 Urban to Peri-urban Expansion

The conversion of croplands into other uses is at times associated with the expansion (growth) of urban areas into peri-urban areas (Kiita, 2013). Woodlot trees can be regarded as future or long-term asset/investment or land security. Urban areas, such as the Mbeya City Council, tend to expand their areas by acquiring lands that boarder them (peri-urban areas). About 5.2% of the people in Ijombe ward indicated that they grew woodlot trees in their croplands in future expectations of being handsomely compensated for the trees when their fields are acquired by the municipality. This factor was reported by respondents in Ijombe ward (peri-urban area) only. However, a multinomial regression analysis indicated that, urban to peri-urban expansion was more likely to influence the conversion of croplands into woodlots than any other factor, although the observation was not significant. Thus, the possibilities of urban areas expanding into peri-urban areas have influenced farmers to convert croplands into woodlots in expectation of good compensation for the trees. This was supported by key informants and FGD participants in Ijombe Ntangano, and Nsongwi Mantanji villages. A key informant in Ijombe Ntangano village was quoted as saying (Box 5):

Box 5

"I had experience from my relative in Iyunga who had woodlots, and at one time the government wanted to take away his farm, at least he was compensated because of the woodlots the farm had, but his neighbours whose croplands had no trees were never given any compensation …So since then I leant a lesson, and since I live close to the urban areas, I decided to grow woodlot trees so that when the government decides to take my farm, at least I will be compensated"

A male interviewee at Ijombe Ntangano village, 2016

5. Discussion

The results show that the conversion of productive croplands into woodlots has been occurring over time. The trend of that conversion was increasing both at the individual household level and the community level in the research area. The increase in croplands converted into woodlots has reduced areas for crop cultivation. For instance, FGDs in the Galijembe village have noted that areas that were previously used for crop cultivation have greatly been reduced. They were even worried on what would happen in the future if the same trend of

converting croplands into woodlots continued. The increase in croplands converted into woodlots in Mbeya rural district is similar to the one reported by Gizachew (2017), and Yitaferu et al. (2013) in Ethiopia.

The results also suggest that farmers in the research area were influenced by one or a combination of factors to convert their croplands into woodlots. For instance, the Uporoto Highlands in Mbeya rural district is well connected to good market areas where farmers can easily sell their tree products. Likewise, good markets are linked with good transport networks like roads and railways that facilitate transportation of tree products to the markets. The presence of good markets was also associated with the growth of towns, which is accompanied by an increasing demand for timber and poles for building activities. Therefore, the presence of a good market for tree products has influenced farmers to convert their productive croplands into woodlots. This is in line with Kallio (2013) who indicated that the availability of a functional market have influenced farmers to plant trees for cash purpose. This result is also supported by Gizachew (2017), Wanjira (2019) and Yitaferu et al. (2013), who have indicated that high market demand and high price for tree products influenced farmers in Southern Ethiopia, Indonesia, and the Ethiopia Highlands, respectively, to convert croplands into woodlots. However, the factor of market conditions might be a bit complex unlike how it is perceived by farmers in Uporoto Highlands. This is because trees take 10 to 25 years to mature, so they do not provide immediate economic returns; only that farmers have used the current market prices to predict future market prices for which they are not sure. This is supported by Kallio (2013), who noted that tree growers are exposed to risks in terms of price fluctuations due to the long period trees take to mature.

The results also indicate that social/peer groups have influenced farmers in the research area to convert their productive croplands into woodlots. For instance, it was revealed that when neighbouring farmers have grown woodlots, adjacent farmers did the same because without doing so, food crops grown their farms tend to be affected by trees shades from neighbours' woodlots. This observation was revealed by the key informants and FGD participants in the research area. This result is similar to that of Gizachew (2017), who reported that farmers in Cheha District in Ethiopia were influenced by their neighbours who had woodlots to convert their croplands into eucalyptus woodlots. Likewise, Kallio (2013) reported that social reasons like 'following the other farmers' influenced a majority of acacia planters in Kenya to convert their croplands into woodlots.

Any government has the power of influencing people towards performing certain activities. This is through formulating policy, regulations, programmes and projects (Nkonya et al., 2013). Some projects are either self-sponsored or

funded by donors. Most of the developmental projects in African countries like Tanzania are donor-funded. These include the Hifadhi ya Mazingira (HIMA) in Iringa region, and the Private Forestry and Carbon Trading Project in Iringa and Njombe regions (Ngaga, 2011). In the research area, the government -- through its institutions like the district council has -- either willingly or unwillingly made citizens implement planned projects on tree planting. The government has also enforced regulation to farmers not to cultivate 60 metres from water sources, thus replacing all croplands that were near water sources with woodlots. This finding is similar to observations by Appiah (2019), Kallio (2013) and Kiita (2013), which indicated that the government -- through policies, programmes, regulations and institutions -- influences the conversion of croplands into woodlots.

Likewise, it was revealed that farmers in the research area perceived trees as assets. They grew trees to hold land for future use. This includes meeting their children's and grand children's education needs, and for accessing loans from financial institutions. Govindaprasad and Manikandan (2014) support this funding by stating that woodlots generate utility such as insurance, asset, collateral to access credit from financial institution, and an inheritance for future generation. Kallio (2013:15) further added that "… trees sometimes serve as a 'saving account' for farmers and in some ways act as rural insurance system." The findings have also revealed that low capital, less labour demand, and the ability of trees to be mixed with food crops has influenced farmers in the study area to convert their croplands into woodlots. This is supported by Kallio (2013) who has indicated that young woodlot trees are mixed with annual crops before shading.

Moreover, this paper noted that both sex and education level of the head of households influences land use decisions, including cropland conversion. For instance, males in Uporoto Highlands have converted more croplands than females. This is due to the patriarchal cultural practice in which land is mostly owned by men. In line with this paper, Oburu (2011) has reported that men, as the heads of households, were given power and believed to have authority over land resources, and so had a great influence in the conversion of croplands into other land uses such as woodlots (Ashraf et al., 2015; Kulindwa, 2016; Tsani et al., 2018). Additionally, the results show that the more formal or indigenous knowledge, skills and experience on tree farming, the higher the rate of practicing it. Consequently, this influenced the conversion of croplands into woodlots. This result is supported by Ashraf et al. (2015), Islam et al. (2019), Kallio (2013), Kamilah (2013), Thacher et al. (1997), Tilumanywa (2013) and Tsani et al. (2018) who have indicated that, education, knowledge and experience of the household head influence decisions on land use, including tree planting.

This paper revealed also that the expansion of Mbeya town has influenced people in Ijombe ward to convert their croplands into woodlots in the anticipation that it would be more lucrative in compensations when the Mbeya city expanded into their areas. This result is supported by Govindaprasad and Manikandan (2014), and Kiita (2013) who stated that croplands, which are adjacent to urban areas, are more likely to be converted into woodlots.

6. Conclusion

This paper has assessed the trend of conversion of croplands into woodlots based on farmers' viewpoint, and the factors that have influenced the conversion in Uporoto Highlands, Mbeya Rural District. The results show that farmers have been converting their productive croplands into woodlots since the 1980s, and the trend has been on the increase, especially since the 2000s. This is a threat to the agriculture sector as it reduces areas for crop cultivation, consequently threaten people's livelihoods. Thus, for crop cultivation to thrive, agricultural intensification could be applied as a means of ensuring food security of an increasing population.

The results also show that at times there are either internal or external factors (or a combination of both) that have influenced farmers to convert their productive croplands into woodlots. Despite the fact that the presence of a good market for tree and tree products was the leading factor in influencing that conversion, social or peer pressure has also played a great role in influencing the conversion. This indicates that social systems -- including peer pressure -- have a great role in influencing land use decisions. Therefore, government policy should involve the social system in the process of informing land use decisions, both in theory and practice.

Acknowledgements

The authors thank the Dar es Salaam University College of Education (DUCE) for funding the PhD research that led to this paper.

References

Alliance for a Green Revolution in Africa (AGRA) (2013) *Africa Agriculture Status Report*: Focus on Staple Crops. Nairobi, Kenya.

Appiah, D. O., Asante, F., and Nketiah, B. (2019) Perspectives on Agricultural Land Use Conversionand Food Security in Rural Ghana. *Scientia Forestalis,* 1 (1), 1-14.

Ashraf, J., Pandey, R., de Jong, W., and Nagar, B. (2015) Factors Influencing Farmers' Decisions to Plant Trees on Their Farms in Uttar Pradesh, India. *Small Scale*

Forestry, 14 (3), 301–313. Available from: https://doi:10.1007/s11842-015-9289-7 [Accessed 15th February, 2019].

Boserup, E. (1965) *The Conditions of Agricultural Growth: The Economics of Agrarian Change under Population Pressure*. Aldine, New York.

Buyinza, M., Banana, A. Y., Nabanoga, G., and Ntakimye, A. (2008) Socio-economic Determinants of Farmers' Adoption of Rotational Woodlot Technology in Kigorobya sub-county, Hoima District, Uganda. *South African Journal of Agricultural Extension*, 37(1), 1-16.

Creswell, J. W. (2008) *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, Third Edition, SAGE, London.

Food and Agriculture Organization (FAO) (2009) *How to Feed the World 2050; the Special Challenge for Sub-Saharan Africa. High-Level Expert Forum*, Rome 12-13 October 2009. Available from: www.fao.org/wsfs/forum2050/wsfs-background documents/ hlef-issues-briefs/en/[Accessed 30th April, 2016].

Food and Agriculture Organization (FAO) (2011) *The State of the World's Land and Water Resources for Food and Agriculture (SOLAW) – Managing Systems at Risk*. Food and Agriculture Organization of the United Nations, Rome and Earthscan, London.

Forest Development Trust (FDT) (2015) *Household Survey (2014), Baseline Tree Grower Survey Report*, Farmers Registration Survey 2015, http://forestry-trust.org/wp-content/uploads/2015/10/FDT-Baseline-Tree-Grower-Survey-Report-Final.pdf [Accessed 29th April, 2016].

Fei, W., Rui, L., Feng, J., Qingke, Y., and Junliang, T. (2005) The Impact of Cropland Conversion on Environmental Effect in the Loess Plateau: A Pilot Study Based on the National Experimental Bases. *Journal of Geographical Sciences* 15 (4) 480-490.

Francis, P.D. (2012) *Small-Scale Timber Stand Management Techniques: A Case Study of Woodlots in Isangati, Tanzania*. A Masters' Thesis, Michigan Technological University, Michigan, United States. Available from: http://digitalcommons.mtu.edu/etds/176[Accessed 5th May, 2014].

Garb, G. (1971) A Theory of Market Demand. *Kyklos*, 24(1), 50-64.

Gizachew, K. (2017) Expansion of Eucalypt Woodlot and Its Factors in Cheha District, Southern Ethiopia. *World Scientific News*, 66 (2017), 163-180.

Govindaprasad, P. K., and Manikandan, K. (2014) Agricultural Land Conversion and Food Security: A Thematic Analysis. *International Research Journal of Agriculture and Rural Development,* 3 (1), 1-19.

Islam, M. M., Jannat, A., Dhar, A. R., and Ahamed, T. (2019) Factors Determining Conversion of Agricultural Land Use in Bangladesh: Farmers' Perceptions and Perspectives of Climate Change. *Geo Journal*, 85 (2020), 343-362.

Kallio, M.H. (2013) *Factors Influencing Farmers' Tree Planting and Management Activity in Four Case Studies in Indonesia*: Doctoral Dissertation, University of Helsinki, Viikki Tropical Resources Institute (VITRI), Helsinki.

Kamilah, A. (2013) Economic Analysis of Agricultural Land Function in Bekasi City (Case of Kecamatan North Bekasi and Bantar Gebang), CEFARS: *Agribusiness Journal and Regional Development,* 5 (1) 35-49. Available from:http:// jurnal. unismabekasi. ac.id/index.php/cefars/article/view/48[Accessed 17th January, 2020].

Khan, M. E., Anker, M., Patel, B. C, Barge, S., Sadhwani, H., and Kohle, R. (1991) The Use of Focus Groups in Social and Behavioural Research: Some Methodological Issues. *World Health Statistics Quarterly*, 44 (3):145-149.

Kiita, E. M. (2013) *An Investigation into Causes and Effects of Agricultural Land Use Conversions in the Urban Fringes*: A Case Study of Nairobi-Kiambu Interface. Unpublished Master's thesis, Department of Real Estate and Construction Management, University of Nairobi.

Kulindwa, Y. J. (2016) Key Factors that Influence Households' Tree Planting Behaviour. *In Natural Resources Forum,* 40 (1), 37-50).

Ngaga, Y. M. (2011) Forest Plantations and Woodlots in Tanzania, African Forest Forum (AFF), Working Paper Series, Volume 1, Issue 16, 2011.

Nkonya, E., Koo, J., Kato, E., and Guo, Z. (2013) Trends and Patterns of Land Use Change and International Aid in Sub-Saharan Africa, WIDER *Working Paper* No. 2013/110.

Nzilano, B. L. (2013) *Contribution of Agroforestry Homegardens to Household Food Security and Income Generation among Communities in Mbeya Rural District, Tanzania,* Doctoral Dissertation, Sokoine University of Agriculture.

Oburu, P. O. (2011) Attributions and Attitudes of Mothers and Fathers in Kenya. *Parenting*, 11 (2-3), 152-162.

Oladele, O. I (2005) A Tobit Analysis of Propensity to Discontinue Adoption of Agricultural Technology among Farmers in South-western Nigeria. *Journal of Central European Agriculture*, 6 (3), 249-254.

Olson, J.M., Misana, S., Campbell, D.J, Mbonile, M., and Mugisha, S. (2004) The Spatial Patterns and Root Causes of Land Use Change in East Africa, LUCID Project *Working Paper* 47.

Palela, E.B. (2011) *Understanding Change in the Traditional Vinyungu Farming System: A Case of the Little Ruaha River in Iringa Region, Tanzania*. PhD Dissertation, Universität Bremen, Germany. Available from:http://elib.suub.uni-bremen.de/edocs/00101856-1.pdf[Accessed 3rd August, 2015].

Rogers, E.M. (2003) *Diffusion of Innovations*, (5thEd.) Macmillan Publishing Co. The Free Press, New York.

Sali, G. (2012) *Agricultural Land Consumption in Developed Countries*. Selected Poster Prepared for Presentation at the International Association of Agricultural Economists (IAAE), Triennial Conference, Foz do Iguaçu, Brazil, 18th-24th August, 2012.

Sokoni, C.H. (2001) *The Influence of Agricultural Marketing Reforms on Highland Farming Systems in Tanzania, The Case of the Uporoto Highlands, Mbeya Region*. Unpublished PhD Thesis, University of Dar es Salaam, Dar es Salaam.

Thacher, T., Lee, D. R., and Schelhas, J.W. (1997) Farmer Participation in Reforestation Incentive Programs in Costa Rica. *Working paper* 97-11. Department of Agricultural, Resource and Managerial Economics; Cornell University, Ithaca, New York.

Tilumanywa, V.T. (2013) *Land Use and Livelihood Changes in the Mount Rungwe Ecosystem*, *Tanzania*. PhD Dissertation, Stellenbosch University, South Africa.

The International Assessment of Agricultural Knowledge, Science, and Technology for Development (IAASTD) (2009) Agriculture at a Crossroads, International Assessment of Agricultural Knowledge, Science and Technology for Development, *Sub-Saharan Africa (SSA) Report*, Volume V, Island Press, Washington, DC.

Tsani, A. F., Purwaningsih, Y., and Daerobi, A. (2018) Farmer's Decision in Converting the Function of Agricultural Lands. *Jurnal Ekonomi Pembangunan: Kajian Masalah Ekonomidan Pembangunan*,19 (1), 1-11.

United Republic of Tanzania (URT) (1997a) *Mbeya District Socio-Economic Profile,* The Planning Commission, Dar es Salaam and Mbeya District Council, Mbeya.

United Republic of Tanzania (URT) (1997b) *National Land Policy*. Ministry of Lands, and Human Settlements Development. Dar es Salaam, Tanzania.

United Republic of Tanzania (URT) (2007) *National Sample Census of Agriculture 2002/2003 Volume Vl: Regional Report*: Mbeya Region, National Bureau of Statistics, Dar es Salaam.

United Republic of Tanzania (URT) (2012) National Sample Census of Agriculture 2007/2008 Volume Vl: Mbeya Region Agriculture Sample Census - 2007/08*, Regional Report*: *Mbeya Region*. National Bureau of Statistics, Dar es Salaam.

United Republic of Tanzania (URT) (2013a)*National Agriculture Policy*. Dar es Salaam, Tanzania.

United Republic of Tanzania (URT) (2013b) *2012 Tanzania Population and Housing Census*, National Bureau of Statistics, Dar es Salaam.

United Republic of Tanzania (URT) (2018) *Mbeya Region, Socio-Economic Profile 2015*. Jointly Prepared by National Bureau of Statistics, Ministry of Finance and Planning and Mbeya Regional Secretariat, National Bureau of Statistics, Dar es Salaam.

Wanjira, E. O. (2019) *Smallholder Farmers' Perception and Practice of On-Farm Tree Species Diversification in Siaya County, Western Kenya*, Doctoral Dissertation, Kenyatta University, Kenya.

Yitaferu, B., Abewa, A., and Amare, T. (2013) Expansion of Eucalyptus Woodlots in the Fertile Soils of the Highlands of Ethiopia: Could it Be a Treat on Future Cropland Use? *Journal of Agricultural Science*, 5 (8); 97-107.