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Shifting Cultivation, Wood Use and Deforestation Attributes of Tobacco Farming in Urambo District, Tanzania

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Abstract: Tobacco farming in Tanzania relies heavily on shifting cultivation and abundant supply of fuel wood to cure the crop. Vast deforestation of miombo woodlands has also been an attribute in tobacco growing areas. This study report on an assessment survey carried out to characterize these three attributes of tobacco farming in Urambo district, Tanzania. Focus group discussions and questionnaires were used to gather information from a selection of households in four tobacco growing villages. Seventy five percent of the farming households were regular tobacco growers. On average, a farmer cultivated 1.3 ha of tobacco each growing season. Over 61,000 ha of land are cleared annually for tobacco growing in the district. A conservative average crop harvest stood at 1,000 kg (cured) per ha which consume 23 m^3 of wood for curing. Shifting cultivation, with fallow periods reduced to only 4 years, is no longer sustainable in Urambo district. The high demands of wood for the tobacco industry can as well no longer be sustained under the implicated pace of woodland deforestation. For small scale tobacco farming households, these are inevitable consequences of use for livelihood and survival.

Key words: Deforestation, flue-cured tobacco, miombo woodlands, tobacco fallow land, urambo

INTRODUCTION

Tobacco is among the major agricultural cash crops in Tanzania together with coffee, cotton and tea (Waluye, 1994; Putterman, 1995; Kagaruki, 2010). Tobacco remains to be a useful crop in the miombo woodlands regions where it is apparently considered there is still plenty and reliable source of wood to support its production (Waluye, 1994; Monela and Abdallah, 2007). Three main types of tobacco are produced in Tanzania. These are the flue-cured, fire-cured and air-cured burley tobacco (Waluye, 1994; Abdallah *et al*., 2007; Kagaruki, 2010). And, about 80% of the tobacco produced in Tanzania is flue-cured (Geist, 1999).

While tobacco production is seen to expand in Tanzania, mainly due to the perpetuated political economy of low-cost production (Otañez, 2008; Geist *et al*., 2009), it remains particularly, one of the world's most controversial crops in terms of land use repercussions (Otañez, 2008; Geist *et al*., 2009; Kagaruki, 2010). Tobacco farming involves severe, arguably irreversible costs to the resource poor farmers, their families and communities (Otañez, 2008; Kagaruki, 2010) not only to socio-economic development but also to environmental and natural resource sustainability (Geist *et al*., 2009; Kagaruki, 2010).

For example, the booming of flue-cured tobacco farming in some areas of Tanzania during the early days of independence (Waluye, 1994) led to vast clearance of the miombo forests for more virgin land and wood to cure the crop. In the central-western region of Tabora, in particular, Temu (1980) pioneered to report that one hectare of woodland is required to flue-cure one hectare of planted tobacco. Wood which was previously left in the woodland fallows as waste is now a precious raw material in the production of flue-cured tobacco. This suggests that, expansion of tobacco farming obviously results into massive clearance of the woodlands. Furthermore, in his pioneer work Temu (1980) reported that the industry attracted farmers from other neighbouring regions like Kigoma, Singida and Shinyanga and the number of families growing tobacco increased rapidly, exerting more pressure on the woodlands not only for tobacco growing but also for other food crops and wood to build houses and supply of domestic fuelwood. Consequently, availability of sufficient forest area to supply the needed fuelwood and still fulfil other forest functions has since become a matter of concern (Mangora, 2005; Sauer and Abdallah, 2007; Kagaruki, 2010; Yanda, 2010). This paper assesses some socio-economic aspects of tobacco farming and its heavy use of miombo woodlands resource in Urambo-Tabora, Tanzania.

METHODOLOGY

Study area: Urambo district is located in the mid-western part of Tanzania on the central plateau, covering an area of 21,299 km^2 with an elevation varying from 1,000 to

1,500 m. The National Population Census of 2002 indicated the district to have had a population of 370,796, implying a density of 17 people/km^2. Urambo district has been the leading flue-cured tobacco producer in the country since its independence (Waluye, 1994). The climate is warm with daily mean temperature of 23ºC and over 1,000 mm of rain annually. Soils are of medium fertility when first cleared of woodland, but both structure and fertility declines under successive cropping. There are four forest reserves covering a total area of 994,000 ha dominated by the miombo woodlands and about 291,144 ha of general arable land. In total the whole forested land is 1,212,358 ha, respectively in the district. However, these woodlands have had rapidly being converted into cultivated land to give way for the expanding tobacco farming (Mangora, 2005; Sauer and Abdallah, 2007) following macro policies like structural adjustment programme (Yanda, 2010) and market liberalization (Putterman, 1995).

Field procedures: A combination of Participatory Rural Appraisal (PRA) and household questionnaire survey were conducted in four tobacco growing villages of Motomoto, Imalamakoye, Kasungu and Mtakuja randomly selected from two divisions of Urambo and Kaliua, two in each. A structured questionnaire with a mixture of both closed and open-ended questions was administered to a total of 61 heads of households randomly selected from the village household registers but taking into account proportional representation of three wealth classes of the rich, poor and very poor. These wealth classes were self delineated by the villagers basing on three indicative attributes of:

- Household food and income security
- Household assets and material life styles
- Household literacy and health wellbeing

Physical measurements of stacked wood prepared for tobacco curing was done at the curing barns of each of the questionnaire respondent who grew tobacco.

Data analysis: The collected information were analysed using Statistical Package for Social Sciences (SPSS) computer software and results summarised and presented in frequency tables, descriptive statistics, and cross tabulations. A regression analysis was further performed to develop and represent the relationship between the quantity of wood used to cure tobacco and size of tobacco field and quantity of tobacco harvest per season.

RESULTS AND DISCUSSION

Shifting cultivation and deforestation: Ninety percent of the households surveyed were farmers and they depended on crop production as their sole source of income. Tobacco farming was the major economic activity in the district with more than 75% of all farmers being regular tobacco growers. This proportion implied that over 46,975 households of the total 62,633 in the district practices tobacco farming. On average a household was found to cultivate about 1.3 ha of tobacco in a season giving an estimated 61,067 ha of land cleared and cultivated with tobacco in a season, district wise.

Characteristically, tobacco is never grown in mixed cropping. Each season a new field for tobacco has to be cleared where about 69% of tobacco farmers clear a new area of woodlands for tobacco cultivation in every growing season. This is prompted by fear of tobacco diseases because most farmers can not afford the heavy use of chemical pesticides. Only 25% of tobacco farmers indicated to grow tobacco on the same piece of land for two consecutive growing seasons while as few as 6% well-off indicated to cultivate tobacco on the same land for more than two consecutive growing seasons.

Essentially, shifting cultivation remained the major farming system in the miombo woodlands of Urambo district not only for tobacco but also for other subsistence crops like maize, beans and groundnuts. The fallow period averaged 4 years. However, a notable characteristic of most fallows was that, because of the heavy application of chemical fertilizers in tobacco fields (Sauer and Abdallah, 2007; Otañez, 2008), farmers tended to plant cereal crops, especially maize, in the season following tobacco harvest to maximise the use of the remaining traces of fertilizers applied for tobacco. A rotation with other crops such as beans, groundnuts and cassava may follow for up to 4 consecutive seasons before a field is abandoned to natural fallow. Nonetheless, it was becoming common to farmers to return to those fields for tobacco cultivation after the 4 years of rotation, breaking away the shifting cultivation. This provides a reflection on the magnitude and rate of miombo woodlands depletion in Urambo district because the shorter the fallow period, the large the area cleared. Furthermore, it was an indication that fresh land suitable for tobacco becomes scarce and/or more distant.

However due to the relatively limited power of the poor farmers to clear extensive land areas for tobacco cultivation, the size of a tobacco field a farmer cultivates in a season seem to be a little less than most farmers desire. With this farmers' view "little clearance", still the pace of woodlands removal stand at a higher side when one thinks of the available arable land in Urambo district. It represents a very high rate of depletion of the woodlands in the district, at 20.9% of arable land (general woodlands) per annum only to care for tobacco farming. Considering the whole of forested land in Urambo district, clearing for tobacco farming represent an annual deforestation of 6.1%. Brylinsky (1996) reported a 13%

increase in land area used for tobacco farming in Tanzania due to primarily the structural adjustment policies (Putterman, 1995). Earlier, Geist (1999) and later Kagaruki (2010) reported that tobacco induced deforestation in Tanzania amounted to 4%. This implies that deforestation caused by tobacco farming is considered to be high but not serious on a national scale; rather the impact of tobacco related deforestation will assumedly be felt more at local levels.

This escalating pace of loss of vegetation connected with tobacco farming has drawn much attention to environmentalists and as long as tobacco production continues and the fact that flue-cured tobacco requires a readily supply of wood for curing, availability of sufficient forest area to supply the needed fuel wood and still fulfil other forest and environmental functions is a major issue of concern to natural resource managers, tobacco promoters and policy makers (Mangora, 2005; Sauer and Abdallah, 2007; Yanda, 2010). While there is growing of not only environmental (Geist, 1999; Mangora, 2005; Sauer and Abdallah, 2007; Yanda, 2010) but also public health concern against tobacco (Minh *et al*., 2009; Arnson and Shoenfe, 2010; Takahashi *et al*., 2010) and social disruptions to as low as family level of tobacco growers (Otañez, 2008), the tobacco industry in contrast has had been trying to repudiate the problem by downsizing the issue that deforestation associated with tobacco curing cannot currently be considered a significant negative externality (ITGA, 1997). The International Tobacco Growers Association (ITGA) for instance, has been criticising various figures reported on the rate of tobacco associated deforestation (the area cleared and the quantity of wood used to cure) that they are overstated (ITGA, 1997, 2010). No matter which side is correct, the fact is that there are environmental hitches with tobacco farming and deliberated efforts are needed to combat the dilemma. Tree planting programmes have been suggested (Nshubemuki *et al*., 1998; Abdallah *et al*., 2007) as the lasting solution in alleviating fuel shortage faced by tobacco industry. During early 1990s Tanzania Tobacco Board (TTB) established what it called an afforestation strategy in tobacco growing areas and in seven years time only a total of 10,460.85 ha of planted forest were established which is far below that of the woodlands area which is annually cleared. Geist (1999) reported that only 7% of Tanzanian flue-cured tobacco growers had their own fuel wood plantings. This suggests that tree planting programmes in tobacco growing areas need not only campaigning but also be backed by a policy intervention.

Complexities in tobacco farming make it however difficult to have reliable and consistent estimations on the rate of depletion of woodlands due to the fact that in expanding land for agriculture a farmer undergoes some few tricky stages in clearing the woodlands. In a given tobacco growing season for example, it was noted that an individual farmer clear one hectare of woodlands to grow tobacco and whereas he plants tobacco on the cleared area, the cleared debris is used for fuel wood over the season. When the planted tobacco becomes ready for curing, the farmer clears another one hectare to get fuel wood for curing the harvested tobacco. So this farmer would have cleared two hectare of woodlands in one particular season. The two hectares may however be cleared at once when the farmer deems it necessary and due to expected difficulties as tobacco harvesting and consequent curing usually starts in the mid of the rain season.

Furthermore, as tobacco prefers more virgin land and due to fear of soil borne diseases (Gibbon and Pain, 1985), the farmer would wish to clear another virgin land to reap a bumper harvest (Mangora, 2005; Abdallah *et al*., 2007). Fuel wood for curing tobacco harvested from this sort of land has to however, be ceded by cutting down new woodlands (Waluye, 1994; Sauer and Abdallah, 2007). Fallow periods have consequently been shortening over time to most farmers and in worst cases completely breaking away the shifting cultivation system to more intensive systems (Chidumayo, 1999) that rely on applications of chemical fertilisers (Sauer and Abdallah, 2007; Otañez, 2008).

For the shifting cultivation system to remain sustainable the estimated carrying capacity in miombo woodlands is suggested to be 3-4/persons km^2 (Stromgaard, 1985; Chidumayo, 1987; 1999). This low population density would allow enough fallow periods (at least 20 years) for woodlands natural fertility to be restored. But, increase in population and dependence on other forest products in Urambo district have resulted into higher population density of up to 17 persons/km^2. With this exceeded carrying capacity, woodlands recovery is highly threatened and a change of land cover from woodlands to bush lands or even permanent deforestation (Chidumayo, 1999) may soon or later take its course. Conforming to the conclusion by Mangora (2005) that, shifting cultivation practice in Urambo district is no longer sustainable and the consequences of permanent cultivation may soon be apparent.

Harvest and wood use for tobacco: Tobacco harvest per season depended on the size of the tobacco field and the level of tending (timely and proper weeding and appropriate fertilizer and herbicide application). On average a farmer cultivating 1.2-1.5 ha reported to harvest and produce 1,000-1,400 kg of cured tobacco.

In the curing process, tobacco requires substantial amounts of wood for a variety of purposes, from the construction of the curing barn (poles, withies/sticks and ropes) and tying of tobacco leaves to actual curing of the crop. Farmers start to prepare wood for curing tobacco of the coming season immediately after the sale of the current crop and before the onset of rains. They have always at least a prior idea of how much wood should be gathered for tobacco curing. Primarily, the quantity of wood required to flue-cure tobacco also depended on the size of tobacco field and the quantity of harvested green tobacco. To model this relationship, the following regression equation was developed taking all other factors constant.

$$QW = 5.72 + 2.64\ Fs + 0.01\ Hq\ (r^2 = 0.88;\ p<0.05)$$

where
QW = quantity of wood used (m^3)
Fs = size of tobacco field (ha)
Hq = quantity of cured tobacco obtained (harvested) (kg)

Putting this equation into application and by considering only the actual curing process, 23 m^3 of stacked wood was required to cure tobacco from an average of 1.3 ha of planted tobacco from which a farmer expected the highest at 1,400 kg of cured tobacco in a given crop season.

Although the quality of the curing barn could also influence the quantity of wood required (Otañez, 2008), it was however beyond the scope of this study, but Wheeler *et al*. (1989) reported a reduction of up to two thirds of the quantity of wood used to cure tobacco when improved curing barns are employed in place of unimproved ones. So the relatively lower quantity of fuel wood observed in this study may suggestively be associated with the improvement of tobacco curing barns (Geist, 1999) done by tobacco farmers following the early 1990s agricultural market liberalisation (Putterman, 1995). Following this policy move (Misana *et al*., 1996; Nshubemuki *et al*., 1998) the financial power of tobacco farmers improved to enable them reconstruct, regularly maintain and replace the flues/pipes in their tobacco curing barns.

Although part of wood cut during field preparation is retained (fairly big logs) to be used later for curing, a great amount is used as domestic firewood. So additional woodlands clearing has to be done to fulfil the required amount of fuelwood needed for tobacco curing. In Tanzania as it is in Malawi (Tørres, 2000), there is yet no alternative technological source of fuel to cure tobacco. From the regression equation, the observed estimate of the quantity of wood used to cure tobacco closely resembles those by Geist (1999) who estimated 19.9 m^3 per tonne of tobacco and Otañez (2008) reported that the production of 1 kg of tobacco consumes 20 kg of fire wood for curing equating to between 10 and 40 tonnes of dry wood per a tonne of processed tobacco.

However, the estimations of wood use for tobacco curing regarding the unit area of woodland against the unit area of planted tobacco has to be specific with age and structure of the woodland (Mangora, 2005). The wood inventory of tobacco fallow lands of Urambo district reported by Mangora (2005) indicated that 1 ha of fallow lands of 1-10 years produce less than the average volume of wood (23 m^3) required to cure 1 ha of planted tobacco. Therefore for 1 ha of woodland to produce enough wood to cure tobacco from 1.3 ha of planted tobacco it must be those of over 10 years of fallow otherwise more has to be cut. During this fallow period, this farmer has to keep on shifting every new season to new old enough and often distant woodlands to cut for tobacco curing (Waluye, 1994). It is therefore implicated here that, for sustainability, tobacco farmers in Urambo district have to adopt a cutting cycle of at least 10 years in their tobacco fallow lands. This is however practically difficult given the current growing population in the district and the increasing demand for wood resources not only for tobacco curing but also other uses. The earlier estimations by Temu (1980) relating the unit area of woodlands required to be cleared to cure a given unit area of planted tobacco seem to be not explicit as the structure and stem density of the woodlands changes with space and time (Mangora, 2005). Therefore, concurring with Mangora (2005), Sauer and Abdallah (2007) and Yanda (2010), that if the current utilisation pressure is not checked, tobacco industry can not be sustained by the miombo woodlands due to its high demand for clearing new areas for growing and curing. It is from this point of view that Otañez (2008) maintained that to tobacco farming will continue to erode the lives of present and future generations of farmers, harming human and land capital, which are key assets for rural development, and that could otherwise be devoted to healthy crops and environmentally friendly agriculture.

CONCLUSION

Miombo woodlands still play a major role in contributing to rural welfare but their loss which is mainly a result of agricultural activities is on the increase due to limited and weak control mechanisms and restrictions from the authorities on one hand and some intervening social characteristics of the population on the other. This situation therefore requires the development of multi-institutional and holistic approaches to management and conservation of these woodland resources. The challenge is to identify robust and meaningful indicators of the linkages between poverty, environment and the natural resources that provide insights into the impact of poverty reduction initiatives. Until now, human development, poverty and environmental issues have generally been looked at separately and the linkages among them have not been widely appreciated. This study therefore, conforms with the conclusion made by Solbrig and Young (1993), that incurring costs in reducing land resources degradation must be the aim of any rational land use policy as nobody consciously tries to degrade the woodland resources, rather it is an inevitable consequence of use for livelihood and survival.

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