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Planning for Agricultural Space in Developing Countries and the Changing Nature of Shifting Cultivation among Smallholder Farmers: A Case ofLudewa Districtin Tanzania

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Abstract

The nature of shifting cultivation has kept on changing to reflect the ongoing local conflicts in land used for agricultural production. This study examines the manifestation of change in space used for shifting cultivation among smallholder farmers as a result of planning for agricultural space in four villages in Ludewa District. The study adopted a cross-sectional survey. Questionnaires, in-depth interview, satellite images and field visits were the major instruments of data collection. The data were qualitatively and quantitatively analysed. The study found that change in land cover reflects the changing area used for shifting cultivation. Besides, the study found a reduction in fallow period to as short as three to five years. In addition, we found that even though, the shifting cultivation was prevalent in the study area, it was common in areas allocated by village governments. The study concludes that space for shifting cultivation has not only shrunk but also its nature has kept on changing in response to existing socio-economic factors, especially government policies on re-settlement and promotion of cash crops. The paper recommends that any planning for agricultural landscape should consider the changing nature of shifting cultivation, especially on the use of the so called 'abandoned lands'.

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1.0 Background

Shifting cultivation is one of the fundamental land uses responsible for making of agricultural space. This comes as shifting cultivation is dynamic land use whose resulting landscapes depend upon the extent of perturbation in the forested landscape (Boserup, 1965). The major features of shifting cultivation are forest clearance, drying and burning of cut trees, and cropping (Singh *et al.*, 2016). In its traditional setting, cleared land is cultivated for a period of two to three years and then left to fallow for a number of years. For that matter, the rest period so experienced in the shifting cultivation make it to be considered as ecologically and economically viable provided the population densities are low and fallow periods are long enough to maintain ecological balance (Datta *et al.*, 2014). In most cases, the same process is repeated in a new plot. In so doing, from time to time the smallholder farmers are creating new agricultural space. In this case, shifting cultivation is maintained not as a separate agro-ecological system rather complementary to other land uses (Rambo, 2010).

Despite its importance in adaptation to the special conditions of tropical soil and climate (Boserup, 1965), the long fallow is neglected by agronomists and ecologists. In the circle of the agronomists and ecologists, shifting cultivation is viewed as subsistence, economically unviable and environmentally destructive (Pant *et al.*, 2018). Cherrier *et al.* (2018) study asserts that for a large part shifting cultivation is stigmatized in Asia. This is illustrated by Springate-Baginski (2018) study in Myanmar who suggests that in the eyes of the policy makers, shifting cultivation is regarded as an inferior and bad land use that should be eradicated. In that case, it is not news to find that most of the fallow lands have been appropriated by the governments in the pretext of being degraded forest and/or abandoned land. The appropriation of the so called abandoned lands has made shifting cultivation a centre of conflict which is a subject of debate, public misconceptions and stereotyping.

Various studies (Boserup, 1965; Rambo, 2010; Grogan *et al.*, 2013; Datta *et al.*, 2014; Jakovac *et al.*, 2017) have shown that the nature of shifting cultivation has kept on changing. The manifested changes in space used for shifting cultivation among the smallholder farmers are attributed to socio-economic factors such as government restrictions of forest use, changes in land tenure systems, demographic pressures,

and policies that promote cash crops (Thrupp *et al.*, 1997). Lestrelin *et al.* (2019) study in Southern Asia indicates that these socio-economic factors are responsible for gradual reduction and/or abandonment of traditional shifting cultivation. A study in North-East India has shown that the most prominent change resulting from these socio-economic factors is the change in fallow period resulting in smallholder farmers' failure to sustain the soil fertility (Datta *et al.*, 2014). Similar socio-economic factors are reported by Grogan *et al.* (2013) to be responsible for change in shifting cultivation where woodland based *chitemene* and *ntemele* system have been replaced by grassland based system in Northern Zambia and South West Tanzania, respectively. The change in farming systems has reduced the fallow period from 20 to 30 years to three and five years. In most cases, this change in fallow period has affected shifting cultivation following land use changes, access, control and utilization of their resources. In the same line, both Friis-Hansen (1987) and Bryceson (1988) acknowledge that villagisation programme and its associated block farming and settlement patterns were responsible for national-wide onset of continuous cultivation which has limited the sustainability nature of shifting cultivation in Tanzania. The villagisation programme led to creation of nucleated settlements for the formerly scattered population in rural areas. Furthermore, Friis-Hansen (1987) using where fields are located and change in the kind of crops grown has demonstrated the changes in landscape used for shifting cultivation in Makete District in the Southern Highlands of Tanzania.

The change in landscape used for shifting cultivation reflects the ongoing local conflicts in land used for agricultural production. According to Panti and Tiwari (2018) study in India, the source of this conflict is the fact that land used for shifting cultivation fall under two subjects at different time periods. The land is under the agriculture sector when used for cultivation and under forest sector during fallow period. It should be noted that both agricultural and forest sector set laws, regulations, guidelines and management strategies which are contradictory and impact negatively on sustainability of shifting cultivation. The findings of agricultural research and other development institutions have led to emphasis being given to sedentary agriculture and overlooking what shifting cultivation can offer (Brookfield and Padoch, 1994 as cited by Thrupp *et al.*, 1997). In Tanzania, several studies (Mangora, 2005; Mangora, 2012; Njana *et al.*, 2013; Jew *et al.*, 2017) have reported

on the expansion of tobacco cultivation and the deforestation related to tobacco cultivation. However, neither these studies nor those done in the study area have considered the influence of public agricultural policies especially those related to introduction of tobacco and its associated block farming on the nature of areas used for shifting cultivation. This paper is centred on Lefebvre's (1991) argument (cited by Babere, 2015) that there exists constant conflict between the conceptualised space of planners and the lived space experienced by the shifting cultivators. Specifically, this study attempts to determine dynamics in the area used for shifting cultivation and change in fallow period in the study area. This information is important as far as planning for agricultural space and sustainability of shifting cultivation is concerned.

2.0 Methodology

2.1 Study Area

This study was conducted in Masasi Division (Fig. 1). Masasi Division is found in the southern part of Ludewa District in Njombe Region, in the Southern Highlands of Tanzania. Masasi Division is situated between latitudes 10°15' and 10°30' South and longitudes 34°30' and 34°52' East. Large parts of Masasi Division are found in the lowlands area that is characterised as medium dry intermediate agro-ecological zone, commonly referred to as the Ruhuhu Basin. The northern part of Masasi Division is dominated by deep dark sandy loams on rolling hills and shallow sandy clay on steeper slopes and hills (EEC, 1987). According to De Pauw (1984) the southern part of Masasi Division is dominated by yellow sandy soils of very low fertility. The dominant vegetation in Masasi Division is *Miombo* woodland in hilly and upland areas, wooded or bushed grassland on undulating landscape, and scattered *Commiphora*, acacia scrubs, baobabs and *Combretum spp* on plains and floodplains along the main rivers.

In consultation with the District Council Management Team, three wards which experienced in and out migration, namely, Luilo, Masasi, and Nkomang'ombe were purposefully selected and involved in the study. In Luilo ward, two villages, namely, Lifua and Kipangala that received migrants in the villagisation programmes were selected. On the other hand, Kimelembe and Kiyogo villages whose population was forced to move during the villagisation were selected from Masasi and Nkomang'ombe ward, respectively. In that case, the choice of study villages is based

on population movements and trends in land use. This study used the spatial and temporal distribution of population and fields to illustrate the dynamics of shifting cultivation in the study area.

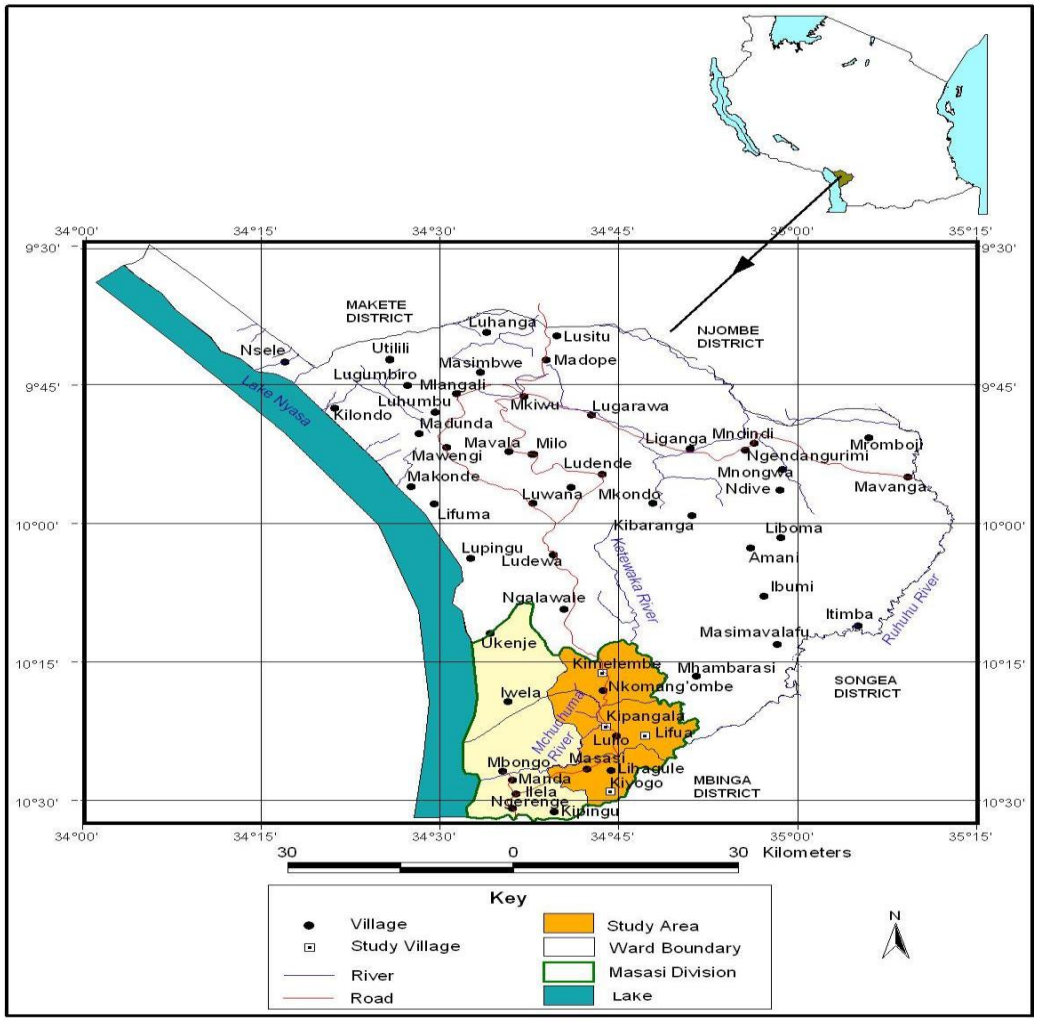

Figure 1: Map of Ludewa District and Tanzania showing study wards and villages

2.2 Research Design

In order to approve and/or disapprove assumptions on the nature of shifting cultivation the study adopted a cross-sectional survey from 240 stratified random sampled respondents. The cross-sectional study was complimented by repeated observations of change in land use/covers based on satellite images at three periods separated by years (1979, 1990, and 2002) freely obtained from United States Geological Society (USGS).

2.3 Data Collection and Analysis

Three sub-scenes of different temporal dimensions (1979, 1990, and 2002) were extracted from the three satellite imageries and geo-referenced to the coordinates and national mapping system as per UTM zone 36 south using WGS84 projection. The satellite imageries of early dry season (The Landsat4 Multispectral Scanner (MSS) path 180 row 067 of 25 July, 1979, Landsat5 Thematic Mapper (TM) path 168 row 067 of 10July, 1990, and Landsat7 Enhanced Thematic Mapper plus (ETM+) path 168 row 067 of 18 June 2002) for the study area were selected as they had little burning, little atmospheric haze, more visible cultural features, and vegetation growth (King, 1984). Using an ARCVIEW GIS mapping software a supervised classification to establish land use/covers for various periods was done to select training data by on screen computer digitisation.

In addition, snowball sampling was employed to get 80 farmers with different villagisation programme experiences participated in focused group discussions (FGDs). In order to gain in-depth understanding of the influence of socio-economic factors on shifting cultivation a total of 16 FGDs were employed where each village had four groups. The first and second groups had five members aged 40+ years old of male and female, respectively. While the third and fourth groups were composed of male and female aged below 40 years old. The composition of FGDs groups based on gender and age was of great help in understanding of local perceptions and experiences on the changing landscape. Besides, ten key informants were purposively selected for in-depth interview. The key informants included planning officer, land officer, agricultural and livestock officer, forest officer, and water engineer from the District Council Management Team (CMT). Also, employed in the in-depth interview were one Village Executive Officer (VEO), two retired government officers and two elders. The in-depth interviews provided context on the impact of both villagisation and tobacco cultivation on shifting cultivation.

A questionnaire was pre-tested a month before survey in two villages (Luilo, Nkomang'ombe) found in the study area but not included in the main survey. In company of either sub-village chairman or VEO we administered a pre-tested questionnaire to head of households in their homesteads. Both frequency and

percentage were used to analyse the collected information from household surveys. On the other hand, all the FGDs were held at the respective village office. In the FGDs, both Kiswahili and local language, that is, *Manda* were used during the discussion to ensure the participants are free to express what they real appreciate. The audio tapes were used to record all the FGDs. As suggested by Krueger and Casey (2009), we recorded the body language and reactions such as head nodding, laughter and smiles expressed in the interview using the field note book to capture the unspoken feelings and meaning. The information from FGDs and in-depth interview with key informants was translated, transcribed, sorted, labelled to develop themes and extract meanings from reported data.

3.0 Results

3.1 Areas used for shifting cultivation in the study area

The areas used for shifting cultivation were deduced from change in land use/cover types delivered from Landsat imagery of 1979, 1990, and 2002. The major land use/cover types (Table 1) identified in the study area was collated by the members of FGDs in local name as indicated in the brackets based on their local knowledge. The results (Table 1) show that 30 percent of the study area in 1979 was dominated by open woodland.

Table 1: Land use/cover types in the study areas

Variable	1979		1990		2002	
Land use/cover types	ha	%	Ha	%	ha	%
Bushed grassland (Bg) (*lutala*)	8,987	20	5,228	12	4,544	10
Bushland with scattered cropping (Bsc) (*ndumba*)	1,773	4	9,966	22	7,219	16
Grassland with scattered cropping (Gsc) (*ruhaha*)	4,286	10	5,162	11	7,093	15
Settlement with mixed cropping (Smc) (*luvala*)	6,626	15	6,136	14	9,791	22
Closed woodland (Wc)	5,104	11	7,854	17	4,395	10
Open woodland (Wo)	13,578	30	4,492	10	2,152	5
Woodland with scattered cropping (Wsc) (*matema*)	4,734	10	6,250	14	9,894	22
Total	45,088	100	45,088	100	45,088	100

According to in-depth interview with key informants, the open woodland strived in that period as villagisation forced rural population in the scattered hamlets to leave their native residences and settle in few nucleated villages. The key informants reported that residents of Kiyogo sub-village were moved to Lihagule and Masasi village. While those of Liumba and Liughai sub-villages were resettled in Lifua village. Similarly, the residents of Kimelembe hamlet were resettled in Nkomang'ombe village. In contrast, Kipangala, which by then was the sub-village of Luilo, received migrants from neighbouring scattered hamlets along the Mchuchuma River basin.

The documentary review (URT, 2013) has shown that despite the increasing population since 1967 census (6 600 persons in 1967, 7 690 persons in 1975, 15 258 persons in 1988, 17 970 persons in 2002, and 19 236 persons in 2012), Masasi Division has remained the lowest populated area in Ludewa District. The population density of Masasi Division had increased from 6.1 persons per square kilometre in 1967 census, 14.2 persons per square kilometre in 1988 census, 16.7 persons per square kilometre in 2002 census to 17.8 persons per square kilometre in 2012 census. Based on ward area and population as per 2002 census, population density of study area was 19 people per square kilometre for Luilo and Nkomang'ombe wards and 21 people per square kilometre for Masasi ward.

The in-depth interview with key informants and FGDs with participants aged above 40 years old found that prior to 1975, woodland with scattered cropping (*matema*) and bushland with scattered cropping (*ndumba*) were the major areas for shifting cultivation in the study area. However, following rural villagisation programme, the former bushland with scattered cropping (*ndumba*) and the settlement with mixed cropping (*luvala*) became the main residential area. The change in land use and its resultant effects brought by the villagisation programmes is illustrated by one male FGD participant aged above 40 years who said that,

> Things changed a lot with Operation Sogeza (unofficial phrase for villagisation programme). The incoming migrants from the neighbouring villages and hamlets were settled in my fields located in both bushland with scattered cropping (ndumba) and the settlement with mixed cropping (luvala). No compensation was made for the taken fields. You know by then everything was a public good. So, I lost my cashew fields as they were either cleared to

> establish new settlements or now were on the new comer home grounds (July 2008).

Furthermore, the results (Table 1) show that in the 1990s the bushland with scattered cropping (*ndumba*) dominated the study area. The bushland with scattered cropping (*ndumba*) increased its area from area formerly occupied by grassland with scattered cropping (*ruhaha*), open woodland, settlement with mixed cropping (*luvala*), and woodland with scattered cropping. According to both in-depth interview with key informants and FGDs participants, this was made possible as in the same period, the study area experienced new population movement trends. In Lifua village, two sub-villages, namely, Liumba and Liughai sub-villages were re-established in location occupied prior to villagisation. Similarly, in the same period, the key informants reported the establishment of a new sub-village of Maramba in Kipangala village. Besides, the key informants reported re-establishment of the settlements for flood victims from Lituhi village in Mbinga District in a sub-village of Kimelembe in 1981. Based on data from satellite images, the re-establishment of these settlements is supported by the increase in the area covered by both woodland with scattered cropping (*matema*) and settlement with mixed cropping (*luvala*) from 1990 to 2002 in the study area (Table 1). The increase in area occupied by bushland with scattered cropping (*ndumba*), woodland with scattered cropping (*matema*), and settlement with mixed cropping (*luvala*) were associated with the steady decrease of open woodland (Table 1).

Apart from population dynamics in the area occupied by settlement with mixed cropping (*luvala*), the key informants reported the change in farming systems in the late 1970s. The leading change in the farming systems was the introduction of tobacco (*Nicotiana tabacum*) cultivation. According to FGDs, the introduction of tobacco (*Nicotiana tabacum*) in the woodland with scattered cropping (*matema*) replaced area formerly dominated by finger millet (*Eleusine coracana*) cultivation. In addition, the introduction of tobacco cultivation brought change on the ways the woodland with scattered cropping (*matema*), the bushland with scattered cropping (*ndumba*) and grassland with scattered cropping (*ruhaha*) were managed as highlighted by one FGDs participant aged above 40 year old who lamented that,

> The introduction of tobacco brought miseries in our society. The government took my finger millet fields and distributed to other villagers in order to establish bega kwa bega fields (block farming) for tobacco growing. Worse

> enough, tobacco cultivation involved cutting of trees to establish fields and get wood for curing tobacco. This dried our natural springs in the grassland with scattered cropping (ruhaha) so we can no longer grow cassava during the dry season. In addition, the extension officer brought chemical fertilizers which destroyed our soils. Before the villagisation, I just spread cattle manure and kitchen wastes to restore fertility in my home gardens (April 2009).

Furthermore, other FGD participants aged above 40 years old reported that prior to villagisation, cassava (*Manihot esculenta*) cultivation was the dominant crop in bushland with scattered cropping (*ndumba*) and grassland with scattered cropping (*ruhaha*). The mode of cassava cultivation by then is expressed by one of the FGDs participants aged above 40 years old who said:

> In the past, I had enough time to attend my crops. In the rainy season, I intercropped cassava, groundnuts and pigeon peas in the bushland with scattered cropping (ndumba). Then, at the end of rain season, I planted cassava and sweet potatoes in the grassland with scattered cropping (ruhaha) (July 2008).

Even though all FGD participants complained of change in farming system, in-depth interview with one elder from Kipangala village asserted that the shift in crop grown cannot solely be attributed to villagisation programme. Citing example of cashew (*Anacardium occidental L*) production which was the dominant crop in both the bushland with scattered cropping (*ndumba*) and settlement with mixed cropping (*luvala*), the participant had this to say,

> Cashew fields were established in exhausted fields that could not support cassava production. Unfortunately, when the migrants brought by Operation Sogeza came, they cleared my cashew trees in order to establish settlements. I lost access to their produces and as nobody took care of them that marked the beginning of decline in cashew production in our area (September 2008).

The importance of cashew production in the study area is also shared by agricultural extension officer from District Agricultural and Livestock Development Office who reported the revival of cashew production as a main cash crop following the termination of tobacco (*Nicotiana tabacum*) cultivation in 2000 in the study area.

The FGD participants asserted that the establishment of settlements in bushland with scattered cropping (*ndumba*), led to advance of cassava (*Manihot esculenta*) cultivation in settlement with mixed cropping (*luvala*) and valley bottom (madimba). Besides, the FGD participants reported that the advance of cassava (*Manihot esculenta*) in settlement with mixed cropping (*luvala*) replaced other crops

especially, maize (*Zea mays*), sweet potatoes (*Ipomoeat batatas*), cowpeas (*Vigna sinensis*), pigeon peas (*Cajanus cajan*), velvet beans (*Mucuna pruriens*), lablab beans (*Lablab purpureus*), and common beans (*Phaseolus vulgaris*) in home gardens.

3.2 Change in fallow period over time

According to FGDs, the fallow periods in the study areas had been long enough to allow soil fertility replenishment in the past. However, FGD participants from all groups were in agreement on the shortened fallow period due to a number of reasons as suggested by one male FGD participant aged 40 years old:

> Prior to 1980s I used hired labour for land clearing. But, now I cannot afford to hire one. During the villagisation I lost my cattle. I was forced to slaughter my cows due to lack of grazing area and I was not willing to leave the village centre. Besides, the villagisation programme made schooling more accessible to our children. Unfortunately, they left us without support after completing their study. So do not expect an old and weak person like me to clear the forest for establishment of new fields (April 2009).

The claims by FGD participants on shortened fallow period are supported by survey results (Figure 2) which indicated that 47 percent of the respondents in the study villages cultivated their fields continuously. Besides, only 9 (4%) of all the 240 respondents reported to have left their fields fallow for three to five years. Based on household survey data (Fig.2) the three to five years was the longest period the fields were allowed to rest in the study area.

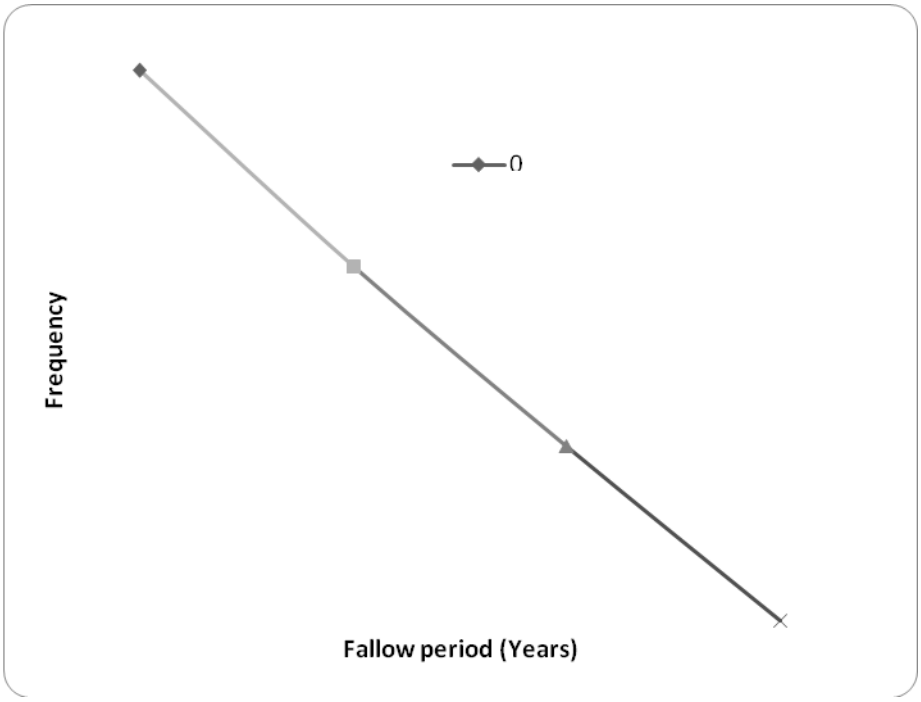

Figure 2: Trend of fallow period (Years) in the study area

4.0 Discussion

4.1 Areas used for shifting cultivation in the study area

Results revealed that changes in land use/cover types in the study area were associated with changes in the nature of shifting cultivation. The results have shown that the shift in the location of fields used by shifting cultivators was associated with the change in public policies in agricultural planning as manifested by the villagisation programme and the introduction of tobacco cultivation in the study area. The villagisation programme during the mid-1970s not only increased pressure on the bushland with scattered cropping (*ndumba*) and settlement with mixed cropping (*luvala*) but also led to encroachment of marginal lands as manifested by increased cassava cultivation in valley bottom (*madimba*). Besides, the findings show that both during and post villagisation programme, population movements initiated a new wave of shifting cultivation that saw opening of new fields and settlements in the open woodland. Besides, the reported revival of cashew production in the study area implies not only the reduction of area occupied by bushland with scattered cropping (*ndumba*) but also the enhanced power of village government in land allocation. The drastic change in areas covered by bushland with

scattered cropping (*ndumba*) and settlement with mixed cropping (*luvala*) reflect the change in socio-economic factors which govern the nature of shifting cultivation. The power relations brought by changes in socio-economic factors such as villagisation increased land use conflicts even in sparsely populated areas like the study area. The importance of public policies and socio-economic changes in influencing the changes in shifting cultivation is also acknowledged by Jakovac *et al.* (2017) study in middle-Amazonas River.

Apart from the villagisation programme and revival of cashew production in the study area, the introduction of tobacco cultivation in block farming further depleted shifting cultivators' power on land use management. In the block farming system, the role of field allocation to farmers was placed in hands of the village government. But in absence of land use management plans, the village governments failed to manage the delicate crop rotation associated with shifting cultivation in the bushland with scattered cropping (*ndumba*) and woodland with scattered cropping (*matema*). This is because there were no land improvement strategies for vast cleared miombo woodland associated with tobacco cultivation in the study area. In most cases, the exhausted tobacco fields were abandoned so increasing area occupied by grassland with scattered cropping (*ruhaha*). Besides, increasing involvement of village government in land allocation simplified the land acquisition and the establishment of new agricultural landscape and settlements in areas formerly occupied by the open and closed woodlands. The acquisition of new fields was necessary as smallholder famers could not afford the additional agricultural inputs required to maintain the block farming. Similar observation of existing technologies for increasing productivity to ignore improvement of exhausted land is reported by Birch-Thomsen *et al.* (2001) study in Iringa District.

4.2 Change in fallow period over time

The reported shortened fallow periods in study area correspond to the conversions of the woodland with scattered cropping (*matema*) into bushland with scattered cropping (*ndumba*). The shortening of fallow period in woodland with scattered cropping (*matema*) and bushland with scattered cropping (*ndumba*) was associated with the introduction of tobacco cultivation. The use of the bushland with scattered cropping (*ndumba*) for both settlements and tobacco cultivation made it the centre

of land use conflicts for shifting cultivators and village governments. With villagisation, the land was under the village government and no longer under the control of the clans. So, the shifting cultivators lost area for crop rotation whilst bushland with scattered cropping (*ndumba*) reduced its capacity to support bush fallow. In this case, the former shifting cultivation areas become areas for continuous cultivation as shifting cultivators could not access new fields for expansion. This kind of land use conflicts brought by the villagisation programme in the sparsely populated area affected the nature of farming systems especially in the settlement with mixed cropping (*luvala*) and valley bottoms (*madimba*). The nature of shortened fallow period in sparsely populated area like that of Masasi Division is also reported by Boserup (1981) as cited by Jeus *et al.* (2012).

5.0 Conclusion and Recommendations

This study examined the changing nature of shifting cultivation as a result of the government efforts to plan for the agricultural landscape. On the basis of both descriptive statistics and content analysis, the study conclude that the space for shifting cultivation has not only shrunk but also its nature has kept on changing in response to existing socio-economic factors, especially government policies on re-settlement and promotion of cash crops. The study has demonstrated the neglect of local agro-ecological conditions which governed the sustainability of shifting cultivation in the study area. In that case, as measure to manage the current farming systems and overcome the encroachment of marginal lands, there is need to consider land restoration in the study area. On the basis of the discussion, this study recommends that any planning for agricultural landscape should consider the changing nature of shifting cultivation, especially on the use of the so called 'abandoned lands'.

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