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How Land Use Policies Are Transforming Shifting Cultivation to Short Fallow Systems and Permanent Cultivation of Annual Crops in Tanzania

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Abstract

Recent studies show that shifting cultivation in Tanzania has transformed into more intensive farming practices. One of the drivers of this shift is the implementation of policies that favor sedentary farming. However, there is inadequate information on how this transformation operates at the village level. Based on a case study of one village in Central Tanzania, this study demonstrates that the village land use plan is the primary policy tool for the transformation and intensification of shifting cultivation at the village level. Through the land use planning process, land is allocated only for lawful uses such as settlement, permanent cultivation, and the village forest reserve. No land is designated for shifting cultivation. Additionally, the land use plans are accompanied by by-laws that restrict shifting cultivation practices, such as the use of fire during land preparation and leaving the land fallow for more than 3 years. The intensification of shifting cultivation was not associated with an increase in the use of farm inputs such as improved seeds, fertilizer, or irrigation, as is commonly practiced in sustainable intensive agriculture. Instead, it was associated with the adoption of short fallow farming systems and labor-intensive land preparation methods, such as deep plowing to loosen the soil and subsoiling vegetation.

Keywords

Land Use Planning, Land Use Change, Short Fallow Systems, Slash-and-Burn

1. Introduction

Traditional shifting cultivation in Tanzania, also known in Kiswahili as “mahame”

(shifted land) or "malale" (fallow land), has been practiced for many years in semi-humid areas. During the pre-colonial and colonial periods, it served as the primary farming strategy as farmers lived in scattered settlements to avoid slavery and tribal wars. It was also employed as a strategy to evade tsetse flies and dangerous wild animals prevalent in sedentary settlements (Kikula, 1997; Kjekshus, 2022). The farming system was additionally utilized to control the prevalence of weeds, pests, and diseases, while also contributing to the restoration of soil fertility and productivity (Kilawe, Mertz et al., 2018; Kilawe et al., 2022).

Recent studies have shown that traditional long fallow shifting cultivation has been intensified into short fallow systems and continuous annual cropping (Birch-Thomsen & Fog, 1996; Grogan et al., 2013; Itani, 2007; Kilawe, Mertz et al., 2018; Luoga et al., 2000). Population pressure, market access, technological advancement and policies have been cited as the major drivers of land-use intensification in East Africa (Birch-Thomsen, 1999; Birch-Thomsen & Fog, 1996; Chidumayo, 1987; Grogan et al., 2013; Itani, 2007; Kilawe, Mertz et al., 2018; Luoga et al., 2000; Van Vliet et al., 2012). Most studies such as those of (Birch-Thomsen, 1999; Chidumayo, 1987; Grogan et al., 2013; Stromgaard, 1989) have analyzed the role of population growth, technology and market in intensification of shifting cultivation in the region. There are few studies that show the role of policies on small-scale farming and how the farmers have reacted to these policies to change their farming systems (Sunseri, 2003).

Consequently, this case study explores the role of land-tenure, agriculture, and forestry policies on intensification of shifting cultivation at a village level in Tanzania. The study is based on data acquired through intensive review of the policy documents, individual and group farmer interview and field observation. The paper starts with a literature review on how policies developed over the past 100 years have contributed to the transformation of shifting cultivation in Tanzania. Thereafter, I present a case study showing the role of policies in intensification of shifting cultivation at village level.

2. Literature Review on Historical Impacts of Land Use Policies on Shifting Cultivation

Tanzania-previously known as Tanganyika, was colonized by German between 1885 and 1918. Ten years after German successful invasion, they passed a land-tenure Act called "Regarding creations, Acquisition and Conveyance of Crown land" of 1895. The Act declared all lands in Tanganyika as crown land vested in German empire (Iliffe, 1969; Sundet, 1997; United Republic of Tanzania, 1995). This Act recognized two types of land ownership: public land managed and administered by Governor on behalf of German Empire and the freehold land owned and managed by settlers. The Africans could only access and use reserved land for the Natives on condition that it should be physically occupied (Hamilton & Mwasha, 1989; Iliffe, 1969). The colonial administration introduced and promoted intensive agriculture that was based on well managed plantations of cotton, coffee, peanut, sisal and rubber (Iliffe, 1969; Kikula, 1997; Sunseri, 2003). They

prohibited and discouraged traditional agriculture characterized with shifting cultivation, even though it continued to be practiced secretly (Kikula, 1997; Raikes, 1986). The intensive agriculture promoted and established by the colonialist proved failure during the two decades of their administration in Tanganyika (Iliffe, 1969). The farming system failed largely due to poor climatic conditions and soils, pests and endless wars from locals who protested against land alienation, land-use restrictions and forced labor (Hamilton & Mwasha, 1989; Iliffe, 1969; Sunseri, 2003). The colonialists reviewed their land and agricultural policies to give the natives more access to land and freedom to labor. Albrecht von Rechenberg, the German East Africa governor of the time wrote: "It serves the public interest to promote native settlement and their attachment to the soil, not to diminish it" (Iliffe, 1969). The Germans then introduced a "Nyamwezi and Peanut Policy" in the Central and "Peasant Cotton Policy" in the Lake zone and Southeast Tanzania (Iliffe, 1969; Sunseri, 2003). The context of the policies was to promote local farming systems on the view that it was more adapted to local environmental conditions. It was assumed that the local farming systems would naturally intensify due to attractions from the market demand and the German government would benefit from collection of tax (Iliffe, 1969). They consigned intensive cultivation of managed crop plantations to settlers confined in the Northern Zone of Tanganyika (Hamilton & Mwasha, 1989; Iliffe, 1969). The German agricultural reform model performed very well with massive increase in tax collection and decline in conflicts in a very short time (Iliffe, 1969). Besides agriculture, the colonialist promoted forest protection for production purposes-establishment of crop plantations and timber for export (Hamilton & Mwasha, 1989; Iliffe, 1969). They created and gazetted several forest reserves and enforced stringent rules and regulations, but the rules only applied to gazetted or reserved forests (Hamilton & Mwasha, 1989; Iliffe, 1969; Sunseri, 2003; Zahabu et al., 2009).

The German colonial administration in Tanganyika was overthrown by British during the First World War (1914-1918). The British ruled Tanganyika between 1919 and 1961, when Tanganyika gained her independence. The British continued with the land-tenure Act enacted by Germans until 1923, when they enacted the Land Tenure Ordinance No.3-also known as Land Ordinance Chapter 113. This Act declared all lands in Tanzania as public lands and the right over or in land were vested under the British Governor in Tanganyika (United Republic of Tanzania, 1995). Like German era, under British, the Natives could only access and use land approved by the Governor (Kikula, 1997; Reed, 1979; Sundet, 1997). However, in 1928, the Land Tenure Ordinance was amended and customary right of occupancy for the Natives introduced. The new Act vested the powers on land (held and used by local communities) to local Chiefs and the Chiefs could exercise the powers to the locals based on traditional norms and regulations (Reed, 1979). The aims of this approach were described as: "first to provide a form of local government, close to the people, which the people themselves understood, using traditional leaders of the people as administrator, and second to initiate participation by the indigenous people in the Government of the country, such as could be

expanded with their increasing education and experience into full integration" (Reed, 1979). The British continued the agricultural policies implemented by the Germans (Reed, 1979). They promoted intensive agriculture such as managed groundnuts, coffee, tobacco, tea, oil palms, rubber, and sisal. However, intensive agriculture did not deliver the desired results due to high crop failure caused by pests and diseases, drought and poor soils (Hamilton & Mwasha, 1989; Sundet, 1997). The British administration also continued the establishment of forest reserves, but unlike the Germans, their motives for establishment of forest reserves were to conserve soil, water and biodiversity (Hamilton & Mwasha, 1989). During the late years of British administration in Tanganyika, they enacted the Forest Ordinance Chapter 389 of 1959. This Act imposed restriction on local access to protected forests, but the rules and regulations were only applicable to gazetted or declared forest reserves (Zahabu et al., 2009)

Tanganyika gained independence from British in 1961 and in 1964 it became the United Republic of Tanzania after a merge with Zanzibar Archipelago. The first phase of government was led by the President Mwalimu Julius Kambarage Nyerere between 1961 and 1985. Tanzania continued with the Land Tenure Ordinance Act of 1923 enacted by the British administration. However, in 1963 the government enacted African Chiefs Ordinance Act No.13 which made absolute the powers of Chiefs in allocation and distribution of lands to individuals under customary laws (United Republic of Tanzania, 1995). In 1965, the government enacted another act, The Land Tenure Act. The Act granted the government settlement authority, the powers of allocation and distribution of community land to individuals. Further, the Act converted the freehold tenure to Government Leasehold not exceeding 99 years (Sundet, 1997; United Republic of Tanzania, 1995). In 1967, the government introduced a voluntary re-settlement programme called Ujamaa (familyhood) which required rural people to move to a concentrated area called Ujamaa village. The aim was to change traditional settlement characterized with isolated pockets, shifting cultivation, small farms, poor implements, and low yields to larger permanent settlement characterized with modern permanent cultivation, higher yield and with easy provision of development facilities (Daley, 2005; Kikula, 1997; Limbu, 1995). However, rural communities did not respond to the call since by the end of 1969 only 2.5% of the country's population had voluntarily resettled into the villages (Daley, 2005; Kikula, 1997). Between 1970 and 1976, the government introduced and implemented a forceful re-settlement of rural communities from traditional settlement to Ujamaa villages—this programme is also known as "villagisation" (Operation Vijiji in Swahili). The Ujamaa village consisted between 250 - 600 families and the land was allocated to the household by the Village Council (Kikula, 1997; Sundet, 1997). The villagisation programme was accompanied by several agricultural policies such as *Siasa ni Kilimo* (Politics is Agriculture) of 1972 and *Kilimo cha Kufa na Kupona* (Do or die agriculture) of 1974 all of which promoted intensive and permanent cultivation. Farmers were supplied with subsidized improved hybrid maize seeds and fertilizers, Tri-Super Phosphate (TSP) and Calcium-Ammonium Nitrate (CAN)

(Birch-Thomsen, 1999; Kikula, 1997). Further, in Ujamaa village, only two type of farming systems were allowed: Communal farming system (Ujamaa farming), where crop production was performed on village field(s) on a cooperative basis and a block farming system (*bega kwa bega*), whereby individuals were allocated small private fields, but the fields were located adjacent to each other in a block form for easy supervision and supply of agriculture inputs (Daley, 2005; Kikula, 1997). Despite all the efforts to modernize traditional agriculture, productivity declined significantly during villagisation leading to severe hunger and poverty in the early 1980s (Daley, 2005; Kikula, 1997). Decline in productivity was associated with inadequate knowledge on fertilizer application, poor climate condition; cultivation of one site for long period and state monopoly of crop market and poor infrastructure (Kikula, 1997; Limbu, 1995; Raikes, 1986; Sundet, 1997). In 1983, the government developed the National Agricultural Policy to prevent the breakdown of the sector. The policy among many encouraged commercial agriculture, and relaxed land-use restrictions (Birch-Thomsen & Fog, 1996; Daley, 2005; Sundet, 1997). Some villagers reacted to these changes by going back to their old traditional settlement and cultivation methods (Daley, 2005; Sundet, 1997). Shifting cultivation of maize and finger millet was once again on course and this time saw large forest area opened for cultivation, expanding radially outward from village core (Birch-Thomsen, 1999; Daley, 2005; Kikula, 1997; Raikes, 1986). In 1984, the government introduced land use planning in villages in attempt to control land degradation caused by poor farming methods (Sundet, 1997). However, village land use planning failed to make an impact largely due to its top-down approach, poor quality and inability to solve land-tittle issues (Sundet, 1997). During the first government phase, the government adopted the Forest Ordinance of 1959 enacted during the British administration.

The second phase government was elected and governed between 1985 and 1995. This phase is known as a period of economic liberalization and recovery from the economic downturn of the first government phase. Contrary to the first phase, this phase agricultural subsidies were removed, the government withdrew from physical agriculture and private sector allowed to process and trade on agricultural products (Birch-Thomsen, 1999; Daley, 2005; Grogan et al., 2013; Limbu, 1995). There were few restrictions imposed on agriculture development in this phase, thus the small scale, medium and commercial agriculture increased (Sundet, 1997). Toward the end of this phase, the government approved the National Land Policy of 1995. The Policy recognized two types of land-tenure: the granted right of occupancy in reserved National lands and customary right of occupancy in Village lands. The village council was granted the power to administer the customary right of occupancy on village lands on conditions that the village should: 1) have a land use plan, 2) village land certificate and 3) village land registry. In this Policy, the top-down approach of the 1984 land-use plans was replaced with introduction of participatory approach in land-use planning, however some land-uses such as shifting cultivation and nomadism were prohibited (Sundet, 1997; United Republic of Tanzania, 1995). In this phase, the Forest

Ordinance of 1959 continued to be used in management of forest resources. However, in 1992 the concept of Participatory Forest Management was introduced whereby involvement of local communities in forest management was sought (Zahabu et al., 2009).

The third phase government governed between 1995 and 2005. This government phase witnessed a sharp increase in interest in formal settlement and nature conservation. In this phase, the National Land Policy of 1995 was translated into the National Land Act No. 4 of 1999 and the Village Land Act No. 5 of 1999. The National Land Act declares all land in Tanzania as public land, held in trust by the Head of State. Land tenure is in-form of a right of occupancy for Tanzanians and leasehold for foreigners. The Act categorizes lands into three: The reserved land, village land and general land. The reserved lands encompass all lands set aside for special purpose, including forest reserves, game parks, game reserves, land reserved for public utilities and highways, hazardous land and land reserved for settlement. Reserved land is managed by the sector under which it was reserved. The land tenure for this land category is granted right of occupancy or derivative right of occupancy granted by the Commissioner of lands on behalf of the President of United Republic of Tanzania. General lands denote all lands which are not reserved land or village land, including unused or unoccupied village land. The management, administration and land tenure in general land is similar to reserved lands (URT, 1999a). The village land encompasses all lands within the boundaries of the village. The land is managed by the village assembly. The land tenure in village land is customary right of occupancy administered by the Village Council on behalf of Village Assembly (URT, 1999a, 1999b). The Village Land Act made land-use plans a requirement for a village to be registered and granted Village Land Certificate (URT, 1999b). In other words, villages that have not conducted land use planning, do not have village land certificate or village boundaries, and are thus considered to be in general land category. Further, the Act identifies the lawful land-uses that a village land-use plan should contain. It prohibits leaving a piece of land to fallow for a period of more than five years, otherwise the land is declared abandoned, and the Act directs village council to revoke the ownership and transfer it back to the village council or to another villager (URT, 1999b). In the context, ownership of a village land is not real customary as claimed in the Act since the central government has already decided the uses the land should be put to. During the third government phase, the government passed the National Agricultural and Livestock Policy of 1997. The Policy supports land-use planning for efficient delivery of agricultural education and extension services. The policy condemns shifting cultivation and directs that it should be discouraged, and intensive permanent agriculture promoted (URT, 2007). In this government phase, the government also passed the National Forestry Policy of 1998 and enacted the National Forest Act No.14 of 2002. The Policy defines forest in a broader way that also includes agricultural fields under fallow. Forest is defined as: "all land bearing vegetation association dominated by trees of any size, exploitable or not, and capable of producing wood or other products of exerting influence on the climate

or water regime or providing shelter to livestock and wildlife (URT, 1998). The Policy categories forest tenure into: Central and local authority forest reserve, community forest reserves, private forests, and forest on public land (non-reserved forest land). The implication of this categorization is that agricultural fields under fallow fall under private forest if the farmer has the certificate of customary right of occupancy (CCRO) or forest on public land if the villager does not have the CCRO. The Policy identifies shifting cultivation as a threat to forest cover and biodiversity in reserved forests and non-reserved forest in public lands thus direct the conversion of later to forest reserves and ensure intensive survey in forest reserves (URT, 1998). The Forest Act requires all forests (including fields under fallows) to be managed according to forest management plan approved by the Director of Forest. The Act also prohibit the extraction of forest products without authorized license or permit (URT, 2002). In other words, it is illegal for a farmer to clear his/her fallow without permit.

The fourth phase government governed between 2005 and 2015. In this phase, the land tenure policies developed in the previous phase were adopted. However, the land-use planning was given a particular emphasis through development of Guidelines of Participatory Land Use Management (PLUM) in 2006 and enactment of the National Land Use Planning Act in 2007. PLUM provided six main steps on how to conduct participatory village land-use planning (NLUPC 2006). The guide suggested the potential land-use for villages in Tanzania but gave the flexibility to include the already established land-uses in the villages. The Land Use Planning Act approved the village council to be the planning authority in village land-use planning. The Act called on the village council to follow the procedures outlined in Village Land Act of 1999 and PLUM of 2006 to conduct land-use plans that involves participation of all land beneficiaries and based on land suitability assessment (URT, 2007). Regarding agriculture, this government phase was seen as a period of agriculture revolution due to large investment and focus on intensive agriculture. The government launched big and ambitious agricultural programmes such as Agriculture Sector Development Strategy (ASDS) of 2006, Agricultural Sector Development Programme (ASDP) of 2008, Kilimo Kwanza (Agriculture First) of 2009 and Private Public Partnership (PPP) of 2012. The programs aimed to modernize and commercialize agriculture through involvement of private sector (Ngaiza, 2012). Ideally, private investors are granted large piece of village land for large scale commercial cultivation. The programmes provide guidelines on how to increase agriculture productivity in small scale agriculture through provision of subsidies such as fertilizer, improved seeds, irrigation and mechanization (Ngaiza, 2012). Further, the programmes provide a guideline on how to avoid degradation due to shifting cultivation through adoption of climate resilient agriculture (Mshale et al., 2012). Under this concept, "intensive" agriculture demonstration gardens (Shamba Darasa), were developed in almost every village or wards. The villagers were advised to follow the Shamba darasa model in their own gardens. A survey of two villages in Kilosa District revealed that this model has not been voluntarily accepted by the farmers. Less than 5% of the

famers use fertilizers, pesticides, even when those were provided for free (Kilawe, Mertz et al., 2018). Regarding forestry, in this phase, the government continued to implement the Forest Policy of 1998 and enforce the Forest Act of 2002. In 2007, the government ratified the Kyoto protocol. The international agreement allows the member countries to reduce their greenhouse gas emissions through market-based mechanisms. The mechanisms through which the emissions can be traded are the Clean Development Mechanism (CDM) and the proposed Reduced Emission from Deforestation and Forest Degradation plus (REDD+). The later mechanism is seen as a threat to shifting cultivation since it targets the restoration of deforested and degraded landscape. In Tanzania the National Forest Policy of 1998 and the National REDD Strategy of 2013 identify the fallows as degraded "forest" (URT, 2007). There is considerable risk that shifting cultivators may lose their land in expense of establishment of forest reserves for carbon sequestration and storage.

Shifting cultivation in Tanzania has survived despite the effort to convert it to intensive permanent cultivation. The recent official figures show that the farming system occupies 7.6% of the total country land area and 33% of area classified as woodlands in Tanzania (Malimbwi & Zahabu, 2014). There are no country level estimates of the number of people relying on this land-use. However, local level estimates are: 5% in Sumbawanga (Grogan et al., 2013); 20% - 50% in Kilosa (Kilawe, Mertz et al., 2018; Norrlund & Brus, 2004); 68% in Kitulanghalo (Luoga et al., 2000); 90% in Urambo (Mangora, 2012) and 70% - 100% in Lindi rural district (Mshale et al., 2012). The practices and techniques in shifting cultivation have however been transformed into intensive short fallows and grass composite systems (Grogan et al., 2013; Kilawe, Mertz et al., 2018).

3. Methodology

3.1. The Case Study Area

This study was conducted in Ulaya Mbuyuni Village in Kilosa District. The village was selected randomly from the list of eight other villages with a history of shifting cultivation and had performed land-use planning.

Ulaya Mbuyuni village is situated 30 km along the rough road from Kilosa to Mikumi Township and is bounded by latitude 7˚01'29" and 7˚01'55" South and longitudes 36˚57'07" and 36˚58'01" East (**Figure 1**). The village has a total village area of 57.22 km^2 and with the total population of 3474 people, resulting in a population density of 60 persons per km^2. The village had 354 households divided into six sub-villages (KDC, 2012a). The traditional ethnic group in the village is Wasagala, but many other ethnic groups such as Wagogo, Wasukuma, Waha, Wanyamwezi, Wangoni, Wahehe and Wakwiva have moved in over time. Most of the immigrants were laborers in the failed sisal plantations in the district. According to Kilosa District Council, the village falls under central and southern agro-climatic zone (KDC, 2012a). The mean annual rainfall is estimated to range between 1000 and 1400 mm falling in two seasons ("long" rains between March and May and "short" rains between October and December). Mean annual

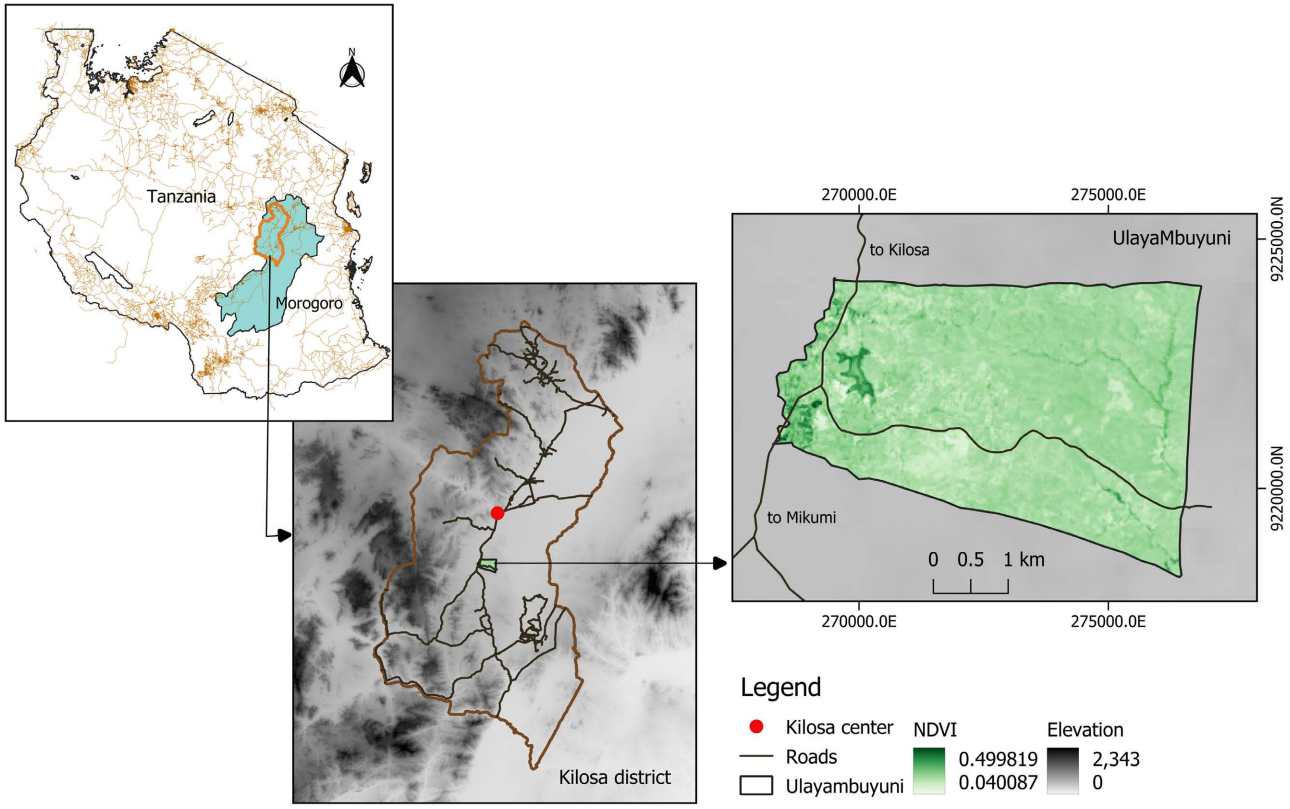

Figure 1. Map of study area. The map was created by Mr. Thadei Rugambwa.

temperature ranges between 25˚C - 27˚C. The natural vegetation is Miombo woodland dominated by *Brachystegia microphylla*, *Brachystegia boehmii*, *Diplorhynchus condylocarpon* and *Combretum collinum*. The soils of Ulaya Mbuyuni village are typically an association of very deep, well drained, dark gray, very friable, clays with thick reddish-brown clay top soils on ridge summits (Rhodi-Ferric Ferralsols) and very deep, well drained, dark brown to strong brown, sandy clay loams with thin brown sandy loam top soils on ridge slopes (Ferri-Profondic Luvisols and Acrisols) (Kimaro et al., 2008).

The main economic activity in this village is small-scale farming, comprising 81% of the households. The main crops are Maize, sorghum, rice, pigeon pea, sesame, cowpea, and sunflower. Farming takes two forms: 1) Permanent and continuous cultivation around the village and valleys or nearby the rivers. This involves cultivation of rice, maize, sunflower, beans, bananas and most vegetables and 2) shifting cultivation is practiced far (around 4 km) from the village core, scattering all over the woodland. The crops grown under shifting cultivation are sesame, cowpea and pigeon pea.

3.2. Field Method and Data

This study is based on data acquired through review of the land use plan, individual and group farmer interview and field observation. Land use plan was selected because it is a tool framed for implementation of land tenure and resource use

policies at village level (URT, 2007). The steps provided in the guidelines for participatory land-use management (PLUM) of 2006 were evaluated against actual procedures in the villages. The actual procedures in the villages are documented in the village land use plan of 2012 (KDC, 2012b). The interview of village land use management committee (VLUMC) was conducted in 2013 to determine the official perception of the land-use plan and their effects on shifting cultivation. The VLUM were particularly important because they are the ones responsible for land demarcation during land use plan, allocation of land to individuals in the village and enforcement of by-laws attached to each land-use. Semi-structured interviews were administered to seven shifting cultivators, firstly individually and finally in groups. The first shifting cultivator was selected with the assistance of the Village Executive Officer. Through snow bowling technique, the other six shifting cultivators were selected and interviewed. The questions aimed to get the farmers' view on land use planning and how this has or would affect their farming system currently and the future.

4. Results

4.1. Shifting Cultivation before Land-Use Planning.

According to the Village Land Use Management Committee (VLUMC), shifting cultivation was practiced by 30% - 35% of all households in the village before the land use planning. VLUMC described the areas where shifting cultivation was practiced as "msituni" (in the forest), implying that the area was dominated by trees. Interviews with shifting cultivators revealed that all of them had permanent fields around their homes or in the valleys. Shifting cultivators mentioned several reasons for practicing shifting cultivation, including controlling weeds and pests, optimizing labor, restoring fertility, controlling soil erosion, and using the fallow phase as a "small bank". In times of hardship, they could produce timber, poles, or charcoal to sustain the household. They emphasized that weeding was performed only once in a newly opened area but at least three times in an area cultivated continuously for more than three years. The farmers described the practice of shifting cultivation in the following steps: 1) Land clearing was performed between July and September, involving clearing of vegetation and collecting it into several small heaps. 2) Burning of the plant residue (collected in heaps) was done between late September and early October. 3) Post-fire land preparation is performed between October and November. It involves deep plowing to loosen the soil and burry undecomposed vegetation (known as *Kukwatua* in Kiswahili Language) or scratching of the soil surface and spreading the undecomposed vegetation on the soil surface (*Kuberega*). 4) Planting was performed between late November and Early January. The crops planted are mostly sesame and pigeon pea if the farms are located far from settlement but otherwise include a mix of different crops such as cowpea, maize, sunflower, millet, sorghum, cassava, beans, and groundnuts. 5) Fallowing and shifting to another field. Cropping continues until

the increase in weed and pest infestation becomes too high or yields declines, usually three years for field under sesame or sorghum and five years for field under pigeon pea, maize, or mixture of both. Then farmers shift to another field and leave the current farm to rest as fallow.

4.2. The Land Use Planning Process

Land-use planning in this village was conducted in 2012. It was facilitated by two local NGOs. The local NGOs were the initiators of the land-use plan since they were interested in establishing forest reserves for a charcoal project. Land-use planning becomes important here because through it, the village land certificate is granted, land category changes from general land managed and administered by commissioner of lands to village land managed and administered by village council. Further, the land-tenure for individual ownership of land changed from granted right of occupancy to customary right of occupancy. This land-use plan was developed following four steps identified in the Guidelines of Village Land Use Planning of 1998, instead of the six steps identified in 2006 guideline (KDC, 2012b). According to the land use plan report and the interview with VLUMC, all villagers were involved in land use planning exercise. However, all (7) interviewed shifting cultivators claimed that they were only involved in village seminars and workshops during awareness creation. They claimed that they were not involved in boundary demarcation and development of by-laws. The village land use planning exercises led to a Land Use Plan that includes five land use categories summarized in **Table 1**. The table shows dramatic change in areas allocated to some of land uses, the most being agriculture declining from 70.5% to 35.5%, shifting cultivation declining from 28.3% to 0.5% and area allocated for forest reserve increasing from 0 to 61%.

Table 1. The area under different land uses before and after land use planning in Ulaya Mbuyuni Village.

Land Use	Area before land-use planning (Acre)	Percentage of total area	Area after land-use planning (Acre)	Percentage of total area
Concentrated settlement	164.4	1.1	231.82	1.6
Agriculture	10,093	70.5	5102.5	35.6
Scattered settlement and farms/shifting cultivation	4057	28.3	79	0.6
Grazing	0	0.0	44.5	0.3
Village forest reserve	0	0.0	8743	61.1
Community service	0	0.0	113.58	0.8
Total	14,314.4	100.0	14,314.4	100.0

Source: Extracted from (KDC, 2012b).

By-laws were enacted to discourage/stop shifting cultivation in areas allocated for agriculture or village forest reserves. The by-laws prohibit any sort of slash-and-burn during land preparation and fallowing for duration longer than 3 years. The by-laws also prohibited extraction of trees for charcoal or timber in these land-uses. Failure to comply with the law could lead to a punishment of TZS50,000 (25USD) or dispossession of the land holding (KDC, 2012b). According to VLUM, the fields of more than 30 farms were reclassified as forest reserve and thus they were supposed to be re-allocated other area in the village. The Land Use Planning Team (PLUM) commented on the agriculture practiced in the village as "poor" caused by lack of knowledge on good agriculture practice. They introduced new farming system called "conservation agriculture" for maize and cowpea. The new farming practice involved scratching a piece of land, marking it into lines and plots. The distance between line was 75 cm and between plots 30 cm. In each plot four maize seed were planted and between the lines, green gram was planted. This farming method was demonstrated in the demonstration garden (*Shamba darasa*) and the farmers were asked to adopt in their farming system.

4.3. Shifting Cultivation after the Land Use Planning

According to the VLUM, shifting cultivators in the village declined from 30% - 35% to 25% between 2012 and 2015. However, admitted that it was difficult to enforce the by-laws since the shifting cultivators were returned to their former fields. Interview with shifting cultivators and field observations reveals that the shifting cultivation methods were still widely practiced in 2015. Slash-and-burn and fallowing were still practiced despite being restricted. An important change, however, was that the fallows were managed to look like they were 3 - 4 years as required by the by-law (Table 2). Field observation in the village found the oldest fallow to be 7 years, and even this one, the farmer had already chopped all big trees. Additionally, charcoaling was not being performed in the fields under fallow. Shifting cultivators complained about this one as to why they should not be allowed to do so in their private field. The introduced conservation farming system model was not successful since only 1/7 farmers adopted it. The farmers who tried and abandoned this farming system claimed that it was laborious, due to difficulty in marking and digging the holes. Also, the system required the use of improved maize seeds and fertilizer. The farmers insist that the farming system was not flexible, to include the crops that they wanted. Further, they claimed that the introduced maize seeds required special handling such as fertilizer and pesticides and these should be bought in every season which they cannot afford.

Table 2. Farming practices among shifting cultivators before and after land use planning in Ulaya Mbuyuni Village.

Land use practices	Before land use planning	After land use planning
Fallow duration (years)	4 - 7	3

Continued

Burning of vegetation	√	×
No-till (*kuberega*)	√	√
Deep till (*kukwatua*)	×	√
Mechanization and use of farm input-ox or tractor land preparation, use of improved seeds, fertilizer, pesticides, or irrigation (%)	0	0
Use of tree resources in the fallow for firewood, timber, or charcoal	√	×

Where: √: practiced ×: not practiced.

5. Discussion

This case study shows how policy instruments have been used to drive the intensification of shifting cultivation at the village level. Through land use planning, no land was allocated to shifting cultivation, and many restrictions were imposed on shifting cultivation practices, such as the use of fire during land preparation and the restriction on fallow periods longer than three years. It was also found that some shifting cultivators were returning to their former fields (from which they were evicted after land use planning). This can partly be attributed to difficulties in implementing the alternative livelihood strategies imposed on them, leading to periods of food insecurity (Kilawe, Mertz et al., 2018). Alternative farming technologies, such as conservation agriculture, were introduced, but the adoption rate was very low because they were labor-intensive and there was a general lack of farm inputs such as pesticides and fertilizer.

The additional restrictions, such as not allowing farmers to leave the land fallow for more than three years, might lead to a degraded shifting cultivation landscape. Low tree cover in agricultural fields could lead to a shortage of firewood, charcoal, medicine, and timber, which will attract people to encroach on reserved forests. Furthermore, the restriction on using trees during the fallow period could result in low motivation for maintaining trees in agricultural landscapes. It has been argued that the benefits associated with smallholder farming systems must be given to the farmers involved (Mertz & Bruun, 2017).

It has been suggested that sustainable intensification of traditional farming practices should come through agricultural technologies developed, tested, and adopted by farmers themselves. This kind of intensification, described as autonomous intensification, occurs gradually over time and is shaped by an increase in population and innovation of new technologies (Birch-Thomsen, 1999; Mertz & Bruun, 2017). Market opportunities, for example, have been shown to lead to the adoption of animal traction in Southern Tanzania (Birch-Thomsen, 1999). Forceful intensification of shifting cultivation can negatively affect the livelihoods of the farmers involved (Kilawe, Mertz et al., 2018)

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Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

Birch-Thomsen, T., & Fog, B. (1996). Changes within Small-Scale Agriculture. A Case-Study from the Southwestern Tanzania. *Geografisk Tidsskrift-Danish Journal of Geography, 96,* 60-69. https://doi.org/10.1080/00167223.1996.10649377

Birch-Thomsen, T., Karim-Sesay, J. A., & Croxton, S. (1999). 2. Animal Traction and Market Conditions: A Case Study from South-Western Tanzania and Northern Zambia; Draft Animal Power Potential and Utilisation in the Tonota District of Botswana; Users in Control: Farmer Participation in Technology Research and Development. In P. Starkey, & P. Kaumbutho (Eds.), *Meeting the Challenges of Animal Traction* (pp. 33-50). Practical Action Publishing.

Chidumayo, E. N. (1987). A Shifting Cultivation Land Use System under Population Pressure in Zambia. *Agroforestry Systems, 5,* 15-25. https://doi.org/10.1007/bf00046411

Daley, E. (2005). Land and Social Change in a Tanzanian Village 1: Kinyanambo, 1920s-1990. *Journal of Agrarian Change, 5,* 363-404. https://doi.org/10.1111/j.1471-0366.2005.00105.x

Grogan, K., Birch-Thomsen, T., & Lyimo, J. (2013). Transition of Shifting Cultivation and Its Impact on People's Livelihoods in the Miombo Woodlands of Northern Zambia and South-Western Tanzania. *Human Ecology, 41,* 77-92. https://doi.org/10.1007/s10745-012-9537-9

Hamilton, A. C., & Mwasha, I. V. (1989). History of Resource Utilization and Management. In A. C. Hamilton, & R. Bensted-Smith (Eds.), *Forest Conservation in the East Usambara Mountains Tanzania* (pp. 45-56). IUCN.

Iliffe, J. (1969). *Tanganyika under German Rule 1905-1912*. Cambridge University Press. https://doi.org/10.1017/cbo9780511759635

Itani, J. (2007). Effects of Socio-Economic Changes on Cultivation Systems under Customary Land Tenure in MBozi District, Southerzania. *African Study Monographs, No. 34,* 57-74.

KDC (2012a). *Kilosa District Socio-Economic Profile*. Kilosa District Council.

KDC (2012b). *Mpango wa Matumizi Bora ya Ardhi ya Kijiji cha Ulaya Mbuyuni*. Kilosa District Council.

Kikula, I. S. (1997). *Policy Implications on Environment: The Case of Villagisation in Tanzania*. Nordic Africa Institute.

Kilawe, C. J., Maliondo, S. M., Bruun, T. B., Birch-Thomsen, T., Silayo, D. S. A., & Mertz, O. (2022). The Intensification of Shifting Cultivation in Tanzania: Effects on Soil and Vegetation. In A. A. Rukhsana (Ed.), *Agriculture, Environment and Sustainable Development: Experiences and Case Studies* (pp. 21-42). Springer International Publishing. https://doi.org/10.1007/978-3-031-10406-0_3

Kilawe, C. J., Mertz, O., Silayo, D. S. A., Birch-Thomsen, T., & Maliondo, S. M. (2018). Transformation of Shifting Cultivation: Extent, Driving Forces and Impacts on Livelihoods in Tanzania. *Applied Geography, 94,* 84-94. https://doi.org/10.1016/j.apgeog.2018.03.002

Kimaro, D. N., Msanya, B. M., Ashimogo, G., Mbilinyi, B. P., & Kadigi, R. (2008). *Development of Land Suitability Maps with Environmental Overlays for Kilosa District, Tanzania*. United Republic of Tanzania.

Kjekshus, H. (2022). *Ecology Control and Economic Development in East African History: The Case of Tanganyika 1850-1950*. Ohio U Press.

Limbu, F. (1995). *Agriculture and Rural Development in Tanzania: A Survey of the 1980-1985 Literature (Issue 7)*. Economic and Social Research Foundation.

Luoga, E. J., Witkowski, E. T. F., & Balkwill, K. (2000). Subsistence Use of Wood Products and Shifting Cultivation within a Miombo Woodland of Eastern Tanzania, with Some Notes on Commercial Uses. *South African Journal of Botany, 66,* 72-85. https://doi.org/10.1016/s0254-6299(15)31053-x

Malimbwi, R. E., & Zahabu, E. (2014). *NAFORMA Process and Biophysical Results*.

Mangora, M. M. (2012). Shifting Cultivation, Wood Use and Deforestation Attributes of Tobacco Farming in Urambo District, Tanzania. *Current Research Journal of Social Sciences, 4,* 135-140.

Mertz, O., & Bruun, T. B. (2017). Shifting Cultivation Policies in Southeast Asia: A Need to Work with, Rather than against, Smallholder Farmers. In M. Cairns (Ed.), *Shifting Cultivation Policies: Balancing Environmental and Social Sustainability* (pp. 27-42). CABI. https://doi.org/10.1079/9781786391797.0027

Mshale, B., Mshana, D., & Yared, P. (2012). *Improving Agricultural Practices in the Context of REDD Readiness in Lindi Rural District, Tanzania: A Review of Current Agricultural Practices and Recommendations for Project Interventions, Tanzania*. Tanzania Forest Conservation Group.

Ngaiza, R. S. (2012). Kilimo Kwanza: The Declaration of Tanzania's Agricultural Transformation. In *FAO Regional Workshop on an Integrated Policy Approach to Commercializing Smallholder Maize Production* (p. 63). University of Nairobi.

Norrlund, L., & Brus, L. (2004). *Agricultural Practices in Relation to Soil Properties and Water Supply in a Miombo Forest Village* (p. 107). Minor Field Study, Committee of Tropical Ecology, Uppsala University.

Raikes, P. (1986). Eating the Carrot and Wielding the Stick: The Agricultural Sector in Tanzania. In J. Boesen, *et al.* (Eds.), *Tanzania: Crisis and Struggle for Survival* (pp. 105-141). Scandinavian Institute of African Studies.

Reed, J. S. (1979). *Government Publications Relating to Tanganyika, 1919-1961*. EP Microform Limited.

Stromgaard, P. (1989). Adaptive Strategies in the Breakdown of Shifting Cultivation: The Case of Mambwe, Lamha, and Lala of Northern Zambia. *Human Ecology, 17,* 427-444. https://doi.org/10.1007/bf00889499

Sundet, G. (1997). *The Politics of Land in Tanzania*. University of Oxford.

Sunseri, T. (2003). Reinterpreting a Colonial Rebellion: Forestry and Social Control in

German East Africa, 1874-1915. *Environmental History, 8,* 430-451. https://doi.org/10.2307/3986203

United Republic of Tanzania (1995). *National Land Policy*. Government Printer.

URT (1998). *National Forest Policy*. Government Printers.

URT (1999a). *National Land Act (and Regulations) No. 4 of 1999*. Ministry of Lands and Human Settlements Development.

URT (1999b). *Village Land Act (and Regulations) No. 5 of 1999*. Ministry of Lands and Human Settlements Development.

URT (2002). *Forest Act No. 14 of 2002*. Tanzania Government Printers.

URT (2007). *Land Use Planning Act No. 6 of 2007*. Ministry of Lands and Human Settlements Development.

van Vliet, N., Mertz, O., Heinimann, A., Langanke, T., Pascual, U., Schmook, B. et al. (2012). Trends, Drivers and Impacts of Changes in Swidden Cultivation in Tropical Forest-Agriculture Frontiers: A Global Assessment. *Global Environmental Change, 22,* 418-429. https://doi.org/10.1016/j.gloenvcha.2011.10.009

Zahabu, E., Eid, T., Kajembe, G., Mbwambo, L., Mongo, C., Sangeda, A., Malimbwi, R., Katani, J., Kashaigili, J., & Luoga, E. (2009). *Forestland Tenure Systems in Tanzania: An Overview of Policy Changes in Relation to Forest Management*. Department of Ecology and Natural Resource Management Norwegian University of Life Sciences.