

Chapter 10

Three Planting and Household Food Security: The Case of the Shouthern Highlands of Tanzania

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The Setting

Large-scale investment in land in Sub Saharan Africa has been well documented (Cotula et al., 2009; Fairhead et al., 2012; German et al., 2013). Since independence, tree plantations in Tanzania had gone through undulating phases (Van den Berg et al., 2013; MNRT, 2014; PFP, 2016; Held et al., 2017; Kimambo et al., 2020) concern for forest loss has spurred ambitious restoration goals for climatic, ecological, and livelihood benefits. Restoration activities typically rely on government-led or large-scale tree planting. A narrow focus on top-down initiatives could promote the recentralization of forestry activities and overlook important contributions by smallholders, especially in Africa. Smallholder tree planting activities are harder to track than institutional efforts. Here we quantify the extent of tree planting on smallholder woodlots in southern and eastern Tanzania, in comparison to large-

scale plantations. In Google Earth Pro, we digitized all woodlots in randomly selected areas, and estimated woodlots' area, distribution, and expansion rate. We found that by year 2018, woodlots in the smallest size class (< 1 Ha. Promotion of tree planting by donor funded projects has been focusing on environmental aspects such as carbon trading (Lasco, 2008, MNRT, 2010; Vainio-Matilla, 2011, Kimambo et al., 2020). Furthermore, the dominance of the sector by the state during the 1970s and 1980s was primarily focused on the establishment of large-scale tree plantations in the Southern Highlands (Pedersen, 2017)³⁷. Nevertheless, for a long period of time, tree plantations in the Southern Highlands of Tanzania has been done by public plantations and big commercial private companies for timber and other commercial purposes (PFP, 2016). A study done by PFP found that Tanzania experienced a reduction in government managed plantations particularly in the supply of mature pine round wood logs (PFP, 2016). It indicated a reduction of 30% (total 540,300 m³) in government allocations from 2014/15 to 2015/16 harvesting season whereas number of beneficiaries for allocations increased from 832 to 964 respectively.

Currently, major forest industries with plantation operations include Green Resources (GR), Mufindi Paper Mills (MPM), and New Forest Company (NFC). An estimated 78 percent of forest plantation area in Tanzania is located in the Southern Highlands (MNRT, 2015). Since the beginning of the 2000s, the trend has been changing dramatically as the number of individual private tree growers has been growing rapidly (FDT, 2015) giving rise to what has been referred to as the Timber Rush (see this book's chapter 2). Most recently, the 2016 plantation mapping indicated that there are about 196 000 ha of plantations in the Southern Highlands of which 71percent are located outside government and company-owned plantations (PFP, 2018). These are essentially under non-industrial private forestry (NIPF).

Such massive increase in private tree planting investment is conceived as being driven by several factors among which are market opportunities/economic reasons³⁸, growing interest in off-setting carbon emission

³⁷ By 1992, there were only two major private companies, Tanganyika Wattle Company (TANWAT) and Kilombero Valley Teak Company (KVTC), which were involved in plantation forestry.

³⁸ Since the early 2000s in Tanzania, and particularly in the Southern Highlands, acquisition of land for investment in private forestry has been undertaken by domestic investors including small and medium scale tree growers. This has largely been the result of increased demand for poles and timber for both domestic and export market especially exports to Middle East, Kenya, Burundi and neighboring countries (see for example MNRT 2011; PFP 2016; FDT 2017)

through tree planting to mitigate climate change, and curbing land degradation/deforestation (Cotula, 2011; Aabø & Kring, 2012; Ingram et al., 2016). Despite the enormous expansion of plantation forestry in the global south for bio-economic development (timber and carbon offset) particularly in Africa, some doubts have emerged over the impacts of these interventions (Lyons & Westoby, 2014; Ingram et al., 2016).

Nevertheless, one of the claims and indeed one which dominated the debate in 2000s was that investments that take up arable land for production of biofuels pose a threat to food security especially in developing countries (Naylor et al, 2007; Escobar et al, 2009; Fischer et al., 2009; Negash & Swinnen, 2012; Koizumi, 2015). Similar observations have been reported in other studies elsewhere (Mousseau & Sosnoff, 2011; Yengoh & Armah, 2015) and in Tanzania (Chachage & Baha, 2010). However, generally, there is limited understanding of the impact of non-industrial private forestry investments on household food security. Against this background this Chapter explores the impact that NIPF has had on household food security in the Southern Highlands of Tanzania where there has been an on-going rush for land for investments in tree planting partly driven by private local investors³⁹ with particular focus on resident villagers.

Conceptual Framework

Food security as a concept has evolved with time⁴⁰. Indeed, various frameworks that have informed research on food security suggest on one hand the concept as being flexible but on the other hand its complexity. Food security is shown to be not merely involving supply side issues as earlier understood⁴¹. These frameworks include the four pillars/dimensions of food security; food systems approach and Sen's entitlement approach, which informs the analysis of the household food security in the study area (see box).

³⁹ Lusasi et al. (2020) identified four types of investors in non-industrial private forestry in the Southern Highlands of Tanzania, namely resident villagers, urban-based investors, urban investors originating from the area, and government and religious organisations.

⁴⁰ See for example Smith et al, 1993; FAO 1996; Maxwell, 1996; Pinstrup-Andersen; 2009; Malaysia, 2010; Upton et al., 2016; Devereux, 2001; 2020).

⁴¹ The first definition of food security by the World Food Conference in 1974 defined food security as: "Availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices" (FAO 1996, pg. 1). It reflected the comprehensive concerns on the availability of world food supplies

Frameworks for conceptualising household food security

(i) The standard conceptual frameworks of food security, usually associated with the Food and Agriculture Organisation (FAO, 1996), have four pillars: availability, accessibility, utilization, and stability⁴². Availability refers to effective demand for food (economic) and proximity of markets (physical access). Utilisation is about biological processing of food, which is partly related to dietary quality. Stability captures the dynamic aspect- as food is a daily necessity, being food secure requires stability in the other three pillars over time.

(ii) Food systems⁴³ approach

A food system approach to food security is not just about a holistic view and including all processes ‘from farm to plate’. It is also about recognizing the dynamic and inter-dependent nature of relations between the different components and actors in the system, including trade-offs and feedback (Ericksen, 2008). As such, a particular strength of a food system approach is its recognition that a change in one component is likely to affect several others, sometimes with unintended detrimental consequences.

(iii) Entitlement approach

Sen (1984, p.497) defines entitlements as ‘the set of alternative commodity bundles that a person can command in a society using the totality of rights and opportunities that he or she faces’ According to the entitlement approach “food security is not simply a supply-side issue. Instead, it is fundamentally about who gets access to available food, which is about the distribution of wealth and resources. The four legal sources of food at the individual and household level are production-based (growing food), own-labour (working for food), trade-based (buying food), and transfer entitlement (being given food by others) (Devereux, 2001; Devereux, 2020).

⁴² This is similar to the four dimension of food security presented by Devereaux (2020), which are as follows: Availability of food determined by domestic production, import capacity, existence of food stocks and food aid; Access to food depends on levels of poverty, purchasing power of households, prices and the existence of transport and market infrastructure and food distribution systems; Stability of supply and access may be affected by weather, price fluctuations, human-induced disasters and a variety of political and economic factors; and safe and healthy food utilization depends on care and feeding, food safety and quality, access to clean water, health and sanitation. More recently, the food security concept has been expanded from a four-pillar framework to a six-dimensional one following the addition of two more dimensions, namely agency and sustainability (see Clapp et al., 2022)

⁴³ A food system includes “all the elements (environment, people, inputs, processes, infrastructures, institutions, etc) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the output of these activities, including socio-economic and environmental outcomes.

Drawing on Sen's approach, which informs this study, food security is defined as access to food based on own production, buying it from the market, and/or food aid from other people.

Study Focus and Research Methodology

This study sought to explore the impact of tree planting and especially NIPF is having on household food security. We sought to answer the following question: What is the household food security status in the context of Timber Rush and in particular NIPF in the Southern Highlands of Tanzania? It employed a mixed methods approach involving collection of both quantitative and qualitative data. Quantitative household survey involved a sample of 400 households from 12 randomly selected villages from six district councils of Njombe and Iringa regions. In the Njombe region, the study was conducted in Makete (Iyoka village and Nkenja village), Wanging'ombe (Mhaji village), Njombe town district council (Kiyaula village and Miva village) and Njombe district council (Lupembe village and Ihang'ana village). From Iringa region the district councils involved are Mufindi (Nyigo village and Mpanga village) and Kilolo (Ndengisivilii village and Kiwalomo village). The quantitative data were analyzed using Statistical Package for Social Science (SPSS) and presented using descriptive and inferential statistics.

In addition to the household survey, qualitative data were collected using FGDs in 12 villages mentioned earlier. FGDs were done in villages other than those covered in the household survey. These are Ikang'asi, Matembwe, and Matiganjora (Njombe District Council), Kifanya, Lwangu and Lilombwi (Njombe Town Council), Mago, Ibaga, Ivalalila (Makete District Council), Mtili, Lugongo and Mwitikirwa (Mufindi District Council). In addition, qualitative data involving the conduct of in-depth interviews were carried out in Matembwe (Njombe District Council), Kifanya (Njombe Town Council) and Mago (Makete District Council). In total, during 2017 and 2018, 26 FGDs and 103 individual in-depth interviews were carried out in the study area. During the same period, semi-structured interviews were done with local government officials (16) as well as village government officials (26), NGO staff (8) as well as small and medium scale tree growers and other community members (53). Participants in both in-depth interviews, SSIs and FGDs were selected with the help of district and village government officials. Both the interviews and FGDs were mostly conducted in Swahili to ensure active engagement of the actors during data collection

regarding experiences of the actors in tree planting. Data were recorded, transcribed and analyzed using content analysis.

Fieldwork Methodology

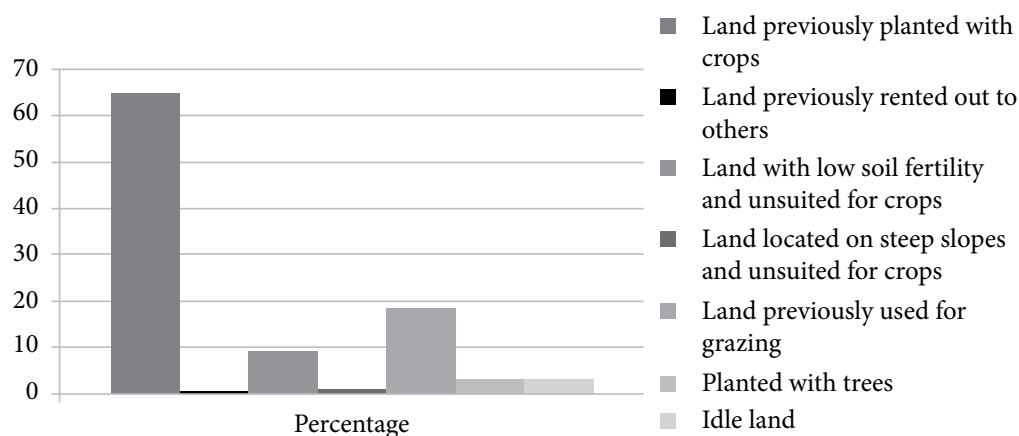
Data for this study were collected using a combination of quantitative and qualitative methods. Quantitative data were collected through a survey of 400 randomly selected tree growers representing 12 villages randomly selected from six district councils of Njombe and Iringa regions. In Njombe region the study was conducted in Makete (Iyoka village and Nkenja village), Wanging'ombe (Mhaji village), Njombe town district council (Kiyaula village and Miva village) and Njombe district council (Lupembe village and Ihang'ana village). From Iringa region the district councils involved are Mufindi (Nyigo village and Mpanga village) and Kilolo (Ndengisivilii village and Kiwalomo village). Qualitative methods used to collect primary data include direct observation, FGDs, key informant and in-depth interviews with resident village investors. The quantitative data were analyzed using Statistical Package for Social Science (SPSS) and presented using descriptive and inferential statistics. On the other hand, qualitative data were analysed through content and case study analysis.

Results

Tree Planting

Results from the household survey conducted in 2018 show changes in land use based on conversion of cropped land. The findings show that about two third of the land which was previously cropped was planted with trees. This is also supported by focus group discussions (FGDs) conducted in 12 randomly sampled villages, which revealed that the rate of conversion of agricultural land to forestry had grown rapidly in the past decade. Although our study did not deeply explore the precise dynamics behind this observation, we support the argument made by FDT (2015) that the results are indicative of shifting land use patterns, and some degree of competition between forestry and agriculture. The findings are also in agreement with FDT study which found that more than 60% of the current land is planted with trees while land size committed to annual crops like maize, wheat and beans is significantly small (FDT, 2017). Furthermore, the findings of the study are supported by Hintz and Pretzsch (2023), who found that a little over two-thirds (64.9%) of households landholdings was allocated for tree growing, suggesting that only 35.1% was left for other uses including food production.

Figure 10.1: Land uses converted to tree planting

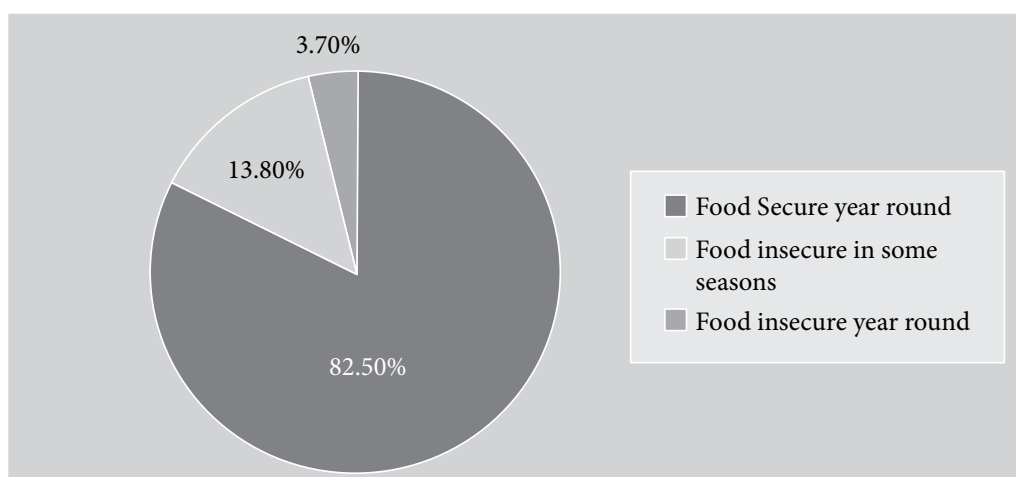


Source: Timber Rush research program household survey

Tree Planting and Household Food Security

Overall, households involved in tree planting did perceive themselves as being food secure throughout the year (Fig 2). This was defined based on the number of meals that the household obtained, which ranged from one to three meals per day. Generally, the findings in figure 2 show that majority (82.5%) perceived themselves to be food secure year-round while only a few (3.7%) perceived themselves to be food insecure year-round.

Figure 10.2: Overall Own-household perception on food security status



Source: Timber Rush research program household survey

Also, results of cross tabulation show that households with more trees were more food secure than those with fewer trees. Indeed, Table 1 shows that the bigger the size of trees planted the more year round household food security. However, it is important to note that the results of cross

tabulation between the status of household food security and the size of land planted with trees did not show any statistically significant difference between households with more trees and those with fewer trees.

Table 10.1: Cross tabulation: Food security status of the household and size of land planted with trees

Food security status of the household	Size of land planted with trees in acres				
	0-2	2.1-4	4.1-6	6.1-8	8.1-10
Food secure year-round	196 (78.7%)	78 (89.7%)	32 (84.2%)	20 (90.9%)	4 (100%)
Food insecure in some seasons	40 (16.1%)	8 (9.2%)	5 (13.2%)	2 (9.1%)	0 (0.0%)
Food insecure year round	13 (5.2%)	1 (0.01%)	1(2.6%)	0 (0.0%)	0 (0.0%)
Total	249 (100%)	87(100%)	38 (100%)	22 (100%)	4 (100%)

P = .375; Chi-Square = 8.620; df = 8

Source: Timber Rush research program household survey

Furthermore, the status of food security/insecurity was analysed through inferential statistics. The multinomial regression results show that a tree growing household was less likely to be food insecure in some of the seasons than being food secured all year round, though the relationship was not statistically significant ($p > 0.05$). Similarly, the tree growing households were noted to be less likely food insecure all year-round than being food secured (Table 2). These results were statistically significant ($P < 0.05$), and the relationship between the variable and the outcome (food insecure all year-round) was negative indicating that the chances of being food insecure all year -round decreased by the farmer deciding to grow trees.

The increase in area planted with trees and croplands, rendered interviewed households being more likely to be food secure all year-round than being food insecure in some seasons. More specifically, the influence of total cropland on a household being food secured all year round was statistically significant ($p < 0.05$), as shown in Table 2. That is, a unit increase in tree planted area or cropland reduced likelihood of households being food insecure in some seasons by 0.035 and 0.230 times respectively. This implies that the increase in trees and area planted with crops increased possibilities of households to improve their food

security through own food production, and increased income obtained by selling trees/sawn timber enable households to buy food. However, the increase in total area planted with trees had significant positive relationship ($p < 0.05$) with households being food insecure all year-round by 0.024 chances. This implies that tree growing has a threshold beyond which it poses a threat to household food security. Also, this could be associated with other food security threatening factors when more land is planted with trees. These factors include increase in vermin encroachment in cropland, a situation which threatens food security and intra-household dynamics such as inability of women to control and access money obtained from selling trees/sawn timber. This argument is supported by a study conducted in the study area which shows that men play a key and dominant role in decision making on the marketing of timber (Nsenga & Mwaseba, 2021). Therefore, we contend that the money accrued from trees farming may not necessarily be spent on food, which might also contribute to household food insecurity.

Table 10.2: The implications of tree growing on food security status

		Parameter Estimates					
Food security ^a		B	Std. Error	Wald χ^2	df	Sig.	Exp(B)
Food insecure in some seasons	Intercept	-1.893	.784	5.838	1	.016	
	Sex of Household head	.086	.409	.045	1	.832	1.090
	Age of household head	.008	.011	.570	1	.450	1.008
	Household size	.313	.092	11.535	1	.001	1.368
	Tree growing status	-.281	.422	.445	1	.505	.755
	Grand total (assets)	.000	.000	1.229	1	.268	1.000
	Total household income	.000	.000	6.321	1	.012	1.000
	Total Cropland	-.230	.105	4.758	1	.029	.795
	Total Tree Area	-.035	.045	.592	1	.441	.966

		Parameter Estimates					
Food security ^a		B	Std. Error	Wald x ²	df	Sig.	Exp(B)
Food insecure year-round	Intercept	-1.796	1.224	2.152	1	.142	
	Sex of Household head	-.589	.716	.678	1	.410	.555
	Age of household head	.014	.018	.617	1	.432	1.015
	Household size	.015	.187	.006	1	.938	1.015
	Tree growing status	-2.576	.653	15.578	1	.000	.076
	Grand total (assets)	.000	.000	2.594	1	.107	1.000
	Total household income	.000	.000	.058	1	.810	1.000
	Total Cropland	-.002	.071	.001	1	.977	.998
	Total Tree Area	.024	.010	5.678	1	.017	1.025
a. The reference category is: Food secured year-round.							

Source: Timber Rush research program household survey.

Household food security is a dynamic process and is thus further explored based on three cases presented below. These cases highlight both the food security status and strategies employed by the households to ensure they are food secure.

Case 1: Household without Trees (Relies on Selling Labour)

This household is one without trees. The head of the household is 35 years old and was born and has been living in his community throughout his entire life. The household comprises of six (6) members (father, mother, three children and a nephew). In terms of education, all household members completed standard seven. The household own about two acres of land where they grow different crops by inter-cropping them. Crops grown are maize, millet, vegetables, and cow peas. Vegetable and cow peas are grown in the lowland plot. Also, the household keep poultry and guinea pigs. Furthermore, they have small general shop (kiosk) where they sell groceries such as maize flour, soaps and cooking oil. Additionally, one of the children is a motorist and operates a *bodaboda* business. According to the head of this household, they did not invest in trees because of limited capital especially land and finances. According to him: *“It needs more lands and capital to invest in trees, so once we are*

financially well, we are going to invest in trees planting.” Regarding the status of household food security, they do not perceive themselves being food insecure for he remarked:

Generally, we never experienced any food shortage. I ensure my household is food secure by ensuring that every season I cultivate the little land I have and after harvest I store enough food. Also, I work very hard for those tree investors so that I get enough money to buy all home necessities including food. Furthermore, when we experience food shortage and if my financial situation is not good my son, who runs the bodaboda business, supplements his income which helps me when my family is short on food. Therefore, as a family we do not suffer the shortage of food because we already set the ways of ensuring food security including working as labourers and use other ways I have mentioned. Also, I am good at raising seedlings, establishing fire lines, and pruning trees and all these activities give me enough money to survive.

The head of the household further explained that due to limited land resources, they rent land to grow crops. However, he was not happy with the system of renting in land, especially one that is not cleared for once it is cleared, landowners claim it back under the pretext that they are no longer interested in renting it out. The household head perceived this as wastage of time and labour.

Case 2: Households with Large Land Area Planted with Trees.

This case presents a case of a household with a large land area planted with trees. The head of household is aged 46 years old. His household comprises four members including him (the father), the mother and two children (one daughter and one son). The head of the household has been living in this community for about 20 years. Other years were spent in the neighbouring village where he was born. In terms of level of education, the household head completed form four while his wife completed standard seven. The two children are still in primary school. Regarding land resources, the household owns about six acres out of which four acres are planted with trees, one and half acres is used for growing food crops mostly Irish potatoes, beans and maize and half an acre is planted with avocado. Irish potato is mainly grown for the market; thus, the household mainly consumes maize. The household started planting trees in 2009 after recognizing that investment in trees is profitable. Before 2009, the household was engaged in cultivation of food crops. However, the crops they grew did not give them enough income to venture into other businesses. After harvesting trees, they

obtained a large sum of money which motivated them to continue investing in tree planting. Currently this household is still looking for more plots of land for investing in trees. The household also runs small businesses; they own a medical store (pharmacy) and a small food store or *genge*. In terms of food security status, the head of household explained that his household does not suffer from food shortage. In 2019, when they harvested their wood for the first time, the income obtained enabled them to invest in other businesses. He perceives that his household is more food secure as he has more alternatives of getting food because they can also buy from the market when they experience shortage of food from own production. Nevertheless, the household use various strategies to ensure that his household get enough food. First, they do not sell harvested maize; all maize is stored for food. Also, to ensure they get good harvest, they adopt improved technologies of maize production. He further explained:

Although the size of land that we plant food crops is small, we still get enough food to take us throughout the year. This is possible because we use improved seed, use inorganic fertiliser, plant on maize on strait line and we protect our planted maize from pest and diseases by applying pesticides. In most cases we don't buy food from the market but if we anticipate that what we have harvested will not last long, we buy maize from other farmers when then the price is still low (usually one month after maize is harvested) harvesting). These strategies help us in getting enough food and, after all, my family is not big. Because I have controlled expenditure on food, that's why I can afford to do other development activities for instance building houses and paying school fees for my children. Therefore, all income obtained from selling trees and my business (pharmacy) is used to finance development activities and not buying food like some other people do. I have also realised that when you own trees you can get a loan because it is easy to be trusted. I remember when I wanted to start this business of selling medicine, I approached a timber trader to lend me some money with the agreement that I will pay him trees. Therefore, he lent me TZS 1.6 million which I repaid by allowing him to harvest 400 trees. Now I own a pharmacy because of the trees and that's why I am still looking for more plots to buy so that I can plant more trees.

Case 3: Household with Medium Land Area Planted with Trees

This household has medium land area planted with trees. The head of household was born in this village and has lived in this village ever since. The household comprises five members, the husband, wife and three

children (all boys) who are attending secondary school education. The household own approximately 26 acres which are located in different parts of Kifanya village. Apart from tree investment, this household also keep chickens (layers and broilers) and they own a barber shop and one motorcycle (*bodaboda*). Recently they have also invested in saw milling business and built two houses for renting. The head of household explained that he started investing in tree planting in 2007 when he completed vocation training and the clan decided to partition their farm to family members. His remarks:

Our clan used to have large areas, so all male relatives were involved in the division of those areas, so I got a share of 12 acres in that allocation. After getting my share (12 acres) I prepared seedlings and hired people who helped me in planting. By that time, I did not manage to plant all 12 acres, so I was planting one or two acres every year. So far, I have harvested 3 times (2017, 2019 and 2021). In all harvests, I got “good money” which enabled me to buy 11 acres and later I added 3 acres. Currently, about 13 out of 26 acres of my land is planted trees (about 11 acres pine trees, eucalyptus one acre and another acre planted avocado). The rest of the land (about 12 or 13 acres) is for food crops mainly maize, beans, Irish potatoes, millet, and vegetables. This year I have planted only 4 acres of maize due to price of fertilisers in other years I used to plant up to seven acres of maize and up to 5 acres of Irish potatoes but this year I planted only three.

Regarding household food security, he explained that prior to 2007, the year he started planting trees, the household was growing food crops only and the amount of harvest they used to get before investing in tree planting has not changed as compared to the current situation where almost 50% of their land is planted with trees. He perceives that planting trees has not significantly changed the size of household arable land because most of the woodlots are planted on marginal land where food crops cannot grow well. He further explained that food security is ensured by balancing tree growing and food crops. He elaborated thus:

Although I have planted many trees, I still reserve enough land for growing food crops to ensure enough food. Therefore, after harvesting, I store enough food for my family and the excess is sold. I can therefore say that my family have never experienced any food shortage because we grow enough food and the excess, especially maize is given to labourers who work in our woodlots. Furthermore, because I have diversified my business, if I don't harvest enough food, I can still buy from the market because I am also a businessman.

Furthermore, the study shows that NIPF has created a labour market associated with tree planting. This is because wealth generated by tree growing has expanded and formalised a rural labour market and made it possible for poor people to be food secure by working as casual labourers. Increased opportunity to work as casual labourer year-round allows poor farmers to be food secure through buying food. This is well depicted in the following remarks by a shop manager at Igeleke village, Mufindi District when describing the food security status in the village:

In this village of course and the neighbouring villages for a long time it was a shame to buy maize flour from a shop or vendors. That has already changed since now people comfortably go to the shop and carry their food home. Five years ago, I used to bring to my shop 2 tons of maize flour; it could take up to two months to finish the stock. Nowadays I bring 10 tons it is finished in three to four weeks. To my surprise all who buy, they pay cash; no one is buying on credit. This shows that people have some money that sustains them. I presume the money is obtained there in the forest! The money they have must have come from the forest operations all year round. The employment levels have increased with tree planting, activities such as planting, access thinning and pruning, running log processing-machines, loading and unloading trucks etc. All these activities contribute not only to cash availability but also to household income re-distribution”.

Also, FGDs revealed other strategies employed by households to ensure food security. Such strategies include households having more than one woodlot with trees of different age. This enables the households to have reliable source of income from timber sales, which they can use to buy food. Besides, although there are some exceptions, some households do harvest timber almost every year which enable them to buy enough stock of food for their needs.

Discussion

As indicated earlier, while there is scanty literature on the impact of tree growing and NIPF in particular with respect to household food security, the literature on the impact of acquisition of land for large scale investments (e.g. production of biofuel) show them as having a negative impact on household food security. The major argument advanced against these investments is that they reduce available land for crop production with immediate impact on food production and ultimately household food security. In this regard, Jayne et al. (2016), for example, reported an increase in the proportion of agricultural land held by urban-based investors in Tanzania, which reduces land for production

of food crops by the village residents. However, in large measure, this study shows that tree planting and NIPF, is having a positive impact on household food security. In fact, drawing on Sen's entitlement approach to food security, we find that households access food mainly through own production, selling labour and buying from the market.

More specifically, well off households that have also invested in tree planting achieve household food security in two ways. In the first instance they grow own food by employing intensification methods of food production involving the use of improved agronomic practices such as fertiliser, improved seed, and pesticides. This affords them to produce more food per unit area of land because of high productivity. In addition, they use income obtained from selling timber to purchase food from the market. In their study, Sanga et al. (2022) indicated that farmers will always engage in the production of crops that have high value in the market. However, growing investment in tree planting suggests that rewards are better for households that invest in tree planting than in crop production. This is why there is conversion of crop lands to timber production because trees have a higher market value. Farmers are using the incomes earned from tree growing to cater for their household food and other needs.

However, while it pays to grow trees, resource constraints limit involvement in the business. Thus, households that are not well to do and which are not able to invest in tree planting because of resource constraint diversify their strategies to access and ensure household food security. They do this by selling labour, which is required in various operations associated with tree planting. Although they produce own food using either own or rented land, it is not enough to carry them through to the next season. This is the reason they rely on the various employment opportunities that NIPF provide. In other words, they work for food, by using income obtained to it from the market. This is, however, in contrast to their counterparts in the Kilombero River Valley. For, according to Sulle and Nelson (2013), following large investments on village land for sugarcane production, smallholder families had to commute from their sugarcane producing villages, sometimes to distant villages to access farming plots for food crops. Based on the above village, residents have two options: they can either stay in the farming community and share the remaining land or switch to wage employment on the investment farms, by choosing the option that offers the higher pay-off (Dessy, et al., 2012). Thus it can be argued that small scale farmers in the Southern Highlands of Tanzania have opted

to stay in farming by producing food while at the same time growing trees. Furthermore, the study also shows their involvement in seasonal employment opportunities along the timber value chain which is not a total shift to wage employment.

Conclusion and Policy Implications

Following the Timber Rush a large land area previously planted with food crops has been planted with trees adjacent to the village settlements. This has had implications with regards to household food security in the area. Tree planting has helped in diversification of sources of food for the households in the study area. However, the study shows differential impact of tree planting on household food depending on the household's well-being. On one hand, smallholder farmers' households with limited resources and which are unable to embark on crop intensification to compensate for reduced cropped area get less food harvest from their land. They end up being food insecure when they solely depend on own food production. However, some of these households become food secure as a result of complementing own household food production by buying food from the market using income obtained from paid labour whose demand has increased as a result of the Timber Rush. On the other hand, and in contrast with smallholder farmers' households, well-to-do households are food secure in two ways. Firstly, they can produce more food through crop intensification using income obtained from selling timber. Additionally, these households can buy food from the market using income obtained from timber sales. Despite this, household food security status both for the well-off and poor households and especially the latter would continue to depend on the profitability of investment in tree planting with more serious consequences on the poor households. The policy implications are two-fold. One, the government should continue to support NIPF to overcome the barriers that limit the profitability of investing in NIPF. These are essentially governance issues that include lack of distinction between industrial timber production and NIPF despite their differences. The lack of distinction between the two types of forestry has partly resulted in high transaction costs notably many taxes which are unaffordable by most actors in the NIPF value chain.

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