

Can subsistence farmers commercialize? Evidence from the southern highlands of Tanzania



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ABSTRACT

Improving rural livelihoods remains a challenge due to subsistence production. This study uses 206 surveys to assess whether smallholders can go commercial. We conducted the surveys in eight villages of the southern highlands of Tanzania, which we prioritized based on market access (low, high) and integration into commercial food systems (low, high). In addition, we included eight focus group discussions and six key informant interviews to supplement the survey data. We analyzed survey data using descriptive statistics and the general linear model with robust standard errors. Significant findings are fivefold. First, men dominate crops perceived as commercial, and women are less likely to be commercial. Second, youth are more likely to be commercial than adults. Third, smallholders are willing to quit farming over employment. Fourth, over half of surveyed smallholders perceived themselves as commercially oriented to a small extent, moderate, or great extent. Fifth, factors such as the sex of smallholders, age, land ownership, access to extension services, household size of the smallholder, and ownership of assets influenced the commercial orientation of smallholders. The study concludes that smallholders can indeed and gradually go commercial, albeit on a small scale and within the existing farming systems.

1. Introduction

The 2017/18 Household Budget Survey (HBS) shows that 81% of the poor people in Tanzania's Mainland live in rural areas and are engaged in subsistence agriculture (National Bureau of Statistics (NBS), 2019). Those subsistence farmers usually farm on small, fragmented plots of about 0.9–3 ha mainly for food (Mpogole, 2013; Wolter, 2009). Even though subsistence farmers produce most of the food, the rural population needs to be more food secure than its urban counterparts. However, HBS 2017/18 shows that extreme food poverty is more pronounced in rural areas (10%) than in urban areas (4%), an issue of concern in an attempt to improve rural livelihoods. As the literature shows, one of the viable approaches to improving the livelihood of rural people is the commercialization of agriculture, especially food crops, in which the majority of smallholder farmers are engaged (Ochieng and Hepelwa, 2018; Wiggins et al., 2013; Wolter, 2009). Commercialization of agriculture is consistent with the Agricultural Marketing Policy of 2008 and the National Agriculture Policy (NAP) of 2013, which aim to transform agriculture from subsistence farming towards commercialization and

modernization (United Republic of Tanzania (URT), 2008; URT, 2013).

Commercialization of subsistence agriculture is an indispensable pathway toward food security, income for the rural population, and economic growth (Mitiku, 2014; Omiti et al., 2006; Otekinrin, 2022; Raj and Hall, 2020; Zhou et al., 2013). Existing literature shows a link between the commercialization of smallholder agriculture and the income levels of the rural population (Jaleta et al., 2009; Mitiku, 2014; Neme and Tefera, 2021; Ochieng and Hepelwa, 2018; Wiggins et al., 2013). Given the opportunity to produce for markets, smallholder farmers are often able to intensify their production of crops for sale, hence raising their incomes and increasing local demand for hired labor, use of purchased inputs, and mechanization (Mitiku, 2014; Ochieng and Hepelwa, 2018; Wiggins et al., 2013). According to Wiggins et al. (2013), smallholder farmers with a commercial orientation have more land, assets, and access to credit or savings than other farmers. Moreover, the commercialization of smallholder agriculture influences nonfarm activities and employment in the processing subsector (Badiane et al., 2022).

While the outcomes of the commercialization of subsistence agriculture are clear, smallholders face many institutional, environmental, and

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individual constraints to commercialize (Zhou et al., 2013). As such, the commercialization of subsistence agriculture in Tanzania remains marginal (Mpogole, 2013; Mpogole et al., 2012; Wolter, 2009). Nevertheless, existing literature on commercial agriculture is fraught with ideological debates about what works and what does not (Diwan et al., 2013). The discussions center on commercial versus conventional subsistence agriculture (Sumberg and Giller, 2022) and whether subsistence farmers can commercialize their production, given that they struggle to meet their food needs (Collier and Dercon, 2014; Wolter, 2009). Thus, two schools of thought can be derived: proponents of large-scale investments and smallholder farmers (Diwan et al., 2013). Proponents of large-scale investments argue that smallholders, left to their own devices, lack the capacity, finance, and technical know-how to commercialize agriculture significantly (Diwan et al., 2013). Those smallholders have yet to choose to be entrepreneurs but are farming by default on small and fragmented plots and are struggling to meet their food requirements, let alone produce a surplus (Collier and Dercon, 2014; Wolter, 2009). They argue that it is risky to leave the agricultural sector to peasants as it will threaten the performance of agriculture, limit growth, and exacerbate poverty (Collier and Dercon, 2014).

On the other hand, proponents of smallholder farmers, as with this study, argue that given the opportunity, smallholders can commercialize. They say that 'small is beautiful' and that the best way to commercialize agriculture is to provide small atomistic farmers with the proper institutional and material support so they can connect directly to markets without "predatory" intermediaries (Diwan et al., 2013; Schumacher, 1989). According to Diwan et al. (2013), proponents of this view contend that colonial farming models such as plantations result in exploitation, land grabs, and marginalization of smallholder farmers. Smallholder-centered farming is inevitable in developing countries, including Tanzania, since smallholders represent 70 to 80 percent of producers. In the face of land scarcity, land grabs, and ownership tend to be emotive subjects, and large-scale farming is perceived as a threat to farmers' livelihood and property rights (Diwan et al., 2013). Proponents of smallholder farmers believe that when positioned correctly in their proper business ecologies, smallholder farmers can be equally effective at commercializing agriculture. However, inadequate access to capital constrains smallholder farmers. What is needed then is to establish models of commercialization of smallholder agriculture that relax those constraints (Diwan et al., 2013). However, how is the commercialization of agriculture measured?

Several studies, such as Abdullah (2017), Carletto et al. (2017), Mpogole et al. (2012), Ochieng and Hepelwa (2018), and van Asselt and Useche (2022) have measured the extent to which smallholder farmers were market oriented by using the commercialization index. However, a specific crop, either from the input or output side, measures the commercialization index (Mpogole, 2013; Mpogole et al., 2012; Strasberg et al., 1999; von Braun and Kennedy, 1994). For instance, Mpogole et al. (2012) establish that the commercialization index of smallholder farmers concerning round potatoes in the Southern Highlands of Tanzania is 88%, implying that smallholders highly commercialized round potato production. Similar measurements have been conducted by Ochieng and Hepelwa (2018) in Liwale District in the Lindi Region, showing a commercialization index of 66%. Finally, Carletto et al. (2017) show that the levels of commercialization in Tanzania, Malawi, and Uganda are as high as 90%, even among the poorest and smallest landholders.

Consistent with Jaleta et al. (2009), measuring the commercialization of smallholder farms concerning a specific crop may not indicate smallholders' overall market orientation. Moreover, existing literature shows that smallholder farmers produce crops mainly for food but sell some surplus to meet their immediate needs (Mpogole, 2013). This means that smallholder farmers have one foot in subsistence and another in the market (Ayele et al., 2021; Mpogole, 2013; Nyikai, 2003). Even with smallholder farmers occasionally selling some surplus, we can regard them as something other than commercially oriented farmers. Thus, a

measurement beyond the commercialization index is needed to fully understand smallholder farmers' commercialization processes. According to Jaleta et al. (2009), there appears to be no well-accepted and comprehensive definition that could give a multidimensional view to the concept of commercialization of agriculture so that one can easily judge to what extent a given smallholder farmer is commercially oriented in its overall production, marketing, and consumption decisions. Indeed, smallholder farmers' ability to commercialize depends on personal and institutional factors (Achandi and Mujawamariya, 2016; Anteneh and Endalew, 2023). Therefore, this study is an attempt to gain a deeper understanding of the commercialization of smallholders beyond the commercialization index. The study serves both descriptive and normative purposes. Firstly, this study aimed to advance knowledge in the literature on commercializing smallholder agriculture. Secondly, this study aimed to generate evidence-based recommendations on commercializing smallholder agriculture to support government efforts in transforming subsistence production.

2. Methods

2.1. Study areas and data collection

We conducted this study in Kilolo and Iringa Districts in the Iringa Region located in the southern highlands of Tanzania. According to the 2022 Population and Housing Census: Administrative Units Population Distribution Report (URT, 2022), Kilolo District has a total population of 263,559, with 51.4% female. The District has 69,597 households with an average household size of 3.8 compared to the national average of 4.3 for Tanzania Mainland. Iringa District has a total population of 315,354, with 51.3% female. The District has 81,106 households with an average household size of 3.9. The two Districts have agroecological zones and agrobiodiversity supporting diverse crops and livestock. Kilolo and Iringa Districts have smallholder farmers cultivating crops such as maize, rice, wheat, round potato, tomato, onion, fruits, and other horticultural crops, as well as livestock and poultry. Also, the two Districts have medium and large-scale investors, some of whom practice contract farming and nucleus farms. This diversity provided great potential for learning the commercialization of smallholder agriculture in the study areas.

With the help of agricultural officers from respective Local Government Authorities (LGAs) and by the selection matrix of Omiti et al. (2006), we prioritized the study villages based on the production of particular crops, livestock or dairy (low or high) and market access or integration into commercialized food systems (low or high). Villages were categorized as having high market access or integration if they were collection centers of a particular crop, had agro-processing industries, and had medium and large-scale agricultural investors with which smallholders could link. In addition, due to limited data on crop production in the study areas, villages were categorized as having a high output of a particular crop in history, as known to the agricultural officers. Based on these assumptions, four villages were selected in each of the two Districts, totaling eight study villages, as shown in Table 1. For Kilolo District, the selected villages were Lulanzi, Mbigili, Ilula, and Luganga. For Iringa District, the selected villages were Isimani, Ihemi, Kisinga, and Tanangozi, as shown in Fig. 1.

Table 1
Village selection matrix.

	Market access/integration into commercialized food systems	
	Low	High
Low	Type one (Kisinga and Mbigili villages)	Type two (Isimani and Tanangozi villages)
High	Type three (Luganga and Lulanzi villages)	Type four (Ihemi and Ilula villages)

Source: Adapted from Omiti et al. (2006; 23)

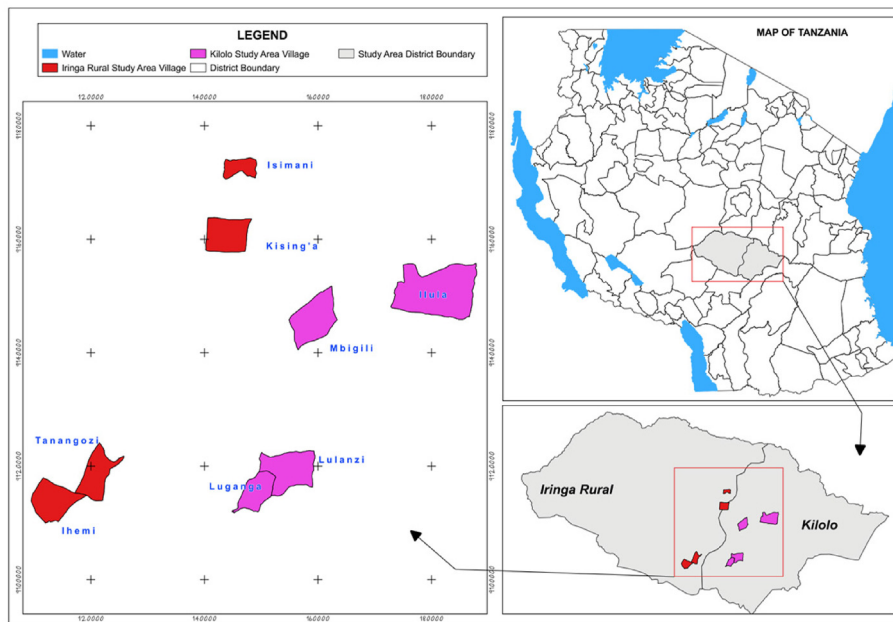


Fig. 1. Study areas.

Ilula and Ihemi were considered to have high production and high market integration because of the presence of medium and large-scale agricultural investments, agro-processing, and act as collection centers for various crops. For instance, Ihemi has large-scale investments, especially in potato and maize production and processing, under the Southern Agricultural Growth Corridor of Tanzania (SAGCOT). SAGCOT supports land consolidation for large-scale agricultural investments linked to smallholder farmers. Therefore, we expect smallholders surrounding such investments to learn and commercialize farming. In addition, Ilula is a center for horticulture production and marketing and is a collection center of maize from surrounding villages.

On the other hand, we considered Kisinga and Mbigili villages to have low production and market integration because of limited medium and large-scale agricultural investments, agro-processing industries, and linkages between smallholders and investors. Although data on the production of various crops at the village level were not readily available, Table 2 indicates the average household production of maize, the main cultivated crop. In this study, we aimed to achieve some diversity in explaining the commercialization of smallholder farmers rather than comparisons.

The unit of analysis was a smallholder farmer in the study areas. However, most smallholders operated family farms; hence, we collected data at the household level targeting the head of the household or an adult member in charge of the family farm. Due to the absence of registers, we identified farmers in collaboration with Village Executive Officers (VEOs) and Village Chairpersons. For each village, we asked village leaders to identify and stratify farmers according to subsistence farmers

Table 2 Household maize production of sampled villages.

Village	Household maize production (100 kg bags)			
	Min	Max	Mean	Std. Deviation
Kisinga	2	30	10.68	8.43
Mbigili	3	40	15.47	10.75
Tanangozi	2	27	10.19	7.09
Isimani	1	50	12.86	14.58
Lulanzi	3	60	19.11	16.71
Luganga	2	80	17.28	14.58
Ilula	1	176	52.27	49.05
Ihemi	2	90	24.37	22.51

with estimated land under cultivation smaller than 2 acres and others with over 2 acres of cultivated land. We aimed to reach a large sample size of 30 farmers in each village. However, since we collected data during farming season, there were some cases of noncontact/response. The final sample size was 206 farmers. We considered this sample size adequate for this study, which was primarily descriptive as we did not aim to estimate the population's mean from our sample's results (e.g., Snedecor and Cochran, 1989). According to Hair et al. (2006) and Snedecor and Cochran (1989), researchers can consider any reasonable sample size adequate for a descriptive study. Although we performed a general linear model (GLM), this study did not aim to meet any statistical significance level.

The study employed a cross-sectional survey with some elements of participatory methodologies. According to Omiti et al. (2006), study findings demonstrate the relevance of participatory methods in investigating pertinent issues in agricultural commercialization in rural settings. We used a survey questionnaire to determine if and how subsistence farmers can transform to commercial production and their perceptions towards commercial agriculture. There were three types of questions: closed-ended, perception (Likert scale), and open-ended. Open-ended questions were mainly those that required responses in the form of a number such as age, experience in farming, amount of land owned, land under cultivation, labor employed, distance to farm, and outputs. In addition, the questionnaire contained a background information section such as demographic characteristics and farming experience and four categories of other questions about 1) agricultural production practices, 2) market orientation and commercialization pathways, 3) linkages between smallholders and medium and large-scale farmers and agro-industries, and 4) perceptions of smallholders towards commercial farming.

The study included focus group discussions (FGDs) of farmers to understand their views on the commercialization of smallholder production. Participants of the FGDs were not part of the farmer survey. Each FGD consisted of 8–12 smallholder farmers. An FGD checklist composed of 1) general information on the commercial orientation of farmers in respective villages; 2) commercialization concerning various crops, livestock, dairy, or poultry; 3) linkages with medium and large-scale farmers and agro-industries; 4) production and marketing constraints; and, 5) the extent to which farmers considered the market before production. In each selected village, we conducted one FGD, making eight

FGDs in this study. In addition, we conducted six key informant interviews (KIIs) with officers of LGAs, including extension officers, to understand their views on how they saw a smallholder farmer in the commercialization process. There were six items on the checklist of KIIs concerning 1) the presence of smallholders that can be considered as commercially oriented in the respective District, 2) common crops, poultry, or livestock that are produced or kept for commercial purposes, 3) what motivates or discourages smallholders from commercializing, 4) potentials for commercial farming in the respective District, 5) challenges of commercial farming in the District, and 6) current plans of LGAs in the commercialization of subsistence farming. Those FGDs and KIIs supplemented the information obtained through the survey questionnaire to aid the discussion of key findings.

2.2. Data analysis

Collected data was cleaned and verified before analysis. We used both quantitative and qualitative approaches. First, we triangulated results from the survey, KIIs, and FGDs so that the study compared findings across methodologies. We analyzed KII and FGD results according to the research themes looking for patterns across groups and key differences or unexpected findings. Quantitative analysis included descriptive statistics and the GLM with robust standard errors (e.g., Lu and White, 2014). We used the model in Equation (1) to determine factors for smallholder farmers' commercial orientation.

$$Y = \alpha_0 + \sum_{i=1}^{i=9} \alpha_i X_i + \varepsilon \quad (1)$$

Where α_0 is a constant and ε is a stochastic error term. We outline other variables in Table 3.

3. Results

3.1. Characteristics of respondents

The study involved 206 respondents from 8 villages with different characteristics, as shown in Table 4. Therefore, this study sought the respondents' background information regarding their age, sex, level of education, marital status, and other characteristics of interest to

Table 3
Description of regression variables.

Variable	Name	Description	Measurement
Y	Commercial orientation	Perceived commercial orientation of a respondent	Likert scale (1 = not sure, 2 = not at all, 3 = to a small extent, 4 = to a moderate extent, 5 = to a great extent)
X ₁	Sex	Sex of a respondent	1 = Male, 0 = Female
X ₂	Age	Age of a respondent	Years
X ₃	Land	Land owned by a respondent	Acres
X ₄	Extension	Access to an extension to services	1 = if have access to extension services, 0 if otherwise
X ₅	HHsize	Household size of a respondent	Number of persons in a respondent's home
X ₆	Education	Highest level of education of a respondent	1 = if no formal education, 2 = primary education, 3 = secondary education, 4 = post-secondary education
X ₇	Asset	The highest valued asset of a respondent	1 = other rudimentary tools, 2 = hand hoe, 3 = oven plow, 4 = power tiller, 5 = tractor
X ₈	Experience	Farming experience of a respondent	Number of years of farming
X ₉	Yield	The yield of the main crop produced	The ratio of total output to cultivated land of the main crop

understand this population's characteristics. We expected these characteristics to determine the decision to participate in commercial agriculture and the type of crops that smallholders commercialize.

The sex composition of respondents varied among villages. As shown in Table 4, about 70% of the respondents involved in the study were male. The highest male percentage was in Ilula (96.6%), Luganga (93.8%), and Mbigili (93.1%). Those villages with higher male than female composition had specific crops produced mainly for commercial purposes, including tomato in Ilula and Mbigili and rice in Luganga. According to Mpogole et al. (2012), males are likely to take over crops that are considered commercial. Of the female farmers involved in the study, about 30% of which the majority were from Kisinga village in Iringa DC (58.6%). About 80% of all respondents were married, and 13.6% were single. Regarding education level, about 75% of respondents had primary education, with a comparatively large proportion in Ilula (86.2%) and a small proportion in Lulanzi (56.2%). Only about 14% of respondents had secondary education, with the highest proportion in Mbigili (34.5%).

Consistent with Mpogole (2013) and Wolter (2009), the land holdings of the smallholders were relatively small, about 7.3 acres, with average cultivated land of 4.9 acres. Nearly half of the respondents had access to extension services, with the highest rates in two nearby peri-urban villages of Isimani and Kisinga. The primary crop yields were relatively low, with some exceptions of Ilula and Ithemi villages, which we rated as having high production and integration with commercialized food systems. Regarding market orientation, slightly over half of surveyed smallholders perceived themselves as commercially oriented to a small extent, moderate, or great extent.

3.2. Ownership of production machinery

Ownership or access to different assets and infrastructure largely determines households' livelihood (Mpogole, 2013). Families that own various resources, such as land and production machinery, and have access to communication networks such as roads and other forms of infrastructure have a broader range of economic opportunities compared to those with less access. Households will have less access to resources, or assets may be limited to agricultural activities for subsistence. Access to infrastructure, as a proxy for access to input and product markets, may also positively influence the type of agricultural activity. We asked respondents about ownership of production machinery such as hand hoe, oxen plow, power tiller, tractor, and other tools. As presented in Fig. 2, nearly 70% of respondents owned a hand hoe as the highest-valued asset. About 25% owned oxen plow, and only a few respondents owned a tractor (5.1%). Other farmers rented tractors or power tillers from within or outside their villages when needed.

3.3. Crop selection and commercialization decisions

We asked farmers about the main criteria for selecting a crop for production. As shown in Fig. 3, some smallholder farmers considered market factors. Other smallholder farmers regarded issues of food security and availability of seeds. Moreover, peers and extension officers influenced some farmers in commercialization decisions. Smallholders produced specific crops for the market, food, or both. Smallholders predominantly cultivated sunflowers and horticultural crops like tomatoes for commercial purposes, while staples like maize were most dominant for subsistence and surplus selling. Production of some crops for commercial purposes and other specific crops for food is where the measurement of the commercial orientation of smallholders is not unambiguous. Looking at some crops, smallholders may appear to be subsistent and, at the same time, commercial concerning other crops. This implies that smallholders are concerned with food security and income, making them neither fully subsistent nor fully commercial.

Regarding pathways for commercialization, the study found that traditional surplus selling and individual farmers' commercial production

Table 4
Characteristics of respondents.

Variable	Village Name								Total
	Ihemi	Ilula	Isimani	Kisinga	Luganga	Lulanzi	Mbigili	Tanangozi	
Sample size (n)	19	29	29	29	25	16	29	30	206
Sex (%)									
Male	47.4	96.6	65.5	41.4	93.8	68.0	93.1	56.7	69.9
Female	52.6	3.4	34.5	58.6	32.0	6.2	6.9	43.3	30.1
Age (years)									
18–35	31.6	31.0	34.5	13.8	20.0	50.0	72.4	36.7	35.9
36–45	15.8	62.1	10.3	24.1	36.0	25.0	17.3	23.3	27.2
46–60	36.8	6.9	41.4	55.2	32.0	25.0	3.4	36.7	29.6
Above 60	15.8	0.0	13.8	6.9	12.0	0.0	6.9	3.3	7.3
Education (%)									
None	10.5	3.4	0.0	10.3	12.0	0.0	0.0	6.7	5.3
Primary	78.9	86.2	82.8	82.8	76.6	56.2	62.1	70.0	75.2
Secondary	0.0	6.9	10.3	3.4	8.0	31.2	34.5	20.0	14.1
Post-secondary	10.5	0.0	6.9	3.4	4.0	6.2	0.0	0.0	3.4
Tertiary	0.0	3.4	0.0	0.0	0.0	0.2	3.4	3.3	1.9
Marital status (%)									
Married	63.2	86.2	89.7	79.3	88.0	87.5	79.3	66.7	80.1
Single	15.8	13.8	6.9	10.3	8.0	12.5	20.7	20.0	13.6
Divorced/separated	5.3	0.0	0.0	3.4	4.0	0.0	0.0	6.7	2.4
Widowed	15.8	0.0	3.4	6.9	0.0	0.0	0.0	6.7	3.9
Access to extension (%)									
Yes	52.9	46.2	88.5	78.6	23.8	50.0	42.9	31.0	52.4
No	47.1	53.8	11.5	21.4	76.2	50.0	57.1	69.0	47.6
Other characteristics									
Household size	4.7	5.1	5.4	5.6	5.2	4.9	4.1	3.7	4.8
Farming experience (years)	17.7	12.8	20.8	25.6	23.2	13.3	11.5	19.0	18.1
Total land owned (acres)	4.8	8.9	9.2	8.5	5.0	12.8	5.1	5.1	7.3
Land under cultivation (acres)	3.3	7.6	7.1	6.7	3.6	5.2	3.4	2.2	4.9
Estimated output of maize, the main crop (100 kg bags)	24.4	52.3	12.9	10.7	17.3	19.1	15.5	10.2	19.7
Yield (100 kg bags of prominent crop/acre)	7.9	8.5	2.7	1.7	5.6	5.0	4.1	4.7	4.9
Perceived commercial orientation									
Not sure	0.0	0.0	7.1	0.0	0.0	0.0	0.0	0.0	1.0
Not at all	78.9	24.1	78.6	24.1	28.0	31.3	14.3	70.0	43.1
To a small extent	5.3	10.3	10.7	41.4	36.0	18.8	25.0	16.7	21.1
To a moderate extent	10.5	37.9	0.0	31.0	28.0	25.0	32.1	13.3	22.5
To a great extent	5.3	27.6	3.6	3.4	8.0	25.0	28.6	0.0	12.3

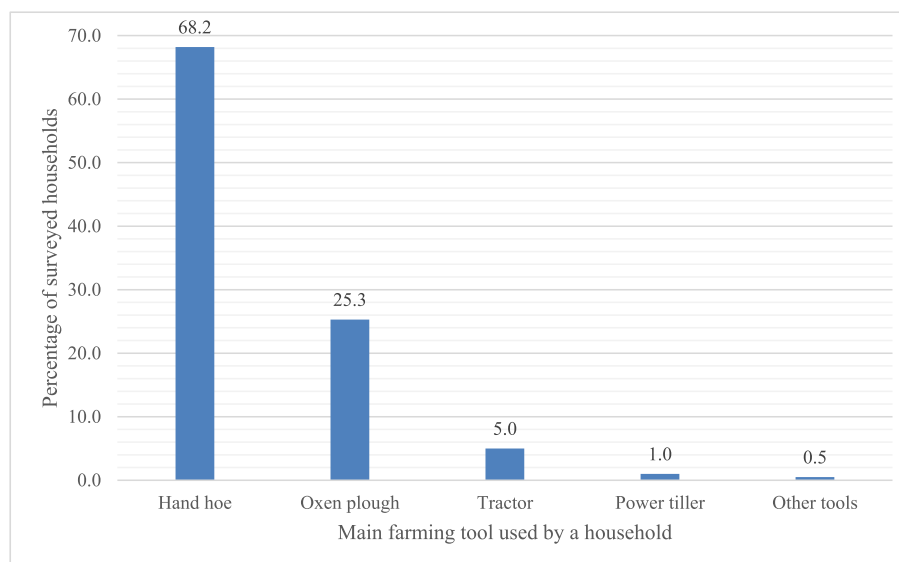


Fig. 2. Highest valued farming tool owned by surveyed households (n = 198).

were the most common ways, as shown in Fig. 4. This implies that some farmers were not necessarily produced for the market but sold accrued surplus to meet their basic requirements. A few farmers, however, were purposely producing for the market. These results are consistent with Mpogole et al. (2012), that although some farmers do not consider issues of the market when they make decisions to produce, they may end up

selling the surplus or part of their produce to meet other essential requirements. Although crucial, smallholders hardly mentioned co-operatives as a pathway to commercializing production. According to Mpogole et al. (2012) and Mpogole (2013), farmer groups or associations enhance smallholder farmers' productivity and commercial orientation.

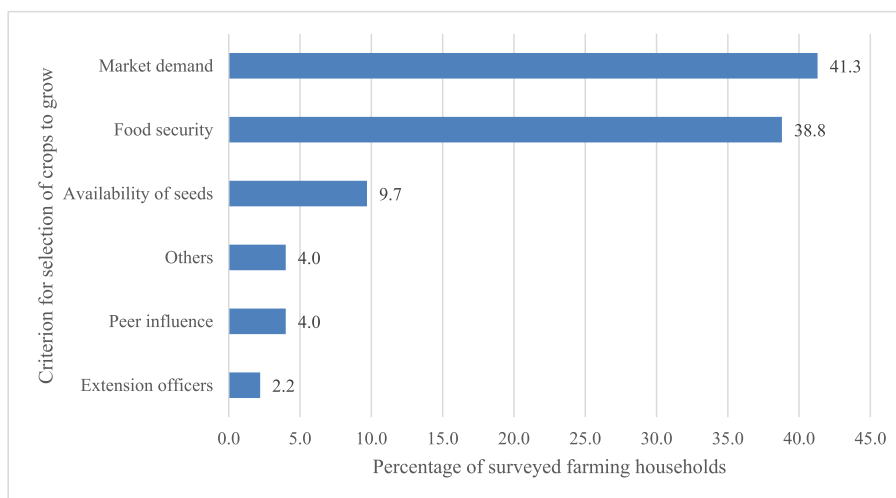


Fig. 3. Main criteria used by farming households for the selection of crops to grow (n = 201).

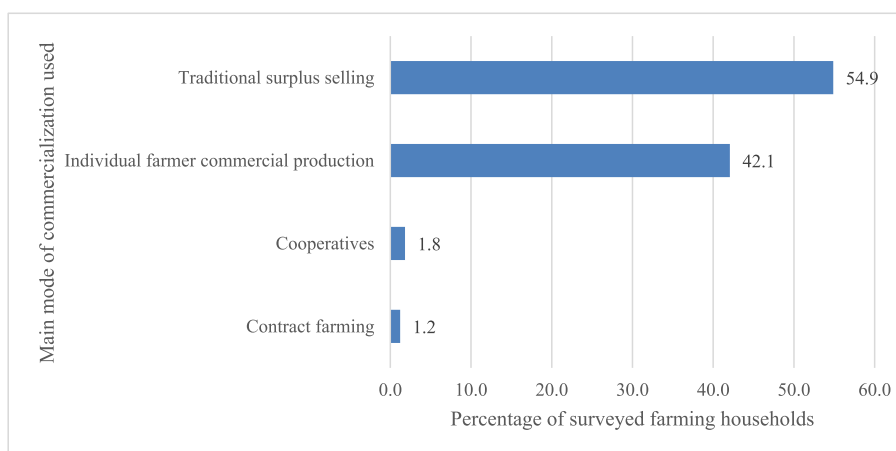


Fig. 4. Pathways for commercialization of smallholder production (n = 164).

3.4. Factors influencing the commercial orientation of smallholder farmers

To ascertain the factors influencing the commercial orientation of farmers, we performed a regression analysis using the GLM with robust standard errors, as shown in Equation (1). Table 5 and Table 6 show the

Table 5 Tests of between-subjects effects.

Source	Commercial orientation				
	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	47.704 ^a	9	5.300	6.350	0.000
Intercept	32.847	1	32.847	39.351	0.000
Sex	4.218	1	4.218	5.054	0.026
Age	2.179	1	2.179	2.611	0.108
Land	3.481	1	3.481	4.171	0.043
Extension	5.380	1	5.380	6.446	0.012
HHsize	5.919	1	5.919	7.091	0.009
Education	0.272	1	0.272	0.326	0.569
Asset	15.963	1	15.963	19.124	0.000
Experience	0.014	1	0.014	0.016	0.899
Yield	0.233	1	0.233	0.279	0.598
Error	111.851	134	0.835		
Total	1504.000	144			
Corrected Total	159.556	143			

^a R Squared = 0.299 (Adjusted R Squared = 0.252).

Table 6 Parameter estimates with robust standard errors.

Dependent Variable: Parameter	Commercial orientation					
	B	Robust Std. Error ^a	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	3.514	0.587	5.985	0.000	2.353	4.675
Sex	-0.407	0.176	-2.313	0.022	-0.755	-0.059
Age	-0.019	0.012	-1.675	0.096	-0.042	0.003
Land	0.016	0.007	2.294	0.023	0.002	0.030
Extension	-0.406	0.172	-2.357	0.020	-0.747	-0.065
HHsize	0.111	0.048	2.298	0.023	0.015	0.206
Education	0.064	0.119	0.535	0.593	-0.171	0.299
Asset	0.410	0.115	3.560	0.001	0.182	0.638
Experience	0.002	0.011	0.134	0.893	-0.021	0.024
Yield	0.010	0.021	0.464	0.644	-0.032	0.052

^a HC3 method.

regression results. The robustness test showed that the estimated coefficients' signs and magnitude were plausible (e.g., Lu and White, 2014). R-squared was about 30%, with an adjusted R-squared of 25%. This value is adequate given that the dependent variable was a 5-point Likert scale item. Factors such as sex, age, ownership of land, access to extension

services, household size, and asset ownership significantly influenced the commercial orientation of smallholder farmers. For example, female farmers were less likely to be commercial than their male counterparts. Similarly, elderly farmers were less likely to be commercial than the youth.

Farmers with limited or no access to extension services were less likely to be commercial than those with access to the services. The larger the land owned by farmers, farming assets, and household size, the more the likelihood of becoming commercial. Contrary to our expectations (e.g., Abdullah, 2017; Ogutu and Qaim, 2019), education level did not significantly influence the commercial orientation of farmers. This could be because about 75% of respondents had a primary level of education (Table 4), and only about 19% had secondary or higher education.

3.5. Willingness of small-scale farmers to offer labor to investors

Since smallholders were neither fully subsistence nor fully commercial, we asked them if they would be willing to quit farming in case of some employment opportunity for investors. As shown in Fig. 5, over 70% of respondents indicated they were unwilling to leave farming to provide labor to investors. However, in Tanangozi Village in Iringa District, nearly half of the respondents (48.3%) were willing to quit farming to work for investors. This could be due to the urban characteristics of Tanangozi Village, in which people prefer employment over agriculture. Although the majority indicated they were unwilling to quit farming over job employment, 56% of respondents stated that they had seen or known smallholder farmers who left farming to work for investors as casual laborers. This indicates that leaving farming for job employment among smallholders was not uncommon.

The study further investigated the attitudes of rural communities towards smallholders who quit farming for employment elsewhere. As shown in Fig. 6, nearly half of the respondents were positive toward smallholders who left farming for job employment. However, leaving agriculture for employment severely affects efforts to enhance smallholder production's commercialization. If smallholders are pessimistic about farming activity, they are unlikely to respond to interventions encouraging them to remain in farming to produce for the market. Thus, efforts of the government to enhance the commercialization of smallholders should identify farmers with market orientation who are ready to go commercial. Targeting every farmer may not yield positive results as not all are willing to produce primarily for the market. Smallholders willing to quit farming if alternative employment opportunities were available are not the kind of farmers to target the interventions if actual commercialization is to occur.

Fig. 7 shows the reasons for some farmers not quitting farming over employment elsewhere. Over 70% of those who would not quit farming stated that the main reasons for not preferring to leave farming over job employment were freedom to do what they wanted or to ensure household food security. This finding is also interesting since no farmer mentioned that they would not quit their farming employment because it was a profitable venture. This implies that surveyed smallholder farmers did not consider farming a business, which is a deterrent to commercialization efforts.

We further asked respondents about their linkages with medium and large-scale farmers and agro-industries and if those linkages would promote their commercial orientation. Fig. 8 indicates that about one-third of all respondents stated that there was a linkage between smallholders and agricultural investors. This is similar to the interview results with farmers, where the interaction between individual small-scale farmers and farming investors was minimal. Moreover, FGDs indicated that agricultural investors had better linkages with smallholders at their initial stages of investment. For instance, smallholders cited an example of a livestock investor who purchased maize and other animal feeds from farmers at the initial stages. Afterward, the investor started to produce their maize and other animal feeds. Finally, the investor stopped purchasing maize from smallholder farmers. As a result, there was no linkage

with such investors, and smallholder farmers struggled to access markets elsewhere.

4. Discussion of findings

Consistent with Daum et al. (2022), this study has established that the level of mechanization among smallholders in the study areas still needs to be improved. Smallholders continued to rely on hand hoes as their primary production machinery. Farming on small and fragmented plots using hand hoes does not guarantee meaningful food output and is a significant deterrent to commercial production. The study has shown that the highest-valued farm asset/equipment influenced the commercialization of smallholders. Other studies, such as Asfaw et al. (2011), Ayele et al. (2021), Muricho (2015), Nwafor and van der Westhuizen (2020), and Ogutu and Qaim (2019) show that improved farm technologies and agricultural assets influence the commercial orientation of smallholder farmers. However, whether these agricultural assets affect a smallholder to do commercial agriculture or that commercialization increases assets remains an issue for further investigation. For instance, Abdullah (2017) establish that commercializing smallholder farming increases household welfare. This could be because when a smallholder farmer participates in the market is likely to earn more income, which smallholders can use to purchase improved farm technologies.

This study has shown that female farmers were less likely to be commercial than their male counterparts because the study area was a dominant male society regarding decisions concerning the farm and the household (e.g., Abdullah, 2017). Our results are consistent with Kawarazuka et al. (2022), Mpogole et al. (2012), and Ntakyio and Van Den Berg (2022) that men dominate crops perceived as commercial, leaving women with food crops and other household chores. Ntakyio and Van Den Berg (2022) show that commercial crops are considered men's domain. Similarly, elderly farmers were less likely to be commercial than youth. This result contradicts Abdullah (2017), which establishes a positive coefficient between age and commercialization decisions of smallholder farmers. This is because the need for formal employment among youth in the study areas necessitates them to engage in commercial agriculture. According to a survey by the Ministry of Agriculture Livestock and Fisheries between January and March 2014, the number of youths involved in commercial agriculture increased. In addition, the survey found that youth had formed different groups to pull their efforts together to improve production. Increasing youth engagement in commercial agriculture is linked to measures taken by the government of Tanzania and other stakeholders, including the formulation of the Youth Policy 2013 and the National Strategy for Youth Involvement in Agriculture of 2016–2021. Furthermore, youth have limited options, including agriculture, because of declining employment in the formal sector. Thus, engaging energetic youth in commercial agriculture is likely a viable approach to enhance the sector's productivity, value addition, and competitiveness.

In line with Anteneh and Endalew (2023), Ayele et al. (2021), and Nwafor and van der Westhuizen (2020) we have shown that ownership of land, access to extension services, and household size influenced the commercial orientation of smallholder farmers. The land is an essential asset in farming. With poor farm technologies, smallholders must farm in larger plots to realize meaningful commercial outputs. Similarly, farmers with access to extension services tend to undergo good agronomical practices and have more access to market information through the extension officers. Unexpectedly, the National Sample Census of Agriculture 2019/2020 shows that access to extension services among farmers in Tanzania has declined from 67% in 2007/2008 to 7% in 2019/2020 (National Bureau of Statistics (NBS) and Office of Chief Government Statistician, Zanzibar (OCGS), 2021). Declining access to extension services poses significant challenges to commercializing smallholder farming. Consistent with Abdullah (2017), we find that household size has a positive and significant coefficient implying that, *ceteris paribus*, a smallholder farmer from a large family is more likely to

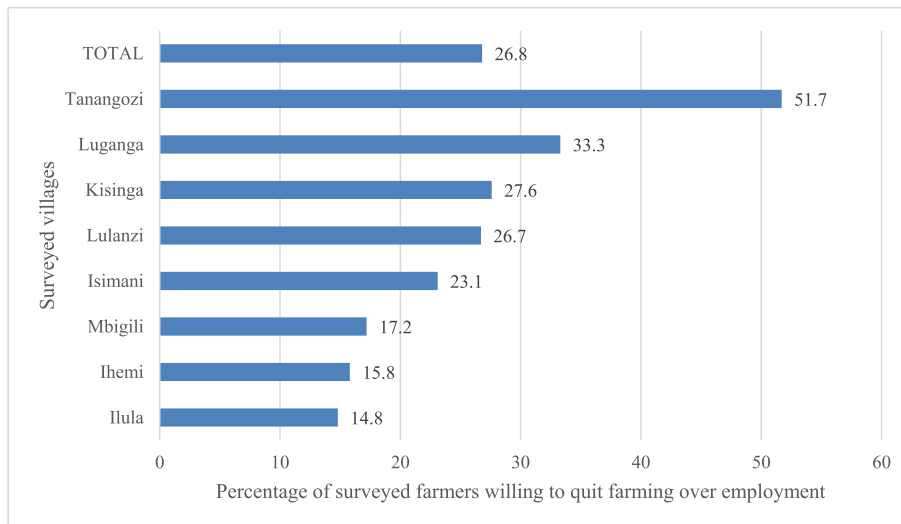


Fig. 5. Willingness to quit own farming over employment (n = 195).

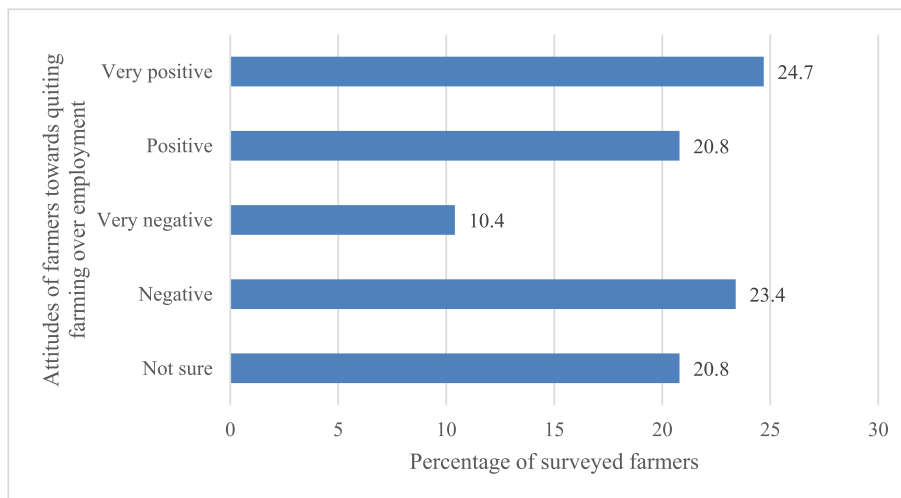


Fig. 6. Attitudes of farmers toward quitting farming over employment (n = 154).

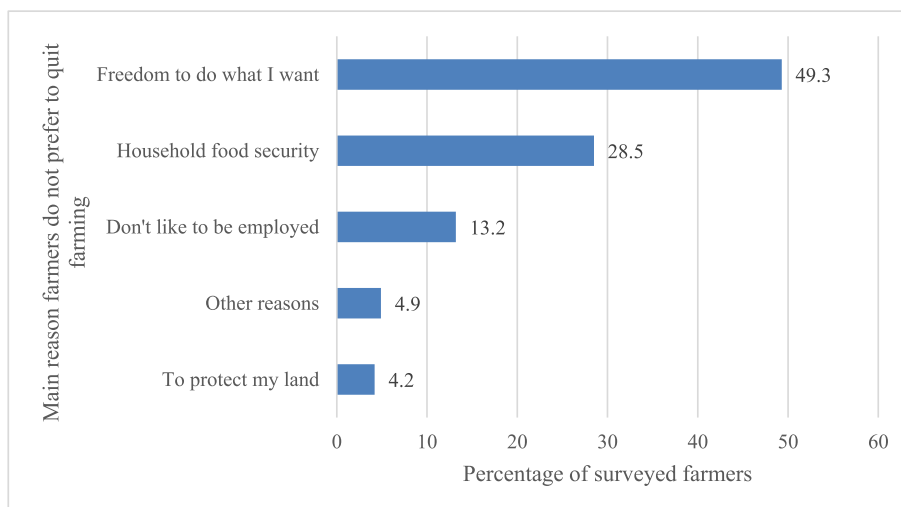


Fig. 7. Reasons farmers do not prefer to quit farming over employment (n = 144).

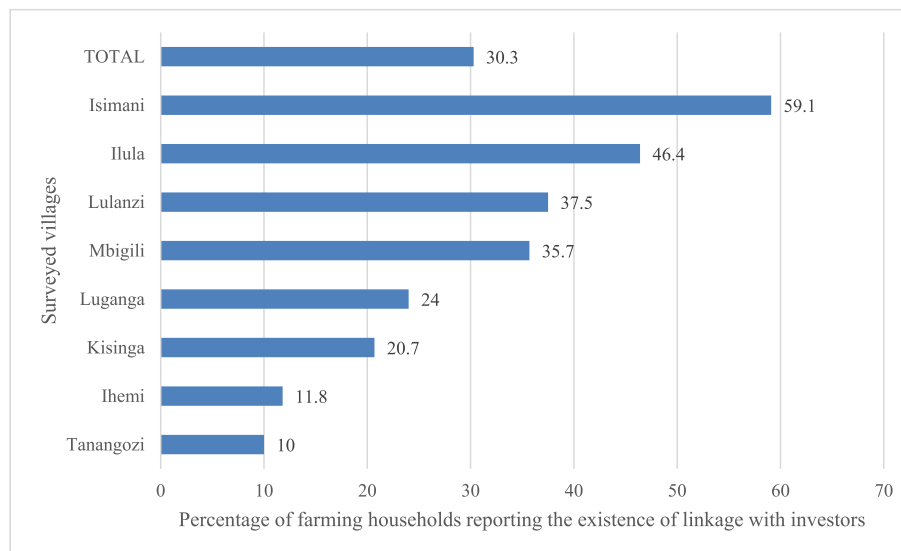


Fig. 8. Linkages between smallholders and agricultural investors (n = 206).

commercialize than others. A smallholder from a large family enjoys family labor instead of hired labor, which could be unaffordable.

Apart from market demand, this study has shown that smallholders considered food security and other criteria necessary in farming decisions. Similarly, Mpogole et al. (2012) establish that smallholders consider criteria other than the market in selecting crops or crop varieties to grow. Moreover, this study has shown that smallholders are neither fully commercial nor fully subsistence. This is not uncommon, as smallholders are said to have one foot in the market and another foot in subsistence (Ayele et al., 2021; Mpogole et al., 2012). Having one foot in the market and another on subsistence is an issue of significant concern as it may imply that those smallholders have no particular objective. The amount of surplus produced dictates the commercial orientation of smallholders. Although some farmers cultivated specific crops for the market, traditional surplus selling was the primary pathway or model of smallholder commercialization. This traditional surplus selling does not amount to the conclusion that smallholders are semi-commercial farmers. Occasional surplus selling to meet some household requirements does not imply commercial orientation. Commercial production should be a deliberate decision to produce for and based on the market demand.

Lastly, the study has established limited linkage between smallholders and medium and large-scale farmers and agro-industries, which could promote commercialization. We seldom observed contract farming between smallholder farmers and agro-processors. Those contracts involved the provision of inputs to farmers who repaid in kind after harvest. However, there was limited adherence to contract agreements on both sides, which made smallholders feel insecure and exploited. In some villages, smallholders were willing to quit farming over employment to investors when available. Examples of smallholders who left their farming to provide labor to investors were not uncommon, and other farmers perceived this as a positive thing. However, for farmers who did not plan to quit farming, none mentioned that they would not stop farming because it was a profitable venture. This implies that surveyed smallholder farmers did not consider farming a business, which is a deterrent to commercialization efforts. Similarly, Adzawla et al. (2022) show that the economic viability of smallholder agriculture is doubtful. If smallholders are pessimistic about farming activity, they are unlikely to respond to interventions encouraging them to remain in farming to produce for the market.

5. Conclusion

Since smallholders showed elements of both subsistence and market orientation, the study concludes that they can indeed and gradually go commercial, albeit on a small scale and within the existing farming systems. Our conclusion is consistent with Mpogole et al. (2012) study in the Southern Highlands of Tanzania, where the researchers found that smallholder farmers were increasingly becoming commercial concerning round potato production. The findings of this study have both practical and theoretical significance. In practical terms, the ability of smallholder farmers to market any accrued surplus or to link with agricultural investors through associations, contract farming, or out-grower schemes increase smallholders' income, productivity, and commercial orientation. The challenge for policy and development practitioners is to enhance the participation of smallholders in commercial farming as well as to strengthen forward and backward linkages with agricultural input suppliers and processors. Theoretically, the challenge is understanding how smallholder farmers commercialize, which smallholder farmers commercialize, and to what extent. Further research is needed to understand the drivers of change for smallholders to commercialize.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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