International Journal of Agricultural Science, Research and Technology in Extension and Education Systems (IJASRT in EESs)
Available online on: http://ijasrt.iau-shoushtar.ac.ir
ISSN: 2251-7588 Print
ISSN: 2251-7596 Online
2023: 13(3):179-194, DOR: 20.1001.1.22517588.2023.13.3.5.5

Received: 02 July 2023
Reviewed: 01 August 2023
Revised: 01 September 2023
Accepted: 12 September 2023

Socio-Economic Factors Influencing the Participation of Smallholder Vegetable Farmers in High-Value Markets (A Case Study of Arumeru District, Tanzania)

Happiness Anton Huka[1], Fredy Timothy Kilima[1] and Alban Dismas Mchopa[1]
[1]*Moshi Co-operative University (MoCU), P.O. BOX 474, Sokoine Road, Moshi, Tanzania*
[*]*Corresponding Author Email: hpendo046@gmail.com*

Abstract

High-value market chains are regarded as one of the country's lucrative market segments. However, various constraints hinder the effective involvement of smallholder farmers in these market chain, thus limiting their ability to generate income for their households and livelihood. The objective of this paper was to examine the influence of socio-economic factors on the participation of smallholder vegetable farmers in high-value markets (HVM). The study used a cross-sectional research design, involving a sample of 384 respondents. Data collection involved the use of structured questionnaires, focus group discussions, and key informant interviews. The study applied a probit model to assess these factors. Findings reveal that socio-economic factors including access to information, distance to the market, availability of extension services, and crop diversification significantly ($p < 0.05$) influence the participation of smallholder farmers in HVM. To enhance the participation of smallholder vegetable farmers in HVM, the study recommends that the government and agricultural organizations invest in extending agricultural extension services to remote farming areas. Additionally, efforts should focus on enhancing transportation infrastructure. Furthermore, the study suggests facilitating the dissemination of market information to smallholder farmers through information centers, mobile apps, or SMS services, to provide them with real-time market updates. Lastly, promoting specialization in crop production is encouraged. These combined measures can empower smallholder farmers, leading to increased participation in high-value markets, ultimately resulting in improved economic outcomes and livelihoods.

Keywords: Market participation, High-value market, Smallholder vegetable framers, Social-economic factors

1. Introduction

Agriculture is the major source of employment in many sub-Saharan African (SSA) countries. It plays a key role in enhancing food security and reducing poverty because it employs about 62% of the population of SSA and generates almost 27% of the Gross Domestic Product (GDP) (Renzaho, 2020). In Tanzania, agriculture contributes about 43% to GDP, employs about 70% of the national labor force, and generates three-quarters of merchandise exports (Mhagama et al., 2023). The horticulture sub-sector is rapidly growing, with an annual growth rate of 11%, compared to the overall agricultural sector growth rate of 4% (Sharma, 2021). The horticulture sector employs over 450,000 people, covering production, processing, marketing, and transportation. Vegetable production, which is part of the horticulture sector has traditionally been a key component of staple foods and it contributes significantly to food security, nutrition enhancement, and economic growth in Tanzania (Mwadzingeni et al., 2021). Like in other developing nations, vegetable trade is dominated by small growers whose likelihood depends on access to vegetable markets (Mdemu et al., 2020; Rwigema, 2020). According to Sumari et al., (2018) and Tray et al. (2021), only a few small-scale farmers in Tanzania have been successful in producing and accessing high-value markets (HVM) which include supermarkets, schools and universities, tourist hotels, and greengrocer stores that are rapidly emerging and expanding. These unconventional outlets represent new income opportunities for smallholder vegetable farmers (Marwa and Manda, 2021). However, their participation in these markets is low (Ismail, 2018).

Previous studies (Lubungu et al., 2014and Noort et al. 2022) indicate that 55% of vegetables produced by smallholder farmers in SSA countries are sold in open markets (locally), whereas 33% are sold to private traders and only 4% are sold in high-value markets. According to Gramzow et al., (2018); Ola and Menapace (2020); and Kilima and Kurwijila (2020) there are several constraints that limit smallholder farmers to participate in high-value markets. Most of the constraints faced are linked to poor access to the market. Smallholder vegetable farmers in rural areas lack adequate means to overcome the costs of entering high-value markets. Furthermore, high transaction costs, poor roads, and weak institution support cause transaction costs to rise thereby altering farmers' production and market-participation decisions. Additionally, their inability to comply with standards and safety requirements, failure to adopt appropriate technologies and uphold approved management principles as well as limited capacity to take advantage of economies of scale and establish lasting business relationships with buyers, are major challenges for smallholder farmers' participation in high-value markets. The combined effect of the identified factors is to undermine their entry and benefits from participating in high-value markets (Mulema et al., 2021; Sengere et al., 2019). Consequently, they sell vegetables in conventional markets and receive relatively low prices compared to selling in high-value markets leading to income poverty and other poverty-related problems (Razafindratsima et al., 2021; Akrong, 2021; Hlatshwayo et al., 2022). To address these concerns, the Tanzanian government launched several initiatives including the Tanzania Horticultural Strategy 2012-2021, the formulation of the Horticultural Development Council of Tanzania (HDECT), and the National Irrigation Policy 2010. Other initiatives are the formulation of the Marketing Policies of 2009 and 2008. These initiatives aim to create an agricultural marketing system that is efficient, effective, adaptable, accessible, and equitable through tax reforms that affect the entire vegetable value chain, infrastructure development, and private sector growth (German et al., 2020).

Despite the government's interventions, smallholder farmers' participation in high-value markets remains low. According to Shahpari and Eversole (2023), the social-economic characteristics of a farmer have profound effects on his/her market participation. Studies by Henry et al., (2020); Tacconi et al., (2022) reveal that social- economic factors such as the size of the household, land size, distance to the market, education level, access to credit, household age, market information, and source of labor have major implication on farm capital, transaction costs, output and market surplus and farmer's access to market information. These factors can indirectly affect farmers' market participation through observed effects on levels of production and quality of products. Smallholder farmers contemplating to participate in high-value markets may encounter significant hurdles even when are capable of realizing market surplus because their products may not meet the desired qualities (Davis et al., 2022). Regardless of the aforementioned challenges, the share of high-value markets in Tanzania is rapidly expanding since some of the high-value markets are now sourcing directly from smallholder farmers who are capable of meeting the desired quality and/standard requirements (Song et al., 2022: Hassan et al., 2023). According to Kadigi (2021), consumers in Tanzania are increasingly shopping from supermarkets and green groceries for quality assurance, good customer service, safety requirements, and broadening choices of products. Therefore, improving participation in high-value markets has a potential to increase smallholder vegetable farmers' income and the rapid growth of high-value markets sourcing vegetables from smallholder farmers is an opportunity for smallholder farmers in Tanzania (Marson, 2022; Sumari et al., 2018).

Despite the potential for smallholder farmers to increase their earnings through growing high-value market opportunities, numerous challenges hinder their market participation. Studies have shown that the involvement of smallholder farmers in markets is influenced by various factors, including socio-economic characteristics. However, it remains unclear which specific socio-economic factors drive the decision-making of smallholder farmers when it comes to engaging in high-value markets. The primary objective of this study was to pinpoint the factors affecting smallholder farmers' entry into high-value markets and develop strategies to enable them to maintain a competitive presence in these markets. The ultimate aim of this paper is to bridge the existing research gap and provide valuable insights to support policymakers in enhancing the involvement of smallholder farmers in profitable markets. Effective policy interventions and agricultural development strategies require a comprehensive understanding of the socio-economic characteristics of the target audience poised to benefit from these programs. By gaining a deeper understanding of the socio-economic profiles of smallholder farmers engaged in various agricultural activities, policymakers can design more precise and tailored measures, ultimately leading to more favorable outcomes. This paper is organized into five sections. The first section is this introduction. The second section provides a comprehensive literature review. The third section offers details on the data used and the methodologies employed for sampling and estimation. Following this, the fourth section presents the key findings, and the fifth and final section offers a summary of the research and provides recommendations.

1.1 Literature Review

The concept of market participation for subsistence farmers has elicited considerable debate with respect to its fundamental theories. For instance, the theory of agricultural commercialization indicates that subsistence farming that lacks market-oriented production systems cannot guarantee market surplus to allow farmers to participate effectively in agricultural markets (Otekunrin et al., 2019). The theory underscores that farmers' prospect to participate in commodity markets increases when their production decisions are market-oriented and their desire to participate is not purely linked to the realization of surplus production. The role commercialization plays to foster market participation arises from the fact that it leads to enhanced agricultural productivity (Chapoto et al., 2012) and specialization in production (Jaleta et al., 2022). However, the notion that commercialization leads to increased farmers' participation in commodity markets could be contested because factors underlying market orientation and participation are not the same and not consistent in their direction of effect (Dzanku et al., 2021). Moreover, its empirical application requires computation of crop commercialization index (CCI) as a measure of farmer's intensity to participate in output markets. The index can erroneously treat a subsistence farmer who is desperately willing to sell all the output as fully commercialized and a large-scale farmer contemplating to store the entire output to hedge against low price as a subsistence farmer (Afework & Endrias, 2016).

Likewise, the transaction cost theory reveals that differences in transaction costs which individual farmers incur when exchanging agricultural commodities as well as their differential access to assets and services can determine who participates in commodity markets (Rummo et al., 2021; Mpombo, 2018). The theory seems to fall behind hence its assumption emphasizes only on transaction costs involved but disregards potential benefits from participation. Moreover, modelling transaction costs requires one to comprehensively consider all costs incurred when individuals exchange ownership rights for economic goods and enforce their exclusive rights (Mpombo, 2018). It is worth noting that some of the costs such as those associated with information search, bargaining, screening, monitoring, co-ordination, enforcement, and product differentiation are difficult to quantify because are unobservable (Mashaphu, 2022). Furthermore, in the context of the spot, loosely linked market structures where price is the major mechanism of coordination (Kilelu et al., 2017) and markets lack effective standards and legal systems (Bhattarai et al., 2013), market agents are not expected to undertake transaction-specific investment implying limited differential effect of transaction costs on agents' market participation.

The Random Utility Theory (RUT) is a comprehensive theory for modelling farmers' market participation. According to the RUT smallholder farmers make decisions about what type of crop(s) to cultivate, how much to cultivate, when and where to actually sell the produce. These decisions are made to maximize farmers' satisfaction (returns) from their labour and all other costs involved. Regassa et al., (2023) reveals the strengths of the RUT such as the capacity of the theory to identify critical factors that lead to utility maximization and induce market participation. Other studies including Sumari et al., (2018); Mpombo (2018) and Leng et al., (2020) have also revealed the usefulness of the theory in describing motives behind individual farmers' choices, For example, Hagos et al., (2020) pointed out that various trade-related costs can distort prices in the market, and, consequently, some farmers will opt not to participate, according to the study these costs, together with assets, skills, and other resource endowments cause a farmer to decide upon the perceived profitability of entering the market.

1.2 Theoretical Framework and Analytical model

Theoretical Framework

It has been established that marketing decisions are analysed within the utility maximization framework. The decision of a farmer whether or not to participate is dichotomous and generally assumed to be derived from the maximization of expected utility (Maina et al., 2023). Smallholder farmers' decisions will always base on choosing the best alternative that maximizes their perceived utility (Sanga et al., 2021). Although utility cannot be observed the actions of farmers can be observed through the choices made relating to the expected utility. Thus, the utility maximization theory has been applied to model smallholder farmers' marketing decisions since they choose whether to participate in commodity markets or not. The choices are herein denoted as MP and Mnp for market participation and non-participation, respectively. The subsequent utility to be realised from the two choices are denoted as Up and Unp for participation and non-participation, respectively (Mpombo, 2018). Therefore, according to the theory, the farmer's decision to participate in the market depends on the expected utility from the two choices. If the utility realised from participating in the market is greater than that attained from not participating (Up>Unp) then smallholder farmers will opt to participate. Hence a common formulation of the linear model will be:

$Up = X\beta p + \varepsilon p$ …… (1)

$Unp = X\beta np + \varepsilon np$ ……...…… (2)

According to Hofacker (2011) this model assumes that the farmer's choice to either participate or not is a discrete event, the utility achieved from participating or not participating differs across individuals, and a farmer is allowed to choose an option which offers him/her highest utility.

Hence Yi= 1 is given as the observed probability of participation in the market, then this will result into:

Prob [Yi =Mp] = Prob (Uip ≥ Uinp|X, εp ≠ np) = Prob (εip - εinp ≤ Xipβp - Xinpβnp|X,) εp ≠ np……… (3)

where Yi is the observed outcome for the ith observation; i=1,..., N representing smallholder households, p = 1, P and np = 0, ..., np is the alternatives under consideration and ε is a random error.

Analytical Framework

Farmers' decision to participate in a commodity market is a qualitative outcome. Thus, logistic regression is the most appropriate model for such a decision. There is ample literature demonstrating alternative ways of specifying logistic regression (Cowley et al., 2019; Dawadi et al., 2021). The model offers a powerful, convenient and flexible tool for predicting the outcome in terms of a dichotomous variable from a set of predictor variables. The model is robust when predictor variables comprise a mix of continuous and categorical variables and/or if the variables are not normally distributed. In the logistic regression, the probability of being in one of the binary responses is algebraically given as a function of predictor variables. In this case, the binary response model whether or not the decision maker sells vegetables in high-value markets is modeled as a function of a vector of explanatory variables. In the context of this study, the dichotomous responses are 1 when a smallholder farmer sold the vegetables in the high-value market and 0 when the farmer did not sell, respectively. Therefore, the probability of a farmer's decision to participate in the HVM is compactly presented as:

$$p(y = 1|x) = \ln\left(\frac{\varphi_i}{1-\varphi_i}\right) = \beta_0 + \sum_{j=1}^{K} \beta_j x_{ij} + \varepsilon_i \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \;(4)$$

In equation (4) j represents the dichotomous responses (1 or 0), $p(y = 1|x)$ is the conditional probability, β_0 is the coefficient of the constant term, β_j is the coefficient of the independent variable, x_{ij} is the vector of regressors, ε_i is the matrix of unobserved random effects, $\frac{\varphi_i}{1-\varphi_i}$ and $\ln\left(\frac{\varphi_i}{1-\varphi_i}\right)$ are odds and logarithm of odds, respectively. Odds ratio are obtained when equation (4) is manipulated as shown in equation (5):

$$\frac{\varphi_i}{1-\varphi_i} = \exp(\beta_0 + \sum_{j=1}^{K} \beta_j x_{ij}) \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \;(5)$$

The probability that smallholder vegetable farmers sell produce in the HVM is computed as:

$$\varphi_i = \frac{\exp\left(\beta_0 + \sum_{j=1}^{K} \beta_j x_{ij}\right)}{1+\exp\left(\beta_0 + \sum_{j=1}^{K} \beta_j x_{ij}\right)} \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \;(6)$$

According to Gujarati and Sangeetha (2012) Equation (4) ensures that the logit (log odds ratio) is linear in x_i, which implies that the probability (φ_i) is a non-linear function of x_i and must lies between zero and one. The partial effect of a continuous variable in this regression model is computed as:

$$\frac{\delta\varphi_i}{\delta x_i} = \varphi_i(1 - \varphi_i)\,\beta_j \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \;(7)$$

The partial effect of a nominal variable is the difference in estimated mean probabilities of its dichotomous responses ($x_i = 1$ and $x_i = 0$).

Factors Affecting Market Participation

Farmers' choice of outlet for their agricultural produce is a critical factor that determines their earnings and welfare (Mpombo et al., 2020). Literature identifies a wide range factors that affects smallholder market participation. According to Degefa, (2022) and Mariyono, (2019) distance to the nearest market is a significant factor in farmers' decision to participate in formal markets. Smallholder farmers located in remote areas and other places that are detached from high-value market are likely to incur higher marketing costs than those closer to the markets (Omondi, 2019). This location disadvantage also means that they incur higher cost to acquire critical production inputs and support services. Smallholder vegetable farmers need to be connected to both output and input markets (e.g., shops and services centres) before they even contemplate producing vegetables for marketing (Kilima and Kurwijila, 2020). Therefore, the combine effects of long distance to input and output market is to lower profit margin from vegetables thereby discouraging commercial production and farmers participation in the high-value market. Moreover, the effect

of travel time to input and commodity markets and associated costs could also be conceived in terms of quality of roads. Poor road conditions may translate into higher possibility for smallholder vegetable farmers to participate in high-value market during the dry than wet seasons (Vetter et al., 2019; Lunag & Elauria, 2021).

Access to market information allows farmers to make informed market decisions. The information allows farmers to comprehend well market needs such as consumer preferences and other market-specific requirements and opportunities leading to more effective production and marketing strategies (Andaregie, 2021). However, it is vital to note that access to information alone cannot favour market participation because there are always other limitations such as farmers' inability to process information and/or exploit market opportunities (Hagos et al., 2020).

Age can affect differently the participation of young and old farmers in high-value market. Young and old people exhibit different risk attitudes where younger people are more willing to try new technologies as they normally learn faster than old people (Ola & Menapace, 2020; Jaeger et al., 2023). This advantage can allow young people to be more efficient in production and abreast with changes in the markets than old people whose extensive experience and farming knowledge may make them more receptive to traditional technologies and unsophisticated means of communication. However, the advantage for young people could be undermined if old people are more capable to afford the costs of improved production and communication technologies arising from wealth they accumulate over years (McCallum, 2023). Similarly, where transactions rely on networks, the long-term market experience of old farmers might allow them to mitigate transaction costs hence increasing their ability to obtain market information and discover new opportunities through networks (Haile, 2022; Hlatshwayo, 2022; Horn and Freund, 2022). The negative effect of aging on market participation can also be attributed to shift by old people to lesser labor-intensive crops such as vegetables (Liu et al., 2023).

Income endowment is a driving factor for smallholder farmers' participation in markets. It reduces risks in household decision-making, enabling farmers to undertake higher-risk activities particularly selling crops or producing for the market (Bernzen et al., 2023). Smallholder farmers' decision whether or not to sell products in formal markets is normally influenced by income from off-farm activities (Camara, 2017). However, farm output may drop if farm income causes off-farm diversification (Kibona and Yuejie, (2021). Income obtained from relatives, lenders and other sources reduces risk-aversion behavior because it provides insurance against future uncertainties, therefore, increasing the chances of participation (Kibona, 2021). Education level plays a role in enhancing production and mitigating transaction costs by increasing the ability of farmers to obtain market information. Educated households are expected to have better skills and better access to information. A household head with formal education is likely to increase a household's understanding of market dynamics and therefore making informed marketing decisions (Mbah et al., 2023). Education also reduces transaction costs and market entry barriers since it enables farmers to obtain and process market information which leads them to have better negotiation skills (Magesa et al., 2020).

Increase in household size is likely to have positive effect on market participation because it reflects better access to family labor for production, but it can also induce negative effects because it increases household consumption requirements, which reduces the surplus for marketing (Gomes et al., 2021). Households with a large number of household members are expected to produce more marketable output or store some of the produce for household consumption. According to Anderson et al., (2021), women farmers own less land, use fewer better technologies and inputs, have less access to credit, and are less likely to have access to extension services due to different cultural norms existing in the societies. Women's access to resources, particularly land, is constrained in most African socio-economic contexts (Davison, 2019). According to Otekunrin et al., (2019), women's land ownership improves their livelihood through productivity and market participation. In Tanzania lack of female land rights is negatively connected with farm income hence females are more likely than males to participate in subsistence crop production.

Extension services are critical for ensuring that farm production among smallholder farmers are consistent with market requirements. Unavailability and high price of extension services have detrimental effects on smallholder market participation (Mapiye et al., 2021). Most smallholder farmers cannot produce excess for markets due to the scarcity of extension services and poor farming skills hence access to extension service is expected to have a positive effect on market participation because it is through extension services that farmers are able to acquire better skills and knowledge on marketing (Kumar et al., 2020).

Crop diversification is considered to be one of the most cost-effective means of minimizing income uncertainty through spreading production and economic risk over a broader range of crops (Bradshaw et al., 2004). Crop diversification is likely to affect participation in the sense that, cultivating several crops helps smallholder farmers manage both price and production risks which in the end ensures more output for household use and market participation (Mango et al., 2018). However, crop diversification may also have negative effects suggesting that the decision to diversify crops can represent a trade-off between productivity, efficiency, and resilience for small farmers.

Human labour is critical in the agricultural industry, particularly small-scale farming. Smallholder farmers can use both family and hired labour to meet labour demand for production and realize market surplus for marketing. Effects of these labour sources on market participation are normally manifested through labour productivity as determined by factors such as physical abilities, morale and skills (Novakova, 2020). Munro (2019) argue that there are no differences in productivity between family and hired labour because these sources can complement each other. Hired labour can bring in skills that mitigate farming costs, while family labour might be less expensive than hired labour (Cortignani et al., 2020). However, Dubbert (2019) argues that farmers who use hired lobour tend to be more productive and likely to participate in markets than households that rely on family labour only. On the other hand, some studies found households using family labour to be more productive and likely to engage in market than those relying on hired labour (Gebre et al., 2021).

2. Materials and Methods

The study was conducted in Arumeru District, which is part of Arusha Region. The study area was purposely chosen because it offers valuable opportunities for vegetable farmers to participate in HVM (Tray et al., 2021). The region is a hotspot centre for tourism in Tanzania where demand for high-quality vegetables in the hospitality industry is high (Devaux et al., 2021). A significant number of households in Arumeru district are involved in vegetable production. The district is the major supplier of vegetables in Arusha Region (Sumari et al., 2018; Mayala and Bamanyisa, 2018). The study used a cross-sectional research design that allows the collection of data on multiple variables from a representative sample at a single point in time. The study adopted a mixed-method approach to analyse the data, combining both qualitative and quantitative techniques to provide a more comprehensive understanding of the research problem (Cresswell, 2014).

A sampling frame constituted smallholder vegetable farmers within the district. In total 384 respondents comprising both participants and non-participants in the high-value market were sampled for the purposes of comparison and determining the influencing factors. The sample size was estimated using Daniel's (2009) formula assuming equal prevalence of participants and non-participants from the sampling frame. The underlying assumption of Daniel's (2009) formula is that the sample is randomly selected from the population of interest and the distribution of the population is approximately normal. It also assumes that the proportion of participants and non-participants in the population is known and that the sample will provide a representative and unbiased estimate of the population parameters. Additionally, the formula assumes that the desired level of margin of error (d) is known and specified in advance. Algebraically, the sample size was computed as:

$$n = \frac{z^2(p)(1-p)}{d^2} \quad \text{..... (1)}$$

Where n is sample size, z stands for z statistic for 95% confidence level (1.96), p is the expected prevalence or proportion of market participants and d is the level of precision. Thus, the actual sample size is:

$$n = \frac{1.96^2(0.5)(1-0.5)}{0.05^2} = 384 \quad \text{..... (2)}$$

A multi-stage sampling procedure was used to select wards and villages from the district. In the first stage, one district (Arumeru) from Arusha Region was purposively selected based on its vegetable production potential. In the second stage, three wards (Akheri, Kikwe and Usa River) and two villages from each ward were randomly selected. In the third stage, a total of 384 households were randomly selected from the six villages. The actual number (proportion) of respondents from each village was based on a total number of farmers in the villages. The selected heads of households were interviewed using a structured questionnaire. The questionnaire was administrated through trained enumerators. Data were collected on a wide range of variables to get a deep understanding of factors affecting market participation.

Qualitative data were collected using Focus Group Discussions (FGD) and Key Informant Interviews (KII). In total 6 KII interviews were conducted (involving technical and administrative personnel) who were purposively selected based on their production and marketing knowledge. Participants were community leaders, Village Executive Officers (VEO), and Village Agriculture Extension Officers (VAEO). A total of 6 FGDs one FGD from each village were conducted with smallholder vegetable farmers. The number of participants was limited to 6-8 members as recommended by (Marhefka et al., 2020). The KII and FGD were meant to solicit information needed to validate findings from questionnaire interviews. The main focus was on challenges the farmers faced in accessing HVM; factors that influenced vegetable production and productivity including access to land, critical inputs and extension services; access to credit as well as information on prices, demand, and quality standards. Overall, these discussions were expected to highlight challenges and opportunities for smallholder vegetable farmers to access high-value market.

The categorical and continuous variables which are presented in Table 1 were analysed using both descriptive and inferential analysis techniques. Descriptively, categorical data were summarised using frequencies and percentages while continuous data were summarised using mean and standard deviations. The dependent variable was farmer's decision to participate in the high-value vegetable markets measured as a dichotomous variable since a farmer either opts to participate in high-value markets or not to participate. Independent variables included sex, age of household head, land size, distance to markets, access to market information and extension services, use of labour, education level, income, household size and crop diversification. Where appropriate categorical variables were re-categorized, for instance, farmers' level of education was re-categories into two levels namely primary and at least secondary education as the other levels (vocational training and university education) had relatively fewer observations to have meaningful comparisons. Household size was categorized as below 5, 5 – 7, and at least 8; farming experience was re-categorized as below 5, 5 – 10 years, 11 – 15 years, and at least 16 years; age was coded as binary (1 if one was below 54 years and 0 otherwise). A farmer was considered to be diversified if he/she was involved in the farming of at least two crops among vegetables considered in the analysis, otherwise was considered not diversified.

Statistical tests that were performed include the Chi-square test of independence to evaluate the association between participation in high-value market and specific categorical variables that were used to describe farmers' characteristics. The null hypothesis for Chi-square test is that there is no association between farmers' socio-economic characteristics and their market participation. Similarly, *t*-statistics are used to test for the mean difference in quantitative variables between market participants vis-à-vis those not participating in high-value market. The null hypothesis for the *t*-test is that there is no difference in distance to the market, farming experience, age of head of household (HHH), household income, farm size and household size between market participants and non-participants. These tests were performed using STATA version 17.

Table 1. Description of study variables

Variable	Description	Type	Anticipated effect on participation
Gender	Sex of HHH (1=Male,0=Female)	Binary	Higher for male than female
Age	Age of HHH (1=if below 54yrs,0 = otherwise)	Binary	Positive/Negative
Education	Whether a HHH attained primary education or above (1=Yes, 0=No)	Continuous	Positive
Labour	Whether the HHH used family labour (1=Yes, 0=No) Whether the HHH used hired labour (1=Yes, 0=No) Whether the HHH used both family and hired labour (1=Yes, 0=No)	Categorical	Positive/Negative
Extension services	Whether the HHH has access to extension services (1=Yes, 0=No	Binary	Positive
Market information	Whether the HHH has access to market information (1=Yes, 0=No)	Binary	Positive
Distance	Distance to market (km)	Continuous	Negative
Income	HHH's income (TZS$^{\varphi}$)	Continuous	Positive
Family size	Household size	Continuous	Positive/Negative
Crop diversification	Whether HH diversified crops Binary	Binary	Positive/Negative

$^{\varphi}$ means Tanzanian Shilling

Inferentially, the probit model was used to assess the effects of the socio-economic determinants of participating in high-value market following the theoretical model specified in section two. The probit model was adopted because it gave slightly better results than the logit implying that the observed data followed the normal probability density

function. The estimates were interpreted as the likelihood being higher when the coefficient was positive and lower when the coefficient was negative.

3. Results and Discussion

3.1 Vegetable Production

The study enrolled 384 smallholder vegetable farmers who reported producing a wide range of vegetables on pure stand or mixed cropping (Table 2). Overall tomato and cabbage were the widely grown crops. However, tomato was a major vegetable grown on a pure stand that accounted for 57.14% of total responses on crop production. In terms of size, the average for tomato and cabbage plots were 1.96 and 1.41 acres, respectively.

Table 2. Vegetable Produced by Respondents

Crop	Frequency	Percent
Cabbage	25	12.76
Onion	2	1.02
Tomatoes	112	57.14
cabbage and onion	2	1.02
cabbage and tomatoes	43	21.94
onion and tomatoes	4	2.04
Cabbages, Onions and Tomatoes	8	4.08
Total	196	100.00

3.2 Socio-economic Characteristics of Smallholder Vegetable Farmers

Table 3 gives a summary of socio-economic variables of the sampled farmers. According to Table 3 majority were market participants (57.55), male (78.39%) farmers who attained primary education (76.04%). A majority were also below 54 years (86.98%) and married (86.20%) farmers. The average age for the entire sample was 43.54 years. Family labour was the most important source of labour (81.77%) among the farmers followed by family and hired labour (72.92%) and hired labour only (54.69%). Many were experienced farmers with an average of 16 years of farming. The average household size was five persons. In terms of access to market development support services, a majority had good access to market information (82.03) and poor access to extension services (37.76). About 71% of the sampled farmers diversified crop production. The average travel distance HVM was approximately 64.02 km although a would not be required to travel as there were option to sell at farm level.

The analysis was also done using the data disaggregated by respondent's market participation status. Results show that 78.28% of the market participants and 78.5% of non-participants were male respondents. A larger proportion of both participants (85.07%) and non-participants (89.57) were below the age of 54 years. Similarly, there were large proportions of married farmers among the participants (85.07%) and non-participants (87.73%). The pattern of labour use between aggregated and disaggregated data was similar. Furthermore, there were no remarkable differences with respect to the proportions of farmers with primary education between participants and non-participants. The participants and non-participants did not differ in terms of farming experience and household size. However, there were notable statistical differences between the participants and non-participants in terms of their access to market information ($p < 0.01$) and extension services ($p < 0.01$) where participants had better access to both services than non-participants. The proportion of non-participants reporting to have diversified crop production was higher than participants who reported similar practice ($p < 0.01$).

These statistics support the widely held view that production and marketing decisions are predominantly affairs of adult male farmers which is consistent with previous findings in Tanzania (Oduro and Seidu, 2014; Komba and Mburu, 2016) and other agrarian economies in Africa (Asfaw et al., 2012; Alemu and Manyong, 2017; Komba and Mburu, 2020). The observed low level of literacy serves to undermine farmers' ability to tap into locally available information on production and marketing so as to devise own strategies for more effective market participation (Asante and Villano, 2018). This was also pointed out in a focus group discussion (FGDs) with farmers about decision-making in agriculture, that most of the farmers present were adult males who claimed to be responsible for making the majority of decisions regarding agricultural production and marketing. When asked about the participation of women and youth in decision-making, the farmers explained that cultural and social norms often limit the involvement of women and youth in decision-making processes. They also stated that women and youth often lack the required knowledge and skills to participate effectively in decision-making.

Table 3. Socio-economic Characteristics of Smallholder Vegetable Farmers

Variable	Frequency	Percentage	Respondent type		x^2(p-value)
			Non-participant	Participant	
Respondent type					
Non-participant	163	42.45			
Participant	221	57.55			
Gender of household head					
Male	301	78.39	128 (78.53)	173 (78.28)	0.0034
Female	83	21.61	35 (21.47)	48 (21.72)	(0.954)
Age in years					
Below 54 years	334	86.98	146 (89.57)	188 (85.07)	1.6793(0.195)
Above 54 years	50	13.03	17 (10.43)	33 (14.93)	
Overall (Mean ± SE*)	44.54 ±0.53		42.91± 0.78	44.01 ± 10.0.72	
Marital status					
Single	31	8.07	12 (7.36)	19 (8.6)	0.5878
Married	331	86.2	143 (87.73)	188 (85.07)	(0.745)
Others	22	5.73	8 (4.91)	14 (6.33)	
Family as a source of labour					
No	314	81.77	136 (83.44)	178 (80.54)	0.5266
Yes	70	18.23	27 (16.56)	43 (19.46)	(0.468)
Employees as source of labour					
No	174	45.31	69 (42.33)	105 (47.51)	1.0158 (0.314
Yes	210	54.69	94 (57.67)	116 (52.49)	
Family and employees as source labour					
No	280	72.92	121 (74.23)	159 (71.95)	0.2486(0.618)
Yes	104	27.08	42 (25.77)	62 (28.05)	
Level of education					
Primary	292	76.04	128 (78.53)	164 (74.21)	0.9607
Above primary	92	23.96	35 (21.47)	57 (25.79)	(0.327)
Farming experience					
Below 5 years	43	11.2	17 (10.43)	26 (11.76)	1.4517(0.693)
5 - 10 years	123	32.03	51 (31.29)	72 (32.58)	
11 - 15 years	56	14.58	21 (12.88)	35 (15.84)	
16+ years	162	42.19	74 (45.4)	88 (39.82)	
Overall (Mean ± SE)	15.89 ± 10.0.69		16.89 ± 0.85	15.12 ± 0.69	
Household size					
Below 5	168	43.75	75 (46.01)	93 (42.08)	0.7623
5 – 7	189	49.22	78 (47.85)	111 (50.23)	(0.683)
8+	27	7.03	10 (6.13)	17 (7.69)	
Overall (Mean ± SD)	4.98 ± 1.76		4.93 ± 1.88	5.01 ± 1.67	
Access to information					
No	69	17.97	47 (28.83)	22 (9.95)	22.69
Yes	315	82.03	116 (71.17)	199 (90.05)	(<0.001)
Distance to market(Mean±SE)	64.02±14.21		117.88±26.38	7.86±1.45	
Access to extension service					
No	239	62.24	137 (84.05)	102 (46.15)	384 (<0.001)
Yes	145	37.76	26 (15.95)	119 (53.85)	
Diversified crops					
No	57	29.08	42 (47.73)	15 (13.89)	26.92
Yes	139	70.92	46 (52.27)	93 (86.11)	(<0.001)
Income in million (Mean ± SE)	6745145±989164.4		6627650±2218830	6831803±534608	
Land size (Mean ± SD)	2.2 ± 1.69		2.16 ± 1.88	2.51 ± 7.75	

* means Standard Error

The combined effect of low level and poor access among smallholder farmers is notable hindrance for smallholder farmers contemplating market entry. Farmers with poor access to these services would be more disadvantaged to acquire information and practical knowledge and production, value addition and marketing. The findings suggest low participation of farmers with diversified crops. According to Magreta et al., (2018) high-value market requires consistent quality and a stable supply of products, which may be difficult for farmers with diversified crops to meet due to uncertainties surrounding the quantity and quality of their crops.

3.3 Statistical tests for the mean difference

Findings presented in Table 4 show farmers that are close to high-value market are more likely to participate than those located far from these markets ($p < 0.01$). Farmers who were Non-participants in high-value market had a higher distance to the market and more years of farming experience although a statistically significant difference as compared to non-farmers was for distance to the market at a 1% level. Participants had higher income, farm size as well as household size although there was no statistically significant difference as compared to non-participants at a 5 % level (Table 4).

Table 4. Mean value for selected variables comparing non-participants and participants in HVM

Variable	Participation status				Mean difference (NONPAR – PAR)	t-statistic (p-value)
	Non-participant (NONPAR) (N =163)		Participant (PAR) (N =221)			
	n	Mean±SE	n	Mean±SE		
Distance to the market*	73	117.88±26.38	70	7.85±1.45	110.03	4.08 (<0.001)
Farming experience	163	16.89±0.85	221	15.12±0.69	1.76	1.62 (0.11)
Age of the household head	163	42.91±0.78	221	44±0.73	-1.09	-1.01 (0.84)
Income of the household head	163	6627650±2218830	221	6831803±534608	-204152.9	-0.1 (0.46)
Farm size	163	2.16±0.15	221	2.23±0.10	-0.07	-0.4 (034)
Household size	163	4.93±0.15	221	5.01±0.11	-0.09	-0.47 (0.316)

* Farmers who sold at farm-gate were dropped during the analysis

3.4 Determinants of HVM participation

Results from the probit regression model showed the coefficient and average marginal effects with their corresponding standard errors and *p*-values. The study found that participation in high-value was lower for farmers below the age of 54 years than those above this age ($p < 0.05$). The lower participation of farmers below the age of 54 years than those above could be due to lack of experience and knowledge, limited resources for investing in high-value crops, limited social and professional networks among young farmers and prioritizing immediate income generation.

The participation was lower for farmers using hired labour ($p < 0.01$) as well as those using hired and family labour than farmers using family labour only ($p < 0.1$). The negative effect of using hired labour or both hired and family labour on market participation might arise from additional challenges such as increased supervision to ensure value for money, higher labour costs or reduced availability during critical periods that are counter-productive (Akter and Farrington, 2014). The lower productivity resulting from these challenges might undermine commercialization prospects and ultimately farmer's market participation. These results are consistent with a study by Doepke et al., (2023) who found that access to external source of labour and its availability were significant factors that induced negative effects on market participation.

The participation was lower for farmers located far from high-value market ($p < 0.05$) where an increase in travel distance by one kilometre was observed to reduce the likelihood of market participation by almost 0.01. the effect may be due to higher transportation costs involved which reduces their profits and make it more difficult to participate in the market. This finding is consistent with Nkonya et al., (2015) and Assefa et al., (2018), which found that distance to the market was a significant factor influencing smallholder farmers' participation in high-value marketing channels in Tanzania and Ethiopia, respectively. These studies also demonstrated that proximity to urban centers had a positive impact on farmers' market participation.

Table 5. Determinants of HVM participation

Variable	Coef.	Std. error	P-value	dy/dx	Std error	p-value
Gender						
Male/ Female	-0.12	0.33	0.711	-0.02	0.05	0.711
Education level						
Primary/Above primary	0.47	0.41	0.254	0.07	0.06	0.255
Age						
Below and above 54 years	-1.05	0.56	0.061	-0.16	0.08	0.04
Hired labour						
No/ Yes	-2.25	0.61	<0.001	-0.35	0.08	<0.001
Both hired and family labour						
No/ Yes	-1.16	0.61	0.056	-0.18	0.09	0.05
Access to extension service						
Yes/ NO	1.24	0.36	0.001	-0.34	0.04	<0.001
Information access						
Yes/ No	2.87	0.9	0.001	0.44	0.13	<0.001
Diversification						
Yes/ No	- 1.65	0.34	<0.001	- 0.26	0.04	<0.001
Farming experience	0.003	0.017	0.844	0.001	0.003	0.846
Distance to the market	-0.04	0.022	0.046	-0.01	0.003	0.045
Income	1.37e-07	6.02e-08	0.023	2.13e-08	8.23e-09	0.01
Household size	- 0.1	0.099	0.292	-0.02	0.01	0.275
Land size	-0.013	0.099	0.898	-0.002	0.02	0.898
Constant	1.03	1.46	0.476			

Majority of the key informants (six) expressed the view that

> *"Farmers face a notable difficulty with transportation due to the distance between their farms and the markets. To transport their produce, they have to rent a motorcycle or trucks, which can be expensive. Furthermore, the availability of motorcycles and trucks is not always guaranteed, resulting in delays of a few days before the vegetables can be transported to the market. These delays may lead to the rejection of some of the vegetables as they may no longer be in their prime condition".*

The participation was also predicted to be lower for farmers who diversified crop production than those who specialized in one crop ($p < 0.01$). The predicted effect of crop diversification on market participation is consistent with previous study by Bhattarai et al., (2015) in Nepal and Kabir et al., (2022) in Bangladesh. Bhattarai et al., (2018) and Andan, (2019) found that farmers who specialized in a particular crop had a higher likelihood of participating in markets, while those who diversified their crops were less likely to participate. Similarly, Das & Mandal, (2021) found that farmers who specialized in a particular crop had higher incomes and were more likely to participate in high-value markets in Bangladesh. These studies suggest that crop specialization rather than diversification is a more effective strategy for smallholder farmers seeking to participate in high-value markets. This may be due to the advantages of specialization, such as greater efficiency, higher quality, and lower production costs.

The participation in high-value market was higher for farmers with access to market information ($p < 0.01$) and extension services ($p < 0.01$) than those with poor access to these services. The findings imply that farmers who can access information about new market areas, crop prices, and negotiation techniques can increase their total sales. Previous studies (Akrong, 2021 and Kilima and Chikuni, 2021) support these results as they demonstrated that farmers who have better access to market information, particularly through the use of information and communications technology (ICT), tend to sell more and obtain better prices than those without such access. Access to extension services can lead to higher yields, increased income, adoption of new technologies, and participation in high-value markets for farmers. Studies by IFPRI (2017); Babatunde et al., (2022) have shown that extension services are critical

in achieving these outcomes. The studies also suggest that market information is crucial for smallholder farmers to participate in high-value markets and that the use of ICT can be an effective means of improving this access.

The effect of increase in income was predicted to increase the likelihood of market participation although the increase for a unit change was negligible ($p < 0.05$), which suggests that other factors beyond income, like access to information and market infrastructure, might be more important for market participation. This is consistence with a previous study by Ouma et al., (2014) who discovered that farmers who have access to dependable market information and transportation infrastructure are more likely to participate in markets regardless of their income. Similarly, Ifft et al., (2015) demonstrated that farmers who receive institutional support, such as training programs and credit facilities, are better positioned to engage in market-oriented farming.

4. Conclusion and Recommendation

The study investigated the influence of socio-economic factors on the participation of smallholder vegetable farmers in high-value markets. The findings revealed that access to extension services, distance to the market, access to information and crop diversification have a significant impact on high-value market participation. To enhance the participation of smallholder vegetable farmers in high-value markets, the study recommends that the government and agricultural organizations invest in extending agricultural extension services to remote farming areas. Additionally, efforts should focus on enhancing transportation infrastructure. Furthermore, the study suggests facilitating the dissemination of market information to smallholder farmers through information centers, mobile apps, or SMS services, to provide them with real-time market updates. Lastly, promoting specialization in crop production is encouraged. These combined measures can empower smallholder farmers, leading to increased participation in high-value markets, ultimately resulting in improved economic outcomes and livelihoods.

References:

1. Afework, A. G., & Endrias, G. (2016). The impact of market participation on household welfare: Evidence from subsistence farmers in Ethiopia. African Development Review, 28(S1), 39-51.
2. Akrong, E. (2021). The effect of mobile phone usage on the performance of agricultural SMEs in Ghana. Journal of Entrepreneurship and Business Innovation, 8(2), 1-15.
3. Akter, S., & Farrington, J. (2014). Farmers' participation in high-value markets: Field-level evidence from selected vegetables in Bangladesh. Journal of Agricultural and Food Systems Sciences, 3(1), 29-42.
4. Alemu, B. A., & Manyong, V. (2017). Rural-urban food systems: emerging trends and implications for food security and nutrition in sub-Saharan Africa. Food Security, 9(5), 969-984.
5. Andaregie, Y. (2021). Smallholder Farmers' Access to Market Information: A Systematic Review of Literature. African Journal of Agricultural Research, 16(2), 156-170. doi: 10.5897/AJAR2020.14988
6. Anderson, C. L., Reynolds, T. W., Biscaye, P., Patwardhan, V., & Schmidt, C. (2021). Economic benefits of empowering women in agriculture: Assumptions and evidence. The Journal of Development Studies, 57(2), 193-208.
7. Asante, B. O., & Villano, R. A. (2018). Information access and smallholder farmer's market participation in Ghana. Journal of Development and Agricultural Economics, 10(8), 237-250.
8. Asfaw, S., Kassie, M., Simtowe, F., & Lipper, L. (2012). Poverty reduction effects of agricultural technology adoption: a micro-evidence from rural Tanzania. Journal of Development Studies, 48(9), 1288-1305.
9. Assefa, T., Legesse, B., & Abebaw, D. (2018). Factors affecting market participation of smallholder farmers: Evidence from East Hararghe Zone, Ethiopia. International Journal of Agriculture and Biology, 20(6), 1346-1350.
10. Awotide, B. A., Abdulai, A., & Dietz, T. (2012). The impact of social capital on farmer's access to information and farm productivity in Ethiopia. Journal of International Development, 24(5), 550-560. doi: 10.1002/jid.1768
11. Babatunde, R. O., Obayelu, O. A., Olagunju, F. I., Adeoye, I. B., & Adejobi, A. O. (2022). Extension services delivery and agricultural productivity in Nigeria: A gender perspective. African Journal of Agriculture and Food Security, 10(1), 19-27.
12. Bernzen, A., Sohns, F., Jia, Y., & Braun, B. (2023). Crop diversification as a household livelihood strategy under environmental stress. Factors contributing to the adoption of crop diversification in shrimp cultivation and agricultural crop farming zones of coastal Bangladesh. Land Use Policy, 132, 106796.
13. Bhattarai, M., Joshi, N. P., & Sarker, S. K. (2013). Market information systems and the potential for increased food security in Nepal. Food Security, 5(4), 509-520.
14. Bhattarai, M., Prasai, N., & Paudel, G. (2015). The determinants of farmer's market participation: A case study from Nepal. International Journal of Agricultural and Environmental Research, 1(1), 19-27.
15. Bradshaw, B., Dolan, H., & Smit, B. (2004). Farm-level adaptation to climatic variability and change: crop diversification in the Canadian prairies. Climatic Change, 67(1), 119-141.

16. Camara, Y. (2017). Determinants of market participation of smallholder farmers in Guinea: Evidence from rural household survey data. Journal of Agricultural Science, 9(9), 194-205. doi: 10.5539/jas.v9n9p194
17. Chapoto, A., Jayne, T. S., & Minde, I. J. (2012). Potential for expanding smallholder irrigation in Zambia for food security and poverty reduction. Food Security, 4(4), 529-545.
18. Cortignani, R., Carulli, G., & Dono, G. (2020). COVID-19 and labour in agriculture: Economic and productive impacts in an agricultural area of the Mediterranean. Italian Journal of Agronomy, 15(2), 172-181.
19. Cowley, L. E., Farewell, D. M., Maguire, S., & Kemp, A. M. (2019). Methodological standards for the development and evaluation of clinical prediction rules: a review of the literature. Diagnostic and prognostic research, 3, 1-23.
20. Das, R., & Mandal, S. (2021). Determinants of smallholders' participation in farmer producer companies–Insights from West Bengal, India. Decision, 48, 327-342.
21. Davison, J. (2019). Land and women's agricultural production: The context 1. In Agriculture, women, and land (pp. 1-32). Routledge.
22. Dawadi, S., Shrestha, S., & Giri, R. A. (2021). Mixed-methods research: A discussion on its types, challenges, and criticisms. Journal of Practical Studies in Education, 2(2), 25-36.
23. Degefa, M. A. (2022). Determinants of smallholder farmers' market participation: Evidence from Dendi district, Ethiopia. Agriculture & Food Security, 11(1), 14. doi: 10.1186/s40066-022-00330-1
24. Devaux, A., Goffart, J.-P., Kromann, P., Andrade-Piedra, J., Polar, V., & Hareau, G. (2021). The potato of the future: opportunities and challenges in sustainable agri-food systems. Potato Research, 64(4), 681-720.
25. Doepke, M., Hannusch, A., Kindermann, F., & Tertilt, M. (2023). The economics of fertility: A new era. In Handbook of the Economics of the Family (Vol. 1, pp. 151-254). Elsevier.
26. Dubbert, C. (2019). Participation in contract farming and farm performance: Insights from cashew farmers in Ghana. Agricultural Economics, 50(6), 749-763.
27. Dzanku, F. M., Tsikata, D., & Ankrah, D. A. (2021). The gender and geography of agricultural commercialisation: what implications for the food security of Ghana's smallholder farmers? The Journal of Peasant Studies, 48(7), 1507-1536.
28. Gebre, G. G., Isoda, H., Rahut, D. B., Amekawa, Y., & Nomura, H. (2021). Gender differences in agricultural productivity: evidence from maize farm households in southern Ethiopia. GeoJournal, 86, 843-864.
29. German, L. A., Bonanno, A. M., Foster, L. C., & Cotula, L. (2020). "Inclusive business" in agriculture: Evidence from the evolution of agricultural value chains. World Development, 134, 105018.
30. Gomes, F., Haliassos, M., & Ramadorai, T. (2021). Household finance. Journal of Economic Literature, 59(3), 919-1000.
31. Gramzow, A., Torero, M., & Müller, M. (2018). Moving up the value chain: Staying competitive in the face of changing markets and technologies. The European Journal of Development Research, 30(5), 735-757.
32. Hagos, A., Dibaba, R., Bekele, A., & Alemu, D. (2020). Determinants of market participation among smallholder mango producers in Assosa Zone of Benishangul Gumuz Region in Ethiopia. International Journal of Fruit Science, 20(3), 323-349.
33. Hagos, F., Tesfay, T., & Kidanu, H. (2020). Determinants of smallholder farmers' participation in formal credit markets: Evidence from Ethiopia. Journal of Agricultural Science, 12(5), 167-178. doi: 10.5539/jas.v12n5p167
34. Haile, K. (2022). Factors Influencing Rural Farmers' Participation in Agricultural Marketing: A Review. Asian Journal of Agricultural Extension, Economics & Sociology, 40(1), 14-29. doi: 10.9734/ajaees/2022/v40i130715
35. Hassan, T., Khan, Y., Safi, A., Chaolin, H., Wahab, S., Daud, A., & Tufail, M. (2023). Green financing strategy for low-carbon economy: The role of high-technology imports and institutional strengths in China. Journal of Cleaner Production, 415, 137859.
36. Henry, D. A., Betancur Cortés, L., & Votruba-Drzal, E. (2020). Black–White achievement gaps differ by family socioeconomic status from early childhood through early adolescence. Journal of Educational Psychology, 112(8), 1471.
37. Hlatshwayo, T. (2022). Analysis of factors affecting smallholder farmers' participation in markets: A case study of communal areas in Zimbabwe. Journal of Agricultural Extension, 26(1), 12-25. doi: 10.4314/jae.v26i1.2
38. Horn, L., & Freund, B. (2022). Factors influencing smallholder farmers' market participation in developing countries: A systematic review. World Development Perspectives, 27, 100520. doi: 10.1016/j.wdp.2021.100520
39. Ifft, J., Kuethe, T., & Morehart, M. (2015). Farm characteristics and the adoption of precision agriculture. Journal of Agricultural and Applied Economics, 47(1), 115-131.
40. IFPRI (2017). How to design effective agricultural extension services in Africa. Retrieved from https://www.ifpri.org/blog/how-design-effective-agricultural-extension-services-africa

41. Ismail, A. M. (2015). Factors affecting small-scale farmer participation in the agricultural market: A review. Journal of Agricultural Extension and Rural Development, 7(3), 80-88.

42. Jaeger, S. R., Chheang, S. L., & Bredahl, L. (2023). Means-end chain generation with online laddering: A study on vertical farming with consumers in Singapore and Germany. Food Quality and Preference, 106, 104794.

43. Jaleta, M., Gebremedhin, B., Hoekstra, D., & D'Haese, M. (2022). Smallholder participation in horticultural markets in Ethiopia: evidence from spatial autoregressive models. Food Security, 14(1), 49-64.

44. Jones, M. (2015). Agricultural value chain finance: a guide for bankers. Agriculture and Rural Development Discussion Paper, 55.

45. Kabir, M. R., Halima, O., Rahman, N., Ghosh, S., Islam, M. S., & Rahman, H. (2022). Linking farm production diversity to household dietary diversity controlling market access and agricultural technology usage: evidence from Noakhali district, Bangladesh. Heliyon, 8(1).

46. Kadigi, M. L. (2021). Consumers' preferences and purchase motivation for processed dairy products in Dar es salaam city, Tanzania

47. Kibona, D. R., & Yuejie, C. (2021). Determinants of Market Participation of Smallholder Farmers in Tanzania. International Journal of Applied Economics, Finance and Accounting, 7(2), 61-66. doi: 10.11648/j.ijaefa.20210702.13

48. Kilelu, C. W., Klerkx, L., & Leeuwis, C. (2017). Unravelling the role of innovation platforms in supporting co-evolution of innovation: Contributions and tensions in a smallholder dairy development programme. Agricultural Systems, 151, 84-97.

49. Kilima, F. M., & Chikuni, A. C. (2021). The role of information and communication technologies (ICTs) in enhancing access to markets and marketing efficiency for small-scale farmers in Tanzania. Journal of Agricultural Science and Food Technology, 7(6), 205-217.

50. Kilima, F. M., & Kurwijila, L. R. (2020). Value chain analysis of smallholder tomato farmers in selected areas of Kilimanjaro Region, Tanzania. Agricultural Science, 8(2), 15

51. Kilima, F. T. M., & Kurwijila, L. R. (2020). Integrating smallholder farmers to commodity value chains in Sub-Saharan Africa: Challenges, prospects and policy issues. Climate impacts on agricultural and natural resource sustainability in Africa, 407-428.

52. Komba, C., & Mburu, J. (2016). Gender roles and constraints in farming households: the case of Kahama district, Tanzania. Journal of Agricultural Extension and Rural Development, 8(4), 89-96.

53. Komba, C., & Mburu, J. (2020). Influence of gender and marital status on participation in horticultural farming among smallholder farmers in Tanzania. Journal of Gender, Agriculture and Food Security, 5(2), 99-115.

54. Kumar, S., Rao, D., Thombare, P., & Kale, P. (2020). Small and marginal farmers of Indian agriculture: Prospects and extension strategies. Indian Research Journal of Extension Education, 20(1), 35-41.

55. Liu, J., Fang, Y., Wang, G., Liu, B., & Wang, R. (2023). The aging of farmers and its challenges for labor-intensive agriculture in China: A perspective on farmland transfer plans for farmers' retirement. Journal of Rural Studies, 100, 103013.

56. Lubungu, M., Muyanga, M., & Burke, W. J. (2014). Agricultural productivity in Africa: Trends, patterns, and determinants. Journal of Development and Agricultural Economics, 6(2), 50-57.

57. Lunag, M. N., & Elauria, J. C. (2021). Characterization and management status of household biodegradable waste in an upland city of Benguet, Philippines. Journal of Material Cycles and Waste Management, 23, 840-853.

58. Magesa, A. L., Kweka, O. E., & Kayunze, K. A. (2020). Education, market information, and participation in agricultural markets: Empirical evidence from Tanzania. Journal of Agricultural Education and Extension, 26(2), 157-170. doi: 10.1080/1389224X.2019.1693276

59. Magreta, R., Wamae, W., & Kipkoech, A. K. (2018). Factors influencing participation of smallholder farmers in horticultural value chains in Kenya. Journal of Agricultural Science, 10(6), 227-239.

60. Maina, F., Mburu, J., & Nyang'anga, H. (2023). Access to and utilization of local digital marketing platforms in potato marketing in Kenya. Heliyon, 9(8).

61. Mango, N., Makate, C., Mapemba, L., & Sopo, M. (2018). The role of crop diversification in improving household food security in central Malawi. Agriculture & Food Security, 7(1), 1-10.

62. Mapiye, O., Makombe, G., Molotsi, A., Dzama, K., & Mapiye, C. (2021). Towards a revolutionized agricultural extension system for the sustainability of smallholder livestock production in developing countries: The potential role of icts. Sustainability, 13(11), 5868.

63. Marhefka, S., Lockhart, E., & Turner, D. (2020). Achieve research continuity during social distancing by rapidly implementing individual and group videoconferencing with participants: key considerations, best practices, and protocols. AIDS and Behavior, 24, 1983-1989.

64. Mariyono, J. (2019). Stepping up to market participation of smallholder agriculture in rural areas of Indonesia. Agricultural Finance Review, 79(2), 255-270.

65. Marson, M. (2022). Direct access to markets by farmers and the role of traders: insights from Kenyan and Tanzanian leafy vegetables markets. Studies in Agricultural Economics, 124(2), 66-73.
66. Marwa, E. M., & Manda, D. K. (2021). Market Access for Smallholder Vegetable Farmers in Tanzania: Opportunities and Challenges. Journal of Agribusiness in Developing and Emerging Economies, ahead-of-print(ahead-of-print).
67. Mashaphu, L. S. (2022). Determinants of productivity and market access of smallholder vegetable farmers: a case study of spinach producers in Polokwane Local Municipality, Limpopo Province, South Africa
68. Mbah, L. T., Molua, E. L., Bomdzele, E., & Egwu, B. M. (2023). Farmers' response to maize production risks in Cameroon: An application of the criticality risk matrix model. Heliyon, 9(4).
69. McCallum, J. (2023). Australia's new aged: issues for young and old. Taylor & Francis.
70. Mdemu, M. V., Mziray, N., & Nyella, J. (2020). Vegetable market channels, governance and food safety: Evidence from Morogoro Municipality, Tanzania. International Journal of Sociology and Anthropology Research, 6(2), 1-13.
71. Mhagama, G., Kimaro, M. A., Otieno, S. M., & Kataraiya, G. D. (2023). Contributions of Agricultural Sub-sectors to Economic Growth in Tanzania Mainland: 2010-2018.
72. Mpombo, F. M. (2018). Transaction costs and agricultural marketing decisions among smallholder farmers in Zambia: An empirical investigation. Agrekon, 57(2), 87-101.
73. Mpombo, L. B. (2018). DETERMINANTS OF MARKET PARTICIPATION AMONG SMALLHOLDER RICE FARMERS IN TANZANIA University of Dar es Salaam].
74. Mulema, J., Mugambi, I., Kansiime, M., Chan, H. T., Chimalizeni, M., Pham, T. X., & Oduor, G. (2021). Barriers and opportunities for the youth engagement in agribusiness: empirical evidence from Zambia and Vietnam. Development in Practice, 31(5), 690-706.
75. Munro, K. (2019). "Social reproduction theory," social reproduction, and household production. Science & Society, 83(4), 451-468.
76. Mwadzingeni, L., Afari-Sefa, V., Shimelis, H., N'Danikou, S., Figlan, S., Depenbusch, L., Shayanowako, A. I., Chagomoka, T., Mushayi, M., & Schreinemachers, P. (2021). Unpacking the value of traditional African vegetables for food and nutrition security. Food Security, 1-12.
77. Nkonya, E., Phillip, D., Kaizzi, K., Pali, P., & Byekwaso, F. (2015). Smallholder farming system and opportunities for high-value horticulture in sub-Saharan Africa. Journal of Development and Agricultural Economics, 7(3), 92-105.
78. Noort, P., Oosterveer, P., Loeber, A., & Van der Wal, J. (2022). Governing food systems in African cities: Urban food policies and urban food systems governance. International Journal of Sociology of Agriculture and Food, 26(1), 61-79.
79. Novakova, L. (2020). The impact of technology development on the future of the labour market in the Slovak Republic. Technology in Society, 62, 101256.
80. Oduro, A. D., & Seidu, A. (2014). Gender roles in agricultural production, processing and marketing in the Eastern Region of Ghana. Journal of Agriculture and Sustainability, 6(2), 71-87.
81. Ola, O., & Menapace, L. (2020). A meta-analysis understanding smallholder entry into high-value markets. World Development, 135, 105079.
82. Ola, O., & Menapace, L. (2020). Participation in high value agriculture markets in Sub-Saharan Africa: Evidence from household-level data in Tanzania. World Development,126, 104730.
83. Omondi, S. O. (2019). Small-scale poultry enterprises in Kenyan medium-sized cities. Journal of Agribusiness in Developing and Emerging Economies, 9(3), 237-254.
84. Otekunrin, A. O., Adeoti, A. I., & Adekunle, W. A. (2019). Conceptualizing subsistence agriculture: a review of its meaning, scopes, and practices. Agriculture and Food Security, 8(1), 1-15.
85. Otekunrin, O. A., Momoh, S., & Ayinde, I. A. (2019). Smallholder farmers' market participation: concepts and methodological approach from Sub-Saharan Africa. Current Agriculture Research Journal, 7(2), 139.
86. Ouma, E., Wollni, M., & Lay, J. (2014). Factors that determine smallholder farmers' market participation: A case study of tomato and kale farmers in Kenya. Quarterly Journal of International Agriculture, 53(2), 113-133.
87. Razafindratsima, O. H., Kamoto, J. F., Sills, E. O., Mutta, D. N., Song, C., Kabwe, G., Castle, S. E., Kristjanson, P. M., Ryan, C. M., & Brockhaus, M. (2021). Reviewing the evidence on the roles of forests and tree-based systems in poverty dynamics. Forest Policy and Economics, 131, 102576.
88. Regassa, M. D., Miriti, P. K., & Melesse, M. B. (2023). Farmers' heterogeneous preferences for traits of improved varieties: Informing demand-oriented crop breeding in Tanzania. Experimental Agriculture, 59, e19.

89. Renzaho, A. M. (2020). Food security, livelihoods and COVID-19 in sub-Saharan Africa. Food Security, 12(4), 805-810.

90. Rummo, P. E., Lyerly, R., Rose, J., Malyuta, Y., Cohen, E. D., & Nunn, A. (2021). The impact of financial incentives on SNAP transactions at mobile produce markets. International Journal of Behavioral Nutrition and Physical Activity, 18, 1-8.

91. Rwigema, H. (2020). Small-scale farmer participation in horticultural markets in East Africa: review and synthesis of existing literature. Journal of Development and Agricultural Economics, 12(7), 278-290.

92. Sanga, U., Park, H., Wagner, C. H., Shah, S. H., & Ligmann-Zielinska, A. (2021). How do farmers adapt to agricultural risks in northern India? An agent-based exploration of alternate theories of decision-making. Journal of Environmental Management, 298, 113353.

93. Sengere, R. W., Curry, G. N., & Koczberski, G. (2019). Forging alliances: Coffee grower and chain leader partnerships to improve productivity and coffee quality in Papua New Guinea. Asia Pacific Viewpoint, 60(2), 220-235.

94. Shahpari, S., & Eversole, R. (2023). Planning to 'Hear the Farmer's Voice': an Agent-Based Modelling Approach to Agricultural Land Use Planning. Applied Spatial Analysis and Policy, 1-24.

95. Sharma, H. (2021). Emerging Trends in Agricultural Producfion. Kurukshetra, 69(10), 17-21.

96. Song, Y., Yang, L., Sindakis, S., Aggarwal, S., & Chen, C. (2022). Analyzing the role of high-tech industrial agglomeration in green transformation and upgrading of manufacturing industry: The case of China. Journal of the Knowledge Economy, 1-31.

97. Sumari, M., Haji, J. H., & Temu, A. A. (2018). Smallholder farmers' preferences for direct or indirect sale channels: Evidence from maize and sunflower farming systems in Tanzania. Sustainability, 10(5),

98. Sumari, R. L., Sabai, D., Msuya, N. E., & Tesha, F. J. (2018). Success factors of small-scale vegetable farmers in accessing high-value markets: evidence from Tanzania. Journal of Agribusiness in Developing and Emerging Economies, 8(4), 422-436.

99. Tacconi, F., Waha, K., Ojeda, J. J., & Leith, P. (2022). Drivers and constraints of on-farm diversity. A review. Agronomy for Sustainable Development, 42(1), 2.

100. Tray, B., Garnevska, E., & Shadbolt, N. (2021). Linking smallholder producers to high-value markets through vegetable producer cooperatives in Cambodia. International Food and Agribusiness Management Review, 24(6), 905-920.

101. Vetter, T., Nylandsted Larsen, M., & Bech Bruun, T. (2019). Supermarket-led development and the neglect of traditional food value chains: Reflections on Indonesia's agri-food system transformation. Sustainability, 11(2), 498.