Agricultural Diversification and Commercialization of Smallholder Farming in Malawi: Extent, Drivers, Impacts and Policy Options

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Executive Summary

Agricultural diversification and commercialization are widely seen as effective strategies for increasing household income, reducing poverty, and improving food and nutrition security. Our study examined the levels, drivers, challenges, and impacts of agriculture diversification and commercialization in Malawi using Malawi Rural Agricultural Livelihoods Survey (MRALS) data collected in 2019 and 2024. The findings indicate that while the level of diversification among farmers is moderate, there has been a decline in diversification between 2019 and 2024, potentially impacting farm resilience and resource allocation. Moreover, the study reveals significant variation in the level of commercialization among small-scale farmers in Malawi, with an average increase from 27% in 2019 to 35% in 2024, signifying progress towards more market-oriented farming practices.

Furthermore, the study underscores that agricultural diversification and commercialization among farmers are influenced by several pivotal factors such as gender of the head, education of the household head, distance to the extension office, access to credit, ownership of livestock, the size of land under cultivation, engagement with crop extension services, the utilization of hybrid seeds, inorganic fertilizers, and organic fertilizers. Additionally, the study reveals that agricultural diversification has a positive and significant relationship with dietary diversity, household income, and asset values, while a higher level of agricultural commercialization is also positively and significantly associated with increased household dietary diversity, income, and asset value possession. The high input costs and availability, limited start-up capital, limited land availability, limited extension or technical services, and lack of access to finance are some of the significant challenges

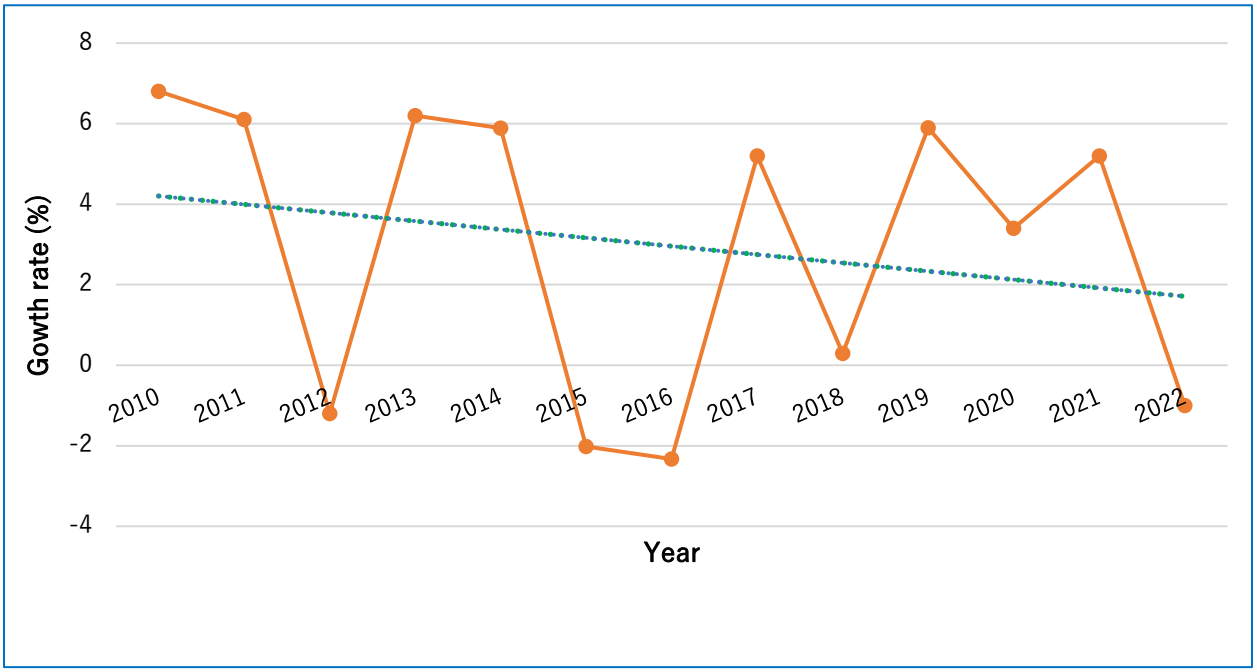
hindering smallholder farmers' efforts to diversify and commercialize their agriculture activities.

In light of these findings, the study offers policy options aimed at enhancing agricultural diversification and commercialization among smallholder farmers in Malawi, including expediting the development or finalization of the agricultural diversification strategy. This necessitates the government's prompt formulation and implementation of policies and strategies that promote inclusive agriculture diversification and commercialization in the country. Additionally, farmers should be encouraged to diversify towards high-value commodities, taking advantage of the policy support and initiatives promoting commercialization. It is also imperative to raise awareness of the incentives and financing opportunities for agriculture diversification and commercialization, as well as to improve smallholder farmers' access to productive assets, financial resources, and extension services to facilitate their efforts in diversifying and commercializing their agricultural activities.

1. Introduction

Agriculture remains the fundamental pillar of Malawi's economy, accounting for nearly 22 percent of total gross domestic product (GDP), 80 percent of total export earnings, and over 40 percent of employment (Government of Malawi, 2023). However, the annual agriculture GDP growth rate over the past decade has been volatile and declining (Figure 1). This could be partly due to the significant development challenges the country has been facing over the past decade, induced by extreme weather events and climate change.

Figure 1: Agriculture GDP Growth Rate from 2017 to 2022



Source: 2023 Agriculture Sector Performance Report

The vast majority of Malawi's population are farmers, with about 80 percent of them depending on subsistence agriculture for their livelihoods. They contribute about 70 percent of the country's agricultural production, with three-quarters of the farmers operating farms on less than one hectare (Kamwamba-Mtethiwa, 2020; Muyanga et al., 2020). Further, small-scale agriculture in Malawi is characterized by limited access to farm inputs and land; low agricultural productivity; poor access to finance; weak linkages to markets; low

mechanization; limited irrigation and increasing land fragmentation; and lack of agriculture diversification among others (FAO et al., 2023; Mapemba et al., 2020; Muyanga et al., 2020)

Transforming the agricultural landscape in Malawi requires a serious rethinking of the current strategies and the implementation of policies to transition from subsistence-based to market-oriented commercial agriculture. Agriculture diversification and commercialization have been deemed as one of the key steps or national strategies to agriculture transformation in many developing countries. Agriculture diversification refers to the shift from the dominance of one crop to production of a number of crops on a farm or in a region, to meet the ever-increasing demand for food (Asante et al., 2018). Agricultural commercialization, on the other hand, According to Pingali & Rosegrant (1995), agricultural commercialization is defined as continuous shift and transition from subsistence to market-oriented production of crops and livestock (production and input decisions are based on profit maximization and reinforcing vertical linkages between input and output markets).

Agricultural commercialization and diversification are considered indispensable tools that can lead to improved nutritional and food security (Gidelew et al., 2022; Mamo et al., 2017), poverty reduction (Dureti et al., 2023; Saha et al., 2022; Muricho et al., 2017; Carter & Barrett, 2006) and climate change adaptation and mitigation (Tavenner et al., 2019). This shift in production focus or addition of enterprises can lead to increased productivity and profitability, as well as improved access to markets and higher-quality agricultural inputs.

In recent years, policy-makers and stakeholders in Malawi have shown a growing interest in and debate around how the country's agriculture could be commercialized and diversified. In line with this, Malawi has developed a long-term agenda, Malawi 2063 (Mw2063), and its first 10-year implementation plan (MIP-1), which is anchored on three pillars: agricultural productivity and commercialization, industrialization, and urbanization. The debate on agricultural diversification and commercialization has been heavily discussed in annual high-level dialogues such as the National Development Conferences (NDC), the Joint Sector

Review Meetings, Ndizotheka Eminent Speaker Series events and the Malawi Agriculture Productivity and Commercialization Conference (MAPCC).

In this study, we present findings from an in-depth study on diversification and commercialization of smallholder agriculture in Malawi, focusing on various aspects such as, levels, drivers, barriers, and impacts. The findings from this study will enable an informed dialogue on these issues and contribute to the discussion on policies that are critical to tobacco farmers who wish to diversify their production away from tobacco. It will underscore the role of smallholder farmers in the national development strategy and recommend measures that elevate their status to a productive class by addressing constraints that hinder their productivity. The findings of this study are significant for policymakers and other stakeholders involved in the agricultural sector and can help shape policies that promote sustainable agriculture and rural development in Malawi. With this direction, the study will specifically:

1. Explore the changes in the levels in diversification and commercialization among smallholder farmers in Malawi
2. Examine the drivers of agriculture diversification and commercialization among smallholder farmers in Malawi
3. Establish the barriers to agricultural diversification and commercialization among smallholder farmers
4. Assess the impact of agricultural diversification and commercialization on household welfare (household dietary diversity, household income, and assets) and resilience of smallholder farming households
5. Recommend strategies and policies that can promote and support agriculture diversification and commercialization among the smallholder farmers in Malawi

2. Data sources and methods

2.1. Data sources

The study used data drawn from a sub-sample of the Malawi Rural Agricultural Livelihood Survey (MRALS) which was first collected in 2019. The MRALS covered eight Rumphi, Mzimba, Kasungu, Lilongwe, Dowa, Mchinji, Neno, and Blantyre. The collected data was representative at the district level. The current study aimed at examining changes in agricultural diversification and commercialization and thus required the use of panel data set. Hence another round of data was collected from four districts namely Mzimba, Kasungu, Mchinji and Blantyre as shown in Table 1. The four districts were included due to resource constraints and their sampling was done purposively. From each district, a sub-sample of 80 percent of the 2019 sample was randomly selected for interview in 2024 due to budget constraints. A summary of the household demographic and socioeconomic characteristics are shown in Table A1 and A2, respectively.

Table 1: Study Sample Distribution

District	*No. farming households in 2019*	*Visited EAs*	*Interviewed HHs (2019)*	*Households interviewed (2024)*
Mzimba	194,823	20	480	363
Kasungu	179,008	18	432	304
Mchinji	136,663	14	336	264
Blantyre rural	109,962	17	408	314
Total	620,456	69	1,656	1,245

Source: computed from MRALS 2019 and Sub-set MRALS 2024

2.2. Descriptive analysis

The study used descriptive statistics to quantify the levels of agricultural diversification and commercialization in Malawi. Specifically, Simpson Diversity Index (SDI) was used to measure household diversification while Household Crop Commercialization Index (HCI) was used to measure household agricultural commercialization levels.

The Simpson Diversity Index has been used to measure the level of agricultural diversification among smallholder farmers due to robustness as compared to indices (Gebiso et al., 2023; Heumesser & Kray, 2019, 2019; B. Saha & Bahal(Alemu, 2023), 2014; Sen et al., 2017; Torres et al., 2018). The SDI is computed as follows:

$$SDI_{kt} = 1 - \sum_{i=1}^{n} \left[\frac{a_{it}}{A}\right]^2 \quad (1)$$

where SDI_{kt} is Simpson Diversity Index for farm household k in each period t; a_{it} is the amount of land allocated to crop i produced by farm household k in each period t; and A is total operated land for crops owned by farm household k. The Index ranges from zero to one. A value of zero indicates complete specialisation, while a value of one means that the household is fully diversified. The farmer households were classified into three categories based on the degree of diversification as follows: low (SDI<0.3), medium (0.3≤ SDI≤ 0.6) and high (SDI>0.6) (see Gebiso et al. 2023; Heumesser & Kray, 2019; and Saha & Bahal, 2014).

The Household Crop Commercialization Index (HCCI) also refered to as Crop Output Market Participation Index (COMPI) is the ratio of the value of crop outputs sold to the total value of crop outputs produced by a household, and is computed as follows,

$$COMPI_k = \sum_{i=1}^{n} \frac{P_k S_{ik}}{P_k Q_{ik}};\ Q_{ki} \geq S_{ki} \quad (2)$$

where S_{ik} is the quantiry of crop output k sold by household i evaluated at an average given price P_k, and Q_{ik} is total crop output k produced by household i. The households were divided into three commercialization categories, namely, non-commercial or subsistence (<30%), semi-commercial (30-65%), and commercial-oriented (>65%) (see Gebiso et al., 2023; Gebremedhin & Jaleta, 2010a; Gidelew et al., 2022; and Strasberg et al., 1999).

2.3. Empirical models and estimation strategy

Analysis of factors affecting crop diversification and Commercialization

The results of both the crop diversification and crop commercialization indices were categorized into three using terciles[1] as low, medium and high, making them ordinal data. Analysis if such ordinal data requires the use of ordered probit models. The ordered probit has been widely used to assess the determinants of crop diversification and commercialization (Waseem et al., 2023; Ayele et al., 2021; Piedra-Bonilla et al., 2020; Islam et al., 2017). Following Islam et al. (2017), the ordered probit model is specified as in equation (3).

$$Y_{it}^* = \beta_i' X_{it} + \mu_{it} \quad (3)$$

$$Y_{it} = \begin{cases} Y_{it}^* = low\ if\ if\ \ Y_{it}^* < 0.3 \\ Y_{it}^* = medium\ if\ \ Y_{it}^* \geq 0.3\ \leq 0.65 \\ Y_{it}^* = high\ if\ Y_{it}^* > 0.65 \end{cases}$$

where y^* is the unobservable index variable (the SDI index or the COMPI index), Y_{it} is the observed index level, β' are a vector of parameters to be estimated, X_{it}= vector of

[1] To create terciles, data is arranged in order from lowest to highest and then divided into three equal groups.

socioeconomic and demographic variables (Table A3), μ_{it} = the error term is assumed to be independently and normally distributed with mean and variance of 0 and σ_i^2, respectively.

Welfare impacts of crop diversification and Commercialization

To assess the impact of crop diversification and commercialization on household welfare (Household income, assets and food consumption score) for MRALs two-wave data (2019 and 2024), a fixed effects regression model was used. The fixed effects model is defined as in equation (4).

$$O_{it} = \alpha_0 + \alpha_1 Z_{it} + \alpha_2 SDI_{it} + \alpha_3 COM_{it} + u_{it} \qquad (4)$$

Where O_{it} represent the household welfare outcome variables (*namely household income, assets and food consumption score*), Z_{it} represents a set of household and socio-economic factors (Table A3), SDI_{it} represents households' crop diversification index, and $COMPI_{it}$ represents households' crop commercialization index, μ_{it} is the error term.

In this study, household income is defined as the total income from both on-farm and off-farm activities, assets represent the total value of the assets owned by the household, and food consumption score is a composite score based on dietary diversity, frequency of various foods consumed, and the relative nutritional importance of the various food groups consumed.

2.4. Definition of the variables to be used in the models

Agriculture diversification and commercialization are influenced and impacted by various factors, as reported by researchers around the world (Abdullah et al., 2019; Gani & Hossain, 2015; Gebiso et al., 2023b, 2023a; Gebremedhin & Jaleta, 2010; Mutabazi et al., 2013; Ndip et al., 2023; Tafesse et al., 2020; Zondi et al., 2022). Table A3 summarizes the variables used in our econometric model.

3. Results and discussion

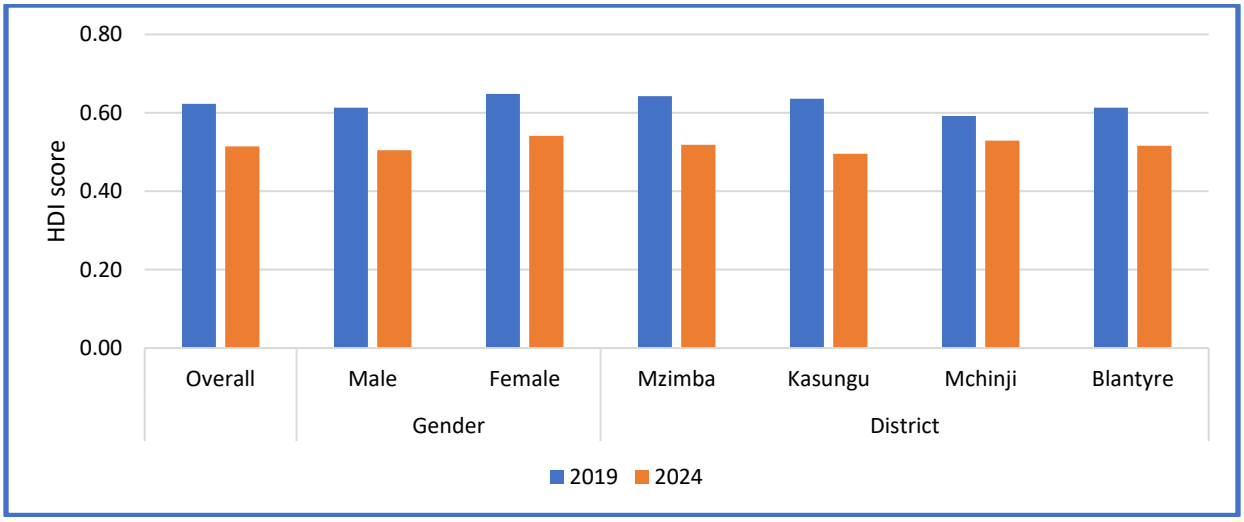
3.1. Levels of agriculture diversification and Commercialization

3.1.1. Agriculture diversification

Figures 2 and 3 and Table A4 present the results of the farm households' levels of crop diversification. The findings reveal that the average level of crop diversification among the respondents was 0.62 in 2019 and dropped down to 0.51 in 2024. This suggests that, overall, the level of diversification among the farmers is moderate. Similar results were observed by Mango et al. (2018), who found a mean diversification index of 0.61 in the central region of Malawi. Nyamayevu et al. (2024) also found that the diversification index ranged from 0.39 to 0.57 for various groups of farmers in Kasungu, Mchinji, and Lilongwe districts.

Analysis by gender shows that the diversification levels are higher for Female-headed households compared to Male-headed households in both survey years. The mean SDI for women is 0.65 in 2019 and 0.54 in 2024, compared to that of 0.61 in 2019 and 0.50 in 2024 for males. Kamkwamba et al. (2018) and Tacconi et al. (2022) also reported high diversification levels among female farmers compared to male farmers. Female farmers tend to diversify as a risk-reducing measure to shocks to which they are more vulnerable. Analysis by district shows high diversification levels in 2024 for Mchinji (0.53), followed by Blantyre and Mzimba (0.52) and Kasungu (0.50).

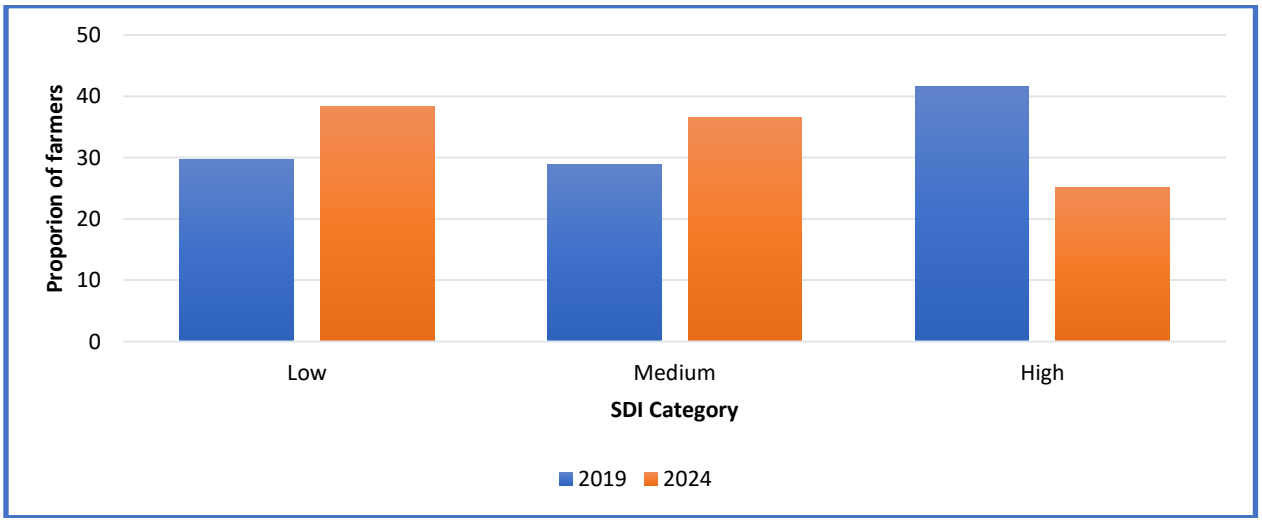
Figure 2: Level of Diversification among Farmers by Various Categories



Source: computed from MRALS 2019 and Sub-set MRALS 2024

When we consider the diversification categories discussed in the methods section, we find an increase in the proportion of farmers classified as 'low' diversified from 30 to 38 percent between 2019 and 2024 and a significant reduction in the proportion of farm households categorized as 'high' from 42 to 25 percent within the same period (Figure 3).

Figure 3: Distribution of Farmers by SDI Category



Source: computed from MRALS 2019 and Sub-set MRALS 2024

Table 3 presents results for the crops cultivated by farmers and their respective share of cultivated land for each crop. As expected, the study revealed that maize remains the

dominant staple crop cultivated by farmers as well as the area allocated to it. In 2019, 97% of the interviewed farmers cultivated maize on an average landholding size of one acre. The proportion of farmers increased to 98% in 2024 with the average land area allocated also increasing to 1.4 acres. Over the last five years, there has also been an increase in the proportion of households cultivating soybeans and pigeon peas, while the proportion of farmers cultivating groundnuts, tobacco, beans, sweet potatoes, tomatoes, and Irish potatoes has decreased. It is important to note that there has been a slight decline in the proportion of farmers engaged in tobacco cultivation from 14% in 2019 to 6% in 2024. These findings are consistent with a study conducted by Shah et al. (2021), which revealed a decade-long trend among smallholder farmers in Malawi. The proportion of tobacco growers decreased from 16% in 2009/10 to 5% in 2018/19 seasons. The findings underscore the critical need for Malawi to actively explore alternative high-value commodities (legumes, oily seeds, edible nuts) to diversify its export portfolio beyond tobacco, as relying solely on tobacco appears risky and unsustainable.

Table 3: Selected Crops Cultivated Mainly by Farmers and Share of Land Cultivated for Various Crops

	Prop. of HHs growing crop			Cultivated area (acres)		
Crop	*2019*	*2024*	*Diff*	*2019*	*2024*	*Diff*
Maize	0.97	0.98	0.01	1.06	1.38	0.32
Groundnuts	0.44	0.35	-0.09	0.28	0.34	0.06
Soya beans	0.32	0.44	0.12	0.37	0.49	0.12
Tobacco	0.14	0.06	-0.08	0.13	0.15	0.02
Beans	0.13	0.08	-0.05	0.04	0.05	0.01
Pigeon peas	0.11	0.13	0.02	0.04	0.05	0.01
Sweet potatoes	0.07	0.05	-0.02	0.02	0.03	0.01
Tomato	0.07	0	-0.07	0	0	0
Cassava	0.03	0.03	0	0.02	0.03	0.01
Irish potatoes	0.03	0.01	-0.02	0	0	0
Tanaposi	0.03	0	-0.03	0	0	0
Sugarcane	0.01	0	-0.01	0	0	0
Ground beans	0.01	0.01	0	0	0	0
Ground beans	0.01	0.01	0	0	0	0

Source: computed from MRALS 2019 and Sub-set MRALS 2024

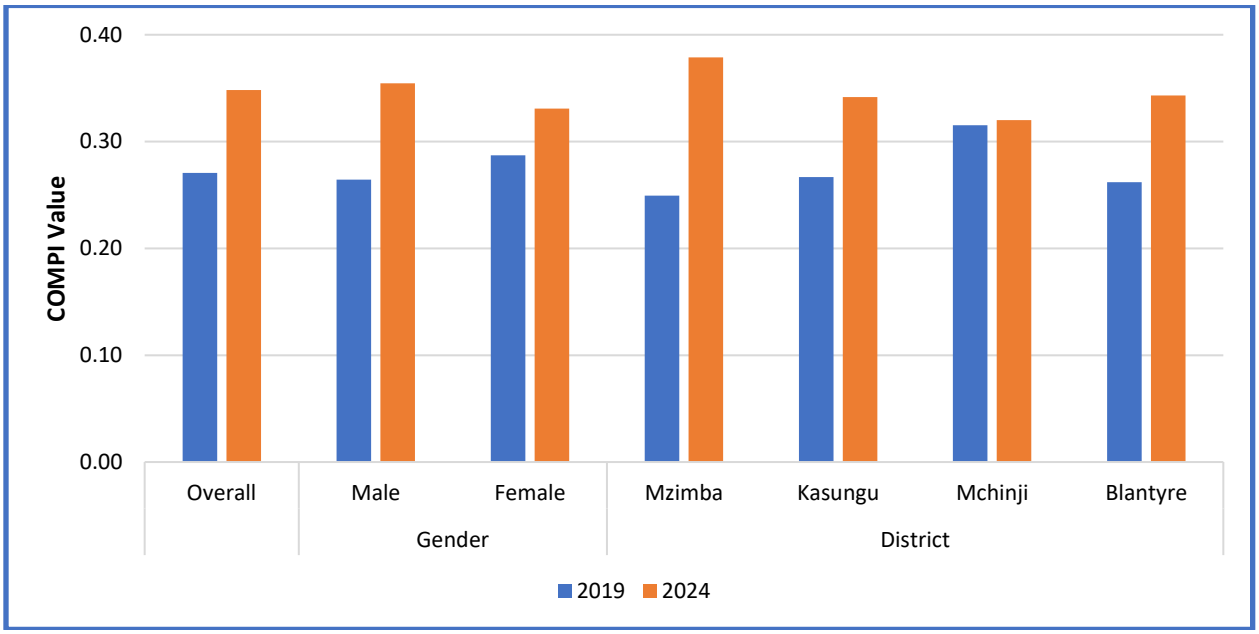
3.1.2. Agriculture commercialization

The levels of commercialization among small-scale farmers in Malawi were estimated using the crop output market participation (COMP) index. Table A4 and Figures 4 and 5 show the levels of agriculture commercialization of Malawian farmers. The overall mean commercialization level of the farmers in 2024 was 0.35, an increase from the 0.27 observed in 2019.

Gender-specific analysis reveals that male and female farmers exhibit comparable levels of commercialization. However, the commercialization index score for women was higher

than for men in 2019, estimated at 0.29. In 2024, males had the highest commercialization index of 0.35 compared to females' 0.33. Jolex and Benson (2021) and Rabbi et al. (2024) noted that existing gender disparities in the agricultural sector favor males in the participation of the output market. District analysis shows that Mzimba (0.38) had the highest level of commercialization reported in 2024, followed by Blantyre, Kasungu (0.34) and Mchinji (0.32).

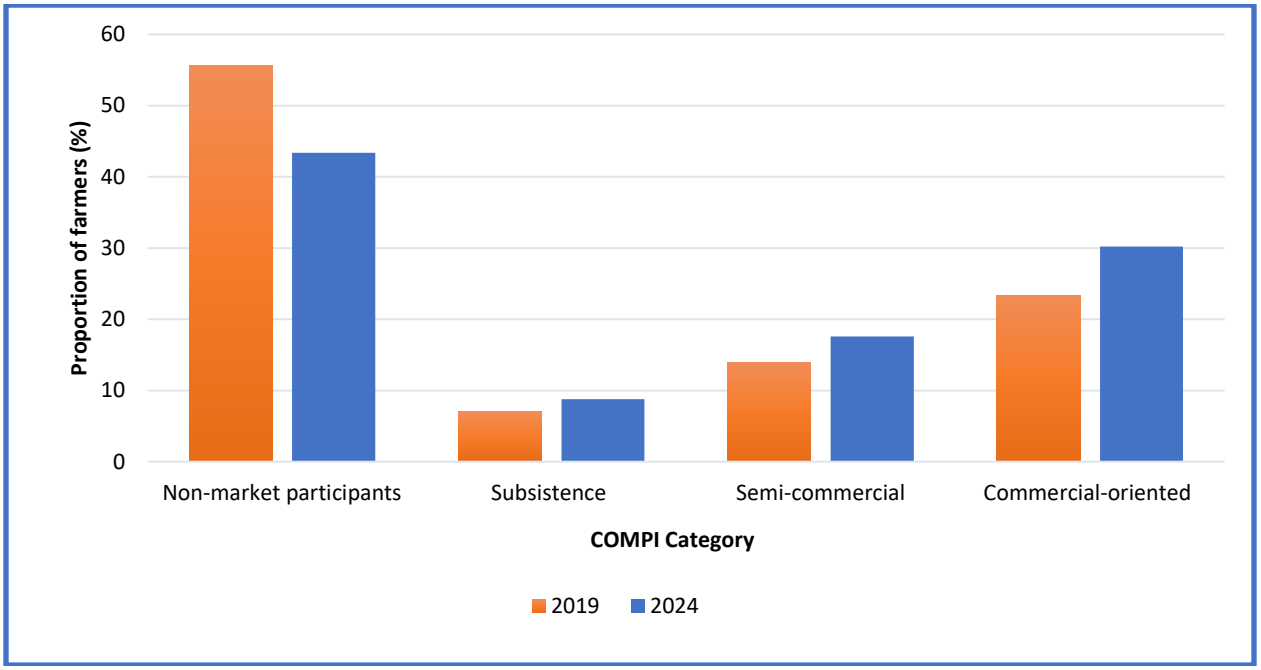
Figure 4: Commercialization Levels of Farmers by COMPI Category, District and Gender



Source: computed from MRALS 2019 and Sub-set MRALS 2024

Data in Figure 5 further shows that approximately half of the farmers (49.55%) did not sell their agricultural produce at all (0% commercialization level) and, thus, did not produce for market orientation or commercialization purposes. In comparison, 7.89%, 15.75% and 26.81% of the farmers are subsistence (producing for home consumption), semi-commercial and commercial-oriented farming households. Thus, 26.81% of the farmers in Malawi supply more than 65% of their produce to the market.

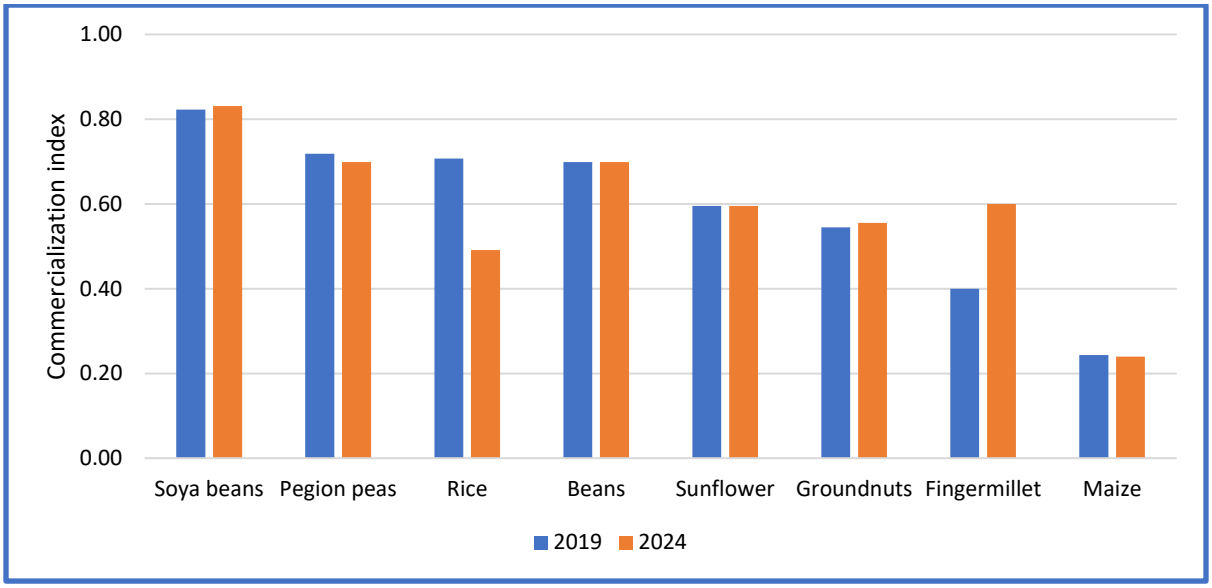
Figure 5: Share of Farmers by COMPI Category



Source: computed from MRALS 2019 and Sub-set MRALS 2024

Interesting results on the commercialization levels of selected crops are presented in Figure 6. Our findings show that legumes (e.g. soya beans, beans, pigeon peas), rice and sunflower are relatively highly commercialized, implying that farmers contribute more than 65% of their total output to the market. However, the mean commercialization index score for rice significantly declined by more than 20% between 2019 and 2024. Conversely, finger millet's mean commercialization has increased by 20% during the same period.

Figure 6: Levels of Commercialization for Selected Crops



Source: computed from MRALS 2019 and Sub-set MRALS 2024

3.5. Drivers of Agriculture diversification and commercialization

3.5.1 Agriculture diversification

Table 4 presents the marginal effects of various explanatory variables on the different categories of crop diversification among small-scale farmers. The data reveals several significant determinants of low and high crop diversification among the farmers, including the gender of the head, education of the household head, distance to the extension office, access to credit, the extent of land under cultivation, engagement with crop extension services, and the utilization of hybrid seeds and inorganic fertilizers, and the year dummies.

Being a male-headed household increases low levels of diversification by 5.2% while reducing high levels of diversification by the same magnitude. This implies that male-headed households are less likely to highly diversify, while female-headed households opt to highly diversify.

All educational variables (levels) of household heads exhibit a positive correlation with high crop diversification, and a negative association with low crop diversification,

underscoring the significance of knowledge and the ability of the farmers to absorb new information and acquire work-related skills and new competencies. As a result, this empowers farmers to diversify, adapt, innovate, and explore new opportunities. Attainment of PSLCE, JCE, and tertiary qualification by the household head increases high levels of crop diversification by 1.6%, 2.7% and 6.9%, respectively.

Access to credit and crop extension reduced the probability of farmers increasing high diversification by 10% and 9%, respectively, while distance to extension services increased the probability of low diversification by 0.2%. Limited access to extension and credit services may impede the farmers' ability to diversify in Malawi.

The use of hybrid seeds and inorganic fertilizers increases low levels of crop diversification by 5.7% and 6.9%, respectively. An increase in cultivated land also increases low levels of crop diversification by 0.5%.

Table 4: Ordered Probit Regression of Drivers of Crop Diversification

	Parameters		Marginal Effects		
Variable	Coefficient	Std. Err	Low	Medium	High
Age	-0.0007	0.0016	0.0002	0.0000	-0.0002
Household size	0.0156	0.0114	-0.0054	0.0000	0.0054
Gender of head	-0.1508**	0.0771	0.0522**	-0.0004	-0.0518**
Marital status	0.0214	0.0815	-0.0074	0.0001	0.0074
Head has PSLCE	0.0463**	0.0686	-0.0160**	0.0001	0.0159**
Head has JCE	0.0791**	0.0837	-0.0274**	0.0002	0.0271**
Head has MSCE	-0.0801	0.1012	0.0277	-0.0002	-0.0275
Head has tertiary	0.2017*	0.1792	-0.0698*	0.0006	0.0692*
Distance to boma	0.0008	0.0010	-0.0003	0.0000	0.0003
Distance to ADMARC	-0.0013	0.0027	0.0004	0.0000	-0.0004
Distance to agrodealer	0.0037	0.0030	-0.0013	0.0000	0.0013
Distance to extension office	-0.0057**	0.0030	0.0020**	0.0000	-0.0020**
Access to credit	-0.2943**	0.0689	0.1022***	-0.0008	-0.1014***
Access to seed coupon	-0.0302	0.0954	0.0117	-0.0001	-0.0116
Access to fertilizer coupon	-0.0640	0.0584	0.0234	-0.0002	-0.0232
Cultivated land in acres	0.0138***	0.0051	-0.0048***	0.0000	0.0047***
Crop extension	-0.2935***	0.0612	0.0998***	-0.0008	-0.0990***
Insurance/credit extension	0.0216	0.0985	-0.0083	0.0001	0.0083
TTLU	-0.0009	0.0108	0.0002	0.0000	-0.0002
Use of hybrid seeds	-0.1684***	0.0491	0.0574***	-0.0005	-0.0570***
Use of inorganic fertilizer	-0.2013***	0.0700	0.0692***	-0.0006	-0.0686***
Use of organic fertilizer	-0.0339	0.0513	0.0123	-0.0001	-0.0122
Mechanized tillage	-0.1109	0.1303	0.0430	-0.0003	-0.0427
2019	0.4194***	0.0545	-0.1461***	0.0012	0.1449***
Number of observations	2,355				
Log likelihood	-2475.8883				
Wald chi2(26)	216.75				
Prob > chi2	0.000				

Statistical significance $^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Source: computed from MRALS 2019 and Sub-set MRALS 2024

3.5.2 Agriculture commercialization

Table 5 displays an estimation of ordered probit regression on the drivers of agriculture commercialization of farmers in Malawi. Factors such as age, gender, marital status, access to credit, the extent of land under cultivation, ownership of livestock, engagement with crop extension services, and use of organic fertilizers significantly affect the probability of farmers to commercialization their crops. Results shows factors associated with low crop commercialization levels include the age of the household head (by 0.1%), male-headed heads (5.9%), access to credit (5%), increase in size of cultivated land (2.2%), access to crop extension (7.5%) and use of organic fertilizer (4.7%). On the other hand, low level of crop commercializarion is reduced by factors such as being married (6%) and ownership of livestock (0.7%).

Households that diversify their agricultural practices are more likely to commercialize their farming activities as it enables farmers to tap into multiple income streams, respond effectively to market demands, and mitigate the risks associated with relying solely on a single crop or activity. Additionally, older household heads and male household heads are more inclined to adopt commercial farming practices. In Malawi, studies have shown that male-headed households typically make decisions about production and income use and have better access to resources and income, allowing them to commercialize more effectively and enjoy better livelihoods than female-headed households (Mgalamadzi et al., 2021). The extent of land under cultivation is another significant factor; larger areas of cultivated land provide more opportunities for commercial farming. Furthermore, farmers who actively engage with crop extension services, which offer technical assistance and information on best practices, are better equipped to commercialize their farming operations.

Conversely, it is evident that certain factors, such as marital status and livestock ownership, negatively impact smallholder farmers' decisions to commercialize, as illustrated

in Table 5. Married household heads may face additional constraints, such as increased family responsibilities and financial obligations, which can limit their ability to transition from subsistence to commercial agriculture. Similarly, livestock ownership can divert resources and attention away from crop production. Managing livestock requires time, labor, and financial investment, which might otherwise be allocated to enhancing crop yields and market participation. As a result, households with significant livestock holdings may find it more challenging to commercialize their farming activities, as their resources are spread across multiple agricultural investments.

Table 5: Drivers of Crop Commercialization: Ordered Probit Regression

	Parameters		Marginal Effects		
Variable	Coefficient	Std. Err	Low	Medium	High
Age	0.0033**	0.0017	-0.0012**	0.0001**	0.0011**
Household size	0.0119	0.0119	-0.0045	0.0004	0.0041
Gender of head	0.1575**	0.0819	-0.0597**	0.0058**	0.0539**
Marital status	-0.1593*	0.0858	0.0604*	-0.0058*	-0.0545*
Head has PSLCE	0.1710	0.1071	-0.0648	0.0063	0.0585
Head has JCE	-0.0599	0.1196	0.0227	-0.0022	-0.0205
Head has MSCE	0.0220	0.1336	-0.0083	0.0008	0.0075
Head has tertiary	0.1250	0.2039	-0.0474	0.0046	0.0428
Distance to boma	-0.0015	0.0011	0.0006	-0.0001	-0.0005
Distance to ADMARC	0.0020	0.0028	-0.0008	0.0001	0.0007
Distance to agrodealer	-0.0029	0.0031	0.0011	-0.0001	-0.0010
Distance to extension office	0.0016	0.0031	-0.0006	0.0001	0.0005
Access to credit	0.1335*	0.0716	-0.0506*	0.0049*	0.0457*
Access to seed coupon	0.0131	0.1003	-0.0050	0.0005	0.0045
Access to fertilizer coupon	-0.0312	0.0612	0.0118	-0.0011	-0.0107
Cultivated land in acres	0.0580***	0.0054	-0.0220***	0.0021***	0.0199***
Crop extension	0.1976***	0.0640	-0.0749***	0.0072***	0.0676***
Insurance/credit extension	0.0885	0.1028	-0.0336	0.0032	0.0303
TTLU	-0.0199*	0.0119	0.0075*	-0.0007*	-0.0068*
Use of hybrid seeds	0.0565	0.0516	-0.0214	0.0021	0.0194
Use of inorganic fertilizer	0.1123	0.0737	-0.0426	0.0041	0.0385
Use of organic fertilizer	0.1299***	0.0539	-0.0492***	0.0048***	0.0445***
Mechanized tillage	-0.0067	0.1352	0.0025	-0.0002	-0.0023
Use of local seed	-0.2487	0.0568	-0.0142	0.0014	0.0129
2019	0.0033***	0.0017	0.0943***	-0.0091***	-0.0851***
Number of observations	2,355				
Log likelihood	-2270.7942				
Wald chi2(26)	235.25				
Prob > chi2	0.000				

Statistical significance $^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Source: computed from MRALS 2019 and Sub-set MRALS 2024

3.6. Impacts of agricultural diversification and commercialization on the welfare of farming households

Understanding and leveraging the linkages between agriculture diversification, commercialization, and food and nutrition security is crucial for devising effective and comprehensive strategies that support smallholder farmers. Achieving food and nutrition security, which is affected by population growth coupled with the effects of climate change, is an extremely high priority for Malawi. Tables 6, 7 and 8 present the estimated results of the impact of agriculture diversification and commercialization on household food and nutrition security, income and assets using the pooled regression, fixed effects model.

Our study has estimated a positive and significant relationship between agriculture diversification and dietary diversity, household income and asset values. The findings suggest that a one-unit increase in agricultural diversification results in 140%, 215%, and 75% increase in dietary diversity, household income, and asset values, respectively. The findings are consistent with findings from several studies that demonstrated that agriculture diversification led to improved dietary diversity (Ayenew et al., 2018; Fatch et al., 2023; Chegere & Kauky, 2022; Mastura et al., 2023; Nkonde et al., 2021; Rajendran et al., 2017), increased household income (Basantaray et al., 2024; Fatch et al., 2023; Kurdyś-Kujawska et al., 2021; Sehgal, 2023) and higher asset accumulation (Ahmadzai & Morrissey, 2023; Fatch et al., 2023).

On the other hand, further results show that a higher level of agriculture commercialization is positively and significantly associated with high household dietary diversity, income, and asset value possession. The estimated relationship indicates that after controlling for other variables that influence HDDS, household income and asset accumulation, a unit increase in the household's level of agriculture commercialization is associated with a substantial 97%, 144% and 38% increase in HDDS, income and asset value possession respectively. The findings are consistent with similar studies from the Sub-

sahara African countries, which also found a positive and significant correlation between agriculture commercialization and food and nutrition security outcomes, income and assets accumulation (Assefa et al., 2024; Etuk & Ayuk, 2021; Fatch et al., 2023; Chegere & Kauky, 2022; Kilimani et al., 2022; Ma et al., 2024; Madududu et al., 2021; Ogutu et al., 2020).

Table 6: Impact of Crop Diversification and Commercialization on Household Dietary Diversity Score (HDDS): Pooled Regression, Fixed Effects Model

	Model 1		Model 2	
Variable	Coefficient	Std. Err	Coefficient	Std. Err
COMPI index	0.970***	0.197	0.389**	0.172
SDI index	1.400***	0.205	0.834***	0.179
Age			0.072***	0.008
Household size			0.085**	0.038
Gender of head			-0.223	0.245
Marital status			-0.205	0.256
No education qualification			0.015	0.168
Distance to ADMARC			0.019***	0.007
Distance to agrodealer			-0.032***	0.008
Distance to extension office			0.011	0.008
Access to credit			-1.851***	0.173
Access to seed coupon			0.475**	0.244
Access to fertilizer coupon			0.837***	0.146
Cultivated land in acres			0.035**	0.014
Crop extension			1.435***	0.153
Insurance/credit extension			-0.516**	0.258
TTLU			-0.045*	0.026
Use of hybrid seeds			-0.551***	0.128
Use of local seed			-1.607***	0.176
Use of inorganic fertilizer			-0.737***	0.129
Use of organic fertilizer			0.282***	0.331
Mechanized tillage			-0.345	0.124
Constant	3.887	0.140	1.913	0.505
Number of observations	2391		2391	
Prob > F	0.000		0.000	

Statistical significance $^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Source: computed from MRALS 2019 and Sub-set MRALS 2024

Table 7: Impact of Crop Diversification and Commercialization on Household Income: Pooled Regression, Fixed Effects Model

	Model 1		Model 2	
	Coefficient	Std. Err	Coefficient	Std. Err
COMPI index	1.44***	0.19	0.61***	0.19
SDI index	2.15***	0.20	1.18***	0.20
Age			0.00	0.01
Household size			0.06	0.04
Gender of head			-0.11	0.26
Marital status			0.26	0.28
No education qualification			-0.02	0.19
Distance to ADMARC			0.00	0.01
Distance to agro-dealer			0.01	0.01
Distance to extension office			-0.01	0.01
Access to credit			0.89***	0.16
Access to seed coupon			-0.17	0.26
Access to fertilizer coupon			0.22	0.15
Cultivated land in acres			0.02*	0.01
Crop extension			1.29***	0.16
Insurance/credit extension			-0.09	0.26
TTLU			-0.03	0.03
Use of hybrid seeds			-0.06	0.14
Use of inorganic fertilizer			-0.10	0.25
Use of organic fertilizer			0.05	0.15
Mechanized tillage			0.26	0.38
Constant	13.16	0.10	10.38	0.56
Number of observations	2215		2155	
Prob > F	0.000		0.000	

Statistical significance $^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Source: computed from MRALS 2019 and Sub-set MRALS 2024

Table 8: Impact of Crop Diversification and Commercialization on Household Asset Value: Pooled Regression, Fixed Effects Model

	Model 1		Model 2	
	Coefficient	Std. Err	Coefficient	Std. Err
COMPI index	0.378***	0.135	0.146	0.127
SDI index	0.749***	0.140	0.634***	0.133
Age			0.034***	0.006
Household size			0.044	0.028
Gender of head			0.035	0.180
Marital status			-0.321*	0.188
No education qualification			0.078	0.124
Distance to ADMARC			0.007	0.005
Distance to agro-dealer			-0.012**	0.006
Distance to extension office			0.003	0.006
Access to credit			-0.529***	0.128
Access to seed coupon			0.478***	0.180
Access to fertilizer coupon			0.373***	0.108
Cultivated land in acres			0.030***	0.010
Crop extension			0.251**	0.113
Insurance/credit extension			-0.382**	0.190
TTLU			-0.022	0.019
Use of hybrid seeds			-0.394***	0.094
Use of inorganic fertilizer			-1.407***	0.129
Use of organic fertilizer			-0.494***	0.095
Mechanized tillage			-0.443**	0.245
Constant	10.998	0.083	11.068	0.358
Number of observations	2429		2429	
Prob > F	0.000		0.000	

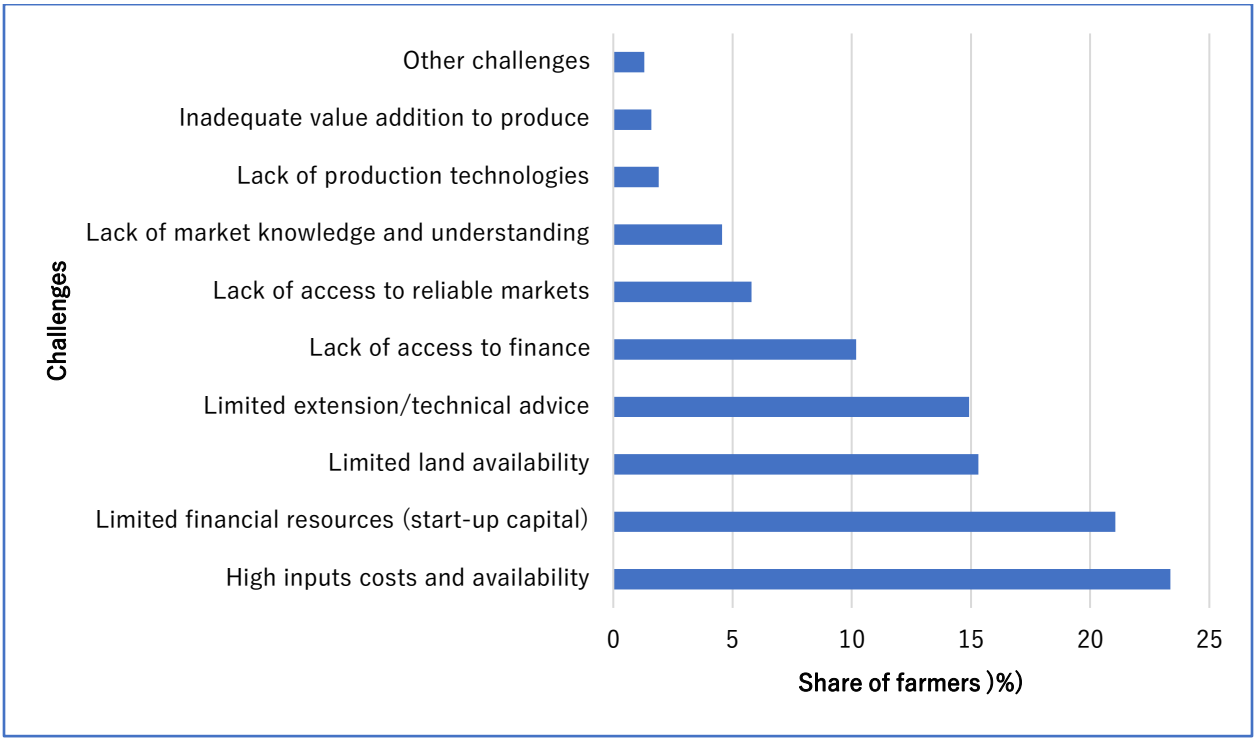
Statistical significance $^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Source: Computed from MRALS 2019 and Sub-set MRALS 2024

3.7. Perceived challenges hindering small-scale farmers to diversify and commercialize

The study also examined the critical barriers perceived by Malawian farmers that prevent them from diversifying and transitioning from subsistence-oriented agriculture to commercial agriculture (Figure 8). According to the results, the greatest barriers to agriculture diversification and commercialization are high input costs and availability (23.4%), limited start-up capital (21.1%), limited land availability (15.3%), limited extension or technical services (14.9%) and lack of access to finance (10.1%). These findings suggest the need for targeted inventions and policy support aiming to achieve a diversified and commercialized agriculture sector as stipulated in Malawi2063 vision.

Figure 7: Perceived Barriers to Agriculture Diversification and Commercialization



Source: Subset MRALS 2024

4. Summary and policy implications

Agricultural diversification and commercialization are widely seen as effective strategies for increasing household income, reducing poverty, and improving food and nutrition security. Using the MRALS datasets, the study aimed to investigate changes in diversification and commercialization levels among smallholder farmers in Malawi, as well as to identify the drivers, barriers, and impacts. The study reveals that the level of diversification among the farmers is medium, but there has been a decline in diversification between 2019 and 2024. This shift could have implications for farm resilience and resource allocation. Similarly, the findings reveal that the level of commercialization among small-scale farmers in Malawi varies widely, ranging from 0% to 77%. On average, farmers exhibit semi-commercial levels of commercialization, with an overall mean increase from 27% in 2019 to 35% in 2024, which suggests progress towards more market-oriented farming practices.

The study also indicates that agriculture diversification and commercialization among farmers are driven by several key factors that play a critical role in the decision-making process. These include gender of the head, education of the household head, distance to extension office, access to credit, ownership of livestock, the size of land under cultivation, engagement with crop extension services, the utilization of hybrid seeds, inorganic fertilizers and organic fertilizers. Understanding and leveraging the linkages between agriculture diversification, commercialization, and food and nutrition security is crucial for devising effective and comprehensive strategies that support smallholder farmers. Our study further reveals that agriculture diversification positively and significantly influences dietary diversity, household income and asset values. Further, the results show that a higher level of agriculture commercialization is positively and significantly associated with high household dietary diversity, income, and asset value possession.

In view of this, the findings have a number of context-based policy implications for enhancing agriculture diversification and commercialization among smallholder farmers in Malawi. These include:

Expedite the development or finalization of the agriculture diversification strategy: The government needs to develop and implement policies and strategies that promote inclusive agriculture diversification and commercialization in the country. For instance, the government commenced the development of an agriculture diversification strategy. However, the process has been delayed. Hence, there is a need to expedite the finalization process.

Encourage farmers to diversify towards high-value commodities: Smallholder farmers in Malawi can take advantage of the policy support for the diversification and commercialization of agriculture. Our results show that diversification among farmers is more subsistence or low-value crops oriented. The government is implementing initiatives and programs such as the Agriculture Commercialization Project (AGCOM) and the Shire Valley Transformation Programme (SVTP) that are promoting commercialization; as such, farmers should be encouraged to diversify toward high-value commodities such as fruits, meat, dairy, fish, macadamia and legumes.

Raise awareness of the incentives and financing opportunities for agriculture diversification and commercialization: The Government of Malawi recently launched the "Government of Malawi Incentives for Agriculture Diversification and Commercialization booklet", which highlights the fiscal and non-fiscal incentives and financing opportunities provided by the government and available in the agriculture sector. There is a need for deliberate efforts by various stakeholders to disseminate this information to smallholder farmers through various platforms, including farmer field days and agricultural shows, national and community radios, and training workshops, among others.

Improve smallholder farmers' access to productive assets and financial resources: Our study has established that the extent of land under cultivation positively influences smallholder farmers' decisions to diversify or commercialize their agriculture activities. Additionally, we have found that limited access to land and financial resources, including credit and start-up capital, poses significant challenges to farmers' ability to diversify and commercialize. The finding highlights the critical need to enhance farmers' access to land and financial resources, as they are essential for expanding their farming operations and enabling them to invest in or adopt more diversified and commercialized farming practices.

Enhance access to or availability of extension services to farmers: There is a pressing need to enhance access to and the availability of extension services for farmers to support their efforts in diversifying and commercializing their agricultural activities. This can be achieved by increasing the number of trained extension officers and ensuring they are well-equipped to provide relevant and timely advice. Leveraging modern tools such as information and communication technologies (ICTs) to provide timely and tailored agricultural advice directly to farmers can also facilitate the dissemination of information and best practices to a broader audience. Additionally, creating community-based extension programs can foster peer learning and support among farmers. By improving the reach and quality of extension services, farmers will be better equipped to adopt new crops and farming techniques, ultimately leading to increased productivity, higher incomes, and more resilient agricultural systems

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ANNEXES

Table A1: Household Demographic Characteristics

	2019		2024	
Variable	Mean	SD	Mean	SD
Age	43.78	15.81	49.02	15.64
Household size	5.11	2.17	5.42	2.14
Household head is male	0.73	0.44	0.73	0.44
Ever attended school	0.91	0.29	0.90	0.30
Highest education qualification				
None	0.64	0.48	0.65	0.48
PSLC	0.16	0.37	0.16	0.36
JCE	0.11	0.31	0.10	0.30
MSCE	0.07	0.25	0.07	0.26
Diploma	0.01	0.08	0.01	0.07
Degree	0.00	0.04	0.00	0.05
Marital status				
Married	0.68	0.47	0.69	0.46
Polygamy	0.09	0.28	0.05	0.21
Separated	0.04	0.19	0.05	0.22
Divorced	0.08	0.28	0.05	0.23
Widowed	0.10	0.30	0.16	0.36
Never married	0.01	0.09	0.00	0.06
Region				
North	0.29	0.45	0.29	0.45
Central	0.46	0.50	0.46	0.50
Southern	0.25	0.43	0.25	0.43
District				
Mzimba	0.29	0.45	0.29	0.45
Kasungu	0.24	0.43	0.24	0.43
Mchinji	0.21	0.41	0.21	0.41
Blantyre	0.25	0.43	0.25	0.43
Number of observations	1,245		1,245	

Table A2: Household Socioeconomic Characteristics

	2019		2024	
Variable	Mean	SD	Mean	SD
Income sources				
Regular employment	0.10	0.30	0.08	0.27
Casual labour	0.56	0.50	0.50	0.50
Household enterprises	0.32	0.47	0.49	0.50
Gifts including remittances	0.11	0.32	0.11	0.31
Social cash transfers	0.03	0.18	0.03	0.16
Assets				
Value of durable assets	105,229	326,989	408,375	763,676
Value of productive assets	25,179	110,951	105,888	554,242
Distance to agricultural services				
Distance to boma	39.60	24.25	38.18	24.55
Distance to agro-dealer	11.05	11.62	9.67	8.91
Distance to ADMARC	10.75	11.77	11.00	10.91
Distance to the extension office	12.12	12.05	12.29	9.25
Distance to the tarmac road	11.72	12.67	12.88	15.80
Distance to the livestock market	12.86	12.96	10.05	10.97
Distance to tractor hire service	19.62	19.94	23.90	26.17

Table A3: Definition and Measurement of the Variables to be Used in the Econometric Model

Variable	Description and measurement	Expected sign (±)
Dependent variables		
COMPI	Commercialization index	
SDI	Diversification index	
Explanatory variables		
Age of HH	Age of the HH head	+
Gender	1 if HH head is male, 0 otherwise	+
Marital status	1 if the HH head is married, 0 otherwise	+
Household size	Total number of people living in the house	+
Literacy	1 if the household has formal education, 0 otherwise	+
Farming experience	The number of years of farming experience	+
Household income	Total income from both on-farm and off-farm activities	+
Off-farm income	1 if the household participated in off-farm activities, 0 otherwise	+
Hired labour	1 if the household has used hired labour, 0 otherwise	+
Main occupation	1 if farming is the main occupation, 0 otherwise	+
Landlord	1 if the household is a landlord, 0 otherwise	+
Land tenure	Status of household land ownership (1 if household inherited land, 0 otherwise)	+
Landholding size	Total and owned by the household in ha	+
Land fragmentation	Number of plots cultivated by the household	+
Mechanization level	Household level of mechanization using farm mechanization index (FMI)	+
Livestock hold	Number of livestock owned by the household in TLU[2]	+
Level of wealth	The total value of the assets owned by the household using an Asset-based wealth index	+
Association	1 if the household belongs to club, association or cooperative	+

[2] TLU=(1.0*Cattle)+(0.5*Donkey)+(0.2*Pigs)+(0.1*Goats)+(0.1*Sheep)+(0.03*Ducks/Turkeys/Geese)+(0.02*Rabbits)+(0.01*Poultry)

AIP beneficiary	1 if the household participated in AIP, 0 otherwise	+
Share of sales from crops and livestock	Share of crops/livestock sold	
Extension services	1 if the household has contact with an extension agent, 0 otherwise	+
Credit access	1 if the household has access to credit, 0 otherwise	+
Access to irrigation	1 if the household has access to irrigation, 0 otherwise	+
Access to transport	Household distance to an all-weather road (km)	+
Markets	1 If the household has access to formal or informal markets, otherwise	+
Access to market information	1 if the household had access to market information, 0 otherwise	+
Distance to closest main market (km)	The distance of the household to the nearest market (MK)	-
Distance to closest input source	Distance to input source e.g. fertilizers, seeds etc (km)	-
Distance to closest extension office	Distance to extension office (km)	-

Table A4: Diversification and Commercialization Indices Summary Statistics

	2019		2024	
Variable	Mean	Percent	Mean	Percent
SDI index	0.62	100.00	0.51	100.00
SDI index Categories				
Low	0.17	29.64	0.17	38.31
Medium	0.61	28.84	0.61	36.55
High	0.95	41.53	0.90	25.14
Percentile distribution value				
10	0.00		0.00	
25	0.44		0.33	
50	0.67		0.54	
75	1.00		0.79	
90	1.00		0.91	
Number of observations	1245		1245	
COMP index	0.27	100.00	0.35	100.00
COMP index Categories				
Low	0.00	55.69	0.00	43.49
Medium	0.30	15.2	0.30	18.97
High	0.77	29.11	0.78	37.54
Percentile distribution value				
10	0.00		0.00	
25	0.00		0.00	
50	0.00		0.25	
75	0.54		0.67	
90	0.88		0.93	
Number of observations	1079		1028	

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