




## Article

# Role of Policies, Stakeholder Programs and Interventions in Agricultural Diversification among Smallholder Farmers: A Case of Lilongwe District in Malawi

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**Abstract:** Globally, governments and agricultural organizations implement policies and programs reflected in interventions such as input subsidies, extension services for modern inputs and training, which either enable or hinder agricultural diversification. A study was carried out from 2016 to 2019 in Lilongwe district, Malawi, to determine the influence of policies, programs and interventions on agricultural diversification. The study was using a mixed-method sequential explanatory design. It involved a literature review, interviews with 424 male and female smallholder farmers, 35 demonstration plots on agricultural diversification, 27 focus group discussions with farmers, and 17 key informant interviews with stakeholder representatives. The literature review showed that the 2016 Malawi agricultural policy already prioritized agricultural diversification as it included a policy statement and policy objective on agricultural diversification. This study found that stakeholders, namely the Ministry of Agriculture, Total Land Care, National Smallholder Farmers Association of Malawi, School of Agriculture for Family Independence, and Trustees of Agriculture Promotion Program, were promoting agricultural diversification. They did it by (i) organizing farmers into groups for agricultural diversification activities, (ii) provision of extension advice, and (iii) providing inputs for different crops as well as livestock either for free, on pass-on, or through loans. However, interventions were on small scale, had not fully addressed hindrances to agricultural diversification, were mostly supply-driven, and the interventions themselves faced sustainability-threatening problems such as failure to pass on livestock and seeds. The agricultural policy was thus not sufficiently translated into widespread programs and interventions to foster improvement in agricultural diversification. As such, we suggest re-channeling of funding from promoting mono-cropping to agricultural diversification by broadening the crop and livestock focus of advisory services, enabling farmer organization initiatives and community engagement for farmers to solve most diversification challenges on their own.

**Keywords:** diversification promotion; intervention challenges; policy impact

## 1. Introduction

### 1.1. Background

Various soil types, local climates, and distribution of water resources give Malawi the possibility of producing different crops and livestock [1] in a large range, hence favorable conditions for agricultural diversification to prevail. Its level, however, is low as farming is dominated by maize (*Zea mays*) production [2]. As in the case and globally, economic incentives such as input subsidies, encourage the production of a few crops, coupled with the belief that mono-cropping is more productive than diversified systems. Such subsidies have been part of the hindrances in promoting agricultural diversification. Yet, agricultural diversification is one of the most rational and cost-effective methods for risk management and resilience to challenges such as pest outbreaks and climate variability, which affect crops differently. Diversification spreads the risk since the poor performance of one crop is compensated by other crops and livestock [3]. Agricultural policies, however, have failed to move from the Green Revolution era staple-cereal-crop-bias to being more crop type neutral, which would “create a level policy playing field” for agricultural diversification [4].

### 1.2. Research Objectives

There is limited research on agricultural policies, programs, and interventions, which relate to agricultural diversification [5,6]. This paper aims to fill the gap in understanding how better policies and programs can enable or bad policy hinder agricultural diversification. Malawi’s support for agricultural diversification in some agricultural policies and programs are compared to neighboring countries, namely Tanzania, Zambia, Mozambique, and Botswana. However, it was not known whether programs and interventions promoting agricultural diversification by government and non-governmental organizations (NGOs) were effective, especially in Lilongwe district, where we researched, and there in to achieve significant change in agricultural diversification. This leads us to ask our research question: Are the policies, programs, and interventions working at all? Why/why not? We hypothesize specifically that the existing policies, programs, and their aligned interventions have failed to address challenges, limiting agricultural diversification in the Lilongwe district because of a focus on maize mono-cropping, not recognizing nutrition security.

Lilongwe district is a low agricultural diversity area, located in central Malawi. The 2010/11 Integrated Household Survey results showed that farmers in Lilongwe Agricultural Development Division (ADD) grew a mean of 2.14 major crop species and scored a mean Simpsons Diversification Index (SDI) of 34.7% (0.347) which was lower than the national SDI of 39.9% [2]. With farmers’ focus on maize mono-cropping, it is expected that implementation of policies, programs, and interventions on agricultural diversification is likely to be challenging and need to address the low diversification effectively on the ground. To this effect, we used a mix-method approach to examine policies, programs, and interventions implemented by the government and NGOs as well as a university-led agricultural diversification intervention in Lilongwe under the project “Crops for Healthy Diets: Linking Agriculture and Nutrition (HealthyLAND)”. We also investigated the perceptions of stakeholders and farmers on factors hindering agricultural diversification in Lilongwe district, being representative as a case study for Malawi. The results showed that the prioritization of maize mono-cropping by farmers is artificially induced by government subsidies and maize-oriented extension service provision. The few agricultural diversification interventions were not accessed widely by farmers. The significance of these findings is that they highlight a need that extension services, input subsidies, and other input provision interventions should be re-designed and broadened to vigorously support agricultural diversification beyond rhetoric.

### 1.3. Agricultural Diversification Inclusion in Policies and Programs in Malawi

Prior to 2016, Malawi had no comprehensive agricultural policy but rather fragmented policies guiding the different agricultural sub-sectors. Some fragmented sub-sector policies are still operational, but under the umbrella of the 2016 National Agriculture Policy, a new

paradigm emerged. The 1996 Malawi Crop Production Policy aims “to get a balanced and diversified production of food and cash crops to meet the country’s requirements for food, foreign exchange, and raising rural incomes while maintaining the productive potential of the land” (p. 3) and specifically to ensure “diversification of both food and cash crops for food security, promoting import substitution of expanding exports while accommodating changing market conditions is increased” (p. 4) [7]. The 2004 Malawi Livestock Policy states that the “Government shall promote the conservation and utilization of the existing biodiversity among indigenous livestock breeds through deliberate selection (p. 11)” [8].

Though the 2016 Malawi National Agricultural Policy recognizes the importance of agricultural diversification and outlines policy statements, objectives, and strategies to enhance diversification, it has been weak as will be shown. Policy statement 3.1.7 reads “Provide incentives to farmers to diversify their crop, livestock, and fisheries production and utilization” while its corresponding policy objective reads “Improve the diversification of crop, livestock, and fisheries production in the country” (p. 38) [9]. On the other hand, Mozambique’s 2010 Strategic Plan for Agricultural Development [10], Tanzania 2013 National Agriculture Policy [11], and Zambia’s 2016 Second National Agriculture Policy [12] do not have policy statements and policy objectives on agricultural diversification at all. Therefore, at the policy level, Malawi, it seems, has placed a high priority on agricultural diversification compared to its neighboring countries.

Historically, there have been major programs/projects in Malawi, having different effects on agricultural diversification. These include Lilongwe Land Development Program (LLDP), National Rural Development Program (NRDP), Farm Income Diversification Program (FIDP), and input subsidies whose details are outlined below. For instance, LLDP, 1967–1981, was a crop extension program aiming at increasing productivity and production. It was supported by integrated complementary activities such as credit and marketing [13]. Based on its design, the program did not propagate a more diverse farming system, such as widespread integration of crop and livestock production among farmers in the Lilongwe district [14].

The NRDP, launched in 1978, aimed to improve crop yields (maize and other crops), thereby maintaining self-sufficiency in staple foods, expand agricultural exports and increase smallholder income. In reality, and in contrast to policy statements, cropping patterns under NRDP were dominated by maize and tobacco (*Nicotiana tabacum*), especially in the Lilongwe district [15]. The FIDP, 2007–2009 and 2010–2014 envisaged to increase and diversify income sources for farmers on crops, livestock, forest, and off-farm income through the provision of extension services, credit, and processing equipment. As a result, some diversification towards livestock production was recorded among program participants. Consequently, the share of income from livestock increased while the share of off-farm income was reduced [16].

Regarding historical large-scale agricultural programs, Malawi’s literature cited in this paper is consistent with findings from Botswana. In Botswana, the Arable Lands Development Program (ALDEP) and the Accelerated Rain-fed Arable Program (ARAP), which supplied free capital and operating inputs to farmers focusing on grain production, did not foster agricultural diversification as much as the Financial Assistance Policy (FAP), which promoted non-traditional agriculture (including horticulture, dairy, and poultry) through investment grants for venturing into productive agricultural activities in the 1980s and 1990s [17]. The focus of ALDEP and ARAP for Botswana of the past was similar to Malawi’s Lilongwe Land Development Program (LLDP) and the National Rural Development Program (NRDP), which similarly failed to promote agricultural diversification owing to their non-diversification oriented design and failure to allow farmers to demand agricultural enterprises of their choice. Botswana’s FAP had similar features to Malawi’s Farm Income Diversification Program (FIDP), which was more flexible by allowing farmers to engage in enterprises of their choice and resulted in diversification from grain production to livestock production among participating farmers.

Since 2011, the Government of Malawi has implemented projects guided by prioritized and harmonized investment frameworks, namely the 2011–2015 Agriculture Sector Wide Approach (ASWAp) and later the 2017–2023 National Agricultural Investment Plan (NAIP). According to the Government of Malawi [18], the ASWAp identified three focus areas, namely (i) food security and risk management, (ii) commercial agriculture, agro-processing and market development, and (iii) sustainable agricultural land, and water management. The approach transitioned to a six-year plan with less focus on food security and risk management, i.e., the NAIP, which has four program areas, namely (i) policies, institutions, and coordination, (ii) resilient livelihoods and agricultural systems, (iii) production and productivity, and (iv) markets, value addition, trade and finance [19]. While the agricultural policy said something about agricultural diversification through a policy statement in the 2016 National Agricultural Policy, [9], the commitment to invest in agricultural diversification was not demonstrated; it failed, at a high level since the 2017–2023 NAIP [19] has no real program area on agricultural diversification. Food security, defined by the 1996 World Food Summit as “all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” [20], could be achieved under agricultural diversification since multiple crops and livestock types provide diverse nutrients, unlike maize mono-cropping which provides a limited number of nutrients despite providing large quantities of food.

Malawi has implemented seven farm input programs since the 1970s, all of which have been dominated by inputs for maize. The input programs were: (i) agricultural input subsidy program (1970 to 1995)–subsidized maize seed and inorganic fertilizer for smallholder farmers; (ii) supplementary input program (1995 to 1997)–distributed maize seed and fertilizer to vulnerable households; (iii) starter pack program (1998 to 1999)–universal distribution of maize seed and inorganic fertilizer to smallholder farmers; (iv) targeted input program (2000 to 2004)–targeted distribution of maize seed and inorganic fertilizer; (v) extended targeted input program (2005)–expanded targeted distribution of maize seed and inorganic fertilizer; and (vi) farm input subsidy program (from 2006 to 2019)–targeted voucher-based seed and fertilizer subsidies [21]. The farm input subsidy program in 2020 was transformed to the “affordable input program (AIP)”. According to the Government of Malawi [22], the now replaced farm input subsidy program targeted 900,000 to 1,500,000 farmers, while the new affordable input program aims to provide improved maize seed and inorganic fertilizer to all 4,279,000 farming households registered.

Expenditure on maize has dominated Malawi’s public budget for the agricultural sector, accounting for an average of 71% of the public expenditures on agriculture from 2006 to 2013 [23]. While the subsidies have (at times) included subsidies for other crops, these components have been very small compared to maize [24]. The choice of the crops to be subsidized was supply-driven rather than demand-driven since the government made such decisions without consulting the farming clientele. Consequently, with the production incentive for maize through subsidies, farmers allocated less land to other crops such as groundnuts (*Arachis hypogaea*), soybeans (*Glycine max*), and common beans (*Phaseolus vulgaris*) [25], vegetables, and other food crops, which are needed to achieve nutrition security and combat hidden hunger. Maize is equated to food and at times food security in Malawi. The slogan of “eating three times a day” is based on estimates of a bumper harvest of maize due to AIP [22]. Nevertheless, some studies have reported increases in crop diversity as a secondary effect of farm input subsidies that seemed to help to raise maize productivity and enabled farmers to meet their maize requirements; the idea is that it releases the remaining land for other crops [26,27]. Finally, note that the current dominance of maize in the agricultural budget by the Government of Malawi mirrors Zambia. In Zambia, the government reserves more than 50% of the Ministry of Agriculture budget for input and output subsidies, mainly aiming at the production and marketing of maize [28,29]. Therefore, we wanted to understand why this policy was developed and what are the implications?

## 2. Materials and Methods

### 2.1. Study Design and Setting

A mixed-method study, using a modified mixed-method sequential explanatory design, was conducted in Lilongwe district, Malawi. This was through a case study field survey (base- and end-line survey), an intervention, a review of literature on policies and programs in agriculture, focus group discussions, and key informant interviews (Figure 1). The baseline and end-line surveys were conducted to determine farmers' access to agricultural diversification interventions, levels of practice of agricultural diversification, and their household characteristics. The sub-sample field survey was conducted to complement information on the level of agricultural diversification by field observations and to probe more whether the farmers received specific advice for the different crops that they grew. Key informant interviews were conducted to get details of the interventions implemented by stakeholders and their perceptions on why the levels of diversification remained low despite their interventions, as well as their reaction to the HealthyLAND project agricultural diversification intervention. Focus group discussions (FGDs) were implemented to get farmer perspectives on why the levels of diversification were low and the farmers' reaction to the HealthyLAND project intervention. The key informant interviews and FGDs were, thus, conducted at the end as they had to be conducted after the completion of the HealthyLAND project intervention.

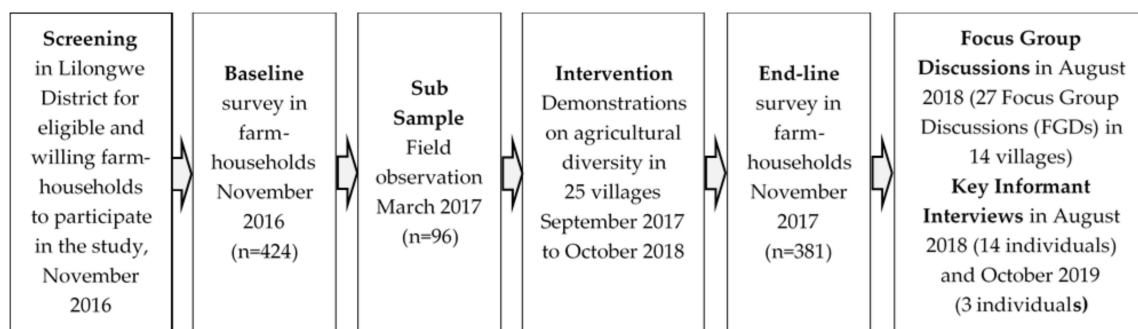


Figure 1. Study flow diagram.

### 2.2. Sampling

Proportional probability sampling was conducted to select three sections per Extension Planning Area (EPA) and three villages per section. A list of all households in the sampled 36 villages was obtained from Lilongwe District Agriculture Office. Simple random sampling was used to sample 424 households with children below five years at baseline in 2016. From the baseline sample, 381 households also participated in the end-line survey in 2017. FGD participants were randomly sampled from the 424 households in 14 out of the 36 villages. Key informant interview stakeholders were drawn purposively from a list of stakeholders, working in the study villages in the EPAs. Table 1 indicates the distribution of participants of the baseline survey, sub-sample field observation, demonstrations, end-line, FGDs, and key informant interviews in the Lilongwe district.

### 2.3. Agricultural Diversification Intervention

The Crops for Healthy Diets–Linking Agriculture and Nutrition (HealthyLAND) research project implemented several agricultural diversification demonstrations in Lilongwe District. The HealthyLAND project was implemented in Lilongwe district in Malawi by the Lilongwe University of Agriculture and Natural Resources (LUANAR) of Malawi with their partners from the Justus Liebig University Giessen, Germany, and the University of Hohenheim, Germany. The project was funded by the German Federal Ministry of Food and Agriculture (BMEL) with the support from the Federal Office for agriculture and food (ptble) (no. 2813FSNU02).

**Table 1.** Distribution of study participants in Lilongwe District.

Extension Planning Area (EPA)	Section	Village	No. of Baseline Survey Participants	No. of Subsample Participants	No. of Demonstration Sites	No. of End-Line Survey Participants	No. of Focus Group Discussions	No. of Key Informant Interviews
Chitsime	Mchesi	Tumbwe	12	0	1	11	0	-
		Kanthyoka	12	0	1	12	2	-
		Tanga	12	0	0	11	0	-
	Chamchere	Kalumba	12	4	1	9	2	-
		Kuchiswe	12	4	1	12	0	-
		Mwase	11	4	1	10	0	-
		Mbuna	10	4	1	10	0	-
	Nansunguzi	Ng'ozo	11	4	1	11	0	-
		Mphanyama	11	4	1	11	2	-
	Sub Total	3	9	103	24	8	97	6
Chiwamba	Gumulira	Chikhosi	13	4	1	12	0	-
		Chimatira	8	4	1	8	0	-
		Chinoko-Kawenga	12	4	1	9	2	-
	Mthyoka	Mthyoka	12	4	1	10	2	-
		Sadulira	12	4	1	10	0	-
		Kamgwanda	12	4	1	10	0	-
		Nkhalamba	12	0	1	8	0	-
	Mkachukwa	Mwadenje	12	0	1	12	2	-
		Lipalama	12	0	1	12	0	-
	Sub Total	3	9	105	24	9	89	6
Mpenu	Mlodza	Gubu	12	4	1	11	0	-
		Magalamula	12	4	1	11	2	-
		Chambala	12	4	1	11	0	-
	Kazizira	Mchenga	12	0	1	11	0	-
		Namlera	12	0	1	9	2	-
		Kazizira	12	0	1	11	0	-
		Chipwa	12	4	1	11	2	-
	Kamundi	Sokelere	12	4	1	11	0	-
		Lufeyo	12	4	1	12	0	-
	Sub Total	3	9	108	24	9	98	6
Malingunde	Mswera	Chiwale	12	4	1	10	2	-
		Dickson	12	4	1	11	0	-
		Sameta	12	4	1	12	2	-
	Kangamchaka	Mamina	12	4	1	10	0	-
		Chasowa	12	4	1	12	0	-
		Mdima	12	4	1	10	2	-
		Bwakatantha	12	0	1	9	0	-
	Chikulungunde	Gowera	12	0	1	11	1	-
		Mphunzi	12	0	1	12	2	-
	Sub Total	3	9	108	24	9	97	9
Total	9	36	424	96	35	381	27	17

The overall objective was to provide evidence for a positive correlation (link) between enhanced agricultural diversity (including agrobiodiversity and farming practices) and improved food and nutrition security. The project was implemented from 2016 to 2019. The project involved the collection of data on agriculture and nutrition and an agricultural intervention. The HealthyLAND agricultural intervention was implemented from September 2017 to October 2018 and hence was completed after the end-line study of the project. The HealthyLAND interventions thus started during the dry season of Malawi, which runs from May to early October while the rainy season runs from mid-October to April [30]. The agriculture intervention was conducted in line with preliminary findings of the baseline study, which showed that the farmers were not diversifying the crops they were growing. There was a need to promote crops that had high nutritive value. These would help to diversify existing diets, while, at the same time, offer economic benefit to the households.

The crops and varieties were specifically chosen by the researchers in the HealthyLAND project in accordance with nationally approved recommendations. Details on crops, tasks, and inputs for the agriculture intervention are outlined in Table 2.

There were no control villages as researchers assumed that proximity of the villages to each other would result in intervention spill-over effects. Frontline extension staff were designated as facilitators of the demonstrations, simulating the existing system whereby the government frontline extension staff are the major facilitators for agricultural demonstrations in Malawi. The interventions were implemented in 35 out of 36 villages

in the four EPAs. In the 36th village, farmers rejected the demonstrations, indicating that they had no land and time for the demonstrations. Households that participated in the interventions provided land and labor for demonstrations whilst seed and fertilizer were provided by the research project.

**Table 2.** Agricultural diversity demonstration crops, tasks, and inputs.

Field Demonstrations (on 0.2 Hectare Per Village)	Backyard Garden (on 0.01 Hectare Per Village)	Method Demonstration	Field Day	Inputs Provided Per Village	
Crop	Crop			Field Demonstration	Backyard Garden
Legumes: pigeon peas ( <i>Cajanus cajan</i> ), common beans; Tubers: sweet potatoes ( <i>Ipomoea batatas</i> ), cassava ( <i>Manihot esculenta</i> ); Fruits: papaws ( <i>Carica papaya</i> ), mangoes ( <i>Mangifera indica</i> ); Intercrops: maize and pigeon peas, maize and beans	Amaranthus ( <i>Amaranthus cruentus</i> ), black jack ( <i>Bidens pilosa</i> ), pumpkin ( <i>Cucurbita moschata</i> ), cat whiskers ( <i>Orthosiphon aristatus</i> )	Land preparation; planting; fertilizer application; weeding; banking; pest and disease management; harvesting	Soon after crop emergence; Before tasseling; Harvesting	Urea fertilizer 16.7 kg; NPK 23;21;0 + 4S fertilizer 16.7 kg; maize: 1 kg ZM 523 and 1 kg ZM423 common beans NUA 45 variety 1 kg; pigeon peas: Mwayiwathu Alimi variety 1 kg; cassava: Manyokola variety 4 5 kg bundles; sweet potatoes: Zonden (orange fleshed) variety one 8 kg bag; mangoes: 4 seedlings; papaw: 4 seedlings	Amaranthus: 10 g; cat whiskers 10 g; black jack 10 g; pumpkins 10 g.

#### 2.4. Instrumentation and Data Collection

A pre-tested semi-structured questionnaire, translated into the Chichewa language, was used for data collection during the quantitative surveys. A total of 15 enumerators were trained for one week during baseline, and one week during end-line to familiarize them with the questionnaire. For this study, the main occupation and gender of the household heads were descriptive data that were collected. The respondents were female farmers who grew at least one crop and had at least one child under five years of age at baseline in 2016, based on the requirements of the agriculture and nutrition components of the HealthyLAND project.

Data collected included government and NGO interventions on crop diversity, livestock diversity, backyard gardening and agroforestry and challenges faced in implementing the interventions, sources of extension services, most important agricultural advice/topic/service received, a household member who received extension service agricultural advice/topic/service being applied or used, farmer access to extension service per crop, were collected through quantitative surveys and field observations. Farmer perceptions and stakeholder perceptions on reasons for low crop and livestock diversity, low adoption of backyard gardening, and low practice of agroforestry were collected using focus group discussions while the data on stakeholder perceptions and interventions on agricultural diversification were collected using key informant interviews respectively. Quantities of field crops harvested under HealthyLAND demonstrations, and farmer and staff perceptions on HealthyLAND agricultural diversity demonstrations were documented by researchers and research assistants.

The advice farmers received at baseline did not include HealthyLAND project extension advice since HealthyLAND interventions were not yet implemented. The government extension workers disseminated extension advice on agricultural diversification obtained from HealthyLAND project researchers two months before the end-live survey (from September to November 2017).

### 2.5. Analytical Methods

Descriptive statistics such as frequencies, percentages, and cross-tabulations were used to analyze categorical quantitative data wherein means, standard deviations were generated for the continuous quantitative data. IBM SPSS Statistics for Windows version 22.0 was the software used to conduct quantitative data analysis. Qualitative data, such as perceptions collected through FGDs and key informant interviews, were analyzed through content analysis. Notes were taken during the key informant interviews and FGDs. Both, inductive and deductive approaches were used to come up with themes from the codes identified in the notes of the interviews and the data that were already quantitatively collected through baseline, sub-sample, and end-line surveys, respectively. Considering that the qualitative data were voluminous, information from individual key informant interviews and FGDs were subjected to latent rather than semantic analysis since it was not necessary to report explicit content of the data considering that the perceptions were recurring. The content analysis was conducted manually.

### 2.6. Ethical Consideration

Ethical approval was obtained from the Institutional Review Board of the University of Giessen in Germany (approval number 56/16) and the National Health Sciences Research Committee in Malawi (approval number 1686). Both approvals were obtained prior to the field activities of the study.

## 3. Results

### 3.1. Stakeholder Interventions on Agricultural Diversification

Table 3 presents interventions implemented on agricultural diversification from 2016 to 2018 in the Lilongwe district. The interventions were classified into (i) general, (ii) crops, (iii) livestock, (iv) backyard gardening, and (v) agroforestry. The interventions can be more broadly categorized into three: (i) farmer organization, (ii) advisory services, and (iii) input provision, although a mixture of the three categories of the intervention types were common. The interventions were implemented with varying degrees of success, considering that as much as the interventions were designed to solve problems affecting agricultural diversification, the interventions themselves met challenges/problems which are outlined in Table 3. It is also noted that stakeholder programs on backyard gardening were the least, perhaps due to complexity. Only the government, InterAid, National Smallholder Farmers Association of Malawi (NASFAM), and Total Land Care (TLC) had activities on backyard gardening, promoting nutritious crops.

One major intervention on livestock diversity was livestock pass-on. At first, a farmer was asked to give offspring to another farmer. This did not work due to high cases of defaulting to pass on the offspring. In the second modified model which NASFAM promoted, the farmer who received the livestock passed the mother livestock to another farmer, while retaining the offspring. In the third model, TLC identified secondary and tertiary beneficiaries in advance so that the primary beneficiaries had other farmers monitoring their livestock management for passing on. An agreement was signed between TLC, farmers, and chiefs to formalize the process of passing on the livestock.

Despite the prioritization of maize subsidization in Malawi's Government national budget (program), extension staff in the study sites of this research reported the presence of other high-level government projects such as the Agriculture Sector Wide Approach Support Project (ASWAp-SP) and Sustainable Agriculture Production Program (SAPP). All are designed to complement the government budget and included activities that went beyond maize, but recognition was low because more cash came with maize programs.



**Table 3.** Stakeholder interventions on agricultural diversity in Chitsime, Chiwamba, Mpenu, and Malingude Extension Planning Areas in Lilongwe district.

Diversity Category	Interventions	Implementing Organizations	Challenges on the Interventions
General	Organization of farmers into clubs, associations, and cooperatives for different agriculture commodities	Government, Farmers World, TAPP, NASFAM, TLC, SAFI, InterAid	
Crop	Training, demonstrations, and harmonized demonstrations on crop associations, mixed cropping, rotations, using crops such as groundnuts, soybeans, sunflower, pigeon peas, cowpeas, maize, sweet potatoes, beans birds eye chili, and paprika	Government (through ASWAp-SP) InterAid, Farmers World, TLC, SAFI	
	Provision of planting materials/seeds on a pass-on-basis and on loan	Government, SAFI, NASFAM	
	Establishment of seed banks	Government	
	Promotion of irrigation farming	Government, TLC	
Livestock	Buying of crops produced	NASFAM	
	Pass-on programs on rabbits, pigs, and chicken such as black australian breed	Government, SAFI, InterAid, NASFAM	Reluctance of farmers to pass on Selling livestock before passing on
	Livestock vaccination	Government, NASFAM, TLC, TAPP	Local vaccinators fail to re-stock vaccines
	Demonstrations and training modern livestock housing, livestock breeding, disease control, housing, and feeding	Government, TAPP, SAFI	Lack of implementation of the practices
	Dip tanks	Government	
	Linking livestock farmers to formal meat markets such as Nyama World	TLC	
	Provision of seeds such as amaranthus, black jack, tomato, onions, and papaws for free or pass on	Government, InterAid	Farmers do not make fences, do not water the gardens, and do not buy chemicals to control pests and diseases
Backyard gardening	Inclusion of backyard gardens in model villages	Government	
	Vertical gardening where the soil is put in sacks and vegetables are grown on the sides of the sacks	NASFAM	
	Domestic water recycling	NASFAM, TLC	
	Provision agroforestry tree seedlings such as <i>Tephrosia vogelli</i> , <i>Gliricidia sepium</i> , <i>Moringa oleifera</i> , <i>Acacia polyacantha</i> , <i>Faidherbia albida</i> , papaws ( <i>Carica papaya</i> ), guavas ( <i>Psidium guajava</i> ), and oranges ( <i>Citrus × sinensis</i> )	Government, (through SAPP, Land O Lakes, and ICRAF), TAPP, NASFAM, TLC, SAFI	Farmers sell the agroforestry tree seeds instead of planting.
	Establishment of agroforestry seedling nurseries	Government, TLC	Shortage of polythene tubes
Community woodlots	NASFAM	Uprooting of trees to plant in individual fields	

Table 3. Cont.

Diversity Category	Interventions	Implementing Organizations	Challenges on the Interventions
	Agroforestry tree demonstrations	Government	Livestock graze on the trees Local leaders not implementing by-laws to control grazing.
	Assisted regeneration of trees on the land that has no crops	TLC	

Note: ASWAp-SP = Agriculture Sector Wide Approach Support Project, ICRAF = World Agroforestry Centre, NASFAM = National Smallholder Farmers Association of Malawi, SAFI = School of Agriculture for Family Independence, SAPP = Sustainable Agriculture Production Program, TAPP = Trustees of Agriculture Promotion Program, TLC = Total Land Care.

In detail, extension methods used in the provision of advisory services for agricultural diversification listed in Table 3 are, by design, supply-driven types of extension methods. Demonstrations entail the dissemination of technologies and crops that are prioritized by researchers. We checked for the idea of “demand-driven”. Demand-driven extension methods were not mentioned by frontline extension workers who should be major promoters of diversification. Such demand-driven oriented methods that were not being used may include farmer field schools, field tours, clusters and *Ulimi wa Mndandanda* (belt farming), household approach, and plant clinics. The demand-driven extension approaches that can be utilized for promoting diversification are new, unlike demonstrations. Since fortnightly training sessions in EPAs were abolished by the government, frontline extension workers have no regular platform from which they can learn the new demand-driven extension methods which have proven to be a means of stimulating demand among farmers and catalyzing farmer participation in agriculture programs. Without the fortnightly training sessions, extension workers will remain incapacitated to implement demand-driven agricultural diversification policies, programs, and interventions.

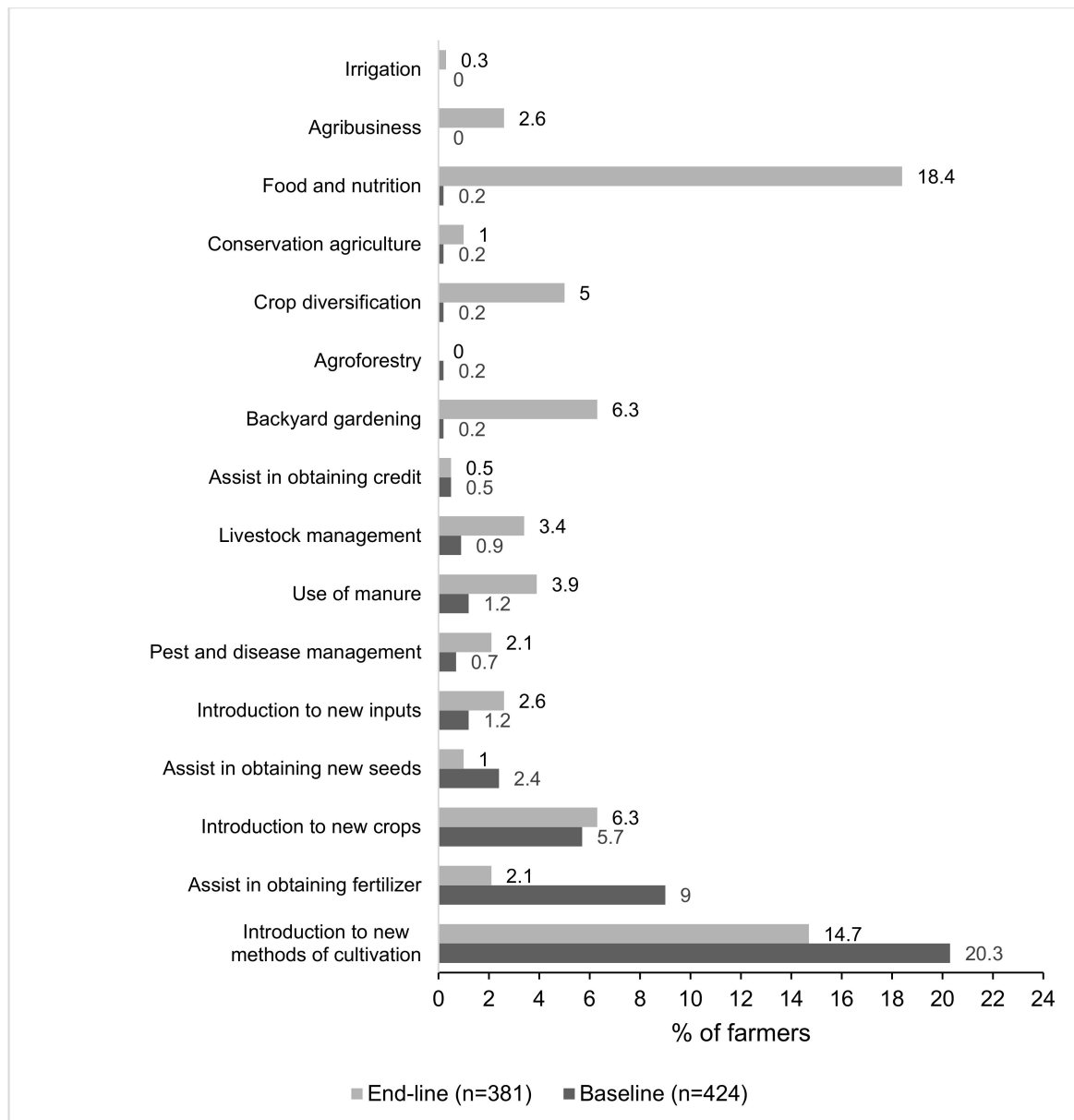
### 3.2. Farmer Access to Extension Advice and Implications on Agricultural Diversification

Extension services can play a major role in enhancing access to agricultural information, including agricultural diversification, designed for promotion among smallholder farmers. The extension services can be obtained from different sources, covering different topics and reaching different household members. In this study, farmers were asked to state the sources of extension services at baseline and end-line (Table 4). Government extension agents were the main source of agricultural extension services followed by the media. There was an increase in the number of farmers who reported having access to extension services at the end-line compared to baseline. This can be attributed to the HealthyLAND intervention, which engaged the farmers sampled for this study. However, not all farmers were reached by the extension services, including the HealthyLAND intervention since at the end-line, 27.6% of the farmers did not yet receive advice.

Table 4. Sources of agricultural advice reported by farmers.

Source of Agricultural Advice	Baseline <i>n</i> = 424	End-Line <i>n</i> = 381
	No. of Farmers (%)	No. of Farmers (%)
Government extension agent	88 (20.8)	216 (56.7)
NGO	19 (4.5)	33 (8.7)
Media (radio, newspapers)	16 (3.8)	33 (8.7)
Family, friends or neighbors, acquaintances	12 (2.8)	17 (4.5)
Farmer cooperatives/association	6 (1.4)	3 (0.8)
Input supplier	5 (1.2)	2 (0.5)
No advice received	292 (68.9)	105 (27.6)

Farmers received a wide range of messages and services from the extension service providers, which the farmers deemed to be most important (Figure 2). Some messages directly related to agricultural diversification such as the introduction of new crops, backyard gardening, agroforestry, crop diversification, and conservation agriculture.



**Figure 2.** Agricultural advice/topic/service received by farmers (%).

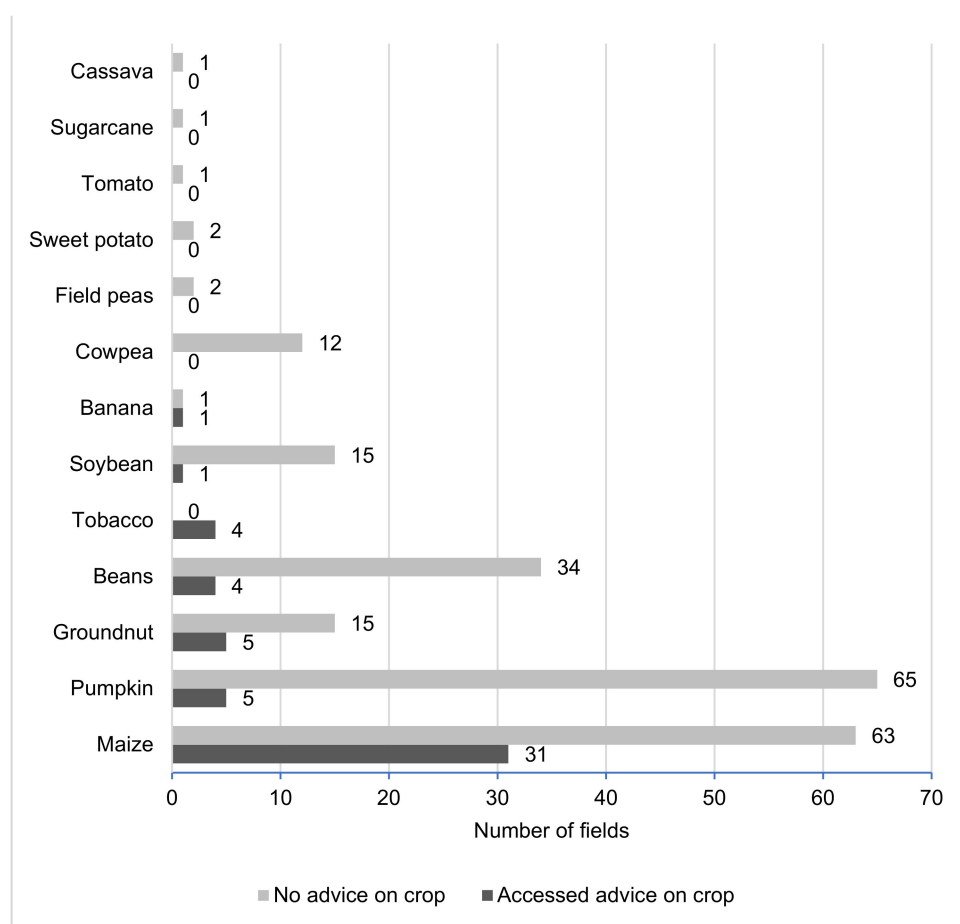
Table 5 presents the number of household members who received extension services. Both, male and female headed households, and spouses of male headed households received agricultural advice from the extension service providers.

During the sub-sample field observation (prior to HealthyLAND project intervention), fields of 96 farmers were visited, crops grown on those fields were identified and interviews were conducted regarding the extension advice received on the crops. Results are presented in Figure 3. The most common crop was maize, followed by pumpkins, beans, groundnuts, soybeans, and cowpeas. The rest of the crops were found in less than five fields of the 96 farmers visited. Farmers were asked if they received extension advice for each of the crops that were observed in their field. Farmers did not receive extension advice for most

of the crops that they grew, except for maize. Thus, extension service providers are putting more emphasis on maize production only, thereby undermining crop diversification. It is unclear whether it is due to own preference or lack of government instructions.

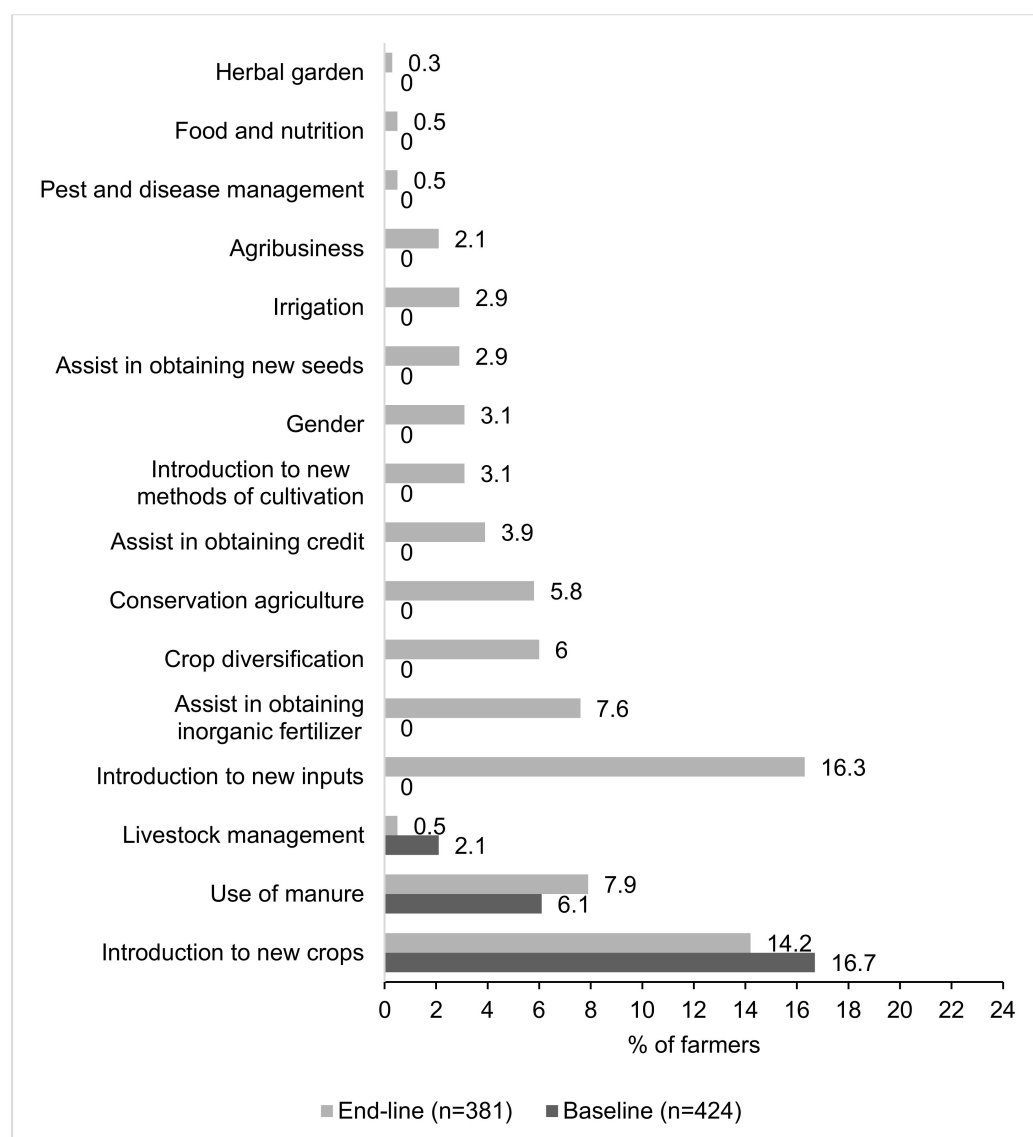
**Table 5.** Household members who received advice in male and female headed households.

Household Member Who Received Advice	Baseline <i>n</i> = 424		End-Line <i>n</i> = 381	
	Male Headed Households <i>n</i> = 325	Female Headed Households <i>n</i> = 99	Male Headed Households <i>n</i> = 294	Female Headed Households <i>n</i> = 87
	Number (%)	Number (%)	Number (%)	Number (%)
Household head	34 (10.5)	35 (35.4)	42 (14.3)	63 (72.4)
Spouse	46 (14.2)	-	121 (41.2)	-
Both household head and spouse	22 (6.8)	-	39 (13.3)	-



**Figure 3.** Farmer access to extension advice per crop observed during sub-sample field observation.

The pattern of application and use of agricultural advice and services provided by the extension service showed that farmers were interested to diversify crops (Figure 4). There was more application of extension advice and services at the end-line compared to baseline. Some of the advice and services directly related to agricultural diversification were actually applied by farmers at the end-line. Compared to the baseline, it included crop diversification, conservation agriculture, obtaining new seeds, irrigation, and herbal gardening. Farmers applied more advice on crop production than other categories. The main occupation of 53.8 percent of household heads was crop production



**Figure 4.** Application/implementation of agricultural advice/topic/service (%).

### 3.3. Changes in Diversification

According to measurements reported by Fatch et al. [31], the level of diversification among the HealthyLAND project participating smallholder farmers in Lilongwe was low since, at baseline, farmers grew a mean of 2.41 crop species in the rainy season, 0.56 crop species in the dry season, 0.60 fruit tree species and kept a mean of 0.98 livestock species. At the end-line, farmers grew a mean of 2.4 crop species in the rainy season, 0.74 crop species in the dry season, 0.78 fruit tree species, and kept a mean of 0.71 livestock species respectively. Statistically significant increases in specie diversification from baseline to end-line were only recorded in dry season crop species number ( $t = -2.071$ ,  $p = 0.039$ ) and fruit tree numbers ( $t = -3.867$ ,  $p = 0.000$ ) respectively. These findings suggest that there were no major increases in the level of agricultural diversification in the rainy season despite the interventions being implemented by various stakeholders in the area for crops. The only significant changes happened in the crops and fruit trees species in the dry season, which coincided with the period when HealthyLAND interventions started.

### 3.4. Performance of HealthyLAND Intervention on Agricultural Diversification

Table 6 presents quantities of field crops' produce that were harvested from the HealthyLAND demonstration plots. One extension worker used the individual approach

where the demonstrations were managed by individuals and not by the groups while all other extension workers entrusted the whole group to manage the demonstrations. Farmers, however, stated that they would have preferred if the inputs were given to them as individuals, not through groups. Communal backyard garden on the other hand was a challenge for the groups since it was difficult to water the gardens.

**Table 6.** Quantities of field crops harvested under HealthyLAND demonstrations.

Extension Planning Area (EPA)	Village	Approach Used Individual = I Group = G	Quantities of Crops (in kg) Harvested on Diversified 0.2 ha Plot Per Village				
			Maize	Beans	Pigeon Peas	Cassava	Sweet Potatoes
Chitsime	Tumbwe	G	100	30	48	0	0
	Kanthyoka	G	150	10	49	150	90
	Kalumba	G	143	18	27	101	53
	Kuchiswe	G	178	15	31	98	71
	Mwase	G	232	13	29	108	62
	Mbuna	G	164	14	28	120	78
	Ng'ozo	G	276	19	35	112	65
Chiwamba	Mphanyama	G	153	9	21	96	63
	Chikhosi	G	125	2.5	15	84	50
	Chimatira	G	100	5	14	98	78
	Chinoko-Kawenga	G	100	7	18	81	65
	Mthyoka	G	150	7	10	50	40
	Sadulira	G	90	4	12	60	50
	Kamgwanda	G	100	5	10	85	62
	Nkhalamba	G	300	13	25	98	80
	Mwadenje	G	150	7	30	105	85
	Lipalama	G	0	0	25	110	87
	Gubu	G	153	23	3.4	75	185
Mpenu	Magalamula	G	165	30	4.1	83	198
	Chambala	G	172	24	3.7	83	163
	Mchenga	G	100	3	3.8	74	131
	Namlera	G	100	2	5.1	119	236
	Kazizira	G	110	6	4.6	84	236
	Chipwa	G	0	0	0	0	136.9
	Sokelere	G	0	0	0	0	0
	Lufeyo	G	0	0	0	148.1	0
Malingunde	Chiwale	G	31	0	0	0	0
	Dickson	G	0	0	0	0	0
	Sameta	G	50	0	0	0	0
	Mamina	I	0	5	0	0	0
	Chasowa	I	0	0	0	0	0
	Mdimba	I	0	0	0	0	0
	Bwakatantha	G	0	0	17	0	0
	Gowera	G	0	0	10	0	0
	Mphunzi	G	0	0	13	0	0
		Mean		96.9	7.8	14.0	63.5
	Standard Deviation		82.9	8.8	13.8	49.7	68.4

Maize matured fast and was considered as high yielding by farmers. Some farmers were eager to buy the “best” maize varieties. Other farmers planted the harvested maize during the dry season since they were open pollinating varieties, hence could be recycled. The performance of the demonstrations was affected by dry spells in some areas, especially in Malingunde Extension Planning Area. Fall armyworms also affected the performance of the demonstrations. Some farmers were not willing to plant pigeon peas which are not a popular crop in the area.

Farmers also had fruit trees. Approximately 35% of the fruit trees that were planted survived, but no harvests were made during the time of harvesting the field crops because the fruits did not start flowering early. Farmers stated that HealthyLAND interventions showed them that it was easy to produce foods for the six food groups promoted by nutritionists in Malawi. Participants stated that it was also possible to save money used to buy relish for the households since the backyard gardens now provided a diversity of vegetables that were expensive on the market. Beans and pigeon peas were also cited as equally expensive, especially during the lean seasons.

Participating extension workers proposed that if such agricultural diversity intervention would be implemented in the future, there would be a need to increase the number of farmers hosting the demonstrations. Similarly, livestock should be included through a pass-on program to complete agricultural diversification. Additionally, backyard gardens should be implemented individually not in a group. Pit planting should be introduced as part of rainwater harvesting in combination with the agricultural diversification message to address the challenge of drought. Other crops such as sorghum and more fruit trees should be included.

### 3.5. Stakeholder Perceptions on Reasons for Low Agricultural Diversity

Government and NGO extension officers were asked after the end-line, during key informant interviews, to express their opinions on why agricultural diversity was low in the Lilongwe district. The perceptions/reasons for low agricultural diversity are presented in Table 7.

### 3.6. Farmer Perceptions on Benefits of Agricultural Diversity and Reasons for Low Agricultural Diversity

During the focus group discussions implemented after the end-line, farmers stated the benefits of agricultural diversification and the reasons why agricultural diversity was low in their area. They also expressed their own concern over the low level of agricultural diversity over the years.

**Table 7.** Reasons for low agricultural diversity perceived by stakeholders.

Diversity Category	Reasons for Low Diversity Perceived by Stakeholders
Crop	<p>Government research and extension systems favored maize production.  Farmers prioritized maize production because it was (considered) a staple food.  Markets for most crops are not well developed, hence prices mostly low.  Limited land to include more crops.  Farmer knowledge on intercropping was low, mostly grew crops in pure stand.  Certified seed of various crops species was not available on the market.  Free-range livestock grazing discouraged growing crops during the off-season.  Inadequate knowledge on non-conventional crops among 30% of extension workers.  Farmers were not very receptive to new crops.</p>
Livestock	<p>Lack of capital to buy and rear various species.  Poor livestock management resulting in pests and diseases such as Newcastle disease for chickens, foot and mouth disease for goats and cattle, and African swine fever in pigs.  Chemicals for controlling pests and diseases costly.  Dislike of some species such as rabbits and ducks by farmers.  Limited communal grazing land and limited capital for livestock feed.  Theft of livestock.  Overselling livestock due to high demand.</p>
Backyard garden	<p>Failure by farmers to source their own seed.  Preference by farmers to grow vegetables in wetlands, not backyard gardens.  Limited water sources.  Livestock grazing on plants.  Reluctance by men to build fences for backyard gardens.  Too much labor required.</p>

Table 7. Cont.

Diversity Category	Reasons for Low Diversity Perceived by Stakeholders
Agroforestry	<p>Agroforestry seedlings scarce and expensive.</p> <p>Inadequate knowledge among farmers to manage seedlings.</p> <p>High demand for trees (especially mango trees) to burn bricks.</p> <p>Fruits consumed by other people who pass by fields, hence less incentive to grow.</p> <p>Inadequate water to apply to citrus fruits.</p> <p>Inadequate farmer knowledge on health benefits of fruits.</p> <p>Most trees took too long to grow.</p> <p>Most farmers preferred inorganic fertilizers for instant results rather than soil fertility trees.</p> <p>Failure by farmers to buy own agroforestry tree seed.</p> <p>Agroforestry trees occupied land for other priority crops.</p> <p>Agroforestry trees canopy shaded priority crops.</p> <p>Fire destroyed soil fertility trees.</p> <p>Livestock grazed agroforestry trees.</p> <p>Most soil fertility tree seeds supplied did not germinate.</p> <p>25% of extension workers reported inadequate knowledge of soil fertility trees.</p>
General	Poor coordination of agricultural diversification initiatives at the national level.

Farmers stated that when they keep a few animal species, they lose all their livestock when a species is attacked by a serious disease. Goats increased in numbers over the past 10 to 20 years in the villages due to their relatively better disease resistance. Some farmers preferred chicken over other livestock because it was easy to buy and multiplied quickly. Moreover, chicken can also be kept in the dwelling house. Rabbits, guinea fowls, turkey, or guinea pigs were kept less by farmers over time.

Thereafter, farmers gave reasons for the low agricultural diversity. The reasons were largely similar to the ones given by the key informants (stakeholders), although the farmers did not agree that they had inadequate knowledge on the benefits of agricultural diversification as pointed out by the stakeholders (Table 7). Farmers also gave some additional reasons for the low agricultural diversity. The additional reasons are provided in Table 8 below.

Table 8. Reasons for low agricultural diversity perceived by farmers.

Diversity Category	Reasons for Low Diversity Perceived by Farmers
Crop	<p>Intercropping not preferred because it resulted in poor performance of the crops.</p> <p>Some crops such as bananas almost disappeared in the area due to pests and diseases such as banana bunchy top disease.</p>
Livestock	<p>Diseases that affected livestock diversity included blindness of livestock, ticks, wounds for rabbits, jiggers, swelling of legs of livestock, swelling of necks in livestock, abnormal release of saliva by cows, swine flu, stomach worms.</p>
Backyard garden	<p>Houses for different people in most villages were built close to each other, hence there was no land left to make backyard gardens.</p> <p>Predation of chicken and goats by dogs.</p>
Agroforestry	<p>No good markets for fruits.</p> <p>Termites ate the tree seedlings.</p>

Note: Table 8 contains only reasons not mentioned by stakeholders as outlined in Table 7.

#### 4. Discussion

For meaningful agricultural diversification and its promotion at the frontline level, national policies, and programs, as well as NGO projects, should be translated into robust interventions accessible to the farming community. They should, at the same time, address the problems hindering agricultural diversification at the farmer, institutional and cross-institutional levels. Miah and Haque [32], categorize problems that farmers face in



agricultural diversification as (i) production, (ii) marketing, and (iii) social. The discussion of the results of this study is divided as follows:

- analysis of the supply-driven design of the stakeholder programs in covering major components of agricultural diversification namely crops, livestock, backyard gardening, and agroforestry,
- analysis of the robustness of the three-pronged intervention approach (farmer organization, extension advice, and input provision) in solving the multifaceted (production, marketing, social) problems hindering agricultural diversification,
- analysis of farmer access to services rendered in promotion of agricultural diversification,
- examination of capacitation of extension workers to promote agricultural diversification, and
- examination of national and local level stakeholder coordination and networking on agricultural diversification.

Stakeholder programs covering major components of agricultural diversification, namely crops, livestock, backyard gardening, and agroforestry were not demand-driven but rather supply-driven. The supply-driven nature of interventions on agricultural diversification in Lilongwe was a result of two major factors. First, the design of the programs which brought the interventions was rigid in such a way that only prescribed interventions were implemented. One such example was a mismatch of the crops or livestock chosen by the implementing organizations versus farmer preferences. Second, organizations may have wanted to see specific changes in the villages being attributed to them such as specific livestock breeds or crop species that may not be promoted by any other organization in the area. The organizations respond to the needs of the financiers rather than the needs of the farmers.

All this is contrary to Malawi's extension policy which encourages demand-driven agricultural extension services [33]. Farmers tend to be more committed to participate in interventions and adopt the technologies and practices promoted if the approach is demand-driven. Lin [3] recommends the participatory development of interventions on agricultural diversification between stakeholders and farmers. In the end, the rhetoric of agricultural diversification in the policies is not matched with the uptake of agricultural diversification because farmers cannot identify with the interventions brought about by the government and NGOs as they are supply-driven.

The three-pronged intervention approach (farmer organization, extension advice, and input provision) partly solved the multifaceted (production, marketing, social) problems, hindering agricultural diversification at the farmers' level. The major approach in interventions on agricultural diversification by government and NGOs in Lilongwe district was the provision of inputs of diverse agricultural products for free or on loan or through pass-on programs. Extension message dissemination and training were conducted to accompany the inputs to build the capacity of the farmers, although they were overshadowed by extension messages for maize. These interventions were mainly targeting the production-related problems, hindering agricultural diversification at the farmer level. We called the programs supply-driven and farmers are left with an equation of "productivity increase in maize is food security".

Marketing and social problems were equally not addressed. The farmer organization intervention had the potential to solve the market problems hindering agricultural diversification at the farmer level. The organizations promoting agriculture in Lilongwe, however, did not have robust interventions to address social hindrances to agricultural diversification. Problems of theft of crops and livestock, gender issues in backyard gardening including failure by men to provide labor for fencing were not addressed. Social remedies which would deter owners of goats from releasing their goats on free-range grazing as soon as major crops were harvested were also not put into consideration. Failure to address these social problems pointed to limited community engagement. Some of the problems could have been better solved by engaging community members who were not members of the agricultural diversification farmer groups. Thus, there is a need to change from the

three-pronged intervention approach (farmer organization, extension advice, and input provision) to a four-pronged intervention approach (farmer organization, extension advice, and input provision, plus community engagement) to address the production, marketing, and social hindrances to agricultural diversification.

An analysis of farmer access to services rendered in the promotion of agricultural diversification shows that farmers did not have enough access to the services. Judging by the proportions of farmers who accessed the extension services, this was indeed limited. This was against the background that farmers were generally receptive to the interventions and were able to identify the benefits of the diverse agricultural enterprises promoted to them. The compliments made by farmers to the interventions implemented by the HealthyLAND project were a witness to the positivity of farmers to make promotion demand-driven. In addition, the most widely used message by farmers was on introduction to new crops which means that farmers were willing to diversify from the currently limited crop portfolio. Stakeholders, however, did not adequately take advantage of the clientele that were receptive to agricultural diversification services. What was evident, was that the interventions were done at a small scale. This was verified by the low access to the services by the farmers. The small-scale interventions could be a result of financial limitations for the organizations that promoted agricultural diversification and the tendency to increase the area of coverage thereby reducing the support given to individual households. In the end, the farmers do not get services such as training and inputs that would assist them to meaningfully diversify.

Apart from the production, marketing, and social problems which would be solved by direct stakeholder/farmer interactions, other challenges were institutional that required improvement of the stakeholders themselves. There were cases of inadequate knowledge among extension workers on non-conventional crops. Extension workers were thus deprived of opportunities to broaden knowledge about the diversity of crops and livestock, particularly those in the government. This was so because there was no regular contact between the frontline extension staff and specialists at the district level who had the knowledge and would be better placed to technically backstop the frontline extension staff. Fortnightly training sessions which used to provide a platform for the passing of knowledge to frontline extension staff were rarely conducted in the Extension Planning Areas hence the extension staff lacked refresher and booster training. It is imperative to re-tool frontline extension staff with knowledge on demand-driven technology dissemination extension methods, farmer organization skills, community mobilization techniques, and to enable the frontline extension staff to have access to resources such as demand-driven diversified inputs which they can provide to farmers alongside agricultural advice.

What is also needed is better national and local level coordination and networking on agricultural diversification. It could best be achieved if there was a taskforce or network that would bring the agricultural diversification stakeholders together, there to share lessons and innovate. As identified by the key informants in this study, such a body did not exist in Malawi. According to Labeirie et al., [34], the lack of meaningful coordination and networking on agricultural diversification at national and local levels is a widespread global problem and where such networks exist, the composition of the platforms is not holistic as they exclude crucial stakeholders such as farmers. However, such coordination and networking platforms have immense potential since they could bring sociologists, ecologists, farmers, and other professional types together thereby improving agricultural diversification management and governance. Some of the challenges hindering agricultural diversification (such as failure to reach more farmers with extension services on agricultural diversification) may not be solved by individual stakeholders but rather combined efforts of all stakeholders are needed.

## 5. Conclusions and Recommendations

This study provided evidence from Lilongwe District that policies, programs, and interventions in Malawi coordinated by the government did not trigger the wanted change

from maize mono-cropping to agricultural diversification among smallholder farmers. The policies, programs, and interventions embarked on were supply-driven, inadequate to reach all farmers, and failed to address social problems such as theft of crops and livestock. The reason why almost no-demand-driven aspects were included was that frontline staff in the government were not capacitated to promote demand-driven agricultural diversification. As well, stakeholders promoting agricultural diversification did not coordinate and network adequately. However, the HealthyLAND project intervention on agricultural diversification showed that it was possible to influence farmer appreciation of the importance of agricultural diversification within a short period. This was possible primarily because the HealthyLAND project followed the concept of need detection.

The promotion of agricultural diversification can be intensified if extension officers get the support that they need in terms of refresher training. Farmers should have access to the extension officers, farmers should be organized into robust farmer groups, and if seeds and other inputs are available, they will respond. This would be in line with the Malawi agricultural policy which prioritizes agricultural diversification unlike agricultural policies of neighboring countries namely Tanzania, Zambia, and Mozambique, i.e., if it goes beyond paper-based statements. In the end, the agricultural policy may signal a high-level shift from maize-based agriculture in Malawi towards agricultural diversity if it is embedded in local concerns. Yet, currently, farmers do not have sufficient access to services that can enable them to diversify agriculture.

The results of this study have a profound implication on policy and practice regarding agricultural diversification. Policies and stakeholder programs should prompt and support the improvement of the extension system such that frontline extension workers should increase interface with farmers and other community members. Diversity should become a message per se. The message should be extended to the agroecological benefits of agricultural diversity. To holistically address challenges faced in agricultural diversity, social problems should be addressed through community engagement. Interventions for agricultural diversity should cover all components of agricultural diversification, notably backyard gardening and agroforestry. The interventions should be flexible, and demand-driven. Frontline extension staff should be capacitated with the knowledge to promote both conventional and non-conventional crops and livestock through platforms such as fortnightly training sessions. There is a need for organizations promoting agricultural diversification to share best practices relating agroecology to efforts for improving interventions such as pass-on programs. This can be done through the creation of a national taskforce on agricultural diversification which will then lobby for agricultural diversification at policy and implementation levels.

A study must be conducted to document further progress in the promotion of agricultural diversification under the 2016 Malawi agriculture policy in case new programs and interventions are instituted to implement the policy. The study should be implemented in various districts in all three regions of Malawi, engaging more farmers and more stakeholders in both interviews and demand-driven agricultural diversification interventions.

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## References

1. Benson, T.; Mabiso, A.; Nankhuni, F. Detailed Crop Suitability Maps and an Agricultural Zonation Scheme for Malawi: Spatial Information for Agricultural Planning Purposes. In *Feed the Future Innovation Lab for Food Security Policy Research Papers 259052*; Michigan State University: East Lansing, MI, USA, 2016. [CrossRef]
2. Kankwamba, H.; Kadzamura, M.; Pauw, K. How diversified is cropping in Malawi? patterns, determinants and policy implications. *Food Secur.* **2018**, *10*, 323–338. [CrossRef]
3. Lin, B.B. Resilience in agriculture through crop diversification: Adaptive management for environmental change. *BioScience* **2011**, *61*, 183–193. [CrossRef]
4. Pingali, P. Agricultural policy and nutrition outcomes getting beyond the preoccupation with staple grains. *Food Secur.* **2015**, *7*, 583–591. [CrossRef]
5. Berti, P.R.; Jones, A.D. Biodiversity's contribution to dietary diversity: Magnitude, meaning and measurement. In *Diversifying Food and Diets: Agricultural Biodiversity to Improve Nutrition and Health*; Franzo, J., Hunter, D., Borelli, T., Mattei, F., Eds.; Routledge Earthscan: London, UK, 2013; pp. 186–206.
6. Snapp, S.S.; Fisher, M. "Filling the maize basket" supports crop diversity and quality of household diet in Malawi. *Food Secur.* **2015**, *7*, 83–96. [CrossRef]
7. Government of Malawi. *Crop Production Policy*; Ministry of Agriculture: Lilongwe, Malawi, 1996.
8. Government of Malawi. *Policy Document on Livestock in Malawi*; Ministry of Agriculture: Lilongwe, Malawi, 2004.
9. Government of Malawi. *National Agriculture Policy*; Ministry of Agriculture, Irrigation and Water Development: Lilongwe, Malawi, 2016.
10. Government of Mozambique. *Strategic Plan for Agricultural Development PEDSA 2010 to 2019*; Ministry of Agriculture: Maputo, Mozambique, 2010.
11. Government of Tanzania. *National Agriculture Policy*; Ministry of Agriculture, Food Security and Cooperatives: Dar es Salaam, Tanzania, 2013.
12. Government of Zambia. *Second National Agriculture Policy*; Ministry of Agriculture and Ministry of Fisheries and Livestock: Lusaka, Zambia, 2016.
13. Kinsey, B.H. Integrated rural development, agricultural growth and equity in Malawi: Redefining development strategies and tactics for the 1980s. *Agric. Adm.* **1984**, *15*, 45–63. [CrossRef]
14. Lele, U. Designing rural development programs: Lessons from past experiences in Africa. *Econ. Dev. Cult. Chang.* **1976**, *24*, 287–308. [CrossRef]
15. World Bank. *Malawi National Rural Development Program Phase 1 Project Completion Report*; The World Bank: Washington, DC, USA, 1987.
16. Chirwa, C.W.; Makoka, D.; Maonga, B.B.; Ng'ong'ola, D.H. Impact of Malawi's Farm Income Diversification Programme on Household Welfare: Empirical Evidence from Eleven Districts. In *Malawi Strategy Support Program*; Working Paper 20; International Food Policy Research Institute (IFPRI): Washington, DC, USA, 2017.
17. Seleka, T.B. *Challenges for Agricultural Diversification in Botswana under the Proposed SADC-EU Economic Partnership Agreement (EPA)*; Working Paper 27; Botswana Institute for Development Policy Analysis (BIDPA): Gaborone, Botswana, 2005.
18. Government of Malawi. *Malawi Agricultural Sector Wide Approach: A Prioritised and Harmonised Agricultural Development Agenda: 2011–2015*; Ministry of Agriculture, Irrigation and Water Development: Lilongwe, Malawi, 2011.
19. Government of Malawi. *National Agricultural Investment Plan (NAIP): Prioritised and Coordinated Agricultural Transformation Plan for Malawi from 2017/18 to 2022/23*; Ministry of Agriculture, Irrigation and Water Development: Lilongwe, Malawi, 2018.
20. Food and Agriculture Organization—FAO. *Food Security, Policy Brief Issue 2*; FAO: Rome, Italy, 2006.
21. Food and Agriculture Organization—FAO. *Malawi Country Fact Sheet on Food and Agriculture Policy Trends*; FAO: Rome, Italy, 2015.
22. Government of Malawi. *Ministerial Statement on the Affordable Inputs Programme Delivered to the National Assembly by Honourable Lobin Lowe, Member of Parliament, Minister of Agriculture 8 September 2020*; Ministry of Agriculture: Lilongwe, Malawi, 2010.
23. Food and Agriculture Organization—FAO. *Review of Food and Agricultural Policies in Malawi*; Monitoring and Analysing Food and Agriculture Policies (MAFAP) Country Report Series; FAO: Rome, Italy, 2015.
24. Arndt, C.; Pauw, K.; Thurlow, J. The Economy-wide impacts and risks of Malawi's Farm Input Subsidy Program. *Am. J. Agric. Econ.* **2016**, *98*, 962–980. [CrossRef]
25. Chibwana, C.; Fisher, M.; Shively, G. Cropland allocation effects of agricultural input subsidies in Malawi. *World Dev.* **2011**, *40*, 124–133. [CrossRef]
26. Holden, S.; Lunduka, R. *Too Poor to Be Efficient? Impacts of the Targeted Fertilizer Subsidy Program in Malawi on Farm Plot Level Input Use, Crop Choice and Land Productivity*; Noragric Report Number 55; Norwegian University of Life Sciences: Ås, Norway, 2010.
27. Karamba, R.W. *Input Subsidies and Their Effect on Cropland Allocation, Agricultural Productivity, and Child Nutrition: Evidence from Malawi*. Ph.D. Thesis, American University, Washington, DC, USA, 2013.

28. Chapoto, A.; Zulu, M.; Hoffman, B.D.; Kabaghe, C.; Sitko, N.J.; Kuteya, A.; Zulu, B. *The Politics of Maize in Zambia: Who Holds the Key to Change the Status Quo*; Working Paper 99; Indaba Agricultural Policy Research Institute (IAPRI): Lusaka, Zambia, 2015.
29. Mwanamwenge, M.; Cook, S. *Beyond Maize: Exploring Agricultural Diversification in Zambia from Different Perspectives*; Hivos and International Institute for Environment and Development (IIED): Lusaka, Zambia, 2019.
30. Mungai, L.M.; Messina, J.P.; Snapp, S. Spatial pattern of agricultural productivity trends in Malawi. *Sustainability* **2020**, *12*, 1313. [[CrossRef](#)]
31. Fatch, P.; Masangano, C.; Hilger, T.; Jordan, I.; Mambo, I.; Kamoto, J.F.M.; Kalimira, A.; Nuppenau, E.A. Holistic agricultural diversity index as a measure of agricultural diversity: A cross-sectional study of smallholder farmers in Lilongwe district of Malawi. *Agric. Syst.* **2021**, *187*, 102991. [[CrossRef](#)]
32. Miah, M.A.; Haque, A.K.E. *Policy Options for Supporting Agricultural Diversification in Bangladesh*; Bangladesh Agricultural Research Institute: Dhaka, Bangladesh, 2013.
33. Government of Malawi. *Agricultural Extension in the New Millennium: Towards Pluralistic and Demand-Driven Services in Malawi*; Policy document; Ministry of Agriculture and Irrigation: Lilongwe, Malawi, 2000.
34. Labeyrie, V.; Antona, M.; Baudry, J.; Bazile, D.; Bodin, Ö.; Caillon, S.; Leclerc, C.; Le Page, C.; Louafi, S.; Mariel, J.; et al. Networking agrobiodiversity management to foster biodiversity-based agriculture. A review. *Agron. Sustain. Dev.* **2021**, *41*, e4. [[CrossRef](#)]