

**INTEGRATION OF LAND TENURE MONITORING IN AGRICULTURAL  
DEVELOPMENT PROJECTS IN MALAWI USING GEO-SPATIAL TECHNOLOGIES**

**KEFASI KAMOYO<sup>1</sup>, SOLOMON MKUMBWA<sup>2</sup>, REX BALUWA<sup>1</sup>, HAROLD  
LIVERSAGE<sup>3</sup>,**

1: Ministry of Agriculture, Irrigation and Water Development, MALAWI, 2: Land and  
Global Land Tool Network-UN Habitat, KENYA, 3: International Fund for Agricultural  
Development, ITALY

kamokefa@yahoo.com

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## 1.0 INTRODUCTION

Agriculture plays a significant role in Malawi because it accounts for 30% of Gross Domestic Product (GDP) and generates over 80% of national export earnings. The agriculture sector in Malawi comprises of smallholder and the estate sub-sectors, with more than 99% of households involved in smallholder subsectors which contribute 80% of overall production and 70% of agricultural GDP. However, sustainable agricultural production and productivity has proven much less pro-poor because of inequitable distribution of land and failure to recognize legitimate land rights for youth, women and subsistence farmers. This depends on land, ownership of, or access to, agricultural land. Many rural people suffer from hunger because either they are landless, they do not hold secure tenure or their properties are so small that they cannot grow enough food to feed themselves. The land tenure system affects agricultural land use, prospects for improvement, productivity and food security. The UN Special Rapporteur on the Right to Food notes that “many rural people suffer from hunger because either they are landless, they do not hold secure tenure or their properties are so small that they cannot grow enough food to feed themselves” (Commission on Human Rights, 2002:23).

In view of the above, land tenure security is central to agricultural production and sustainable use of agricultural resources, and therefore for individual livelihoods, food security and poverty reduction. There are now clear indications that governments are recognizing the enduring importance of improved land tenure security and are making efforts to improve the allocation and management of land rights at local level.

Access to land and security of tenure are essential for the fulfilment of a range of human rights, including the right to housing, food and water. Without secure land rights, individuals and communities live under the constant threat of eviction, impacting a range of fundamental human rights. Tenure security in land or secure usage rights in land, in the form of formal legal, customary or religious rights, can provide more predictability and secure access to fundamental rights, including to food, housing, water, and health. In addition, access to land affects a broad range of fundamental human rights. The rights to food, water, health, work, are all tied to access to land. In rural areas in particular, the realization of the right to food is intimately tied to the availability of land on which to grow crops necessary to realize the right to food and to be free from hunger.

There is, therefore, inextricable link between land access tenure security on one hand, and income/food security on the other. This is no surprise that in most developing countries, agriculture is espoused as the cornerstone of the national economies, and studies with examples from East Asian green revolution experience, have provided had facts that agricultural growth is pro-poor. Asia’s green revolution demonstrated how agricultural growth that reaches large numbers of small farms could transform rural economies and raise enormous numbers of people out of poverty (Rosegrant & Hazell, 2000).

However, the extent to which agricultural growth will be pro-poor depends heavily on the pattern of land distribution: When land is distributed relatively evenly, agricultural growth can be powerfully pro-poor (Ravallion & Datt, 2002). Recent studies also show that a more egalitarian

distribution of land not only leads to higher economic growth but also helps ensure that the growth that is achieved is more beneficial to the poor (Deininger & Squire, 1998; Ravallion & Datt, 2002). In contrast, agricultural growth has proven much less pro-poor in countries that began with an inequitable distribution of land. Good examples of this case can be seen in many parts of Latin America, Sub-Saharan Africa (Ravallion & Datt, 2002).

In order to achieve agriculture-led economic growth in line with the Comprehensive African Agricultural Development Programme (CAADP) targets, Malawi Government developed, within the Agriculture Sector-Wide Approach, ASWAp (2011-2015), several agricultural development programmes. One of them is Sustainable Agricultural Production Programme (SAPP); funded by International Fund for Agricultural Development (IFAD).

SAPP is 10 year investment programme of Malawi Government that aim at enhancing agricultural productivity and improving rural food security among smallholder farmers in Malawi through improved food - crop yields. The programme targets about 200,000 poorest households who receive support to increase crop yields, particularly improved seed, fertilizers, and advice on good agricultural practices in six districts which are: Nkhhotakota, Balaka, Chitipa, Lilongwe, Chiladzulu and Blantyre and started being implemented in the year 2012

This support withstanding, access to land and land resource degradation remain key impeding factors for these poorest farmers to gain form the SAPP programme. Some SAPP beneficiaries work on borrowed land pieces that are rented to them often on seasonal basis. Land related conflicts have also been on the rise due to rising population pressure and agricultural intensification.

During the design of the programme, issues to do with land tenure were not taken into consideration as to see how they can impact on the technology adoption and food security. This paper therefore exams how Geographic Information System (GIS) can be effectively integrated in monitoring land tenure issues in SAPP to ensure that maximum benefits are derived from the interventions i.e. how the structure of land tenure system among the beneficiaries of the programme influences technology adoption, agricultural productivity and food security among beneficiary households in one of the programme districts i.e Nkhotokota.

Land in Nkhotakota is accessed through inheritance (52%) and marriage (18%). Rights to land through marriage and inheritance are governed by one of two customary systems. Under the matrilineal system prevalent in the central and southern regions of the country, land is handed down through the female line. If the husband moved to the wife's village at marriage, he generally loses rights to use the household land in the event of divorce or his wife's death. Under the patrilineal system prevalent in the northern region, land is transferred from fathers to sons. If a woman moves to her husband's village at the time of marriage, she often loses rights to use the household land in the event of divorce or the death of her husband (Matchaya 2009; UNEP/UNDP 2001; Chirwa 2008).

## 2.0 OBJECTIVE OF THE PAPER

The overall objective of the study was to assess the impact of land tenure on Sustainable Agricultural Production Programme in Nkhotakota by use of geo spatial technologies. Specifically the study was to:

- create a geodata base of land ownership for two consecutive seasons
- assess the impact of adaption of technologies related to ownership of land
- Assess food security status for SAPP beneficiaries in relation to land ownership and.
- identify land related conflicts in Nkhotakota district targeting SAPP beneficiaries

## 3.0 METHODOLOGY

### 3.1 Study area

The study targeted Nkhotakota district as one of the SAPP implementing districts. The district has seven Agricultural Extension Planning Areas (EPAs) as shown in Figure 1 and has a total of 107,590 farming households of which 69,376 are male headed, 38,138 are female headed and 76 are child headed.

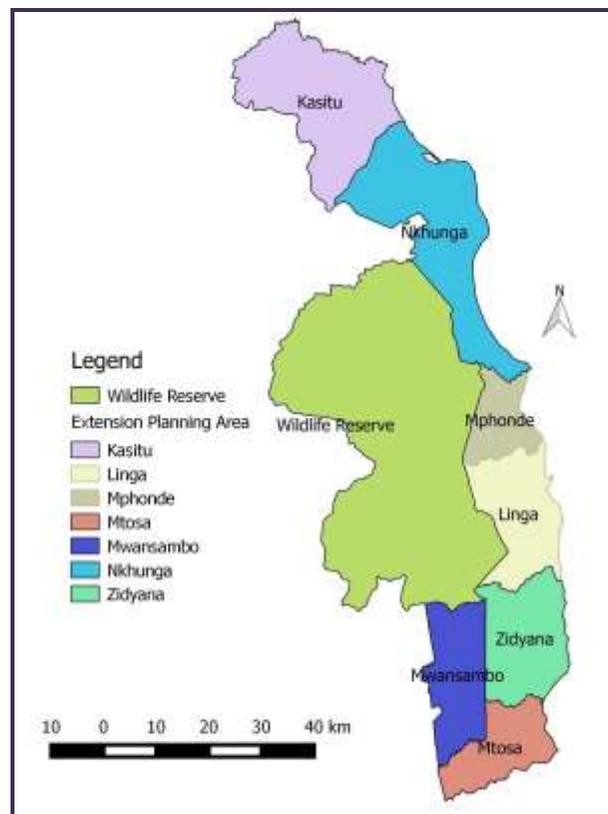


Figure 1: Map of Nkhotakota District Showing Agricultural Planning Areas and Wildlife Reserve

## 3.2 Sample Design

### 3.2.1 Targeted Beneficiaries

The study targeted 304 and 874 programme beneficiaries for 2015/2016 and 2016/2017 seasons respectively. In order to facilitate follow up in the adoption of technologies and for easy analysis of the data into Social Tenure Domain Model (STDM); Global Positioning System (GPS) coordinates were recorded for each household's farm.

### 3.2.2 Sampling Procedure

The study captured all beneficiaries for two successive seasons i.e. 2015/2016 and 2016/2017 seasons in the district. Table 1 shows the gender categories of the targeted farming households.

**Table 1: Gender Categories of the interviewed beneficiaries**

Farming Season	Gender Category			Total
	MHH	FHH	CLUB	
2015/2016	193	55	56	304
2016/2017	510	321	43	874

### 3.2.3. Data Collection Methods and Tools

A number of research techniques were used to collect information and data, some of which included Key Informants Interviews (KII), Focus Group Discussions (FGDs) and administration of structured questionnaires to farm households. The Agricultural Extension Development Officers (AEDOs) were used to collect data for the study. The District Land Resources Conservation Officer (DLRCO) was responsible for monitoring and supervising the data collection exercise.

**The Household Questionnaire** was the main instrument for collecting quantitative data from farming households. It had nine sections and collection information on household composition and characteristics, field characteristics and geo-location, livelihood activities, land tenure issues, land and water management practices, crop production.

**Focus Group Discussion (FGD) Guide** was the main instrument for collecting qualitative data from farming households. Focus group discussions (FGDs) were conducted with SAPP clubs/associations of beneficiaries by gender in the selected communities in the District. The focus group discussions employed several Participatory Rural Appraisal (PRA) techniques such as problem analysis, social and resource mapping, livelihood analysis, institutional analysis and seasonal maps. The FGDs also focused on general issues about farmer adoption of Good Agricultural Practices (GAPs) so as to triangulate with findings from the household questionnaire. The guide started with understanding of different wellbeing groups in the

community, and then moved to discussion on farming characteristics and household food security, access to agricultural inputs, access to extension services and experiences with good agricultural practices.

**Key Informants Interview Guide** was used for key informants' interviews with stakeholders in the area, at district and EPA levels. The key informants included the Agricultural Extension Development Coordinators (AEDC) and traditional leaders at the area level, the District Agricultural Development Officer (DADO) at the district level.

#### 3.2.4 Data Analysis

Data was analyzed using the Social Tenure Domain Model (STDM). STDM which is a pro-poor, gender responsive and participatory land information system developed by the Global Land Tool Network (GLTN). STDM is a QGIS plugin that enables users to benefit from all the features of QGIS and adds several features relevant to land information and tenure security for analysis of land information, tenure, and other related attribute variables. The most powerful feature of STDM is its ability to allow users to create and customize database tables using the Configuration Wizard.

Social Tenure Domain Model (STDM) integrated into Quantum Geographic Information Systems (QGIS) was used. STDM, geospatial pro poor land management tool, was deployed to analysis the georeferenced data for two consecutive years i.e. 2015/16 and 2016/2017 season Nkhotakota district.

## 4.0 RESULTS AND DISCUSSION

### 4.1 Land Ownership

Land ownership is crucial in the promotion of agricultural interventions in any programme. From the Figure 2, there were 81.2 % and 92.1 % of households beneficiaries owned land in 2015/2016 and 2016/2017 seasons respectively and none of them had their land leased. Owned land is land on which the households has ownership or cultivation rights including land rented out but excluding land rented.

It was observed that 80 % of those renting land were mainly clubs. These clubs were in form of: farmer field and business schools, cooperatives and associations whereby they were demonstrating different enterprises. These clubs were not paying rent as the owner of the land was part and parcel of the club membership. Kasitu and Nkhunga Agricultural Extension Planning Areas (EPAs) had least number of households renting fields unlike the rest of the EPAs. This is because most of the landless households were not engaged in farming activities and had been employed as casual labourer by Dwangwa Sugar Estate located within the two EPAs. From Figure 2 it could be observed a lot of farming households and clubs were renting land in Mwansombo EPA which is far from the lake where there were no fishing activities.

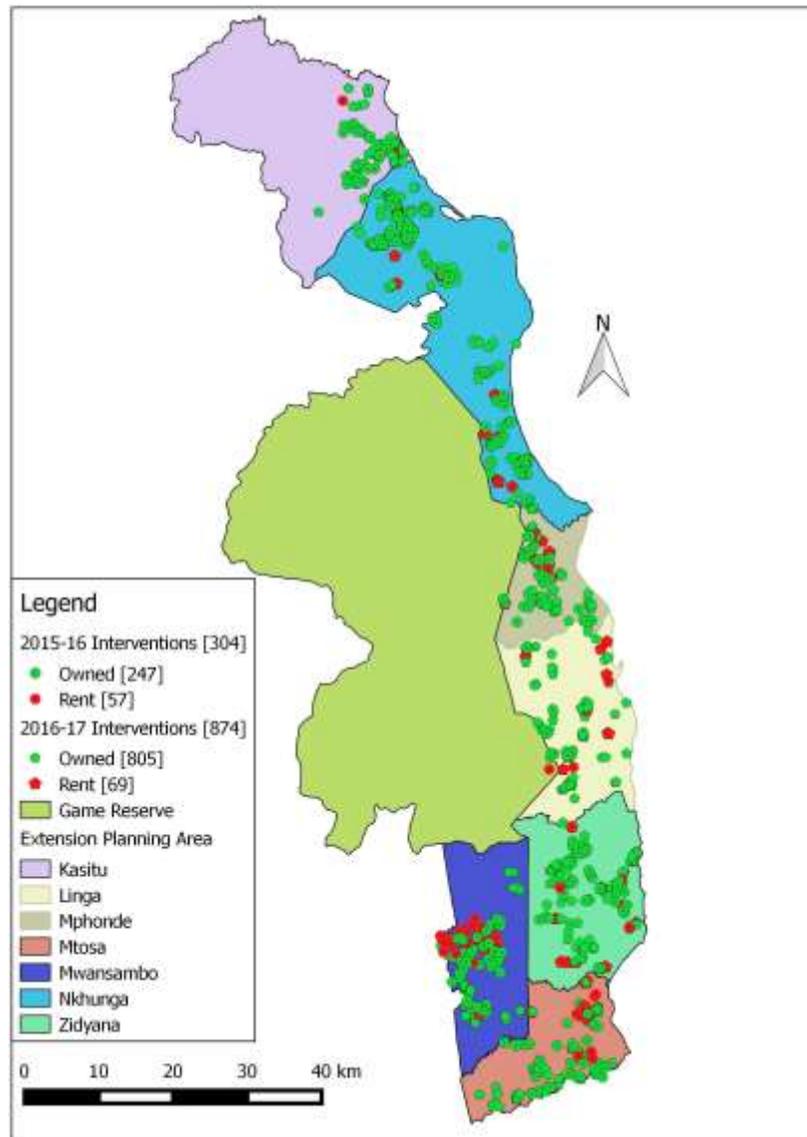


Figure 2: Status of Land ownership for SAPP beneficiaries for consecutive two seasons

#### 4.2 Adoption of Interventions Between the Two Seasons

There was 196% increase in the implementation of intervention in the second season i.e. from 304 to 874 beneficiaries from 2015/16 to 2016/2017 season as shown in Figure 3. However, 31 % of beneficiaries in 2016/17 had received livestock like goat and chickens received from the programme with the aim of increasing manure and income among poor households as well as improve nutrition.

There were 47% of farmers renting fields dropped the interventions in 2016/17 season leading to decreased rates of adoption among farmers as it can be seen in Mwansambo and Mtosa agricultural planning areas in Figure 3.

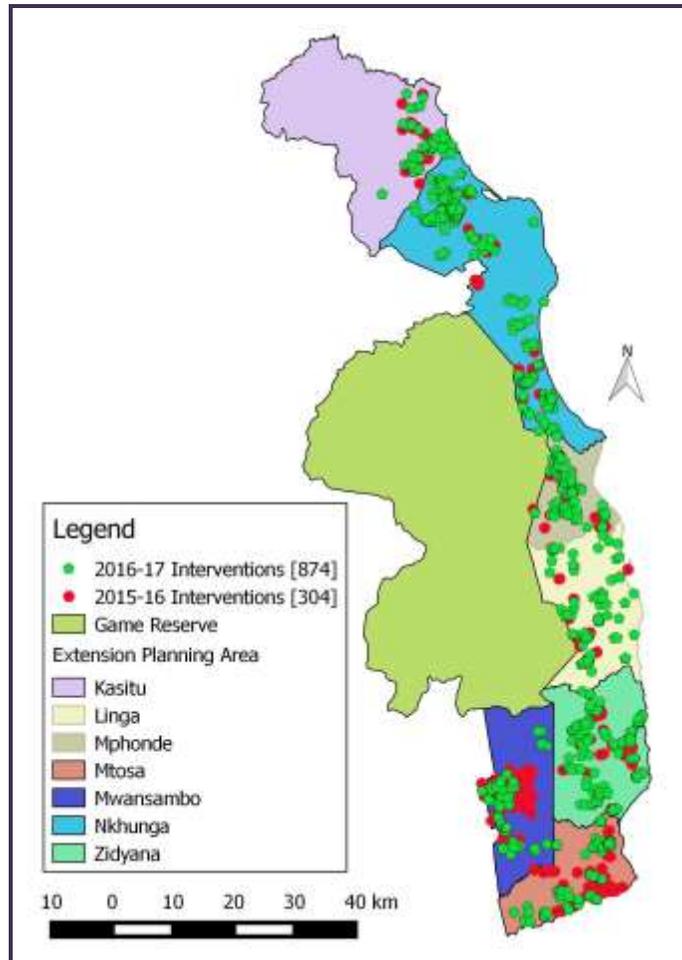


Figure 3: Adoption of technologies in between two seasons

There were 87% of farmers who owned land that continued implementing the programme interventions and even expanding their land for implementing interventions as most of the criteria set for beneficiaries to receive inputs favoured those farmers that owned land.

#### 4.3 Geo Spatial Location of the Fields in Relation to Access Roads

It was found out that 90 % of interventions were being implemented in the fields which were within a mean road buffer zone of 0.5 kilometers. These fields were mainly owned by farmers. The rented fields were far from the roads with a mean buffer distance of 2 kilometers, which meant that many farmers would want to rent out a field which is far from their homes and roads. This can be seen in Linga EPA in Figure 4 where rented fields are far from the roads.

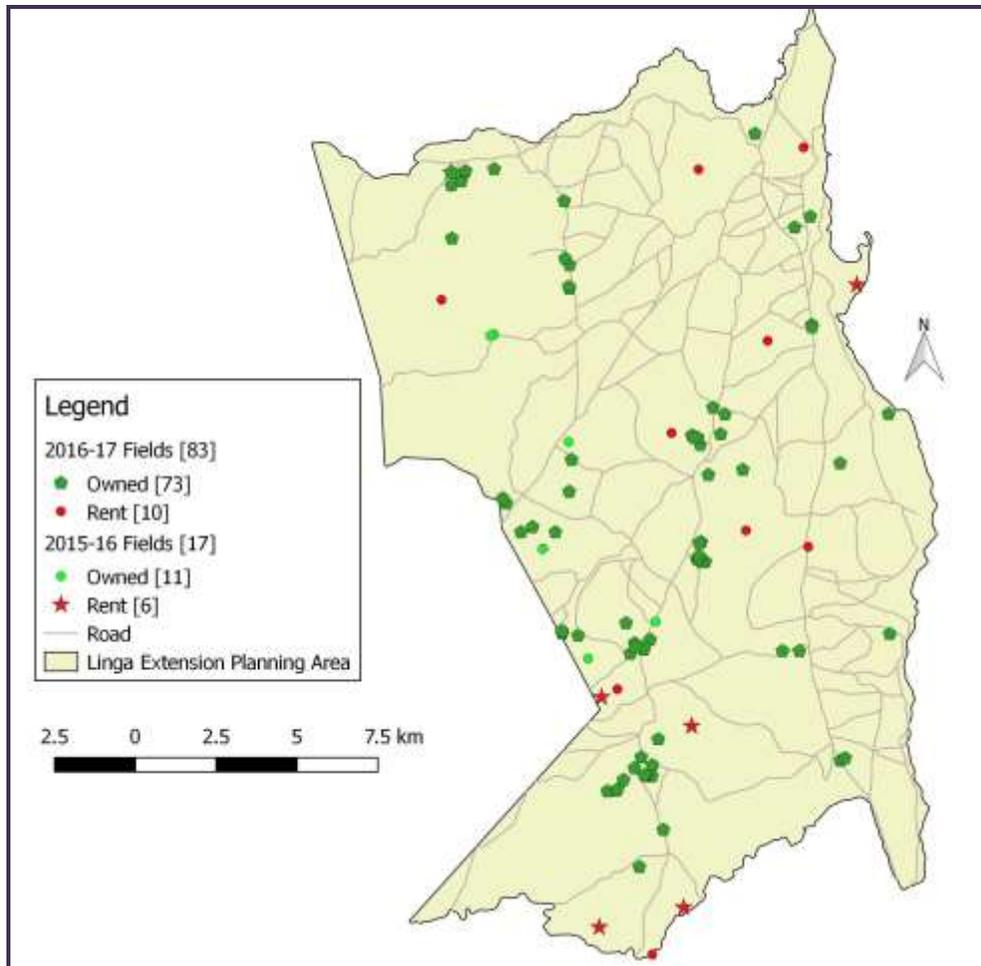


Figure 4: Location of the fields in relation to the access roads in Linga EPA in Nkhotakota district

The rented fields for clubs were closer to the road and community homes for demonstration purposes. This was a deliberate siting for passersby to appreciate the interventions under the programme in so doing promoting up and out scaling of such interventions.

#### 4.4 Land Size Holdings and Programme Farm Size

The study sought to establish the land holding sizes among smallholder farmers in the district. On average, households owned 0.94 and 0.80 hectares in 2015/2016 and 2016/2017 respectively and available for cultivation. This is similar to the national mean size of 0.964 hectares (NSO, 2012). The land is relatively scarce in the district due to presence of game reserve, high population (with an annual growth rate of 2.9 %) and new marriages. These are contributing factors to the decreasing land holding sizes where land is fragmented further to accommodate the new marriages and population.

However the study further sought to see how much land are the households implementing programme interventions out of the average land holding sizes. From Figure 5 it was observed that average farm sizes for 2015/2016 season were lower than 2016/2017 season except for female headed households who were renting land; there was no difference in the average farm sizes for the two seasons it was around 0.3 ha representing 34% of the total land holding size for a household, meaning they were applying good agriculture practices introduced by the programme on one third of their land holding size.

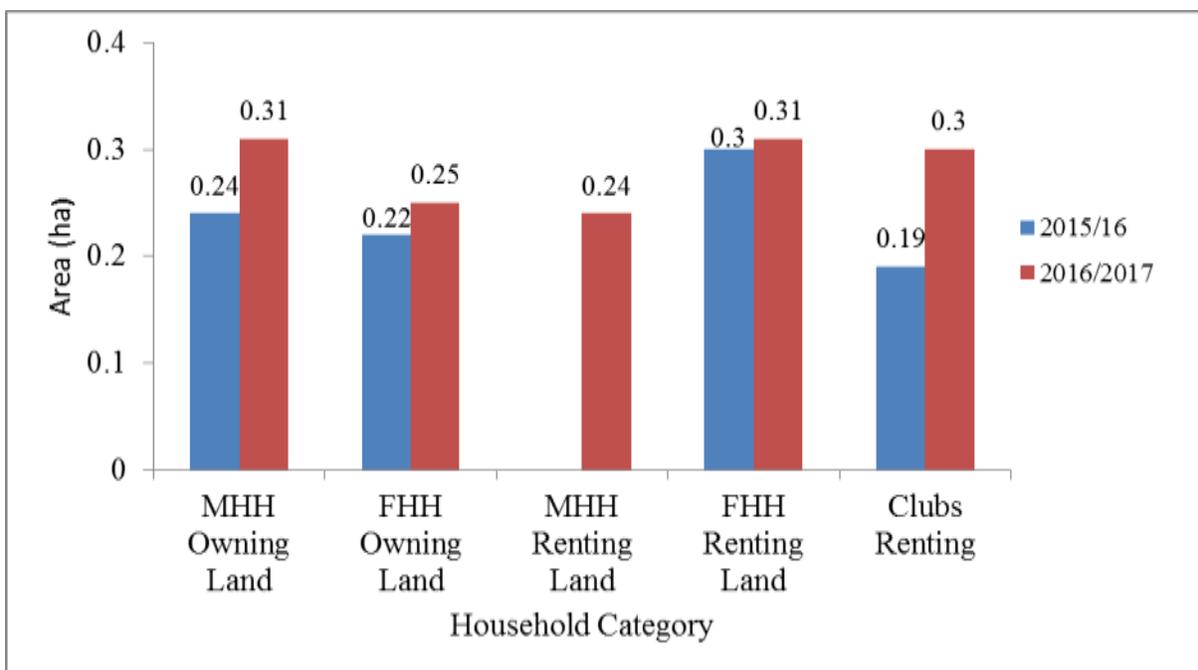


Figure 5: Average Farm Sizes for programme Interventions

In general there was increase in average farm sizes in the second season i.e. 2016/2017s due to multiple benefits realised in the first season 2015/2016 for instance beneficiaries were receiving inputs like seed, fertilizers and herbicides hence many farmers implemented the interventions. Further around 10% of Male headed households rented land in 2016/2017 compared to 2015/2016 season where no male headed householded rented land because they thought they would benefit from inputs.

#### 4.5 Crop Grown

Maize was found to be the dominant crop grown by 67% of the sampled beneficiaries for food security purposes, with legumes grown by 50% of farmers for household income and soil fertility improvement. Maize was grown as a sole crop but over 52% of the sampled beneficiaries were intercropping maize with legumes. These legumes were soya beans, beans, cowpeas, pigeon peas and the highest proportion growing groundnuts. In terms of land allocation, 61% was devoted to maize (staple crop), followed by groundnuts (28%), pigeon peas (24%), beans (19%), soya

beans (18%) and 5% for cow peas. There is limited diversity in the cultivation of the focal crops, on average farmers just cultivating two of these crops.

The study found that over 72 % of farmers that were renting the field were growing maize for own consumption to meet their food demand while the rest were for securing income . Further they were growing soya, beans and groundnuts for income. This concurs with previous studies that showed that over 58 % renting in the district do so for household food security. The decision as to what crops to be grown on a piece of land was made by household head not necessary depending on the land ownership.

#### 4.6 Incidence of Hunger and Hunger Seasons

Improving agricultural production and food security are stated as the main goals of SAPP. This is consistent with current and previous goals of agricultural development in Malawi. The reduction of hunger and improvements in food and nutrition security are critical measures of success in the programme.

The 2013 SAPP baseline report indicated that the incidence of hunger in Nkhotakota was at 12.0% of households and the mean hunger season was 3 months. From Table 2, there were 8 % and 2 % of the households were food insecure in the district in 2015/2016 and 2016/2017 seasons respectively and mean hunger period was found to be 3.0 and 2.0 months in 2015/16 and 2016/2017 seasons

**Table 2:** Households experiencing hunger season (%)

Household description	2015/2016 Season		2016/2017 Season	
	% of Households	Mean Duration of Hunger (Months)	% of Households	Mean Duration of Hunger (Months)
MHH owning land	8	1.6	2.7	1.6
MHH renting land		-	3	3
FHH owing land	8	1.8	2	1.8
FHH renting land		-	4	3.1

However, It was found out that 92% of those households owning land and with no land related conflicts were found to be more food secure and had surplus to sale for income during the lean period. These households were also practicing sustainable land management practices like soil and water conservation, conservation agriculture and rainwater harvesting.

Farmers that were practicing conservation agriculture especially those that owned land had their yield increase by 50% because the fields were able to withstand prolonged dry spells. However, those that were not practicing conservation agriculture indicated that that due to lack of herbicides and mulch material they were unable to practice it. Those that were renting the field

explained that it was difficult for them to indulge in conservation agriculture because they would need more years to start experiencing benefits of the practice.

Further, 90 % of households renting land hardly experience increase in yield due to land resource degradation in their fields as they were not implementing sustainable land management practices in their fields so even applying inorganic fertilizers it was being washed away and not fully taken by the crop. This concur with what Matchaya (2009) found i.e. households are less likely to invest in soil conservation measures when their plot was acquired through short term tenancy contract

## 5.0 CONCLUSION AND RECOMMENDATION

The use of the geo spatial technology has enabled us to give a breadth of the distribution of the programme intervention with and between the years. It is clear that that 47% of farmers renting fields dropped the interventions in the second year leading to decreased rates of adoption among farmers. There were 87% of farmers who owned land that continued implementing the project interventions and even expanding their land for implementing interventions as most of the criteria set for beneficiaries to receive inputs favoured those farmers that owned land and that It was found out that 90 % of interventions were being implemented in the fields which were within a mean road buffer zone of 500 meters. These fields were mainly owned by farmers. The introduction of the programme in the district expected that farmers would embrace good agricultural practices (GAPs)

In terms of land tenure security, the study finds that on average there was a high likelihood that female headed households would feel land tenure secure than male headed ones in the matrilineal societies casting doubt as to whether the claim that women may feel more discriminated against and may feel more insecure under the existing customary land tenure regimes is the universal truth. However, it could be argued that land titling could undermine women's grip of land in Malawi. Further, the decision on how to use land was with household head not necessarily owner of the land. This study also finds that land tenure insecurity was not much of a problem to many households

In conclusion, the paper recommends that for effective and sustainable impact, initial analysis of tenure on land and natural resources should be a key component of any design of agricultural development investment programme and also deployment of Geo spatial technologies are useful in monitoring land tenure security and should be promoted to be used.

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