Interim report

on household case studies and management of trade-offs in Malawi

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Acronyms

ADMARC	Agricultural Development and Marketing Corporation
CA	Conservation agriculture
EPA	Extension Planning Area
FISP	Farm Input Subsidy Program
GBI	Green Belt Initiative
NBS	New Building Society
SAIRLA	Sustainable Agricultural Intensification Research and Learning in Africa
SIA	Sustainable intensification of agricultural
TLC	Total Land Care

Summary

This report summarises the initial analysis of farm household case studies undertaken in Mwansambo Extension Planning Area (EPA), Central Malawi, within the framework of the SITAM project (Sustainable intensification: trade-offs for agricultural management). The project aims to address the challenges and opportunities of smallholder farmers, in particular poor farmers and women farmers, in managing the trade-offs between production, sustainability and other socioeconomic and environmental factors. 10 case study households were purposefully selected from the baseline survey that was conducted at the beginning of the project to represent a range from low to high extent of SIA. The objective of the household case studies is to understand the perceptions and visions of SIA of different households, and different household members, particularly in terms of the main influences on farmer decisions that establish trade-offs and synergies. The aim is to develop detailed participatory findings on trade-offs and synergies and the level of success in terms of sustainable intensification. These findings will contribute to the formulation of specific recommendations for how to effectively promote Sustainable Agricultural Intensification.

Within the Mwansambo EPA, two communities (Mgombe and Chikango) were selected, based on their proximity to the main trading centre of the area. In each village, five households were selected in each village. Groundnut and maize are the main crops of the area and are widely grown by most households. Some households grow tobacco, soybean, cassava, rice and cotton. The handheld hoe is the main tool used for land preparation, though some farmers may use zero tillage as part of practicing conservation agriculture (CA). Agricultural inputs are readily available in the market for farmers to purchase for use on their farms, but poorer farmers with less land are normally unable to afford these inputs. Farming is the main source of income in the area, and there is high export of groundnut out of the area through vendors or middle men. The main livestock owned by households are goats and poultry, and only a few households have cattle. In the main trading centre, there are several small to medium of farm enterprises.

Sustainable Intensification aims to promote achieve economic, social and environmental objectives simultaneously. According to farmers in the research sites, their specific SIA objectives are; (i) increase productivity of their land, (ii) increase profitability of their farming and household economic status, and (iii) improve household food security. It is evident that economic factors and/or gains are the main driving force of farming and other activities in the area. Though farmers are aware of the damage currently being done to their natural resources, it is not a priority for them to concentrate on the environmental and social aspects, whilst they are struggling with household economic and food needs. In community and group discussions, farmers were able to identify the negative changes in the environment as well as social aspects in the last decade, and well understand the reasons behind these changes.

Five key trade-offs have been identified from the data that has been collected. The main objectives and reasons behinds these decisions stem from achieving food security, meeting cash needs for non-food expenses, conserving community resources, improving soil fertility and reducing risks. Decisions are usually made between growing one crop or the other, food for sustenance or economic gain, the environment and economic gains, increasing risks by taking a loan or not. So far, the major external factors that influence these decisions are: extension services in the area, other farmers' choices, economic needs, landholding size, availability of inputs and resources, and availability of markets for purchase and for sale.

Introduction

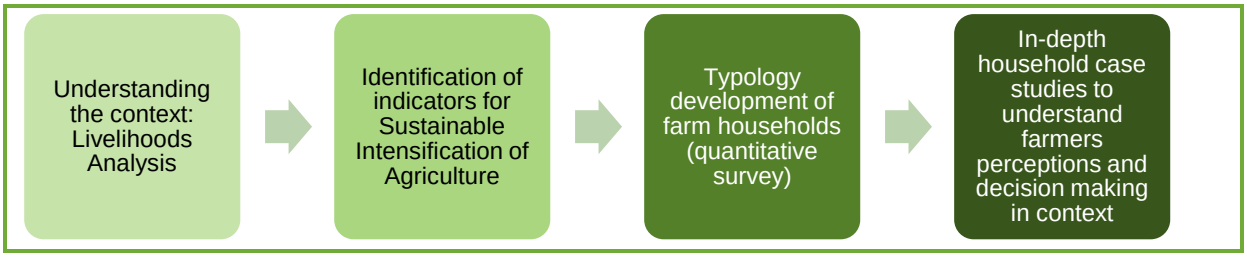
This report summarises the initial analysis of farm household case studies undertaken between April and October 2018 in Mwansambo Extension Planning Area (EPA), Central Malawi, within the framework of the SITAM[1] project (Sustainable intensification: trade-offs for agricultural management). The project aims to address the challenges and opportunities of smallholder farmers, in particular poor farmers and women farmers, in managing the trade-offs between production, sustainability and other socioeconomic and environmental factors.

Prior to the household case studies, a document review of farming and livelihoods systems in the study sites was undertaken, followed by a quantitative household survey to assess household performance along a range of sustainable intensification of agricultural (SIA) indictors. Case study households were purposefully selected form the survey households, to represent a range from low to high extent of SIA.

Field work was carried out by staff from SITAM partner Total Land Care (TLC), led by a Malawian consultant (former LUANAR staff), with the initial training and technical support provided by IIED and Practical Action Consulting.

The objective of the household case studies is to understand the perceptions and visions of SIA of different households, and different household members, particularly in terms of the main influences on farmer decisions that establish trade-offs and synergies. This pertains to “Stage 4” of SITAM which is to “Conduct In-depth Perceptions Analysis of Smallholder Farmers”.

Figure 1 The SITAM research steps



Of specific interest is to understand, on the basis of farmer responses, the convergence and divergence in their perceptions of SIA, the various factors that influence their decisions and the linkages between them, and to do this for different categories of farm households.

The aim is to develop detailed participatory findings on trade-offs and synergies and the level of success in terms of sustainable intensification. This includes an emphasis on the perceptions of women and youths (either as key decision-makers, or as observers excluded from decision-making), and the specific barriers they experience in moving towards sustainable intensification.

These findings will contribute to the formulation of specific recommendations for how to effectively promote Sustainable Agricultural Intensification.

[1] https://www.iied.org/trade-offs-sustainable-intensification. The project is part of the SAIRLA (Sustainable Agricultural Intensification Research and Learning in Africa) programme, https://sairla.nri.org/.

Farming and livelihood systems in the study area

Location of the study sites

The study is being carried out in Mgombe and Chikango villages, which are located in Mwansambo EPA in Nkhotakota District, Central Region. Mwansambo EPA is located in the area bordering Ntchisi district and has 110 villages and a total of 10,240 farming households. Chikango village is located 15 kilometres away from the EPA's main trading centre and Mgombe village is located only about 5 Kilometres from the main trading centre.

Natural resources

The area has a number of streams draining into Lake Malawi, natural forests and shrubland and land for agriculture. The EPA has a total area of 28,839 ha with 7,574 ha of arable land, 9,274 ha of non-arable land area and 2,432 of Dambo (wetlands used for gardens) land. The prominent soil type within the EPA is Sandy Loam. The EPA has 4 main streams (Lifuliza, Kavuma, Mcholi and Kasangadzi), which are the main water sources for both domestic and agricultural use. The major economic activity carried out along these rivers is winter irrigation farming, which has decreased in the past decade due to land degradation along the rivers due to erosion. The area also borders Ntchisi forest reserve, which is one of the major reserves in Malawi.

Crops grown and livestock kept

The main crops grown in the EPA are maize, groundnuts (especially the variety CG7), cotton, rice, tobacco, paprika, sweet potatoes, cassava, soybeans, cowpeas, vegetables, and various fruits. Groundnut farming is more prominent in the area, with large portions of land being allocated to the crop by the majority of farmers due to the monetary benefits. Maize as their staple food is the other preferred crop that is grown by almost every household across the EPA. Most farmers grow the local varieties of maize, even though some may use improved open pollinated varieties for resilience to climate change due to a shorter growing period. A few farmers use hybrid seed.

Even though only a few households have significant numbers of livestock, cattle, goats, sheep and small ruminants such as rabbits are usually available within a village. Regarding poultry farming, local chickens, guinea fowls and ducks are the predominant types raised by many farmers.

Farm sizes and land tenure

The average land holding size is between 0.4 and 0.6 hectares, but some farmers have ten times that much land. Most farmers own the land that they farm, which has been passed down to them within the family. It is possible to seasonally rent land in the study villages, and in some cases, farmers have 'purchased' land from the traditional chief. However, very few farmers have the economic capacity to purchase land and may just rent addition land during the farming season to increase production. Farmers with more land rent out plots if they do not have sufficient resources for inputs (in particular fertiliser) and labour, or if they decide to invest their income in off-farm activities (in particular trade).

Farming methods

Most farmers have for a long time used the tradition hand-held hoe for land preparation and tillage. With the coming of Total Land Care (TLC) and other NGOs, some farmers have begun adopting minimum tillage, thereby reducing the use of the hoe. Very few farmers use ploughs for land preparation. The use of external inputs such as fertilisers and herbicides is widespread in the area. Conservation Agriculture (CA) has also become widespread, including the two villages Chikango and Mgombe, where most of the farmers are practicing some elements of CA. However, usually not the

whole range of CA practices are used – i.e. farmers may not burn crop residues and practice rotation, but adoption of zero tillage is still rare because of insufficient amounts of residues, making it harder to plant as the soil remains compacted. Due to the high demand for agricultural produce from the area, most farmers are now practicing crop diversification (in particular growing groundnuts) in order to increase their income base as well as reducing risk of crop failure.

Use of fertilisers and herbicides is wide spread within the area, even though a majority of farmers are struggling to afford these inputs. In most cases farmers use recycled seed, because they cannot afford to purchase seed each year. The government and some NGOs help some households with agricultural inputs such as fertilisers and seeds for the next growing season, which are provide for free in some instances, but the FISP prices of inputs are subsidised. However, the quantity of inputs thus available has never been sufficient to satisfy the needs of the households, and fertiliser application rates remain far below those recommended (50 kg of top-dressing fertiliser and 50 kg of basal application per acre).

Infrastructure for processing, storage and marketing

The area has NBS (New Building Society) local Banking services, 2 ADMARC's (Agricultural Development and Marketing Corperation) and 1 produce market (Mwansambo Trading Centre), where farmers buy and sell agricultural commodities. There are also some seasonal produce markets, where vendors buy directly from the villages at lower prices. The area has an influx of vendors who are the main buyers of produce which is said to eventually be exported; not much information is available on where exactly these middle men sell the produce from the area. In addition to groundnuts, other crops that are exported include tobacco and cotton, which are grown by a few households. The area also has some locally owned storage facilities, but not many processing activities are being conducted in the area, apart from grading and some deshelling.

Social and community institutions, gender roles

The area is served by 1 health centre, 15 primary schools, and a post office. The majority of farm households own dwelling houses (confirmed by the Environmental and Socio-Economic Survey of NORAD, 2009). The survey found that most households live in traditional houses with mud walls and grass-thatched roofs. However, the housing conditions in Mwansambo EPA, as observed during field visits appear to be improving, with most households residing in permanent structures (burnt bricks with an iron-sheet roof). The average annual expenditure for male-headed households in Nkhotakota district is significantly higher than for the female-headed households.

Off-farm opportunities / income

The main source of income in the area is small-scale farming, more especially commercial groundnut production. Some farmers also grow tobacco, soybean, cassava and rice for income generation. Mwansambo is the main agricultural producer within the district and other neighbouring districts such as Ntchisi and Salima.

Besides farming, some farm households have opened up small-scale enterprises, where different commodities are offered to the local people. Some own small restaurants to provide catering services to local buyers and other people visiting the centre. Selling fish was reported to be one of livelihood activities among some households, considering the close proximity of the study area to Lake Malawi.

In addition, a larger proportion of the households are involved in selling firewood, vegetables, livestock, processed/roasted groundnuts, sugarcane, bananas and local butchery. Apart from relying on businesses and farm produce, other farmers, including the youths, do some piecemeal works such as building people's houses, tilling other people's fields and helping in crop harvesting and storing of food crops.

The Ntchisi Forest Reserve also provides non-timber forest products such as fruits, mushrooms and honey. The main forest products sold by the majority of households include firewood and charcoal. Charcoal is mainly produced by men in the area, while the majority of women and children (mainly the girls) are mainly involved in firewood collection for sale at the local market and for household use.

Agricultural services, institutions and policies

There are several services being provided for the agricultural sector in the area, and these are guided by different institutions and policies. They include the Farm Input Subsidy Program (FISP) and the Green Belt Initiative (GBI) that directly target the smallholder farmers, particularly the resource poor households. Extension services for agriculture are provided by both the government and NGOs in the area. Different NGO and local institutions, in partnership with the government and traditional leadership, have put in place community by-laws to regulate the management of natural forests.

Social outcomes: Education, health, food security, coping strategies

Formal education is not currently widespread in Mwansambo EPA, despite the area having many schools. This could be attributed to a number of factors such as a demand for family labour among many farm households, which keeps children out of the school. Cases of school dropouts have been high in the study are and the majority of the young people dropped out of school whilst at primary school level.

Most adults in Mwansambo EPA have basic vocational skills, such as carpentry and brick laying, since most of them did not go higher than secondary school level. Local people have basic knowledge and experience in health and wellbeing, farming, and managing small-scale businesses

The area faces high rates of out-migration, especially during hunger periods; some household members, especially men and the youths, go to seek some piecework in other parts of Nkhotakota district. Most households were reported to run out of food stocks before the next harvest, which is acute among female-headed households due the factors relating to land ownership, access to farm inputs and labour. Some survey reports including the Environmental and Socio-Economic Baseline study for Malawi conducted by NORAD in 2009 revealed that most female-headed households generate only enough staple food of their own to last 5 to 6 months. In such situations, the majority of food insecure households cope by doing piecework, reduce the number of meals, or depend on wild foods such as fruits. Households in Nkhotakota also sell household assets when faced with critical food shortages or depend on borrowing.

The majority of food insecure households are left helpless and end up selling their assets such as livestock, with some relying on relief food aid.

Farmer’s perception of sustainability

Economic dimension

It is evident that farmers in Mwansambo area have significantly invested in farming as a source of income and food for their households. All of the case study households solely rely on farming as their source of income, even though it is important to note that a majority of them do not have the means to excel in the activity; means being access to inputs as well as the financial capacity to fully engage in the activity. Throughout the case studies it becomes evident that, even though farmers do have the eagerness to increase productivity, they believe that they do not have the means to enable them to do so. Some of the common hindrances they are facing are: small land holdings, lack of money to purchase fertilisers and the decrease of soil fertility and productivity. Financing seems to be a common problem across the households, as the little income that they earn from previous sales is

usually required for other household activities included non-farm related expenses. Farmers lack enough money to purchase fertilisers and believe that they are unable to achieve high productivity for maize without it. Due to the high need of fertiliser in maize, most households have diversified to groundnuts, which they believe requires less inputs than maize. Some households have even gone to the extent of not growing maize at all, so as to eliminate the purchase of fertiliser all together. Most farmers believe that the profitability of their farming is directly linked to higher production of the crop overall, therefore the more they produce the higher gains they will achieve. In addition to this, farmers have also realised that other crops, which are able to fetch higher prices on the market such as groundnuts and soy bean, even tobacco (not favoured during the past years due to low and unstable prices), are a better option than to grow maize in terms of profitability. Farmers also believe that due to informal loans taken during the farming period (it is common in the area that better-off farmers will lend food or seed to less fortunate farmers), they are unable to gain any profits from their produce, seeing as they have to repay those loans immediately after harvest, and usually double what they took in the first place.

Mwansambo area is the food basket of most of the surrounding areas, therefore there are many vendors who come to the area to buy produce from the local farmers. Farmers in this area view themselves as producers selling their produce to the available market. The concept of value addition is not highly considered as a way to increasing their income, but farmers will grade their produce as per request of their buyers. Well-graded produce may at times fetch a slightly higher price, but this is typically dependent on the quality of the produce itself and in some cases the variety. Beyond shelling and grading, farmers do not engage in any other forms of value addition. At times even groundnuts are sold unshelled, so as not to incur the cost of labour for shelling.

One of the many challenges that the area faces is the issue of marketing as well as pricing. Most of the households believe that the influx of vendors into their area causes unfair prices, as vendors are usually middle men, who buy from farmers in order to sell on to wholesalers at higher prices. Because farmers have no access to the main markets, and because of other household needs, farmers feel that they are forced to sell their produce wherever they can. In addition to this, farmers have complained that due to other household challenges that require money immediately after harvest, they are unable to store produce to sale later when the prices have gone up.

Social dimension

Most households are highly concerned with the wellbeing of their family and community members. The concept of human wellbeing is mostly understood as being able to eat a variety of foods, being able to have an iron sheet roofed dwelling and being able to have good clothes. Some households are concerned, but this is minimal, about their status in the community. As farming households, they are able to invest in schooling for their children. As primary school is free, we cannot determine if some of the households with younger children will continue to encourage them going to school once it becomes an expense to the household. So far, most of the households have taken a positive stand towards education, with some of them sacrificing a lot for their children to complete school (including selling assets such as livestock and farm implements).

Even though gender inequality issues are being addressed at community level, with different awareness raising activities, it is evident through the exercises conducted that there are gender gaps still existing within the setup of the household. In most cases, the husband will claim to make all decisions in terms of what to grow on how much land, when and how to sell the produce and what to do with the money. The women and children are in most cases viewed as part of the labour force. Even though household members are aware of gender equality issues, they seem to not take a more proactive stand in reducing inequalities, mostly because they believe that their current roles are normal and work just fine. During most interviews, the husband will lead the conversation and will respond mostly to the questions, whilst the women will just tend to quietly agree with what the men say. It is part of Malawi culture that women must not interrupt or argue with their husband in public, hence the reason for less interaction of the women during the interview.

Because of the subordinate position that women and the youth take in society, there is a reduction of conflicts in terms of interests, decisions and ideas. Both these sets of individuals will await the

decision of the head of the household, with little or no resistance to the decision made. Similarly, the traditional authorities will influence households in decisions made, for example the use of conservation agriculture within the area has increased a lot due to the influence of chiefs and other community leaders. These positions of influence have helped to reduce a lot of conflicts within the community and household but have also helped to preserve the culture and knowledge of the area.

Environmental dimension

Farmers in Mwansambo area are well aware of the environmental damage that has been done so far in the area. Most households have said that they realised that their soil productivity was going down after continuous use of the land as well as external inputs such and fertiliser and pesticides. But in recent growing seasons, they have seen an improvement in the soils because they started using soil conservation measures. Members of the community realise the importance of preserving their soils so that future generations may be able to farm the same land productively. However, it is very difficult for them to make the decision to leave the land fallow, as they do not own much land, and as much as they would like to preserve the land, they have no choice but to cultivate it continuously. Many farmers are trying to increase the number of trees on their plots as a conservation measure, as well as invest in community woodlots and forests. The two villages have a community natural forest which has in the past 5 years seen a reduction of trees, but the community has taken the initiative to plant more trees.

In terms of water sources, these seem to be the most degraded and are of greatest concern to the community. Due to farming along the river banks, there has been a high level of siltation of rivers and small streams, as well erosion along the water sources. Large gullies have formed where small streams once existed, and farmers believe that if they had knowledge of gully management and the importance of trees, degradation wouldn't be as bad. But most households have taken an initiative to reduce these effects to their best ability and realise how this can affect farming activities.

The community understands that, due to population increases in the past 10 years, demand for natural resources such as trees, water and land has gone up, and they foresee that the demand might increase even more in the future. It is common understanding that previous use of natural resources was not very considerate of the fact that they might need the same natural resources in the future. But now that the community is aware of the effects of unsustainable use of resource (because of NGO interventions), measures have been put in place at community level to help conserve and replenish the natural resource base, such as community by-laws, which require farmers to pay a fee or fine to use forest resources.

Farmers' objectives

The priority objectives of case study farmers are (i) Increase productivity of their land, (ii) increase profitability of their farming and household economic status, and (iii) improve household food security. Food security though is the number one objective of many of the households, and it is clear that most farmers will work towards achieving this by any means. This in mind, it is hard for them to align their objectives to the 3 dimensions as the main objective is to acquire basic sustenance. They understand the need for socio-economic progression as well as conserving the environment, but these areas aren't a priority because they are unable to sustain their food supply for a full year. There is a common belief that if they cannot have enough food in their household, they cannot invest their time and resources in improving their economic or social status as well as effectively conserve their natural resources. But almost all households take part at community level natural resource management activities, and the majority agreed that replenishing and conserving their natural resources is a priority object in which they are all working hand in hand.

Managing competing objectives: trade-offs in agricultural intensification

Definitions and framework

For the purpose of this project, we define a **trade-off** as "a compromise between two desirable, but to some extent incompatible, objectives. Managing trade-offs is about maximising the overall level of achievement. **Synergies** exist where the achievement of one objective enhances the achievement of another. The overall achievement is greater than if the two had been unrelated. The aim of farmers' livelihood strategies is to maximise synergies and minimise trade-offs, within the confines of the resources available to them (including their own knowledge and understanding).

To analysis trade-offs, we have used the framework by Mark Musumbam, Philip Grabowski, Cheryl Palm et Sieglinde Snapp (2017): Guide for the Sustainable Intensification Assessment Framework. Washington: USAID (Feed the Future), https://www.k-state.edu/siil/documents/docs_siframework/Guide%20for%20SI%20Assessment%20Framework%20-%2010.24.17.pdf:

Table 1 Categories of trade-offs and synergies, with examples

Category	Decision	Example tradeoff	Potential synergy
Within a domain	Land allocation	Legumes vs. maize	Intercropping increases harvest of both
Across domains	Crop residues	Fodder vs. soil fertility	Integrated system with effective manure use
	Level of input use	Production vs. pollution	Fertilizer stimulates improved soil carbon cycling
Across spatial scales	Land use – intensification or extensification	Farm-level profitability can lead to landscape level habitat loss via agricultural expansion	Investing in diversified agriculture expands habitat (land sharing)
Across time	Time preference in soil management	Immediate gain and long-term loss vs. short-term loss and long-term gain	Multipurpose legumes for food, fodder, fuel, income, and/or soil fertility
Across types of farmers	Community grazing norms during dry season	Crop growers control residues vs. herders with free access	Manure from herders enriches soils of farmers

Trade-offs experienced at farm- and household level

Table 1 shows the Malawi trade-off tracker, which shows common decisions made by our case study households, some of the trade-offs that are currently existing in these households and some synergies and opportunities that emerge from these competing objectives. It also illustrates what are the common influences of such decisions and compromises within the household. Below is a detail description of the trade-offs and compromises made.

Trade-off 1: To incur the cost of external inputs for higher yield or work towards reducing the use of external inputs.

Competing objectives

Either to grow Maize for food self-sufficiency and incur the cost of fertiliser, or to grow groundnuts, forego the cost of fertiliser and achieve food security via purchase of maize in the market

Due to the inability to comfortably afford fertiliser (NPK and urea) and other external inputs, farmers have to choose how to use the little financial resources they have to invest in farming. Most farmers in the area are currently unable to afford fertiliser to apply to their maize, in most cases they have to use the little resources that they have, which could have been used for other household expenses, to purchase fertiliser for their maize. Even when minimising household expenses in favour of input supplies, farmers have rarely acquired adequate fertiliser for their maize. 6 out of the 10 households are unable to have enough food for the whole year but still prefer to use part of their land to grow groundnuts due to limited inputs to grow maize. it is recommended that a farmer use both top and basal fertiliser and most cases poor farmers only afford to purchase one type, or inadequate amounts of both types of fertilisers. If farmers are unable to adequately afford fertiliser, is it economically sustainable therefore for them to purchase an input that will probably not make much difference to their yield?

As farmers are unable to follow principles of integrated soil fertility management, some of them decided to take a route whereby they do not have to purchase fertilisers at all by diversifying their crop production to other, less input demanding crops such as groundnuts (which farmers perceive to perform well without external inputs – the long-term impacts on soil health of a continuous maize/groundnut rotation have not been studied in the research sites). In some cases, to grow a small portion of maize they may decide to use one type of fertiliser, preferably Urea.

Box 1 Groundnut farming - a means for survival

One of the small families in Mgombe village, in addition to dealing with the fact that they do not have enough land to grow their own food, realised a while back that their land had lost its productivity or fertility. In order to still be able to produce something on the land, they decided to switch from growing maize to growing groundnuts, so as to improve the output of the land. Upon further inquiry it was noticed that, despite low land productivity, the family was struggling to get even day to day basic sustenance. Why would they then grow only groundnuts if they did not have any food? The husband explained that they were unable to grow maize because they could not afford fertiliser, hence they opted for the less resource-requiring crop of groundnuts.

Two of the ten households studied completely switched to groundnuts production as a means to reduce input cost, and four households have found a balance in growing both maize and groundnuts. All the ten households practice crop rotation by alternating the two crops with each coming season. So, where a farmer has two plots, he or she would grow maize in plot A and groundnuts in plot B in one year, and the other way around in the next year. Some farmers with only one plot of land will sometimes divide the plot into two sections, at times equal, and grow maze and groundnuts alternately. Farmers have reported that this practice has helped improve their maize yields.

External Factors and Influences

There are several influencing factors that have played a role in farmers switching to groundnut production. The following are some of the important and most prominent reasons for this compromise:

Promotion of conservation agriculture through TLC: Through the promotion of CA, farmers were able to understand the importance of alternately growing groundnuts and maize, so as to help sustain the fertility of their land. Due to this knowledge they believe that this is the most readily available solution to their soil fertility needs (available in the sense that it is easy for them to execute on their own and it does not require much resources). Hence the immediate need to switch to groundnuts as a means for survival.

Fertilizer availability and affordability: This is the main influencing factor for this trade-off, as farmers are trying to divert from the cost of using fertilizer by growing groundnuts. This can also be highly attributed to the country's economic state at the moment, which directly affects the smallholder

farmers who is unable to be economically sustainable. Farmers said that they have not benefitted from the FISP in their area and claim that a whole village may receive only one coupon per growing season, hence it is inaccessible to farmers. This has not been independently verified.

Commodity Market Prices: Because of the higher prices of legumes such as groundnuts and the fact that they require less inputs they have become a more lucrative farming venture than maize. Most farmers explained that they would rather grow groundnuts, sell the produce and buy maize in the market with the money that they acquire.

Other Farmers: Fellow farmers who have previously used the method on their own farms have influenced the decision of other farmers to switch to ground or to grow groundnuts alternately with maize. In addition to that, there are other, better-off farmers within the community that will provide groundnut seed on loan, to be repaid after harvest. Because these loans are readily available farmers will tend to take the option other than having to source seed through purchase.

It is important to note that, aside from government and TLC extension officers working to promote this activity, there have not been any community bylaws or policies set in place to promote the use of CA or other SAI approaches and practices, even though traditional authorities may once in a while emphasise or inform the importance of CA, it is practiced at the will of the farmer and within their own means.

Current Gaps in Knowledge

We still have not been able to understand to what extent women are playing a role in the adoption of CA or other SAI approaches, and making the decision to switch to groundnut farming. It is understood that groundnuts are a cash crop that the male farmer will usually prefer for easy access to money. But we do not know whether the women of the households agree with it, in particular as they tend to be more concerned about food security. In addition to this, despite some households completely switching to groundnut farming to avoid incurring input cost, we do not know to what extent groundnut production requires other inputs (e.g. pesticides or herbicides) or labour (especially during harvest), impacting on its profitability. Also, we note that households are still food insecure, despite switching to groundnuts, but the reasons for this are not clear.

Trade-off 2: To expand production by cultivating closer to water sources during the dry season but risk potential adverse effects.

Competing objectives

Cultivating on river banks is done potentially at the price of overall negative environmental and economic impact in the longer term for the general public / everyone, such as river siltation and gully formation

The two villages are surrounded by several streams, which have become a source of water for farming during the dry season. Some farmers are cultivating close to the river banks so as to enable production during the dry season. This has resulted in siltation of the rivers as well as soil erosion due to detrimental tillage techniques used. The soil erosion has eventually led to formation of large gullies in some areas. Small sources of water that used to be streams have turned into large gullies almost the size of a river. This has further affected the area - during the rainy season the areas will experience some flooding, at times even making the road impassable.

External Factors and Influences

The influencing factors for this trade-off are wide-spread - from policy and legislation to personal farmer decisions and needs. The main influences are as follows:

Lack of regulation or community by-laws for farming along water sources. This seems to be the main reason why this activity continues to be done by farmers, regardless of the fact that it is quite detrimental to the environment or the community's natural resources. Currently the Mwansambo area does not regulate specifically the use of water sources for agriculture, and most farmers are free to do with the land as they please if they claim it. Because there is no board or committee to regulate such

farming activities in a way that minimizes water resource damage, no one is accountable for the damage that they cause. Because farmers are not accountable for the overall damage that is caused by their farming activities, it becomes easier for them to take a decision to reap short-term benefits by farming along the rivers or other water sources, while disregarding the negative effects of their action.

Promotion of irrigation farming. Irrigation farming has been promoted as a means to expand farm production and to extend farming beyond the normal rainy season. Because most farmers do not have the equipment and technical expertise to harvest water during the rainy season, they sorely rely on rivers, streams and wetlands for winter farming and irrigation. This has been a major influence on farmers for irrigation farming, as confirmed by the community during the group sessions conducted. Because they do not have the right equipment and the right technical know-how to execute the activity well, it has led to the detrimental effects they are experiencing right now.

Household economic needs. This is the driving factor for farming alongside water sources. As mentioned before, most farmers are more concerned with fulfilling basic household needs, most importantly food, hence they do not really consider the long-term effects of their actions. But at this point it is evident (as confirmed by the communities themselves) that they are aware of the negative impacts of this activity but have no choice but to continue to engage in it, so as to be able to meet some of the economic needs of their households.

Farmer access to the land. The fact that farmers have access to this land in the first place is also an influencing factor for this trade-off. If they were unable to gain access, then this would not be an option for them.

Current Gaps in Knowledge

It is still unclear if farmers are willing to stop this activity to ensure long term positive environmental outcomes. As much as they understand how this can negatively affect their water sources as well as their farming eventually, it is not clear if they would be willing to give up the activity, and they are willing to give up current economic gains.

Trade-off 3: Use of agricultural produce for home consumption or for sale.

Competing objectives

To store agricultural produce / grain (in particular maize) after harvest for household consumption up to the next season or to sell the produce so as to gain money which can be used for several needs within the household.

Farmers will in often sell the crops that they have harvested to be able to get money for other needs in the home such as school fees or even purchase of external inputs such as fertiliser for the next cropping season. This will sometimes influence food security within the household in that they would not have enough food to last them up to the next growing season. This is quite an issue in most of the households, because most of them heavily depend on farming as a source of food and income. Very few have livestock that can be sold in times of need, and even fewer people have small off-farm businesses to sustain other household needs. Because of this, farmers are always in the dilemma of whether to keep the little they have harvested at the time so that they may have food for the next couple of months, or to sell the produce so as to have money at hand.

Most farmers will choose to have food because the price of food goes up during the lean period, at which time, if produce is not stored and managed properly, they will not have anything to eat. Whilst having money may seem more appealing in that they may be able to buy a variety of foods, it seems to be less economically sustainable in terms of food security. It is interesting to note that the older households will usually store their produce to consume slowly over some months, and, if need be, they will sell a small amount to meet small household needs. They younger households are more prone to selling a large portion of their produce to gain money.

Box 2 Storage enables Food Security

One of the older couples of Chikango village has confirmed that they do not produce all that they need from their farming activities. But because of proper management and storage, they are able to sustain their food supply up until the next harvest. They will sometimes (with the help of their children, who live in the city) buy some food towards the end of the year, in addition to what they had stored. But they have for years survived on their farming by managing their stock. They don't believe that selling their food can do them any good.

Most households are not as lucky as this couple, to have someone living in the city to help sustain their food supplies. Most farmers have created a balance in terms of the amount of produce the sell and the amount they keep. At times they will sell only a small amount, just to meet a need that has emerged at that time. Most farmers do not really have a choice in the matter when there is some kind of emergency. If a household member is ill, or someone has passed away, or if some money is needed for school, they will usually sell whatever they have. This means that later in the season they will most likely experience problems and will need to earn money (mostly through manual labour) to buy food. The perishable nature of many agricultural products limits their access to profitable markets, thus dwindling income of small farmers, therefore the inability to store eventually affects the household income.

External Factors and Influences

The following are the main factors and influences of this trade-off:

Lack of other sources of income. Because farmers have limited sources of income for their households, most of them are forced to sell some or all of their produce in order to gain some financial stability, even short term. The sole reliance on farming as the main activity of the household (as a source of income and food) makes it hard for the household to look any other way in times of financial need.

Lack of proper storage facilities and technologies. This appears to be a common problem among the households, as storage facilities require addition funds. Most of the households cannot afford the necessary pesticides that can help store their produce for an extended period of time. Some farmers will store their produce in a self-made maize silo made from bamboo, but this can only hold their maize for a small period, while maize is still available in the community. When food becomes scarce, the silos are prone to theft, as well as to damage when the rains start. During this time farmers are forced to remove the maize, and, in this case, it has to be treated and stored in sacs or bags. Because of storage issues experienced, farmers prefer selling their produce rather than to store.

Easy accessibility to markets or selling points. Middle men or vendors are easily accessible within the villages; they usually move around the communities asking people if they have any produce for sell. Because farmers do not have to walk long distances to sell their produce, this is a major influencing factor of this decision. Even though farmers are aware that the prices offered by vendors are lower, it is quite appealing to sell to someone standing at your door.

Current Gaps in Knowledge

What independent steps are farmers taking to ensure financial stability of their households? In addition to this we are unaware of current efforts being taken within the area for the purposes of economic development, not agricultural related. Do the farmers have any ambitions or visions that will ensure change for the better in the next years to come or do they believe that this is their life in its entirety and there is nothing more that can be done? How do aspirations vary between younger and older farmers, and between women and men?

Trade-off 4: To invest household labour into own farming activities or as an income generating opportunity for the household

Competing objectives

Ensure household food security in the short term by earning wages as agricultural labourer or ensuring household food security in the longer term by investing in soil quality / productivity via conservation agriculture or soil and water conservation.

CA is an important agriculture practice that has proved to help increase yields in the long term for farmers as shown by those who practice it under TLC. Many farmers in Mwansambo attest to its positive effects and recently several more farmers have begun to practice CA. In spite of this, CA requires investing additional labour, which is a limited resource to most farmers. Farmers are aware that CA takes time to show significant positive results, but most of them, due to their immediate needs, are unwilling to make the investment. It is only after significant damage to the land has been made and after observing other farmers practice the technology for several years, they are now willing to take it on.

In addition to farming for themselves, most farmers will work in other people's farms as a source of some extra income for the household. Considering that CA requires their input and dedication, this shows that farmers are trading off investing in their own farm for future benefit to gaining money for immediate needs. Farmers will during the lean period, which is the peak period for agricultural activities, go and work for other farmers to source food or money for food. This affects their own farming in that they spend less time working in their own farms and more time in other people's farmers in order to source money.

Box 3 Farming for others

One woman from Chikango village talked of how she did not farm her land in a particular year. Upon inquiring the reasons for this, she disclosed that at the time she was ill and could not work on her land in time and also, she did not have the resources to hire labour to do it for her. When asked how she was able to feed her household, she told us that she had to walk a considerable distance so as to find some piece-work, which paid her in form of maize. It was quite surprising that she was too ill to farm her own land but walked to find work farming on someone else's land to find food. It was clear that she was not necessarily interested in investing or working in her land but would have rather worked in someone else's land for what seemed to be quite a small amount of food.

If practiced appropriately, CA can be considered to be a win-win technology, in which farmers are able to produce more in the long run and maintain soil fertility and soil health. But it is not compatible with hiring out one's manual labour in another farmer because of the initial investment of labour required for managing residues and weeds. Most farmers report that they may be too tired after working in another farm to work in their own farm and that this will usually affect their own farming activities.

External Factors and Influences

The following are the main influencing factors for this decision:

Other farmers. Both competing objectives have been somewhat influenced by fellow farmers within the community. First of all, the farmers that are able to plan well in advance to hire labour during the growing season influence this decision in that they are able to provide that option. Secondly the farmers who have practiced CA for some years have influenced other farmers to take up the technology on their own farms.

Insufficient food in the household. Due to inadequate production during the normal season, farmers may be forced to take on extra activities so as to find money to purchase more food. Some may say that this has also created a reluctance to invest in their own land with the justification that they immediately need food for the household.

Lack of Inputs. Most of the farmers that have to make this compromise lack adequate inputs to invest in their own farm and this makes them believe that they have no other choice but to source income through manual labour.

Current Gaps in Knowledge

It is clear that most farmers would rather farm their own land than work for meagre gains in another farmer's land, but how do they envision themselves getting out of this situation? Do they think there is anything that they themselves can do to empower themselves or is there too much reliance on some kind of aid for assistance? It seems a common idea among farmers that the government needs to help them in getting inputs for farming. But, in the absence of government assistance, are they willing to put in the time to slowly better their farming or would they really rather just work for others instead?

Trade-off 5: To expand production by incurring a loan which may lead to indebtedness

Competing objectives

Either to incur an input loan during the planting season which results in immediate repay after the harvest when prices are low or to forgo the loan and have time to sell the little they produce when prices are more lucrative.

It is quite common for farmers to take input loans from micro-credit facilities during the planting season. Some of these input loans require the farmers to begin repaying the loan immediately after harvesting their crops, forcing the farmers to sell their produce earlier when prices are lower. In addition, farmers claim that the loans take long to come through, and this means getting their inputs late or not at the appropriate time, which eventually affects the yield. As much as they are willing to incur loans to expand or improve their production, farmers do not actually benefit that much from taking out loans, because although they might produce more, this larger production does not result in higher income.

In addition to input loans, farmers also at times incur produce loans from fellow farmers within the community. The terms of these produce loans require the farmer to pay back the loan immediately after they harvest at 100 % sometimes even 200% interest rate. These loans seem to be disadvantageous for most farmers, because they end up repaying most of what they have harvested and in a bad year some have even claimed to give back everything they harvested. Most farmers would rather not incur any loan at all, but due to monetary constraints they find themselves having to do it as an investment in production.

Box 4 The risks of borrowing seed

One farmer found that he had to borrow seed for that particular season due to a unforeseen events that left him without other means to source the seed. Even more unfortune was that due to bad rains that year he was unable to produce enough from his land, in fact the produce was not even enough to repay the loan that he had taken. This resulted in the lending farmer confiscating all that he had produced, making his work for the whole season invalid.

External Factors and Influences

The following are the external factors influencing this decision:

Availability of sources of loans. When loan sources are available, it is easy for the farmers to incur such loans, in the case that such lending institutions were unavailable, farmers would be forced to find other means.

Lack of inputs or money to purchase inputs. Because farmers lack inputs or means to source money for inputs, some are forced to take up such loans as a means to invest in their farming or even for

their survival. Some farmers have land but find that as they are nearing the growing season, they have no other source of inputs such as seeds. This forces them to take up such ludicrous terms for loans.

Desire to expand agricultural production. The larger farmers will take input loans in an effort to expand their agricultural activities, so as to be able to produce more. But most have complained this has not really turned out this way.

Current Gaps in Knowledge

We still need to understand all the sources of loans that are currently available in the area, and which ones of the case study household are currently willing to take the risk of taking a loan to expand their production.

Conclusions

Farmers' strategies in the research site are mainly driven by economic needs and food security considerations. Sustainable intensification could contribute to this objective, considering the small sizes of land that they have, but they farmers are unable to intensify their production due to other factors which farmers believe are beyond their control. Despite the introduction of CA, there is very little targeted management of biomass (beyond crop residues) to increase soil organic matter, and existing biomass (e.g. groundnut shells) is not used optimally. Many years of NGO interventions do not seem to have changed farming systems in any significant ways, whereas the development of local markets for food crops (maize), cash crops (groundnuts and tobacco) and inputs (fertiliser and herbicides) has had a significant impact on farmers' practices.

Farmers' perception is still that only fertiliser application can increase maize yields to an acceptable level (despite the low organic matter content in the soils seemingly making fertiliser use uneconomical – but this requires some more investigation). Because most farmers cannot afford fertiliser to produce enough maize to feed their households, they have adopted a maize-groundnut rotation to balance cash and food crop needs. However, this strategy is not working for many of the poorer households, who are forced to sell their crop immediately after the harvest at a relatively low price to pay back loans and meet other cash needs. The monetisation of the economy and commercialisation of agriculture in the EPA has clearly had some beneficial effects on better-off households, who are able to earn off-farm income from trade. However, poorer households seem to be locked into unproductive and unsustainable farming practices, relying on daily wage work for food during the lean season. In this situation, environmental sustainability is not at the top of the priority list of these farmers, even though in the long term this might be a more productive approach to take on the small piece of land that they own. Farmers are more concerned with short term solutions and this is an indication of the level of poverty within the area. The current extension approaches do not seem to have done much to change this.

Annexes

Annex 1 Malawi trade-off tracker

Decision	Trade-off / synergy – description	Category	Influenced by (external environment)	Influence by (other factors)	Who and how affected and how (+ or -)	Further to explore	Possible synergies / opportunities	Threats	Emerging recommendation
Use of External Inputs (fertiliser and Herbicides)	Due to inability to afford fertiliser and other external inputs, farmers have to choose how to use the little financial resources they have. Inputs in the long run compromise the environment as well as human health.	Across time- short term benefits vs long term benefits	Promotion of CA. Promotion of external inputs.	Wealth. Access to CA information and materials.	Farmers. Positive effect higher yields. Negative effect possibility of reduced soil fertility	Are farmers willing to gradually substitute use of external methods such as fertilisers with more organic and environmentally friendly methods?	The positive effect of CA on their yield is an opportunity to promote use of organic inputs.	High dependency on fertiliser by farmers.	
Production from irrigation vs protection from erosion / siltation of river bed	Cultivating the banks of the streams and irrigating with pumps or watering cans can have short term benefits to a few, but potentially at the price of overall negative environmental and economic impact in the longer term for all	Across domains – production vs pollution; across time – short term benefits vs long term loss; across types of farmers (those with vs those without irrigation)	Market for irrigated crops, lack of regulation for land use along rivers?	Wealth. Access to CA information and materials. Access to land and resources for irrigation (watering cans, pumps)	Winners: those with land along the stream; losers: people who can't access the stream e.g. with livestock; potentially everyone in the longer term?	How widespread is this problem? Are there local by-laws to regulate river bank land use?	Still to explore	Still to explore	Discuss with traditional chiefs whether local by-laws can be adapted and / or better enforced
Main use of produce harvested	Use of produce for subsistence and for sale.	Across time: short term benefits vs	Economic factors.	Household financial needs.	Farmers who sell produce when in need of money, only to buy the same	Are there any other off-farm income generating options that can be explored? Are		High dependency on farming for	

Decision	Trade-off / synergy – description	Category	Influenced by (external environment)	Influence by (other factors)	Who and how affected and how (+ or -)	Further to explore	Possible synergies / opportunities	Threats	Emerging recommendation
		long term benefits. Across domains: food security vs other financial needs			produce at a higher price later on when they need food,	farmers willing to take these up?		both food and income.	
Income generation through labour	To invest household labour into own farming activities or as an income generating opportunity for the HH.	Across time: short term benefits vs long term benefits.		Low yields or insufficient yields	Farmers who plan ahead to use other farmers for labour during the lean season benefit positively.				
Use of Loans to finance and expand production	To Expand production by incurring a loan which may lead to immediate repay of loan after harvest when market prices are lower.	Across domains – production vs income	Promotion of external inputs, promotion / availability of loans	Lack of finances to purchase inputs such as fertilisers	Those farmers choosing to take a loan	What are the loan terms? Can't farmers pay back later? Could loan system linked to a warehouse system to store grain collectively until prices increase?	Still to add	Still to add	Still to add