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Main Evaluative Learning Report

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Main Evaluative Learning Report

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Executive Summary

Introduction

This report presents the findings of an evaluation-for-learning study on Farmer Field School (FFS) approaches, within an integrated climate resilience-strengthening project in Malawi, implemented by the Food and Agriculture Organisation (FAO) and funded by the EC's Global Climate Change Alliance Programme. The study offers insights on whether, how and why a Farmer Field School (FFS) approach succeeds in strengthening resilience to climate change and how the approach can be improved to inform project implementers, donors and the wider resilience and agriculture community of practice. The study objectives are to: i) Explore if and how FFS processes are effective and what is their impact, and for whom, in strengthening community resilience? ii) Identify lessons learned about how to improve FFS for strengthening climate resilience.

The Strengthening Climate Resilience (SCR) project (2016 – 2021) seeks to strengthen community and household climate change resilience in four districts (Blantyre, Neno, Phalombe and Zomba) in Southern Malawi and contribute to increased institutional adaptive capacity in Malawi. The project works through the formation of and support for Farmer Field Schools groups (FFSs), as part of an integrated asset-diversification and building approach, with technical, social and financial interventions linked in a mutually reinforcing manner. The community resilience pathway includes four activity sets, which are anticipated to create the following outputs: the adoption of good practices & technologies for greater resilience to CC, HIV and gender-sensitive nutrition practices improved, diversity of sustainable livelihoods increased, Conservation and safeguard of biodiversity enhanced.

The initial project conception was of FFS group formation, followed by participatory FFS planning by the groups, leading to three phases of benefits for farmers and communities: i) foundational knowledge and skills; ii) productivity increases and income rises; iii) accelerated asset accumulation and diversification. The FAO's *Caisses de résilience* (CdR) approach revolves around farming and pastoralist communities (women and men), connecting and integrating productive, financial and social activities. The approach addresses the accumulation and diversification of assets and knowledge as critical elements of resilience.

Methodology

Using theory-based evaluation, a Theory of Change (ToC) was developed with project staff focused upon FFSs within the broader asset building and diversification approach. Project implementation and targeting are anticipated to lead to (mutually reinforcing) capacity and practice changes, which in turn lead to benefits and impacts for participating farmers, as well as scaling in their wider community and beyond. The evaluative learning team gathered evidence to test the theory of change and its associated assumptions. Four FFSs were selected from the initial 174 groups formed in the first project phase, using specific criteria. Key methods included: Focus Group Discussions, individual Household Case Studies including periodic learning plot observations and visits to homes and fields. Video was used to document and share back lessons with participating farmers and project stakeholders. Additional data has been collected by the FAO in baseline and endline surveys, including on outcome indicators selected by our team. A stakeholder validation workshop was held with farmers, extension staff and FAO in Blantyre in October 2019.

Key Lessons on FFS effectiveness and impact

Implementation

Well-functioning FFSs are key. Participation from smallholder farmers has been good; three of the four FFS case studies have good functionality, as characterized by good social cohesion, facilitative leadership, clear rules, a collaborative ethos. Quick wins may also be important, such as goat pass-on schemes, to build belief in the process, although these can lead to over-stocking, so broader natural resource management agreements are needed within the community. Developing a vision with individual farming households of their future farming and livelihood systems, with attention to gender relations, is the ideal, but may be challenging to scale. Developing pilots as hubs and then supporting farmer exchanges so other groups can learn from resilient farmers in a peer learning process is one way to approach scaling.

The quality of external support in facilitating farmer learning is critically important, as is appropriate metrics. The underlying FAO concepts and principles pertaining to FFSs anticipate a *farmer learning-based-on-experience* process. However, during implementation, the FAO project has at times been drawn back into a more traditional 'technology transfer approach'. **Root causes of the constant draw back to 'technology transfer' and the adoption paradigm affecting this (and other) projects needs further joint exploration but include**: government assessment of extension staff performance based on adoption targets; project targets also focused upon adoption of practices and technologies; need for a common vision and commitment across institutional scales supporting farmer-centred learning; the weak capacity of governmental organisations (although there are strong individual examples of shifts in thinking and approach); and the quality of the training and, very importantly, on-going mentoring and supportive institutional environment needed for government, NGO FFS facilitators, and to community-based facilitators.

Three of the four FFS case studies were quite well aligned with several of the guiding FAO principles for FFS including: The field is the learning place; Hands-on and discovery-based learning; Agro-ecosystem analysis (AESA) on the learning plots; Comparative experiments; Equitable rather than hierarchical leadership; Team building; Facilitation not teaching (although the latter to a limited extent). All the FFS groups were able to manage their main learning plots for at least two seasons and the design of the learning plots generally improved over time. **The FFS process aligned less well in terms of the following indicators:** farmers are clearly regarded as experts in their own context; members have influence on defining the curriculum or identifying special topics, participatory monitoring and evaluation taking place.

The SCR project has supported 'inclusive' FFS, with mixed wealth and gender participation, which is valuable from an equity perspective, but also presents specific challenges. It is positive that the FAO project has striven to facilitate the participation of women and poorer households, given that some other FFS projects only engage with better off farmers and other agricultural extension approaches working with lead farmers who tend to have relatively better access to resources. Overall, both women and men are highly positive about the FFS process, but an important reason why some members are less positive is that they had higher initial expectations regarding provision of inputs.

A few examples emerged of clear synergies between the productive, financial, social and environmental aspects of the project at a household level. The SCR project anticipates building community resilience mainly through the FFS approach, working on productive, financial, social and environmental aspects *simultaneously* to diversify and increase farmers' assets. In practice, there are some examples of such integrated change happening in farming households, but to some extent the implementation of the project has treated the individual interventions separately. **A more integrated approach would involve the FFS group in planning holistically themselves, being supported to view their farming, livelihood and communities as systems.** Also, differing levels of emphases were placed on different types of interventions and it is clear that such a multi-pronged approach is quite demanding because **this approach requires diverse sets of skills, knowledge and project management flexibility on the part of implementing partners.**

Capacity change

Assessment shows strong, positive outcomes in terms of capacity strengthening of FFS participants. Capacity change may be considered in terms of not only strengthening capability, but also improving motivation and opportunities. Farmer capacity has been strengthened across all four FFS cases. Overall, capacity strengthening has been strongest in two of the four FFS cases (Nthundu-Phalombe and Kapako Zomba), followed by Nan'gomba-Blantyre in which fairly strong change has occurred for some farmers. Overall, capacity strengthening has been strongest on agronomic cropping practices and crop diversification, with more women gaining nutrition-related information and skills. Capacity strengthening on livestock management, water management, and forest and seed conservation has been a bit less consistent.

The opportunity to 'learn by doing' has been provided by the FFS process, although the comparisons could be improved to support farmers' capacity to evaluate the outcomes.

Provision of key inputs has been important to those who have received them. The inputs have provided new opportunities for some for farming and livelihoods, but the process of distribution is challenging. The issue of dependency remains for some members and some groups.

Multiple shocks undermine farmers' capacity to learn, experiment and adapt. While the whole objective of this project is to support farmer learning and experimentation in a context of increasing climate variability and other rural stressors to build climate resilience, there are also limits to how far individual households and learning groups can work under challenging climatic conditions, especially when combined with other shocks (e.g. the children of a poor household becoming sick, requiring the FFS-member mother to attend hospital for several weeks or months). Farmers have also learned or re-learned though, the importance of crop diversification – in a dry spell, many managed to still 'harvest something' and this has reinforced the lesson.

Motivation is generally high amongst participating farmers. There were also cases of participants dropping out, including quite a significant decline in the Neno FFS case study. The reasons given by remaining participants and by the (limited) drop-outs interviewed are highly variable. They included people leaving the village for economic or social reasons, distance to be travelled to the FFS learning plot, tensions within the group, as well as expectations not being met.

Strengthening resilience capacity in the light of increasing climate variability has improved, but there are clear differences between and within the FFS case studies in the extent of capacity strengthening achieved. Crop diversification has been the most significant change to respond to prolonged dry spells amongst FFS participants. There was positive feedback on the early maturing hybrid maize, but access to hybrid seeds is a challenge, which should be addressed in the context of improving both formal and informal seed systems.

Soil and water management practices can ameliorate the impacts of dry conditions on maize, but it is highly vulnerable to moisture stress and irrigation is needed for prolonged dry spells or a shift to different, less vulnerable, staples. Some soil and water management practices (e.g. increasing soil organic matter through incorporating manure) can help to maintain yields under heavy rains and waterlogged soil conditions as well as dry spells, but other technologies such as box ridges are more specific to particular weather conditions.

Dimba cultivation and irrigation farming, where the wetland or water resources are available, has significantly strengthened farmers' capacity to respond to dry conditions. However, endowments vary in terms of access to residual moisture and / or water for irrigation both within and between communities. The longer-term sustainability of intensified irrigated cropping by accumulating numbers of smallholders needs to be assessed.

Livelihood diversification is an important way of strengthening climate resilience. Many farmers are still reliant on coping mechanisms such as casual labouring ('*ganyu*') under conditions of shocks, such as dry spells and floods, but to a slightly lesser degree, especially for better-off households who have more capacity to experiment and adapt.

Increased awareness of climate change, access to short term weather forecasts and having a positive outlook, was said by some farmers to be important aspects of climate preparedness. However, it is only recently that FAO

has begun providing seasonal forecast climate information to farmers and there does not appear to have been exploration of longer-term projections within the project, implementing partners, researchers and farmers.

Farmers have identified market development activities as a priority.

Behaviour change

The clearest behavioural changes by participating farmers have occurred with respect to crop diversification and agronomic changes. Changes in soil and water management practices are also quite widely reported, although the processes observed are less simple adoption, and more nuanced types of response by farmers.

One of the more systemic change is more intensive, sustainable and continuous *dimba* cropping in the Phalombe and in a small number of Blantyre FFS case studies. Some livestock practice changes have occurred, but to quite a limited extent in terms of numbers of households, but those households who have benefitted, rate the change highly.

A majority of FFS members reported changes in practices relating to nutrition and health in terms of the way they prepare food and the diversity of their diet, but practice change is somewhat limited in extent. Positive feedback was given on new food preparation techniques, by many of those interviewed. A limited number of participating farmers reported that other asset gains helped them to apply new nutrition knowledge in their food choices. It has not been possible to measure dietary changes. Some poorer farmers cannot afford the ingredients. Men were less involved than women in the nutrition training.

The majority of the farmers are now more strongly aware of the importance of conservation of natural resources and highly motivated to preserve and establish trees on their farms and around their homesteads. Many farmers report efforts to conserve more trees in their fields, and some have planted tree seedlings provided by the project, although dry spells meant that some of the seedlings did not survive. Again, environmental impact has not been measured.

Improvements in livelihood strategies were widely reported across all four case study groups, although the extent of changes varies.

Benefits and impacts for participating farmers

The project anticipated an accelerated accumulation of assets by participating households in the third year of the project. By October 2019, participants reported the following changes in some specified assets, resulting from FFS participation:

- Iron sheets for roofing, plastering and cement used in constructing members' houses had increased, but intense rainfall and storms weather had a negative impact on housing in 2019.
- Mobile phone ownership increased, partly as a result of FFS participation.
- More diverse sources of agricultural knowledge and learning-by doing means of acquiring agricultural knowledge.
- Increased access to advice on agriculture from extension workers and fellow FFS members.
- Members are still primarily dependent on family labour for help with agricultural activities, which has implications for implementing labour intensive climate Smart Agriculture practices.
- Some improvement in access to and ability to manage water resources for farming is observed.
- Members' income remains directly or indirectly highly dependent on agriculture.
- Access to credit through VSLs appears to have increased markedly, but generally this is not invested in agriculture.
- FFSs and project organisations are trusted by a majority of members, with a good proportion also indicating that the FFS is the group that they most trust.

Scaling and wider impact

Scaling and wider impact potential was found to have been limited, to date, although sharing has occurred with close kin and neighbours. Farmers have taken some steps to share their new knowledge and skills with other farmers, but generally to a limited extent. Sharing is most common with and amongst close kin and neighbours. Some sharing is reported beyond the FFS community, but to a very limited degree in the FFS case studies covered.

Barriers to sharing and uptake included negativity from other community members, which was reported especially by female farmers, or the fact that technologies were considered inappropriate in heavy rains or required too much labour.

As with the 'adoption paradigm' and our findings that participating farmer decision-making process is not a simple 'yes/no' decision, the same is true for farmers not participating in an FFS group. They are unlikely to adopt technologies wholesale, but to adapt, test elements, combine differently, or, innovate and many may reject as they have not been through the learning process. This suggests a different type of definition and associated thinking about 'scaling' is needed and a focus on how to engage groups more widely in the community, rather than assuming 'copying' will occur.

Conclusion

Evidence from this study of the FAO project gathered during the project shows that the facilitation of Farmer Field Schools (FFS) and other support as part of an integrated, *Caisses de résilience* (CdR)' approach is effective in enhancing farmers' resilience to climate change. The combination of interventions is vitally important for enabling farmers to participate in FFS, to learn and to make changes in their farming, dietary, livelihood and natural resources management as a result. More benefits may be expected in the post-project period.

However, more success could have been achieved if the context were more favourable; the Farmer Field School approach as intended by the FAO, with a strong learning focus, was somewhat constrained by the Malawian enabling environment, which pulled the approach back into a more 'technology transfer' approach at times.

Wider evidence indicates that 'traditional technology transfer' approaches are ineffective in improving farmer livelihoods and climate resilience, and this aligns with the findings of this study as well. Smallholder farmers in Malawi, and elsewhere in Sub-Saharan Africa, are managing household farm systems which are complex and uncertain, unlike monocultural farming systems. They often lack access to necessary resources as well. Such farmers constantly have to make difficult decisions between the options open to them, e.g. choices about which combinations of crops to grow and livestock to keep, what food to eat and how to earn income. Investing more in one aspect of their farm or activity, may mean less investment in something else – in other words, such decisions involve trade-offs in the livelihood (and environmental) outcomes. Increasing climate variability and other rural stresses, such as land scarcity, are making the daily trade-off decisions that farmers have to make ever more difficult.

In the Sub-Saharan African context, it is becoming increasingly clear from broader evidence and from the findings of this study that a technology transfer approach does not effectively support farmers to achieve better and more resilient livelihoods because blanket prescriptions are insufficiently tailored to their contexts and do not support farmer experimentation. In reality, when farmers encounter a new technology or practice, they do not make a simple yes/no decision, they may reconfigure it (testing it in one corner of one plot, or adapting it, or combining it differently with other practices etc). Measures of uptake of individual technologies and methods can thus give a misleading view of what is happening in the farmer's decision-making and fields and helps explain why success has been so elusive despite investment in agricultural extension in these types of contexts.

Recognizing the nuanced reality of *how farmer practice change happens* and considering the complexity of trade-offs and opportunities across household farming systems is fundamental to the future success of Malawian agricultural extension services in the climate change context. This means embracing smallholder farmer-centred learning approaches to agricultural extension and seeking to make these work more effectively and quickly for resource-poor farmers.

Acronyms

EC	European Commission
FAO	Food and Agriculture Organisation
FFS	Farmer Field Schools
FGD	Focus Group Discussion
GCCA	Global Climate Change Alliance
LC	Learning Cycle
LP	Learning Plot
M&E	Monitoring and Evaluation
MEL	Monitoring, Evaluation and Learning
NRI	Natural Resources Institute
PSC	Project Steering Committee
SCR	Strengthening Climate Resilience
TOC	Theory of Change

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Contents

1. Introduction

This report presents the findings of an evaluative learning study of the Strengthening Climate Resilience Project – a project implemented by the FAO and funded by the EC Global Climate Change Alliance Programme.

The overall study approach is evaluative learning, which is based upon theory-based evaluation. The lessons focus on the 'how' and 'why' questions in relation to the effectiveness and impact of the FFS (not the entire FAO project) and was designed to be a complement to the FAO's own MEL activities, which include a baseline representative survey of participating farmers and FGDs with participating farmers. This report also integrates the data collected by the FAO commissioned evaluation and questionnaire survey data collected on indicators identified by the evaluative learning team.

The objectives of the evaluative learning study are to:

1. Explore if and how FFS processes are effective and their impact in strengthening community resilience to climate change, through in-depth, qualitative case studies of individual farmers and FFS groups, linked to FAO project M&E, and
2. Provide further understanding of whether, how, and for whom FFS contribute to strengthening farmer climate resilience across the four FAO result areas.

The report presents the Farmer Field School theory of change (section 2), lessons from wider evidence on FFS approaches and effectiveness (section 3), the methodology (section 4), findings (section 6). We conclude with a discussion, recommendations and next steps (section 7).

It should be noted that the FAO project is still underway because of a short no-cost extension, but this assessment is the final stage of the evaluative learning. The findings are aimed at the GCCA Programme, but they may also be useful for implementers and other interested stakeholders for them to strengthen and improve the quality of future delivery. The findings will also form a contribution to the wider community of practice engaging in initiatives to support climate adaptation and resilience in agricultural support services in Sub-Saharan Africa.

2. The Strengthening Climate Resilience Project

The Food and Agriculture Organization of the United Nations (FAO) together with Total Land Care (TLC) and Evangelical Association of Malawi (EAM), were awarded a grant of € 5.5M (Euro Five and half million) by the European Union to implement the project '*Strengthening Community Resilience to Climate Change in Blantyre, Zomba, Neno and Phalombe Districts*' between June 2015 - December 2019, with an additional no-cost 6 month extension. The project aims at strengthening the resilience of vulnerable communities to climate variability and change through sound safety nets and productive investments using a holistic approach that blends Disaster Risk Reduction and Climate Change Adaptation, addressing thus multiple threats to livelihoods with short- and medium-term interventions. It was designed to consolidate linkages and synergies amongst ongoing resilience building and social protection programs led by government. The concepts underpinning the project are included in Box 1.

Box 1: The FAO concept: An Innovative, Integrated, Community Centred Approach

- Designed to support vulnerable communities as to strengthen their resilience to climate variability and change through sound safety nets and productive investments using a holistic approach of Climate Change Adaptation (CCA), thus addressing multiple threats to livelihoods with short- and medium-term interventions.
- "*Les caisses de résilience*" (CdR) approach links the social, technical and financial dimensions, in a mutually reinforcing way. Through combined efforts on these three dimensions, the aim is to enable farmers to diversify and accumulate assets, two key sources for increasing resilience of livelihoods at households' and community levels.
    - Technical dimension: Imparting knowledge and skills on sustainable and climate smart agricultural production practices, post-harvest handling, bio-intensive backyard gardening, food safety, HIV and gender-sensitive nutrition education.

- Social dimension: focuses on group cohesion reinforced through governance structures and conflict management, leadership and dignified safety nets like common savings mechanisms,
- Financial dimensions: aspects of farming as a business, entrepreneurial skills, income generating activities, savings and investment mechanisms, and group marketing among others.

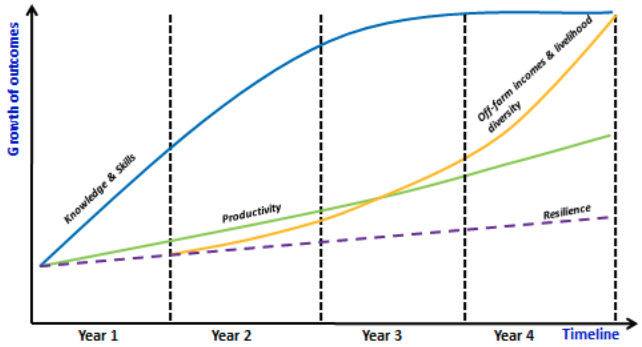
Further, the project aimed to consolidate similar ongoing government initiatives with a global goal of strengthening the capacity of vulnerable Malawian communities to adapt to climate change impacts and contribute to poverty reduction in rural areas. Six reinforcing results anchored on two specific objectives in a twin track approach focusing on both upstream (institutional) and downstream (community level) interventions.

Over time, a flexible set of interventions are delivered, working with existing groups, and a relative progression is envisaged during the period of implementation to achieve desired outcomes.

- Year 1: Focus on knowledge and skills development as a foundation upon which resilience or CCA, productivity, off farm income enhancement and livelihood diversity interventions will hinge. This will follow a comprehensive and practical field school curriculum.
- Year 2: As farmers adopt good CCA practices, productivity will gradually increase contributing to a relative increase in household income.
- Year 3: productivity and income increases will speed up, as various income generating activities envisaged have been initiated and the savings mechanism is fully operational.

This gradual build-up to the outcomes will ensure sustained results of the interventions after the action ends. The institutional level activities are tailored towards increasing dialogue among policy makers and implementer with a view of harmonising a common understanding and raising the profile of CCA, fostering better coherence and coordination, and build synergies of interventions.

Schematic flow of outcomes – FAO figure 3 in Project Proposal (undated)



Source: FAO Proposal (p5, and p7).

By design, the project has a large community outreach targeting at least 172,800 active resource users organized around 240 groups in selected micro catchments. The activities are articulated around six reinforcing results anchored on two specific objectives in a twin track approach focusing on both upstream (institutional) and downstream (community and household level) interventions contributing towards increasing adaptive capacities. Thus:

SO1. 'Increased resilience of vulnerable communities and households to climate variability and change (R1-R4)': Target - 172,800 active resource users.

SO2. 'Increased institutional adaptive capacities for scaling up and replication (R5-R6)': Target - 900 technocrats, civic, media and parliamentarians.

3. FAO Farmer Field School Theory of Change

A theory of change was developed with project stakeholders in a dedicated workshop held in Blantyre, Malawi, October 2016. See Figure 1 below.

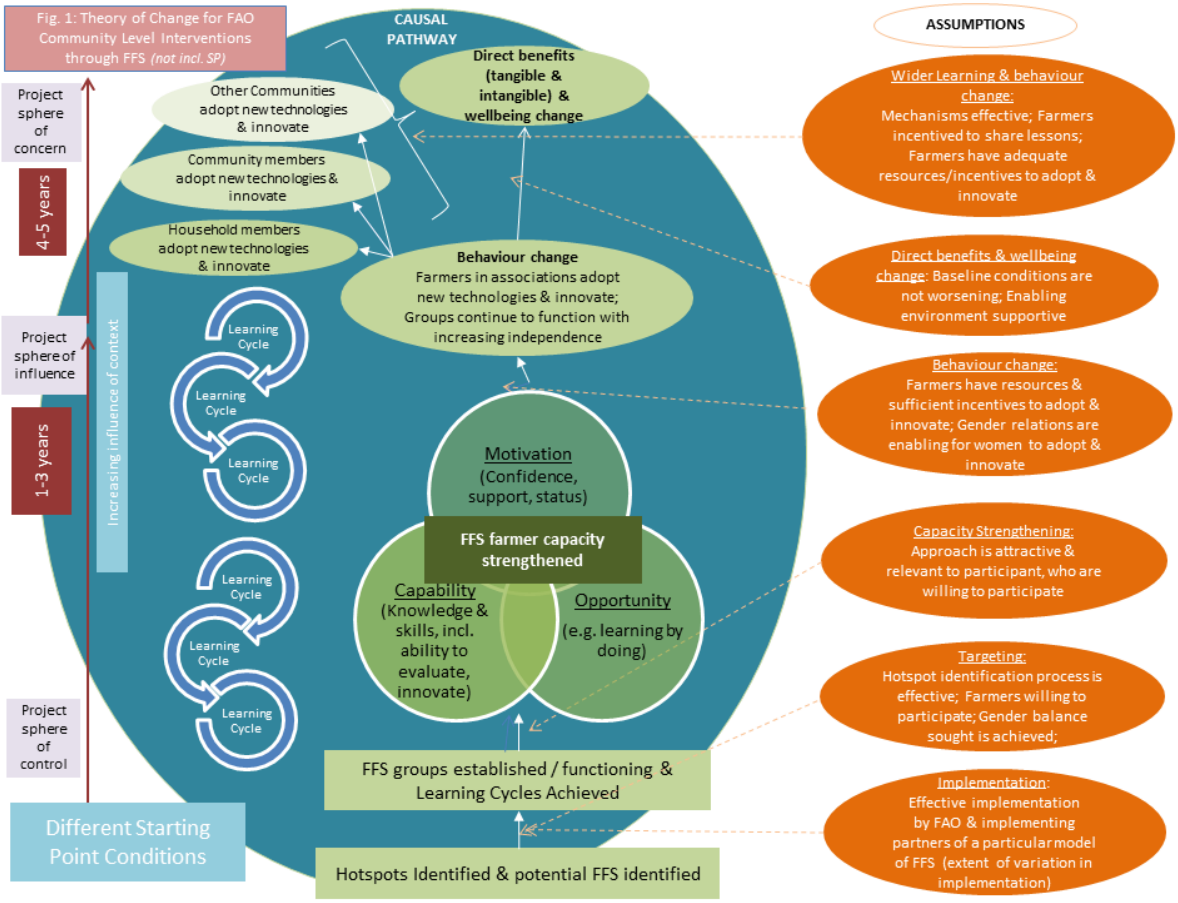


Figure 1: Farmer Field School Theory of Change in FAO project

The first step in the theory of change is the facilitation by FAO of hotspot identification and the identification of potential communities in which Farmer Field Schools could be set up within the four target districts (Blantyre, Neno, Phalombe and Zomba) in Southern Malawi. Alongside this, there is a need to ensure availability of FFS facilitators who are trained, and work with the identified communities and groups. The FAO and implementing partners then establish FFS groups and facilitate learning cycles (one cycle is approximately 18 months) with each group. Farmer Field School approaches are essentially 'practical farmer education through learning-by-doing in a field setting[1]' Farmers in the FFS group are supported to identify priority activities to be conducted in a learning plot and to implement these following key principles. See table 1 below.

[1] FAO (2015) 'Building resilient agricultural systems through farmer field schools.' Integrated Production and Pest Management Programme. Plant Production and Protection Division.

Table 1: Farmer Field School Principles as Identified by FAO[2]

1. The field is the learning place.
2. Facilitation, not teaching. *Facilitate members to think, observe, analyze & discover answers by themselves.*
3. Hands-on and discovery-based learning "*learning by doing".*
4. The farmer as expert. *Recognize community members as the experts within their particular contexts*.
5. Equity and no hierarchy. *All to participate on an equal basis.*
6. Integrated and learner-defined curriculum. *FFS curriculum is defined by the learners, unique to group, though much of learning enterprises are pre-designed under mandate of implementing agencies*.
7. Comparative experiments. *Knowledge is gained through practical experiments where different options are compared with each other*.
8. Agro-ecosystem analysis (AESA). This *involves observation, analysis and presentation for synthesis and discussion to enhances participants' skills of analysis, as well as their presentation, thereby improving knowledge-based decision making in addition to their communication capabilities.*
9. Special topics. *The focus of special topics decided on by the group and plays a central role in FFS.*
10. Team building and social animation. *Team building, group dynamics and social animation through song, dance and drama people share knowledge and culture, build cohesion, and learn communication and leadership skills. This also creates a platform for dealing with difficult subjects such as abuse, gender and HIV/AIDS.*
11. Participatory monitoring and evaluation. *While preparing the FFS curriculum, participants develop a plan for monitoring and evaluating progress to assess whether they are achieving the agreed objectives.*

These principles emphasize an approach that is different to traditional, technology-transfer approaches, which have been widely used in Malawian agricultural extension in previous years (see section 4 below). These principles inform the evaluative learning study in that the fieldwork is exploring how the FFS approach is being implemented *in practice,* how the implementation practice fits with the FAO principles and the implications and lessons therein. It is grounded in the assessment of the realities of the FFS processes, as dynamic processes of learning and technological change, rather than as a simplistic, technology adoption interpretation. The principles are part of the theory of change of the FFS approach, although during the project stakeholder workshop they were not discussed explicitly, despite the participants including those recently trained in the FFS approach. There may be lessons here in terms of the quality of the training provided, which will be explored in following evaluative learning activities with training providers, funders and participants.

Implementation of the FFS process according to the FAO FFS Implementation Guide principles is anticipated as leading to participating farmer capacity strengthening as a result of the full exposure of participants to all the developmental stages of the enterprise around which the learning is organized. The FAO identifies 5 types of capacity strengthening for participating farmers which can be clustered into capabilities, motivation and opportunity following the COM-B Model[3] of behaviour change (Mayne, 2017).[4] Improved capabilities include enhanced knowledge, skills and attitudinal changes. Opportunity relates to the new opportunities which arise because of the external environment and in this case the FFS process. Combined, enhanced capabilities and opportunity, leads to stronger motivation to act. Motivation relates to internal psychological factors and emotions, such as self-confidence, risk-taking and drive.

[2] Farmer Field Schools Implementation Guide. http://www.fao.org/docrep/016/i2561e/i2561e01.pdf

[3] Michie, Stralen and West (2011, p4) define *Capability* as the individual's psychological and physical capacity to engage in the activity concerned. It includes having the necessary knowledge and skills. *Motivation* is defined as all those brain processes that energize and direct behaviour, not just goals and conscious decision-making. It includes habitual processes, emotional responding, as well as analytical decision-making. *Opportunity* is defined as all the factors that lie outside the individual that make the behaviour possible or prompt it.

[4] Mayne, J. (2016) 'The COM-B Theory of Change Model'. https://www.researchgate.net/publication/314086441_The_COM-B_Theory_of_Change_Model_V3

Table 2: How FFS is anticipated to benefit farmers in terms of capabilities, opportunity and motivation (COM-B)

Anticipated benefits	Mapping to COM-B model of behaviour change
1. **Strengthening observation capability and increasing knowledge ownership through discovery-based learning**.	Capabilities
2. **Building self-confidence and enhancing decision-making capacity.**	Motivation
3. **Minimizing risks in experimenting with new practices.** FFS provides farmers with the opportunity to try out new practices on a group farm where risks are minimal, and potential losses would be shared by group members.	Opportunity
4. **Changing deep-rooted beliefs and practices**. Farmers have a wealth of knowledge, which is usually based on their experience. It is also true that they are sometime based on misconceptions. Wrong ideas or false deep-rooted impressions cannot be easily swept aside through short term training or field visits. FFS provides an analytical structure and season long regular interactions with the field, facilitators, and other FFS members, which enables participants to learn first-hand the benefits of testing new technologies in PCE and to understand the behaviour of introduced crops. The FFS experience can as well assist them to recognize misunderstandings and avoid errors in farming practices or beliefs.	Motivation
5. **Developing problem-solving capabilities.** A farmer is an agricultural entrepreneur who must deal with constantly changing natural and socio-economic circumstances. To be successful, a farmer needs a range of skills including natural resource management, accounting, marketing, negotiation, problem solving and conflict management. Without such capacities, farmers may be unprepared for uncertain events caused by political and economic unrests as well as climate change. Any one-off training event cannot provide solutions for all farm related problems, nor can it provide the broad range of skills needed to support improved productivity at the farm level. However, FFSs offer integrated learning opportunities for a period of one year in which participating farmers acquire problem solving capabilities that can encourage pro- active behaviour and positive attitude towards an often, uncertain future.	Capabilities

The FAO project employs FFS but aims to link social, technical and financial dimensions in a mutually reinforcing way, in an approach called '*Les caisses de résilience*' (CdR) such that the combination enables farmers to diversify and accumulate assets, which can enhance livelihood resilience of households and the wider community. A further key dimension is an environmental one, which may be considered to enhance natural capital, particularly through the conservation and safeguarding of biodiversity. Technically, the aim is to enhance knowledge and skills on sustainable and climate smart agricultural production practices, post-harvest handling, bio-intensive backyard gardening, food safety, HIV and gender-sensitive nutrition education. Socially, the approach seeks to build group cohesion reinforced through governance structures and conflict management, leadership and dignified safety nets like common savings mechanisms. Financially, the focus is on farming as a business, entrepreneurial skills, income generating activities, savings and investment mechanisms and group marketing. Environmental aims include strengthening local seed systems, supporting community- based, watershed management and sustainable use of wetlands, promoting agro-forestry and appropriate energy saving technologies. Greater emphasis should be given to the combined nature of the interventions and how their outcomes can be shown at field, household and community level. A flexible set of interventions are delivered via the FFS and a progression is envisaged, from strengthening foundational knowledge and skills in year one, to farmer adoption of good climate change adaptation practices, productivity and household income increases, and operation of the savings mechanism in year 2, followed by accelerating income growth with new income generating activities and a fully functioning savings mechanism. This gradual progression ensures sustained results post-intervention in year 3.

In the theory of change, FFS are effectively established and are supported in several learning cycles, to enable farmers, organised in groups under facilitation by a trained facilitator, to experiment and learn, focused on a learning plot. Enhanced capacity leads to farmer behaviour change – participating farmers adapt and innovate in

their own plots after having engaged in the process of learning by doing through the study plots and the groups continue independently. The process of scaling involves sharing participating farmers and/or copying by others within the same household, with the community and beyond the FFS community to other communities (Result 1). The process of scaling up involves strengthening institutional capacity (Result 2).

There are several assumptions (preconditions which need to be in place) between each step of the theory of change. These are depicted as orange circles in Figure 1. For example, for the FFS groups to be established and supported to conduct learning cycles, it is necessary that the FAO and implementing partners effectively implement the FFS approach (with reference to the FAO principles). For the FFS to function effectively, project stakeholders in the workshop in Blantyre (October 2016) identified the need for the FFS groups to have a good gender balance and for farmers to be willing to participate. The latter relies upon farmers seeing the approach as attractive and relevant to them and for this to be sustained over time. For the FFS approach to strengthen the capacity of participating farmers sufficiently (in terms of capabilities, motivation and opportunity) depends upon the quality and type of FFS process implemented in practice and the intensity and quality of support provided. The capacity strengthening may be effective, but for farmer behaviour to also change their practices requires that farmers have enough resources to evaluate and adapt practices relevant to their own circumstances and to do so effectively. For both capacity and behaviour change steps, issues of social difference and gender are likely to be relevant, but so far this has not been covered and will be explored in future rounds of fieldwork. For behaviour change to lead to direct benefits requires a favourable environment (e.g. access to relevant markets).

A key question is also how far baseline conditions are changing – social, economic, and environmental, including climate variability and what these different pressures mean combined for the target communities. If these baseline conditions are generally worsening, and / or if there are major shocks, then it is more challenging for the project to achieve its goals. To some extent a project aimed at strengthening climate resilience must enable farmers to overcome future changing and unpredictable rainfall patterns, extended dry periods, extreme events (floods, droughts), but if current climate conditions are highly challenging then it may be difficult to build up resilience *sufficiently*. The Malawi Poverty and Vulnerability Assessment (2007) finds that high vulnerability to shocks, such as droughts or price volatility, are a major cause of poverty and leads to large movements in and out of poverty for households. The report finds that two-thirds of households have moved in and out of poverty in the period since 1998, and this is because a quarter of the population have income levels within 20% points of the poverty line. Therefore, strategies which prepare for shocks are critical for addressing poverty[5]. It also shows how difficult it is for farmers to experiment and innovate when they are already experiencing such poverty and affected by shocks, as in 2017/18 dry spells.

Moving along the theory of change, external factors increasingly influence farmer livelihoods and climate resilience and processes of wider scaling. There are also assumptions relating to the scaling process: Are participating farmers in the FFS willing and actively sharing their new knowledge and skills with others in the community and beyond? Can other farmers also learn to experiment and adapt if they do not have same opportunity as provided in the FFS process (e.g. resources such as chickens and local seeds, and/or the opportunity to collectively practice on the learning plot).

4. Lessons from Wider Literature

Evidence on the effectiveness and impact of FFS

Farmer Field Schools (FFS) are an increasingly common approach to agricultural extension based on adult learning (2016 GEM report). A recent Systematic Review of available evidence on the effectiveness of Farmer

[5] PVA (2007) Malawi Poverty and Vulnerability Assessment: Investing in Our Future. Full report. Poverty Reduction and Economic Management 1 Africa Region. Republic of Malawi and World Bank. Report No. 36546-MW http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2008/10/03/000333038_20081003000558/Rendered/PDF/365460vol020ES1disclosed09130120081.pdf

Field Schools[6] found that approximately 10 – 15 million farmers globally have participated in FFS in 90 countries (Waddington et al 2014; (Campbell Collaboration Summary, 2017). The review found positive benefits, but challenges in terms of scaling, probably because of the critical nature of participation in the experiential learning process itself. See box 2 for a summary of findings. Waddington et al (2014) conclude that gradual scale is more likely to be effective, rather than large-scale programmes, with the latter often finding challenges in recruitment and training of facilitators, but they note that the evidence that large-scale programmes are not effective is also limited, so national studies are required.

Box 2: Systematic Review of FFS Summary of Findings

In the systematic review, FFS are characterized as 'The purpose of farmer field schools is to improve farmers' skills to empower them to make better decisions. Different programmes have different objectives, but they often aim to reduce pesticides use, promote better farming practices and boost yields or income. Field schools use facilitators who employ participatory, experiential learning methods over an entire growing season. For example, farmer field schools use 'practice plots' where farmers can compare results from different farming methods. In contrast to traditional agricultural extension projects, which mainly teach simple practices such as applying fertilisers, farmer field schools often teach holistic techniques, such as integrated pest management' (Campbell Collaboration Summary, 2017).

- Improves farmers' knowledge and adoption of better practices and increasing agricultural production and income. The results of the statistical meta-analysis '*provide evidence that FFS are beneficial in improving intermediate outcomes relating to knowledge learned and adoption of beneficial practices, as well as final outcomes relating to agricultural production and farmers' incomes. The findings suggest this to be the case for FFS promoting integrated pest management (IPM) technology, as well as other techniques. However, the rigorous impact evaluation evidence base is small and there are no studies that we were able to identify as having a low risk of bias'.* This suggests that FFS can be an effective development approach to agricultural extension, but that more research is needed, because evidence tends to come from short-term evaluations of pilots.
- Limited spread to neighbouring farmers: The evidence in the meta-review on scaling processes in larger-scale initiatives is less positive: *'There is no evidence that neighbouring non-participant farmers benefit from diffusion of IPM knowledge from FFS participants. Therefore, they do not experience improvements in IPM adoption and agriculture outcomes.'* The researchers suggest that because FFS approaches are based on 'experiential' training and scaling would 'require the benefits of FFS technology to be observed' and these inherent characteristics act as a barrier to 'spontaneous diffusion' compared to traditional extension approaches that disseminate knowledge on more simple practices such as the adoption of improved seeds.
- Positive agricultural and environmental outcomes for small scale initiatives (limited evidence/no studies with a low risk of bias available): Available evidence finds that FFS improve farmers' knowledge and adoption of beneficial practices and reduce the overuse of pesticides. On average farmers benefit from a 13% increase in agricultural yields and a 20% increase in income. Pesticide use is reduced, as is environmental degradation. Studies conducted more than two years after implementation did not find positive programme outcomes.
- Large-scale FFS programmes are not effective: Facilitator recruitment and training in large-scale programmes is a challenge.
- Empowerment is a common objective, but weak evidence is available: A small number of qualitative studies find that participating farmers grow in self-confidence, but more rigorous analysis is needed.
- The lack of learning by neighbours suggests that it is the complexity of the concepts taught which limit scalability and the experiential learning process cannot be bypassed: 'The complex concepts taught in farmer field schools may be difficult to learn through conversations and self-study, so the experience gained in farmer field schools may be the key reason the intervention works' (Campbell Collaboration Summary).

[6] A systematic review of the effectiveness of Farmer Field Schools for Improving Farming Practices and Farmer Outcomes: A Systematic Review' by Waddington et al (2014). The review includes 92 impact evaluation studies conducted in low or middle-income countries. The review also includes 20 qualitative evaluations of the barriers to and enablers of change in farmer field school projects.

- Gradual scale up is likely to be more effective, and FFS are not likely to be suitable for large-scale challenges. But the available evidence on large-scale FFS implementation is limited, so more rigorous national studies are needed.

The Systematic Review reports on 92 evaluations of FFS and finds that they increased crop yields by 13% and farmers' net income by 19%.

Framing

A critique of previous studies on agricultural investment for technological change, is the narrow, simplistic focus on adoption, which creates misleading findings and contributes to a weak evidence base and a continued frustration as to why poorer farmers often do not benefit from new technologies, even where this is a specific objective of programmes (Glover, Sumberg and Andersson, 2016)[7]. The term technological development refers to the development and application of new knowledge, materials, tools and practices (Glover et al, ibid, p4). See box 3 below.

Box 3: Flaws in 'adoption' conceptions of technological change

- Technologies are 'not discrete, generic, transferable packages of material and practical components' (p4)
- Technological change is not a simple, largely individual, dichotomous yes/no, once-and-for all and linear progression by which inferior existing materials, tools and/or methods become obsolete and are abandoned in favour of new, superior ones'(p4).
- Instead technology is a 'more fluid assembly of both social and technical components, and of socio-technical change as situated, iterative and contingent (Crane, 2014; Jansen and Vellema, 2011, p4).
- Technological change processes can include 'adaptation, creolization, hybridization and incorporation' (p4).
- There is an interplay between 'new and old results in complex dynamics of change and diversification of technological repertoires…technology is something people do, make or remake, not something they receive or adopt' (p4).

Source: Glover et al, 2016.

The evidence base focusing on adoption and its effects is therefore weakened, because meta-reviews cannot find enough studies that clearly define adoption (i.e. is it one off use, multiple uses over several seasons, or an intensity of adoption issue). A Systematic Review on whether technology adoption leads to increased agricultural productivity (Loevinsohn et al, 2013), excludes 94% of the papers for this reason and so we continue to 'not know' the conditions for success (Glover et al, 2016). A meta-review of Conservation Agriculture (CA) adoption in southern Africa (Andersson and D'Souza, 2014) is similarly hampered by CA definitional uncertainties, as well as undermined by donor incentive provision, so that the findings are not informative. Many of the studies analysed implicitly assume that the definition of the CA adopter is 'a farmer who practices the minimum tillage component of CA on some part of his/her land in a given season' and other practices, area covered, and number of cropping seasons covered are neglected (Andersson and D'Souza, 2014, p129, cited by Glover et al, 2016). Future studies should therefore embrace wider definitions including adaptation, hybridization, change of use, and innovation etc, because this is the reality of farmer decision-making and the critical element is whether farmers are building their on-going capabilities to evaluate technologies, to decide and understand what elements are useful to improve the resilience of their overall farming system.

Instead of doing increased numbers of adoption studies, even if these were improved in terms of definition, Glover et al, (2016) call for a focus on technological change as opposed to adoption to obtain greater insight into the scale, impacts and dynamics involved. Rethinking adoption involves shifting to a focus on technological

[7] Glover et al (2016) 'The adoption problem or why we still understand so little about technological change in African agriculture'. Outlook on AGRICULTURE Vol 45, No 1, 2016, pp 3–6 doi: 10.5367/oa.2016.0235

change, recognizing farms as socio-technical systems, drawing upon sociological and anthropological insight, recognize the iterative and non-linear characteristics of many such processes, address the multiple scales at which technologies operate and differing complexities of technology or sets of technologies, and support be underpinned by robust evaluation (see box 4 for more details). A key aspect of this, we suggest, is understanding farmer agency and the dynamics of individual and cumulative decisions by individual farming households, but also to have a systems lens at different scales.

Box 4: Key elements of rethinking adoption and shifting to understanding technological change processes

A new approach should recognize the following:

(1) sociological and anthropological understandings of technological change. Farms as interlocking socio-technical systems
(2) change processes that are emergent, and those that are iterative or incremental. The process of technological change may emerge over time or may start with (or never get beyond) small informal 'trials' or try-outs; it may also be reversed. A new practice or input may be tried for one season in a small corner of a single field; used for a few years and then abandoned; or used on an on-going basis, but only on a small scale alongside established technologies.
(3) change processes that are partial and/or adaptive, involving the alteration or reinvention of the new technology. Components or aspects of the technical package introduced may not be used at all or may be altered or used differently from what was expected.
(4) handle technologies of different complexity. New agricultural technologies cover a broad range from an established crop variety into which a new gene for disease resistance has been inserted, through to complex new production systems – for example, the System of Rice Intensification or conservation agriculture. Space for user experimentation and adaptation varies with different approaches. Some require more exposure, new knowledge or market infrastructure than others.
(5) multiple levels and scales at which technologies operate, including those that require coordination or collective action at a farm, household, village and/or watershed level.
(6) Based on robust and cost-effective estimates of the effects of investment in specific technology development and promotion programmes.

Source: Summarized from Glover et al, 2016, p4-5)

Using a systems lens

Glover et al, (2016) argue that 'The adoption problem is in every sense an agricultural systems problem, and re-conceptualizing and researching technological change along the lines indicated above will require a concerted, cross-disciplinary effort'. Rather than assuming farms are homogeneous entities and that these similar structure farms make up a farming system, it is important to recognize that in reality, '*a given farm is likely to have links (flows, synergies, dependencies etc) to farms with dissimilar structure, as well as to non-agricultural and non-rural parts of the economy. These links are integral to the farm system and to the broader economy. In this sense, a 'farming system' is conceptualized as a heterogeneous population of interacting 'farm systems' with links to the non-farm and non-rural economies'*[8]. The dynamics of technological change are shaped by different factors, but what works for one farmer is not necessarily going to work for another because each farm system may have a dissimilar structure, set of intra-household relations, personalities and social networks, flows and connections in and out of the agricultural and broader economy. It is therefore important that the experiential learning process enables the farmer to evaluate technologies, and encourages adaptation, experimentation, innovation etc. At the same time, there are different systems at community, landscape, national levels which will shape technological change processes and the outcomes.

This insight is particularly important when considering FFS used to strengthen climate resilience, as opposed to a narrower intervention e.g. improving sweet potato farming. In the FAO project the aim is to strengthen climate resilience through a combined package of measures to build up ('*caisses de resilience'*) – there are diverse

[8] https://steps-centre.org/blog/a-new-way-farms-systems/

agronomic measures, crop diversification, but also health and nutrition and conservation and biodiversity safeguarding etc. This means that the intervention itself is relatively complex in nature, and so to understand whether climate resilience has been strengthened at different levels, we cannot think of simple, adoption processes, but need to unpack the dynamics of technological change, and consider the multiple scales at which technologies operate, plus the enabling environment and contextual change factors.

A new conceptual framework for rethinking technological change in smallholder agriculture is provided by Glover et al, 2019). It explains how a new technology, whether self-generated or introduced by deliberate external interventions, begins as an idea or image of what it could or might be and opens up new ways of working and potential outcomes (propositions). Each proposition has material aspects (e.g. seeds, fertilizers), as well as associated practical aspects (e.g. methods, techniques and practices on how to use the technology for optimal use) and relational aspects in terms of the assumptions made about target farmer motivations and capabilities. In a specific occasion or arena when a farmer is made aware of a new proposition (encounters), power and politics are at work and the quality and quantity of the encounter will vary, in turn shaping the freedom and scope given to farmers to appreciate and mobilize. Farmers are agents and their disposition are shaped by individual and household characteristics, the dynamics and quality of the encounter and the features of the proposition. This is combined with the external context (i.e. cultural, biophysical etc) which all shape how farmers interpret and perceive the proposition with respect to their own situation. Their perceptions may evolve over time as their own circumstances change, and/or as they gain more experience with a proposition. Those farmers who are positively disposed, reconfigure the proposition (material, practical and relational aspects) through learning, experimentation, adaptation etc. There is scope for positive and negative, expected and unexpected responses and outcomes (Glover et al, 2019). Some farmers may reject the propositions outright. We also note that the context in which farmers are operating is also dynamic, but the extent and speed of change will be context specific. See Figure 2 below.

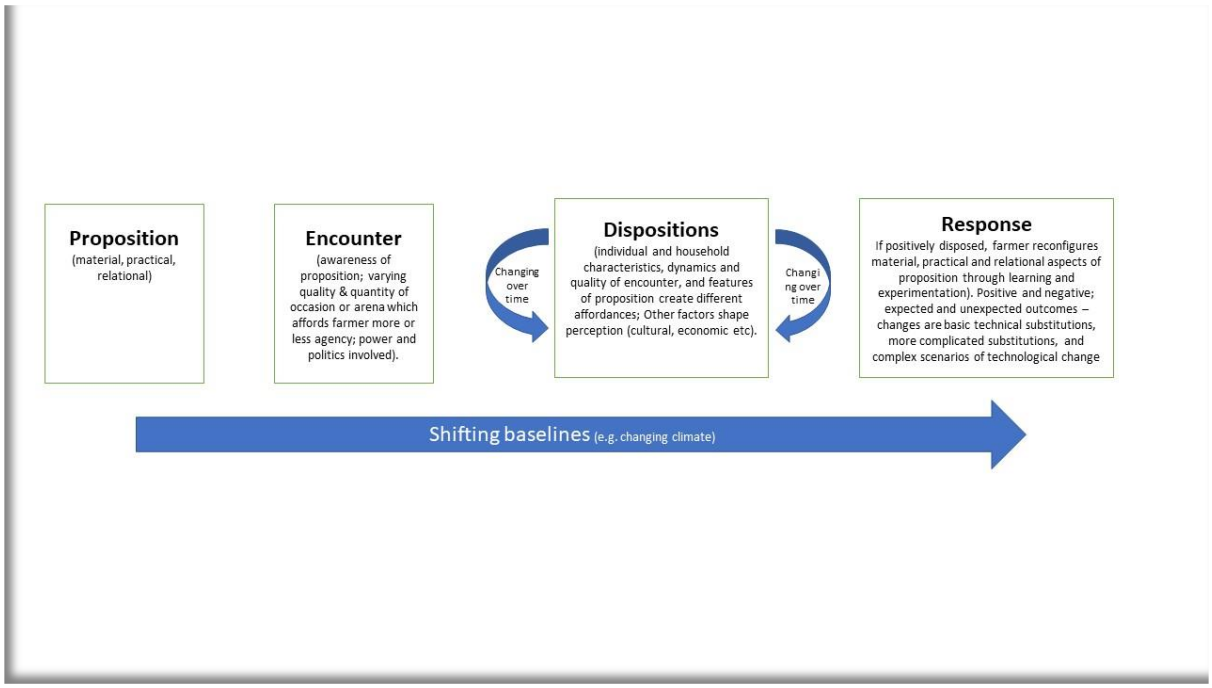


Figure 2: Technological change in smallholder agriculture (after Glover et al, 2019)

Smallholder farmers in Malawi are faced with the challenge of managing complex and dynamic farming systems while also adapting to change within volatile agroecological conditions. Their management decisions are influenced by a combination of factors including: local knowledge, expert recommendations/government prescriptions and support; markets and on-farm experimentation. Although many smallholder farmers actively

experiment with new crops and technologies, little is known about the prevalence of experimentation or the types of experiments farmers conduct. Recent research Hockett and Richardson, 2018[9]) has assessed farmer experimentation in Malawi and some key points emerge. Firstly, most farmers are experimenters, but to varying extents. In their study, the authors identified three categories of farmer experimenters: Project participants (farmers who only reported trying something that had been actively promoted to them (e.g., by extension agents); Followers (farmers who reported trying something that they had observed or had heard mention of) and Independents (farmers who reported trying something that was their own idea). Secondly, the majority of experiments reported on in the study fell into three categories: new crops (34%), new varieties - maize and legumes (40%) and plant spacing experiments (15%). Thirdly, the study explored farmer motivations for experimentation and categorized these into three types: proactive, reactive and external. Proactive experiments include those driven by a farmer's desire to create a positive change in their life circumstances or farm system (e.g. to increase food production, generate household income, improve soil fertility or maximize land use). Reactive experiments are those prompted by a farmer's response to unexpected circumstances, such as the impacts of climate change, pest or disease problems or access to resources. External experiments were those where a farmer was invited to try something new by an influential source (e.g., intervention project or extension agent). It was not uncommon, however, for farmers to attribute experimentation to a combination of motivators. Unlike proactive and external motivators that primarily drove new experiments, reactive factors (e.g., climate change, resource availability) could also act as barriers to experimentation. FFSs provide a potential means of reducing these barriers to experimentation.

During the interview process, farmers explained that their experiments with maize varieties were driven by reaction to changes in rainfall patterns more than any other motivator. These findings are compounded when compared with the survey data, where 86.1% of farmers said they had noticed changes in the rains over the last 20 years, and out of those farmers, 67.2% reported that the changes they noticed included less rain, erratic rainfall and a tendency for the rains to stop before the crops had matured. These results indicate that farmers are not only noticing the effects of climate change, but they are actively experimenting with maize varieties and new techniques in an effort to adapt to undesirable environmental changes. In addition to climate change, farmers cited their landholdings (or the number of fields held by a farmer) as a factor that affected their decision-making processes during an experiment. Many farmers shared the opinion that initiating a new experiment – or scaling out a successful experiment–required extra space, which often meant renting additional land.

The relationship between a farmer's ideas of success (failure), satisfaction (dissatisfaction) and future intentions for an experiment is not direct; it is mediated by other factors. Thus, dissatisfaction with an experiment does not necessarily result in the abandonment of that experiment. Likewise, satisfaction with an experiment does not necessarily result in its repetition, as repetition is somewhat dependent on a farmer's access to resources such as follows: landholdings (both total farm size and number of fields); input availability in local markets, from intervention projects or through government subsidies (e.g., seed, fertilizer, pesticides, etc.); household income to purchase agricultural inputs; and available labour (which is closely related to a farmer's personal health). Overall, farmers expressed that their choice to continue or abandon an experiment varies from season to season, depending on a host of external factors. This was consistent with the theoretical frameworks supporting Hockett and Richardson's study (Nitsch, 1990; Schön,1983), where experimentation is defined as an iterative and context-specific phenomenon.

Trade-offs

The target districts of the FAO project are challenging in terms of the multiple rural stressors. It is well known that there is growing pressure and land scarcity in southern Malawi (see Table 7). The project is seeking to build up climate resilience by building up household assets and tackle poverty. Land scarcity and the already challenging climatic pressures, combined with poverty levels, raises questions about the trade-offs that farmers will face in engaging in FFS and any technological change that is sparked as a result. Farmers and other stakeholders have

[9] Hockett, M., & Richardson, R. (2018). Examining the drivers of agricultural experimentation among smallholder farmers in Malawi. Experimental agriculture, 54(1), 45-65. Doi:10.1017/s0014479716000673

multiple aims regarding farming systems in Malawi. Intensification pressures are strong – food security is a major public policy priority which is now fully embedded in Malawian electoral politics and unfortunately, farm input subsidies are exacerbating processes of rent extraction and undermining implementation (Chinsinga, 2018[10]), as well as for local communities in southern Malawi. "A powerful national narrative links maize consumption with food security (Smale 1995)" in Sutcliffe et al. 2015[11] . From a maize producer perspective, there is recent evidence that there are positive effects of the FISP in terms of improved fertilizer use and maize yields, increasing overall national production, leading to a better income for the rural sector: those receiving the subsidy had higher incomes and rural workers had higher wages (Schiesari et al 2016[12]). However, for many authors, this highly expensive programme is not bringing sufficient social benefits to the country as a whole because: a) the programme is poorly targeted – a limited number of poor farmers have benefitted, and a significant number of non-poor households; b) although some producers have improved their production, most consumers have not benefited from lower prices (Schiesari et al ibid). Overall, there has not been a significant impact on food security, which suggests a need for improved targeting of the programme (Schiesari et al, 2016), modifications and/ or alternative approaches.

As the GEM 2016 report notes, smallholder farming is already complex and risky, but innovative farming may be even more challenging. For farmers there are risks involved, and the trade-offs need to be more clearly recognized in contexts of significant land scarcity, climate impacts, poverty etc. While some argue that FFS are especially useful to promote sustainable agricultural intensification (GEM, 2016)[13], in the FAO project the approach is to try and address not only intensification and resilience through sustainable and climate smart agricultural production practices, but also improving natural resources management (including the dimension of natural regeneration), access to markets, health and nutrition, given the importance of ecosystem services for livelihoods and health, and nature's contribution to people (IPBES, 2018[14]). The FAO project proposal states that '*to improve resilience of vulnerable communities under conditions of increasing climate variability and change amid environmental degradation coupled with a rapidly growing population pressure, a transformative community empowerment outreach process is required. This will be achieved through an innovative, integrated community centred approach – 'Les caisses de résilience'* (FAO, p5).

5. Methodology

The overall methodology is based upon cases studies to test the theory of change, combined with Contribution Analysis to assess the role of the project. These comparative case studies are combined with the FAO Project M&E data to produce a comprehensive picture and to generate lessons. This report presents a set of findings based on baseline fieldwork in December 2016, monitoring fieldwork in May 2018 and March 2019, plus a final evaluation in October 2019. A stakeholder validation workshop was held in Blantyre in October 2019, at which FAO personnel, government extension staff from the project implementing areas, and FFS members (women and men) a minimum of two from each case study group were invited to participate to review the findings and contribute to the development of lessons.

The purpose of the FFS case studies is to enable the MEL team to facilitate a participatory assessment of change from FFS participants' perspectives. The lessons are intended to inform the wider community of practice engaged in agricultural development in a context of the changing climate, the GCCA programme evaluation for the European Commission. The process and lessons could potentially inform the implementing partners as well, although the opportunity for adaptive learning within the programme was relatively limited according to FAO

[10] Chinsinga, B (2018) 'The Political Economy of Agricultural Commercialisation in Malawi'. Working Paper 17, 2018 Agricultural Policy Research in Africa.

[11] Sutcliffe, C., Dougill, A.J. & Quinn, C.H. (2016) Evidence and perceptions of rainfall change in Malawi: Do maize cultivar choices enhance climate change adaptation in subSaharan Africa? Reg Environ Change (2016) 16: 1215- 1224. https://doi.org/10.1007/s10113-015-0842-x

[12] Carolina Schiesari and Jonathan Mockshell and Manfred Zeller (2016) Farm input subsidy program in Malawi: the rationale behind the policy University of Hohenheim. 22 May 2016. Online at https://mpra.ub.uni-muenchen.de/81409/ MPRA Paper No. 81409, posted 18 September 2017 17:41 UTC

[13] UNESCO (2016) 'Global Education Monitoring Report: Creating Sustainable Futures for All'

[14] Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2018)

project representatives attending a project stakeholder workshop in Blantyre, 2016 and due to a delay instituted by the EC in the work of the programme MEL team.

The case studies were designed as a complement to the FAO MEL plans which were already in place when the programme MEL team started its work, including a questionnaire survey and Focus Group Discussions. The case studies present a more open approach to exploring the theory of change, gathering evidence at each stage of the causal pathway and addressing the assumptions, i.e. the pre-conditions which need to be in place for the intended theory of change to occur in practice. The theory of change was developed at a dedicated workshop in Blantyre in October 2016. See the evidence and learning questions in table 3 below.

Table 3: Evidence and Learning Questions

Learning Questions based on theory of change assumptions	
Implementation **Management of implementing partners** **Identification of hotspots** **Establishment and support for FFS groups and learning cycles facilitated**	• Were hotspot locations effectively identified and used in planning of activities? • Has there been effective implementation by FAO? Were the implementing partners effectively selected, trained and managed and did they deliver effectively? Was the training of implementing partners effective (i.e. did it enable those delivering extension to facilitate FFS as per the FAO principles?) • To what extent has approach/model implemented followed FAO FFS principles in practice? • Is the FFS approach attractive and relevant to (different groups of) farmers? Have they met participants' expectations? To what extent are farmer expectations in line with project aims? What would farmers like to change? • How functional are the FFS groups? What are their strengths and weaknesses? • How has the willingness of farmers to participate changed over time? Who has participated? Who has not? What has been the gender balance? Reasons? Have there been drop-outs? • What have been the benefits of participation?
Capacity changes (capability, opportunity, motivation)	• What kinds of capacity changes have been achieved? How and why? For whom? • What are the barriers to capacity change? • Is the process creating enough motivation and opportunity for farmers to change? • Gender relations within households and extent to which women empowered to adopt and innovate?
Behaviour change	• What kinds of behaviour changes have been achieved and how/why? For whom? If not, why not? • Barriers to behaviour change? (Internal and External)
Direct Benefits & Impacts	• What kinds of benefits, costs and impacts have been achieved? For whom? How and Why? • What improvements in farmer resilience have been achieved, if any? • Is the enabling environment sufficiently supportive? • Are wider social, climatic, economic, and environmental contextual conditions changing since the baseline? Are they worsening or improving? How does this affect individual farmer household climate resilience?
Scaling (wider learning)	• What kind of scaling has occurred beyond the FFS group? Have participants in the FFS shared their knowledge and supported learning by other community members and those outside the village? Are other farmers copying, innovating, adapting, experimenting more due to the FFS?

Data has been collected against each step of the theory of change – see the evaluation matrix Table 1 and to answer learning questions which derive from the identified assumptions (see Table 4).

Table 4: Evaluation Matrix

Theory of Change	Data collection – baseline & Monitoring
Implementation	• Interviews with FAO staff • Interviews with implementing partner representatives • Individual farmer case studies (selected using rapid wealth ranking) – feedback on FFS group strengths and weaknesses and functionality • Focus Group Discussions – planning process and activities undertaken, functionality of FFS • Learning plot visit • Participatory validation workshop
Capacity Change	• Individual farmer case studies (selected using rapid wealth ranking) – feedback on capacity changes & farm visits • Focus Group Discussions – capacity changes • Participatory validation workshop
Behaviour Change	• Individual farmer case studies (selected using rapid wealth ranking) – feedback on behaviour changes & farm visits • Focus Group Discussions – behaviour changes • Participatory validation workshop
Direct Benefits & Impact	• Individual farmer case studies (selected using rapid wealth ranking) – feedback on benefits and impacts & farm visits • Focus Group Discussions – benefits and impacts • Participatory validation workshop

Scaling & Sustainability	• Individual farmer case studies (longitudinal, selected using rapid wealth ranking) – sharing within and beyond community • Focus Group Discussions – sharing within and beyond community • Participatory validation workshop

Selection of Farmer Field Schools

The Programme M&E team developed criteria for the selection of four FFS, in discussion with the FAO team. The latter explained that at that stage there were no inherent variations between the FFS groups except their geographical locations. Selection criteria were then chosen as a) geographical spread – 1 FFS per district, b) accessibility (given the onset of rains it was necessary to be able to reach the FFS). Participation in the FGDs was requested from all the members of the group.

Baseline Assessment 2016

The baseline assessment explored farmer perceptions of climate variability and change, farming practices and capacity and participants' expectations and plans the newly formed FFS and included interviews with the FAO, implementing partners, separate women's and men's focus group discussions, individual farmer case studies (interviews and home/field visits), learning plot visits. Checklists were developed to guide each exercise.

For the FGDs, one representative who was knowledgeable about their community was identified in advance by the FAO or implementing NGO team to act as a key informant (e.g. village headman, village development committee chairperson etc) providing a rapid wealth ranking of the participants in the group. The selection of participants for the household case studies was based upon the wealth ranking conducted by the key informants. A proportionate number of women and men were chosen (reflecting the overall ratio of men to women in the group) with a proportionate spread of people from the relevant wealth categories which had been identified by the key informants.

In total, 8 FGD discussion groups were held, plus 36 household case studies and 4 rapid wealth ranking exercises:

- Focus Group Discussions: FGDs were held with the Farmer Field School (FFS) groups (2 to 3-hour sessions) as well as key informant interviews (wealth ranking/basic village profile) and individual case studies. The aim was to provide a baseline assessment of a selection of FFS members in terms of their involvement in the FFS, and current assets, capacity and behaviour.
- Mapping: Separate women's and men's groups were asked to create maps of their village 30 years ago, currently and in the future, highlighting natural resources issues, farming practices, changes in the climate etc, settlement, etc).
- Reflecting upon the village mapping they discussed what has changed and/or reconstruct the map to facilitate discussion (NRs, population, farming practices) and the FFS process to date (timeline, who has participated in the FFS and where they live, what has changed already, if anything, following the group formation and preliminary activities etc.
- Wealth ranking: Key informants were asked to provide a village profile, to identify locally relevant key indicators of wealth and to categorize members of FFS against each category
- Household case studies: From the list of FFS participants (showing gender, age, community) the team selected individual FFS members who can be interviewed as part of case studies on a regular basis. The household case studies collected information on the members of the household (members, key livelihood activities and assets, farming practices, gender roles) and documented their participation to date in the FFS, quality of process, what learnt, how capacity may have changed or not). The study employs generative causation, rather than an experimental design involving control groups, due to the complexity of the context and intervention.

The discussions and exercises were documented using video as well as notetaking. The results were tabulated, and a baseline report was produced.

Table 5: Summary of Farmer Field School Groups (Baseline and Monitoring)

		FGDs		Case Studies			
District	Farmer Field school	Baseline	Monitoring	Baseline	Monitoring May 2018	Monitoring March 2019	Final learning visit Oct. 2019
Blantyre	Nang'omba Farmer Field School Lemu GVC, TA Kuntaja Lemu, Magombo and Kasawala villages	2	2,2,1+	9	9	8	9
Neno	Tikondane Farmer Field School Symon GVC TA Symon Kandonje Village	2	2, 0, 1	9	7	7	6
Phalombe	Nthundu Farmer Field School GVC TA Jenala Ndungunya Two Village	2	2, 2, 1	9	9	7	7
Zomba	Kapako* Farmer Field School Kabalasa Group Village Head Chombe 3, Ntonga, Sikinala, Nlusu	2	2, 2, 1	9	9	8	9

+Number of FGDs during monitoring for May 2018, March 2019 and October 2019

There is a good representation of farmers with respect to gender, age and asset status and proportionate to the composition of individual FFS group.

Monitoring 2018

Limited changes were made to the checklists to ensure that the questions covered changes since the baseline (e.g. in asset levels) and captured the extent to which the expectations of the farmers had been met with respect to the FFS process, reflections on the functioning of the group and activities undertaken, as well as capacity and behaviour change and benefits relating to the four desired result areas of FAO and to understand the extent to which scaling has occurred (via sharing and copying within the community and beyond).

In the monitoring visit, 8 FGDs were conducted (4 men's, 4 women's[15]), plus 34 individual case study farmer interviews and field visits, plus learning site visits, and interviews with the relevant FAO and implementing partners.

Monitoring

Limited changes were made to the checklists to ensure that the questions covered changes since the baseline (e.g. in asset levels) and captured the extent to which the expectations of the farmers had been met with respect to the FFS process, reflections on the functioning of the group and activities undertaken, as well as capacity and behaviour change relating to the four desired result areas of FAO. The main focus was on observing, documenting by video and understanding changes in farmers' capacity and practice in their fields and key issues such as climate adaptive capacity. In the monitoring visit, 6 FGDs were conducted (3 men's, 3 women's), plus 30 individual case study farmer interviews and field visits, plus learning site visits, and interviews with the relevant FAO and implementing partners. In Neno District, social cash transfers were being made and Tikondane FFS was experiencing significant dissatisfaction with the group leadership. The combined effect resulted in it not being possible to meet members together. However, individual interviews were conducted.

[15] Separate women's and men's FGDs were considered necessary in order to allow women's voices to be heard in this evaluative process, given the cultural norms which can prevent them from speaking out.

Final evaluative learning visit (October 2019).

The FGD included: Participation, FFS activities; Weather conditions since the FFS began; How the FFS has helped to cope with the variability; Changes in wider community as a result of FFS; Expectations of the group since the start to now; How the group measures if it is succeeding; Examples of a recent problem met by farmers and the solution to the problem drawing upon the FFS experience; Future plans and own participation. Individual Interviews focused on Change in the household; Access to other support services; Behaviour change (nutrition, livelihoods, conservation and safeguarding) and changes in livelihood assets. In the visit, 4 FGDs were conducted (1 combined men and women FGD for each FFS) where videos of that specific FFS were shared to facilitate reflection by the members, plus 31 individual case study farmer interviews, plus learning site visits, and interviews with the relevant FAO and implementing partners.

Participatory validation workshop

A workshop was held in Blantyre in October 2019, to present the key lessons and evidence generated by this study and allow for discussion and validation by key stakeholders. The workshop presented the lessons and evidence following the FFS theory of change and after each step in the theory of change, break-out groups were organized with plenary feedback to share key insights. There were approximately 30 participants from 3 stakeholder groups (FFS member, Extension staff, FAO staff). A separate workshop report is available.

Strengths of Methodology

- It is possible to explore in more depth how farmers experience the FFS process and to understand their perceptions of its effectiveness
- Detailed analysis important to complement wider quantitative data collected by the FAO which will be more representative. The case studies can help to validate the project data, but also provide insights into how and why FFS may or may not work in strengthening farmers' climate resilience in Southern Malawi.

Limitations

- Data is not representative. Only a small number of cases are included. The approach seeks to shed light on the dynamics involved in technological change. The study only includes 1 FFS per district, which were also selected by the project partner (although using criteria supplied by the evaluative learning team). There could be wide biophysical and socio-economic differences within the district. However, a) the team has integrated the case study data with the questionnaire survey data of the FAO, including requesting data collection on additional outcome-oriented questions, b) using comparative case study methodologies framed by the theory of change (conceptual and analytical framework).
- FFS is near the road (different situation to more remote communities)?
- The common risks of bias involved in qualitative work apply, such as confirmation bias: these have been addressed through conducting interviews with different stakeholders and using different sources of data (e.g. individual case studies, FGDs, secondary statistics etc).
- A number of FFS member cases were not available during visits. This was either on a temporary or permanent basis. However, where we were able to follow up the "missing" members this provided valuable insights into how rural dynamics and their implications for effective FFSs.

6. Findings

6.1 Context

Population density in Blantyre, Phalombe and Zomba districts is well above the Malawian national average, whereas the figure for Neno District is significantly lower. The area of land owned per household is also lower than the national average in Blantyre, Phalombe and Zomba (0.9-1.3 acres) and the same for Neno District (1.4 acres) (Table 6). In all districts, population density has increased by at least 29% between 2008 and 2018 (Table 6 and Figure 3). Neno and Phalombe districts have a higher proportion of poor people than the national average for rural areas (Table 7).

Table 6: Area, population, population density (2008 and 2018) and area of land per household (2016/17)

	Land area	Population		Population density			Area owned/ household (acres)+
	(sq km)	2008	2018	2008	2018	% increase	
Blantyre	1,785	339,406	451,220	190	253	33	0.9
Neno	1,561	108,339	138,291	69	89	29	1.4
Phalombe	1,323	315,185	429,450	238	325	37	1.1
Zomba	2,363	578,766	746,724	245	316	29	1.3
Malawi	94,552	13,029,498	17,563,749	138	186	35	1.4

National Statistical Office. 2008. Population Projections. Zomba, Malawi[16].

National Statistical Office. 2019[17].

+ National Statistical Office. 2017[18]. Integrated Household Survey 2016-17. Zomba, Malawi.

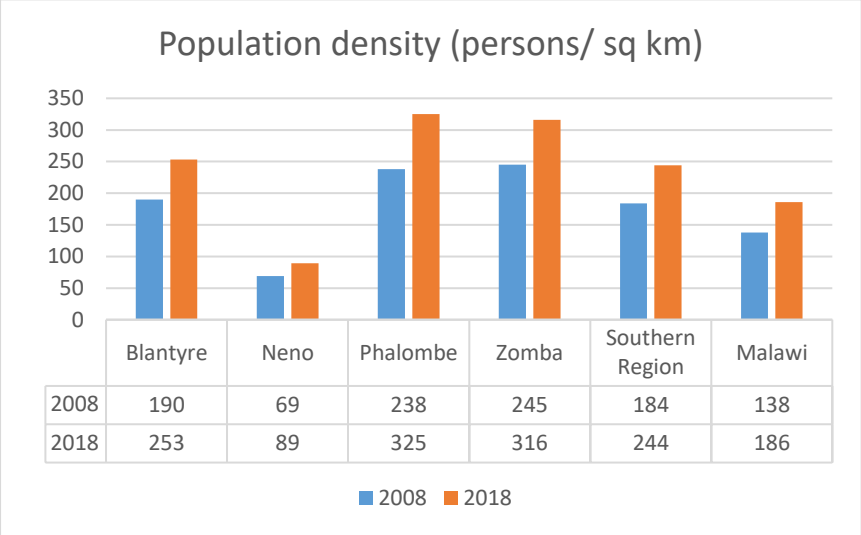


Figure 3: Population density of Blantyre, Neno, Phalombe and Zomba Districts, southern region and Malawi (2008 - 2018).

Table 7: Percentage of population considered poor or ultra-poor (2011/12) and percentage of households reporting inadequate consumption of food (2016/17)

	Poor	Ultra-poor	Inadequate consumption of food+
Malawi	50.7	24.5	63.8
Urban	17.3	4.3	41.6
Rural	56.6	28.1	69
Rural North	59.9	29.0	
Rural Centre	48.7	21.5	
Rural South	63.3	34.2	
Zomba	56.6	26.4	80.5
Blantyre	40.0	13.5	60.7
Neno	65.3	29.7	66.3
Phalombe	64.5	41.7	69.2

National Statistical Office. 2011. Integrated Household Survey 2010-2011. Zomba, Malawi.

+ National Statistical Office. 2017. Integrated Household Survey 2016-17. Zomba, Malawi.

[16] http://www.nsomalawi.mw/images/stories/data_on_line/demography/census_2008/Main%20Report/ThematicReports/Population%20Projections%20Malawi.pdf;

[17] National Statistical Office. 2019. Malawi Population and Housing Census report – 2018. Zomba, Malawi. http://www.nsomalawi.mw/images/stories/data_on_line/demography/census_2018/2018%20Malawi%20Population%20and%20Housing%20Census%20Main%20Report.pdf

[18] National Statistical Office. 2017. Integrated Household Survey 2016-17. Zomba, Malawi.

Agriculture is the main livelihood activity in all the districts. However, at least 47% of people over the age of 10 in the four districts engage in '*ganyu'* (Table 8), which is a term widely used in Malawi to describe a range of short-term rural labour relationships, the most common of which is piecework weeding or ridging on the fields of other smallholders, or on agricultural estates. After own-farm production, *ganyu* is the most important source of livelihood for most poor households and for some it is becoming even more important than own-farm production. *Ganyu* is the most important coping strategy for most poor households in the crucial hungry period between food stores running out and the next harvest. The need to do *ganyu* to obtain an immediate supply of food may conflict with own farm production and therefore, while addressing an immediate crisis, can lock some households into a vicious cycle of food insecurity. Low *ganyu* wage rates mean agricultural labourers do not earn sufficient incomes to invest in sustainable livelihood development (Whiteside, 2000[19]).

Table 8: Reporting Source of Livelihood 2018 (Percentage of population aged 10 or over*)

District	Population	Enterprenuership	Employment	Ganyu	Petty trading	Remittances	Pension	Public works	Fishing	Food crop sales	Cash crop sales	Social cash transfer	Forestry products	Other
Blantyre	387,719	18	18	56	2	3	1	0	0	5	3	0	2	7
Neno	117,418	15	10	56	1	1	1	1	0	16	7	0	2	8
Phalombe	359,901	17	6	55	1	2	0	0	1	19	12	1	1	4
Zomba	630,192	20	10	47	1	2	0	1	0	17	9	1	1	8
Malawi	14,930,871	17	15	43	2	2	1	0	1	15	13	0	1	8

*Note: This was recorded for all people aged 10 years and above

Source: National Statistical Office. 2019.

A number of support programmes are in operation in Malawi (Table 9) and several studies have taken place exploring the complementarities or synergies between these programmes. For example, a study by Pace et al (2016[20]) showed that there are positive synergies between the Social Cash Transfer Programme and Farm Input Subsidy Programme in increasing expenditure and the value of agricultural production, crop production, livestock, and weakly, in improving food security. The most common source of support reported by the four FFS members was credit from a VSL, the FISP and the school feeding programme.

Table 9: Percentage of Households that Received Assistance and Source of Assistance, 2018

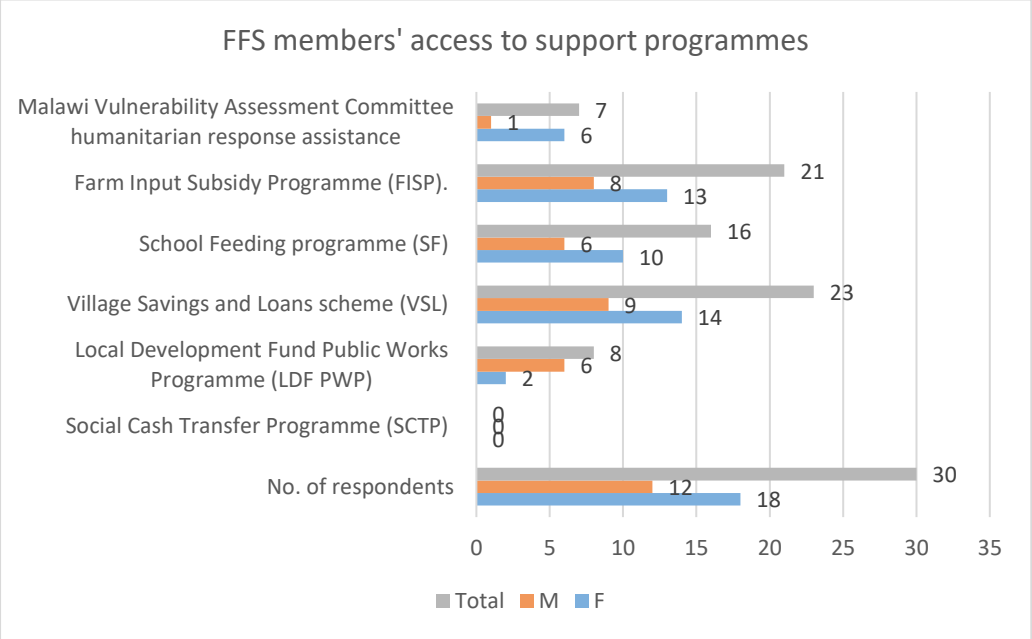
			Source of Assistance					
District	Total Households	% of households received assistance	Family/ Friends	Government	NGO	Religious Organisation	International Organisation	Other
Blantyre	109,963	10.8	2.1	4.1	3.6	0.2	0.6	0.3
Neno	31,490	6.8	1.3	2.8	2.3	0.1	0.2	0.1
Phalombe	98,848	15.6	0.8	5.2	8.7	0.3	0.6	0.1
Zomba	177,680	14.0	2.2	4.8	5.8	0.2	0.7	0.2
Malawi	3,984,981	8.7	2.2	2.9	2.9	0.2	0.3	0.2

Source: National Statistical Office. 2019.

[19] Whiteside M (2000) Ganyu labour in Malawi and its implications for livelihood security interventions – an analysis of recent literature and implications for poverty alleviation. ODI AgRen Network Paper No. 9. https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8256.pdf

[20] N. Pace, S. Daidone, B. Davis, S. Handa, M. Knowles, R. Pickmans (2016) The Social Cash Transfer Programme and Farm Input Subsidy Programme in Malawi: complementary instruments for supporting agricultural transformation and increasing consumption and productive activities? Food and Agriculture Organization of the United Nations (FAO).

Figure 3: FFS members' access to support programmes (at least once) while belonging to the FFS



In terms of land cover, Bone *et al* (2017[21]) suggest that in Malawi over a 37-year period from 1972 to 2009, there has been a loss of 12,760 km2 (36%) of original forested area but also 11,161 km2 of new forest establishment, resulting in an overall net loss of 1 599 km2 (5%). Over the same period, mosaic land cover had a net gain of 2 804 km2 (+5%). In three of the project districts between 1972 and 2009 there has been a net gain in forest cover and a net loss in mosaic cover (defined as a mixture of cropland, forest, woodland, grassland, scrubland and other natural vegetation). In contrast, Neno district has experienced a 10% net reduction in forest cover and 10% gain in mosaic cover (Table 10).

Table 10: Changes in forest and mosaic (defined as a mixture of cropland, forest, woodland, grassland, scrubland, and other natural vegetation) area between 1972 and 2009 in Blantyre, Neno, Phalombe and Zomba Districts

District	% forest cover 1993+	Forest change (km2)	Percentage forest change (%)	Mosaic land cover change (km2)	Percentage mosaic land cover change (%)
Blantyre	30	23	7	−23	−2
Neno	31*	−75	−10	82	10
Phalombe	Not available	28	16	−7	−1
Zomba	7	181	57	−92	−5

*Data for Mwanza district, before Neno split from Mwanza; Source: Bone *et al* (2017); + Daulos et al, 2010[22];

All four districts face a situation where difficult trade-offs decisions are required, and strengthening agricultural climate resilience needs to be facilitated, but also sustainable agricultural intensification to meet the food security needs of growing rural and urban populations.

[21] Rachel A Bone, Kate E Parks, Malcolm D Hudson, Mathews Tsirinzeni & Simon Willcock (2017) Deforestation since independence: a quantitative assessment of four decades of land-cover change in Malawi, Southern Forests: a Journal of Forest Science, 79:4, 269-275, DOI: 10.2989/20702620.2016.1233777

[22] Daulos D.C. Mauambeta, David Chitedze, Reginald Mumba (2010) Status of forests and tree management in Malawi: A position paper prepared for the Coordination Union for Rehabilitation of the Environment (CURE). file:///D:/MalawiGCCAcall/FAO/FollowupstudyMay2018/STATUSOFFORESTSANDTREEMANAGEMENTINMALAWI-DDCMAUAMBETAETAL.pdf

6.2 Implementation

Were hotspot locations effectively identified and used in planning of activities?

FFS has identified hotspots and measures have been implemented. However, a robust evaluation of the effectiveness of the measures undertaken appears to be lacking. The hotspot identification enabled the FAO to identify locations where improvement actions would be undertaken (e.g. tackling gullies, managing water sources) and FFS groups could be established (Interview with FAO, project manager, 2016). This study does not seek to evaluate the effectiveness of the hotspot mapping, nor is it designed to measure the environmental impacts of improvement measures (e.g. areas reforested etc). However, the team did visit various hotspots during the research.

Has there been effective implementation by FAO?

This evaluation is learning, rather than accountability oriented. To generate lessons on how far and under what conditions FFS works as an approach to agricultural extension and livelihood support to build climate resilience, it is helpful to identify lessons and to scrutinize the assumptions relating to implementation.

A large number of FFS groups have been established by October 2019. 325 groups were established across the 4 districts, exceeding the original target of 240. 9,750 farmers have participated. See Table 11 below.

Table 11: Number of Outreach Groups and Beneficiaries by District

District	Number of FFS groups	Number of FFS members	Number of follower farmers	Number of resource users influenced
Blantyre	60	1,800	5,400	36,000
Zomba	84	2,520	7,560	50,400
Neno	100	3,000	9,000	60,000
Phalombe	81	2,430	7,290	48,600
Total	**325**	**9,750**	**29,250**	**195,000**

Source: FAO, 2019[23]

A shift occurred in the FAO's project implementation strategy, but it is not clear which approach is more effective: This was achieved by a switch in implementation strategy: instead of working with NGOs as implementing partners providing the facilitation of the FFS groups, the project shifted to working with government extension agents as a cheaper and more sustainable approach, with facilitation from the AEDOs, combined with community-based facilitators from the community. FFS members were selected who had an aptitude for facilitation of other farmers (e.g. they could read and write, could interpret technologies for fellow farmers). 120 CBFs were trained in Neno, Blantyre and Phalombe, with 21 days of intensive training provided. The training also continues in the community as they facilitate the FFS, through support from the government extension officer. The latter strategy allowed for an increased target. However, we note that there is arguably a risk to working with CBFs – although such an approach may be cheaper and more sustainable, it is not clearly evidenced as to whether it is more effective in terms of achieving outcomes. One of the challenges seen in this project, is the constant pull back to the 'adoption' paradigm.

Other outreach methods were undertaken during the project, but better monitoring is needed to assess effectiveness: 341 field days were held, for example, when FFS members showcase their work to the wider community. Again, the effectiveness of such approaches has not been monitored and evaluated to generate

[23] Source: FAO (2019) Strengthening Community Resilience to Climate Change in Blantyre, Zomba, Neno and Phalombe Districts. Reporting period 1stJune 2018 – 31st May 2019. Fourth Interim Narrative report

lessons as to whether and under what conditions they are effective. There are possible risks relating to the 'adoption' paradigm in scaling and 'showcasing' methods.

The FAO project leader reported (2019) that different technologies had been promoted:

- Conservation Agriculture practices especially those on water and soil management. This is Conservation Agriculture. Pit planting, organic manure, agroforestry, irrigation production, crop diversification.
- All the groups (218) had VSLs over the past year (VSLs to start individual businesses).
- Energy efficient cookstoves were promoted.
- Natural tree regeneration: the team analysed different catchment areas and hotspots and then identified how to rehabilitate the area through natural tree regeneration and supporting tree planting. 5 million tree seedlings have been distributed. 248 hectares in village forest areas now allowing natural tree regeneration.

Other progress reported (FAO team leader, October 2019) is as follows:

- Strong 'adoption' levels by 2019 by over three quarters of communities adopting some technologies. Over 75 % of communities involved in FFS adopting some technologies, with at least 3 Climate Smart Agriculture practices adopted by each farming household.
- Integration with agroforestry: not just to enhance soil fertility, but also fruit trees. Promotion of woodlots around the homesteads for easy access. Distribution of 30K fruit tree seedlings to contribute to nutrition and income (all improved varieties so production expected within 3 years).
- 9,750 people participated in training on balanced food diet and nutrition. Sometimes the project reached non-FFS members as well, and so the reach may be under-reported. The nutrition training promoted six food groups as part of the balanced diet, as this is government policy. The project data shows an increase in consumption of 6 food groups – from studies at baseline and after training.
- Sustainable livelihoods activities have been facilitated: These include the facilitation of 218 voluntary savings and loans schemes. The FAO reported that 46.8 million Malawi Kwacha has been mobilized in local savings to circulate as capital for business start-ups and to buy inputs. This has enabled the participants to invest variously in livestock, bicycles, house reconstruction – the latter being important due to the heavy rains in 2018. Some participants have set up small businesses to buy and sell farm produce. Others use the access to the savings to increase their production and then sell and market locally.
- Enhancing farming as a business has been a recent focus and is viewed as part of project sustainability. Each FFS group will have a group enterprise. This will be a source of learning on how to do business and will help to generate profits, to enable members to invest in other learning activities. Training was being carried out on business management, VSLs and how to sustain FFS in all 325 groups in October 2019, with 100 already competed (FAO project manager). Each group will receive a small grant to groups for business start-ups and members will also contribute via the VSL. It is not clear how the effects of this 'FFS group as a business' will be monitored and evaluated. The FAO are also promoting production and sale of non-timber forest products from natural regeneration areas, and activities such as beekeeping. One group in Blantyre is selling ground nut seeds which they multiply on the learning plot to a seed company. Groups in Phalombe and Neno are selling pigeon peas produced on the learning plot. Such activities potentially provide an income stream for the group, but there is a risk that experimentation may not be feasible.
- Construction of community adaptive infrastructure has advanced in 2019: Water harvesting structures have been constructed: 37 seepage wells and 4 ponds. The project still had to construct 10 seepage wells in October 2019, but this had been delayed due to the floods/heavy rains of 2018. Support has been given to ensure that different areas have access to irrigation: in those areas 38 hectares now under irrigation via 37 and 4 new structures exist.
- Enhanced focus on agrobiodiversity and environment in 2019. In the past year, there has been enhanced awareness creation on agrobiodiversity – different varieties of crops e.g. drought tolerant ones adapted

to different conditions. There has been a registered increase in number of farmers growing (6,800 farmers could get seeds, e.g. pigeon peas, local maize, cowpeas and *cocoyams* etc). Environmental conservation work includes e.g. check dams and vegetative materials, sandbags, brushwood.

- Specific challenges encountered pertaining to Conservation Agriculture: Conservation agriculture methods include minimum disturbance of the soil, ground cover and crop rotation. During the rainy season of 2019 there was excessive rainfall, the project sites were picked due to the common occurrence of dry spells. So, productivity has declined in some of these areas. The FAO implementing partners have discussed with the affected groups about repeating the trials, e.g. wet season *dimba* farming trials. In the future, the lesson for FAO is that they need to adapt some of the promoted practices to better help communities – e.g. if rainfall patterns change, farmers need to adapt technologies, e.g. remove mulch as conserving too much moisture when heavy rains. Some practices need to be adapted (e.g. mulching) if it is too wet, but others are good for farmers whether wet or dry (e.g. use of organic manure).
- The project has also promoted energy saving stoves. 4,000 households have reportedly benefitted.
- Piloting of the United Beneficiary Scheme: As part of the institutional aspects of the FAO project (outcomes 5 and 6), the project piloted the Unified Beneficiary Scheme: A 100% pilot was completed in Phalombe and recently scaled to another 10 districts. Government has initiated some pilots as well, so the total now reaches 13 districts in all.
- Communication of messages to community members. This season climate information has been provided to target communities from the Department of Climate Change and Meteorological Services Department. National seasonal district forecasts are also provided. This provides early warning given to farmers. Information is given via radio and extension staff. It is not clear why such information was not provided earlier in the project.

The functionality and effectiveness as groups is not monitored and evaluated systematically by the FAO. See next section for more analysis of this.

There is a clear increase in the number of farmers 'adopting adaptive practices' in year 4 compared to year 3, according to FAO data, with backyard gardening, crop diversification, organic manure and agroforestry being the most popular. The increase in number of farmers 'adopting adaptive practices' is encouraging, with all these practices providing potential opportunities to strengthen farmers' climate resilience. However, it is not clear what exactly adoption means here. For example, does it mean a farmer has tried the practice at least once? If so, this may be regarded as an experiment and as indicated by (Hockett and Richardson, 2018) in section 4 above, "*experimentation is the first step on the adoption spectrum, where experimentation leads to the development of an innovation, and the long-term use of an innovation with repeated successful outcomes will lead to the adoption of that innovation. Such innovations may be adapted or modified by farmers in future experiments, making the process truly iterative*". The FAO presents strong data on 'adoption'; in the following sections we present more nuanced evidence on the processes of farmer capacity and practice change generated through this study.

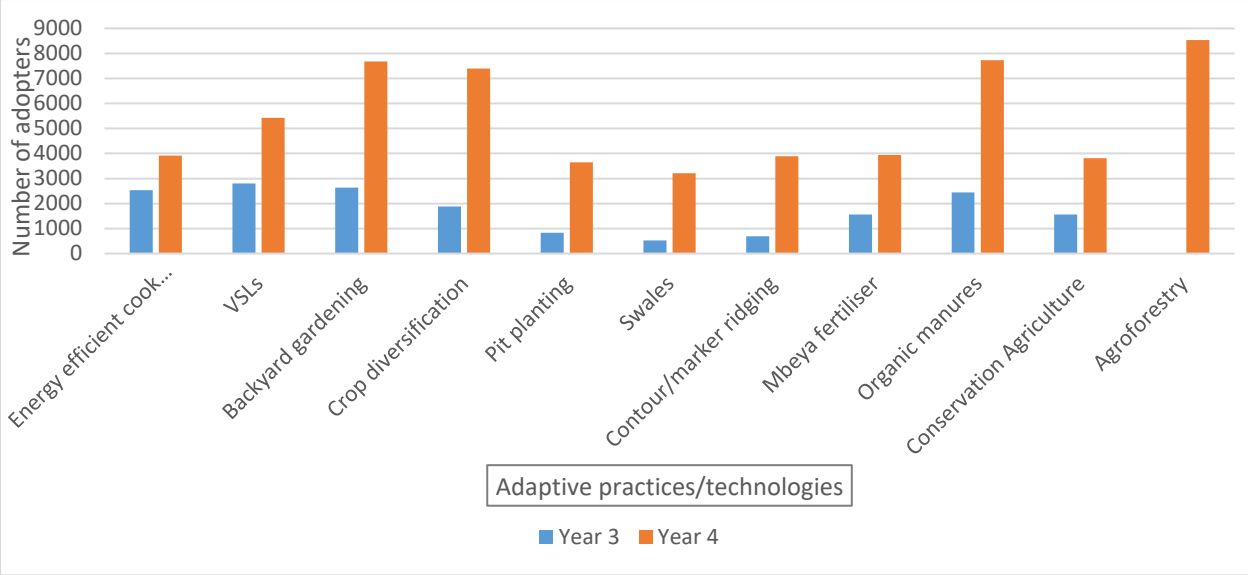


Figure 4: Adoption of adaptive practices/technologies by FFS members by year of implementation

Source: FAO (2019)

Under the project's Strategic Objective 1 which is to 'Increase resilience of vulnerable communities and households to climate variability and change, targeting at least 172,800 active resource users organised around 240 community outreach groups in selected micro-catchments'., the Key Result Areas are (Source FAO, 2018) as following:

- Good practices and technologies for greater resilience to climate change adopted by 70% of beneficiaries.
- HIV and gender-sensitive nutrition practices improved among 7,200 Households.
- Diversity of sustainable livelihoods increased among 7,200 households.
- Conservation and safeguard of biodiversity enhanced.

Results reported by the FAO for April 2018[24] and May 2019 (FAO, 2019) are summarized in table 13 below. Broadly speaking, the FFS case study findings are consistent with the results reported by FAO, although the extent of technological change (measured by the FAO as increase in the adoption of practices) is more complex in practice, and more time is needed to establish if participating farmers make changes in their farming system of sufficient scale and quality to enable farmers to push past thresholds to accumulate and diversify their assets. This is also the case for nutrition practices promotion and change processes. The interventions on sustainable livelihoods, particularly Village Savings and Loans Schemes and winter *dimba* irrigated farming are highly valued, but the latter was not operational in all four of our cases. A majority of participants want more support on this front. The work on conservation and safeguarding biodiversity has been more challenging, with emerging lessons on the importance of engaging at the entire community level for improving forest protection (e.g. of woodlots) and establishing disincentives such as byelaws to prevent bushfires. There have been poor survival rates for tree seedlings, due to prolonged dry spells during the main 2017/18 growing season, frustrating the efforts of many farmers to establish trees around their homesteads, on farm and in the community[25]. This situation improved in 2018/19. Learning has been challenging during a period of 'shock' i.e. poor rain, strong winds etc, in 2017/18, and very intense rain and storms in 208/19 in a context of other shocks experienced several seasons before.

[24] FAO (2018) Strengthening Community Resilience to Climate Change in Blantyre, Zomba, Neno and Phalombe Districts. Progress Brief as of 16th April 2018,

[25] 'A total of 1,162,076 seedlings were out-planted in village forest areas, individual woodlots and farmlands. With better rainfall distribution in most of the Action sites, establishment of out planted tree seedlings averaged 92% across the Action sites. The Action is also promoting farmer managed natural tree regeneration in over 56 sites and covering about 248 hectares of land' (FAO 4th Interim Report).

Data provided by FAO's 4th Interim report indicates that 5,350 affected households received flood recovery inputs support, variously including maize seeds, legume seeds, potato vines and fertilizers (Table 12).

Table 12: Flood Recovery Inputs Support to Affected Households

District	Number of households reached	Quantity of maize seeds provided (2Kgs each HH) (Kgs)	Quantity of legume seeds provided (2Kgs each HH) (Kgs)	Quantity of sweet potato vines provided (2 bundles each HH) (# of bundles)	Quantity of Fertilizers provided (10Kgs NPK & 10Kgs Urea/HH) (Kgs)
Blantyre	1,000	2,000	1,400	-	20,000
Zomba	700	1,400	1,400	1,400	14,000
Neno	650	1,300	1,300	-	13,000
Phalombe	3,000	6,000	6,000	6,000	60,000
Total	**5,350**	**10,700**	**10,100**	**7,400**	**107,000**

Source: FAO, 2019

Table 13: Summary of Outputs Achieved to Date by FAO Project (as of 2019)

Strategic Objective 1: "Increased resilience of vulnerable communities and households to climate variability and change"	
Key Result Areas	**Key Outputs Attained to date**
Good practices and technologies for greater resilience to climate change adopted by 70% beneficiaries	Through implementation of group outreach activities, adoption of diverse climate change adaptive and resilient practices such as conservation agriculture, soil and water conservation, organic manure making and application, diversified crop production, livestock farming, and village savings and loans has been promoted. Adoption of the practices has increased by 34% among beneficiaries. Adoption is further expected to increase as the community outreach expands (2018) Having completed season long learning in 174 outreach groups in Year Three, holistic adoption of at least three climate change adaptive practices among households increased from 34% in Year Three to about 72% in Year Four in the Action sites (page 6, FAO,2019).
HIV and gender-sensitive nutrition practices improved among 7,200 Households.	Household dietary diversity has increased to more balanced diets with the six food groups as more households engage in own legumes & vegetables production as well as domesticate small stock like chickens (2018). Through 752 sessions conducted during the period under review, nutrition training has been mainstreamed within the FFS learning in all the 325 outreach groups, reaching out to about 9,750 (6,210 female and 3,540 male) household heads. Key sessions in the nutrition trainings with farmer groups included the six food groups and their sources, preservation of vegetables, food processing and preparation, hygiene and sanitation, feeding for under-five children, nutrition needs for persons on antiretroviral treatment (ART) and backyard gardening. Introduction of the sessions in the FFS groups has led to nutrition diversification, increased adoption of backyard production of vegetables (6,138 households) and fruit trees planting among beneficiary communities (page 9, FAO, 2019)
Diversity of sustainable livelihoods increased among 7,200 households.	With the introduction of village savings and loans schemes and farming as a business training within the community outreach groups' curriculum, savings mobilization has increased to about MK13.8 million, creating a source of capital for small scale businesses among beneficiaries. With the introduction of water harvesting structures like seepage wells and ponds, an increasing number of households in the project districts, estimated at 1,260 households have started engaging in irrigated crop production, providing an opportunity to diversify household food sources (2018). 218 Village Savings and Loans (VSLs) groups have been established with a membership of 5,434 (4,088 Female and 1,346 Male) and cumulative savings grossing over MK46,860,000 and providing beneficiaries an opportunity to make savings and borrow some capital for starting or expanding their household business enterprises. The VSL approach has inculcated a culture of saving among the community members, as well

	as creating an opportunity for running small-scale businesses, that are directly contributing to increased household incomes and diversified income sources (page 11, FAO, 2019)
Conservation and safeguard of biodiversity enhanced	The action has contributed to community capacity enhancement on catchments management and sustainable land use. Some local seed varieties that were almost extinct have been restored back to communities, thereby contributing to seed biodiversity (2018). 120 learning plots in seed systems biodiversity across the four districts. The initial 60 FFS outreach groups that hosted the learning plots in Year Three conducted field days and biodiversity fairs to promote the use of local landraces and passed some of the planting materials to 60 other groups. Each of the 120 outreach groups have established a seed bank for storage of seeds after harvest. Through 9 local biodiversity fairs, farmers gained knowledge on the importance of growing local landraces (page 15, FAO, 2019) A total of 128 gullies were treated with stone check-dams and brushwood, covering a cumulative length of 52,814 metres (page 16, FAO, 2019) A total of 1,162,076 seedlings were planted in village forest areas, individual woodlots and farmlands. With better rainfall distribution in most of the Action sites, establishment of out planted tree seedlings averaged 92% across the Action sites. The Action is also promoting farmer managed natural tree regeneration in over 56 sites and covering about 248 hectares of land. Adoption of agroforestry practices has been increasing among beneficiary communities, with 8,538 households adopting crop and tree associations in their maize production. (page 16 FAO, 2019)
Key Result Areas	**Key Outputs Attained to date**
Knowledge and advocacy for good governance on resilience to CC improved	Development of the Malawi National Social Support Programme (MNSSP) II was informed by the evidence generated on the impacts of integrated agriculture and social protection programmes. The MNSSP II now identifies resilient livelihoods as a second thematic area of investment. National dialogue on a multi-sectoral approach in implementation of the National Climate Change Policy and Resilience Interventions also supported (2018).
Coordination & monitoring of actions on CCA & resilience programming strengthened	Social protection coordination committees harmonized and the Unified Beneficiary Registry (UBR) piloted at 100% scale of the district population registration in Phalombe. A total of 72,626 households was registered in the district (2018).

The main success measure used by the FAO and EC to judge performance is adoption of technologies, but this is not well aligned with the farmer-learning, integrated and cumulative approach originally conceived. The measures used by the FAO and EC to judge performance focus on a simple concept of 'adoption' which is somewhat at odds with the integrated and progression-oriented FFS approach initially conceived in the project design and given the focus on community climate resilience, which requires a multi-faceted approach. In the past many FFS have been supported to achieve more narrow objectives, such as improving sweet potato production or Integrated Pest Management. In the FAO Project, the approach could be termed 'FFS CdR community integrated approach' for community resilience, implemented in contexts of severe pressures (shocks and stresses are already well-established). For short we will term this FFS CdR, to distinguish it from more focused FFS approaches (See box 1 for more details on the FAO approach). FFS CdR implies *sets of technologies*. Within each of the FAO results areas are sets of technologies: '*Good practices and technologies for greater resilience to climate change adopted by 70% beneficiaries'* including cropping, crop diversification, on livestock management and diversification, on nutrition, on natural resources management. The participatory planning process, in theory, allows flexibility in the activities of the FFS group and the support provided by the FAO – i.e. the inputs and activities are variable between groups and there is intended to be scope for farmers to choose specific topics they are keen to focus upon. This variation means that simple adoption measures are not that instructive and pull the focus on evaluating success based on adoption does not afford either a more targeted approach to offering propositions through encounters to fit with

the needs of specific groups or more expansive, generous approaches which encourage reconfiguration to suit needs and contexts. Technological change processes are heterogeneous in nature and the emerging case study work demonstrates that farmers are not making simple 'yes/no' decisions. Farmers are reporting that they may experiment or adapt certain elements, but reject others, e.g. because they are too labour intensive or do not work. In some instances, a farmer may try a new technique one year, but not continue with it the next, but say they are considering trying this again. The risk is that how performance is measured drives the implementation process.

Given the complexity of the intervention, contextual variation between within and between communities in the target districts and the uncertainties and variation in actual climate change impacts (Box 5), it is essential that farmers can develop locally tailored solutions (or that the solutions are specifically tailored for them). Firstly, this means being able to evaluate new technologies and to experiment with them to decide what makes sense for them in their own context. Secondly, it also means considering the whole farming system. Thirdly, it means that farmers and those offering propositions need to have good understanding of climate projections to evaluate technologies and solve problems from a climate change perspective. The current FFS approach tends to focus on individual techniques, rather than analysis by farmers of more far reaching changes they may need or could make given their changing context. For example, maize remains at the heart of the farming system, yet it is not the most suitable crop given its vulnerability to dry periods which have been experienced during the main growing season.

Box 5: Climate projections for Malawi

For southern Africa maize yields are projected to decline on average by 18%.[26] But there is a high level of uncertainty around future precipitation for Malawi. In Malawi, the range of projections from different models is large and straddles both negative and positive changes (-13% to +32%). Seasonally, the projections tend towards decreases in dry season rainfall (June-November), and increases in wet season rainfall (December - May). Models consistently project increases in the proportion of rainfall that falls in heavy events under the higher emissions scenarios (A2 and A1B), of up to 19% by the 2090s.These increases mainly arise from increases in heavy events in the wet seasons and are partially offset by decreases in June - August and September-November. In southern Malawi climate projections suggest a general increase in temperature, more frequent occurrence of heavy precipitation events, and a slight decrease in rainfall amount and/or duration[27].

In the following sections we review the FFS activities as reported by the implementing partners and farmers, the extent to which these match the ideal principles of the FAO. We explore participating farmer-feedback on the attractiveness of the FFS approach, the implementation by the partner organisations and the functionality of the FFS.

Amongst the implementing partners, the main challenge encountered relates to the performance of the NGO implementer tasked with facilitating the FFS in Neno District. The EC and FAO are aware of this issue. The weaknesses in the extension support and then its cessation have been reported by the Neno FFS members. The FAO project later shifted to government as the implementing partner, as a more sustainable option, and this has meant that overall in Neno district there has been progress.

Farmer Field School Activities – Farmer Feedback

During the baseline 2016 FGDs farmers were asked to indicate what they planned to conduct.

Farmers were asked to report on the learning plot and other FFS activities they have undertaken. The findings are summarized in tables 14 and 15 below.

[26] N. Zinyengere, O. Crespo and S. Hachigonta (2013) Crop response to climate change in southern Africa: A comprehensive review Global and Planetary Change Volume 111, December 2013, Pages 118-126

[27] McSweeney, C., New, M., Lizcano, G., (2010). UNDP Climate Change Country Profiles Malawi. 27pp. http://www.geog.ox.ac.uk/research/climate/projects/undp-cp/UNDP_reports/Malawi/Malawi.hires.report.pdf

The FGDs indicate that the participating farmers have a good understanding of the FFS activities and the purpose of the group. However, it is important to note that we interviewed primarily farmers who continue within the group, rather than those who have dropped out (in all the 4 groups, there are individuals who have discontinued participation). In most cases we do not know their understanding of the FFS. The FGDs confirm the individual cases in terms of the range of activities undertaken. There was a continued emphasis on good practices and technologies for greater resilience to climate change. Following the early emphasis on main season crop agronomy and crop diversification, later activities put increasing emphasis on *dimba* cultivation (across three of the four FFSs), multi-functional role of trees, livestock and crop systems, and FAW management (two FFSs). Nutrition activities have been undertaken by the project in 3 of the 4 groups and by other projects in the case of Nang'omba FFS, Blantyre. Tree planting has been attempted in all 4 FFSs. Most struggled with low survival of tree seedlings up until the 2018/19 season; with the heavy rains in that season survival rates appear to have been higher. There also appears to have been more emphasis on conserving existing trees. Management of gullies was only mentioned in Zomba, although it was observed in at least one field of a Tikondane FFS member in Neno. VSL establishment was finally reported across all four FFSs.

The learning plot visits demonstrate that the participants generally have a good understanding of the activities involved and the objectives, although some differences were observed between the Blantyre FFS members' descriptions and the maps drawn of the learning plot and between men's and women's explanations. Improvements have been made in the quality of the experiments and tests undertaken. In the early stages, the Zomba group designed the simplest experiments (mainly comparing crop varieties) which made comparisons easier. In the other 3 FFS cases, the design of the experiments was more complicated and did not allow for clear comparisons of performance of crop varieties and agronomic practices. However, as *dimba* learning plots also became established the design of the experiments appears to have improved for at least three of the FFSs. By the 2018/19 main season Ntundu FFS (Phalombe) and Kapko FFS (Zomba) had quite well-designed experiments allowing members to compare the performance of maize under different FAW control methods. However, for different reasons the other two FFSs were not so successful. In the case of Nang'omba FFS (Blantyre) the seed that was planned to be used in the experiments was not made available to the members and in the case of Tikondane FFS (Neno) there was no main learning plot activity.

Farmers were asked to report on the learning plot and the FFS activities they have undertaken. The findings are summarized in tables 14 and 15 below. The learning plot visits demonstrate that the participants generally have a good understanding of the activities involved and the objectives, although some differences were observed between the Blantyre FFS members' descriptions and the maps drawn of the learning plot.

Improvements can still be made in the quality of the experiments and tests undertaken: The Zomba group designed the simplest experiments (mainly comparing crop varieties) which made comparisons easier. In the other 3 FFS cases, the design of the experiments was more complicated and did not allow for clear comparisons of performance of crop varieties and agronomic practices.

Table 14: Summary Table: FFS Activities reported by Farmers in FFS Case Studies (Source of Evidence - FGDs)

Nang'omba FFS, Blantyre	Tikondane FFS, Neno	Nthundu FFS, Phalombe	Kapako FFS, Zomba
Good practices and technologies for greater resilience to climate change • Closer ridge construction • Methods of growing crops (e.g. 1-1 per station) • A variety of crops (e.g. early sweet potato) more resistant to climate change • Conservation agriculture (covering soil with maize stalks along ridges to conserve moisture) • Groundnuts – no till cultivation (benefit of reduced labour and resists pests) • Continuing pit planting to conserve moisture. • Mulching is important to conserve moisture and decomposes • Livestock production i.e. goat farming • Planting of agro-forestry trees • Dimba cropping (*although not reported in FGDs*) Nutrition: None reported by men. •Nutrition training but from another project (via government extension). What learnt? Making doughnuts from sweet potato flour. In the household but not started selling them but plan to and, also, to sell stuff from goats. •Ground nut flour – add to relish. • Making milk from soya (Women's FGD) Conservation & biodiversity safeguarding: Planting tree seedlings, transfer to fields, seeds from advisors and from tree seedlings collected locally. Aim is to make climate is like it was before. Tree management e.g. weeding, pruning. Regeneration of forests/ woodland management	Good practices and technologies for greater resilience to climate change • Farming crops (e.g. ground nuts, millet; Planting trees to restore fertility (e.g.Gliricida); Pit farming; mulching, making manure). • Planting maize – with and without tillage. Conservation agriculture – each farming method at the same time so can differentiate the outcomes. • Observing how crops grow. • Learning about importance of self-sufficiency • Crop diversification for climate resilience (growing crops and varieties) • Taught about dimba inter-cropping but did not do in 2016/17 as too far away and no-one cared for it. • Dimba cropping • Taught about livestock production & received chickens • No main learning plot in 2018/19 but cleared land for 2019/20 • As a group, decided to plant new seeds, preparing to buy the seed together as a group. Nutrition: eating healthy foods. Having a planned menu for the week. How to cook/new recipes, but they do not always have resources do to this. Conservation & biodiversity safeguarding: Planting trees on farms and around houses. Only learning plot seedlings survived. • Nursery establishment Sustainable livelihoods: Taught about VSL, but not initially implemented. Establishment of Village Savings Loan (VSL) for FFS members	Good practices and technologies for greater resilience to climate change • Making fertilizer (compost manure and Mbeya fertilizer). Making of compost manure (chimato) using animal dung and plant residuals is to reduce the use of chemical fertilizer which is expensive. • Planting early maturing varieties (local and hybrid) • Intercropping/crop diversification • Vegetable farming in dimba/kitchen gardens (and received mustard seeds) • Water harvesting and box ridges • Ridge spacing and construction station planting of maize • IPM (e.g. Fall Army Worm). • How to select seed • Training on livestock management • AESA system to know what harms our crops & induces growth • Planting of trees in the homes and the fields to control soil erosion, add nutrients as the leaves are good to the soil after decomposition and also protect the houses from the strong winds. • FAW management Nutrition: Cooking lessons Were taught on six groups of food, milk production from soya beans, cooking of eggs mixing with eggs, porridge cooking from pumpkins together with groundnuts flour, make of cowpea and meat balls. HIV trainings on how to prevent the virus, how to take care of affected and infected people [women's FGD],	Good practices and technologies for greater resilience to climate change • Crop diversification - maize, cowpeas, sorghum, pigeon peas, yams, groundnuts, coco yam to survive drought. • Choosing and remembering drought tolerant crops (cow pea, millet, velvet beans, sorghum). • Agronomic practices (coverage of soil using maize stalks to keep moisture, zero tillage, ridge construction, box ridges, making manure) • AESA • How to select seed • Trying new seeds from extension workers (pigeon peas etc). Sorghum seed type comparisons. Local vs hybrid hyacinth beans. Millet and groundnut local and hybrid comparisons. • Coco yams - only one type tested. • Understanding natural enemies of pests in the field • Dimba farming • Planting of trees in the homes and the fields to control soil erosion, add nutrients as the leaves are good to the soil after decomposition and, also protect the houses from the strong winds. • Learnt about modern farming technologies - 1 seed per planting station can lead to more yield if effectively done. • Good to keep livestock with crops • FAW management (*although not reported in FGDs*) Nutrition: Learning new recipes and how to cook new crops to enhance nutrition reported by women. Men mentioned being taught about home gardening. Crop diversification enables a diverse diet (FGDs). Conservation & biodiversity safeguarding: Planting trees in nursery, at home and on farms. Taking care of local trees. Taught how to manage gullies in fields. Tree management training by the Government agriculture offices. They provided the farmers with tree seedlings which they must manage in their homes and fields. Learnt about natural resource

Sustainable Livelihoods: Village Savings bank created to help us secure our finances and pay for children's fees with bank loans •Pass on Programme for goats (see above) •They have an idea in the pipeline to form a cooperative, so as to encourage FFS members to take farming as a business		Receiving leafy vegetable seeds for dimba plot. Training in maintaining a balanced diet. [men's group] Conservation & biodiversity safeguarding: Given tree seeds, planted and then shared amongst group, explained purpose (add soil fertility, provide shade). Also clearing around trees to prevent bush fires. Energy saving stoves. Tree management training They were taught how to make environmentally-friendly, ovens (*chitetezo mbaula*) which uses few firewood pieces to cook more food [Men's & Women's FGDs] Sustainable Livelihoods: VSLs; Dimba cropping where the members were taught on good bed where they can be planting different crops like tomato, leaf vegetables which they can be selling after harvest.	conservation. Leaving of existing trees, not uprooting and planting new trees Sustainable Livelihoods: VSL, whereby the group has another executive which is responsible for the VSL and farmers in the group get loans with an interest so that the savings should be high at the end of the year. •Livestock management and farmers are given goats to pass on to other members of the same FFS when they breed. •Growing and selling of sweet potatoes and ground nuts by the members to have more money at the VSL account. "*You have many different things and when you link them all up then your household automatically changes*"
Planned/Actual All was as planned, except village banking and the introduction of livestock by TLC. These were not in the plans.	Planned/Actual Everything has been as planned. Planned to do a *dimba* in upcoming winter season, but they were discouraged from this after theft. In second did not do all that they planned (did grow soya and millet but not as planned) due to shortage of rainfall. Work on VSL and farming as a business not done – promised this by NGO but don't know what happened.	Planned/Actual No major differences, AESA, irrigation farming, fertilizer making [women's group] and addition of goats, the latter highly valued [men's group] Sanitation and hygiene training –Each household should have a toilet and washing facility. This came through another NGO, but the FFS thought it was a good initiative, so they took it on as a group. [MEN]	Planned/Actual Seepage well added In 2016/17 added groundnuts which was not planned.

Table 15: Summary of Learning Plot Visits and Explanations by FFS Members

Year	Nang'omba FFS, Blantyre	Tikondane FFS, Neno	Nthundu FFS, Phalombe	Kapako FFS, Zomba
2016/17	Managed the main LP for 3 seasons and dimba plot for 2 seasons Main aims were to compare maize agronomic practices including: Maize monocrop vs Maize and pigeon pea; Mulching vs Non-mulching; Zero tillage vs tillage, basins vs no basins.	Managed the main LP for 2 seasons. 2016/17: Maize (4 varieties) Groundnut, soya, cow pea, pigeon pea and sorghum comparisons	Managed the main LP for 3 main seasons, plus a second plot for *dimba* winter cropping season learning for 3 seasons. 2016/17 Main plot - 6 crops involved. Aimed to assess crop or variety performance. Only clear comparison between 2 varieties of pigeon pea. Farmers judged Cocoyam as not suited to their soil, but sunflower is suitable. 2017 *dimba* plot: Experiments with maize and tomato	Managed the main LP for 3 seasons plus dimba learning plot for 2 seasons 2016/17 Main plot – Maize and legume experiments and different practices
2017/18	2017/18 season various maize soil management practices are compared (mulching, basins, local farmer practice) 2018 winter/ dimba plot. Cowpea, beans, chinese cabbage -comparing distance between stations; with and without manure and irrigation frequency; Maize variety comparison.	2017/18: maize (Kanyani only), with box ridges and agroforestry trees, groundnuts, Cow pea (2 small plots), sorghum (small plot), millet (small plot) and hyacinth bean (khungudzi) (small plot).	2017-18 main plot: Mixture of agronomic practice comparisons (e.g. ridge spacing, no. of seeds per station), variety comparisons, crops researchers had brought which FFS members said were new to area (velvet beans, finger millet) and neglected crops (sorghum, pearl millet). 2018 Winter season/ Dimba plot (0.5 acres) FAW control on maize (*kanyani*) using: Soil method; Neem; Cybermethrin. For each treatment, one plot was mulched, and one not mulched. Mulch improved effectiveness of the control method. Verified through AESA. Soil was best control method, when the maize crop was still young.	2017/18: Many different comparisons and tests. Maize (but failed), plus legumes, groundnuts, cowpeas, pigeon pea, pearl millet and finger millet, sorghum, cocoyam. 2018 Dimba plot i) Comparing yield of tomato varieties (Tanya and Tengeru); ii) Comparing yields of maize varieties (SC403 and SC527) and iii) To see how Chipika sweet potato variety performed as an alternative source of food under drought conditions. Good tomato yields (Tanya performed better); Maize SC403 performed better than SC527; Sweet potato did well because it does not need a lot of water and fertilizer
2018/19	2018/19: rainfed learning plot -comparing crop varieties and different agronomic practices. Women & men gave differing versions. Women: 3 maize varieties (Mapasa AK803, Chiponda and Kanyani SC403) were compared, soya was planted but was destroyed by pests and 1 variety of sweet potato (Ana akwanile) was planted. Men: 1 maize variety (DK8033) planted and 5 varieties of sweet potato (Ana akwanile, Babache, Chitsiru panzere, Kachitsa and Salera) planted to compare their performance. 2019 *dimba* plot planted maize and vegetables with aim of applying organic manure rather than	2018/19. There was no rain-fed learning plot.	2018/19 Main learning plot Control of FAW on maize: Cybermethrin, Neem, Soil method, Chipha njovu (botanical), Physically hand picking FAW, No control of FAW. Best method is neem, then soil method (at early stage), chipha njovu, cybermethrin and finally hand picking. Sunflower planted on one area as a source of income 2019 Dimba plot grown maize in dimba – cultivation as a group. Kanyani variety. Not clear if this was an experiment.	2018/19 Main learning plot Aims: i) To find ways of eliminating FAW on maize: Hand picking and killing FAW; Traditional medicine (neem and applying soil to suffocate the FAW); Artificial medicine. Ii) Sweet potato- main aim was to have food and money from salesiii) Cocoyam planted last year, but not harvested. ii) All FAW control methods did quite well, but plot 3 physically hand picking was best because no money was varietyused. Ii) Sweet potato was a success. 2019 Dimba plot Grew maize, beans and sweet potatoes. Not clear if this was an experiment.

	chemical fertilizers and botanical extracts (e.g. neem) rather than synthetic pesticides to control pests. They are learning how to grow vegetables in this way to both sell and have food for relish.			
Comments	• Differences between members description of plot and activities draw on maps. • The ideas for the learning plot came from the extension worker. • Comparisons not straightforward given the design of the experiments of the plot • Both women and men reported that activities didn't go to plan in 2018/19 because FAO didn't provide the seed that was expected (men explained the Community Facilitator had mis-appropriated the seed). As a result, the plans were modified but the women and men's FGDs gave differing versions of what took place.	• Challenging weather conditions. • Lack of extension support due to issues with the implementing NGO in season 2. • Despite lack of support, FFS members continued to try and manage the plot and managed to harvest some crops in 2017/18. • Design of experiments does not always allow for clear comparisons of performance between varieties and practices. • In 2018/19 there was no main learning plot • Some farmers noted they lack inputs so planted something different on their own farms compared with learning plot which also makes comparisons difficult.	• Members increasingly showed a very good understanding of the activities taking place and the purpose. • Design of the LPs has improved each time, allowing clearer comparisons to be made. In the earlier plots there was variation between the plots which made comparisons difficult (e.g. comparing number of maize seeds per station in main 2017/18 season, but group varied the spacing). • As FAW control became the focus of learning, the comparison of treatments became clearer. • Availability of dimba provided excellent opportunity for a second LP to be managed during the dry season.	• Members increasingly showed a very good understanding of the activities taking place and the purpose. • Some comparison of different crops and varieties made. Traditional crops tested in 2017/18 were planted by individual farmers • Challenging weather conditions • In 2018/19 Field affected by termites and stems are falling over. Weeding more than planned because of the rains. Reddish worms in the soil eating roots of maize when young • In dimba plot labour demanding doing irrigation. Towards end of the season the water table goes right down and can't irrigate all the plot. • Many future plans

To what extent has the approach/model implemented followed FAO FFS principles in practice?

The extent to which the FFS activities and processes, as described by participants, fit with the FFS principles has been analysed by the evaluative learning team. See table 16 (and Annex 4).

Field as a learning place: Analysis indicates that all the FFFs were able to manage their main learning plots for two seasons, even in the case of Neno where the group was without NGO extension support in the second season. However, whereas Nthundu FFS and Kapako FFS successfully completed a third season for the main learning plot, Nang'omba FFS was only partially successful and Tikondane FFS failed to establish a learning plot in the 2018/19 season.

Hand-on and Discovery-based learning: Most FFS participants could explain the purpose of the learning plots and the FFS, including the comparisons between crops and practices. In the earlier stages many members appeared to emphasize what they had learnt in terms of recommended good agronomic practices for maize (and other crops) and assessed performance in terms of short-term yields. However, over time a more effective experimental approach did develop, particularly with the Nthundu (Phalombe) and Kapako (Zomba)groups and to a lesser extent Nang'omba (Blantyre) FFS. There are a number of examples of farmers doing experiments in their own fields.

Facilitation not teaching: Where NGO and later government extension implementers were available to interview, they have a certain level of understanding of the facilitation role, although they were not always available. Overall, the approach used seems to be a combination of teaching (e.g. specific agronomic practices) and facilitation of experiential learning e.g. comparing different ways of controlling FAW.

Farmer as expert in their own context: Overall, there is limited evidence that farmers are recognized as experts in their own contexts. In one case in Neno, participants complained that the implementing NGO had not listened to their advice about the depth of the seepage well, which then failed. However, some members did feel that they had an opportunity to contribute. For example, the Nthundu (Phalombe) group wanted to compare one plant per station (extension idea) with 3 plants per station (their own idea) and they also decided to plant sunflower for income on the Learning plot, so it was not left partially empty. Women in Kapako (Zomba) group reported the following as members' ideas which were implemented: suggesting different technologies to control FAW; growing crops such as groundnuts and sweet potatoes as a group to raise money to be deposited in the VSL and having a welfare committee to help each other when they are in trouble.

Equity and no hierarchy: In 3 of the 4 cases the FFS have functioned well, with a collective spirit and good leadership. In one case, however, a hierarchical leadership style may have contributed to internal tensions in the group and loss of members. The chair of that group was eventually replaced by another group member and the indications are that that FFS was now functioning better.

Integrated, learner-defined curriculum: The curriculum appears integrated, but not much evidence that learners had influence in defining it. A possible exception is Fall Armyworm (FAW) control which was clearly a priority for FFS members and farmers in general. Men in the Nthundu (Phalombe) group reported that the FAW problem was identified by the group; some solutions were identified by the group and some by FAO.

Comparative experiments: In the early stages, the design of the learning plots allowed some comparison of different crops and varieties to be made in Zomba, but in the other districts the comparisons were harder to draw due to the complicated design. The design of the learning plots particularly with the Nthundu (Phalombe)and Kapako (Zomba) groups and FAW control, and to a lesser extent Nang'omba (Blantyre) FFS. There are a number of examples of farmers doing experiments in their own fields (see Box 6 for example), but for others this is not the case. For example, one woman from Nan'gomba FFS, Bantyre commented "*Having being in the group this long, her expectations have not been met entirely, she said the school field is effective on lessons but she fails to fully apply the techniques as she doesn't manage to get some of the tools that are used on the school farm, that way she is limited on her experiments as an individual*".

Box 6: Nang'omba (Blantyre) FFS Individual farmer experiment

With support from the extension officer Mr Lazaro, Andrea Solomon experimented in his own field:

- Comparing Ridge planting and Basin planting using SC403 (Kanyani) variety. He wanted to compare which planting system does better than the other. Have found out that basin planting does better than the ridge planting even though low rains are received in an area. The other important benefit of basin planting is that it does not require a lot of labour. It is only labour-intensive at the onset but after manure application and planting, weeding is reduced because there is only uprooting of the weeds that is required.
- Mulching of the crops to retain moisture – beneficial when the area experiences prolonged dry spells
- One seed per planting station, 2 seed per planting station and 3 seeds per planting station. The aim was to see which number of seeds per station does better.
- New ridges were made (spaced 75cm apart) versus the traditional widely spaced to improve yield on a small plot and also control surface runoff

Agro-ecosystem analysis (AESA): The AESA monitoring system is being used in all the FFSs for the learning plot. However, although some farmers in Neno and Zomba for example reporting using AESA in their own fields, it was not clear to what extent this was happening.

Special topics identified by farmers: The overall topic is strengthening farmers' climate resilience as defined by the project. Not clear to what extent any specific areas had been decided by farmers within this overall topic. Not clear if any specific areas had been decided by farmers. However, FAW was identified by Nthundu (Phalombe) members as a topic they had identified and as indicated above farmers' ideas have been incorporated into group activities.

Team building and social animation: There was consensus among members of three of the groups that they were functioning well. However, there clearly tensions within the Tikondane (Neno) group which was a major contributor to membership reducing from 40 to 19. Expectations were perhaps too high. A new chair eventually emerged remaining participants said they work well together.

Participatory monitoring and evaluation: Based on the FAO's FFS Principle ['While preparing the FFS curriculum, participants develop a plan for monitoring and evaluating progress to assess whether they are achieving the agreed objectives' - See Table 1], little evidence was available that participatory monitoring and/or evaluation was planned or taking place.

Table 16: How FFS Cases Performed Against Key Principles of FAO Farmer Field Schools (Source of Evidence: FGDs, Learning Plot Visits; Case Study Interviews; Field Visits)

FFS Group/ Principles of Learning Plot (LP)	**Nang'omba FFS, Blantyre**	**Tikondane FFS, Neno**	**Nthundu FFS, Phalombe**	**Kapako FFS, Zomba**
1. The field is the learning place.	Group has managed 3 main seasons and a *dimba* plot for 2 winter seasons, including under the challenging dry weather conditions in the second season/cycle and harvested some crops in all seasons	Group managed the plot for 2 seasons, including under the challenging dry weather conditions in the second season/cycle and harvested some crops in both seasons. There was no learning plot in the 2018/19 season.	Group has successfully managed the main plot for 3 main seasons & managed the winter plot for 3 seasons, including in challenging dry weather conditions in 2nd season/cycle and harvested in all seasons.	Group managed the main learning plot for three seasons and a *dimba* plot for 2 seasons including under the challenging dry weather conditions in the second season/cycle and harvested some crops in both seasons
2. Facilitation, not teaching.	Style of leadership was described as strong by the participants. While members create a plan, supported by the extension worker, there appears limited scope for the participants to identify their own activities on the LP.	FFS chair and at least one member (both males) were able to explain what was happening in the learning plot, but chair's style of leadership not facilitative.	Both women and men could draw maps and provide detailed explanations on site in 2019.	Both women and men could draw maps and provide detailed explanations on site in 2019.
3. Hands-on & discovery-based learning "learning by doing".	FFS member could explain what they had learnt through managing the plot for two seasons, but not women and men's versions not consistent. Some evidence that individuals are experimenting in their own fields.	Tensions and conflicts within the group limited the opportunities for learning by doing, but learning had clearly taken place.	Both male and female FFS members could explain what they had learnt by managing the plot for three seasons. Some farmers starting to experiment in their own fields.	Both male and female FFS members could explain what they had learnt through managing the main learning plot and the *dimba* plot.
4. The farmer as expert.	Limited evidence of the extent to which community members are recognized as experts within their own context.	Limited evidence. 1 female member (ML) explained officers did not take local people's advice and built a 5 m seepage well which yielded no water. In nearby village they listened to local people constructed an 8 m seepage well	Limited evidence of the extent to which community members are recognized as experts within their own context, but members felt that they did have an opportunity to contribute.	Limited evidence on whether the farmer was considered an expert in their own context, however, women reported that ideas of the members were put into practice.

		producing water for irrigation		
5. Equity and no hierarchy.	The men's FGD reported the strengths of the FFS relate to the collective spirit to tasks, strong leadership and sharing of knowledge. .	Some evidence leadership may have been too hierarchical and not all participated on equal basis.	Members reported that the group is well led by the chair and extension worker	Participants say the group has functioned well, with good unity. Both women and men agreed that there is good leadership of the group
6. Integrated and learner-defined curriculum.	Curriculum appears integrated, but not much evidence that learners had much influence in defining the detailed curriculum.	Curriculum appears integrated, but not much evidence that learners had much influence in defining the detailed curriculum.	Curriculum appears integrated, but not much evidence that learners had much influence in defining the detailed curriculum. Men reported that the FAW problem was identified by the group; some solutions were identified by the group and some by FAO. The only topic specific to this group was growing of sunflower to pay plot rent.	Curriculum appears integrated, but not much evidence that learners had much influence in defining detailed curriculum.
7. Comparative experiments.	The experiments have not always been designed in such a way as to allow comparisons to be easily made regarding varieties and practices.	Not always easy for the FFS members to compare the performance of varieties and practices.	Design of LPs appears to have improved each time to allow a clearer comparison to be made.	The design of the learning plots allowed some comparison of different crops and varieties to be made. For the FAW experiment, the experimental design was quite straightforward and could allow comparisons to be made.
8. Agro-ecosystem analysis (AESA)	The FFS Facilitator clearly explained AESA using observations of a maize plot. Farmers can describe the AESA methodology, there is limited consistent implementation of the approach by farmers in their own	At least 2 farmers mentioned they are applying this in their own field, particularly for pests and disease monitoring. Not clear to what extent wider analysis has been used.	AESA system mentioned for LP. Monitoring maize.	AESA being used in FFS LP, particularly for pests & disease monitoring. Some individual reported that they were doing this in their own fields.

	fields. Individual members did not report doing this in their own fields.			
9. Special topics. decided on by the group	 Overall topic is strengthening farmers' climate resilience as defined by the project. Not clear if any specific areas had been decided by farmers within this.	 Overall topic is strengthening farmers' climate resilience as defined by the project. Not clear if any specific areas had been decided by farmers within this overall topic.	 The overall topic is strengthening farmers' climate resilience as defined by the project. Not clear if any specific areas had been decided by farmers within this overall topic, although *dimba* farming may have been farmers' prioritization.	 Overall topic is strengthening farmers' climate resilience as defined by the project. Not clear if any specific areas had been decided by farmers. However as indicated above farmers' ideas have been incorporated into group activities.
10.Team building and social animation.	 Women and men commented that they are working well as a group, with motivation given by support from the SP, extension workers, lead farmers and foreign visitors. But there appear to be varying degrees of participation.	 Appears weak and major contributor to membership reducing from 40 to 19. 2017/18 -not really functioned as a group. Absenteeism. Expectations were too high. Remaining participants said they work well together.	 Functioning well as a group. Most are very punctual. '*We are united*' [Women's FGD]. Good leadership, active participation and no dropouts [men's FGD group].	 Team-building and group dynamics were reasonably strong as reported by both women and men. The members appeared to be functioning well as a group. Although 11 members had left this appeared to be at least partly due to how far away they lived and in three cases due to moving to where there was work. Membership reduced from 40 to 29, but at least partly due to members being based in far places and 3 members moving to where they had found work. A lot of activities undertaken.
11.Participatory M&E	 The group has not discussed this.	 Not done.	 Not done.	 Not done.

No evidence of aligning with principle	
Little evidence of aligning with principle	
Some evidence of aligning with principle	
A lot of evidence of aligning with principle	

Attractiveness of the approach to farmers and FFS functionality

Fairly strong performance on meeting expectations – One group reported that their expectations were fully met. Two groups reported that their expectations were partially met. One group reported that their expectations were only partially met.

Fairly strong performance on group functionality – Two groups report that their groups are functioning well, one group reported that their group is functioning quite well, and the further reports that the group is not functioning well. However, none were not functioning at all.

Levels of participation were relatively good, although some groups lost membership: Two groups report a constant membership, one reports a slight decline, and another reports a significant decline. In each group there are drop-outs, but especially Tikondane group (Neno district). The reasons vary. In one case, farmers left because a second FFS was set up to reduce travel times. In other cases, there are deaths and people out-migrating. But there are also individuals who do not see benefits to continuing participation or who are required to leave by others due to internal tensions. In Zomba, the FFS covers several villages and some members found participation harder than others due to the distances involved, but they have now been supported to set up their own FFS. So, although the numbers are reduced, the FFS has seen good participation. Membership in the Blantyre and Phalombe FFS has remained constant or just slightly declining, indicating positive commitment from members. The Neno FFS case has seen the most challenges – both internal, with tensions and issues with the leadership reported, but also from a weak external support from the NGO implementing partner.

A gender analysis of participation indicates some challenges in terms of equitable participation. An analysis demonstrates that there are more women participating in the groups, compared with men, but men dominate in terms of leadership positions or selection as community-based facilitators. Women, especially women in female-headed households and in poorer households face significant constraints – for example, when illness strikes a family member, this can prevent participation in learning activities on the shared plot or on own farm. There appeared to be varying degrees of sharing by members within their households. In the Kapako (Zomba) FFS, one male member went to work in Lilongwe for a period of time, His wife substituted for a husband while he was away and in May 2018 commented that she was aware of the FFS activities through her husband, but now she has joined the FFS she understands.

Plans to continue are clearly stated in all four groups, but once project support ends it may be difficult for at least some of the groups to survive. Two groups have clear, shared plans. The other two have plans, but they hold some ideas for future operational modalities (e.g. operating as a business), but they are not clearly agreed within the group or associated with clear practical plans. It would be important to continue to track the performance of the groups as they move beyond support from FAO.

Strengths of the group related to group cohesion and a cooperative ethos, strong leadership in a facilitative style, solidarity, ability to resolve disputes and sanctions. The quality of external support was also noted by participants. The strengths of the group were often said to be the collective and unified spirit that is engendered and the cooperative ethos. A few of the farmers in the individual cases reported that the members would support each other if someone was sick, hence supporting solidarity within the group and building trust, but the role of leaders was also important in unifying the group. The capacity to resolve differences is important: resolution of differences has been facilitated in Zomba, for example, and this was noted as a key strength of the group. Members in two groups (Blantyre and Phalombe) said the strong leadership is a positive attribute, and that following rules is important to keep the group together, with sanctions for non-attendance and participation. Learning how to do learning plot monitoring (AESA) was viewed by the members as a strength.

Weaknesses related to internal tensions and domination or weak commitment from some individuals, plus practical and external challenges, and weaknesses in facilitation support. Internal tensions can arise in any group. One group suffered particularly from internal tensions, which were worsened by an unconnected violent incident in the village affecting a member. Practical challenges include issues such as the changing climate, pests, lack of access to irrigation and inputs etc. Where some members live at a distance from the where the group meets and the learning plot this can be an obstacle. Late delivery of promised inputs for learning plots by implementing

partners, undermined the FFS groups' capacity to conduct their planned experiments and activities in some cases. When one NGO stopped providing facilitation support, the FFS group were unclear as the reason and this further undermined the group that was suffering internal tensions, with complaints about the unfair distribution of inputs.

A lack of coherence between extension messages from government and NGOs was an issue. This lack of coherence is mainly relating to the outbreak of Fall Army Worm and differing advice on how to respond.

Farmer dependency creates expectations around new projects, despite efforts of implementing partners to avoid giving inputs. There have been some issues with respect to farmers expecting fertilizers and inputs which undermines their faith in the initiative: Several members said that they have expected short term material benefits from participation, but FAO/the project seeks to foster farmers' self-sufficiency and agency. One of the NGO implementing partners said they had tried hard to explain from the outset that this was not the purpose of the group. Internally, some FFS members also criticized their peers for having unrealistic expectations.

There is a lack of clarity relating to the distribution of inputs in FFS groups: There has been support from the FAO project in terms of provision of material inputs, e.g. goats, access to seeds, but it is not clear how it has been decided who should receive this support within groups and between the groups. It is clear that many farmers are unable to access such inputs, and this is a critical issue because the integrated approach posits that such support is part of the wider mix. The NGO implementing partners also noted such dependency issues are widespread. In discussing changes that farmer FFS members desire with respect to their FFS group, many mentioned improved access to equipment, livestock, training etc. Some interesting proposals were also made (e.g. more targeting of the youth, the group should operate as a business etc). Sharing with others and exchange visits were regularly mentioned.

Desired changes identified by members related to more diverse forms of learning and sharing, increased access to inputs, more training on new and existing topics (e.g. livestock management, energy saving stoves). More effort to engage youth is also a priority.

Table 13: Farmer feedback on FFS as organisations (Source of Evidence: FGDs; individual case studies)

	Nang'omba FFS, Blantyre	Tikondane FFS, Neno	Nthundu FFS, Phalombe	Kapako FFS, Zomba
Meeting expectations				
Group functionality				
Participation				
Plans to continue				

Participatory assessment indicated both internal and external factors underpin FFS group success: In Neno, the FFS group were asked in October 2019 how they would judge their own success. They said that a growing membership would be one criterion. Others included success in cropping, diversification to respond to changing climate, VSLs providing money, and making the seepage well work properly (which it currently is not) which requires skills and equipment.

Other factors influencing success were identified by the FAO project team drawing upon their experience of managing the project, and ranged from the assets of members, through the skills held by and attitudes of members, and the external support received. Successful groups were seen to be characterized by members having larger landholdings, good facilitation and communication skills in the group, and willingness of members to learn (e.g. to conduct the AESA monitoring, to share with others, to be self-reliant and to build up their learning over different seasons). Good support by government extension officers, with a relatively high extension officer

to farmer ratio was also considered a key factor. The least successful groups were characterized by unstable group leadership and local government leadership could also be undermining (e.g. local headman is unsupportive). Geographical location can play a role: for example, one set of FFSs are located in a lowland area and are more affected by flooding and unable to do winter cropping. Weak groups were less likely to do repeat studies, and so did not build up their learning in a cumulative manner. Strong groups are able to plan well; weaker groups are not. Poor group cohesion and community-based facilitators without commitment to help others characterised groups that perform less well. In some places, where other organisations have given free handouts in the past, or where food-for-work programmes exist, members are not always so interested to work collectively.

The findings for the evaluative learning FFS case studies and the insights from the project team, align with data collected on outcome-oriented indicators developed by the evaluative learning team and collected by the FAO M&E team consultant in the endline questionnaire survey of FFS members. Indicators relating to the functioning of the FFS groups, suggest that a majority of participants felt that their groups functioned well or very well in terms of group cohesion and leadership, with a majority indicating that they thought quite or highly likely that the group would continue to function beyond the project (86.9%).

Households who indicated that they participated in the FFS were asked how well the FFS functioned in terms of group cohesion and leadership. About 77.5% and 69.4% of the households reported that their working together as an FFS group and FFS leadership were well or very well (FAO Endline Survey on Evaluative Learning Team Indicators).

Table 17: Participatory Analyses of FFS Group Strengths, Weaknesses and Desired Changes

	Nang'omba FFS, Blantyre	Tikondane FFS, Neno	Nthundu FFS, Phalombe	Kapako FFS, Zomba
Strengths	**Cooperative ethos emphasized**: Collective spirit to tasks. Unity and love. **Strong leadership** Sharing of knowledge **Rules which all must follow –** important sanction to stop people being late with fines.	**Cooperative ethos:** They listen to and respect each other. Meet once a week, work hard and implement once a group decision is made. Unite and work hard (remaining members).	**Cooperative ethos emphasized:** Good cooperation in group [women's FGD]. Rules maintain the group. Formed executive committee without help of extension worker. Collected cash from members to buy *dimba* irrigation equipment [Men's FGD]. 4 of 9 said group is functioning well, unity is the key, shared understanding and acceptance of group rules and work involved. Strong leadership [individual cases]. **Role of leaders**: Leaders lead and unite the group. **Key role of facilitators**: Important role of facilitators though in bringing quite diverse groups together.	**Ability to resolve tensions and cooperate:** The group has functioned well. Misunderstandings resolved. They can now do AESA – Agri Systems Analysis to analyse problems in the field. Have rules to follow. Every farmer helps another farmer if there is a problem e.g. if someone is sick. **Improves individual access to extension advice**: Can access extension services easier if in a group. **Good internal collaboration, including participation of women and men** Working well together – they already knew each other. Good collaboration. Women and men participating in VSL.
Weaknesses	**Some individuals do not follow what the leader says or work collaboratively**. Some seek to dominate the group. **Weak commitment:** Some members do not come to all the meetings but are still participants. Absenteeism, backbiting, too much laziness mentioned, but not consistently. Concerns about lack of access to inputs. Lack of a uniform does not help. **Extension worker moved** suddenly undermining their coordination and planning. **Misappropriation of inputs**	**Lack of commitment from members:** Sometimes attendance is poor, power struggles, **Practical challenges**: Lack of inputs for their own fields so they plant something different from the learning plot which makes it difficult to compare (e.g. hybrid v local maize). Challenging weather conditions. **Weaknesses in facilitation support:** Late delivery of inputs for the learning plot. Limited extension support provided during season 2. **Internal tensions**: power struggles, dictatorial approach of some	**External and practical challenges:** Changing climate, pests, lack of access to irrigation equipment and access to seeds and fertilizers. **Weaknesses in facilitation support**: NGO was promising, but not coming. Late supply of agreed inputs such as seeds. **Lack of coherence between extension providers**: Differences in approach between NGO and government extension workers;	**Distance of some members:** Some members live far away and so have had difficulty participating and they have now formed their own FFS. They have used their own money on the learning plot and the time is a cost. **Lack of commitment**: absenteeism has been an issue, although fines have been incurred if you miss a meeting without valid reason. **Lack of farm inputs: e.g.** fertilizers, seeds, money. Sometimes a lack of markets to sell crops. **Weaknesses in facilitation support:** Farm inputs also come late for learning plot which affects their capacity to do learning and experiments.

Desired changes	**Inputs**: Chickens to sell eggs (pass on system for chickens is faster than for goats) Need cows for milk.	**Incentives needed:** e.g. a bottle of insecticide for each member. Visits to other areas. Source of water which they can rely for irrigation. Received chickens, but now they could get goats to show they are growing.	**More diverse forms of learning and sharing:** Interest expressed in radio programme participation and exchange visits to learn and share knowledge. **Specific new or additional work on existing topics:** livestock production, training on energy saving stoves. e.g. making compost, how to organize VSLs. **More support with inputs:** Assistance in buying water pumps or paying for use so can expand irrigation on multiple crops, loans for fertilizers	**More support to share**: To share and see the results of other people, teach others. **Potential for the group to operate as a business:** The group should be like a business and be given capital to start up. They should be self-reliant, but they need access financial services. . **Engage youth more:** Start targeting youth as participants. **Specific topics**: livestock management, dams for fish farming, training on how to manage inputs received e.g. tree seedlings, responding to pests, lessons on banking, **Access to inputs**: Fertilizers.

6.3 Capacity Changes

What kinds of capacity changes have been achieved? How, why and for whom?

This section provides an analysis of farmer capacity changes resulting from FFS participation was assessed according to several different frameworks:

a) FAO 'early outcome' indicators on the anticipated benefits of FFS participation.
b) COM-B capacity, opportunity and motivation framework.
c) Sets of technological practices and methods targeted by the project in agriculture, livestock, nutrition, conservation of biodiversity and sustainable livelihoods.

In this section we assess the findings per district and overall.

BLANTYRE (capacity change)

Participant capacity strengthening in the Blantyre FFS case study had improved somewhat in terms of the FAO 'early outcome' benefits that are anticipated to result from participation in an FFS. By October 2019, we find positive examples on strengthened observation capability, but change is only occurring to a limited extent. There are examples of building self-confidence and enhancing decision-making capacity, although also to a limited degree. The learning plot provides FFS members with the opportunity to minimize risk in experimenting with new practices. However, currently the approach appears to be very incremental, rather than facilitating farmers to analyse their overall system and strengthen its resilience, except in a few cases. Few examples were found in terms of changing deep rooted beliefs and practices. It was not clear whether members' problem-solving capabilities had been significantly developed.

Box 7: Blantyre FFS Group - examples of new problem-solving capacity as a result of FFS participation

- *'At first, I did not apply manure fertilizer, but after a dry spell when the crops died, I knew I should.'*
- *'Before the FFS, farmers had low yields....but after a drought I switched to dimba cropping';*
- *'There was no subsidy programme giving us access to fertilizers in 2016, so, with my wife, we used a manure making approach we learned through the FFS and produced more than those in the subsidy group!'*
- *'Before the FFS we were affected by Fall Army Worm. We had no knowledge on how to control it, but after the FFS we now know how to control it by using soil and applying on the affected area.'*
- *'Dimba cropping is a way to sell products to buy inputs for the rainfed* system.'
- 'At first, I was cultivating one plot, but now I have increased the size of plots by renting another. I am now able to make manure and I got a goat from FFS. Hoping that this can help me to fight against dry spells.'
- *'Before FFS I had no knowledge about controlling runoff in the field, but after with new knowledge I can construct marker ridges.'*
- *Before FFS I had no mulching knowledge or pit planting, but now can do these'; I had no knowledge about business management, but now I do'.*
- *'Now I can borrow money from FFS VSL and start a business.'*
- *'We can do crop diversification e.g. groundnuts, maize, pigeon peas, before we were just growing maize*
- *'At first, we were experiencing hunger, but now with dimba cropping after FFS we could do both dimba and rainfed cropping'.*
- *'Last year, there was not enough fertilizer, but we used FFS knowledge on manure making'.*
- *'Before there was a lack of inputs, but now we can get for the whole plot'.*

Participant capacity strengthening in the Blantyre FFS case study has been strongly enhanced in terms of capacity, motivation and opportunity: In 2018, farmers reported improvements in their capabilities, but the magnitude of these changes appear still fairly limited. There was positive feedback on their learning on cropping practices, and their appreciation of the value of trees, tree planting and natural restoration approaches had increased. Their nutrition knowledge and understanding of community banking had also been enhanced. However, less had been achieved on sustainable livelihood capacity changes (e.g. irrigated farming, livestock management). Motivation had increased across the board and diverse new opportunities were outlined such as improving access to small loans via the VSL, gaining access to resources. In 2019, the women's FGD members said they were very positive about the opportunity provided and they are motivated to continue even if extension support does not continue, although they would prefer continued support from extension advisors. They value the methods of farming they have learnt, such as conservation agriculture and pit planting methods, and feel confident that they can do well, if the rains improve, and this will help them to be more climate resilient. The irrigated winter farming enables them to grow more crops such as sweet potatoes and vegetables, to earn money. The methods which sought to reduce labour requirements were highly valued by the women participants, although there are time costs to being involved. Access to loans is valued. At the same time several barriers to capacity change could also be identified by participants. In the women's FGD, members identified variable participation in the group (some absenteeism as a challenge, although the overall the group is cohesive. Other challenges in the past season include the poor rains, lack of farm equipment and fertilizer, and time costs. In the men's FGD, key barriers included a lack of capital e.g. for seeds, fertilizer, pumps for irrigation and timely availability of inputs.

Farmer capacity in the Blantyre FFS case study had also been strengthened on sets of technological practices and methods, targeted by the project.

In 2018, individual case study farmers reported the following:

- 9 of the 9 farmers interviewed reported learning new skills and knowledge relating to cropping practices in particular: mulching, improved ridge spacing and construction, and crop spacing were commonly mentioned. At least 4 farmers noted learning more about crop diversification and early maturing varieties and the importance of these given climate variability.
- 3 farmers reported gaining increased understanding of the value of tree planting and natural resource management practices.
- 6 of the 9 farmers reported learning about nutrition – more balanced diets, and how to prepare meals.
- 3 mentioned the value of community banking via the VSLs. One farmer, who is the treasurer of the group, said he had learnt how to manage money better.
- Sustainable Livelihoods – limited reporting of diversified livelihood activities. One farmer mentioned irrigated farming and another learning about livestock management.

By 2019, participants had experienced a continued strengthening of their knowledge and skills, although the extent of the change is of limited in magnitude. There is increased motivation and various opportunities noted especially with respect to livestock management.

- 6 of the 6 farmers interviewed and who discussed this issue reported learning new skills and knowledge relating to cropping practices, such as crop diversification and conservation agriculture techniques.
- farmers reported gaining increased understanding of the value of tree planting and natural resource management practices.
- 6 of the 9 farmers reported learning about nutrition – more balanced diets, and how to prepare meals.
- 3 mentioned the value of community banking via the VSLs. One farmer, who is the treasurer of the group, said he had learnt how to manage money better.
- Sustainable Livelihoods – limited reporting of diversified livelihood activities. One farmer mentioned irrigated farming and another learning about livestock management.

NENO (capacity change)

Participant capacity strengthening in the Neno FFS case study had improved strengthened capacity in terms of the FAO 'early outcome' benefits that are anticipated to result from participation in an FFS, but to a limited degree. In 2018, participants were expecting material benefits (handouts), although a small number of members understood the learning plot and reported on using AESA in their own fields. The group had declined in size from 40 members to 19, partly because the inputs participants expected were not given. One member had greater confidence only. Further, the learning plot had provided the opportunity to minimize risks, but the approach was very incremental, rather transformative of farm systems and resilience. It is not clear that farmers' problem-solving capabilities had been strengthened. By October 2019, a participatory exercise was conducted to explore problem-solving capabilities. Most of the problem-solving capabilities identified by respondents included: managing pests; conservation agriculture, pit planting and crop diversification to improve yields and cope with increasing climate variability. In one case the FFS member indicated that there has been no solution to their hunger caused by poor rains.

In the Neno FFS Case Study, participants' capacity has been strengthened in terms of capacity, opportunity and motivation, but only to a limited degree. In May 2018, of the 7 individual farmer cases tracked (2 were unavailable for interview):

- All had learnt new knowledge and skills on different aspects of cropping, such as pit farming, spacing of ridges, planting only maize seed, no till, improved construction of marker ridges, and cover crops.
- Several farmers noted the early maturing *Kanyani* maize variety. The group had bought seeds together to test on the learning plot and in their own fields.
- 4 farmers reported that they had learnt about crop diversification. One or two reported receiving sweet potato planting materials.
- 4 farmers reported that they had improved knowledge of a balanced diet (e.g. including 6 different food groups) and had learnt new ways of preparing meals that are more nutritious.
- One farmer reported having learnt how to make an improved stove.
- One farmer noted improved livestock (chicken) management. Several reported having a new opportunity having received chickens via the FAO FFS group.
- Two farmers reported that they had participated in another group, organized by the same implementing partner, to dig seepage wells, but that one had dried up.

However, many challenges were encountered by the Neno case study group, including limited access to labour to manage tree seedlings in hot, dry spells or to do pit planting (women's FGDs and interviews). A lack of resources and poor group cohesion were also noted.

In the Neno, FFS case study, farmers have gained some knowledge and skills when assessed against the targeted sets of technologies and methods promoted by the project, but to a limited degree only: Farmers are learning relevant knowledge and skills, particularly on crop diversification, soil and water management, and in some instances, conservation agriculture and livestock farming, and, for women only, on nutrition (enhanced focus on six food groups, improved food preparation and recipes). One woman had improved vegetable production, but they were damaged by animals. Several members received chickens, but most did not survive. Training in the VSL was mentioned by the men's FGD, but this was not functioning.

- <u>Cropping activities in response to changing climate</u>: In the women's FGD, participants also reported that they had planted a range of crops such as ground nuts, cowpeas, millet, and had conducted pit farming, planting early maturing maize, zero tillage, ridge spacing etc. However, the shortage of rains in 2017-18 affected the crops such as soya bean and millet. The women's group indicated that previously they had not sought to conserve moisture in the soil in the way that they are now doing. The planting of early yielding crops allows them to harvest something even when the rains are poor. One woman commented

on the benefits and costs of pit farming: *'At first when I was planting maize on the same area without pits I used to harvest only a 50 kg bag – but this year despite difficulties with rainfall with pit farming I reached 100 kgs. Takes a lot of labour to create the pits – could not say how many she had made (a lot)'.* In the men's FGD they explained that the focus was on which crops do best in their location. They also highlighted crop diversification to respond to the changing climate, including SC 403 (*Kanyani*) maize hybrid, but also practices such as mulching, ridge spacing and construction, zero tillage, compost manuring of the fields. The group tested various vegetables, such as mustard, but the seedlings were stolen. They also faced challenges such as Fall Army Worm this season and the absence of the extension workers was lamented. The men's group reported that they had received training on *dimba* farming as a means of adapting unreliable rainfall patterns. However, in 2016/17 season they did not take good care of their *dimba* plot because it was too far away and after the theft of the vegetable crops at the *dimba* learning plot, they had been discouraged from continuing the *dimba* activities. In both the men's and women's groups, the participants mentioned the AISA training they had received which appears to have focused on pests and disease monitoring.

- Livestock: The women's FGD also discussed receiving chickens. They confirmed that each member had received 13 chickens from the implementing NGO, but not all have survived. One says she now has only 7, another 9, but they are laying eggs, and this provides the women with the opportunity to sell eggs. The men's FGD participants said that they had been taught about livestock production, and this provides an opportunity for selling eggs and manure. The men's FGD participants said that before receiving the chickens they had received training on how to manage them and members were given chickens and information about vaccines.
- Natural resources management, the women's group reported how they had planted trees on the learning plot and on their own farms, but the latter had not survived. Only one woman said her trees (4) had survived at her farm/house.
- Nutrition and health: The women's group noted how they had learnt to cook nutritious foods belonging to the six food groups. However, several discussed how some of the ingredients are not affordable, such as eggs. Some things such as soya beans and sweet potatoes are locally available, and they had learnt new forms of preparation. The men's group said that they had been taught about nutrition and what we should eat, and how to plan a menu for the week.
- Sustainable Livelihoods: Participants in the women's and men's FGD said that activities had been planned to establish Village Savings and Loans Group (VSL) and training on running a business, but the extension workers stopped coming so this was not covered. This explains why the individual case study farmers did not report any capacity strengthening on this front. Participants in the women's FGD group expressed the desire to receive fertilizers and said they had been promised loans to obtain them.

PHALOMBE (capacity change)

Participant capacity strengthening in the Phalombe FFS case study has improved led to a strong strengthening of capacity in terms of the FAO 'early outcome' benefits that are anticipated to result from participation in an FFS, but to a limited degree. There are stronger observational capabilities and knowledge ownership, plus improved self-confidence and decision-making capacities amongst a majority of the members. The learning plots also allow for joint experiments, while minimizing risks. Some costs of participation were noted by women participants in term of the fines if they could not attend and the labour/time inputs. There were one or two cases, as well of changes in deep rooted practices – e.g. the example of a charcoal trader who has become an advocate of tree planting. Many participants have intensified their *dimba* cropping, growing a range of vegetables to earn money.

In the Phalombe FFS Case Study, participants' capacity has been strongly strengthened in terms of capacity, opportunity and motivation (COM-B assessment).

In the Phalombe FFS case study, in terms of the targeted technologies and methods promoted by the FAO, there has been strong capacity strengthening. The findings indicate that agronomic skills and knowledge have been improved.

- All the individual farmers report gaining greater understanding of and skills in how to make agronomic changes in their cropping practices, highlighting improved ridge construction and spacing, 1 seed per station, manure making.
- Most discussed having stronger awareness of the importance of crop diversification and the potential of irrigated cropping (e.g. growing tomatoes) and including cow pea and pigeon pea varieties.
- Four farmers reported gaining improved understanding of balanced diets and methods of preparing meals to enhance nutrition.
- Three mentioned increased awareness/attention to tree planting at the homestead and conservation of seed biodiversity, but awareness was already high for many.

However, there is less evidence on changes with respect to water management and livestock management.

ZOMBA (capacity change)

In Zomba FFS case study there were positive capacity strengthening benefits achieved in most cases by participating households, in terms of observational capability and knowledge ownership, self-confidence and decision-making, and minimizing risks in experiments, and problem-solving capabilities, but no clear examples of changes in deep rooted beliefs and practices. The majority of the individuals who demonstrated that they understood the FFS activities and the comparisons involved, although the designs of their experiments and comparisons could be improved in many cases. A small number of individuals reported that they are experimenting in their own plots as well conducting comparisons. There were several examples of farmers' confidence increasing (see box 8 below). The learning plot has provided farmers with the opportunity to experiment while minimizing risks, although some farmers did comment on the time costs of participation incurred. The FFS did not appear to change deep-rooted beliefs and attitudes, for example, no farming households have moved away from maize production with examples of farm system transformation, despite climate change presenting a major threat to maize cultivation in Malawi. There has been re-enforcement of awareness of the need to conserve trees, for example, and to select crops to respond to climate change. By 2019, both female and male members demonstrated their understanding of the learning plot activities and outcomes. There are examples of members demonstrating that their confidence had grown. The learning plot has provided the opportunity to minimize risks, but currently the approach appears to be very incremental, rather than facilitating farmers to analyse their overall system and strengthen its resilience. Farmers were asked to discuss in pairs, in a participatory exercise, how they had overcome a recent problem, drawing upon their FFS experience. Several participants gave concrete examples: e.g. one farmer said that they now grow the hybrid maize, rather than the local variety to cope with the changing climate.

Box 8: Farmer with enhanced problem solving, observational capability and self-confidence as a result of FFS participation

At baseline, Dison Mangani, a participant in the Zomba FFS, already had good skills in problem solving, observational capabilities and self-confidence, but these have improved as a result of FFS participation. He has a learning plot for the household. Last season he planted 3 or 4 varieties of sweet potatoes on a large scale and will select the best variety for future planting. Around his house he has small areas planted to rice, cocoyam, cassava (for planting material) and trees that he has planted.

Photos: Dison's sweet potato field and experimental learning plot next to his house

Box 9: Examples of new knowledge gained by the women in the Zomba FFS from their learning plot participation

Women in the Zomba FFS reported they had strengthened knowledge about harmful and helpful insects in the field e.g. harmful insects are like fall army worms, beetles and aphids that attack the crop parts hence disturbing the growth of the plants. Helpful insects are like butterflies, bees and ants that help in pollination process on the maize plants or control pests, such as Fall Army Worm. Earth worms that help in aeration of the soil and also creating space for roots to pass when growing.

Table 18: Capacity Summary Table: Comparing Between FFS Cases on Farmer Capacity to Adapt, Experiment, Innovate and Evaluate Technologies According to FAO Principles (Source of Evidence: Individual Farmer Case Studies; FGDs).

FFS Group/ Dimension	Nang'omba FFS, Blantyre	Scale	Tikondane FFS, Neno	Scale	Nthundu FFS, Phalombe	Scale	Kapako FFS, Zomba	Scale
Observation capability & Knowledge Ownership	2018: Chair & at least 1 member can clearly explain process and management of plot. Some individuals experimenting in their own plots. 2019: Some examples, but they are limited. One man explained: "*We are now custodians of information ourselves*"		2018: '*When we were 40 members, we didn't learn. People were just following for handouts and money. The group has declined from 40 members to 19 (Men's FGD).* At least 2 farmers are using AESA in their own fields, but both have now left the FFS. 2019: No main learning plot in 2018/19. No FGDs in March 2019 as explained in section 5.		2018: Both female and male FFS members demonstrated their understanding of the learning plot activities/outcomes. 1 woman is experimenting and can carry out tests on her own garden using two plots to compare performance. 2019: Ridge spacing, planting methods and AESA knowledge increased. Reducing risk to cope with changing climate - irrigated farming knowledge gained – how to intensify production (range of vegetables, maize, sweet potatoes etc). Greater knowledge about pests and helpful insects.		2018: Clear comparisons on learning plot allowed participants to make some comparison between different crops and varieties. Female and male members could communicate understanding of learning plot activities and outcomes. Women said that their capacity to identify harmful and beneficial pests had increased. 2019: Both male and female FFS members could explain what they had learnt through managing the main learning plot and the *dimba* plot.	
Self-confidence & decision-making capacity	2018: Some examples of confidence building (e.g. one woman reports growth in social networks and motivated to act on livelihoods and trees for her children's future. 2019: Some examples, but fairly limited in number.		2018: At least one farmer has built his self-confidence through participating in the FFS and this was demonstrated through him experimenting in his own field by planting sweet potato on ridges. 2019: No main learning plot in 2018/19. No FGDs in March 2019 as explained in section 5.		2018: There are examples of members demonstrating that their confidence had grown. 2019: Yes, they are able to make decisions on their own. Members feel empowered. They are able to identify problems and look for alternatives on their own (men's group). Making Mbeya fertilizer – how to plant maize. Right ridging and plant spacing. Tree planting, irrigation farming, (women's group).		Learning plot is well organized and helping participants to learn through practical experience (e.g. fertilizer application) and members can make decisions about what to do on their farms based upon this experience. 2019: Group decided to plant a business plot of maize (SC 403) to provide funds for day to day running of FFS.	
Minimizing risks in experimenting with new practices	2018: Learning plot has provided this opportunity, but focus is more on individual technologies, not supporting farmers to analyse their overall system to strengthen its resilience. 2019: Learning plot has helped, but late delivery of inputs has		2018: Learning plot practices are said not to always be achievable on farmers own land due to either need for external inputs or highly labour demanding 2019: No experiments in 2018/19		2018: Yes, opportunity to minimize risks via the learning plot. The approach is starting to facilitate some farmers to analyse their overall system and strengthen its resilience (e.g. male FFS chairman intensified his winter cropping as an alternative when his main crop fails, expanding the winter plot size and		Through the learning plot, farmers have had the opportunity to minimize risks, but incremental approach, rather than farmers analysing overall farm system to strengthen its resilience. Although one farmer appears to be taking a farming system perspective as an individual.	

	undermined capacity to do experiments.				growing e.g. sweet potato, vegetables, tomatoes). He plans to store the sweet potato for food as dry pellets. He was irrigating with pipes and because the treadle pump is not enough, he uses a petrol pump. He wants to conserve the riverbank, so his fields are far from the river). 2019: Fall Army Worm experiments on the main and *dimba* learning plots are good examples of minimizing risks of trying new practices on a group plot. Sharing lessons amongst members themselves. Farmers report that they assist each other in decision-making. When one has a problem, the others can help, e.g. how to make ridges. Crop diversification – to cope with dry spells, low maize yields, still get something from soya.			
Changing deep rooted beliefs and practices	2018: No cases reported. 2019: No cases reported.		2018: No cases reported. 2019: No cases reported.		2018: No cases reported. 2019: No cases reported. 1 member previously traded charcoal, but he has now become more convinced of need to change and to plant trees. Stronger capacity on *dimba* farming.		2018: No cases reported. 2019: No cases reported.	
Enhanced: farmers' problem-solving capabilities	2018: Some examples of problem solving. 2019: More examples given, but not for every member of group.		2018: It is not clear that farmers' problem-solving capabilities have been strengthened, but more research needed. 2019: Some examples but limited.		2018: Some indication that farmers' problem-solving capabilities have been strengthened, but more research needed. 2019: More focus on tree planting and crop diversification, and soil moisture conservation to cope with dry spells. More understanding of when to irrigate (time during the day) to reduce evaporation). Other problem-solving techniques – planting fruit trees given by the FFS, improving spacing to get better		2018: Some examples, 2019: Some examples. e.g. Dison Mangani	

					yields, expanding livestock production and *dimba* vegetable production, crop diversification to cope with climate variability, improved tomato production knowledge, how to make manure when limited money, growing sweet potatoes when other crops washed away in heavy rains, learning which are the best vegetables to grow via the FFS, and how to tackle Fall Army Worm.			

Dimension	Evaluative scale
No capacity change according to FAO principles	
Little capacity change according to FAO principles	
Some capacity change according to FAO principles	
A lot of capacity change according to FAO principles	

In the Zomba FFS Case Study, participants' capacity has been strongly strengthened in terms of capacity, opportunity and motivation. In 2018, participants responded largely positively:

- 8 of the 9 farmers reported that the FFS had helped them to improve their capacity, mainly by providing them with access to extension advice, access to (limited) inputs and opportunity to learn through shared activities.
- 5 of the 9 reported enhanced motivation and self-confidence, although we did not specifically assess the extent of change (and will cover this in the final evaluation), but 4 farmers did not enhanced motivation.
- One female farmer said that she felt more empowered: '*Before when I hear some farmers talking on the radio giving testimonies of how some projects had changed their lives and I always wondered how could it be possible, but with the knowledge and opportunities gained from the school, I understand that I can also talk about the things I have learned and make people understand*'.
- The opportunity for farmers to access some seeds (but on a limited scale), a treadle pump and access to credit via the VSL group was highlighted by several farmers as positive opportunities, as well as the opportunity to learn new skills and gain knowledge. A small number have accessed groups, but by no means the whole group.

A similar picture emerges by March 2019, farmers had experienced good capacity strengthening of participants, when assessed using the COM-B model:

- Of the 6 farmer case studies interviewed, all mentioned a range of capacity strengthening benefits, ranging from improved knowledge of fertilizer application, crop diversification, conservation agriculture methods, saving skills, and the ability to teach others. 2 farmers gave no feedback.
- Of the 6 farmer case studies, 4 mentioned that they are motivated by increased yields and income.
- Out of the 6 interviewees, 5 emphasized the improved access to goats as a result of the pass-on scheme. One mentioned the opportunity to teach others and to multiply potato vines.

In the Zomba FFS case study, when assessed in terms of capacity on sets of technological practices and methods targeted by the project, farmers report that they have gained strongly in terms of capacity strengthening.
In 2018, the women's FGD reported several areas of capacity strengthening, including crop diversification, growing of early maturing crops, different conservation agriculture and soil and water management practices, and receiving small stock. Individual case study farmers reported:

- 8 out of the 9 individual cases in Zomba study FFS reported learning new knowledge and skills on conservation agriculture techniques due to their participation in the FFS group, which gives them better access to extension services. Ridge spacing and size, one seed per station, construction of box ridges, zero tillage, manure-making and mulching were commonly mentioned methods.
- Crop diversification – 8 out of 9 farmers reported adding vegetables, early maturing maize variety (*Kanyani*), sorghum, pearl millet, sweet potato, and cow pea, although in half of these only one addition was mentioned. Support from the FAO to access seed was mentioned as a benefit by two farmers.
- 3 farmers mentioned capacity strengthening on irrigated farming, but limited details were given, and it is not clear whether this has been supported by the FAO project, or by a related development programme.
- None of the women reported changes in livestock management, but all four of the men interviewed noted enhanced knowledge and skills with respect to chickens or goats. For example, one farmer noted that he had learnt about constructing raised kraals, another on how to tether goats so that they can feed.

- 2 farmers said that have received goats under the 'pass programme', and another said he was aware of the initiative and was waiting his turn. The others did not mention this.
- 6 of the 9 reported learning about more nutritional diets, e.g. about the 6 different food groups and how to seek to a balance, and how to prepare foods to enhance nutrition e.g. from growing and eating vegetables, mixing okra with eggs etc. One woman said she had learnt about constructing a home garden, but she had yet to construct one. The opportunity to implement some of the nutrition lessons may be limited, given the information provided by the case study farmers on the (limited time) their food stocks lasted during the recent, poor, season.
- Not all the individual case study farmers were asked about their involvement in conservation and biodiversity activities. Several appear to have already been committed to forest conservation prior to engaging in the FFS, but the latter appears to have reinforced their commitment and encouraged one or two others to plant trees around the home and in local seed recycling. However, the extent of change as a result of the FAO project appears limited in scope.
- Sustainable livelihoods: 6 of the 9 farmers reported that they have joined the VSL, which enables them to access credit. One said that they use the money to buy and sell groundnuts.

However, there is less evidence on changes with respect to water management.

Table 19: Comparative Assessment of Capacity Change Using COM-B Assessment Approach (Source of Evidence: Individual Farmer Case Studies; FGDs).

COM-B assessment	Nang'omba FFS, Blantyre	Scale	Tikondane FFS, Neno	Scale	Nthundu FFS, Phalombe	Scale	Kapako FFS, Zomba	Scale
Capabilities (knowledge and skills)	2018: Evidence that most farmers had gained some knowledge on cropping practices. Some farmers are also gaining some knowledge and skills on crop diversification, nutrition, tree planting, community banking. 2019: Women's FGD very positive about enhanced capacity for irrigated winter farming, conservation agriculture and pit planting.		2018: All farmers have gained some knowledge and skills on cropping, about half reported learning about crop diversification and nutrition. A handful of farmers noted livestock management skills and lessons had been gained. Fewer have been involved in constructing the seepage wells. 2019: Challenges in reaching farmers to conduct interviews and internal tensions continuing. Also 1 member involved in a car accident. Etc Social protection cash transfer distribution on day of visit due to heavy rains/floods. Of the 5 interviewed, the knowledge gained in the FFS was positively reviewed by the participants in the light of the changing climate and pest challenges.		2018: Yes, evidence that all farmers are gaining capabilities especially in cropping, but also in crop diversification, nutrition and tree planting. 2019: 6 of 8 case study farmers report a range of new capabilities obtained as part of FFS, ranging from environmentally friendly stoves, conservation agriculture methods, manure making, AESA monitoring etc.		2018: Knowledge and skills increased on cropping, crop diversification, nutrition, VSLs. Fewer knowledge and skills have been developed on irrigation and water management. Sustainable livelihood skill development limited in reach. 2019: of 6 farmer case all reported a range of capacity strengthening benefits (improved knowledge of fertilizer application, crop diversification, conservation agriculture, and the ability to teach others (2 farmers did not report).	
Opportunity	2018: Several valued the opportunity to learn as a group. 4 farmers mentioned that the VSL gives an opportunity to save and innovate. One farmers aid that the FFS expands her social networks. 2019: Access to loans, earning money through *dimba* cropping, and learning new skills all highly valued, but barriers ahead.		2018: In terms of improved opportunity through membership of the Tikondane FFS there was a variable response. Challenges were noted: A female case study farmer said she had limited access to labour to manage tree seedlings given the poor rains and hot weather, and limited labour to do pit farming. One farmer noted his lack of resources to purchase inputs. Issues relating to group cohesion also emerged: one farmer noted that it did not function well and so was a lost opportunity, while another said he had been dismissed from the group. 2019: Limited interviews possible (see above), but of the 5 interviewed, and of the 3 that responded on this question, farmer perceptions of the new opportunities, all 3 were positive, naming the opportunity to teach others, learning to be more generous		2018: 3 farmers said they had new opportunities, e.g. planting seeds as a group, doing own test on own plot, learning by doing to make manure. 2019: Limited feedback specifically on this question, but from observations it is clear that there is a strong set of opportunities observed by participants.		2018: Several farmers noted the opportunity for farmers to access some seeds (but on a limited scale), a treadle pump provided, access to credit via VSL. Opportunity to learn new skills and gain knowledge valued. Only a small number of farmer cases offered access to goats so far. 2019: Out of 6 farmer case studies interviewed, 4 emphasized the improved access to goats as a result of the pass-on scheme. One mentioned the opportunity to teach others and to multiply potato vines.	

			and about balancing the diet and being given access to tree seedlings.					
Motivation	2018: The majority, if not all, farmers are motivated to continue to improve their farming system and to engage in entrepreneurial activities. One farmer noted the responsible roles has also taken within the group. 2019: All keen to continue, even if no support from extension advisers.		2018: Somewhat variable amongst members. 2 farmers among the 7 study cases decided to leave the group. Some gained confidence and continue to have interest to participate. 2019: Limited interviews possible (see above) but of the 5 interviewed, the participants remain motivated to continue despite the organisational challenges that have occurred within the group		2018: Several said they are motivated to continue diversifying and exploring new technologies. Some mentioned specific goals (e.g. establishing a tree nursery, rainwater harvesting, diversifying further). 2019: Positive feedback. 1 woman reported developing a much stronger attitude of self-reliance. She was given 1 goat and it has bred so she now has 3.		2018: 5 of 9 reported enhanced motivation and self-confidence, e.g. 1 woman said that she felt more empowered to learn and make changes having participated in the FFS. 2019: 4 out of 6 case study farmers interviewed 4 mentioned that they are motivated by increased yields and incomes	

Dimension	Evaluative scale
No capacity change according to COM-B capacity, motivation and opportunity	
Little capacity change according to COM-B capacity, motivation and opportunity	
Some capacity change according to COM-B capacity, motivation and opportunity	
A lot of capacity change according to COM-B capacity, motivation and opportunity	

Table 20: Comparing FFS Farmer Assessment of Capacity Change in Different Sets of Technologies and Practices Promoted by FFS Project (Source of Evidence: Individual Farmer Case Studies; FGDs)

	Nang'omba FFS, Blantyre	Scale	Tikondane FFS, Neno	Scale	Nthundu FFS, Phalombe	Scale	Kapako FFS, Zomba	Scale
Assessment per cluster of technology and practices								
Cropping (agronomy)	2018: 9 of the 9 farmers interviewed reported learning new skills and knowledge relating to cropping practices in particular: mulching, improved ridge spacing and construction, and crop spacing were commonly mentioned. 2019: 6 of the 6 farmers interviewed and who discussed this issue reported learning new skills and knowledge relating to cropping practices, such as crop diversification and conservation agriculture techniques.		2018: All learnt new knowledge / skills on different aspects of cropping, e.g. pit farming, spacing of ridges, planting only maize seed, no till, improved construction of marker ridges, and cover crops. Early maturing *Kanyani* maize variety valued. The group jointly bought seeds for testing on learning plot and own fields. 2019: Planting of a range of crops (ground nuts, cowpeas, millet), pit farming, planting early maturing maize, zero tillage, ridge spacing etc. Rain shortages in 2017-18 affected the crops e.g. soya bean and millet. Now seeking to conserve soil moisture via mulching, zero tillage, ridge spacing etc. Planting early yielding crops allows them to harvest something even when the rains are poor. Various vegetables tested (e.g. mustard, but the seedlings were stolen). Key challenges: Fall Army Worm and the absence of extension workers. *Dimba* training received to adapt to unreliable rainfall patterns, although in one season they encountered problems and were discouraged and did not continue.		2018: All 9 report greater understanding of and skills in how to make agronomic changes in their cropping practices, highlighting improved ridge construction and spacing, 1 seed per station, manure making. March 2019: All the individual farmers report gaining greater understanding of and skills in how to make agronomic changes in their cropping practices, highlighting improved ridge construction and spacing, 1 seed per station, manure making.		2018: 8 of the 9 cases learnt new knowledge and skills on agronomic techniques e.g. ridge spacing and size, one seed per station, box ridges, zero tillage, manure making and mulching. March 2019: 7 of 9 reported similar skills enhancement (e.g. ridge spacing, fertilizer application, mulching. 2 of the 9 did not comment.	

Crop diversification	2018: At least 4 farmers noted learning more about crop diversification and early maturing varieties and the importance of these given climate variability. 2019: Strengthened crop diversification.		2018: 4 farmers reported that learning about crop diversification. One or two reported receiving sweet potato planning material. 2019: Planting of a range of crops (e.g. cowpeas, millet, groundnuts).		2018: Most discussed having stronger awareness of the importance of crop diversification and the potential of irrigated cropping (e.g. growing tomatoes) and including cow pea and pigeon pea varieties. 2019:		2018: Crop diversification – 4 out of 9 farmers reported adding one of the following - vegetables, early maturing maize variety (*Kanyani*), sorghum, pearl millet, sweet potato, and cow pea. 4 mentioned adding in more than one of the above. 2 farmers noted access to seed March 2019: 4 of the 8 cases reported diversifying their cropping (e.g. use of hybrid varieties).	
Water management	2018: Not mentioned specifically. 2019: Not mentioned.	-	2018: 2 farmers reported that they had participated in another group, organized by the same implementing partner, to dig seepage wells, but that one had dried up. 2019: n/a		2018: Not mentioned specifically. 2019:		2018: 3 farmers noted capacity strengthening on irrigated farming, but limited details given. Opportunity has arisen to irrigate crops as a result of the seepage wells (Women's FGD). **Construction of seepage wells implemented by FAO through other groups (not the FFS).* March 2019: Nothing reported on this.	
Livestock	2018: Not mentioned specifically. 2019: Not specifically mentioned.	-	2018: 1 farmer noted improved livestock (chicken) management. Several reported having a new opportunity having received chickens via the FAO FFS group. 2019: The women's FGD received chickens; each member received 13 from the NGO, but not all survived. Survivors are now laying		2018: Not mentioned specifically. 2019:		2018: 4 men reported improved knowledge and skills on rearing chickens and goats, but no women reported this [2 farmers said that the opportunity to obtain goats arose] March 2019: 3 of the case study farmers report gaining capacity on raising livestock.	

			eggs and women can sell these. Men's FGD learnt about livestock production (chickens) which provides an opportunity for selling eggs and manure.					
Nutrition and Health	2018: 6 of the 9 farmers reported learning about nutrition – more balanced diets, and how to prepare meals. 2019: 6 of the 9 farmers reported learning about nutrition – more balanced diets, and how to prepare meals.		2018: 4 farmers reported that they had improved knowledge of a balanced diet (e.g. including 6 different food groups) and had learnt new ways of preparing meals that are more nutritious. 2019: Cooking of nutritious foods – skills gained and six food groups knowledge, but not all ingredients are affordable (e.g. eggs). Some things such as soya beans and sweet potatoes are locally available, and they had learnt new forms of preparation. The men's group also said that they had been taught about nutrition and what we should eat, and how to plan a menu for the week.		2018: 4 farmers reported gaining improved understanding of balanced diets and methods of preparing meals to enhance nutrition. 2019:		2018: 6 of 9 farmers reported learning more about nutritional diets (e.g. 6 food groups for a balanced diet, preparing food in new ways). 1 farmer reported learning how to construct a home garden (others also noted vegetable gardening – see cropping). March 2019:	-
Conservation of NR and biodiversity safeguarding	2018: 3 farmers gained increased understanding of the value of tree planting and natural resource management practices. 2019: Farmers reported gaining increased understanding of the value of tree planting and natural resource management practices.		2018: 1 farmer reported having learnt how to make an improved stove. 2019: the women's group reported learning to plant trees on the learning plot and on their own farms, but the latter had not survived. Only 1 woman said her trees had survived at her house.		2018: 3 mentioned increased awareness/attention to tree planting at the homestead and conservation of seed biodiversity, but awareness was already high for many. 2019:		2018: Not all were asked. Several already committed to forest conservation, but FFS has reinforced this. 2 farmers report planting trees around homestead and local seed recycling. March 2019: not covered by study.	-

Sustainable livelihoods	2018: Limited. 1 farmer doing irrigated farming. 1 learnt about livestock management. 3 of 9 farmers more highly value community banking. 2019: 3 farmers mentioned the value of community banking via the VSLs. One farmer, who is the treasurer of the group, said he had learnt how to manage money better.		2018: Not covered. 2019: Better planning of activities (VSLs) and training on running a business, but the extension workers stopped coming. Women still expect fertilizers and said they had been promised loans to obtain them.		-.		2018: 6 of 9 farmers have joined a VSL, giving them access to credit. March 2019: not covered by study.	

Dimension	Evaluative scale
No capacity change according to technological practices	
Little capacity change according to technological practices	
Some capacity change according to technological practices	
A lot of capacity change according to technological practices	

OVERALL (capacity)

- FAO anticipated certain 'early outcome benefits' as a result of FFS participation that have been achieved in all four groups, but to varying degrees. Phalombe and Zomba have seen the greatest strengthening. Enhancement has particularly occurred in terms of the strengthening of observational capabilities, building self-confidence and enhancing decision-making capacity, but often to a limited degree – i.e. improvements could be made in terms of the quality of experiments and tests that the groups are conducting on the learning plots. There were no clear instances of deep-rooted changes in thinking, such as a shift away from a reliance on maize production in most groups, but a handful of (male) farmers were identified in the Phalombe FFS group who were starting to make combined, more transformative changes of their farming systems.
    - In the Blantyre FFS case study, there were improvements on most of the indicators, such as strengthened observational capabilities, building self-confidence and enhancing decision-making capacity, but to a limited degree. There were no clear instances of deep-rooted changes in thinking.
    - It was difficult to identify examples of improved capacity in problem solving skills. This may be due the evaluative learning team not finding an appropriate method to enable farmers to provide examples, but it also probably reflects the approach used by the project.
    - A similar picture emerged in the Neno FFS case study as described for Blantyre, with a particular challenge relating to expectation of handouts.
    - The Phalombe FFS case study group had strong capacity strengthening in terms of FAO early outcome benefits anticipated. Stronger observational capabilities and knowledge ownership were reported and observed, as well as improved self-confidence and decision-making amongst a majority of members. The learning plots allow for joint experiments, while minimizing risks. There are some costs to participation according to some female participants. There were a small number of examples of more deep-rooted changes in thinking occurring.
    - Most participants in the Zomba FFS case study group achieved positive benefits from FFS participation, including observational capability and knowledge ownership, self-confidence and decision-making, and minimizing risks in experiments, and problem-solving capabilities. No clear instances of deep-rooted changes in thinking.

- Capacity strengthening has been enhanced in all four FFS groups, in terms of capability, motivation and opportunity (COM-B model), especially in Phalombe and Zomba groups. There is variation between members – those with more resources, which tend to be male, find it easier to participate. It may also be the case that some women in male headed households have less control of resources and less opportunity to make use of their enhanced capability.
    - In the Blantyre FFS capacity, motivation and opportunity were enhanced for the majority of participants, but to a limited degree. Positive feedback was given on cropping practices and conservation agriculture, valuing of tree planting and natural restoration, nutrition knowledge and community banking, irrigated winter farming to earn income and livestock management).
    - The Neno FFS group has improved their capacity, but to quite a limited degree, due to the internal tensions and early end to implementing partner support. All learnt some new knowledge and skills (cropping, conservation agriculture, etc), growing early maturing *Kanyani* maize, crop diversification, improved diets and food preparation (half of farmers reported this), but only one or two farmers reported knowledge on improved stoves, livestock management, and seepage well management respectively.
    - The Phalombe FFS group experienced strong capacity strengthening. Men reported in March 2019 that "*their thinking capacity has also changed*". The chair explained "*The FFS has helped us to start thinking big. It has made me more quick and active*."
    - The Zomba FFS group experienced good capacity strengthening according to participants. New knowledge and skills gained focused upon new methods of making manure/fertilizers, crop diversification, conservation agriculture, saving skills, and the ability to teach others.

- In terms of the promoted technological practices and methods, capacity has been strengthened in all four FFS groups, especially on cropping, crop diversification, sustainable livelihoods and natural resources management, but to a more limited extent on water and livestock management. Livestock management capacity has been less widely strengthened, but it is highly valued and desired by farmers. Capacity strengthening has occurred to varying degrees in the four cases, being strongest overall in Phalombe and Zomba:
    - Blantyre FFS, capacity strengthening has occurred, although of a limited magnitude. Most have learnt new practices in conservation agriculture and crop diversification and have greater awareness of the value of tree planting and natural restoration. A majority also have learned about more balanced diets and how to prepare meals in a more nutritious manner. A small number of the individual cases report greater appreciation of the value of community banking. On natural resource conservation and biodiversity safeguarding, participants have a stronger understanding of the importance of tree planting and natural regeneration practices. Sustainable livelihoods capacity had improved slightly, with some farmers mentioning increased irrigated *dimba* farming and another reporting enhanced livestock management skills.
    - In Neno, farmers have gained new knowledge and skills on crop diversification and soil and water management, and to a lesser extent on conservation agriculture and livestock management (chickens were received, but they had mostly died). Women have gained more nutrition and diet knowledge and cooking skills. While farmers generally more awareness of the importance of NR conservation, participants encountered challenges in tending the trees they were given early on due to dry spells, with women lacking time for watering.
    - Phalombe FFS case study: Strong capacity strengthening has occurred in terms of the promoted technologies and practices. Skills and knowledge have been improved on agronomic cropping practices, on the importance of crop diversification and the potential of irrigated cropping. There has also been improved understanding of balanced diets and food preparation methods, as well as increased awareness and attention to tree planting at the homestead and conservation of seed biodiversity, although there was already quite high awareness of the latter two due to previous interventions in the community.
    - Zomba FFS case study: Strong capacity strengthening has been achieved, especially on crop diversification, growing of early maturing crops, conservation agriculture techniques, and water management practices, as well as receiving and managing small stock.

There is a clear gender dimension to the capacity strengthening process, although this is even more marked at the behaviour or practice change step of the theory of change (see next section).

Capacity to respond to the changing climate

The major climate risk across the sites over the first two years as reported by FFS members was prolonged dry periods during the main growing season, but this was followed by the 2018/19 season where there was excessively heavy rainfall and storms. The capacity to adapt to changing and uncertain rainfall patterns is a key aspect of strengthening farmers' climate resilience. There were clearly differences between and within the FFSs as to the extent members' capacity to respond to changing climate had been strengthened.

Crop diversification appeared to continue to be the most significant change in terms of FFS members' capacity to respond to prolonged dry periods and climate variability. Across the 4 FFSs/ districts, farmers reported that they have improved capacity to diversify their cropping systems and in many cases were doing so. Farmers are diversifying crops (e.g. groundnut, sweet potato, pigeon pea, sorghum, mustard) and crop varieties (e.g. early maturing maize). This is consistent with the study by Hockett and Richardson (2018) elsewhere in Malawi which reported that 74% of farmers' experiments were on new crops and new varieties, particularly maize and legumes. This finding from another project indicates that experimenting with new crops and varieties is very popular with farmers. The new germplasm may or may not displace existing germplasm. For example, Charles Janson (CS1 below) in Blantyre grew local maize (because it is resistant to storage pests), DKA33 hybrid maize (as an experiment) and SC403 (because it is early maturing) in the same year. The four case study farmers (CS1, CS2, CS3, CS4 below) provided details on the crop varieties that had planted in the previous 12 months and the source of the planting material. One of the farmers reported 9 crop varieties[28] , one reported 10 and two reported that they had grown 11 crop varieties. Out of the 45 sources mentioned, only 9 were farmers recycling their own seed, 3 came from family or friends, 23 were sourced from local markets and 9 were from agro-dealers. The majority of varieties grown appear to be released varieties and where local varieties were grown, farmers were not aware of any names for them.

Soil and water management practices (e.g. compost manure, Mbeya fertilizer) alongside short duration varieties can lessen the effects of dry conditions on maize, but in the 2017/18 season all the FFSs maize harvests were badly affected even where they practices were used. Maize is highly vulnerable to moisture stress and although some varieties and practices can improve its resilience, only irrigation would allow maize to perform well under the weather conditions of the 2017/18 season. Conversely, the 2018/19 season was characterised by very heavy rains and winds and some farmers reported having to remove box ridges to allow water to escape their fields. If suitably local historical weather data is available, a decision-making tool, such as PICSA[29], would enable farmers to make a more informed decision about the climate risks in the coming seasons.

Dimba cultivation and irrigation farming, where the wetland or water resources are available, has significantly strengthened farmers' capacity to respond to dry conditions. In three of the four sites, farmers reported that the membership of the FFS appears to have improved their capacity to manage their *dimba* cultivation and / or irrigation. This was particularly the case in Phalombe, where in some cases farmers reported they were doing this for the first time, while others were doing it more strategically, intensively and continuously. In 2018, the chairman (male) of the FFS explained that he intensified his winter cropping as an alternative when his main crop fails. He has increased his winter plot size growing e.g. sweet potato, vegetables, tomatoes. He planned to store the sweet potato for food as dry pellets. He was irrigating with pipes and because the treadle pump cannot suffice, so he uses a petrol pump. He emphasized that he wants to conserve the riverbank, so fields are not too close to the river. At the Blantyre FFS site, one male farmer explained how his *dimba* plots are being managed more intensively (mainly in terms of labour, rather than external inputs -except for seed) and continuously, but also sustainably in terms of a number of soil and water management practices. He is growing a diversity of crops such as tomato, mustard and sugar cane mainly for the market and maize mainly for food. In contrast water was not

[28] In fact we later observed a number of other crops such as cassava and cocoyam that he was growing around his house

[29] Participatory Integrated Climate Services for Agriculture (PICSA), developed by a team from the University of Reading, involves agriculture extension staff working with groups of farmers ahead of the agricultural season to firstly analyse historical climate information and use participatory tools to develop and choose crop, livestock and livelihood options best suited to individual farmers' circumstances. Then soon before and during the season extension staff and farmers consider the practical implications of seasonal and short-term forecasts on the plans which farmers have made.

available to the Neno FFS. However, even in communities where *dimba* cultivation and irrigation farming is currently an option, future sustainability needs to be considered (important link with PCC project).

Livelihood diversification is an important way of strengthening resilience and many farmers already use this as a coping mechanism. In response to unfavourable weather conditions many farmers in the FFSs still appeared to be dependent on coping mechanisms such as casual labouring, petty trading and even in one reported case charcoal making. For example, in Phalombe, one woman explained that her family had sold livestock to cushion the low crop yields by selling and used the money to buy food. Another woman reported that her husband turned to casual labouring (*ganyu*) in Mozambique to help the household with food. They had no support from anyone. Another woman relied on the cash transfer programme (*mtukula pakhomo*) – her mum receives K17,200 every two months. In general, membership of the FFS had not significantly expanded opportunities beyond agriculture, directly or indirectly, for their members.

Increased awareness of climate preparedness and having a positive outlook, was said by some farmers to be important: In Blantyre, one woman explained that she feels that her capacity has been strengthened, because she and others have been trained so that if they see that the season has been bad, they do not give up but should opt for irrigation farming and that they can even plant the same crops that failed in the rainfed field. She shared that before FFS, if the situation looked bad for most of them, they would just give up and '*accept the shock'*. She felt this could be part of the reason why many of them failed to continue with school, for their parents in the past would just tell them to quit. According to her, most families in the village depend on rainfed farming as a source of money and food so that when it fails it meant their life had ended. With the FFS, she said she had learnt other ways of getting money, which is irrigation farming and doing some business as backup. This way they can sustain their children's education.

Table 21: Summarizing Farmer Responses on their Capacity to Respond to the Changing Climate (Source of Evidence: Learning Plot Visits; Individual Farmer Case Studies; FGDs)

Nang'omba FFS, Blantyre	Tikondane FFS, Neno	Nthundu FFS, Phalombe	Kapako FFS, Zomba
Crop diversification: Farmers have learnt to diversify their crops e.g. planting sweet potato in March with later rains after they had seen maize crop had failed: i.e., in 2017/18 relied on groundnuts, sweet potatoes, pigeon peas and sorghum. In 2019, men reported: There is crop diversification among FFS members so as one crop fails, they are to rely on the other ones. As a response to the prolonged rainfall, we have planted sweet potatoes both in the learning plot and in our respective fields. Farmers are now growing crops that are adaptive to climatic conditions e.g. Maize varieties SC403 and DK8033 which are early maturing. 1 woman reported that sweet potato production has helped her to have money for buying maize when yields are low. Soil and water management: In 2019 1 woman explained "too much rains also causes problems in the fields, but she felt in the places she applied manure, the production was better but couldn't explain the reason". I woman commented "Also on pit planting, moisture is conserved during the dry spells hence crops continue to grow, they do not wilt". Using *dambo* land and irrigation: 1 woman planted mustard, rape and Chinese cabbage in the *dimba* as part of coping strategy after house destroyed by wind and dry spells. She has a loan from the VSL to buy fertilizer and produces more than before and sells some for income. 1 man said despite poor rains and Fall Army Worm, so maize destroyed, he has still harvested something. He has done more irrigation farming – planting earlier than usual in the season to work on cash crops (tomatoes, sugarcane) for sale. The FFS has contributed to his skills. In 2019 1 woman reported that they now have a well where they can use a treadle pump for irrigation. 1 man reported growing vegetables with very high raised beds so as to reduce the washing away of our	Maize – men reported maize in LP performed better than maize in their fields: LP had short duration *Kanyani* variety, box ridges, inorganic and organic manure and agroforestry trees. In farmers own fields harvests were very low, although some farmers attributed the harvest-obtained to new short duration variety *Kanyani* and practices such as pit farming, box ridges and using maximum coverage technique to conserved moisture. In other cases, farmers reported that they could not afford to buy maize hybrid seed and had limited labour to make pits or box ridges. Crop diversification – some farmers planted crops such as sweet potato, cow peas with the late rains to compensate for low maize harvest. Too early to judge contribution these crops would make to food security. In LP sorghum and millet had performed poorly whereas as groundnut and hyacinth bean seemed to perform relatively well. In 2019 I woman commented "As you can see I am now able to grow various crops with the idea that where one crop fails I should rely on the other crops" I man commented that crop rotation can give you more yield in a given area. I man commented that crop diversification knowledge has strengthened his ability to adapt. there are different varieties which fit different conditions e.g. Pindalur (OPV) maize variety is early maturing and can escape the dry spells. But some gaps. For example, with respect to varieties. He is still not sure which varieties can fit the weather conditions. He is still experimenting. Yield is his main indicator. Also, early maturity because he doesn't know when rains are going to stop. Soil and water management In 2019 one woman commented that she was doing mulching so as to conserve moisture during drought conditions. She is also doing pit planting and constructing a swale. Allhelp top conserve moisture	Dimba / irrigation farming: The capacity to engage in dimba farming was reported as a key response to dry conditions by 7 out of 9 farmers. Access through ownership or rental. Growing e.g. maize, tomatoes, sweet potato, mustard and other vegetables. In some cases, farmers were doing this for the first time, in other doing more strategically and intensively and FFS appears to have helped to improve their management. In 2019 Men identified, how to cope when 1 crop fails. Can think of others – to reduce risks/ Irrigated farming if rainfed farming fails. Can grow tomatoes, vegetables, maize, sweet potatoes, etc. Some were doing this before FFS but now intensified. Crop diversification: 5 farmers diversifying crops/ varieties to address drought e.g. mustard, sweet potato. cowpea, pigeon peas sunflower, tomatoes., sorghum and soya. 2019 Women identified Planting of drought tolerant crops like sorghum in their fields and Planting early maturing varieties like SC 403 Kanyani. 1 man explained the importance of growing different crops which have different water requirements e.g. soya, sunflower, sorghum. Sorghum needs less. Rice and soya need more moisture. Soil and water management: 3 farmers applied compost manure/ Mbeya fertilizer and applied with aim of retaining moisture, adding soil fertility. I n 2019 one man explained he is doing natural resource conservation i.e. he has planted vetiva grass around the dimba to control overland flow from entering the plot. The grass also blocks water from moving out of the field.	Maize: Learning plot crop did not survive in 2017-18 season due to dry spells. Individual farmers did harvest some maize, but less than the year before: it was a more challenging year in terms of the poor rains. 2019 women reported use of early maturing hybrid varieties Increased awareness of climate preparedness reported by several farmers. Crop diversification: several farmers reported increased knowledge of which crops to grow (e.g. early maturing varieties – sorghum, maize, cow peas) – valued as a strategy to enable farmers to harvest something when main maize crop fails. 2019 – men reported sweet potato. Women reported Planting of drought tolerant crops like pigeon peas, cassava, sweet potatoes and sorghum. 1 man reported the FFS has increased his capacity in cow peas farming. Basically, cowpeas can be grown at three times; Firstly, with the first rains then midway during the growing season and finally at the end of the growing season. He has therefore learnt that one can realize good yield if the cow peas are grown at the end of the growing season. Winter, irrigated cropping supported by FFS. Continuing challenges of Fall Army Worm. [Individual farmer cases] 2019. Men reported that plans are underway for dimba cultivtion. 1 man reported his capacity to cope or adapt to weather conditions has been strengthened. For example, dimba

crops. As for this year, these beds are very useful and important in the case of the rains this year. Tree planting: 1 respondent commented that tree planting protects their house from heavy winds. Village savings: The VSL provides a source of funds which can contribute to strengthening adaptive capacity. One farmer commented that the VSL provide loans for agriculture emergencies such as pest attack. Another explained she used VSL funds to buy fertilizer to increase vegetable production in her *dimba* plot and these were sold to buy food. Livelihood Diversification: One woman explained that she focuses on '*Seeing farming as a business – brings money and then invest…there is a link. Despite climate change'*. She has a new grocery, although it is not clear that this is the result of the FAO project. Livestock: Some FFS members have received goats (and pigs?) through a pass on programme. This is seen as a source manure and income. 1 male farmer with many goats sold goats to buy inputs.	thereby enabling her to realize enough yields during drought conditions. I man commented that that pit farming had helped him to realize enough yield when conditions are bad I man commented "The main things is planting with ridges when there is too much rains and pits/ basins when there is not enough rain." Livestock - chickens provided do not appear to have strengthened farmers 'climate resilience; demand a lot of resources and many chickens perished.	In 2019 one woman reported Yes e.g. This year the area was flooded due to heavy rains. In the learning plot, they had increased ridge spacing in areas prone to logging conditions to prevent this from happening. She did in the plot visited and this helped as the garden never experienced water logging conditions and crop yield expected was more promising. Maize: 1 woman mentioned the FFS had enabled crop yield despite drought 4 bags of maize in 2018 despite the drought and felt that previously this could not happen. Livelihood Diversification: In 2019 one woman explained Can grow vegetables and sell at the market to have money for other food. In 2019 one man explained "*The lessons have built his and family's capacity on how they cope with or adapt to weather conditions. Specifically, they are more alert as farmers that weather conditions may change which makes him and the family to prepare for both situations in their farming activities: they plant different varieties and use different farming techniques ideal for both drought and good rains situations*" One woman explained "*The changes have strengthened their capacity as a household as the husband feels, as students, they are always alert to weather conditions and have to make sure that they are limiting risks every season, by having two or a number of technologies being applied: for example, they did a mulching on one side and left the other open but the whole area was under Sasakawa. He said this helps in them benefiting*."	cultivation has proved to be the best alternative during drought. More able to grow early yielding crops which survive in the drought. Covering the crop with mulch and box ridges help to conserve moisture. Understanding of the potential for irrigation farming and opportunity for irrigated farming using new seepage well [Women's FGD]. Plant earlier with first rains, plant a lot of trees, monitor the weather to decide when to plant, can identify drought tolerant crops [Men's FGD]. Soil and water management In 2019 men reported "In the LP we learnt about box ridges (to conserve water). With the continuous rains we removed the box ridges so the water can run away". 1 man reported "Yes, especially the mulching method as it helps in controlling of soil erosion, conserves moisture in the soil and also adding nutrients as the mulches decompose in the field". 1 woman explained that "for the areas which are very dry, she said to have tried to do the mulching and pit planting this season but unfortunately, the place was attacked by army worms" 1 woman explained that she felt the changes that have happened this season have not really strengthened her capacity to cope to weather as she doesn't usually apply all the techniques arguing that she lacks some tools to do it: 1 woman explained She has applied the knowledge from the sister in her field in the season 2018-2019, but it was affected

			with water rigging that washed away their fertilizer. The extension worker is now more accessible. They teach us about weather predictions. This allows us to plan which inputs to buy and use.

Case Study 1: Charles Janson, Nan'gomba FFS

Charles said that previously he was not doing the type of farming he is doing now, and he has plans for the future. We met him in his *dambo* plots and so he showed us the changes there. It is not clear to what extent his management of upland plots has changed, although he mentioned groundnuts.

The overall change appears to be that these *dimba* plots are being managed more intensively (mainly in terms of labour, rather than external inputs -except for seed) and continuously, but also sustainably in terms of a number of soil and water management practices. He is growing a diversity of crops such as tomato, mustard and sugar cane mainly for the market and maize mainly for food.

Table 22: Case Study 1: Charles Janson's Adaptive Capacity Changes

Tomato in rotation with maize in ***dambo***: "*I transplanted tomato seedlings and planted in beds (the previous crop had been maize). Weeds have been incorporated into the beds. This is a type of conservation farming and the main aim is to conserve moisture. These weeds will also improve soil fertility once they have rotted. When I plant maize here, I know there will be a good crop stand and even the yields are higher whenever I grow maize. With what I am doing here I am also preparing land for the next growing season. I am really thankful to the FFS because it has made me to be a good farmer in terms of preparation for life. Previously there was no farming like this. I am self-reliant in terms of thinking capacity and the like. This type of farming is profitable not only to me, but my entire household members. At the moment I do not have much concern in terms of crop farming. I also do livestock farming with pigs and through the pigs I get manure which I use in my fields. I also have goats. All these livestock help me to realize bumper yields because of the manure I get from the livestock. I am also going to mulch the tomatoes to conserve moisture as well. I am now stable in terms of farming. I don't have challenges because of the village FFS".*	
Vegetables in ***dambo***: "*I also decided to start growing vegetables (mustard). I started constructing beds. As you can see, I started with my nursery. I planted seeds in the nursery and then I transplanted on to beds. The youths from my household helped me in this plot. It is a reliable source of income in my household. I've just started as you can see, but after the rainy season I am going to have a larger proportion of area where I am going to grow crops. I have a lot of plans courtesy of the knowledge I acquired from the FFS. I'm going to fulfil all the plans I have, there is no point in turning back'.*	
Vegetables with raised beds – "*There are other raised beds which you can see which are higher than ones I showed you previously. Mainly we make these beds in the rainy season so as to reduce the washing away of our crops. As for this year, these beds are very useful and important in the case of the rains this year.* "	
Maize in ***dambo*** – *"I usually plant one seed / planting station. This is done mainly in order to get good cobs/ big cobs in terms of production. This is knowledge we have had from the FFS. The ridges are 75 cm apart. As you can see, I have big cobs here. If you follow modern farming techniques, you realize maize of this calibre which have good/ big cobs. At times when we don't have enough rains we also do mulching and when you do this you realize good yields as well. If you properly follow this type of farming you realize enough benefit. You are self- reliant in terms of food production even if conditions are not OK you realize at least enough for food. This is the type of farming I will continue doing for some time to come. Above all what you are seeing here is being through a member of the village FFS where you get knowledge; you are taught how to do things. As you can see here, we follow right procedures. Frankly my life has changed. I rely on mulching; I rely on one plant per planting station. Above all I plan very much on planting hybrid variety. Hybrid varieties are better; local varieties make one to realize low yields and it has a lot of drawbacks. Whenever you visit us it motivates us. Thank you very much."*	

Plot	Size of plot (acres)	Ownership (owned, rented, etc)	Which crops did you plant?	Which varieties of crops grown?	What was the source of the seed?	Why did you choose these crops or varieties?	What did you do or intend to do with the harvest from these plots?
Upland							
1	1	Own	P.pea	Mtawajuni	Local market	High yielding	Home consumption Probability of selling this year
			Cassava	Improved variety	Recycled	Early maturing	Home consumption
			Maize	Local	Recycled	Storage pest resistant	Home consumption
2	0.25	Own	Maize	DKA33	Agrodealer in local market	Experimental trial	Harvest in progress. Home consumption
3	1	Own	P.pea	Mtawajuni	Vendor in local market	High yielding	Home consumption and may sell, depending on yield.
			Maize	SC403	Agrodealer in local market	High yielding Early maturity	Home consumption
			Cassava	Improved variety	Recycled	Large roots	Home consumption
4	0.5	Own	Groundnut	CG7 Chalimbana	Vendor in local market	To compare the 2 varieties	Home consumption and may sell, depending on yield
Dambo							
1	50*4 m	Own	Maize	SC403	Agrodealer in local market	Early maturity	Home consumption Green and mature maize
2	0.25	Own	Tomato	Tengeru	Agrodealer in local market	High yielding Firm skin	Selling
3	0.1	Own	Mustard	Local	Fellow farmer (free)	Good market	Home consumption Selling
4	100*70m	Own	Sugar cane	Sobilika Phombe	Cousin	Good market	Selling Home consumption

Case Study 2: Ganizeni Lisoni, Nthundu FFS Chair

Ganizeni Lisoni showed us his *dimba* plot. Last year he planted tomato. This year after learning from the FFS that he thought he should be clever as he has put maize in this field. To protect the maize from FAW he applied soil. He used a 'modern farming method' learnt from the FFS of spacing 75 cm between the ridges and 25 cm between the stations. The maize has now been harvested and he has planted another crop. This is what he has learnt from the FFS – to plant early, harvest early and then plant another crop. In this case he says: '*I'm replacing with maize again. The maize is planted between the ridges in the furrows to make use of the moisture as the they enter the dry season'*. Because he is a member of the FFS, he is multiplying sweet potato, and this is to diversify his crops because of the changing climate. The sweet potato is grown at the border of the plot and used for food while working in the field and at home. He is rotating maize and tomato because of the changing climate and to help improve the soils. The residue from the tomatoes helps to improve soil fertility. He also reports that they are encouraging each other in the FFS to grow different crops and that is why he is participating. He has a nursery for tomato seedlings. The *Tanya* variety is early maturing and the seed he used had a 97% germination rate. The mustard plot provides relish and a crop to sell. From what we learnt about food groups in the FFS this one has helped. The *dimba* farming is helping him to send one of children to secondary school and two to primary school. The main challenge in this *dimba* has been flooding from the river adjacent to the plot.

Plot	Size of plot (acres)	Ownership (owned, rented, etc)	Which crops did you plant?	Which varieties of crops grown?	What was the source of the seed?	Why did you choose these crops or varieties?	What did you do or intend to do with the harvest from these plots?
Upland							
1	0.5	Rent	Cow pea	Not known	Market	No variety preference	For relish
			Maize	SC 403	Vendor at market	Drought tolerant	For food
2	1.5	Own	Sorghum	Not known	Vendor at market	Grains are big	Sweet beer Nsima
3			Rice	Ejepo	Vendor at market	Early maturing	Food Rice porridge
			Soya	Not known	Vendor at market	High yield More money	To sell
3	1	Own	P.pea	NK (hybrid)	Vendor at market	Early maturing	Food, but will also sell if gets a lot
			Sunflower	Local	Vendor at market	Requires a lot of moisture to pant early (January)?	Food?
Dambo							
1	0.5	Own	Maize	SC403	Agro dealer at 4 ways	Early maturity	Food
			Mustard	NK	Vendor at market	People like it in this area.	Food Selling
			Tomato	Tanya	Agro-dealer	Early maturity*	Selling
			S. potato	Ganba (hybrid)	Bought from friend	Early maturing	Selling Food

Photo: Ganizeni Lisoni shows his dimba plot

Case Study 3: Dison Mangeni, Kapako FFS, Zomba

Dison had farmed 5 plots of land in the previous 12 months, 3 upland and two *dimba*. He showed us his various fields which indicated both a diversity of crops and varieties, but also the diversity of agro-ecological niches that he uses. He also showed his home "learning plot" where he has trying out a number of crops/ varieties on a small scale.

Table 23: Case Study Two: Dison Mangeni's Farm System

Plot	Size of plot (acres)	Ownership (owned, rented, etc)	Which crops did you plant?	Which varieties of crops grown?	What was the source of the seed?	Why did you choose these crops or varieties?	What did you do or intend to do with the harvest from these plots?
Upland							
1	1.5	Own	Gnuts	Chalimbana	Recycled	Locally available	Sale, food
				CG7	Bought locally	High yielding	Sale, food
2	1.5	Rent	S.potato	Babache, Karoti, Kaunjika	Bought locally	Locally available	Food and sale
3	2.5	Own	Maize	SC403	Bought-Lilongwe	High yielding	Food
				Local	Recycled	Locally available	Food
			Gnuts	CG7	Bought locally	High yielding	Food and sale
				Chalimbana	Recycled	Locally available	Food and sale
Dimba							
4	0.25	Rent	Maize	SC403	Bought-Lilongwe	High yielding	Food
			S.potato	Babache,	Recycled	Locally available	Sale, food
			Leafy veg.Mustard	Not reported	Bought local market	Good crop stand Large leaves	Sale
5	0.25	Rent	Rice	Not known	Recycled	Locally found Good aroma	Food and sale

Table 24: Dison Mangeni's Adaptive Capacity Changes

Changes	
Planting 3 or 4 varieties of sweet potato on a large scale. Will select the best variety for future planting.	
'In that school we have learnt that it is important to have a balanced diet'. "*This is a learning plot for my household*. " Around his house he has small plots of rice, cocoyam, cassava (planting material) and trees that he has planted	
Groundnuts 25 cm ridge spacing and 15 cm between stations	
Raised goat house	
Rice farming in rented dimba	
Has plans to move from a small solar panel to a large solar panel	

Added cement to the walls of his house.	

Case Study 4: Margaret Khalango, Kapako FFS

In the original visit Margaret was unwell and so we interviewed her daughter Ethel. By the second visit Margaret was well, but we continued to interview Ethel. On this third visit we interviewed both. Margaret explained that she was the member of the FFS. In the previous 12 months Margaret had farmed 3 fields, two in the upland and in in the dambo. She has banking or saving skills i.e. she is able to save money for future use. She has the desire for further knowledge and skills in farming. The aim is to make a difference in this community i.e. people should appreciate the difference between FFS members and non-members. She is among the people to benefit from the pass on livestock (goat) farming. The FFS received 40 goats from a certain NGO. The FFS distributed to 8 farmers. She explained she is more knowledgeable now in terms of farming techniques e.g. ridge spacing, seed selection, friendly and enemy insects and other animals, FAW control. Her farming system in terms of crops appears to have been quite diverse before the FFS. She felt that the FFS has strengthened her capacity because whenever there are good rains, she realizes good yields (due to reduced ridge spacing). But the knowledge and changes do not help when the rains are not good in that year.

Table 25: Case Study Three: Margaret Khalango's Farm System

Plot	Size of plot (acres)	Ownership (owned, rented, etc)	Which crops did you plant?	Which varieties of crops grown?	What was the source of the seed?	Why did you choose these crops or varieties?	What did you do or intend to do with the harvest from these plots?
Upland							
1	1	Own	Maize	Mapasa	Bought from agro dealers	High yield	Food
			Sorghum	Not known	Bought locally	Locally available	Food and sale
			Pigeon pea	Nazombe	Bought locally	Locally available	Food
			Okra	Not known	Recycled	Locally available	Food and sale
			Yams	"Hybrid" not known	Bought at market	To compare how good these are compared to sweet potatoes	Food Sale
			Kalongonda (Buffalo beans)	"Hybrid" not known	Bought at the market	Drought resistant	Food Sale
2	0.25	Own	Gnuts	Chalimbana	Bought	Drought resistant`	Food Sale
				CG7	Bought	Drought resistant`	Food Sale
.Dambo	0.5	Own	Maize	SC403	Bought agro-dealers	Drought resistant	Food
			Sugar cane	Subslika	Bought locally	High demand on market	Food and sale
				Hombe	Bought locally	High demand on market	Food and sale

Box 10: Upland field

"I reduced ridge spacing to 75 cm apart and I learnt to select viable seed to plant. I have learnt how to control FAW by sprinkling fish soup on to the crop. Ants are then coming. I've learnt there are some insects you call friends e.g. bees and ants. I've learnt a lot and if the rains were good you would have seen a good crop stand. But because of the excessive rain there is stunted growth. The place was waterlogged. It was like a dimba! We had to break the box ridges in order to let the water to flow out of the plot. In this plot I planted sorghum, I also planted pigeon peas, okra and maize. From the sorghum we make nsima and also togwa (sweet beer). The pigeon peas are a source of food as well as income. We sell the pigeon peas whenever we have high yields. The okra is also a source of food and income, when we have produced enough. Maize is our main crop and source of food. Buffalo beans is also a source of income, but mainly a source of food. We also have yams".

Buffalo bean

What are the barriers to capacity change?

Some of the barriers to capacity change were highlighted in the Focus Group Discussions. They included internal challenges, such as tensions and a lack of cohesion and participation within the group, but also external issues such as climate variability, pest outbreaks, lack of farming inputs.

Table 26: Barriers to Capacity Change Noted by Individual Farmers

Blantyre	Neno	Phalombe	Zomba
• Variable participation within the group: some absenteeism, although overall the group is cohesive. • Challenges in the past season given the poor rains. • Lack of farm equipment and fertilizer. • Time costs of participating	• Poor functioning of the FFS • Failure of one of the seepage wells constructed by FAO • Limited access to labour for constructing pit farming and collecting water to water tree seedlings • Limited cash to buy fertilizer. • Insufficient incentives and benefits of members and non-members is not clear enough.	• Lack of farming equipment and inputs	• Changing weather – too much rain destroys the crops and there are shortages of rain • Fall Army Worm

6.3 Behaviour Changes

What kinds of behaviour changes have been achieved (how, why and for whom?)

In this section we review the behaviour changes reported by farmers both in 2018 and by October 2019.

OVERALL (behaviour change)

Crop diversification (e.g. sorghum, mustard, velvet bean), growing early maturing maize hybrid varieties (e.g. *Kanyani*) and conservation agriculture practices are the most commonly cited practices changed by participating farmers across all four FFS groups. Growing a wider diversity of crops is a relatively easy change to make if planting material is accessible and affordable. Conservation agriculture practices, which involve changes in soil and water management practices are also widely reported across the four FFSs, but for certain practices (e.g. pit farming) labour appears to be a significant constraint, and especially for women farmers and female headed households. Some of the practices are not suited to heavy rains.

Most practice changes were observed or reported by Phalombe and Zomba FFS case study group participants:

- Blantyre FFS group gave positive feedback on early maturing maize, changes to ridge spacing, crop diversification and soil moisture conservation methods, although the latter can be labour intensive according to some women farmers.
- Neno FFS group highlighted crop diversification, early maturing maize varieties, tillage technologies and pit planting as key areas of practice changes.
- Phalombe FFS group especially reported on changes they have made with respect to crop diversification, ridge spacing, intensification of *dimba* cropping, mulching and Mbeya manure making.
- Zomba FFS case study group highlighted early maturing hybrid maize, mulching, ridge spacing and one seed per station etc.
- Across all groups, those facing the most significant challenges in terms of making practice changes were the poorer households and especially, women farmers and female-headed households. For example, in Zomba FFS case study group, one female participant explained how she had struggled to put new skills into practice, because she had to attend the hospital with her youngest child. Other such scenarios were reported by female participants in other districts, especially in the Neno District FFS case study group.

Irrigated farming / *dimba* cultivation is the single, biggest change to farmer systems. Changes in terms of intensification of irrigated farming (i.e. winter *dimba* cropping) were most widely made by participants in the Phalombe FFS group, but also in Zomba and to a much lesser extent in Blantyre. The most significant systemic

change to be found appears to be irrigation farming in Phalombe, with some farmers doing this for the first time, some expanding their irrigated farming and some adapting and intensifying what they have been doing. The group chairman was particularly clear that he is intensifying his winter cropping *as an alternative when his main crop fails*, and he has increased his winter plot size growing sweet potato, vegetables, tomato.

Simple 'yes/no' adoption was quite rarely observed: in practice, the process is more complex and nuanced. Almost all farmers are applying at least some elements of the knowledge they have acquired to their fields, but not in a simplistic adoption process. For example, in Blantyre, in 2018, one female farmer member explained she had planted *Kanyani* hybrid maize in basins with compost manure and DK8033 hybrid with mulching to assess what would happen and next year she is planning to try basins and mulching. Also, with groundnut in 2016/17 she compared flat planting with ridges and in 2017/18 continued with ridging, but also reduced spacing. In another example, one young woman from Kapoko FFS, Zomba showed us her sloping field where she had done mulching, box ridges, ridge spacing reduction and planting a diversity of crops (maize, sorghum, pigeon peas, velvet beans) as an experiment. However, it was difficult for her to assess the outcome, because the whole field had been planted this way and then compared to monocrop maize planted in a separate field.

Livestock: Overall, the livestock practice change were less extensive than the cropping-related practice changes, although for the individual farming households that had received goats the changes could be significant. It is not clear how the pass-on schemes operated and how fairly distributed the inputs have been. Similar to cropping, it is not always a straightforward 'adoption' decision.

Relatively little change was reported in the all four FFSs groups.

- Blantyre FFS case study group: Limited success appears to have been achieved for the FFS participants in terms of livestock. Only 1 farmer reported gaining more livestock as a result of FFS participation, although another reported improving their existing *kraal* for goats.
- The Neno FFS case study group farmers report limited success on livestock: each participant received 13 chickens, but survival rates were low (out of 5 farmers, 2 remained with 6 birds, 1 with 1 bird, 1 with none and 1 not known) and this appears to be linked to their requiring greater care (feed, vaccination) than the existing village chickens, as well as the need to solve financial problems through sale of chickens. One respondent said they had bought goats with the sale of groundnuts.
- In Phalombe FFS case study group, 3 farmers (2 female) explained that their overall livestock management had improved (e.g. when an animal is sick are better at identifying the symptoms, feeding, disease and parasite control, keeping kids in a warm place, tethering). 3 members have now increased their livestock production as a result of FFS membership.
- In Zomba FFS case study group, 2 of 9 respondents report making changes in their livestock production Only one reports increased numbers of stock. Another participant reported having to sell their goats and chickens to pay hospital bills.

The evaluative learning team could not measure changes in nutrition and health, but a majority of participants in Phalombe and Zomba FFS groups reported improvements in their diets as a result of FFS participation, although the extent of the changes is uncertain. Crop diversification, backyard farming and *dimba* cropping all help farming households to make dietary, food preparation and cooking practice changes. In Blantyre and Neno, some farmers report some changes, but face barriers in terms of affording certain ingredients. Some FFS members reported changes in practices relating to nutrition and health in terms of the way they prepare food and the diversity of their diet (e.g. Incorporating groundnut flour, eggs), but it was not possible to measure dietary changes directly. The clearest change was where members reported that they had established a backyard garden to improve their access to vegetables or had intensified their *dimba* cropping to produce vegetables or to earn income to buy additional ingredients, but improved yields and the growing of a wider range of crops were also noted as contributing factors. Food diaries could be an option to facilitate members to monitor their own changes and seasonal variations in the future.

Conservation of NR and biodiversity safeguarding practice changes are reported across all four FFS case study groups, although the extent or effectiveness of the practice changes are uncertain given the lack of environmental

monitoring data. Key activities reported include tree planting in fields and around homes, protection of trees in fields[30], and improved protection and natural restoration of village forests. Members appear highly motivated across the four FFSs in terms of preserving and establishing trees. In many cases members were already involved in associated tree management practices, but project resources have helped to strengthen these e.g. through provision of tree seeds or seedlings. The key challenge is to involve the broader community in this process, rather than working only through the FFS group as initially the NGO implementing partners had done. Women participants, in particular, reported challenges in watering tree seedlings during dry spells. As a project, more emphasis was placed upon this aspect in the final year of the project, but it is difficult to assess the impacts in the absence of more robust data. Gully reclamation was supported by the project; in the four FFS case studies hotspot deep gully reclamation was not reported, but we observed examples of small-scale, individual field level efforts, e.g. planting banana along a channel in Neno District.

Sustainable livelihoods: By October 2019, there were improvements in sustainable livelihoods across all four FFS, most especially in Phalombe and Zomba FFS cases, although not for all participants and the extent and sustainability of the practice changes are sometimes hard to ascertain. In some cases, improvements can be achieved, but they are also somewhat fragile, given the number of shocks faced by households in these districts (in the last four seasons of this study, there were two significant dry spells, and one season affected by very heavy rains).

- In Blantyre, a majority indicated some level of improvement in their livelihoods (e.g. *dimba* cropping intensification to earn more money, improving fertilizer application in the *dimba* to raise yields, obtaining loans from the VSL, although it is not clear whether the funds covered basic needs rather than forming productive investments.
- In Neno FFS case study, all 6 respondents (although the group had declined) report some level of improvement in their sustainable livelihoods, but the extent appears relatively limited for the majority. VSL loans were used for trading (e.g. buying and selling of tomatoes and potatoes), others reported higher maize yields, one said better *dimba* cultivation, and two have improved their livestock numbers and income.
- In Phalombe FFS case study, irrigation changes (more intensified *dimba* cropping) has been a key area of practice change for a majority of participants, including some quite transformative changes. For example, one woman says she can now rent land for irrigated farming on her own, buy fertilizers and has learned to be independent. Intensified livestock production was seen as an alternative to migrating to Mozambique to find piecework. Improved access to finance via the VSL has also been important for many participants.
- In Zomba FFS case study, a majority of respondents reported improvements in their sustainable livelihoods (e.g. new sweet potato business, improving maize yields, a handful have received goats and can now sell the manure or animals if necessary, loans from the VSL to buy household goods, intensification of *dimba* farming to sell the vegetables as a business), but there were also a handful who had not managed to achieve improvements.

Gender issues are important in terms of practice changes, because women and female headed households appeared to have fewer resources to make practice changes. While there are positive examples amongst many of the women participants, there are also more cases where women or female headed households reporting that they faced barriers – e.g. illness of children or insufficient resources, which prevented them from making or sustaining practice changes. It also appears that more men in the FFS have received goats compared to women participants. The individual cases where more far-reaching, combinations of changes have been implemented tend to be by male farmers, although not exclusively so. It is also a matter of the geographical location of the FFS group – the Phalombe group are located near to the Phalombe river and have more opportunities for *dimba* cultivation.

[30] Gully reclamation was also a key part of project activities.

In the future, the project is encouraging and training the FFS groups to operate as businesses, i.e. using their learning plots to multiply certain seed varieties or to produce crops for sale. This is an innovative sustainability strategy, but it is not clear how far the groups can a) manage their FFS groups collaboratively and effectively as businesses, which require new skills, especially once the project ends, b) how far the learning aspect of a learning plot, in terms of problem-solving in core cropping activities will be enhanced or could be undermined.

BLANTYRE (Behaviour Change)

Cropping

In 2018, a wide range of practices were mentioned by the case farmers.

- Changing ridge spacing: 7 farmers, including 1 who was currently testing in their field, reported they were implementing this practice. This was the most commonly reported changes in behaviour.
- Conserving soil moisture: Farmers have made changes in farming practices to conserve soil moisture: pit farming (6 including 2 who were currently testing in their field), mulching (4 farmers) and compost manure (3 farmers). Only one farmer mentioned that he was using both box ridges and terraces.
- One seed per station: Planting one seed per station was reported by 4 farmers.
- Crop diversification: This was specifically mentioned by 4 farmers (including sweet potato, vegetables, early maturing maize hybrids and beans). In the case of the beans, one farmer explained that he had to drought.

Overall, we found in 2018 that all the case study farmers (7) are applying at least some elements of the knowledge they have acquired to their fields. The extent to which this is being done and whether a farmer is still testing a practice or if s/he has decided to incorporate the change into their system was not clear.

Box 11: Example of farmer responses to FFS options

One woman explained she had planted *Kanyani* hybrid maize in basins with compost manure and DK8033 hybrid with mulching to assess what would happen and next year she is planning to try basins and mulching. Also, with groundnut in 2016/17 she compared flat planting with ridges and in 2017/18 continued with ridging, but also reduced spacing.

By March 2019, 6 case study farmers were interviewed.

- Early maturing, improved maize variety: Overall, there was positive feedback that the change in practices was helping to improve their maize yields. One farmer highlighted the change from local varieties to improved maize, which can help produce yields, even when the rains are low.
- Changing ridge spacing: 4 of the 6 farmers specifically mentioned that they are continuing with ridge spacing. The other 2 did not mention, but this does not mean they are not practising ridge spacing.
- Conserving soil moisture: Two farmers said that they construct pits for pit planting, but one of them, a female farmer, noted that these activities are labour intensive, mulching: 1 said that they use manure in their *dimba* cropping.
- Crop diversification: The importance of diversifying the crops they grow, or at least intensifying the extent to which they are intercropping, with more emphasis on a diversity of crops.

Box 12: Example of one farmer's experience experimenting with cropping practices changes

In the two plots near the house, he planted one with maize, sorghum and pigeon peas. He compared 3 seeds per station and 1 seed per station. In the first field, the yield was much better. In both he had reduced the ridge spacing (75cm). He explained as following: '*Previously I grew sorghum and pigeon peas, but not to the same extent. I now understand the importance of intercropping now. I reduced the ridge spacing to 75cm and applied fertilizer. Then I weeded so that the weeds don't use up the fertilizer. After 21 days I applied more fertilizer. After this...the maize cobs were big and the stalks - they did well. I have learnt the importance of reducing the*

ridge spacing, and in this field, I planted 1 seed per station. I see that it is important to follow what I learnt through the FFS, because I am harvesting more than before. This is the other field – I applied fertilizer and planted 3 seeds per station. I then weeded and added the second fertilizer. The stalks were small compared to the other plot. I therefore should use 1 seed per station'.

Livestock

In 2018 There was relatively little change reported with respect to livestock. 4 farmers reported that they were now generally managing their livestock better (no specific details) and 2 of these had built kraals for their goats. One woman explained that engagement with the FFS has stimulated her interest in managing livestock more intensively. By March 2019, just one of the 6 farmers interviewed, mentioned that they have acquired more livestock as a result of the FFS. One woman said that she had learnt about how to build a raised *kraal*, but she lacked the resources to build it. However, she built one on the ground near the house, which is more ventilated, and she can access manure from it. A male member of the FFS aid that he has changed the way he keeps livestock, especially goats, and he has built a kraal to improve the health of the animals and to collect the manure. Two other male members reported that they have improved livestock management skills.

Health/Nutrition

In 2018, the main change reported by case farmers with respect to nutrition was that they had diversified the crops they were growing (4 farmers) including sweet potato and vegetables to diversify their diet. Two people mentioned that they were incorporating eggs more into their diet. Two people mentioned food processing such as using groundnut flour in their meals for improved nutrition. By October 2019, 9 out of 9 respondents reported that their diet had changed for the better. At least four members reported that they now know about the importance of a balanced diet and/or there being six food groups. Three members explained that they were producing more food (e.g. pigeon pea, groundnut, sweet potato) and/or incorporating more diverse crops such as beans. Two respondents explained that increased income (one through farming and one running a small grocery business) allowed them to buy food. Two members referred to food processing or preparation – in one case adding groundnut powder to leafy vegetables and in the other making a juice from sweet potatoes. In the case of the sweet potato juice, this was reported by the wife of the FFS member who had learnt it from her husband.

Conservation Safeguarding & Biodiversity

In 2018, at least 7 of the 9 farmers reported that they were doing something in relation to conservation. In most cases this was related to tree planting and management (e.g. working in community nursery, woodlots, trees around homes, trees in fields/agroforestry). One woman reported that she had planted trees around her home, but there had been low survival due to drought and termites. In March 2019 – the data in the table below is wrong. It is summarizing conservation agriculture practices, not tree planting, natural regeneration, forest management, indigenous varieties etc. In October 2019, 9 out of 9 respondents reported some positive changes with regard to conservation and safeguarding activities. There have been previous initiatives in the village which this project appears to have built upon. Some members talked of a heightened awareness of the usefulness of trees and their role in climate change adaptation. At least three respondents reported that they had planted trees, with the FFS playing a role in providing tree seedlings. A number of members have been active in protecting or conserving trees. One member explained that he is involved in managing the village forest – weeding, making fire breaks, pruning, but the whole village does this once a year and this predates the FFS. One man explained that in the past he was concerned with farming only, but now looking at negative environmental impacts. For example, where there are gullies forming, he can make channels so the water can run away; he has a small plot where he plants trees and also, he makes sure that indigenous trees in the fields grow.

Sustainable livelihoods

There were few changes reported in relation to diversifying livelihoods. Five cases reported that they had made use of the FFS VSL. However, as one participant explained, the share-holding is relatively small for the FFS VSL (K500 per week) compared to other VSLs in the community (K1000 per week) and this participant explained that

the FFS VSL was mainly for training purposes on saving and lending and group dynamics. One woman had used VSL money to buy fertilizer for her *dimba* vegetables and another reported that she had used these funds to start a small business. It is not always clear which of the VSL funds were being used. In October 2019, 8 out of 9 respondents reported that they had made changes in their livelihoods since joining the FFS. At least four members referred to making greater use of *dimba* cultivation and the resulting income. As one man explained, the change is that he is in the *dimba* almost every month of the year and this is a source of money. In the past the *dimba* would have been free in certain months especially as they approached the rainy season. One woman explained that she had acquired new knowledge of fertilizer application in *dimba* cultivation. She is now measuring it out and the benefit is that the fertilizer goes further.Two members referred to the goats they had received from the FFS which provided and a source of income. Two respondents explained that the VSL had helped. In one case this helped a woman.

NENO (behaviour change)

Cropping

Overall, in 2018, the FAO representative interviewed reported that farmers were generally positive to be in a group and for the extension services to reach them via this group. Previously they lacked extension advice, but via the FFS they had learned about crop diversification and they have seen that *'diversification is working for them, the weather here is not very conducive for agriculture, but with diversification they are able to get something out of their fields. The major reason is that there is frequency in the extension services – they have been visited regularly and whenever something goes wrong as a group, they have been able to come up with solutions on their own and that's good. It shows they have the power to discuss'.*

Crop diversification was the most commonly reported change in behaviour (4 farmers – 3 female). Crops include cow pea, pigeon pea, cassava and sweet potato. Conservation Agriculture was only reported by 1 farmer and she has not been able to manage the associated weeds. Contour ridges were reported by 2 farmers (1 male and 1 female). Pit farming has been done by 2 farmers (1male, 1 female), but 2 farmers explained they were not doing this because it is too labour intensive. 3 farmers reported growing early maturing hybrid maize. AESA was being used by 2 farmers (1 male and 1 female) in their own fields, one of whom reported that he was able to catch and burn most of the pests found on his fields. One farmer reported that he had stopped most of the old farming practices.

All the case study farmers (7) are applying at least some elements of the knowledge provided to them by EAM to their fields. The extent of use is not clear, but at least one farmer explained that he used a quota of his land to apply some of the knowledge learned from the school. One man mentioned experimenting by planting sweet potatoes on ridge to see how they performed.

Livestock

The men's FG reported that all farmers had received 13 chickens from EAM. However, only 5 farmers reported that they had received chickens (this is presumably because 2 farmers left the group before the chickens were provided). The chickens require greater care than the existing village chickens in terms of the feed (no longer free range) and need for vaccination. Of the 5 farmers reporting that they had received chickens, 2 remained with 6 birds, 1 with bird, 1 with none and 1 not known.

Nutrition

Four farmers reported that the nutrition training had resulted in changes in the way they prepare their food. For example, combining banana and egg; adding groundnut flour, oil and eggs.

Conservation Safeguarding & Biodiversity

Four farmers reported that they had planted tree seedlings. However, the seedlings were distributed at the peak of the drought and so survival rates have been low in some cases. Examples were given of clearing/ fire breaks around forest as well weeding. One woman reported that bushfires have been less of a problem because the chief instructed if found in the act that a fine would be charge of 10,000 *Kwacha*.

Sustainable livelihoods

No major changes in livelihood strategies were reported. Farming, casual labouring and petty trading remain the main activities. One woman reported she still relies on farming and charcoal production.

In March 2019, in the context of cropping, famers in the focus groups emphasised the application of crop diversification including use of drought tolerant and early maturing varieties (to beat the drought or short cropping season) such as sweet potatoes and pigeon peas. Likewise, the individual farmers highlighted use crop diversification and further use of a variety of tillage technologies and livestock to reduce risk from shocks. For example, one female farmer reported that she had adapted the pit-planting technique but learnt that with the heavy rains (received in 2019), the pits, are not feasible. Another also indicated that she had learnt about livestock management, received the livestock from FFS and was able to apply the skills learnt. Another major change for one individual is the use of ridges and pits to manage rainfall variability. Agroforestry is also emphasised. Similar findings were captured for the October 2019 interviews.

Conservation Safeguarding & Biodiversity

6 out of 6 respondents reported that they had made changes in terms of their conservation or safeguarding activities. The changes included either planting (e.g. Moringa, Msangu) taking better care of trees on farm (at least 5 respondents) and planting trees around their houses (at least one respondent). Managing the village forest was reported by at least one respondent.

Nutrition

In October 2019, 6 out of 6 respondents reported that their household diet had changed for the better. Respondents linked the change to the FFS as follows: improved knowledge such as the importance of a balanced diet, food preparation (e.g. mix soya, fish, maize flour for child's porridge); home gardens and *dimba* cultivation and in one case addition of eggs and meat in the diet as a result of livestock received via the FFS.

Sustainable livelihoods

6 out of 6 respondents reported that they had made changes to their livelihood activities since joining the FFS. Two respondents reported change with respect to livestock, in one case selling to solve financial problems and in the other buying goats with income from the sale of groundnuts. Two referred to accessing the VSL, in one case this provided capital for small sales of tomatoes and potatoes. Three (possibly four) respondents reported that their yields had increased increasing their food security and/ or income. One man reported that he was now doing *dimba* cultivation to improve diet in his household through the provision of vegetables. One man reported that his desire for piecework has decreased because he is very busy with farm activities. He says this a good development because one realizes a lot of money from farming as compared to piece work.

PHALOMBE (behaviour change)

Cropping

Dimba cultivation or irrigation farming was clearly the biggest change to these farmers' systems (6 farmers) involving some farmers doing for the first time, some expanding and some adapting and intensifying. Two farmers were using diesel powered pumps. Making and applying compost fertilizer / mbeya fertilizer making was also an important change (6 farmers) with farmers appreciating the moisture conservation as well as the soil fertility enhancement. Crop diversification (4 farmers) included new crops such as mustard and new varieties, for example one woman explained that she used to plant lots of sorghum but now has an early yielding variety she plants a smaller area. One-one planting/ *Sakakawa* method of planting (particularly for maize) was reported by six farmers. Ridge size and spacing reduction (*kubweza mizere*) was reported by 4 farmers. Contour ridging by one farmer. One farmer talked about the application of pesticides and the skills learnt and being able to apply them for preservation of e.g. maize, sunflower and soya beans. In 2017/18 he had managed to harvest 2-5 bags of maize which could not happen in earlier drought years, but the farmer has limited resources: Chemicals are expensive for farmers and hence they experience a lot of postharvest loss because it takes a lot of time to get enough money to purchase chemicals.

All 9 case study farmers are applying at least some elements of the knowledge they have acquired to their fields. The extent to which this is being done and whether a farmer is still testing a practice or if s/he has decided to incorporate the change into their system needs further exploration. One woman explained that she is experimenting and can carry out tests on her own garden using two plots to compare performance. Two farmers explained these changes in a more systemic way. The chairman in particular was clear that he is intensifying his winter cropping as an alternative when his main crop fails, and he has increased his winter plot size growing sweet potato, vegetables, tomatoes.

Livestock

Four farmers referred to change relating to livestock. Three farmers (2 female) explained that their livestock management had improved. For example, when livestock is sick, using signs, able to seek advice from extension worker, feeding, disease and parasite control, keeping kids in a warm place, tethering by the neck, rather than the leg. One farmer had bought many chickens and 4 goats (male) and explained was specifically manage his livestock for manure (Mbeya fertilizer) production (male).

Health/Nutrition

Five farmers referred to changes relating to nutrition, but they tended to be general in nature: e.g. making food decisions to meet nutritional requirements (Female) and diversifying meals (Male). Two specific changes were having a backyard/kitchen garden (Female) and growing sweet potato to store for food as dry pellets (Male). In October 2019, seven out of seven respondents reported that their diet had changed for the better. This was attributed to improved knowledge gained and a wider range of crops grown due to the FFS.

Conservation Safeguarding & Biodiversity

Planting trees was reported by at least 8 out of the 9 case farmers. This included trees which were planted in gardens / farms, along the river, on garden boundary. Planting trees, especially when the village head man calls for tree planting days. In many cases farmers were already planting trees, but the FFS made more (fruit) trees available and one woman explained she had found on her own, *e.g. Mpoza, Acacias, Masau (fruit), M'bowa (*timber*)* and *Moringa*. Two farmers had prepared tree nurseries. Challenges of young trees just planted being more likely to be affected by pests e.g. termites were noted. Bushfire problems as well. Four farmers were involved in tree management e.g. managing fire breaks, volunteering to oversee/patrol in order that that people do not cut tree carelessly and woodlot management. In October 2019 seven out of seven respondents reported changes in conservation and safeguarding activities. At least five respondents reported that they had planted trees. Challenges include: the bushfires. '*Even when kids play – can set fires!'* one woman explained; Charcoal making; People leave their goats wild and they destroy the trees; Erratic rainfall pattern, dryness, very high temperatures associated with drought; Some community members who deliberately destroy seedlings; Fires from mice hunters.

Sustainable livelihoods

The main changes relating to livelihoods have already been mentioned above and appear to be a mixture of achieved and planned. Irrigation was mentioned by 6 farmers. One woman mentioned she is now able to rent land for irrigation farming on her own, buy inputs for fertilizer and has learnt to be independent. Another woman was intensifying her irrigation activities and crop diversification, but she wants to improve further by finding an external profitable market. One man wants to buy a water pump and irrigate crops. Another woman explained that she wanted more livestock as a means of buying necessities at home e.g. soap and notebooks for her children. Intensified livestock production was a way to stop going to Mozambique for piecework for one family. In October 2019 six out of seven respondents reported that they had made changes in their livelihoods since joining the FFS. This was attributed to changes in the crops grown, rearing of livestock, making greater use of dimba land and access to credit through the VSL scheme.

ZOMBA (behaviour change)

Cropping

In 2018, a limited range of crop diversification and conservation agriculture practices were mentioned by farmers:

Crop diversification: Several practices were mentioned by the case farmers. Crop diversification (including velvet beans, sorghum, mustard, as well as early maturing maize hybrid varieties) was the most commonly reported changes in behaviour (6 farmers) and growing of early maturing varieties was associated with this (3 farmers). It was not always clear whether this change could be directly attributed to the FFS. Several practices associated with land preparation and planting were reported: reduced ridge spacing (3 farmers), *Sasakawa*/one-one planting (3 farmers), zero tillage (2 farmers). Practices which can help to conserve moisture included mulching (2 farmers), compost manure (1 farmer).

Conservation agriculture and soil and water management: At least 6 of the 9 case study farmers are applying at least some elements of the knowledge they have acquired to their fields. Two further farmers indicated that they had done so, but they provided no details and for one farmer it was not clear whether what he was doing was a change in behaviour. The extent to which this is being done and whether a farmer is still testing a practice or if s/he has decided to incorporate the change into their system needs further exploration. One young woman showed us her sloping field where she had done mulching, box ridges, ridge spacing reduction and planting a diversity of crops (maize, sorghum, pigeon peas, velvet beans) as an experiment. However, it was difficult to assess the outcome because the whole field had been planted this way and then compared to monocrop maize planted in another field elsewhere.

In 2019, 7 out of 9 case study farmers reported a similar range of practice changes as noted for 2018. Mulching, use of hybrid varieties and crop diversification, ridge spacing and one seed per station. One individual had made significant changes (e.g. planting rice and *cocoyams*, cassava and trees around his house, constructing a house for goats, and planting sweet potato on a large scale. One of the women farmers noted how she had struggled to continue the new skills learnt, because she had to attend the hospital with her youngest child.

Livestock

There was very little change reported with respect to livestock associated with the FFS in 2018. The clearest change was reported by 2 women. One of whom reported that he now had a much greater appreciation of the value of livestock e.g. as a source of manure and another who had acquired 5 goats and had started applying compost manure in her field (transporting it there on her head). One man reported that he plans to intensify his livestock farming. By March 2019, only two of the case study farmers out of nine respondents reported a change with respect to their practices in livestock keeping. One mentioned that their number of livestock has decreased as they have sold their goats and chickens to pay hospital bills for their children. The other said he is now *'serious with livestock management, and he has been given goats to breed and pass on to other FFS members.'*

Nutrition

In 2018, limited change was reported with respect to nutrition associated with the FFS: 3 farmers reported they valued the knowledge, but only one had acted on it and planted a kitchen garden. In October 2019, 6 out of 8 respondents reported that their diet had changed for the better. This was attributed to improved knowledge gained and a wider range of crops grown due to the FFS.

In October 2019, six of the 9 respondents reported an improved diet after joining the FFS. One woman reported that she could improve her diet, due to improved agricultural practices leading to higher yields. Similarly, another woman said that things have improved because of higher yields and crop diversification, especially *dimba* cropping. Another said that he had sold goats to have enough money for household use. One respondent said that they better balance the diet, by trying to include fruits, and also including vegetables with the *nsima*. One farmer said that they include fish and vegetables in the same meal and has pawpaw trees at home. She adds fruits to the meal. She learnt how to cook bananas mixed with eggs. She also said that cocoyam has been promoted and she had not grown this before. However, two respondents said they have not been able to have a balanced diet due to the droughts experienced.

Conservation Safeguarding & Biodiversity

At least 7 of the 9 farmers in 2018 reported that they were doing something in relation to conservation.

- At least 6 of the reported cases this included planting trees around their homes, but there were variable rates of survival.
- Two women reported that they had each planted 10 trees, in one case only 2 had survived and in another, none had survived due primarily to the dry conditions.
- At least two respondents were involved in tree planting and management on the surrounding hillsides. At least two were involved in trying to advocate or act as a role model to others to not cut down trees.

By 2019, 7 out of 9 respondents reported that they had made changes in terms of their conservation or safeguarding activities. 6 out of 8 reported planting trees around their houses. At least 2 out of 8 reported conserving indigenous trees in their fields. Managing the village forest was reported by at least 2 out of 9 respondents. At least 2 out of 8 respondents reported agricultural practices such as planting vetiver grass and conservation agriculture.

Sustainable livelihoods

There were few changes in 2018 in relation to diversifying livelihoods.

- Four cases reported that they had made use of the FFS VSL.
- One woman explained that after they started the VSL she thought it was wise that she starts a business with the loans she gets to not just misuse so she sells bananas and fritters. For the future, plans to have a grocery at her home.
- Another young woman used credit from the VSL to trade in groundnuts, but it appears groundnut trading did not work out too well this year.
- Another woman used money from the VSL to trade in fish and beans, but she calculated that *dimba* farming gave her more money.
- Two farmers (1 female, 1 male) reported that they had taken up irrigation farming.
- One woman reported that she is putting more emphasis on farming and less on casual labouring (*Ganyu)* as a source of income.

By March 2019, 8 out of 8 respondents reported that they had made changes to their livelihood activities since joining the FFS. Two respondents referred to being able to engage in small scale business. Three respondents reported change with respect to owning and benefiting from livestock. Two referred to accessing the VSL. One woman reported that she was now doing *dimba* cultivation to increase food security in the household, which was a livelihood change.

By October 2019, 7 of the 9 respondents interviewed said that their livelihoods had improved. One reported having a new sweet potato business. Another said that all the new practices were building up their yields. Another reported receiving 6 goats, which they returned and now have five themselves. The family sell the manure from their new goats and having the capacity to sell one if they need to. Another farmer reported livestock farming as a source of income, with a higher number of goats now and a pair of pigeons. Two farmers noted that they had borrowed money from the FFS VSL to buy things for the household. Another has intensified their *dimba* cultivation to sell the vegetables as a business. One female headed household respondent said that they could not meet all their household needs due to a lack of money.

Table 23: Comparative assessment of behaviour change as reported by the FFS farmers due to FFS participation

FFS Group/ Dimension	FFS Blantyre	Scale	FFS Neno	Scale	FFS Phalombe	Scale	Kapako FFS, Zomba	Scale
Assessment of Behaviour Change								
Cropping (agronomy and crop diversification)	2018: Wide range of practices reported. Changing ridge spacing (7 farmers), most common reported change. Soil moisture conservation practices: pit farming (6 including 2 testing in their field), mulching (4 farmers) and compost manure (3 farmers). Only one farmer mentioned that he was using both box ridges and terraces. Planting one-one seed was reported by 4 farmers. Crop diversification was specifically mentioned by 4 farmers (including sweet potato, vegetables, early maturing maize hybrids and beans). All farmers (7) are applying at least some elements of the knowledge they have acquired to their fields. 2019: Early maturing maize Positive feedback from all that yields improved from early maturing maize variety, even when rains are low. Changes to ridge spacing (4 of 6 farmers). Conserving soil moisture: (2 pit planting, but 1 said labour intensive; many are mulching, 1 using manure in *dimba*). Crop diversification: Importance of this, and emphasis on intercropping and diversity of crops understood by all.		2018: Crop diversification: most common change (4 farmers – 3 female) e.g. cowpeas, pigeon pea, cassava, sweet potato. Contour ridges were reported by 2 farmers (1 male and 1 female). 3 farmers growing early maturing hybrid maize. 2 farmers doing AESA monitoring in their own fields, helping to control pests. All case study farmers (7) are applying at least some elements of the knowledge to their fields. 2019: Crop diversification including use of drought tolerant and early maturing varieties (to beat the drought or short cropping season) e.g. sweet potatoes and pigeon peas. Individual farmers highlighted crop diversification and further use of a variety of tillage technologies and livestock. Pit planting – 1 farmer said she had used but then heavy rains meant she had to break them again. Another farmer using ridges and pits to manage rainfall variability.		2018: Irrigation farming: the biggest change to these farmers' systems (6 farmers) involving some for the first time, some expanding and some adapting and intensifying. 2 farmers were using diesel powered pumps. Applying compost fertilizer / mbeya fertilizer is an important change with farmers (6) appreciating moisture conservation as well as soil fertility enhancement. Crop diversification (4 farmers) included new crops (e.g. mustard) and new varieties. One-one planting/ *Sasakawa* method of planting (particularly for maize) (6 farmers). Ridge size and spacing reduction (*kubweza mizere*) (4 farmers). 2019: Crop diversification (3 members mention making changes (e.g. sweet potatoes, vegetables, sorghum), tomatoes. 4 of 8 farmers doing ridge spacing, intensified *dimba* farming, 2 noted mulching and Mbeya manure/fertilizer production.		2018: Crop diversification (e.g. velvet beans, sorghum, mustard, as well as early maturing maize hybrid varieties) most commonly reported change (6 farmers) and associated with this early maturing varieties (3 farmers). Not always clear if change directly attributed to the FFS. Land preparation and planting were reported: reduced ridge spacing (3 farmers), Sasakawa/one-one planting (3 farmers), zero tillage (2 farmers). Other moisture conserving practices included mulching (2 farmers), compost manure (1 farmer). At least 6 of 9 farmers are applying elements of knowledge acquired to their fields. 2019: 7 out of 9 case study farmers reported a similar range of practice changes as noted for 2018. Mulching, use of hybrid varieties and crop diversification, ridge spacing and one seed per station. 1 individual had made significant changes (e.g. planting rice and *cocoyams*, cassava and trees around his house, constructing a house for goats, and planting sweet potato on a large scale. 1 female farmer noted how she had struggled to continue the new skills learnt, because she had to attend the hospital with her youngest child.	

Livestock	2018: Relatively little change. 4 farmers reported they were generally managing their livestock better (no specific details) and 2 of these had built kraals for their goats. 1 woman motivated to manage livestock more intensively. 2019: Only 1of 6 farmers have more livestock due to FFS participation. Others had gained more skills, but lack of resources (e.g. to build a *kraal* properly). One member who already had livestock has built a kraal to improve his animals' health and to collect the manure. Two other male members reported that they have improved livestock management skills.		2018: 5 farmers each received 13 chickens (2 remained with 6 birds, 1 with 1 bird, 1 with none and 1 not known). Require greater care than the existing village chickens (feed, vaccination). 2019: Only 2 respondents reported livestock changes (selling chickens to solve financial problems and in the other buying goats with income from the sale of groundnuts		2018: 4 farmers referred to change relating to livestock. 3 farmers (2 female) explained that their livestock management had improved. E.g. when livestock is sick, using symptoms, able to seek advice from extension worker, feeding, disease and parasite control, keeping kids in a warm place, tethering by the neck, rather than the leg. One farmer had bought many chickens and 4 goats (male) and explained was specifically managing his livestock for manure (Mbeya fertilizer) production. 2019: 3 now do livestock production out of 7 interviewed.		2018: Very little change associated with FFS. Clearest change reported by 2 women. One had a much greater appreciation of value of livestock e.g. as a source of manure and 1 had acquired 5 goats and started applying compost manure in her field (transporting it on her head). One man reported that he plans to intensify his livestock farming. 2019: Only 2 out of 9 respondents reported a change. 1 said that their number of livestock has decreased as they have sold their goats and chickens to pay hospital bills for their children. The other said he is now serious with livestock management having received goats through the FFS pass on scheme.	
Nutrition and Health	2018: Main change diversifying crops (4 farmers) e.g. sweet potato and vegetables to diversify diet. 2 people incorporating more eggs into their diet 2 people food processing e.g. groundnut flour for improved nutrition. 2019: 9 out of 9 respondents reported that their diet had improved, although we could not evaluate the magnitude of the improvement. 4 have better knowledge of balanced diet and 3 produce more food / 2 have more income, as a result of FFS so can make diet changes. 2 farmers noted improved food processing or preparation.		2018: 4 farmers reported training resulted in change in way they prepare food. 2019: 6 out of 6 respondents reported that their household diet had changed for the better resulting from FFS: improved knowledge such as the importance of a balanced diet, food preparation (e.g. mix soya, fish, maize flour for child's porridge); home gardens and *dimba* cultivation and in 1 case addition of eggs and meat in the diet as a result of livestock received via the FFS.		2018: 5 farmers referred to changes relating to nutrition, but they tended to be general in nature. 2 specific changes were having a backyard/kitchen garden (Female) and growing sweet potato to store for food as dry pellets (Male). 2019: In October 2019, 7 out of 7 respondents reported that their diet had changed for the better. This was attributed to improved knowledge gained and a wider range of crops grown due to the FFS.		2018: Very little change reported associated with the FFS. 3 farmers reported they valued the knowledge, but only one had acted on it and planted a kitchen garden. 2019: 6 of the 9 respondents reported an improved diet after joining the FFS. 1 woman said she could improve her diet, due to improved agricultural practices leading to higher yields. Another woman said that things have improved because of higher yields and crop diversification, especially *dimba* cropping. Another said that he had sold goats to have enough money for household use. One respondent said that they better balance the diet, by trying to include fruits, and also including vegetables with the *nsima*. 1	

							farmer said that they include fish and vegetables in the same meal and have pawpaw trees at home. She adds fruits to the meal. She learnt how to cook bananas mixed with eggs. She also said that cocoyam has been promoted and she had not grown this before. However, 2 respondents said they have not been able to have a balanced diet due to the droughts experienced.	
Conservation of NR and biodiversity safeguarding	2018: At least 7 farmers reported conservation action. Mostly tree planting and management (e.g. working in community nursery, woodlots, trees around homes, trees in fields/agroforestry. 2019: 9 out of 9 respondents reported some positive changes with regard to conservation and safeguarding activities, building on previous initiatives, but the changes are limited in extent. Stronger awareness of tree planting/natural regeneration to adapt to climate change. 3 have planted trees when given seedlings by FFS. Many FFS members helped in protecting or conserving trees, although this predates FFS. 1 man has strongly changed his perception of need to avoid negative environmental impacts.		2018:4 farmers planted tree seedlings. However, seedlings distributed at peak of drought and so survival rates low in some cases. Examples of clearing/ fire breaks around forest as well weeding. 1 woman reported that bushfires have been less of a problem because the chief instructed if found in the act that a fine would be charge of 10,000 Kwacha. 2019: 6 out of 6 respondents reported that they had made changes in terms of their conservation or safeguarding activities. The changes included either planting (e.g. Moringa, Msangu) taking better care of trees on farm (at least 5 respondents) and planting trees around their houses (at least one respondent). Managing the village forest was reported by at least 1 respondent.		2018: Planting trees was reported by at least 8 farmers, including trees planted at house, gardens/ farm, along river.In many cases farmers were already planting trees, but the FFS made more (fruit) trees available and one woman explained she had found on her own, e.g. Mpoza, Acacias, Masau (fruit), M'bowa (timber) and Moringa. 4 farmers were involved in tree management e.g. fire breaks, patrolling, nursery, woodlot management. 2019: In October 2019 7 out of 7 farmers reported changes. At least 5 reported that they had planted trees. Various challenges though (bushfires, charcoal making).		2018: At least 7 of 9 farmers reported that they were doing something in relation to conservation. At least 6 planting trees around their homes, but variable rates of survival. E.g. 2 women each planted 10 trees, in one case only 2 had survived and in another none, due primarily to the dry conditions. At least 2 were tree planting and management on the surrounding hillsides. At least 2 were involved in trying to advocate or act as a role model to others to not cut down trees. 2019: 7 out of 9 made changes. 6 out of 8 reported planting trees around their houses. At least 2 out of 8 reported conserving indigenous trees in their fields. Managing the village forest was reported by at least 2 out of 9 respondents. At least 2 out of 8 respondents reported agricultural practices such as planting vetiver grass and conservation agriculture.	
Sustainable livelihoods	2018: Few changes reported. 5 had made use of VSL. However, the		2018: No major changes reported. Farming, casual labouring and		2018: Main changes relating to livelihoods have already been		2018: Few changes reported.	

	shareholding is small FFS VSL (K500 per week) compared to other VSLs in the community (K1000 per week). 1 woman had used VSL to buy fertilizer for her *dimba* vegetables and 1 used funds to start a small business. It is not always clear which of the VSL funds were being used. 2019: 8 out of 9 made livelihood changes since joining the FFS. At least 4 have intensified their use of *dimba* cultivation and the resulting income (more production, manure making and improved fertilizer application). 2 members report goats from FFS giving source of income. 1 reports VSL has given loan helping with household needs.		petty trading remain the main activities. One woman reported she still relies on farming and charcoal production. 2019: 6 out of 6 respondents changed their livelihood activities since joining the FFS: 2 respondents reported livestock changes (selling chickens to solve financial problems and in the other buying goats with income from the sale of groundnuts). 2 referred to accessing the VSL, in one case this provided capital for small sales of tomatoes and potatoes. 3 say their yields have increased increasing their food security and/ or income. 1 man now doing *dimba* cultivation to improve diet via vegetables. 1 man reported that his desire for piecework has decreased because he is very busy with farm activities. He says this a good development because one realizes a lot of money from farming as compared to piece work.		mentioned above and appear to be a mixture of achieved and planned. Irrigation was mentioned by 6 farmers. 1 woman can now rent land for irrigation farming on her own, buy inputs for fertilizer and feels independent. Another woman was intensifying her irrigation activities and crop diversification, but she wants to improve further by finding an external profitable market. 1 man wants to buy a water pump and irrigate crops. 2019: 6 out of 7 respondents have made changes in their livelihoods since joining the FFS. This was attributed to changes in the crops grown, rearing of livestock, making greater use of *dimba* land and access to credit through the VSL scheme.		4 used VSL: selling bananas and fritters; trade in groundnuts; trade in fish and beans (all women). 2 farmers (1 female, 1 male) taken up irrigation farming. 1 woman is putting more emphasis on farming and less on casual labouring (*Ganyu*) as a source of income. 2019: 7 of the 9 said that their livelihoods had improved. 1 has a new sweet potato business. 1 said all the new practices were building up their yields. 1 got 6 goats, which they returned and now have 5 themselves. The family sell the manure from their new goats and having the capacity to sell one if they need to. Another said livestock farming is a source of income now, with a higher number of goats now and a pair of pigeons. 2 farmers borrowed money from the FFS VSL to buy things for the household. 1 has intensified their *dimba* cultivation to sell the vegetables as a business. 1 female headed household respondent could not meet all their household needs due to a lack of money.	

Dimension	Evaluative scale
No behaviour change, according to technological practices	
Little behaviour change, according to technological practices	
Some behaviour change, according to technological practices	
A lot of behaviour change, according to technological practices	

Barriers to behaviour change? (Internal and External)

Many different barriers to behaviour change were identified, often including lack of access to inputs, finance, labour, access to markets, climatic stresses, pests, the effect of others cutting trees and setting bushfires, access to information, irrigation equipment etc.

BLANTYRE (barriers to behaviour change)

Farmers in the Blantyre FFS case study reported the following factors:

- Availability, timeliness and cost of inputs like fertilizer and chemicals.
- Access to capital to fund/apply some FFS activities that require some investments.
- Access to labour e.g. weed management.
- Climate: Low survival of trees planted due to dry spell; One farmer's house was destroyed in a storm; Harvest of maize and groundnuts much lower due to dry weather; Availability of water is a challenge; Unreliable sales due to inter-annual climate variability.
- Other people's livelihoods based on natural resources: For example, charcoal makers are cutting down and even uprooting the trees roots for charcoal making, which is discouraging; Mice hunters set fire to woodlots and start bush fires.
- Pre- and post-harvest pests: Termite attacks on planted trees; Pigeon peas attacked by pests in storage despite ash application; Crops pests do not respond to chemicals leading to low crop yield and low income after selling produce.
- Access to a reliable and profitable market when supply from irrigated produce is high e.g. in a drought year when many households turn to winter irrigated vegetable farming to earn money for food purchasing
- Short v long term benefits: Some FFS members become discouraged by non-participants because of a failure to see immediate benefits from the FFS, while they are looking for longer-term benefits.
- Opportunities for wider learning: Want to learn e.g. through exchange visits what other FFSs are doing for enhanced learning.

PHALOMBE (barriers to behaviour change)

Individual farmer cases in the Phalombe FFS group reported the following challenges:

- Climate: The weather pattern is a huge challenge to agricultural productivity; Erratic rainfall patterns; High temperature in prolonged drought destroys seedlings; Bad weather every year; Maize technologies are not working during periods of bad weather, especially use of conventional fertilizer.
- Other people's influence on trees/ natural resources for their livelihoods: Mice hunters burn forests; Sometimes people leave their goats wild and they destroy the trees; Fellow community member can even deliberately destroy seedlings.
- Access to Irrigation equipment: Access to farm implements (treadle pump and water pump) is a challenge – renting or buying is constrained by financial challenge; Irrigation pipes for long distances. Currently they rent pipes and pumps. Pay K4,000 for 4 litres of fuel.
- Access to information: limited knowledge on weather forecasts/information for the coming growing season, e.g. how rains will be distributed in a season to guide decision making in selection on tillage system and crop and variety to grow in a season.
- Access to on-going learning: Exchange visits to continue learning and get more hands-on experience; More visits from extension workers.
- Access to specific training: they were promised that they would be trained how to make energy saving stoves to conserve the environment – this training is yet to be done; Training in business.
- Pests: Young trees are destroyed by termites and *nkhuwawe* (pests); Some pests which are resistant to pesticides.
- Access to markets: Unreliable markets and low market prices.
- Access to finance: lack of financial resources.

- Water resources: There are about 300 households in the village. Currently about 100 households are irrigating. If all 300 households started irrigating then would need to be more wells, and deeper wells. Wells have filled up due to siltation from flooding.

NENO (barriers to behaviour change)

Farmers reported limitations in their access to finance to buy inputs, labour availability and secure access to water in the dry seasons as reasons for not being able to use the knowledge that they had acquired. Wider scale change would need to consider change in the agricultural innovation system to support farmers to be able to analyse and solve problems in both the shorter and longer term, rather than measuring success by short term adoption of technologies. High dependence on a preference for a maize-based diet will continue to make farmers vulnerable to climate risks.

ZOMBA (barriers to behaviour change)

Farmers said that there had been poor progress on natural resources management and the importance of engaging with the entire community, rather than just the FFS members, according to the NGO implementing partner. Farmers reported the following challenges in the individual case studies.

- Lack of labour.
- Lack of capital.
- Climate: Rainfall is a challenge; One farmer explained that '*the dry spells do not develop a farmer rather kills their potential to harvest more*'; Another stated '*Climate change is the main challenge as sometimes their crops fail but since their strength is courage, they always grow over their challenges'*.
- Other people's dependence on trees/ NR for their livelihoods: Sometimes members get discouraged by people insulting them. Some people set fire to tree seedlings. Charcoal makers are often violent and not easy to control; People cut down or set fire to trees (e.g. mice hunters) and people do not care for their goats which end up destroying the trees
- Lack of livestock extension services: One member felt there is a good amount of knowledge on farming activities but expressed concern about a lack of extension services on livestock.
- Need to engage to understand and be motivated: One member explained that the important change for her was that her husband, the original FFS member moved to Lilongwe to work, this created the opportunity for her to become an FFS member and then she started to understand what her husband had been telling her.
- Access to inputs: FFS members need access to inputs, so they can apply lessons e.g. Seeds for vegetables, fertilizer and other inputs
- Access to equipment: Irrigation equipment (e.g. pumps, batteries for solar pumps)
- Access to water: One woman explained that currently, she does not practice irrigated farming and she 'would love to have access to water for irrigation.
- Ability to take risks: One woman explained that deciding on the right variety of crops to try out is difficult because when they try something and make losses then it means they have lost food for the household.
- Pest and diseases: trees have been attacked by some diseases.

6.4 Benefits and Impacts

What kinds of benefits, costs and impacts have been achieved? For whom? How and Why?

The FAO concept note anticipates that the FFS will help participating farmers to accumulate and diversify household assets and livelihoods. In year 2, farmers will be gaining productivity increases leading to higher incomes and in year 3, such gains will accelerate as the combined interventions take effect and as scaling processes occur.

By May 2018, the evidence generated in this evaluative learning study of FFS cases, suggested that few farmers had accumulated and diversified their household assets and livelihoods – which was to be expected given the anticipated timeframe of the project (year 3 is when there is accelerated accumulation). There were instances where individual or a small number of increases in assets and livelihood strategies have been reported – mainly in the Blantyre and Phalombe cases. These were highly valued by participating farmers, but the changes appeared limited to a small number of people and/or limited in magnitude. Not all farmers had managed to gain productivity increases and resultant income growth (year 2), although a few reported that despite the poor rains in the 2017/18 season, they still managed to 'harvest something'. This was especially the case where *dimba* farming and crop diversification has been facilitated. The barriers noted at earlier steps, e.g. access to seeds, which are part of the enabling context and/or non-delivery by FAO / implementing partners, also means that for some farmers the plausibility of future positive impact is uncertain. It is also important to note that some farmers have dropped out of the FFS and this suggests that for at least some of these drop-outs, the approach has not led to positive changes, although one or two farmers who had dropped out did indicate that they had made technological changes in their farm system due to the FFS.

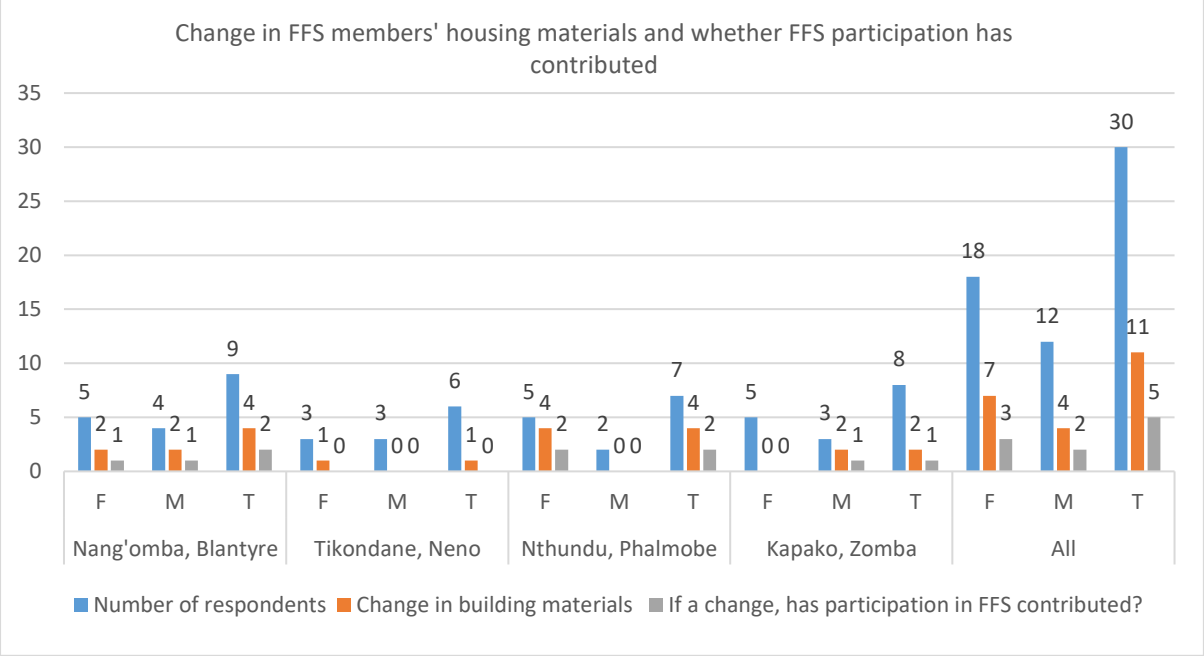
Change in members' livelihood assets by October 2019 In October 2019, FFS members were asked about the status of various livelihood assets and whether membership of the FFS has contributed to any changes.

- Increase in iron sheets, plastering and cement used in constructing members' houses: –

Eleven out of the 30 respondents had made changes in the building materials used in constructing their houses (Figure 4). Five (six if a member who had increased the size of his house is included) out of the 11 reported a link with membership of their FFS. In Nang'omba FFS (Blantyre), 3 respondents explicitly linked these changes to the FFS. One member used money from the VSL, and another explained that membership of the FFS has made him more dedicated to farming and this provided income to increase the size of his house. Two Nthundu FFS (Phalombe) respondents explicitly linked the change to knowledge and skills gained from their FFS. One Kapako FFS (Zomba) member had laid a cement floor and pointed the walls of the house with cement, which he attributed at least partly to income linked to the FFS.

The weather had a pronounced impact on five of the 30 respondents' houses. For Nang'omba FFS (Blantyre), two members' houses had collapsed due to heavy rains. In one of these cases (a woman heading a household) her thatched house was destroyed, so she built a house with iron roofing sheets, but the walls were not protected, and a wall of her new house collapsed. She requested cement to protect her house from the weather. In the case of Tikondane FFS (Neno), 2 members' houses were destroyed by heavy rains and wind in early 2019 (One shown in picture). In Nthundu FFS (Phalombe), one side of member's house fell down on due to heavy rains.

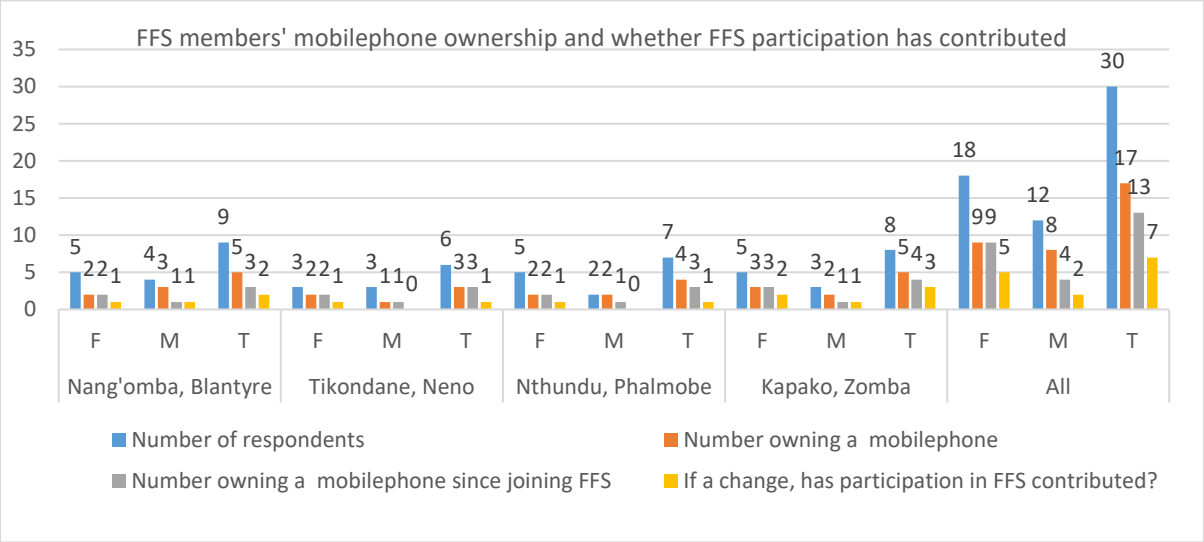
Figure 4: Change in FFS members' housing materials and whether FFS participation has contributed



Increase in mobile phone ownership Seventeen[31] out of 30 respondents had a mobile phone. **13 members had acquired their phones during the life of the FFS, of which seven reported that there was a link with FFS membership** (Figure 5). In Nang'omba FFS (Blantyre), two women explained they used income from the sale of agricultural produce which had been produced using skills acquired through the FFS. In Tikondane FFS (Neno) only one respondent (a woman) linked the purchase to the FFS – she had bought it with revenue from sale of sweet potatoes which she had acquired with help from the FFS. Similarly, for Nthundu FFS (Phalombe) only one member explicitly linked the purchase to the FFS, she bought her phone after VSL members had shared their savings. In Kapako FFS (Zomba), three respondents (two women) linked their purchase of a phone to FFS membership. One woman bought her phone using money borrowed from the VSL and one man had more produce to sell as a result of the knowledge and skills acquired through the FFS.

[31] One woman from the Kapako group also had a phone, but it had just been damaged and so was not included.

Figure 5: FFS members' mobile phone ownership and whether FFS participation has contributed



- **More diverse sources and on the ground means of acquiring agricultural knowledge.** Thirty out of 30 respondents reported that how they acquire knowledge about agriculture has changed. 25 out of 30 respondents attributed the change to membership of the FFS (Figure 6). One man from Blantyre explained "*In those days, the government extension worker could just pass by, but now (we) have access through NGOs. We are now custodians of information ourselves*". In Tikondane FFS (Neno), one man explained "*In the past, knowledge about agriculture could be accessed from government extension workers through the village head. The village could call for a meeting where extension workers could orient the people at such meetings. However, at the moment, there are additional sources of agriculture knowledge; extension workers from NGOs and also FFS members*". Another man commented that in the past, he had no access to knowledge about agriculture, however, currently he has access through FFS members. For Kapako FFS (Zomba), one man explained "*In the past knowledge was from radio which means they were doing things in ignorance. Now things are on the ground and he is gaining practical experience*". One woman explained that previously, she had access to knowledge about agriculture through extension workers only. However, currently she has access through a lot of people like extension workers, community facilitators and other group members, as well as NGO officers.

- **Increased access to advice on agriculture from extension workers and fellow FFS members.** Members were asked who they could seek advice from on agricultural matters. The two most common responses were extension workers (16 out of 30 respondents) and FFS members (15 respondents) (Figure 7). In Nang'omba FFS (Blantyre) at least 5 out of 9 respondents now regard the FFS as a source of advice on agriculture, while 7 of the respondents felt they could get advice from extension workers. For at least 5 of these respondents this was a change linked to joining the FFS. One woman explained that "*at first she was not able to ask and didn't know how to approach"* the extension worker. In Tikandane FFS (Neno) three (one woman) out of the 6 respondents now regard the FFS as a source of advice on agriculture, while one out of 6 reported the (government) extension worker as a source of advice. In Nthundu FFS (Phalombe) at least 4 out of 7 respondents regard the FFS as a source of advice on agriculture, while five respondents felt they could get advice from extension workers. For at least two of these this was a change; prior to joining the FFS they felt that they had no access to extension services. One member explained that joining the FFS gave him the motivation to listen to the radio for more agricultural information. In Kapako FFS (Zomba) at least 6 (4 women) out of 8 respondents regard the FFS as a source of advice on agriculture. 4 (two women) out of 8

reported the (government) extension worker as a source of advice and one man explained that joining the FFS had enlightened him on how to access extension services.

- **Members still primarily dependent on family labour for help with agricultural activities**

In almost all cases, there was no change in how members' access physical help to do their agricultural activities. For Nan'gomba FFS members, in all but 2 cases, family is the only source of labour. Two members had hired labour, but this was not linked in any way to the FFS. In the case of Tikondane FFS, 6 out of 6 respondents reported that they still relied on family labour only. Similarly, in Nthundu FFS all respondents reported that there was no change; in all cases they still relied on family labour only. Most Kapako FFS respondents reported that they still relied on family labour only. Two men reported that they did hire labour, although it was not clear whether this was a change associated with the FFS.

Figure 6: Change in how FFS members acquire knowledge about agriculture and whether FFS participation has contributed

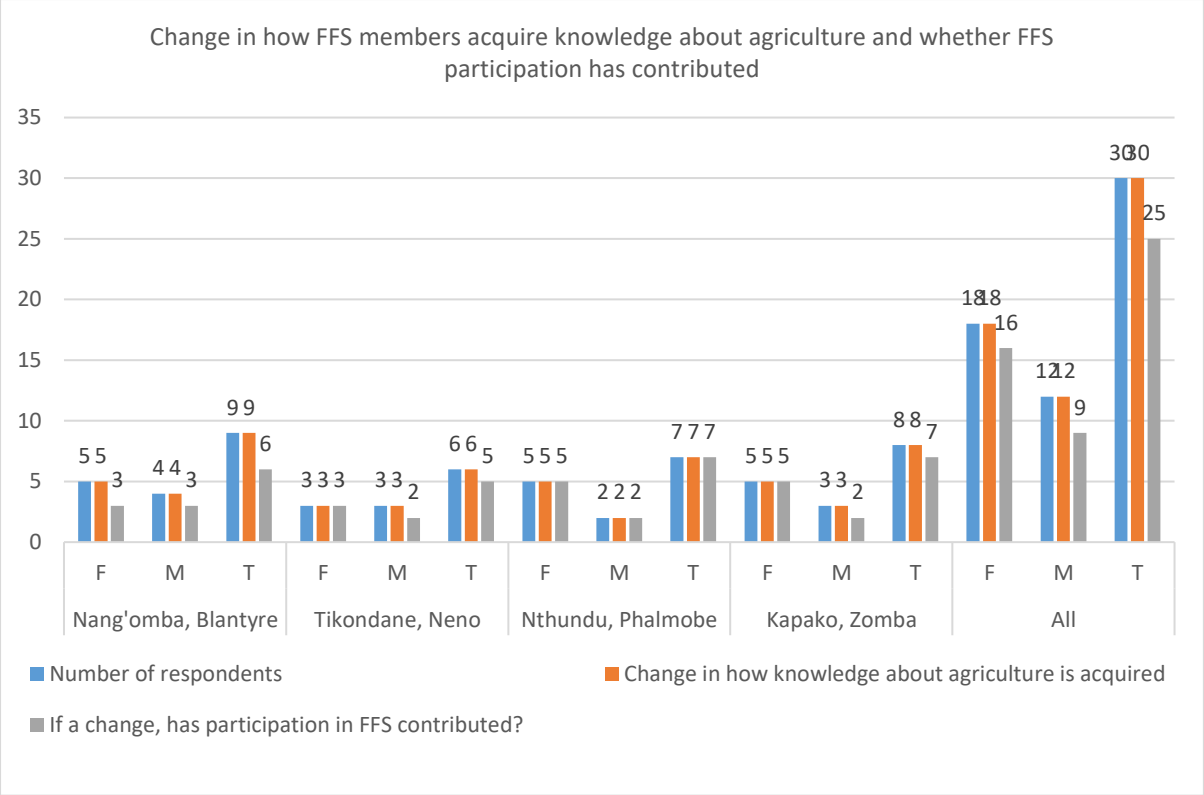
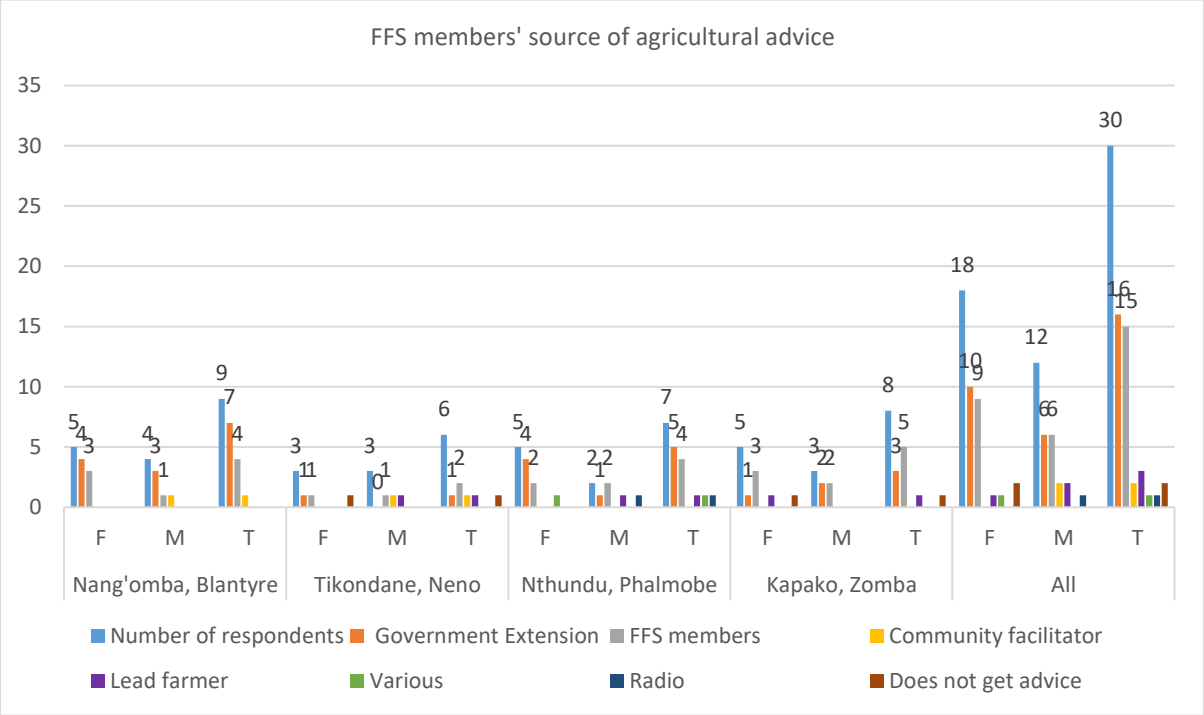


Figure 7: FFS members' source of agricultural advice



➢ **Some improvement in access to and ability to manage water resources for farming**

Access to water resources for farming varies with location. Eight out of 30 respondents reported that there was a change in their access or ability to use water which could be attributed to FFS membership (Figure 9).

In Blantyre 9 out of 9 respondents reported that they have access to water for farming in the dry season. This was either from a well dug themselves (4), a seepage well (2) or a river (3). 2 out of 9 respondents referred to a seepage well which had been constructed. The construction of the seepage well was attributed to Mr Lazaro, the TLC extension worker by one woman and FAO by one man. The man explained that FAO had explained that was a certain organization that wanted to donate a well, looking at the challenges faced by farmer who want to access water for irrigation. The community members were responsible for digging the well and providing sand. FAO brought cement, bricks and other materials. Furthermore, a solar pump and drum tank were provided for *dimba* irrigation.

In Neno, 5 out of 6 respondents reported that they have access to water for farming in the dry season. Sources of water included: wells dug by the farmers themselves (1), seepage well (2) and boreholes (2). One member linked the construction of the seepage well to the presence of the FFS. Another respondent explained that most people in that community do not have access to *dambo* to do *dimba* cultivation.

In Phalombe 6 out of 7 respondents reported access to water for farming in the dry season. This was either from the Phalombe river or a borehole. 3 out of 7 respondents reported a change in access to water for farming and this could be attributed to membership of the FFS. Two women use water from the Phalombe river; one explained that she used the FFS treadle pump and another that she had learnt about irrigation farming through the FFS. One man rented a diesel pump for irrigation and explained that membership of the FFS has motivated him to do this.

In Zomba 7 out of 8 respondents reported access to water for farming in the dry season. Sources of water included: wells dug by farmers themselves (2 respondents), streams (1), dams constructed by government (2), a seepage well, constructed by the FAO (2). 2 out of 7 respondents reported a change in their access to water for farming that could be attributed to membership of the FFS. One man linked the knowledge he had

gained from the FFS to irrigation in *dimba* plots and one woman linked the FFS to the seepage well, constructed by FAO.

Figure 8: FFS members' source of water for agricultural use

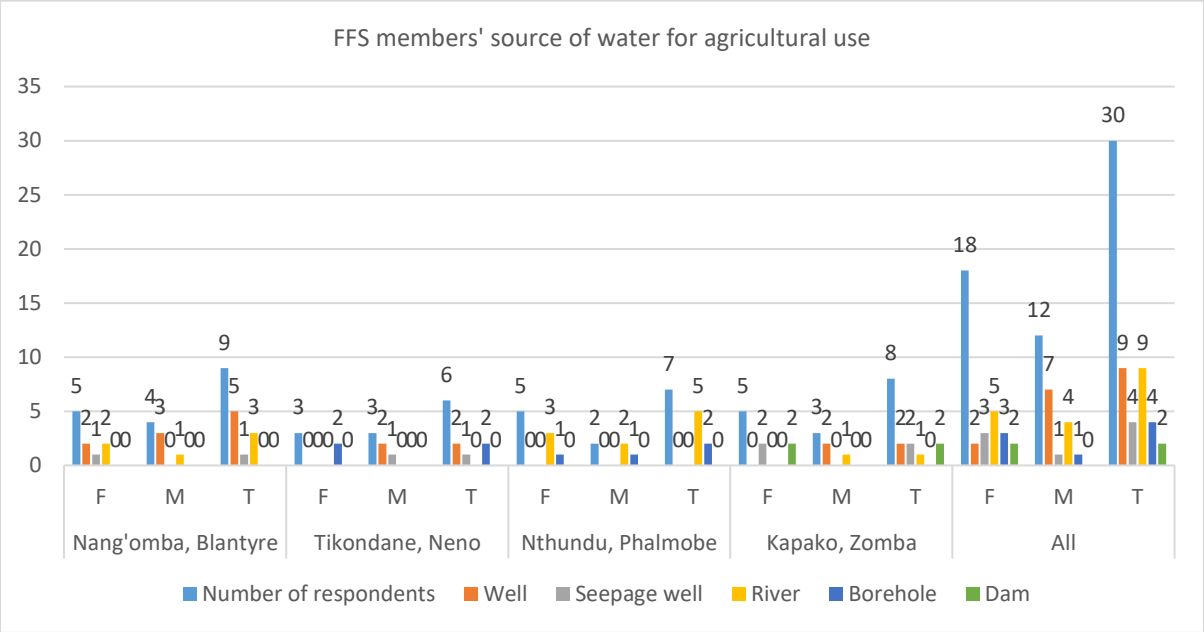
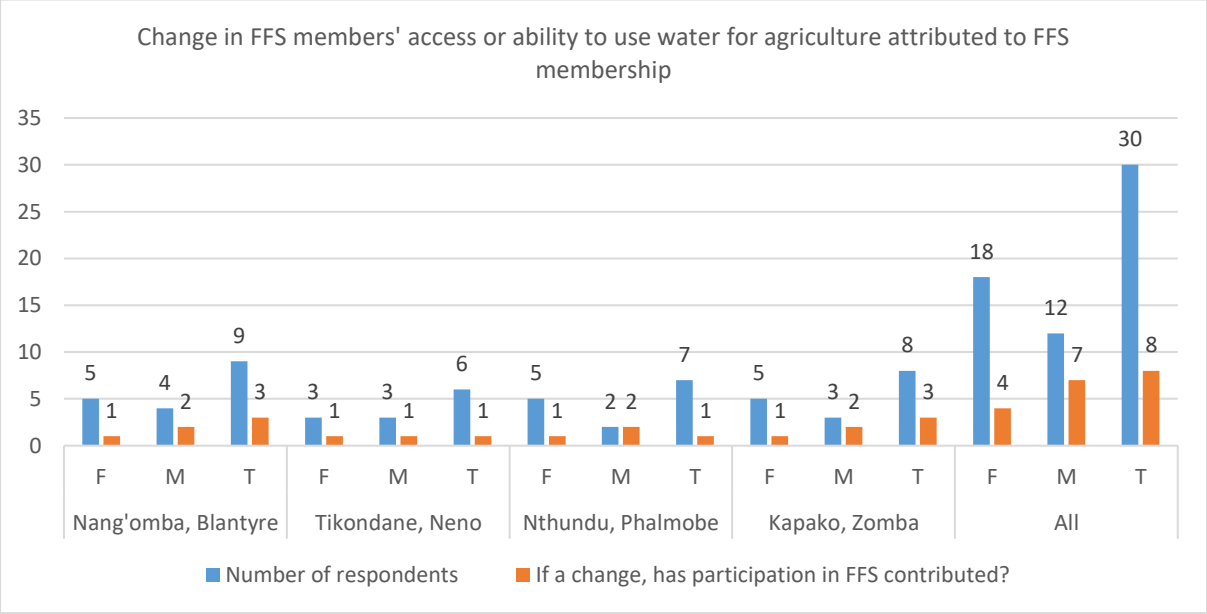


Figure 9: Change in FFS members' access or ability to use water for agriculture attributed to FFS membership



- **Members income remains directly or indirectly highly dependent on agricultural**

  Agriculture remains the most important source of income for the FFS members, with 21 out of 30 respondents reporting at least 50% of their income coming directly from agriculture (Figure 10). Other sources of income such as petty trading (12 respondents) and piece work (11 respondents) are often indirectly dependent on agriculture (Figure 11). Nine out of 30 respondents reported a change in their source or amount of income where FFS membership had contributed (Figure 12).

  In Nang'omba FFS, 9 out of 9 respondents earned income from the sale of agricultural produce, and for two of these members it was their only source of income. Two men reported that part of agricultural

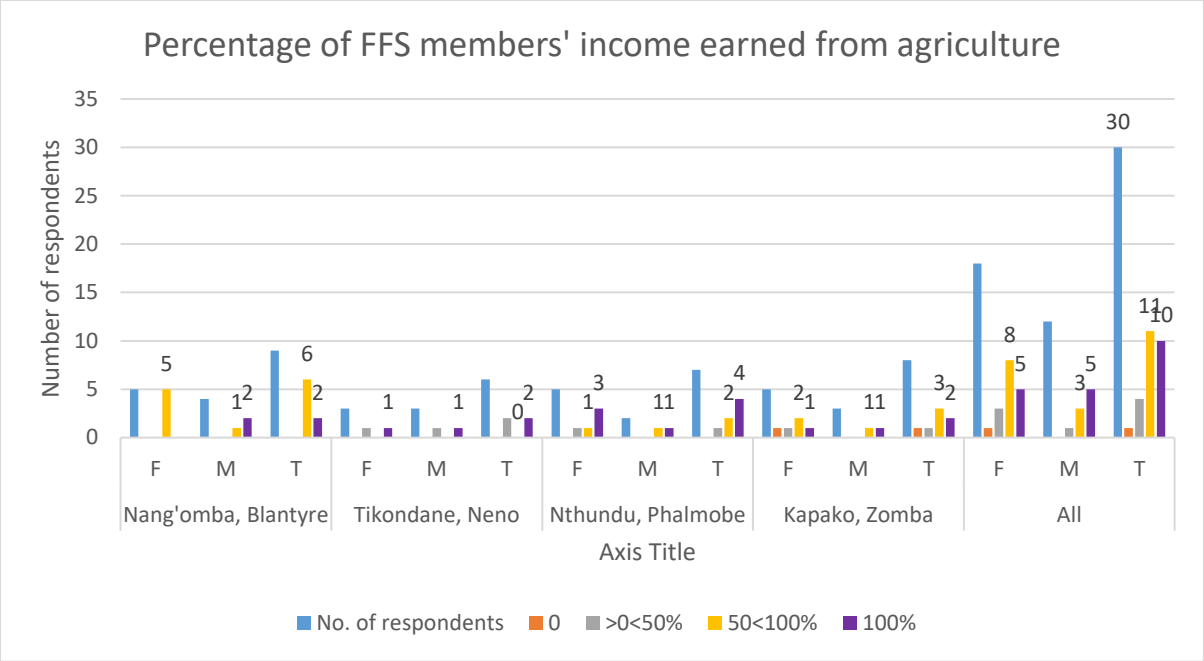
income was from livestock. Two women also reported piecework as a source of income, while two women did petty trading and one woman had a small grocery. One man is a builder. The main change attributed to the FFS was one man explaining that there had been an increase in his income from *dimba* farming and, also livestock. One woman explained that her income from *dimba* cultivation had increased through the knowledge gained from the FFS

Five out of 5 respondents from Tikondane FFS earned income from the sale of their agricultural crops or livestock and for one woman this was her only source of income. One woman earned no income from the sale of her own agricultural produce. Two respondents (both men) reported piecework as a source of income. In all cases respondents were directly or indirectly (piecework or trading) dependent on agriculture. One woman explained that she had received livestock through the FFS. One man reported he was putting more emphasis on agriculture and less on casual labour because of the FFS.

In Nthundu FFS, 7 out of 7 respondents earned income from the sale of agricultural produce, and for four of these members it was their only source of income. Two women also reported piecework as a source of income. The main change attributed to the FFS was one male member explaining that there had been a big change in the percentage of his income coming from agriculture. Previously he had been trading in charcoal, but he had realized the extent to which charcoal burning was causing deforestation.

In Kapako FFS, 6 out of 8 respondents earned income from sale of their agricultural produce; for 2 men it was their only income source. Two women earned no income from the sale of their own agricultural produce. Four respondents (3 women) reported piecework as a source of income and for one woman this was her only source of income. Four women were involved in small scale business/ trading. All respondents were either directly or indirectly (piecework or trading) dependent on agriculture. Three respondents reported that the FFS had contributed to change. One man used to do business & casual labour but was now 100% farming. One woman reported that the FFS VSL (together with the village VSL) allowed her to earn income from selling sweet potatoes, green maize and cabbages. Another woman reported that access to knowledge and borrowing MK 20,000 from the VSL had enabled her to do small scale business.

Figure 10: Percentage of FFS members' income earned from agriculture



Note: 4 of those interviewed did not answer this question

Figure 11: FFS members' source of income

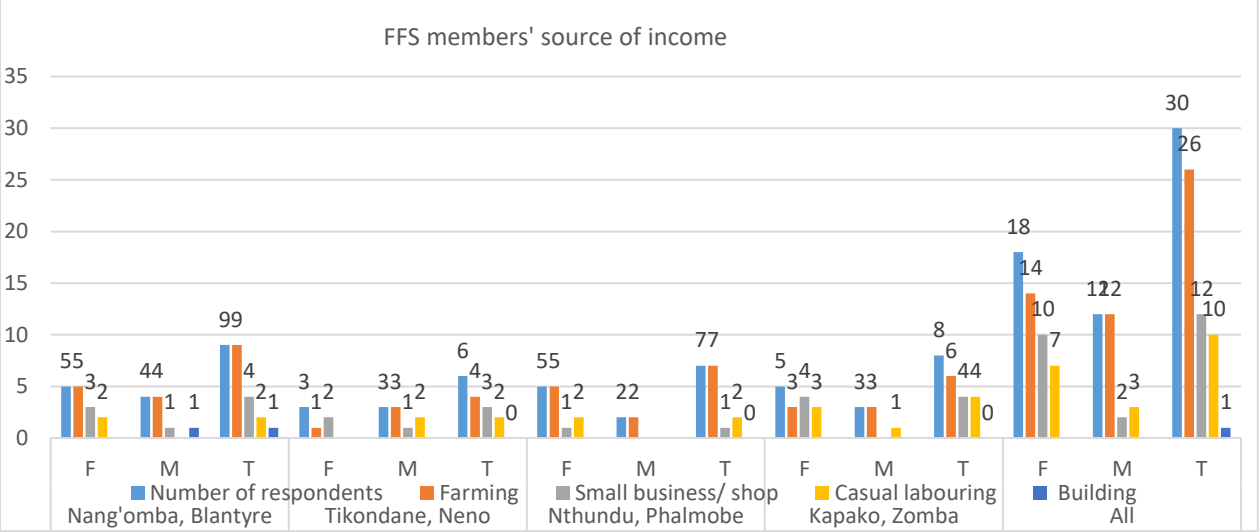
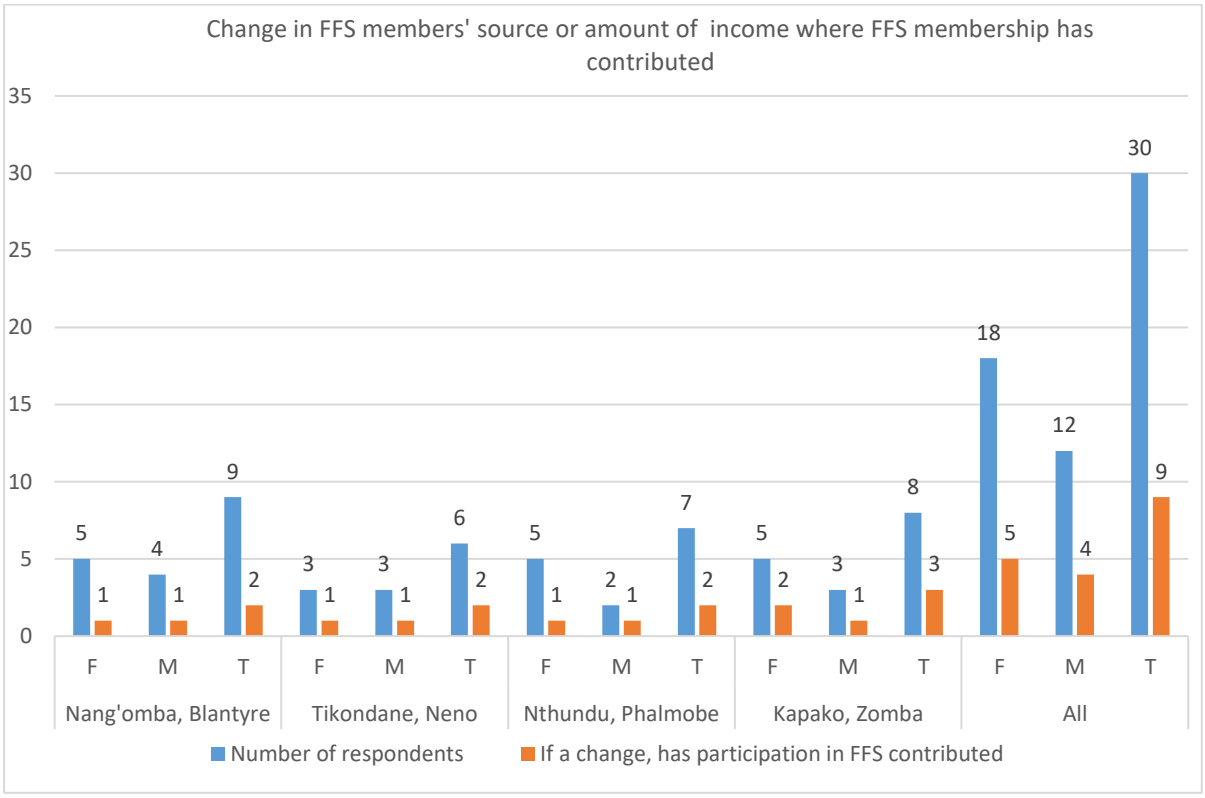


Figure 12: Change in FFS members' source or amount of income where FFS membership has contributed



➢ Access to credit through VSLs appears to have increased markedly

27 out of 30 respondents had accessed credit in the previous 12 months and 25 of these respondents had accessed credit through VSLs (Figure 13). VSLs were established by the four FFSs, often alongside other VSLs in the community. The VSLs are clearly an important source of credit for FFS members, although in most cases the credit does not appear to have been invested in farming.

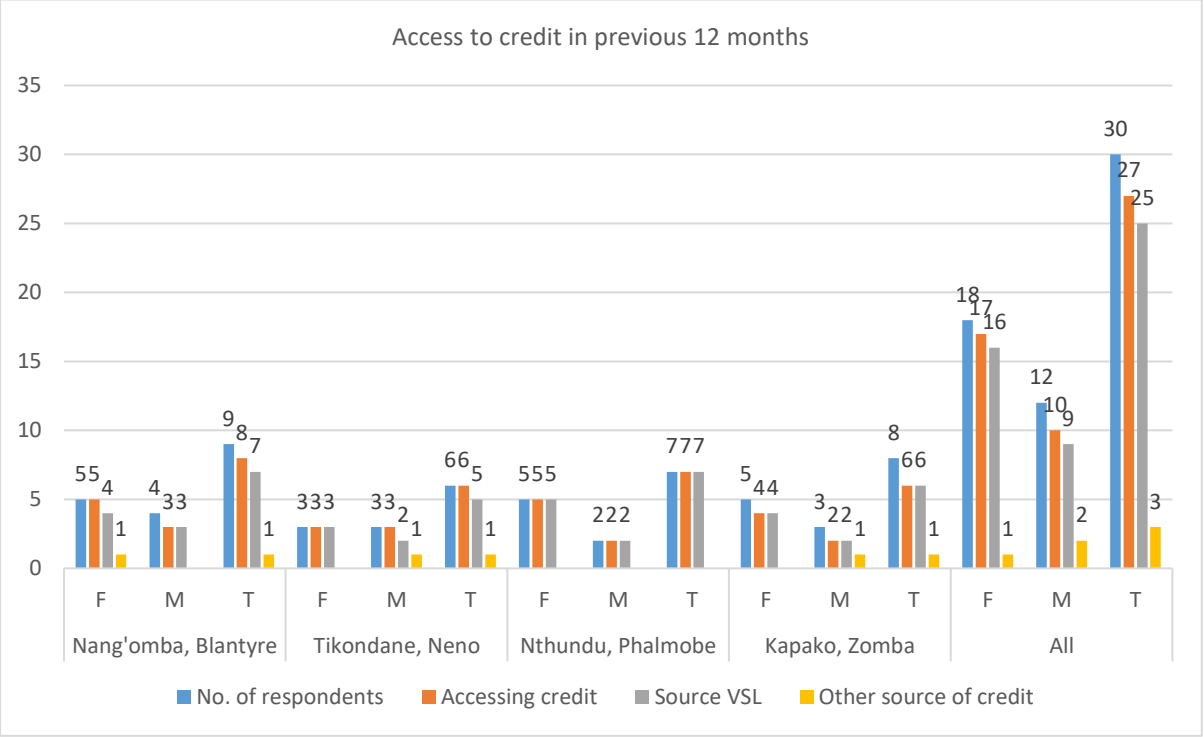
In Nan'gomba FFS, 9 out of 9 respondents reported that they had borrowed money over the past 12 months. The main source of credit was VSLs and it appears that 8 out of 9 respondents accessed credit from the FFS VSL.

In Tikondane FFS, 6 out of 6 respondents reported that they had accessed credit in the past 12 months. At least 4 out of 6 respondents borrowed from the a VSL, but it was not always clear if this was the FFS VSL. One member reported she had borrowed from a bank and another from a private individual. No respondents reported that credit had been invested directly in farming.

In Nthundu FFS, 7 out of 7 respondents reported that they had borrowed money from the FFS VSL in the past 12 months. No other sources of credit were reported.

In Kapako FFS, 6 out of 8 respondents reported that they had borrowed money from the a VSL in the past 12 months, although it was not always clear whether this was the FFS VSL. None of the respondents reported that the credit had been invested directly in farming. The only other source of credit reported was the One Acre Fund.

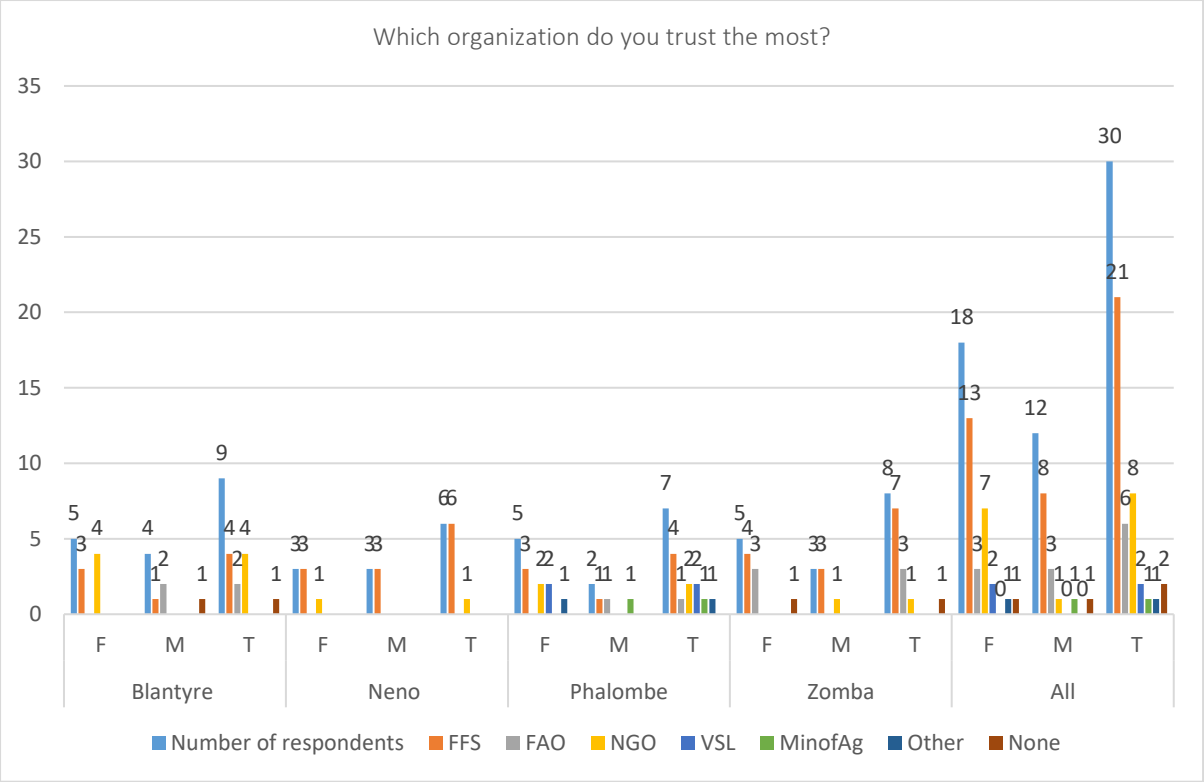
Figure13: Access to credit in previous 12 months



➢ **FFSs and project organisations are mostly trusted by members.**

21 out of 30 respondents expressed trust in their FFS (Figure 14). In Blantyre, 6 out of 9 Nan'gomba FFS respondents mentioned they trust the FFS 3 members (all women) trusted TLC most and 3 FAO. One man reported there is no reliable organization. In Neno, 6 of the 6 Tikondane FFS respondents reported that they trust the FFS. Two men reported that they had never belonged to any other group. In Phalombe, 4 of the 7 Nthundu FFS respondents mentioned that they trust the FFS and /or the VSL. ADRA, World Food Programme and the Social Cash transfer programme (although she was not a member) were each reported by three different women. One man reported that previously there was no organization, but now it is FAO, working with the Ministry of Agriculture. In Zomba, 7 of the 8 Kapako FFS respondents reported that they trust the FFS. 3 respondents mentioned FAO, 2mentioned the NGO Save the Children. 1 woman explained that she trusts FAO very much; this is the only NGO she has so far worked with. She also trusts the FFS because of the good work. She knew almost 75% of FFS members before but started trusting them after joining the FFS.

Figure 14: Organizations most trusted by FFS members



6.5 Scaling

What kind of scaling has occurred within and beyond the FFS group?

Scaling to date has been explored with respect to how far participating FFS farmers have shared with other community members or have observed other community members copying or inspired to act having seen or heard what the participants are doing. A second pathway to scale was identified – sharing beyond the community to neighbouring villages. However, the notion of 'scaling' is often interpreted in a similar way to that of 'adoption', which is problematic and merits further attention. Scaling – if defined as 'catalysing a critical mass of widespread innovation, experimentation, adaptation and practice changes amongst farmers in the same or neighbouring communities', offers a more nuanced approach, which more closely fits the reality of farming systems change processes.

BLANTYRE (Scaling)

In March 2018, participants all reported that they had taught, shared information / practices with other community members. Most reported that they had shared with three other individuals as guided by the implementation partner organisation. The practices shared were mostly conservation agriculture technologies, which were shared with their close kin. By October 2019, some scaling had occurred, but to a limited extent. Farmers mainly share with neighbours, friends and family who are willing to listen, and because they said that wider community members can be quite negative and refuse to listen. Beyond the community, in March 2018, two farmers said that others in a neighbouring community are copying or adapting principles and techniques, but the majority said they had not shared beyond their own community. A similar picture was reported in October 2019.

NENO (Scaling)

In 2018, farmers reported that scaling has been relatively limited in scale both within the community, which is perhaps understandable given the internal challenges within the group and the cessation of support from the NGO implementing partner. Farmers have actively shared with a handful of close kin and neighbours only. By October 2019, members reported that within the community, some non-FFS members are practicing what the FFS members are learning and practicing in their fields, but the extent of change appears limited (e.g. one or two technologies): For example, other community members are now practising ridge spacing of 75 cm and planting station spacing of 25cm. Community members are shifting from the business of making charcoal to irrigation farming, as the water is now available through the seepage wells to make the latter possible. Planting of agroforestry trees like *mthethe*, *mfula*, *mphakasa* and *chitimbe*, species which add to soil fertility is also expanding according to members (FGDs). However, the evaluative team could not validate the extent to which this has occurred. Sharing and practice change beyond the community has been limited according to FFS members.

PHALOMBE (Scaling)

In March 2018, in the Phalombe FFS case study, a majority of farmers had shared with close kin (8 of 9 farmer case studies report sharing with close family members, but usually only with a handful of people. The FFS chair has been actively encouraging others (e.g. to grow vegetables). One farmer mentions that although they have shared practices, others have not yet taken up these practices as they see they are labour intensive. Another woman said that she does not share with others in the community as they 'demean her participation in FFS activities', although she said that there are individuals in the community interested in improved ridge construction and one maize seed per station. By March 2019, two of the 9 household case studies had left the group, one migrated to Mozambique and another divorced his wife and returned to his home village. The seven remaining members all report that they have shared with kin and neighbours. However, for one family that applied the techniques she taught them, such as constructing basins, the crops did not thrive due to the heavy rains which waterlogged the soil. Some FGD participants reported that others are copying the *dimba* cropping, use of Kanyani early maturing maize, tomato growing and application of Mbeya manure.

In 2018, sharing beyond the community has been very limited in the Phalombe FFS case study. Most had not shared beyond the community, and for the handful of individuals who had shared, they had only shared one

specific practice, such as ridge spacing, mulching, one seed per station, tomato growing and making fertilizers. IN 2019, participants said they have shared with others beyond their community, setting aside time to go to an assigned village to share the techniques. However, it has not been possible to validate the extent to which this process of sharing and learning/experimentation has occurred.

ZOMBA (Scaling)

In March 2019, there were indications of limited sharing within the community of the FFS. For example, the women's FGD participants said that they had shared with two people each (kin and non-kin), as well as with people in other communities. They gave the names of 7 women with whom they had shared knowledge and skills. They also said that there were two women who have copied the practices on their own account. The individual case study farmers reported that they have shared knowledge and skills on conservation agriculture with a handful of farmers, but the extent seems limited. Further, one female participant said that others had not been convinced by the technologies she shared with them. At least four individual case study farmers (all women) mentioned that the people they have shared with and influenced are close relatives (e.g. mothers and sisters). In 2019, in a mixed gender FGD, participants said that 'some non-members can copy what members are doing. When they come from the school, we invite 2 or 3 people to teach them. FFS participants report that they have shared some technologies beyond their own community (women's FGD), but in the individual case studies, only a handful reported that they had shared – hence the extent is clearly limited.

OVERALL (Scaling)

Farmers have taken some steps to share their new knowledge and skills, but generally to a limited extent. Examples of direct copying were reported, but these are fairly few in number. Most sharing appears to have occurred in the Blantyre FFS group. In Blantyre, farmer members all reported sharing with 3 individuals each and this appears to have been a clear strategy supported by the FFS facilitator. Where sharing has occurred, the most commonly reported practices were the conservation agriculture practices and making of Mbeya fertilizer, perhaps because these are the most visible practices which are thus easiest to show and share. In Phalombe, farmers reported some copying of *dimba* intensification and other practices, such as tomato growing. In the other groups, there appeared to have been less emphasis from implementing partners on encouraging the sharing process. In the Neno group, very limited sharing was reported, and this may reflect the internal tensions within the group.

Sharing is most common amongst close kin and neighbours. Across all four groups many mentioned sharing the new knowledge and skills with relatives and close kin – even within the same household and occasionally with a neighbour or two. Therefore, the reach of the sharing is relatively limited.

Some sharing is reported beyond the FFS community, but it is not clear the extent to which sharing has occurred in other communities or how effectively.

Barriers to sharing and uptake included negativity from other community members, which was reported especially by female farmers, or the fact that promoted technologies were inappropriate in heavy rains or required too much labour.

7. Discussion, Lessons, Recommendations and Next Steps

7.1 Discussion

Drawing together the different sources of evidence analysed and presented earlier in this report, the evaluative learning team has made an assessment against the Theory of Change to inform project stakeholders. This assessment is based largely on qualitative primary data and secondary sources, but also drawing upon FAO endline survey data on theory of change indicators from a random sample of participants (as requested by the evaluative learning team). The key findings have been validated by project stakeholders in a participatory workshop. The theory-based analysis seeks to generate evidence to improve our understanding of the processes involved and outcomes and impacts achieved in terms of the strengthening of climate resilience amongst the case study FFS groups and the wider communities, and to provide insights to inform the wider community of practice working on climate resilience in Malawi and beyond.

This study focuses on 4 FFS case studies – the groups were in the first tranche of groups participating in the project (later tranches were included by the FAO project as their roll-out proceeded. In the first tranche there were 174 FFS groups formed. The case study groups were chosen one per district, using specific, purposive criteria. Ultimately, the FAO project has formed a much larger number of FFS groups (300+).

OVERALL THEORY OF CHANGE ASSESSMENT

In this section we summarize the findings on the theory of change as anticipated by the FAO project, considering the key stages of implementation, capacity change, practice / behaviour change, benefits/impacts, and scaling. We also analyse the extent to which key assumptions have held true.

IMPLEMENTATION

Implementation has been relatively smooth at 3 of the 4 sites, and good progress has been made, even with a change in service provider from NGO to government extension support. The FFS in Neno experienced internal challenges and received weak support (cessation in season 2), which has undermined the functionality of the FFS, but there are also indications that it is recovering.

Although good progress has been made, the original conceptualisation of the FAO FFS as an experiential learning process has been somewhat pulled back during implementation into a more traditional 'technology transfer approach' in its implementation for reasons relating to government assessment, project targets, the understanding of individuals in implementing organisations and even the FAO itself and the quality of the training provided to government and NGO FFS facilitators, and the training provided to community-based facilitators.

- Within the FAO team there is variable understanding of and capacity with respect to experiential learning. It is also the case that the FAO project results targets were set according to the 'adoption paradigm' and this has driven the measure of success for the project ever since.
- Challenges were encountered in the original training of FFS facilitators (e.g. relating to payment of *per diems* and the curtailed length of the training course) meaning that the NGO and government facilitators were unable to receive the depth of training, which was originally conceived. The depth of training is important because the FFS approach represents a major contrast to the traditional approach to the provision of advisory services and how the performance of those providing these services are assessed.
- Government assesses the performance of agricultural extension staff according to the numbers of technologies they have successfully promoted, with the technologies identified in a government manual.

In general, participation from smallholder farmers has been good. 3 of the 4 FFSs have good functionality, with strong collaborative ethos and internal cohesion, facilitative leadership, clear rules, and commitment from members. The quality of support from the project facilitators is also important. One group has experienced significant internal tensions and weak project support and continue to expect external support more than other groups. More effective groups are characterized by a strong collaborative working spirit, guided by a strong, but

not dictatorial leader. The groups that establish clear rules, such as fines for non-participation in specific activities, also operate more effectively. The commitment of members is also deemed important – in some cases, where there was wavering participation from some individuals, this affected the group. The quality of support from the external facilitators and project team is also very important in strengthening and enabling FFS groups to run effective learning plots. Issues of dependency can be overcome when groups are functional, and participants feel they are benefiting from their engagement in the experiential learning process. Some farmers have dropped out of the FFS where they had high expectations of receiving material, short-term handouts, such as fertilizers and other inputs, despite explanations from the original implementing NGOs that this was not the FFS approach. Such an approach strongly based upon self-reliance can continue to be challenging, when other development programmes continue to provide inputs, albeit on a credit basis. Addressing the dependency culture is recognized by the FAO project team and is integral to the success of the FFS approach, but can be challenging, when such attitudes are highly entrenched; more organized groups, with good leadership appear to have less issues with respect to dependency. As part of the integrated community approach, some benefits have been distributed, and these are highly valued by participants, especially livestock. But the fairness of their distribution has not always been clear, with risks that poorer and female farmers miss out.

All the FFS groups were able to manage their main learning plots for at least two seasons and the design of the learning plots generally improved over time. However, whereas Nthundu, Phalombe FFS and Kapako, Zomba FFS successfully completed a third season for the main learning plot, Nang'omba FFS, Blantyre was only partially successful and Tikondane, Neno, FFS failed to establish a learning plot in the 2018/19 season. Most FFS participants could explain the purpose of the learning plots and the FFS, including the comparisons between crops and practices. In the earlier stages many members appeared to emphasize what they had learnt in terms of recommended good agronomic practices for maize (and other crops) and assessed performance in terms of short-term yields. However, over time a more effective experimental approach did develop, particularly with the Nthundu (Phalombe) and Kapako (Zomba)groups and to a lesser extent Nang'omba (Blantyre) FFS.

In terms of the 11 FAO FFS principles, the performance of the four FFSs varied. In general, at least 3 out of 4 of the FFSs aligned well with the principles according to: the field being the learning place, hand-on and discovery-based learning, Agro-ecosystem analysis (AESA) on the learning plots, comparative experiments, equitable rather than hierarchical leadership, team building and to reasonable extent Facilitation not teaching. Where the FFS process aligned less well with the FFS principles were: Farmers were not clearly regarded as experts in their own context, the members had little influence on defining the curriculum or identifying special topics. There was little little evidence of participatory monitoring and evaluation taking place.

The FAO project has supported 'inclusive' FFS, and this has equity benefits, but also creates specific challenges, compared to FFS projects in which only better off farmers tend to participate. The FAO approach purposively ensured that the FFS groups formed, included poorer households, as well as better off smallholder farming households, with a gender mix. This is positive from an equity perspective, although the poorer households, especially women and female-headed households, tend to have had less capacity to use new skills and knowledge in practice, because they lack access to resources and face more challenges (e.g. children being sick, requiring their accompaniment to hospital). Inclusive FFS, as laudably promoted by the FAO, may also need to be more closely connected to safety net provision.

The FAO project anticipates building community resilience mainly through the FFS approach, by working on multiple dimensions simultaneously i.e. technical, financial, social and environmental ('*les caisses de resilience'*). In practice, there are some examples of such integrated change happening in farming households, but to some extent the implementation of the project has treated the individual interventions somewhat separately. A more integrated approach would involve the FFS group in planning holistically themselves, being supported to view their farming, livelihood and community systems as systems. Also, differing levels of emphases was placed on different types of interventions – a multi-pronged approach, requires diverse sets of skills, knowledge and project management capacity. The integrated community approach, with differing combinations of technologies and practices, such as intensification of *dimba* cropping, improving maize yields, crop diversification and access to

new financial services (e.g. community banking), plus provision of livestock and seeds can unlock new livelihood opportunities. There are some examples of household case studies, who by 2019, are reporting changes in their farming and livelihood systems. For example, improvements in yields, *dimba* intensification, improved livestock management and access to VSL loans had combined to create synergies for individual households – but these were limited in number. There is scope for more such changes to occur post-project, but it is also feasible that some of the benefits will fall away once the project ends. While the nutrition intervention was positively appraised by all participating (mainly female) farmers, and some participants report being able to make some dietary changes, there were also respondents who said they could not act on the changes. There has been no major challenging of the 'maize' paradigm in Malawi, because it is so culturally embedded and supported by government subsidy policies and more could have been done in this regard, to promote 'whole farm systems' transformations. The latter are highly challenging to achieve for poorer households, and in conditions of regular shocks, such as dry spells and floods, but experimentation on this is important in the light of longer-term climate projections.

Overall, farmer feedback (both women and men) is highly positive about the FFS process, but slightly less so for participants in the Neno FFS. All but one of the FFSs appears functional and have achieved unity in conducting their tasks. Good leadership, mutual support and appropriate and agreed rules are key aspects of a group operating effectively. Fair distribution of inputs, such as goats in pass-on schemes, can be challenging to manage, and there were challenges in one group in this regard.

CAPACITY CHANGE

Farmer capacity has been strengthened across all four FFS cases. Overall, capacity strengthening has been strongest in 2 of the four FFS cases (Nthundu-Phalombe and Kapako Zomba), followed by Nan'gomba-Blantyre in which fairly strong change has occurred for some farmers. Overall, capacity strengthening has been strongest on agronomic cropping practices and crop diversification, with more women gaining nutrition-related information and skills. Capacity strengthening on VSLs, livestock management, water management, and forest and seed conservation has been a bit less consistent. Farmers have gained knowledge and skills on diverse sets of promoted cropping and crop diversification technologies and practices, especially crop diversification, including early maturing maize variety, and conservation agriculture methods. Enhanced capacity on nutrition has been reported by female participants on how to achieve a balanced diet, six food groups, and new cooking practices, and a few men also gained information, but it appears they were not invited to the training. Capacity strengthening in the other areas has been less strong, although there are clear examples of positive awareness raising, skills and knowledge development as well. Increased knowledge and skills on community banking were achieved early on in Nan'gomba-Blantyre and Kapako Zomba, and later in the other two FFSs (in one district a separate VSL was already in existence, established through another project). Irrigation and water management skills were gained by some participating farmers in Phalombe and Zomba – in Zomba the FFS had received a treadle pump which has supported their irrigated *dimba* farming. In general, skill development on improved livestock management has been less widespread, but it is highly valued and desired by most farmers. Some farmers did mention 'farming as a business', but it is not clear what this means in practice. The creation of VSLs appears extremely important for providing access to credit, where they have been established, and farmers highly value this access to finance to pay for basic household needs and in fewer cases to support productive and livelihood activities. Some participants some noted that the amounts that can be borrowed are not that high and could be increased by the project. Market access e.g. for vegetables grown, can be an issue.

The opportunity to '*learn by doing*' has been provided by the FFS process, although the comparisons could be improved to support farmers' capacity to evaluate the outcomes. Setting up relatively simple comparisons and including winter season experiments as well rainy season experiments can help to strengthen the capacity of farmers to evaluate outcomes more quickly.

Provision of key inputs has been important to those who have received them, providing new opportunities for some for farming and livelihoods, but the process of distribution is challenging. Other opportunities have also been created by the project due to the provision of certain inputs, e.g. early yielding modern variety seeds or indigenous, neglected crop seeds for the learning plot, provision of chickens and or goats, but not in all cases and many participants identify limited access to such inputs as key constraints.

Multiple shocks undermine farmers' capacity to learn, experiment and adapt. While the whole objective of this project is designed to support farmer learning and experimentation in a context of increasing climate variability and other rural stressors to build climate resilience, there are also limits to how far individual households and learning groups can work under challenging climatic conditions, especially when combined with other shocks (e.g. the children of a poor household becoming sick, requiring mother to attend hospital for several weeks or months). Farmers have also learned though, the importance of crop diversification – in a dry spell, many managed to still 'harvest something' and this has reinforced the lesson. The challenging weather of 2017/18 is part of the context to which this project is seeking to respond, but it has frustrated many of the comparisons conducted by the farmers in the learning plots and fields. At the same time for those who managed to 'still harvest something' despite the drought, this is both important for their survival, but also for reinforcing messages of the importance of diversification and finding out which crops are most viable for a farmer's location, including climate, and farm characteristics.

Motivation is generally high amongst participating farmers, although there were also cases of participants dropping out, including quite a significant decline in the Neno FFS case study. The reasons given by remaining participants and by the (limited) drop-outs interviewed are highly variable. The feedback from participating farmers is generally very positive. Some farmers report some setbacks such as theft of the learning plot crops in one season which they found highly dispiriting, the loss of cared for tree seedlings in the dry spells, and the continued bush fire setting which undermine efforts at tree conservation. Late delivery of promised seeds by extension workers was also reported to be a major challenge to the learning plot implementation (Blantyre case). Negativity from other community members (i.e. making critical comments to FFS members) can also be a problem: particularly reported by some women participants. The unity of the group can be a psychological support and a practical support in hard times extending social networks, according to a few participants. In the Neno FFS case, there was a more variable response with farmers focusing more on constraints and the need for external assistance such as provision of inputs. They noted limited access to labour to water tree seedlings, which then all died during dry spells in the growing season. Women's access to labour to do pit farming was limited, even though they might be keen to trial it in their plots. The poor cohesion of the group and the internal tensions have been challenging for members, although those who have continued to manage the learning plot in the second season even without external NGO support said that they remain committed and have shown tenacity.

Strengthening resilience capacity in the light of increasing climate variability has improved, but there are clear differences between and within the FFS case studies, as to the extent of capacity strengthening achieved. The major climate risk across the sites over the first two years as reported by FFS members was prolonged dry periods during the main growing season, followed by the 2018/19 season where there were exceptionally heavy rains. The capacity to adapt to changing and uncertain rainfall patterns is a key aspect of strengthening farmers' climate resilience and has been strengthened, although there is a lot of variability.

Crop diversification has been the most significant change to respond to prolonged dry spells amongst FFS participants. There was positive feedback on the early maturing hybrid maize, but access to hybrid seeds is a challenge, which should be addressed in the context of improving both formal and informal seed systems. Crop diversification appears to be the most significant change in terms of FFS members' capacity to respond to prolonged dry periods and climate variability. Across the four FFSs farmers reported that they have improved capacity to diversify their cropping systems. Farmers are diversifying crops (e.g. groundnut, sweet potato, pigeon pea, sorghum, mustard) and crop varieties (e.g. early maturing maize which may or may not be alongside other maize varieties). This is consistent with a study in Dedza and Ntcheu districts which reported that 74% of farmers' experiments were on new crops and new varieties, particularly maize and legumes (Hockett and Richardson, 2018). Many farmers reported that access to early maturing maize hybrid varieties was a major challenge because of the cost. Another study in Malawi suggests early maturity is the most important maize varietal characteristic for farmers and a higher priority than yield (Sutcliffe et al, 2016[32]). However, the same study revealed disagreement between seed providers about how far short duration cultivars enable successful adaptation to

[32] Sutcliffe, C., Dougill, A.J. & Quinn, C.H. (2016) Evidence and perceptions of rainfall change in Malawi: Do maize cultivar choices enhance climate change adaptation in subSaharan Africa? Reg Environ Change (2016) 16: 1215- 1224. https://doi.org/10.1007/s10113-015-0842-x

drought. Corporate actors conflated drought escape and drought tolerance and prioritised breeding for early maturity, but public sector participants considered the two to be different and dedicated more resources to breeding specifically for water stress. The findings also reveal an imbalance of market power within the seed system, with short-season hybrid corporate cultivars predominating and drought-tolerant public goods cultivars being scarce.

Soil and water management practices can improve the impacts of dry conditions on maize, but it is highly vulnerable to moisture stress and irrigation is needed for prolonged dry spells or a shift to different, less vulnerable, staples. Some soil and water management practices (e.g. increasing soil organic matter through incorporating manure) improve yields under heavy rains and waterlogged soil conditions, but other technologies such as box ridges produce worse yields. Soil and water management practices, when practised alongside short duration varieties, can lessen the effects of dry conditions on maize, but in the 2017/18 season all the FFSs' maize harvests were badly affected, even where these practices were used. Maize is highly vulnerable to moisture stress and although some practices can improve its resilience, only irrigation would allow maize to perform well under the weather conditions of the 2017/18 season. Conversely, the 2018/19 season was characterised by very heavy rains and storms and some farmers reported having to remove box ridges to allow water to escape their fields to reduce waterlogging. Some practices are more suited to certain rainfall conditions (e.g. pit farming and box ridges to drier weather), while others can help under any conditions (e.g. incorporating manure to increase soil organic content). Similar to the findings from another study from central region of Malawi, farmers in Dedza and Ntcheu districts explained that their experiments with maize varieties were driven by reaction to changes in rainfall patterns more than any other motivator (Hockett and Richardson, 2018). Farmers in the four FAO FFS case studies were also strongly motivated to experiment to try and produce maize when there is either insufficient or too much rainfall. If, suitably local, historical weather data is available, a decision-making tool, such as PICSA[33], would enable farmers to make a more informed decision about the risks of high dependence on maize. This would benefit from being combined with more support for whole farm systems change experimentation and learning.

Dimba cultivation and irrigation farming, where the wetland or water resources are available, has significantly strengthened farmers' capacity to respond to dry conditions. Endowments vary in terms of access to water for irrigation between the case study groups. The longer-term sustainability of intensified irrigated cropping by accumulating numbers of smallholders needs to be assessed. In three of the four sites, farmers reported that the membership of the FFS appears to have improved their capacity to manage their *dimba* cultivation and / or irrigation. This was particularly the case in Phalombe, where in some cases farmers reported they were doing this for the first time, while others were making changes more strategically, intensively and continuously. For example, in 2018, the chairman (male) of the FFS explained that he intensified his winter cropping as an alternative when his main crop fails. He has increased his winter plot size growing e.g. sweet potato, vegetables, tomatoes. He planned to store the sweet potato for food as dry pellets. He was irrigating with pipes and because the treadle pump cannot suffice, he uses a petrol pump. At the Blantyre FFS site, one male farmer explained how his *dimba* plots are being managed more intensively (mainly in terms of labour, rather than external inputs -except for seed) and continuously, but also sustainably in terms of a number of soil and water management practices. He is growing a diversity of crops such as tomato, mustard and sugar cane mainly for the market and maize mainly for food. In contrast water was not available to the Neno FFS, which was more limiting on their opportunities in this regard. However, even in communities where *dimba* cultivation and irrigation farming is currently an option, future sustainability needs to be considered (important link with PCC project).

Livelihood diversification is an important way of strengthening resilience. Many farmers are still reliant on coping mechanisms under conditions of shocks, such as dry spells and floods, but to a slightly lesser degree, especially for better-off households who have more capacity to experiment and adapt. In general, membership of the FFS had not significantly expanded opportunities beyond agriculture, directly or indirectly, for their members. In response to unfavourable weather conditions many farmers in the FFSs still appeared to be dependent on coping mechanisms such as casual labouring, petty trading and even in one reported case charcoal making. There are several examples of asset stripping, i.e. forced sale of assets, such as goats and chickens, to cope with difficult conditions. For example, in Phalombe, one woman explained that her family had sold livestock to cushion the low

[33] PICSA is recently being introduced in a several districts including Phalombe by the University of Reading and partners.

crop yields by selling and used the money to buy food. Another woman reported that her husband turned to casual labouring (*ganyu*) in Mozambique to help the household with food. They had no support from anyone. Another woman relied on the cash transfer programme (*mtukula pakhomo*) – her mother receives K17,200 every two months.

Increased awareness of climate change and having a positive outlook, was said by some farmers to be an important of climate preparedness. However, it is only recently that FAO has begun providing seasonal forecast climate information to farmers and there does not appear to have been exploration of longer-term projections within the project, implementing partners, researchers and farmers. Within the FFS, some individual examples were found of farmers who had learned new ways of getting money, such as irrigation farming, running a small shop, breeding goats. The improvements to sustainable livelihood can provide increased income to sustain children's education, which in itself is a long-term adaptive capacity strategy for many rural households, who aim for the children to find work in urban areas, ideally in skilled jobs. Future initiatives could consider more emphasis on improving access to weather information and with wider stakeholders exploring longer-term climate projections. This could be alongside greater consideration of the trade-offs involved between strengthening climate resilience and increasing productivity. Community, household and farm level visioning would help to move thinking beyond single crop short term yields.

Farmers have identified market development activities as a priority. The FFS groups as a business merit discussion here, but we cannot evaluate effectiveness as training and implementation still in early stages.

BEHAVIOUR CHANGE

The clearest behavioural changes by participating farmers have occurred with respect to crop diversification and agronomic changes. Changes in soil and water management practices are also quite widely reported, although the processes observed are less straight adoption, and more nuanced sets of response by farmers to the propositions and encounters, mediated by their dispositions (e.g. access to resources, personality, intra-household relations). Growing a wider diversity of crops is a relatively easy change to make if planting material is accessible and affordable. Changes in soil and water management practices are quite widely reported across the four FFSs, but for certain practices (e.g. pit farming) labour is a reported constraint according to some of the women farmers. There is not a clear 'yes/no' straightforward adoption across all of the farmers' fields and in some cases, practices were tried on their own-farms and then not continued.

The most systemic change is intensification of *dimba* cropping in Phalombe FFS case study. Some livestock practice changes have occurred, but to quite a limited extent in terms of numbers of households, but those households who have benefitted, rate the change highly. The most significant systemic change is irrigation farming in Phalombe, with some farmers doing this for the first time, some expanding their irrigated farming and some adapting and intensifying what they have been doing. Overall, the livestock practice changes were less extensive than the cropping-related practice changes, although for the individual farming households that had received goats the changes could be significant. It is not clear how the pass-on schemes operated and how fairly distributed the inputs have been. Similar to cropping, it is not always a straightforward 'adoption' decision. Participants in the Neno FFS group, for example, were given improved chickens, but could not sustain the more expensive feeding, and some died, so they have reverted to local chicken keeping. A small number of farmers in Phalombe said their livestock management had improved a certain extent. For those individual participants that achieved changes in livestock, the changes appear to have been significant in terms of extra income earning capacity.

A majority of FFS members reported changes in practices relating to nutrition and health in terms of the way they prepare food and the diversity of their diet, although it has not been possible to measure dietary changes and the extent of the changes made appear limited in magnitude. Some poorer farmers cannot afford the ingredients. Men were less involved than women in the nutrition training. Food diaries represent one means of tracking changes in diet. The clearest changes occurred where members reported that they had established a backyard garden to improve their access to vegetables or managed to sell them for cash or had intensified *dimba* cropping or improved their maize yields.

The majority of the farmers are strongly aware of the importance of conservation of natural resources and highly motivated to preserve and establish trees on their farms and around their homesteads. In many cases members were already involved in associated tree management practices, but project resources have helped to strengthen these e.g. through provision of tree seeds or seedlings. However, tree survival rates were poor, particularly in the early years where there were prolonged dry spells. The project put a lot more emphasis on fruit and indigenous tree seedling distribution in the last year of the project, as well as encouraging farmers to preserve existing trees in their fields as they naturally regenerate. The project recognized that its initial approach of working only through the FFS group on natural resource management issues was inadequate and sought to engage the wider community in later years, but the evaluative learning team could not assess the effectiveness of this. Surprisingly, environmental monitoring has not been a strong feature of the project. Implementing partners (NGOs) recognized that they had not achieved as much in this sphere as in the other sets of practice changes sought in the early years of the project. In Neno, farmers in the FFS, reported that by-laws have been established which are helping to reduce bush fires, but these preceded the FFS.

Improvements in livelihood strategies were widely reported across all four case study groups, although the extent of changes varies. VSLs have been established in all of the 4 FFS cases studied, although in one case it is not clear whether this is because a VSL already exists of which some FFS members are part. VSL funds were being used by women to finance petty trading and in one case to buy fertilizer for *dimba* farming. In many cases VSL credit appeared to be used to address basic household needs, and to respond to health crises and to pay for children's education. A number of farmers mentioned that they now see 'farming as a business', but it is not clear that they have the resources to put new entrepreneurial attitudes into practice. In the latter stages of the project, the FAO has begun providing training to encourage the FFS groups to develop business plans and to work collectively as a business, including using their learning plots to multiply seed varieties and to produce products for market. As this is still ongoing it is not possible for this study to evaluate the effectiveness of this approach. It is a sustainability strategy, but evidence is needed to support learning on effectiveness; there may be added tensions for FFS groups working together as a business, and use of the learning plot for business, may not support experimentation and learning for climate resilience to the same degree.

BENEFITS AND IMPACTS FOR PARTICIPATING FARMERS

The project design anticipated an accelerated accumulation of assets by participating households in the third year of the project, and this was the focus in October 2019 for the evaluative learning team. FFS members were asked about the status of various livelihood assets and whether membership of the FFS has contributed to any changes.

- **Iron sheets for roofing, plastering and cement used in constructing members' houses had increased, but weather had a negative impact on housing in 2019**. Eleven out of the 30 respondents had made changes in the building materials used in constructing their houses). Five of the 11 reported a causal link with membership of their FFS, with increased farming income resulting from FFS application of knowledge and skills gained and, in one case, funds from the VSL. However, the weather had a pronounced impact in 2019 and the houses of 5 of the 30 respondents were partially or completed destroyed by heavy and storms in 2019. Strengthening the climate resilience of domestic dwellings is likely to be increasingly important in the future.
- **Mobile phone ownership increased, partly as a result of FFS participation**. Seventeen out of 30 respondents had a mobile phone, 13 members acquired their phones during the life of the FFS, of which seven reported that there was a link with FFS membership. This was through using income from the sale of agricultural produce which had been produced using skills acquired through the FFS, revenue from sale of sweet potatoes which she had acquired with help from the FFS, rom VSL savings and money borrowed from the VSL.
- **More diverse sources of agricultural knowledge and learning-by doing means of acquiring agricultural knowledge.** All respondents reported a change in how they acquired knowledge about agriculture and 25 out of 30 respondents attributed the change to membership of the FFS. This was through learning with the FFS and greater access to other sources of knowledge through the FFS.
- **Increased access to advice on agriculture from extension workers and fellow FFS members.** As well as advice from fellow members, membership of the FFS had enabled many respondents to learn *how* to better access extension services.

- **Members are still primarily dependent on family labour for help with agricultural activities**. This can be an important determinant of the extent to which households are able to implement labour intensive, CSA practices.
- **Some improvement in access to and ability to manage water resources for farming is observed.** Access to water resources for farming varies with location. Eight out of 30 respondents reported that there was a change in their access or ability to use water which could be attributed to FFS membership. In three out of the four sites, seepage wells have been constructed with support from FAO, but only a relatively small number of respondents felt that this had improved their access to water resources. The location of the well and access to land near the well are amongst the factors determining who benefits. Increased knowledge and skills in water management was also reported by a few members.
- **Members' income remains directly or indirectly highly dependent on agriculture.** Agriculture remains the most important source of income for the FFS members, with 21 out of 30 respondents reporting at least 50% of their income coming directly from agriculture. Other sources of income such as petty trading (12 respondents) and piece work (11 respondents) are often indirectly dependent on agriculture. Nine out of 30 respondents reported a change in their source or amount of income where FFS membership had contributed.
- **Access to credit through VSLs appears to have increased markedly.** 27 out of 30 respondents had accessed credit in the previous 12 months and 25 of these respondents had accessed credit through VSLs. VSLs were established by the four FFSs, often alongside other VSLs in the community. The VSLs are clearly an important source of credit for FFS members, although in most cases the credit does not appear to have been invested in farming.
- **FFSs and project organisations are trusted by a majority of members, with a good proportion also indicating that the FFS is the group that they most trust.** 21 out of 30 respondents expressed trust in their FFS.

SCALING AND WIDER IMPACT POTENTIAL

Farmers have taken some steps to share their new knowledge and skills with other farmers, but generally to a limited extent. Examples of direct copying were reported, but these are fairly few in number. Most sharing appears to have occurred in the Blantyre FFS group. In Blantyre, farmer members all reported sharing with 3 individuals each and this appears to have been a clear strategy supported by the FFS facilitator. Where sharing has occurred, the most commonly reported practices were the conservation agriculture practices and making of Mbeya fertilizer, perhaps because these are the most visible practices which are thus easiest to show and share. In Phalombe, farmers reported some copying of *dimba* intensification and other practices, such as tomato growing. In the other groups, there appeared to have been less emphasis from implementing partners on encouraging the sharing process. In the Neno group, very limited sharing was reported, and this may reflect the internal tensions within the group.

As with the 'adoption paradigm' and our findings that the decision-making process is not a simple yes/no decision, but involves adaptation, rejection, and reconfiguration, ultimately this is also the case with processes of scaling, which suggests a different type of definition and thinking is needed about scaling, as well. A more appropriate definition would focus upon a critical mass change in practices, including experimentation, adaptation, etc, rather than simple notions of copying. A very small number of farmers are reported to be copying practices – those that are, are mainly making agronomic changes, but they are not necessarily applying the practices across their whole farm, for example, sometimes it is just one corner as a test.

Sharing is most common with and amongst close kin and neighbours. Across all four groups many mentioned sharing the new knowledge and skills with relatives and close kin – even within the same household and occasionally with a neighbour or two. Therefore, the reach of the sharing is relatively limited.

Some sharing is reported beyond the FFS community, but to a very limited degree in the FFS case studies covered.

Barriers to sharing and uptake included negativity from other community members, which was reported especially by female farmers, or the fact that promoted technologies were inappropriate in heavy rains or required too much labour.

Table 27: Overall assessment using theory of change

Dimension/ FFS group	Implementation *Very strong; Strong; Weak; Very weak*	Extent capacity has changed positively due to FFS for FFS farmer cases**	Behaviour change of FFS farmer cases ***	Scaling**** *High, Moderate; Low*
Blantyre	Good	√√	√√	Low (but more than in other 3 cases)
Neno	Weak, but starting to be addressed	√	√	Low
Phalombe	After initial challenges, Good	√√√	√√√	Low
Zomba	Good	√√√	√√√	Low

Rating Scale:

***Implementation** (Source of evidence – feedback from farmers on the support provided, interviews with FAO and NGO implementing partners): *Very good:* Very consistent support and highly positive feedback from farmers; *Good:* Consistent support and quite good feedback from farmers; *Weak* inconsistent support and feedback from farmers is mixed; *Very Weak:* Little or no support and/or negative feedback from farmers.

****Assessment of Capacity & Behaviour Change** (source of evidence - individual farmer cases): *Very Significant Change (*√√√*):* Majority of farmer cases demonstrate highly positive change across all three dimensions of capacity (capability, motivation, opportunity), including adaptive capacity; *Moderate Change (*√√): Some farmers cases demonstrate some positive changes on one or two dimensions of capacity; *Limited change* (√): A few farmers demonstrate some positive changes on one dimension of capacity; *No change: (0):* No farmers demonstrate positive changes on any dimensions of capacity

***Behaviour: (source of evidence – individual farmer cases):** *Very Significant Change (*√√√*):* Majority of farmer cases demonstrate highly positive change in different aspects of targeted behaviour change (e.g. cropping, crop diversification, water management, livestock management, health and nutrition, conservation and biodiversity); *Moderate Change (*√√): Some farmers cases demonstrate some positive changes on one or two dimensions of behaviour change (as defined above); *Limited change* (√): Few farmers demonstrate one or two positive behaviour changes; *No change: (0):* No farmers demonstrate positive changes on any dimensions of capacity; *Negative impacts observed (-):* Farmers report mainly negative impacts.

*****Scaling: (source of evidence – FGDs and individual farmer cases):** *High* (extensively in community & beyond); *Medium* (at least 5 people within community); *Low* (limited sharing within community); *None* reported.

Table 28: Analysis of Assumptions of Theory of Change

Theory of Change	Effectiveness / Impact*				Evidence and Lessons
	Blantyre	Neno	Phalombe	Zomba	
Implementation: Effective implementation by FAO & Implementing Partners of learning oriented FFS approach	●	●	●	●	• Good implementation overall, except performance of one IP in one case. Shift from NGO IPs to government as main IP mid-way in programme • Some government staff lack capacity to monitor FFS programme. • To varying degrees there still appears to be significant emphasis on technology/ practice adoption rather than problem solving Mindset change and incentives a barrier to systemic change beyond adoption to learning paradigm (e.g. assessment of extension staff based on technology adoption achieved rather than problem solving; technologies listed under government manual etc). • Attempts made to support farming system diversification, but the learning plot activities still had a strong focus on maize, one of the least climate resilient crops. Challenging to have a farmer-led process only, if there is a need to shift away from maize-based systems in Malawi. Whole farm, food, livelihood and community natural resource management systems approaches are needed with visioning and planning at these scales. • Strong focus on generic climate resilience, but limited attention to participatory review of longer-term climate projections and community strategies. • Combined approach – cropping and livestock, nutrition, natural resources management, etc is valuable as it represents a more integrated approach, but the quality of encounters varies – e.g. nutrition encounters were more one-off and less participatory than cropping-focused encounters. Some inputs provided, but for poorer households there is a need for more support – either from the FFS or from social protection services.
Targeting: Hotspot identification process effective; Farmers willing to participate; Gender balance sought is achieved.	●	●	●	●	• Project evaluation gap on hotspot identification and improvements. • Group social cohesion, facilitative leadership, clear rules and a collaborative ethos all support good FFS functionality. • An inclusive FFS process is critical to success. Diverse membership is feasible under the right leadership conditions. An inclusive FFS group includes households of differing wealth. However, mixed wealth groups present specific challenges: the poorest have lesser access to and control over resources to enable them to participate in learning and to apply and adapt new knowledge and skills, making changes in their farming systems. and may require more tailored support for individual households. • Challenges often most significant for women and female-headed households because of discriminations they face. • Well-coordinated service providers giving complementary support could help to make FFSs more effective, particularly for more vulnerable groups. For example, linkages to effective social protection programmes are important– this is beyond the control of extension services, but it emphasises the need for cross-sector coordination.
Capacity strengthening: Approach is attractive and relevant to participants, who are willing to participate.	●	●	●	●	• Approach is attractive to participants. FFS are generally effective as groups for facilitating awareness raising and training. There are clear examples where the process has gone beyond this and strengthened capacity not only in terms of capability, but also motivation and to some extent opportunity. • There are clear examples of experiential learning, but quality of experiments and learning opportunities sometimes limited.

					• As a climate resilience programme targeted on areas characterized by climate vulnerability, multiple climate related shocks were anticipated, but level of shocks have been *high* (e.g. out of 4 seasons, two seasons marked by extended dry spells; 1 season affected by heavy rains and flooding). This limits the capacity of some farmers, especially those most affected or with least resources to respond, less able to adapt. • Some options strengthen resilience under all weather conditions, but others are specific to particular ones e.g. drought or heavy rains. Access to timely and accurate weather information is important to support farmers' seasonal planning is required and was beginning to be provided in the last year of the project. This points to more of a farm system approach to cope with variability of climate conditions. • Individual visioning and planning of farm, food and livelihood systems is needed. • More early attention to gender dynamics, for example via Gender Action Learning Systems interventions, prior to FFS learning and experimentation, may avoid risks of reinforcing gender inequalities and support scaling. • Access to land & water for *dimba* cropping - attractive to farmers, can significantly strengthen climate resilience, but scaling needs to be climate smart and sustainable. [e.g. Functioning of the local committees looking at water tables etc] • Livestock offer potential to strengthen climate resilience, but potential trade-offs and strong community institutions needed for free range livestock (goats, cattle, sheep). Focus on integrated nature of livestock into the farm system, not just increase in numbers. • To protect trees, community institutions need to be strong. Livelihood alternatives to charcoal production needed. • Inequitable gender relations constrain women's capacity to learn and innovate.
Behaviour change: Farmers have resources and sufficient incentives to adapt and innovate: Gender relations are enabling for women to learn and innovate.					• Quality (understanding and ownership of FFS approach, timeliness and intensity) of service provider support is crucial for FFS success. • Presence and performance of Community-based facilitators is variable • Processes of planning, measuring and reflecting on success could be given more emphasis. • Business capacity and access to markets is lacking. Business training needs to ensure attention to climate resilience. Consider balance between individual business vs group business. • Farmers are not always able to access inputs for learning plots. • FFS sustainability may be undermined where farmers have to bear direct financial costs, e.g. learning plot rent costs. • Address gender roles and decision-making in FFS and household from the start. • Information may be shared within the household, this is not the same as household learning, i.e. learning by doing process of FFS needs to somehow involve household level. • From a sustainability perspective, sufficiently motivated government extension staff have a key role to play. Community Based Facilitators may have traditional mindset and training as lead farmers and instead of enabling this may dilute extension and affect FFS leadership relationship and processes. CBFs need sufficient capacity especially understanding of difference between adoption and learning. • Some FFS members were not accessing extension services prior to FFS, only lead farmers, so group participation is increasing overall access for FFS members. • Groups provide confidence and enhanced access for women to extension advice.
Direct benefits and impacts: Baseline conditions are not worsening; Enabling environment supportive.					• Some farmers do not have enough resources to respond to propositions of which they are made aware or understand through FFS encounters. • VSL funds not generally invested in farming activities.

					• Ensure community leadership provides support to FFS • Irrigation infrastructure should be of good quality and well planned with communities • Project success measures focus on technology adoption, not problem solving • The role of Village Development Committees and their planning processes with respect to FFS needs further exploration • Is there a need to address farmer access to finance issue in additional ways (e.g. linkages to micro finance, payments for environmental services, provision of grants
Wider scaling and behaviour change: Mechanisms effective; Farmer incentivized to share lessons; Farmers have adequate resources / incentives to adopt and innovate.					• Design FFS encounters (and capacity to provide them as such) to take account of the diversity of farmers as a group and individually (including diversity of farm systems). Propositions should be sufficiently targeted to specific populations if they are complex or to have expansive affordances that allow potential users generous scope to reconfigure appropriately to their context. • FFS sustainability may be undermined where farmers have to bear direct financial costs. • A major challenge lies in government extension capacity. There very limited operational funds available for government extension services unless donor funded projects are in place. The DAES system should be helping to coordinate planning and activities at district level, but in general this system does not appear to be functioning (again the exceptions are where donor funded projects exist (e.g. USAID -funded SANE project) exist. • To support local, context specific innovation, Service Providers need to be coordinated around implementation of an agreed policy on extension services, and in strong partnerships with appropriate public, private, NGO actors building an overall high-quality innovation system. • Mindset change and incentives a barrier to systemic change beyond adoption to learning paradigm (e.g. assessment of extension staff based on technology adoption achieved rather than problem solving; technologies listed under government manual etc). • Wider community responses may be negative; affects FFS members' incentives to share with others in the community. • When project-based support for FFS ends, only some will continue as strong, independently functioning groups. • There is a need to strengthen both formal and informal seed systems to enable diversification. • Combined approach – a few cases where the combined approach has created synergistic positive outcomes at a household level in terms of farming and diets, but very limited in number. Natural resources management has not had as much attention and requires more of a community-wide intervention, but there are critical feedback loops to the household-oriented farming systems resilience. • Insufficient attention to climate information until later in the project and missed opportunity to explore longer-term climate projections with project stakeholders, including communities.

Legend		
Effectiveness & Impact Scale		Very Strong
		Strong

		Medium
		Limited or none

7.2 Key Lessons

Promotion of farmer experiential learning through FFS, as part of an integrated set of climate resilience interventions, can build adaptive capacity and stimulate practice changes amongst participating farmers, leading to improvements in more sustainable livelihoods and balanced diets. However, there are factors which draw back such projects into the technology transfer, adoption and scaling paradigm, which undermine success. The qualitative evidence suggests that the FAO project has strengthened the resilience of FFS participants, although it is not clear how far this has led to resilience strengthening across wider communities. The factors which drawback the project into more traditional 'adoption' paradigms are government policy and manuals, project results targets focused upon, individual FAO project and implementing partner mindsets. The project was founded on the notion of combined interventions to support a process of accumulation and diversification of livelihood assets, yet the FAO project results for strategic objectives have focused on simple adoption measures. There are always risks that evaluation indicators start to drive implementation.

The progression anticipated by the FAO includes three phases: foundational knowledge and skills, productivity increases, and income rises, and accelerated asset accumulation and diversification. The evidence generated by this study demonstrate that knowledge and skills have been widely increased, and participants also report some productivity increases and income benefits, plus some asset accumulation, but not universally so, and often to a limited extent per household, and especially for women.

Barriers to change remain significant, especially resource constraints and lack of access to finance, which have a gender and wealth dimension. There were multiple instances where farmers reported that they could not implement experiments on their own fields or more sustained changes in the farming system, because they lack the means – i.e. resource constraints, including lack of access to finance. This implies that many of the technologies proposed require resources to buy external inputs (e.g. hybrid seed), labour or land to implement. In some cases where the VSLs have been established this has started to enable the farmers to take loans, but in some cases, this is to pay for school fees. For others the investments are in productive activities, such as petty trading, irrigated farming etc. Systemic constraints are numerous – a good example is the lack of access of farmers to appropriate seeds and situations in which water resources are very scarce. A clear gender dimension emerged in this regard, with women and female headed households generally facing more challenges.

Achieving a shift from the simple technology 'adoption' paradigm, will require improved communication, understanding and learning employing and embedding a systems approach. Rather than understanding adoption as a simple, 'yes/no', one-off decision, the study aligns with other academic research, to show that the process of proposition, encounter, disposition and response is much more nuanced and complex. To achieve greater understanding of farmer decision-making regarding these new sets of technologies suggests an assessment should focus on a) the capacity of farmers to learn, evaluate and innovate in their farming, livelihood and diet systems on an on-going basis as the climate changes and other pressures occur and opportunities arise; b) technological changes in the household farming system rather than specific uptake of individual practices; c) issues of thresholds – at what point do the combined approaches work to lift farmers across certain socio-economic and environmental thresholds such that they are in an upward rather than a downward spiral.

The project is operating in highly resource-constrained and climate-constrained areas and has adopted an inclusive approach to forming FFS. The project has demonstrated that households of different wealth groups can work collaboratively in FFS processes, although it is harder for those with fewer resources, so more tailored support may be required for those households to fully benefit. While benefits were achieved in 3 of the 4 groups, there were relatively limited examples of combined experiential learning and improved access to services (e.g. finance) or inputs (e.g. goats, irrigation equipment) leading to transformative household changes. Deep-rooted changes, such as a shift away from maize cultivation, were relatively limited.

Changes will be social, not only technological. It is also important to note that changes are not only confined to the technological sphere. Governance innovation may be important – i.e. the collective action to find solutions. There are tantalizing examples of changes in social networks (a few examples emerged of improved linkages) which were associated with some examples of increased peer support. Unity and a positive, confident attitude to solution finding were common characteristics of the more successful groups – so far – including enabling women to have the confidence to participate and to be different, despite negativity from others. The confidence to share

lessons with others beyond close kin and immediate neighbours and the skills to influence them are perhaps under-acknowledged aspects of FFS scaling processes, i.e. the barrier to scaling is not only about lack of economic incentives, for example which might disincentivize knowledge sharing. More lessons will emerge in this regard, in terms of collaborative action, especially if there is no project support after this project ends, as the FAO project promotes its sustainability strategy, providing the FFS groups with business skills training and support for business plan development.

Early outcome indicators are useful to monitor, such as the functionality of the FFS and capacity of participants to observe, have self-confidence and solve problems etc. The functionality of the FFS as an organisation is critical to the success of the FFS process. Group cohesion and strong leadership (not hierarchical, but supportive and inspiring) are important characteristics, and appear to enable the groups to conduct more robust comparisons on the learning plot and hence to identify solutions. The quality of external support merits attention: facilitation must be consistent, high quality, and avoid being sucked back into traditional technology transfer approaches. A functionality assessment tool is desirable for project monitoring.

Successful FFS groups are more likely to continue post-project, but more robust sustainability assessment requires post-project evaluation. The extent to which FFS groups are sustained over time is also an important issue. Key questions include: How long do groups need support for? How long will farmers continue to operate them independently, post-external support and to what effect? All the groups indicated that they were keen to continue their FFS groups and to see them continue. FAO has begun training all of the groups in developing business plans and skills, but it is not yet known how successful the groups will be in operating as collective businesses. The FFS group in Neno continued, despite a period without any external support and has shown signs of recent recovery. Projects need different kinds of results targets and more flexible funding to tailor support to differing groups, but also ultimately, the idea would be for FFS groups to be on-going entities supported by diverse service providers who have a range of funding sources. This would overcome the stop-start nature of projectized support and funding. When there is a very challenging year, although this provides farmers with the opportunity to see the value of climate resilient cropping and livelihood diversification activities, it can frustrate learning as comparisons are not necessarily possible to see.

Scaling has been limited and has mainly been restricted to close neighbours and kin, however, this study only explored FFS participants' reporting of their sharing, rather than being able to assess changes in neighbouring communities directly. One of the barriers relates to farmers' confidence to share and their ability to influence others, as well as distance. It is important to understand that scaling beyond the FFS group and community, is not a simple adoption process, just as we have explained for the within FFS group process.

Community dynamics and resource trends, alongside longer-term climate change play a role and such trends will mediate the success of farming-based interventions. Some FFS members or their household members were having to seek work elsewhere or were observing greater opportunities off-farm and elsewhere. From a broader rural development perspective, land scarcity in southern Malawi means that many rural residents have and will continue to move off the land either temporarily or permanently. There needs to be a much more inclusive and informed debate on the future of smallholders. This may consider the trend towards an increase in medium scale and urban-based farmers, how to facilitate equitable land transfers, the government's role in creating decent work in rural and urban areas through coordinated policies. In such land scarce areas, there will be increasingly challenging trade-offs in household and community decision making, regarding land use. On-farm intensification is being facilitated, with efforts at tree planting around homesteads and around fields, but extensive tree planting may have implications for food production, although soil fertility enhancing trees could conversely help to increase yields. The work to date on natural resources management has experienced more challenges, but a key lesson learnt by one of the implementing NGOs is the importance of engaging with the entire community, rather than only seeking to act via the FFS. More systematic emphasis on ecosystem restoration and enhancement is needed, including community engagement in land use planning and management – the FFS cannot work on this alone. Disincentives such as bylaws are as important as positive incentives (e.g. distributing tree seedlings), and encouragement of preventative measures (e.g. bush clearing to allow natural regeneration to occur). Work on indigenous, neglected crops was positively received by farmers, but is limited in scale and this should be expanded.

Gender dynamics exist in FFS: Women and female headed households tended to have less access to resources to enable them to benefit as much as their male counterparts, although many were positive about the experience and noted that they were achieving greater access to agricultural extension advice. Many of the female headed households and women interviewed as individual case studies encountered serious household shocks, e.g. ill health of children, which combined with the pressures felt across communities with the increased climate variability. There is an opportunity to improve the impact of FFS, if more attention is giving to gender issues in the earlier stages of the initiative (e.g. via Gender Action Learning Systems - a participatory approach). Given the centrality of farmer household decision-making within the FFS process and its outcomes, it is important to unpack the gender dynamics involved. Women are well-represented in many of the groups, and the FAO has been innovative in promoting mixed wealth and gender groups. In one group men had been less interested to join, indicating they did not see value in the group, but women were highly motivated, despite often having heavy work burdens already and limited availability of labour to institute changes on their own plots. The evaluative learning team has not had the chance to explore gender issues in intra-household decision-making in an in-depth manner, but the evidence clearly shows that there are gendered dimensions involved in terms of benefits realized and processes of sharing (scaling).

The enabling environment is far from favourable with respect to farming and livelihoods in southern Malawi. There are many disabling dimensions to the external environment for farmers in southern Malawi, many of which were alluded to by farmers interviewed. For example, although 21 out of 31 respondents accessed the FISP over the life of the project, in many cases they did this only once.

7.3 Recommendations

Recommendations for Project Implementers, Extension Projects Supporting FFS and governments

- Support continued expansion and implementation of Farmer Field Schools, as part of an integrated community development approach as a means of strengthening climate resilience for participants.
- Seek to instil a widespread change of thinking to shift beyond an 'adoption paradigm' to one that promotes a 'learning paradigm'. This means addressing the systemic, root causes that create resistance to change, including individual beliefs, social norms, organisational cultures and formal policies and guidance. Jointly with decision makers examine the implications of 'adoption' thinking and why it undermines effectiveness and positive impact. Wider changes in the agricultural extension system are likely to be needed and should be sought.
- Ensure that monitoring and evaluation systems embrace the new 'learning' paradigm by including appropriate outcome-oriented indicators linked to the theory of change (e.g. participatory monitoring of FFS group functionality, assessment using FFS principles and anticipated benefits and including measures of adaptive capacity). Such monitoring data should be linked to decision-making through stronger field-headquarter learning loops.
- Consider how to ensure experiential learning process can be sustained, despite the inertia and enabling environment signals that pulls projects back to more traditional technology transfer approaches. Recognize that as farmers identify solutions appropriate to them, this can mean all different kinds of outcomes, not only straightforward yes/no adoption.
- Seek to generate systems that provide on-going support to FFS through diverse service providers, rather than stop-start projectized funding support. Fill gaps - i.e. continue and extend support to the FFS where there have been weaknesses in the support or specific gaps that could be fulfilled and to extend the reach of the combined measures to more farmers (e.g. offer of goats, chickens, irrigation equipment). Ensure all groups which would like to do so have a functioning VSLs as a matter of priority.
- Increase investment in participatory gender action research in the initial stages of FFS processes. For example, Gender Action Learning Systems have been shown to support more gender-equitable outcomes and investment in such an initiative would pay dividends for integrated FFS approaches as promoted and would avoid the risk of the unintentional reinforcement of gender inequalities by the

project. A pilot in a small number of districts should be supported to demonstrate effectiveness, followed by cumulative sharing and learning to achieve scaling.

- Trial whole farm-system analysis using decision-support tool such as PICSA to see its potential for exploring more systemic changes in farm, livelihood and diet systems, rather than focusing on individual (sets) of technologies. The pilot should assess what such an approach offers and if it can be integrated into an FFS process via peer learning.
- Consider extending the length of support where farmers have major setback e.g. prolonged dry spells in growing season that frustrate comparisons on LP and on farms. All exits should be graduated to give the FFS more chance of continuing alone.
- Assess technologies and practices in terms a range of climate conditions e.g. to excessive rainfall as well as prolonged dry periods
- Capture lessons on the 'FFS as a business' sustainability exit strategy and to post-project continuation and challenges of FFS groups to inform the wider community of practice.
- Government should recognize the flexibility that implementers need in their funding to enable responsiveness to FFS groups, but also to specific shocks, which might require longer-term support for certain groups.

European Commission

- Continue to support FFS roll out in Malawi, given the positive evidence generated in this report, and to promote uptake of the key insights, notably the need to tackle the root causes of the 'adoption' paradigm stickiness, and the need to shift thinking quickly to a 'learning paradigm', including amongst senior government actors. While the latter may be challenging, a social learning approach, as begun under the SAIRLA programme, may provide a route to engaging policy-makers for more evidence-informed decision-making. Support different kinds of farmer experiential learning-based agricultural extension, such as FFS – the most important thing is enabling farmer learning within a more conducive environment and with improved access to services and markets.
- Ensure that the final external evaluation of the FAO moves beyond the paradigm of technology transfer and adoption and recognizes the key principles of FAO FFS approaches, the specific approach being implemented in the SCR project (FFS CdR) and what this means for evaluation methods.
- Engagement with the government on enabling environment issues to fully unlock the potential of FFS, or indeed other approaches to agricultural extension, as they are rolled out within Malawian agricultural extension services. Promote concrete examples where farmers are benefitting from local processes of technological development and farmer learning. Find and invest in innovative ways to communicate examples and evidence of changes achieved through experiential learning by a range of farmers with different access to resources. The effort should specifically explain the difference between 'adoption' thinking and its consequences, and 'farmer learning' approaches.

Climate Resilience Community of practice

- The room for manoeuvre is quite limited for farmers in highly resource and climate-constrained contexts, although the need for action is high and this study demonstrates that such approach can make a positive contribution, although the results are still fragile and there are challenges in scaling processes.
- Generate robust evidence on different FFS approaches in a context of shifting climate baselines to contribute to a stronger evidence base for Sub-Saharan Africa. This new evidence should recognize the complexity of integrated community approaches channelled via FFS and aiming for climate resilience in highly pressured contexts – evaluating such approaches based upon the 'numbers of technologies adopted' fails to capture the essence of the approach and, therefore fails to really explain outcomes.
- Comparisons between such approaches are needed, which explore the potential of FFS CdR in more- and less-constrained contexts both biophysically and socioeconomically.

Malawi Government

- Ministry of Agriculture and associated relevant ministries to explicitly engage in learning processes to help inform their policies and investments in agriculture under changing climate.
- FFS CdR offers clear potential to strengthen farmers' climate resilience, but it needs to be implemented as part of an integrated approach to strengthening agricultural extension and agricultural services in general.
- Government policy is to diversify agricultural systems to be less dependent on maize, but resources need to be allocated to implement this policy and this will include strengthening capacity for research and extension services to use more of a farm systems approach.

Annex 1: Detailed analysis of FFS groups in the different case studies

FFS Group/ Expectations	Nang'omba FFS, Blantyre	Tikondane FFS, Neno	Nthundu FFS, Phalombe	Kapako FFS, Zomba
Meeting expectations	**Majority Partially or fully met** 2018: Most individual farmers (7) reported that the FFS had met their expectations, with just two reporting that expectations have only been partially been met. 2019 most participants said their expectations have been met; they have enhanced knowledge on cropping and conservation agriculture, on nutrition and money management.	**Partial or limited meeting of expectations** The project had partially met expectations of the remaining members, but membership had declined from 40 to 19 members. Following a good 2016/17 season, in 2017/18 there was a severe drought and the learning plot did not do well. However, although they planted maize later in the learning plot than in their own fields, the maize in the learning plot appeared to perform better than the maize in their own fields. Add from Noella. In October 2019 there was a mixed response on whether expectations had been met, with many participants highlighted improved skills e.g. cropping and soil management, enhanced manure making, access to goats, but the lack of farm inputs or their fair distribution was a disappointment to some.	**Most fully met** 2018: Yes, met individual expectations fully or partially (for one it exceeded) - learning diverse skills. The members understand that the project is addressing food, nutrition and income insecurity which they welcome. Challenge of the 2017/18 season with heavy rains which then stopped affecting crops, although learning plot did produce a maize harvest and a range of previously neglected crops. 2019: Positive responses on higher yields, crop diversification in light of climate change, pest management methods, crop spacing.	**Majority Partially or fully met** In 2018, 2 participants said that the group has not (yet) met their expectations (e.g. they need more skills and knowledge), but the other 7 say that is has. Women's FGD said not all expectations met, but they are pleased to have knowledge on a variety of seeds that can do well in Kapako. By 2019 all farmers were positive that they were better off as a result of their FFS participation despite a difficult last season due to the weather.
Functionality of group	**Functioning quite well.** Functions quite well, although participation is somewhat variable, especially as participants from different villages.	**Not functioning well** The group has suffered internal tensions, exacerbated by a lack of external support as well as an act of extreme violence which affected a key member. A smaller core is continuing and in 2019 the group had resolved some internal tensions.	**Functioning very well:** Functioning well. We are united, good cooperation (women's FGD]. Good leadership, active participation, clear rules and sanctions no 'drop-outs', fines of Kw 200 if people don't attend. Access to irrigation equipment has been a challenge and learning plot costs.	**Functioning very well:** Good functionality – although some members have been supported by the FAO to create a new group to reduce travel times.
Participation (membership of group)	**2018**: • Membership: fairly constant, just 1 drop out (due to death). 29 in group. • Reasons for dropping out: Death of a member's spouse. • Composition; 60% women; 80% below 45 years. Sixth of members are from female headed households. **2019**:	**2018**: • Membership: Declined significantly from 40 to 19 members (10 women, 9 men). Out of 9 case study farmers, 2 have left the FFS (1 woman, 1 man). • Reasons for dropping out: Frustration at seepage well not working. 1 man was dismissed by the group due to misunderstandings. 2 cases could not be interviewed. 1 man has moved out of the village. 1 woman was ill.	**2018**: • Membership: It has remained constant (30 members) • Composition: 22 women, 8 men [*women volunteered, men felt they have other things to do].* Majority less than 45 years old. 1 female headed HH representative. All completed at least some primary schooling, but they did not attend secondary school. **2019**: • Membership: Minor decline from 30 to 27 only.	**2018**: • Membership: There has been quite a significant decline, from 40 members to 29. • Reasons for dropping out: 3 moved out of the village to find work. Some dropped out because they live far away, and they formed their own groups. • Composition: Of 33 of the original members, 61% of the members are women and 73% of the

	• Membership: 30 members • Reasons for dropping out: 5 dropped out (1 is too busy with wage labour, 1 died, 1 migrated, 1 returned to home village following death of spouse (matrilineal system). • Composition: 10 men, 20 women.	• Composition: Of 23 of the original members, 57% of the members were women and 61 % of the members below the age of 45 years. 22% of the members were heads of female headed households. **2019:** • Membership: This increased again slightly (from 19 to 23). (4 men; 19 women). 6 people had dropped out, 7 new members. • Reasons for dropping out: dissatisfaction with benefits obtained (perceived unfair distribution of inputs, benefits not being derived). • Composition: 5 female headed households,18 male headed households.	• Reasons for dropouts: Divorce, migration, 1 just stopped coming as could not see benefits. • Composition: Currently 7 men, 20 women.	members below the age of 45 years. 24% of the members are heads of female headed household **2019**: • Membership: Slight decline (but not only due to lack of commitment). 24 participants (7 men, 17 women) • Reasons for dropping out: to join a separate FFS which was set up closer to their own village to reduce travel time. • Composition:
Future plans for the group	Plans to continue, but some uncertainties. 🟢	Plans to continue, but some uncertainties. 🟢 , plans to divide up learning plot to individual members (not very clear on how this will work therefore).	Definite and clear plans to continue. 🟢	Definite and clear plans to continue. 🟢

Legend:

Meeting expectations	Functionality	Participation	Scale
Not meeting expectations at all	Group not functioning at all	Significant decline	🔴
Partially or limited meeting of expectations for some	Group not functioning well	Slight decline	🟡
Partially or fully meeting expectations for majority	Group functioning quite well	Constant	🟢
Fully meeting expectations of majority	Group functioning very well	Increased	🟢

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Annex 2: Summary of Benefits and Impacts Reported by Farmers (Source of evidence: individual farmer case studies and FGDs)

FFS Blantyre	FFS Neno	FFS Phalombe	Kapako FFS, Zomba
• A range of benefits reported, but they did not report significant changes in household livelihood assets. Some incremental changes were noted, but it is not always clear if these are due to the FAO intervention. Early to assess change in livelihood assets, particularly given the challenges of the recent season. • 1 reported no change in assets, but slightly higher harvest despite challenging conditions. • 1 farmer reported changes such as school fees paid for from the VSL, but it is not clear if this is an FFS VSL, plus the establishment of a grocery which has helped her to buy an iron roof and buy a mobile phone – with a contribution from the project. • 1 farmer reported that their social network has expanded, they have obtained improved yields of ground nuts and changes in livelihood diversification, had obtained a small loan, but this farmer did not yet report a change in livelihood assets. • 1 farmer – her house had been destroyed by storms in 2017, and so she is in a worse position than at the baseline. She has been able to borrow from the FFS VSL bank to buy fertilizer for vegetables to grow them in the dimba and to pay school fees. • 1 farmer has new food source, which has also become a livelihood activity (tomato and home garden production). He also noted that his land is well conserved, obtained loans from the VSL to pay school fees. • 1 farmer – now has a mobile phone and his dambo plot is productive (although the latter is not due to the project), but, overall his assets have not changed significantly, other than a new mobile phone. • **Increased agriculture productivity has led to food diversification and improved disposable income (can now afford to buy clothes).**	• Limited tangible changes in the livelihood assets as reported by the participating farmers, although this is not unsurprising given that this is relatively early in the project cycle. • 3 participants reported improved or slightly improved harvests, despite the prolonged dry spell. • None reported a significant change in household assets, except for one farmer who reported some improvements e.g. in gaining an iron roof and mobile phone, but it is not clear if this is the result of the FFS process. • These findings should be viewed in the context of the unpredictable and low rains that the farmers in Neno experienced as well as poor performance by the implementing partner, which meant that extension advice ceased at a certain point during the second season.	• Overall the farmers reported a range of benefits, but few note major changes in assets and livelihoods resulting from the FFS process so far. • A majority report benefits derived from FFS participation, most notably from slightly improved yields. • 1 woman - sale of mustard at the market has helped her family to cover their basic needs. • 1 man - the irrigated farming and access to VSL loans has helped them to meet their home needs. • 1 woman - increased crop yields, has helped him to buy an engine water pump, additional livestock and to cement the floor of the kitchen, use iron sheets for the roof and use burnt bricks for the walls. • 1 woman said that increased income from livestock and the dimba planting of mustard, sweet potatoes and onions has helped her to buy necessities at home. • 1 man - because of the FFS they had bought ducks and learnt about irrigation farming, which is more profitable, although they did not indicate a change in the household assets/food security. • 1 man - maize cropping is failing in periods of poor weather, especially the use of conventional fertilizers. Although he is moving towards a more resilient farming system, he is not there yet due to the bad weather. He is investing more time in farming and in leading the FFS group, but does not report changes in and food security, so far. • 2 women: no change in assets and food security: One reported improved crop diversification, but not change in assets and a second woman said no change has occurred in their assets.	• Individual cases - few farmers have achieved changes in livelihood assets. • 1 farmer reported receiving 5 goats. • Another reported that he had made improvements in his house, has a mobile phone and overall things are improving. • For the others few concrete benefits have yet been captured due to the FFS process, but it is quite early to expect to see such changes. • In a couple of cases farmers reported that they could still harvest something despite the challenging nature of the preceding season. More time is needed to see if the approach can lead to an increase in livelihood assets, especially in better years, to enable farmers to cope with harder times, especially given the climate projections.

• 1 farmer – now hase a new house with burnt bricks and iron sheets for the roof, although still a mud floor. They have benefited from being within a VSL (loans to pay school fees), but this is not an FAO FFS supported VSL. • 1 farmer reported that the project has led to improved food diversification and income to buy clothes.			

Annex 3: Changes in FFS members' assets by October 2019

	Nang'omba FFS, Blantyre	Tikondane FFS, Neno	Nthundu FFS, Phalombe	Kapako FFS, Zomba
Changes in building materials used in constructing members' houses	• 4 out of 8 respondents had changed the building materials. 2 now have iron sheets as roofing; 1 has plastered and applied lime to the walls and put a cement floor and 1 is buying cement to do so. • 1 member is building a bigger house with the same type of building materials. • 3 respondents explicitly linked these changes to the FFS. One used money from the VSL and another explained that membership of the FFS has made him more dedicated to farming and this provides income. • 2 members' houses had fallen down due to heavy rains. In 1 case her thatched house was completely destroyed, so she built a house with iron sheets, but the walls were not protected, and a wall collapsed.	• Only 1 out of 6 respondents reported a change in building materials for their house. One woman reported that she had plastered the walls, but roof (grass thatched) and floor are unchanged. • In 2 cases, the housing situation had become worse in that the houses were destroyed by the heavy rains and wind in early 2019.	• 4 out of 7 respondents had changed the roof of their houses to iron sheets and a further one was in the process of building a new house with iron sheets. • At least 2 respondents explicitly linked this to knowledge and skills gained from the FFS. • In 1 case the house fell down on one side due to heavy rains	• Only 2 out of 8 respondents reported a change in building materials for their house. • 1 had built a new house using iron sheets for the roof and burnt bricks for the wall and attributed this to income through the sale of goats not linked to the FFS. • 1 had laid a cement floor and pointed the walls of the house with cement, which he attributed to income linked to the FFS
Change in mobile phone	• 5 out of 9 respondents had a mobile phone. • 3 had acquired their phones during the life of the FFS of which two linked this to the FFS. • 2 women explained they used income from the sale of agricultural produce which had been produced using skills acquired through the FFS.	• 3 out of 6 respondents had a mobile phone. • 2 women had not owned a phone before, while one man had but replaced it with a better one. • Only 1 respondent (a woman) linked the purchase to the FFS – she had bought it with revenue from sale of sweet potatoes which she had acquired with help from the FFS.	• 4 out of 7 respondents had a mobile phone • 3 acquired their phones during life of FFS • Only 1 member explicitly linked this to the FFS. She bought her phone after VSL members had shared their savings.	• 5 out of 8 had a mobile phone • 4 acquired their phones during life of FFS • 3 (2 women) linked their purchase of a phone to FFS membership. • 1 woman bought with credit from VSL • 1 man produced more (to sell) as a result of his FFS skills.
How knowledge about agriculture is acquired	• 9 out of 9 respondents reported that how they acquire knowledge about agriculture has changed. • 8 out of the 9 attributed the change to the FFS. • One man explained "*In those days, the government extension worker could just pass by, but now have access through NGOs. They are now custodians of information themselves*".	• Question was not clearly answered. • 6 out of 6 respondents reported that how they gained knowledge had changed, but in most cases, they reported the knowledge they had gained, not how they had gained it. • However, one man explained "*In the past, knowledge about agriculture could be accessed from government extension workers through the village head. The village could call for a meeting where extension workers could orient the people at such meetings. However, at the moment there are additional sources of agriculture knowledge; extension workers from NGOs and also FFS members*". Another man commented that in the past, he had no access to knowledge about agriculture, however, currently he has access through FFS members.	• 7 out of 7 respondents reported that how they acquire knowledge about agriculture has changed. • 6 out of the 7 attributed the change to the FFS.	• Question was not clearly answered. • 8 out of 8 respondents reported that how they gained knowledge had changed, but mostly they reported the knowledge gained, not how they had gained it. • However, 2 respondents clearly linked the change to membership of the FFS • 1 man explained "*In the past knowledge was from radio which means they were doing things in ignorance. Now things are on the ground and he is gaining practical experience*". • One woman explained there have been changes. Previously, she had access to knowledge about agriculture through extension workers only. However, currently she has access through a lot of people like extension workers, community facilitators and other group members, as well as NGO officers.

Source of advice on agriculture	• At least 5 out of 9 respondents now regard the FFS as a source of advice on agriculture. • 7 of the respondents felt they could get advice from extension workers. For at least 5 of these this was a change linked to joining the FFS. • One woman explained that "*at first she was not able to ask and didn't know how to approach*" the extension worker.	• 3 (one woman) out of the 6 respondents now regard the FFS as a source of advice on agriculture. • 1 out of 6 reported the (government) extension worker as a source of advice.	• At least 4 out of 7 respondents regard the FFS as a source of advice on agriculture. • 5 respondents felt they could get advice from extension workers. For at least two of these this was a change; prior to joining the FFS they felt that they had no access to extension services. • 1 member mentioned getting advice from a lead farmer. • 1 member explained that joining the FFS gave him the motivation to listen to the radio for more agricultural information.	• At least 6 (4 women) out of 8 respondents regard the FFS as a source of advice on agriculture. • 4 (two women) out of 8 reported the (government) extension worker as a source of advice and one man explained that joining the FFS had enlightened him on how to access extension services.
Access to physical help in agricultural activities	• There was no change in how members' access physical help to do their agricultural activities. • In all but 2 cases, family is the only source of labour. • 2 members hired labour, but this was not linked in any way to the FFS.	• 6 out of 6 cases respondents reported that they still relied on family labour only.	• 7 out of 7 respondents reported that there was no change • In all cases they still relied on family labour only.	• In most cases respondents reported that they still relied on family labour only. • Two men reported that they did hire labour, although it was not clear whether this was a change associated with the FFS.
Access to water resources for farming	• 9 out of 9 respondents reported that they have access to water for farming in the dry season. • This was either from a well dug themselves (4), a seepage well (2) or a river (3). • 2 out of 9 respondents referred to a seepage well which had been constructed. The construction of the seepage well was attributed to Mr Lazaro, the TLC extension worker by one woman and FAO by one man. The man explained that FAO had explained that was a certain organization that wanted to donate a well, looking at the challenges faced by farmer who want to access water for irrigation. The community were responsible for digging the well and providing sand. FAO brought cement, bricks and other materials. Furthermore, a solar pump and drum tank were provided for *dimba* irrigation.	• 5 out of 6 respondents reported that they have access to water for farming in the dry season. • Sources of water included: wells dug by the farmers themselves (1), seepage well (2) and boreholes (2). • 1 member linked the construction of the seepage well to the presence of the FFS. • One respondent explained that most people in that community do not have access to *dambo* to do *dimba* cultivation.	• 6 out of 7 respondents reported access to water for farming in the dry season. • This was either from the Phalombe river or a borehole. • 3 of 7 respondents reported a change in access to water for farming and this could be attributed to membership of the FFS. • Two women use water from the Phalombe river; one explained that she used the FFS treadle pump and another that she had learnt about irrigation farming through the FFS. • One man rented a diesel pump for irrigation and explained that membership of the FFS has motivated him to do this.	• 7 out of 8 respondents reported access to water for farming in the dry season. • Sources of water included: wells dug by farmers themselves (2 respondents), streams (1), dams constructed by government (2), a seepage well-constructed by the FAO (2). • 2 out of 7 respondents reported a change in their access to water for farming that could be attributed to membership of the FFS. One man linked the knowledge he had gained from the FFS to irrigation in *dimba* plots and one woman linked the FFS to the seepage well-constructed by FAO.
Main source and access to cooking fuel	• 9 out of 9 respondents reported using firewood for cooking fuel and one man reported buying charcoal. • No changes appeared to be linked to the FFS. • One woman reported that she had established a woodlot, but this was prior to the FFS.	• 6 out of 6 respondents reported using firewood for cooking fuel. • No members reported a change linked to the FFS. • Only 1 respondent had a woodlot and he explained that this had been established after getting advice from the FFS.	• At least 5 out of 7seven respondents reported using firewood for cooking fuel and in 3 cases this sometimes involved buying the firewood. • 4 out of 7 respondents used sorghum, maize or sunflower stalks as a source of fuel. • Only one member reported a change relating to the FFS and this was that the FFS was advocating the use of stoves.	• At least 7 out of 8 respondents reported using firewood for cooking fuel. • 2 out of 7 respondents reported using firewood from trees at or close to their house. 2 respondents reported a journey of at least one hour to and from the collection point for firewood. • One woman reported that she uses stalks from maize, pigeon pea as a fuel source. • No members reported change linked to the FFS.

Sources of income and proportion coming from agriculture	• 9 out of 9 respondents earned income from the sale of agricultural produce, and for two of these members it was their only source of income. • 2 men reported that part of agricultural income was from livestock. 2 women also reported piecework as a source of income,2 women did petty trading and one a small grocery. One man is a builder. • The main change attributed to the FFS was 1 man explaining that there had been an increase in his income from *dimba* farming and also livestock. • 1 woman explained that her income from *dimba* cultivation had increased through the knowledge gained from the FFS.	• 5 out of 5 respondents earned income from the sale of their agricultural crops or livestock and for one woman this was their only source of income. • One woman earned no income from the sale of her own agricultural produce. Two respondents (both men) reported piecework as a source of income. • In all cases respondents were directly or indirectly (piecework or trading) dependent on agriculture. • One woman explained that she had received livestock through the FFS. One man reported he was putting more emphasis on agriculture and less on casual labour because of the FFS.	• 7 out of 7respondents earned income from the sale of agricultural produce, and for four of these members it was their only source of income. • Two women also reported piecework as a source of income. • The main change attributed to the FFS was one male member explaining that there had been a big change in the percentage of his income coming from agriculture. Previously he had been trading in charcoal, but he had realized the extent to which charcoal burning was causing deforestation.	• 6 out of 8 respondents earned income from sale of their agricultural produce; for 2 men it was their only income source. • 2 women earned no income from the sale of their own agricultural produce. • 4 respondents (3 women) reported piecework as a source of income and for one woman this was her only source of income. 4 women were involved in small scale business/ trading. • All respondents were either directly or indirectly (piecework or trading) dependent on agriculture. • 3 respondents reported that the FFS had contributed to change. • 1 man used to do business & casual labour but was now 100% farming. • 1 woman reported that the FFS VSL (together with the village VSL) allowed her to earn income from selling sweet potatoes, green maize and cabbages • Another woman reported that access to knowledge and borrowing MK 20,000 from the VSL had enabled her to do small scale business.
Access to credit in the last 12 months	• 9 out of 9 respondents reported that they had borrowed money over the past 12 months. • Main source of credit was VSLs and it appears that 8 out of 9 respondents accessed credit from the FFS VSL.	• 6 out of 6 respondents reported that they had accessed credit in the past 12 months. • At least 4 out of 6 respondents borrowed from a VSL, but it was not always clear if this was the FFS VSL. • 1 member reported she had borrowed from a bank and another from a private individual. • No respondents reported that credit had been invested directly in farming.	• 7 out of 7 respondents reported that they had borrowed money from the FFS VSL in the past 12 months. • No other sources of credit were reported.	• 6 out of 8 respondents reported that they had borrowed money from a VSL in the past 12 months, although it was not always clear whether this was the FFS VSL. • None of the respondents reported that the credit had been invested directly in farming. • The only other source of credit reported was the One Acre Fund.
Organisations or groups in the village most trusted	• 6 out of 9 respondents mentioned they trust the FFS • 3 members (all women) trusted TLC most and 3 FAO. • 1 man reported there is no reliable organization	• 6 of the 6 respondents reported that they trust the FFS. • Two men reported that they had never belonged to any other group.	• 4 of the 7 respondents mentioned that they trust the FFS and /or the VSL. • ADRA, World Food Programme and the Social Cash transfer programme (although she was not a member) were each reported by three different women. • One man reported that previously there was no organization, but now it is FAO, working with the Ministry of Agriculture	• 7 of the 8 respondents reported that they trust the FFS. • 3 respondents mentioned FAO, 2 mentioned the NGO Save the Children. • 1 woman explained that she trusts FAO very much; this is the only NGO she has so far worked with. She also trusts the FFS because of the good work. She knew almost 75% of FFS members before but started trusting them after joining the FFS.

Annex 4: How FFS Cases Performed Against Key Principles of FAO Farmer Field Schools (Source of Evidence: FGDs, Learning Plot Visits; Case Study Interviews; Field Visits)

FFS Group/ Principles of Learning Plot (LP)	**Nang'omba FFS, Blantyre**	**Tikondane FFS, Neno**	**Nthundu FFS, Phalombe**	**Kapako FFS, Zomba**
1. The field is the learning place.	Group has managed 3 main seasons and a *dimba* plot for 2 winter seasons, including under the challenging dry weather conditions in the second season/cycle and harvested some crops in all seasons. However, following the 2018/19 main season did not go to plan, because the agreed seed was not made available to members. Overall there is medium capacity in the group to manage the LP as a site of learning, with some challenges encountered (e.g. seed issue in 2018/19), but also some variable explanations from individuals suggesting inconsistent active participation.	Group managed the plot for 2 seasons, including under the challenging dry weather conditions in the second season/cycle and harvested some crops in both seasons. There was no learning plot in the 2018/19 season. For the 2019/20 season planning to give each FFS member a piece of plot at the learning plot to do research and share the findings to the group.	Group has successfully managed the main plot for 3 main seasons & managed the winter plot for 3 seasons (not clear whether 2019 season activities were an experiment), including in challenging dry weather conditions in 2nd season/cycle and harvested in all seasons. "*The LP is really helping. People are able to see themselves practically what is happening. E.g. how to use chemicals to control FAW*" [Men's FGD 2019]. "*The farmers are able to understand what is happening when done in a practical way hence they are able to apply the technologies at home*". [women]	Group managed the main learning plot for three seasons and a *dimba* plot for 2 seasons (not clear whether 2019 season activities were an experiment), including under the challenging dry weather conditions in the second season/cycle and harvested some crops in both seasons Both men and women referred to learning through practical experience in the learning plots.
2. Facilitation, not teaching.	Local NGO said project aim is to help farmers respond to climate change, to help them identify suitable crops for their area, to experiment with them in the FFS and choose which are best, seeing for themselves. FFS chair and at least one member (both males) were able to explain what was happening in the learning plot. Both women and men could draw maps and explain the main LP on site in 2019. However, the explanations of women and men differed. Style of leadership was described as strong by the participants. While members make a plan with the extension worker, there appears limited scope for the participants to identify their own activities on the LP. Unusually, there are four male, lead farmers, which may influence gender-based decision-making.	FFS chair and at least one member (both males) were able to explain what was happening in the learning plot. FAO representative said farmers need to be able to identify problems and to find solutions together in the FFS. They compare different technologies and come up with the best depending on the climate change experienced.	FFS chair and at least 2 members (all males) could explain LP activities. Female members could also provide detailed explanations in FGDs. 1 female member reports conducting own-farm experiment of maize + chemicals vs maize + organic manure) Both women and men could draw maps and provide detailed explanations on site in 2019.	The approach used seems to be a combination of teaching (e.g. specific agronomic practices) and facilitation of experiential learning e.g. comparing different ways of controlling FAW. FFS chair and at least 6 members (all males) were able to explain what was happening in the learning plot. Female members could also provide a detailed explanation of the learning lot activities. Both women and men could draw maps and provide detailed explanations on site in 2019.
3. Hands-on & discovery-based learning "learning by doing".	FFS chair and at least 1 FFS member could explain what they had learnt through managing the plot for two seasons. Some evidence that individuals are experimenting in their own fields • The original aims of the rain-fed learning plot activities were to compare different crop	FFS chair and at least 1 FFS member could explain what they had learnt through managing the plot for two seasons.	Both male and female FFS members could explain what they had learnt by managing the plot for three seasons. Some farmers starting to experiment in their own fields.	Both male and female FFS members could explain what they had learnt through managing the main learning plot and the dimba plot.

	varieties and different agronomic practices. However, both women and men reported that activities didn't go to plan because FAO didn't provide the seed that was expected (the men explained the trained Community Facilitator has misappropriated the seed). As a result, the plans were modified but the women and men's FGDs gave differing versions of what took place. As in previous years the design of the plots made comparison difficult. The FFS has enabled some collective learning through the LP. However, there are some issues with the extent to which the quality of the comparisons made at the LP and the consistency of individual, active engagement of farmers in the LP.			
4. The farmer as expert.	Limited evidence of the extent to which community members are recognized as experts within their own context. Though farmers test the technologies in the LP, FAO seems to see this as a way in which the farmers can take ownership of the technology and to be convinced of its value, rather than them being able to evaluate its effectiveness for their own context, which might also mean that while there is scientific evidence behind the effectiveness of the technology under controlled conditions, they may not be appropriate for individual farming households, given the diversity of their contexts and characteristics.	Limited evidence. 1 female member (ML) explained officers did not take local people's advice and built a 5 m seepage well which yielded no water. In nearby village they listened to local people constructed an 8 m seepage well producing water for irrigation	Limited evidence of the extent to which community members are recognized as experts within their own context. Members felt that they did have an opportunity to contribute. For example, they wanted to compare one plant per station (extension idea) with 3 plants per station (their own idea). They decided to plant sunflower on the LP, so it was not left partially empty. They can sell the sunflower to get money to pay the rent on the plot.	Limited evidence on whether the farmer was considered an expert in their own context. However, women reported that the idea of different technologies to control FAW was brought by one of the members and everybody welcomed the idea and put it into practice. The idea of growing crops such as groundnuts and sweet potatoes as a group to be selling and the money to be deposited in the VSL of the group was also an idea of a member of the group. The group has a welfare committee which they help each other when they are in trouble, this was also an idea of the group members who saw what was happening in another group in the nearby villages
5. Equity and no hierarchy.	The men's FGD reported the strengths of the FFS relate to the collective spirit to tasks, strong leadership and sharing of knowledge. Social cohesion is said by the group themselves to be strong, and the leadership was praised by the participants for sharing information and fostering collaboration.	Some evidence leadership may have been too hierarchical and not all participated on equal basis. Contributed to membership reducing from 40 to 19 (10 women). However, those remaining appear satisfied.	Group functions well because the executive is 'honest' (executive comprised of 3 men and 1 female); Active participation (When there is something to do then the whole group does it). The number of members (30) remained the same until 2019 when it reduced to 27. "*We have good leadership which takes into account the views of the members. It is not a dictatorship style of leadership. Leaders are humble".* [Men's FGD March 2019]	Participants say the group has functioned well, with good unity. Both women and men agreed that there is good leadership of the group: "*the chairman gives out suggestions, he does not demand. Whenever the group agrees then it is done*" (men) and "*the chairperson is leading the group good as he handles every situation peacefully and he explains to the members what to be done in a good way*".

			"*The chairperson is leading the group well and he is hard working*". and "*The extension worker is also hard working and he comes frequently.*" (Women's FGD March 2019)	
6. Integrated and learner-defined curriculum.	Curriculum appears integrated, but not much evidence that learners had much influence in defining the detailed curriculum. The project has a pre-defined focus on resilience and has developed results areas and a menu of options. While farmers were involved in developing a plan with the extension worker, the extent to which farmers were involved in defining the curriculum to meet their own priorities is limited (medium). It is not clear how well some of the interventions are fully integrated. For example, food and nutrition is integrated in the project design, but at FFS level, the nutrition training was not linked to learning plot decisions.	Curriculum appears integrated, but not much evidence that learners had much influence in defining the detailed curriculum.	Curriculum appears integrated, but not much evidence that learners had much influence in defining the detailed curriculum. Fall Armyworm (FAW) control is clearly a priority for FFS members and farmers in general. Men reported that the FAW problem was identified by the group; some solutions were identified by the group and some by FAO. The only topic specific to this group was growing of sunflower to pay plot rent.	Curriculum appears integrated, but not much evidence that learners had much influence in defining detailed curriculum.
7. Comparative experiments.	The experiments have not always been designed in such a way as to allow comparisons to be easily made regarding varieties and practices.	Not always easy for the FFS members to compare the performance of varieties and practices. Lack of inputs for their own fields, so they plant something different from the learning plot which makes it difficult to compare (e.g. hybrid v local maize).	Design of LPs appears to have improved each time to allow a clearer comparison to be made. Availability of *dimba* provides an excellent opportunity for a second LP to be managed during dry season, but still variability between the plots undermining potential for clear comparisons, (e.g. comparing number of maize seeds per station, but also varying the spacing). The FAW experiments had a much clearer design and allowed farmers to make a clear comparison of control measures.	The design of the learning plots allowed some comparison of different crops and varieties to be made. For the FAW experiment, the experimental design was quite straightforward and could allow comparisons to be made.
8. Agro-ecosystem analysis (AESA)	The FFS Facilitator clearly explained AESA using observations of a maize plot. Farmers can describe the AESA methodology, there is limited consistent implementation of the approach by farmers in their own fields. Individual members did not report doing this in their own fields.	At least 2 farmers mentioned they are applying this in their own field, particularly for pests and disease monitoring. Not clear to what extent wider analysis has been used.	AESA system mentioned for LP. Monitoring maize. Knowing things that can harm our crops and reduce growth. 6am – once per week [Women's FGD]. Members recognize importance of AESA to provide them with knowledge about what is happening in the field (LP) . Not clear to what extent wider analysis has been used and if farmers are using in their own fields.	AESA being used in FFS LP, particularly for pests & disease monitoring. Not clear extent wider analysis has been used or if farmers using in own fields, although some individual reported that they were doing this in their own fields.
9. Special topics. decided on by the group	Overall topic is strengthening farmers' climate resilience as defined by the project. Not clear if	Overall topic is strengthening farmers' climate resilience as defined by the project. Not clear if any specific areas	The overall topic is strengthening farmers' climate resilience as defined by the project. Not clear if any specific areas had been decided	Overall topic is strengthening farmers' climate resilience as defined by the project. Not clear if any specific areas had been

	any specific areas had been decided by farmers within this.	had been decided by farmers within this overall topic.	by farmers within this overall topic, although *dimba* farming may have been farmers' prioritization.	decided by farmers. However as indicated above farmers' ideas have been incorporated into group activities.
10.Team building and social animation.	Women and men commented that they are working well as a group, with motivation given by support from the SP, extension workers, lead farmers and foreign visitors. But there appear to be varying degrees of participation.	Appears weak and major contributor to membership reducing from 40 to 19. 2017/18 - not really functioned as a group. Absenteeism. Expectations were too high. Remaining participants said they work well together.	Functioning well as a group. Most are very punctual. '*We are united'* [Women's FGD]. Good leadership, active participation and no dropouts [men's FGD group].	Team-building and group dynamics were reasonably strong as reported by both women and men. The members appeared to be functioning well as a group. Although 11 members had left this appeared to be at least partly due to how far away they lived and in three cases due to moving to where there was work. Membership reduced from 40 to 29, but at least partly due to members being based in far places and 3 members moving to where they had found work. A lot of activities undertaken.
11.Participatory M&E	The group have not discussed this.	Not clear that this has been done	Not clear that this has been done	Not clear that this has been done