End of project report submitted to IFAD

Project Name:

Improving Delivery of Seed and Soil Fertility Technologies to Smallholder Farmers (IDSST)

Report Period

May 2017 to 31st October 2021

Recipient Organization:

Alliance for a Green Revolution in Africa (AGRA)

Grant Number: 200001303

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List of acronyms

AFAP:	African Fertilizer and Agribusiness Partnership
AGRA:	Alliance for the Green Revolution in Africa
CA:	Conservation Agriculture
CAES:	Community Agribusiness Entrepreneurs
DARS:	Department of Agricultural Research Services
EGS:	Early Generation Seed
FIPS:	Farm Input Promotions
GAPS:	Good Agricultural Practices
IDSST:	Improved Delivery of Seed & Soil Fertility Technologies
IFAD:	International Fund for Agricultural Development
IIAM:	Mozambique's Institute of Agricultural Research
ISFM:	Integrated Soil Fertility Management
KM:	Knowledge Management
MT:	Metric Tonnes
MUSECO:	Multi Seeds Company Limited
NARIs:	National Agricultural Research Institutions
PASIDP II:	Participatory Small-Scale Irrigation Development Programme II
PCU's:	Project Coordination Units
PROSUL:	Pro-poor Value Chain Development Project in the Maputo and Limpopo Corridors
RUMARK:	Rural Market Development Trust
SAPP:	Sustainable Agriculture Production Programme
SHA:	Self Help Africa
ToRs:	Terms of Reference
UEM:	Eduardo Mondlane University

1.0 BACKGROUND

The Improved Delivery of Seed and Soil Fertility Technologies (IDSST) project is a strategic partnership between the Alliance for Green Revolution in Africa (AGRA) and the International Fund for Agricultural Development (IFAD). The grant agreement came into effect on 30th May 2017 to run for four years with a completion date of 31th October 2021. The grant closing date is 31st December 2021. IDSST was a US$2 million project of which US$1 million was a grant from IFAD and US$1 million co-financing from AGRA. Under the IDSST project, AGRA complemented IFAD supported loan programs in Malawi, Mozambique and Ethiopia to address the challenge of linking smallholder farmers to new crop varieties and improved soil fertility management research outputs which is key in sustaining gains made by the IFAD programs.

African farmers have proven to be ready users of new technologies but have been constrained in doing so by under-developed or unsustainable delivery systems as well as lack of awareness of the benefits of the technologies. In the absence of widespread adoption of improved agricultural technologies, average crop yields in Africa have remained well below the averages compared to other regions. However, this trend is gradually changing, and positive improvements are observed in African countries where agricultural technologies have been developed in collaboration with smallholder farmers and successfully commercialized through local agro-dealers or via farmer-to-farmer multiplication initiatives. Many of these technologies have been developed by scientists at National Agricultural Research Institutions (NARIs) supported by the Alliance for the Green Revolution in Africa (AGRA). Through the project, AGRA provided the much-needed technical support in delivery of seeds and soil health technologies.

AGRA complemented the Participatory Small-Scale Irrigation Development Programme II (PASIDP II), the Sustainable Agriculture Production Program (SAPP) and the Pro-poor Value Chain Development Project in the Maputo and Limpopo Corridors (PROSUL) in Ethiopia Malawi, and Mozambique respectively. The IDSST project focused on bringing the missing linkages of the current IFAD investments with the private sector.

1.1 Goal, Objectives and Expected Outcomes, Target Groups and Components

The overall goal of the IDSST project was to increase smallholder farmers' productivity in Ethiopia, Malawi and Mozambique. The main objective was to improve national capacity for the delivery of improved seed and soil fertility technologies to smallholder farmers in the three target IFAD country programmes. Specifically, it would: (i) promote and disseminate improved seed and

soil fertility and (ii) generate and share knowledge. The expected outcomes were: (a) strengthened capacities of National Agricultural Research Institutions (NARIs) and rural agrodealers to support IFAD-loan programmes; (b) increased adoption of new seed and soil fertility technologies by smallholder farmers; and (c) documented lessons learned and recommended solutions for scaling up.

The program targeted beneficiaries (farmers) of IFAD supported programs in the three target countries who are PASIDP beneficiaries in Ethiopia, SAPP beneficiaries in Malawi and PROSUL beneficiaries in Mozambique. The project also targeted players in the targeted value chains such as inputs suppliers and distributors, extension workers and processors.

About SAPP, Malawi

Sustainable Agriculture Production Programme (SAPP) is a 9-year (2012-2021) program being implemented in 6 districts of Blantyre, Chiradzulu, Balaka, Lilongwe, Nkhotakota and Chitipa in Malawi. The goal of the project is to contribute to reduction of poverty and improved food security among the rural population with a specific objective of achieving a viable and sustainable smallholder sector through promotion and adoption of Good Agriculture Practices (GAPs). The programme target to benefit about 200,000 smallholder households. The programme has 3 components:

- Adaptive Research
- Farmers Adoption of Sustainable Good Agriculture Practices
- Programme Management & Knowledge Management

About PASIDP, Ethiopia

The goal of Participatory Small-Scale Irrigation Development Programme II (PASIDP II) is to reduce the country's vulnerability to adverse climate risks & drought, and reduce rural poverty & food insecurity. The programme target is 108,750 HHs beneficiaries. The project has two main components:

- Component 1. Development of 15,000 hectares of small-scale irrigation schemes,
- Component 2: Support linkages to markets and services so that smallholder farmers can increase their productivity, competitiveness and incomes.

About PROSUL, Mozambique

Pro-Poor Value Chain Project in the Maputo and Limpopo Corridors (PROSUL) is a 7 Years (2012-2019) government project in Mozambique funded by IFAD. The goal of PROSUL is to improve livelihoods and climate resilience of smallholder farmers through increased returns. The project's sector focus is Horticulture, Cassava and Red Meat. The cassava component comprises two subcomponents:

- Multiplication of improved cassava varieties;
- Strengthening farmer organizations;
- Support small processing units;
- Improve access to market and Value Chain (VC) environment;

Figure 1 A summary of IFAD programs that anchored IDSST

1.2 Grant components

AGRA implemented this grant through two components: grant making and knowledge management.

***Component 1:* increased access to improved seed and soil fertility technologies**

The main thrust of this component is provision of solutions on improved seed and soil fertility technologies through sub grants to NARIs, NGO and small private input dealers to adapt and demonstrate new crop varieties and soil technologies. In making these sub-grants, AGRA worked in consultation with the IFAD country team and PMU of each country who provided guidance on the grant project components and selection of the projects.

Component 2: Knowledge management and documentation of lessons learned

The project intended to generate and share knowledge on farmer uptake of new technologies through documenting lessons learnt in linking IFAD projects with research outputs/solutions. To this end, the project collected and facilitated exchange of lessons and knowledge among all the stakeholders with a view to enhancing learning. Knowledge management (KM) is incorporated as an important part of IDSST project management.

1.3 Implementation processes and arrangement

AGRA in collaboration with IFAD Country Teams, Project Coordination Units (PCU's) and other stakeholders held in-country validation and inception meetings. AGRA also held field visits to concretize the outcomes of the validation meetings. Project inception meetings took place in three countries as follows: Malawi: 22 August, Mozambique: 25 August and Ethiopia 25 September in 2017. The table below provides a summary of the key findings from the stakeholder validation meetings.

Table 1: Country specific project gaps

Country	Gaps at project development	Gaps at inception and validation with stakeholders
Malawi, SAPP	● Screening, testing and promotion of legume crops with higher productivity, preferred consumer and market traits as well as enhanced nutritional and cooking qualities ● Supporting development of geo-referenced Information system (GIS) for fertilizer recommendations. ● Developing integrated soil fertility management practices in maize-legume system that are adaptable in different agro-ecological zones.	● Create sustainable seed system to improve availability and uptake of high-quality Early Generation Seed and certified seed for legumes to the farming communities ● Create mass awareness amongst smallholder farmers, private traders and NGOs on the importance of using high quality seed of the improved varieties and appropriate agronomic practices. ● Support development of geo-referenced Information system (GIS) for fertilizer recommendations.
Ethiopia, PASIDP II	● Working with agro-dealers, seed and fertilizer companies to provide improved access	● Building the capacities of NARIs on conservation agriculture

	to seeds and fertilizers and pilot the adoption of new seed and soil fertility improving technologies. ● Piloting the adoption of new seed and soil fertility improving technologies.	● Piloting the adoption of new seed and soil fertility improving technologies. (including new blends)
Mozambique, PROSUL	● Strengthening capacity of Mozambique Agricultural Research Institute (IIAM) – laboratory facilities and green houses to ensure production of higher volume and health materials of cassava seedlings using tissue culture technologies ● Testing and promoting climate resilient production practices with IIAM ● Poor cassava market linkages	● Strengthening capacity of Mozambique Agricultural Research Institute (IIAM) – laboratory facilities and green houses to ensure production of higher volume and health materials of cassava seedlings using tissue culture technologies. ● Promotion of post-harvest and good agronomic practices for cassava ● Strengthening agribusiness linkages for cassava.

AGRA delivered this project through different strategies including:

i. Sub-grants to NARIs/Seed companies on building capacities in production of breeder/ foundation seeds and creating linkage with seed companies and agro-dealers.
ii. Sub-grants to service providers to build capacities of existing agro-dealers in delivering good quality inputs and knowledge to farmers.
iii. Support and engage service providers to ensure that knowledge on processes, outcomes, best practices, and lessons learnt is well captured and documented.
iv. Technical expertise in seeds, soil, markets, agribusiness and Knowledge Management.
v. Provide financial leverages and alignment with other existing investments for example Malawi and Ethiopia.

2.0 RESULTS, MILESTONES, AND INDICATORS

As the IDSST project comes to an end, significant strides have been made in linking smallholder farmers to new crop varieties and improved soil fertility technologies in support of IFAD investments in the three countries, Ethiopia, Malawi, and Mozambique. According to an evaluation report (2021) the project was instrumental at deepening the seed systems in Malawi

and Mozambique while enhancing the state's capacity in Ethiopia on conservation agriculture and integrated soil fertility management. Below are some highlights from the 3 target countries.

2.1 IDSST Partnership in Ethiopia

In Ethiopia, the project enhanced the capacity of Participatory Small-Scale Irrigation Development Programme II (PASIDP II) staff and relevant stakeholders to effectively disseminate Integrated Soil Fertility Management (ISFM) technologies and built the capacity of the Ministry of Agriculture in Conservation Agriculture (CA).

a) Establishment of ISFM demonstration plots

One of the strategies set by the project to introduce ISFM technologies and practices is through demonstrations at Farmers Training Centres (FTCs) compound and on farmers' plots. The project established 236 demonstration plots, to give farmers hands-on experience and pilot adoption of ISFM technologies and practices, in the targeted four regions namely Amhara, SNNPR, Tigray and Oromia. The technologies promoted included use of Lime, blended fertilizers (NPSB, NPSZn, urea), bio fertilizers and Conservation Agriculture practices, based on the agro ecological requirement of project sites. The demonstration plots provided an excellent field learning venue where ISFM techniques and practices are promoted. Along with these soil fertility-improving practices, other related good agricultural practices like use of improved seed, 'Berken Maresha' (improved tiller), row planting, timely sowing & weeding were also taught and demonstrated. Improved varieties of Maize, BH 540 and Melkasa 2, Haricot bean varieties (Awasa Dume and Nasir) and Teff varieties (Quncho and Cross 37) were used for demonstrations.

The number and the type of demonstrations along with the implementation sites where they had been carried out is detailed in the table 2 below.

Table 2: Number and type of demonstrations

Region	ISF improvement technologies				Demonstration Site		
	Bio-fertilizer	Conservation Agriculture	Liming	Blended fertilizer	FTC	Farmers' plot	Total
Amhara	29	16	10	24	42	37	79
Tigray	7	5	0	9	12	9	21
SNNPR	17	2	6	9	25	9	34
Oromia	40	30	6	26	23	79	102
Total	**93**	**53**	**22**	**68**	**102**	**134**	**236**

The ISFM demo result showed a significant agronomic performance as compared to farmer's conventional practices. Based on the physical observation of the new practices and available data gathered from the demonstration sites, the introduced technologies have enabled farmers to

improve a remarkable yield advantage over the local practices. For instance, there is a yield increase of 19% and 78% for soya bean and haricot bean crop varieties respectively due to the use of biofertilizer over the conventional practices as shown in the table and picture below:

Table 3: Comparison of yields (kg/0.01ha) on conventional and improved practices

Crop types	Conventional Practices	Improved practices	Yield difference (%)
Haricot bean	17.89	31.77	78%
Soya bean	22	26.2	19%

Source: Sample demo site survey, 2020

Figure 2: Blended fertilizer response on maize in Dawa Chafa, Amhara Region (left) and Biofertilizer response on Mung Bean, Theuludere, Amhara Region (right)

The development of sustainable soil fertility management in the smallholder farming systems requires a long-term process as it involves farmers adapting and making incremental improvements to their existing farming practices. Particularly, adoption of conservation agriculture needs a reasonably good year of implementation, at least three years consecutive implementation to realize the full benefits of the conservation agriculture practices.

b) Development of Training & Knowledge Materials (KM)

ISFM training manuals for four thematic areas of Blended Fertilizers (Fertilizer), Bio fertilizers, Acid Soil Management (Liming) and Conservation Agriculture were developed.

- From these manuals, various communication materials (such as posters, brochures, and banners) were developed and translated into local languages to fit the specific demands of local communities in each region.
- In total, 7,052 training materials 4,100 posters, 2,880 brochures and 7 banners and 2 roll ups were developed, printed, and distributed across the project areas to aid the farmers training programme being organized at village levels.
- Four publications (KM materials) and a project end report were produced. Experience exchange events between woredas were organized for farmers, DAs and woreda experts to facilitate knowledge sharing. In addition, one intra region experience exchange event was conducted and about 14 DAs, 16 lead farmers and 11 woreda staff participated. All products meant for the target audiences have been translated into local languages (Tigrigna, Amharic, and Oromifa) and distributed to FTC and other stakeholders; English version is also available; during COVID, Knowledge Management products were printed, laminated and distributed to EAs and lead farmers.

c) Conservation Agriculture (CA)

The consultancy team began the assignment with a desk review of the PAIDP II Project. The reconnaissance and capacity-building assessment visits were carried out between July 14th and 26th, 2019. The assessment involved meetings and interactions with stakeholders.
Although most sites have different agro-ecologies, rainfall and relief patterns, the cultivation methods are similar across the board. In most areas, even though reduced operation is practiced, not much has been done to capitalize on this traditional practice. These predisposes the site to great vulnerability and repeated crop failure. A well-organized CA technology program would have had a better chance of diffusing to the community as the traditional practice manifests the need for reduced tillage. The knowledge of CA has not been built into the community agricultural practice. The cultivation practice is based on draught animal power and tractor power, but no supplementary CA practice is observed.

Most of the regional bureau and the Woreda offices have enough personnel, but few are specialist in conservation agriculture practice. CA programs, trainings or manuals are not available in these areas, although the issue of climate resilient agriculture is at the top of the agenda.

In order to enhance conservation agriculture, the following are suggested interventions based on the experience from the field visit:

a. Build the knowledge capacity of DA's and Lead farmers through training in CA.
b. Establish long-term demo sites within the scheme so that farmers can see the benefits of conservation agriculture.
c. The awareness program is a requirement to underline the importance of CA. The awareness program should be a training of trainers' program comprising theoretical and practical fieldwork.

d. Matters of policy support and infrastructure requirements necessary to facilitate CA intervention in the region.
e. Theoretical work should dwell on the causes of declining agricultural production as it relates to land and soil degradation. The concepts and capabilities of CA should be addressed in detail.
f. The necessity of collaboration among the stakeholders, periodic updating of knowledge and programs required to improve the agricultural productivity of the community is prime

Figure 3: Capacity needs assessment report

The Capacity building needs – Assessment report is available **here**

To enhance the capacity of Project and Ministry of Agriculture staff involved in the implementation of PASIDP II Project, to advance CA practice and Climate Resilient Technologies, a manual was developed. This was possible with the direct assistance and involvement of value-chain stakeholders from all levels of crop and livestock production systems of Ethiopia. The

training manual is accompanied with a PowerPoint presentation to guide in capacity building in Conservation Agriculture. Training of Trainers (tot) was organized for subject matter specialists so that they can cascade CA knowledge to the grassroots extension system. The online ToT was later carried out on the ground using face-to-face training in selected woredas of Amhara, Oromia and SNNPR Regions. These trainings that lasted 3 full days in each locality were conducted between July 25 and August 10, 2021, in Oromia (Adama City), Amhara (Debre Brehan City) and SNNP (Wolaita Sodo City) regions. All the reports, list of beneficiaries, the training manuals and KM products have been handed over to the PASDIP (Ministry of Agriculture).

d) Training on ISFM

A total of 257 Development Agents (DAs) (229 male, 28 female) and 196 lead farmers (185 male, 11 female) were trained in different approaches of soil fertility management to impact farmers with the necessary knowledge and skills required to apply improved soil fertility management techniques into their normal farming practices. The training was cascaded to 1,550 farmers (including 339 female) across project areas. Further cascading of training was suspended due to COVID-19 and following the Government restrictions. However, ISFM training materials translated into local languages were printed, laminated and distributed to DAs and lead farmers.

e) Participation in Farmer Field Days

Farmers' field days are one of the platforms through which farmers show the performances of the new practices to other members of the community. Field days were organized at different stages of plant growth where others in the nearby village attended to evaluate the performance of the technology. In this regard, 17 farmers' field days have been conducted at farmer's field and Farmers Training Centres (FTCs) where ISFM technologies (blended fertiliser, liming, and bio fertilizer and conservation agriculture) practices were established in 2019 cropping season. This has created awareness and promoted ISFM technologies and practices. Overall, 17 field days were organized and 1,839 participants - 1,676 farmers (198F) & 131(32) gov't staff participated in a field day organized in all the four project target regions.

Figure 4: Field day at Dawachafa woreda -Betho site Field day at Kobo woreda-Amid site

Figure 5: Field day at T/ Bergelle woreda -Giba site

While conducting farmers' field days, ISFM brochures were distributed to field day participants. These brochures were produced in local languages in Amharigna, and Tigregna for Amhara and Tigray region, respectively. 780 brochures were distributed during the field days.

In 2020, the crop stage was still at early stages by the end of the project, yet some joint project visits were conducted on the selected demonstration sites. During the field visits, participants evaluated the performance of the newly introduced ISFM technologies as well as best agronomic practices and experiences were shared between farmers.

f) Establishing linkages and training agro-dealers for input

Until recently, agricultural input supply activities to smallholder rural farmers have been dominantly provided by the government, farmers' cooperatives and their Unions in Ethiopia.

The dominant agricultural inputs provided to the farmers often as part of extension services are packaged at supply-side and mainly include fertilizer, improved seed, pesticides and sometimes farm equipment. Furthermore, these services in many cases are of poor quality and often fail to address the diverse needs of small-scale rural farmers. The role of the private sector in distributing these productive inputs to the farming communities is a recent phenomenon.

While the number of private agro-industries are on the rise and the demand for quality farm inputs is increasing, the sector is constrained by a number of factors including low levels of supply from producers, limited access to technical knowledge, poor business skills of agrodealers, high transportation cost, and poor storage facilities.

With the intention of consolidating the roles of private agro-dealers in input supply market, the project has included capacity building training as one of its essential ISFM project activities with a view to ensuring a sustainable and efficient supply of project-induced soil fertility technologies to its target groups beyond the project lifespan. The purpose of this training is therefore to equip young agro-dealers with the knowledge of agro-dealership business skills and management to improve their participation in sustainable input supply activities.

g) Distribution of small packs of seeds and fertilizer during field days

The project has originally planned to distribute small packs of seeds and fertilizers during the field day events to popularize these technologies along with its improved practices. However, as the filed day's events and the next planting seasons vary the distribution of small pack went when the 2020 production season approached. Moreover, during the Joint Annual Results Review Workshop organized by AGRA in early 2020, a concern was raised by other partners supported by AGRA that small seed packs was not appropriate as farmers show little interest to them. On the basis of this comment, the project has sought alternatives to the distribution of these inputs through consultation of the beneficiary farmers' preference.

In doing so, efforts were made at field level to assess the preferences of the farmers on the basis of the technologies demonstrated in the preceding year. As reports from the field indicated there was high demand for bio fertilizer, and berken maresha among project participating farmers. Based on the views of field staff and development agents, considerable number of farmers expressed interest to try out these project-introduced technologies on their own farm plots. In the face of the expressed demand for these technologies, the project has purchased 50 pieces of 'berken maresha', and 6,000 sachets of bio fertilizers in place of small packs of seeds & fertilizer. The farm implements-berken maresha was distributed to the FTC so that they use them for demonstration purpose in the future while the bio-fertilizers along with some orientations were distributed to 12,000 farmers to enhance ISFM technology adoption and dissemination.

h) Deployment of soil texture kits and NPK Soil Kits

Cascading training on soil test kits handling and soil analysis techniques were provided to development agents (DAs) and experts. 15 DAs were drawn from 5 FTCs and 13 (3F) woreda level experts. The project has introduced 44 mobile soil test kits, the first of its kind in the country to support when spot decision is required for tailor made fertiliser recommendations. Though it is too early to evaluate the soil kits results as an alternative of standard soil laboratory tests, participants during the soil test equipment handling and analysis techniques expressed their satisfaction and commitment to provide at least a quick fix solution to some of the soil problems Farmers are facing. The kits were distributed around the end of the IDSST project, hence it was too early to see results of nutrient gap analysis at farmer level. However, during the soil test kits training, areas specific soil analysis demonstrations done by trainees showed nitrogen deficiencies based on the NPK analysis. The kit also identified soil acidity problems based on the soil PH analysis and was able to differentiate soil texture (clay, sand, loam) to recommend the appropriate fertilizer type.

Figure 6: Joint review meeting

i) Joint Project Review Meetings

Project review virtual meeting was conducted with PASDIP. National and regional PASDIP office, staff from the Ministry of Agriculture and other sector offices participated.

j) Financial leverages and alignment with other existing investments

In addition to the grant and consultancy, AGRA has made an in-kind grant of $856,904 to support IFAD and the Ministry of Agriculture and Livestock (MOAL) as part of the Government of

Ethiopia Cooperation Framework for the provision of technical assistance to enhance the capacity of the partners involved in the implementation of PASIDP II. The technical assistance ensured the delivery of strong programme results through agribusiness and irrigation efficiency support to farmers and farmers' groups, including Water Users' Associations, Cooperatives and/or Marketing Associations, and thus to minimize the substantial investment risks falling short of the Programme's goal to engender thousands of small farmers with the skill to build thriving and sustained agribusiness enterprises. TechnoServe Inc has been engaged to deliver this technical assistance.

2.2 IDSST Partnership in Malawi

In Malawi, the project played a key role in sustaining the gains achieved through Sustainable Agriculture Production Program (SAPP) by creating a sustainable seed system which has helped increase uptake of high-quality seed of improved legume varieties with traits such as high yield, pest/disease tolerance, and nutrient-density and highly preferred by markets. In order to build a sustainable seed system, AGRA fostered strategic partnerships with Department of Agricultural Research Services (DARS) to bulk up breeder seed, Multi Seeds Company (MUSECO) to commercialize seed technologies, and Rural Market Development Trust (RUMARK) to strengthen distribution channels and promote use of improved seed. Through the project, AGRA also provided technical support towards the finalization of soil mapping and development of area specific fertilizer recommendations.

All the grants ended successfully, and it is exciting to report that partnerships made between seed companies, Multi Seeds Company Ltd and later Global Seeds, community certified seed growers, and farmers have continued beyond the life of the project. MUSECO mobilized the weaned seed multiplication groups from SAPP, trained them in seed multiplication as out growers for the companies, offered contracts to the farmer groups, trained the groups in grading and storage of seed besides providing basic seed on credit. While MUSECO alone could not risk engaging the smallholder seed multiplication groups, the project bought the risks and MUSECO has now continued to work with the seed multiplication even beyond the life of the project building a long-lasting relationship with the farmer groups.

Cognizant of the impact of COVID-19 on the input supply system, additional funds were given to RUMARK to consolidate and further strengthen the input distribution system in two of the six SAPP target districts, Nkhotakota and Lilongwe districts.

Production and injection of 584MT into the seed system and therefore increased access to quality improved legume seed.

Access to breeder seed has been a huge challenge for seed companies hindering availability of seed to farmers. On the other hand, seed community multiplication groups supported by SAPP did not have markets for their seed. Through MUSECO and DARS in the project, quality seed was multiplied and accessed by farmers utilizing the seed multiplication groups weaned by SAPP. Below are key milestones under this result area.

a) Training of Seed Out-growers

The project supported the Sustainable Agricultural Production Programme's (SAPP) community certified seed growers and farmers through training, supervisions, inspections, demonstrations, and field days to improve their knowledge and skills in quality seed production. A total of 328 farmers from 38 groups were engaged in seed multiplication.

b) Seed Production

The main objective of IDSST project in Malawi was to ensure the availability of good quality seeds for beans, groundnuts, soya beans, and pigeon peas through the production and distribution of early generation seed of the target crops.

Multi Seeds Company Limited (MUSECO), a partner private seed company, produced 30.24 MT of pre-basic, 358 MT of basic and 169 MT of certified seeds. The pre-basic and basic seeds were distributed to seed producer groups for multiplication of certified seed. The certified seed was distributed to farmers through commercial channels of agro-dealers and village-Based Advisors (VBAs). The seed was also distributed through direct sales to SAPP and other government projects like FISP.

Figure 7: AGRA Board Chair, His Excellency Hailemariam Dessalegn, visiting a community seed multiplier for CG 9, a rosette resistant variety in Nkhotakota district, Malawi.

In production of Early Generation Seed, MUSECO engaged 38 community seed multiplying groups benefiting 328 smallholder farmers who are members of the farmer groups. All these were beneficiaries of SAPP, 80% of which are weaned groups. The connection of smallholder farmers to MUSECO was a game changer as it provided farmers with a ready market for their seed after harvest offering premium prices (1$ per Kg in 2020).

Increased adoption and usage of improved seed technologies and good agronomic practices by 20% and reduced distance that farmers travel to access inputs from 14km to 10km in 2 of 6 SAPP districts

Farmer adoption of seed technologies has remained a challenge in Malawi with just about 50% using improved seed which has heavily impacted farmer productivity with yields stuck at 40% below potential yields. To enhance adoption the project implemented several awareness creation activities such as establishment of demonstration plots, strengthening agro dealer networks and conducting field days, building on the Village Based Advisor model which has proved to be vital in enabling farmer access to seed technologies. Below ae some achievements from activities.

c) Establishment of Demonstrations

To create awareness among farmers on the advantages of using high-quality seed of improved varieties and good agronomic practices, the project established 81 demonstration plots in the 2019/20 season. MUSECO implemented 46 demos and Department of Agricultural Research Services (DARS) 35. The demonstrations were a strong vehicle for transferring technologies to farmers through the field days that were held which showcased different technologies including the double row system of planting for soya bean and groundnut, early planting of legumes, right application method of fertiliser to legumes, and demonstration of new varieties for groundnut and maize. Over 20% of the 10,000 farmers who witnessed and followed the demonstrations through field days have started using a double-row system of planting groundnut and soybean, increasing their production by 40% from their average of 1MT for soya and groundnuts. The yield gap for maize between what they normally got and the output from the demonstration was quite remarkable. Farmers normally got between 2 to 2.5 MT per ha of maize, but most demonstrations produced between 7 and 8 MT per ha of maize. As a result, a club at Malingunde has bought 200 kg of certified seed for Manthu (MH36), a variety that has an average yield of 8.3 MT per ha in the demonstration plots.

Figure 8: Farmers learning from a demonstration plot

d) Training of Hub Agrodealers and retail Agrodealers

Twelve hub agro dealers (5 females, 7 male) have been developed. Hub agro dealers are seasoned agro dealers that have the capacity to wholesale and to mentor new small and remote

agro dealers. Hub agro dealers are linked to major input suppliers that provide them with inputs in bulk thereby enjoying volume discounts which are then trickled down to start-up agrodealers who may not have bulk purchasing power. This keeps the small rural agro dealer competitive. RUMARK observed that this is a working model, which especially benefits newly trained retail agro dealers who have inadequate financing due to lack of access to formal finance.

The development of hub agro dealers has ensured sustainability of the agro dealer model. They support new start up agro dealers who otherwise have no support system in terms of financing for their businesses. The start-up agro dealers now get to enjoy the economies of scale by having proper linkages with the hubs. It is easier for them to acquire stock and run their shops. The discounted prices the hub agro dealer enjoys by procuring in bulk are passed on to the spoke agro dealer. In some cases, provision of inputs to the hub agro dealers is through consignment stock arrangements, the hub agro dealers also extend this consignment to the agrodealers as a form of financing.

The 12 hub agro dealers are supporting a total of 122 retail agro dealers. However, as the hubs businesses continue to prosper, they continue to add on more retail agro dealers to their network to reach underserved areas.

Agro Dealer mapping was a crucial exercise that helped in identifying areas that are underserved by agro dealers as the exercise sought to establish the distance between agro dealers and the smallholder farmers. The results of the mapping exercise have enabled the development of a database of agro dealers and were overlaid on target district maps (Lilongwe and Nkhotakota) to depict the spread of agro dealers in relation to smallholder farmer densities in the districts.

Project baseline data indicates that smallholder farmers travel an estimated 14Km in the project area to access agro dealer services. With the injection of new agro dealers, it is estimated that now smallholder farmers travel an average 10 km to access agro dealer services. However, it is important to note that the maps reveal that agro dealers are mainly in trading centres (village town centres) along passable main roads. Since VBAs live in the community with farmers, it is also worth noting that in the wake of COVID 19, the VBAs collate input orders from farmers which they send to an agro dealer by phone and an agro dealer delivers the ordered inputs. This has limited distances travelled by farmers thus mitigating the spread of COVID 19.

Agro-dealer profiles-IDSST project.xlsx

e) Training of Village Based Advisors (VBAs)

To reach out to as many smallholder farmers as possible, the project trained and mentored 661 VBAs and lead farmers so that they provide linkages between agro-dealers and smallholder farmers. The VBAs were trained to assist in demand creation by setting up demonstrations and distribution of small packs to smallholder farmers to increase the adoption of new crop technologies on offer on the market. Through the trained VBAs, the project distributed 5,291 small packs of seed (maize and soya) from MUSECO, Global seeds and Pannar to smallholder farmers. Agrodealers' sales data indicates a rise in sales (estimated at 18%) of promoted technologies through distribution of small packs.

The Small packs were provided to farmers who were then able to validate efficacy of improved varieties at household level. Small packs were seed packs of 100g which were generously provided by input suppliers. The packs were distributed in response to increased demand and free in the principle of allowing farmers to try out and if like buy it from the agrodealer. For the private sector this is a practical method to demonstrate and market their new products to small farmers.

The VBAs continue to create mass awareness of Good Agricultural Practices that is assisting farmers to grow more, follow recommended practices and eventually produce more for their households and for generation of income.

On average each agrodealer serves 6,500 smallholder farmers with the number being much higher by hubs.

Table 4 : Seed Distribution/sales by retail agro dealers (in MT) in Lilongwe and Nkhotakota districts

Season	Maize seed	Groundnuts	Soya bean	Cow pea	Beans	Total
2017/2018 season	61.102	1.187	4.668	0.053	0.60	67.072
2018/2019 season	300.923	9.461	30.604	0.2732	0.307	341.57
2019/2020 season	438.655	36.125	71.212	0.437	0.930	547.361
Total	**800.68**	**46.773**	**106.484**	**0.7632**	**1.837**	**956.003**

f) Finalization of soil mapping and development of 5 area specific fertilizer recommendations

At the inception of the project, SAPP requested AGRA for support to finalize the soil mapping exercise that had remained stuck since 2014 without progress.

In February 2018, AGRA convened key stakeholders involved in the soil mapping exercise in Malawi where members agreed to form a National Soil Mapping Taskforce to spearhead and escalate the exercise ensuring quick completion and have fertilizer recommendations. The Taskforce currently headed by Department of Land Resource Conservation comprised key stakeholders from DARS, DLRC, DAES, Fertilizer Association of Malawi, Malawi Fertilizer Company, OPTICHEM and AGRA. AGRA through the Head of Soil Fertility and Fertilizer and the Country Team provided constant support besides leveraging the intervention to ensure development of area specific formulations that boosts smallholder farmers' production.

As the IDSST project comes to an end, it is worthwhile to report that soil mapping for the six districts and the whole nation was completed and the Taskforce developed 5 area specific fertilizer recommendations which have been validated through a complementary grant support to the Ministry of Agriculture and African Fertilizer and Agribusiness Partnership (AFAP) from AGRA. The figure 9 below shows a soil nutrient combination map for Lilongwe, one of the SAPP districts.

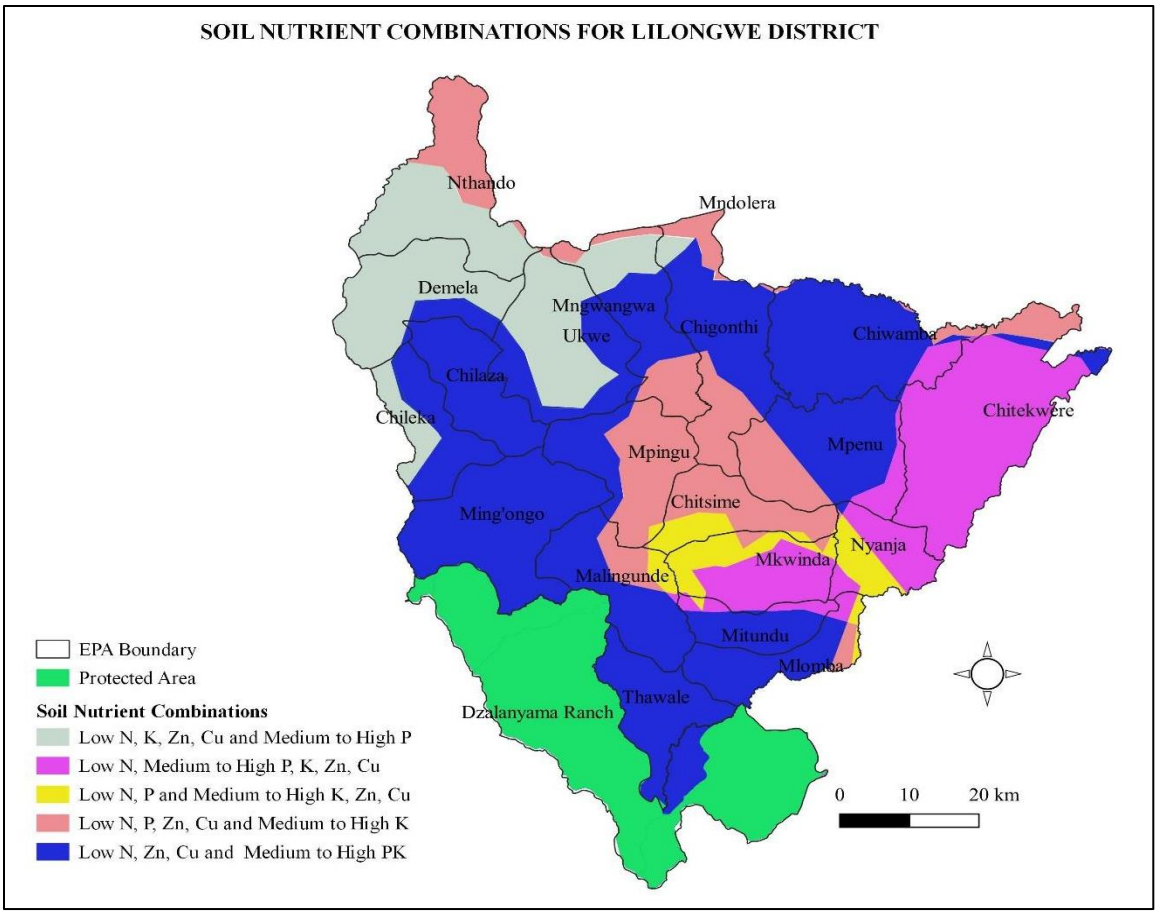


Figure 9: Soil nutrient combination map for Lilongwe, one of the SAPP districts.

2.3 IDSST Partnership in Mozambique

In Mozambique, AGRA worked with implementing partners to support Pro-poor Value Chain Development Project in the Maputo and Limpopo Corridors (PROSUL) in sustainably availing and disseminating quality and disease-free cassava planting material and facilitate market access. The materials and methodologies developed will be carried over to the PROCAVA project for scale out. Three grants were given in Mozambique that include capacity building of personnel in the cassava seed systems from micropropagation to field establishment, extension personnel to increase adoption of technologies and Good Agricultural Practices (GAPs) and agribusiness, processing and marketing of the cassava.

a) Cassava seed production

This project addressed the following gaps: i) lack of skills to develop and improve the delivery of quantity and high-quality cassava stem cuttings for farmers, ii) lack of availability of stem cuttings

of improved varieties for adoption and use by farmers and, iii) low awareness and adoption of technologies and good production practices demonstrated to increase farmers awareness and therefore adoption and consequently increase yields. The objectives were to train 10 laboratory technicians, 18 field personnel from cassava multiplication centers and 10 intern students in the chain of in vitro cassava micro-propagation and to strengthen the laboratory capacity through the acquisition of reagents, basic materials for tissue culture, repair and calibration of equipment and refurbishment of greenhouses. The project also used cassava as a pilot crop to establish the value chain from the in vitro culture, transfer of technologies, application and follow-up of the results through collaboration with public extension services, farmers' associations and NGOs.

The activities were mainly focused on training different target groups at different levels such as cassava seed producers, extension workers, field technicians and laboratory technicians, massive multiplication of seedlings in the laboratory as well as establishment of primary fields for basic seed multiplication. However, the year 2020 was marked by serious challenges imposed by the Corona virus pandemic.

At laboratory level, it was characterized by a gradual increase in the production of breeder seed and basic seed as shown in table 2, which allowed the increase of plants acclimatized and established in primary fields in the Research Centers of Maniquinique, Chokwe and Nhacoongo. Fig 6 and Fig 7.

Figure 10: Acclimatization process

Figure 11: Establishment of primary field

The project strengthened infrastructural capacity for acclimatization and hardening of cassava plantlets from tissue culture, strengthened capacities of 40 field technicians, acclimatized 106,200 plants and trained 25 emergent farmers who multiply seed for sale to many other farmers.

The pictures above show acclimatization and field establishment that were carried out in coordination with the District Economic Activity Directorates (SDAE), where 20 participants including 5 women from the experimental units and seed producers from the districts of Zavala, Inharrime, Jangamo, Morrombene and Massinga were involved. SDAEs are key linking points between farmers and research and therefore play an important role in ensuring sustainability.

The training was focused on the acclimatization aspects with an emphasis on post-flask management with low-cost use appropriate for producers with established irrigation systems. The objective of the course was a) to provide producers with the capacity to receive laboratory plants immediately after pre-acclimatization in bottles and to establish in tunnels made with locally available materials and the use of non-commercial substrates, b) to make participants to know the main biotic and abiotic constraints at this stage of production c) to help participants understand the methodologies for acclimatizing cassava plants, and d) to learn preparation and sterilization of locally produced substrates.

Figure 12: Theoretical part of the trainings(left) and family photo (right) in Massinga district.

Under the component for strengthening delivery of clean cassava planting material which IIAM implemented, 30,600 plantlets were potted at greenhouses for acclimatization and 28,000 transferred to the Chokwe, Maniquinique and Nhacoongo stations for establishment of primary centres, increasing planted area to a total of 4.15 ha. Below Tables show the number of seeds produced in 2020 that will move to the levels of the above plantlets in the field in the coming years to be planted.

Table 5: Number of seedlings produced during the project implementation

Seed categories	Year 1 2018	Year 2 2019	Year 3 2020	Accumulative
Breeder and foundation seed	22,476	65,216	106,200	193,892

Table 6: Total amount of cassava seed produced assuming 15,000 plantlets/cuttings is 1 MT.

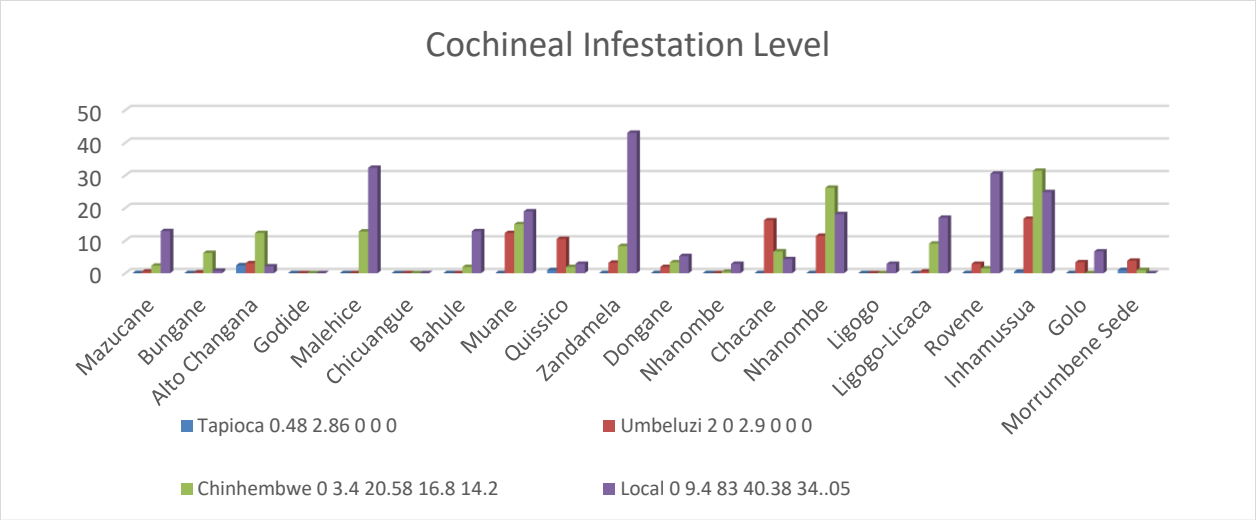
Seed categories	Year 1 2018	Year 2 2019	Year 3 2020	Accumulative
Breeder and foundation seed	1.49 MT	4.34 MT	7.08 MT	12.91 MT

b) Building extension capacity for adoption of improved technologies

The second intervention in Mozambique focussed on building capacity of public and private sector Extension Agents to influence groups of farmers with the skills and knowledge needed to increase productivity, through the adoption of improved cassava varieties, GAPs and the practice of integrated soil fertility management. The project team trained 28 agricultural extension agents and 154 VBAs (Village Based Advisers). They also established 2,739 Demo plots, being 154 Mother demos, of which 28 had fertilizers and 126 without fertilizers, and another 2,585 Baby demos. They distributed 336,340 cassava seedlings of the varieties CHINHEMBWE, UMBELUZI 2 and TAPIOCA. They worked with 154 groups of producers in the 11 districts of the project, involving 3,246 producers (each of the 154 VBA formed their group of producers). Below are some interesting results from this work.

i. Monitoring and Evaluation of Diseases

At 11 months of evaluation, it was observed that the Tapioca variety continued to show low levels of infestation and disease severity. Umbeluzi 2, maintained the data presented at 6 months of evaluation, remaining moderately resistant to the disease. The Chinhembwe and local varieties showed high levels of disease infestation, as well as their severity, when compared to Tapioca and Umbeluzi 2 varieties. This factor contributed to the producers expressing their interest in growing these varieties in large areas of production, since one of the constraints that they faced, was the use of varieties sensitive to diseases that by chance caused low yields.



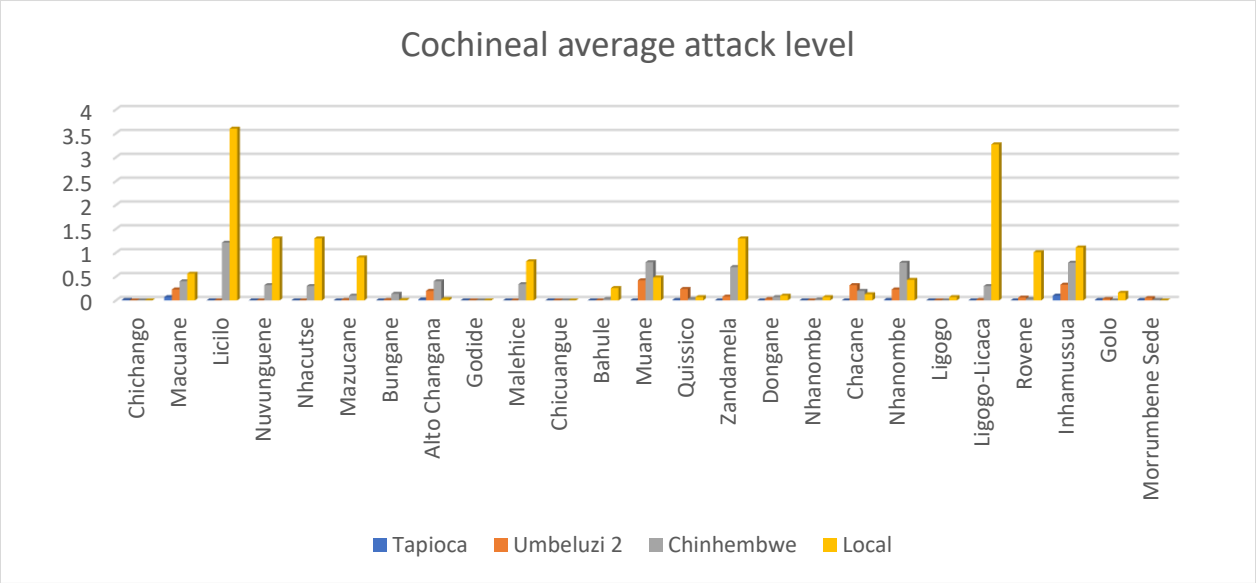


Figure 13: Incidence level and average attack rate of the CASSAVA MEALYBUG in different production sites

Based on the graph, (at 11 months of evaluation), the **Tapioca varieties**, in all production sites, had a low level of infestation and severity. The Umbeluzi 2 variety showed a slight infestation of the pests, while the Chinhembwe and local varieties showed a higher level of infestation.

The producers were satisfied with the potential of the new varieties to resist these pests, since they cause significant damage to the crop yield.

In addition, in terms of scale insect attack rate, of the places where the pest infestation was found, it was noted that the varieties Chinhembwe and Locals had very high rates of infestation when compared to the varieties Tapioca and Umbeluzi 2. Thus, the new varieties present a certain resistance in relation to the other varieties (Chinhembwe and Locals).

Regarding pests and diseases, the Tapioca and Umbeluzi 2 varieties, in all periods of evaluation (4,6,11), and in all places where the demo plots were established, presented low rates of infestation and severity. Producers expressed satisfaction with the new varieties, showing an interest in massification in large areas.

ii. Evaluation of the Average Root Yield

The improved varieties (Tapioca, Umbeluzi 2 and Chinhembwe) performed well in the towns of Bahule, Nhanombe, Golo, Chicuangue and Macuane and performed poorly in the town of Chacane, Nhacutse, Mavila, and Godide. The poor performance of the varieties observed in these places, is associated with the bad management practices (Chacane and Nhacutse) and the climatic conditions of the region (Godide - Chibuto - Arid zone).

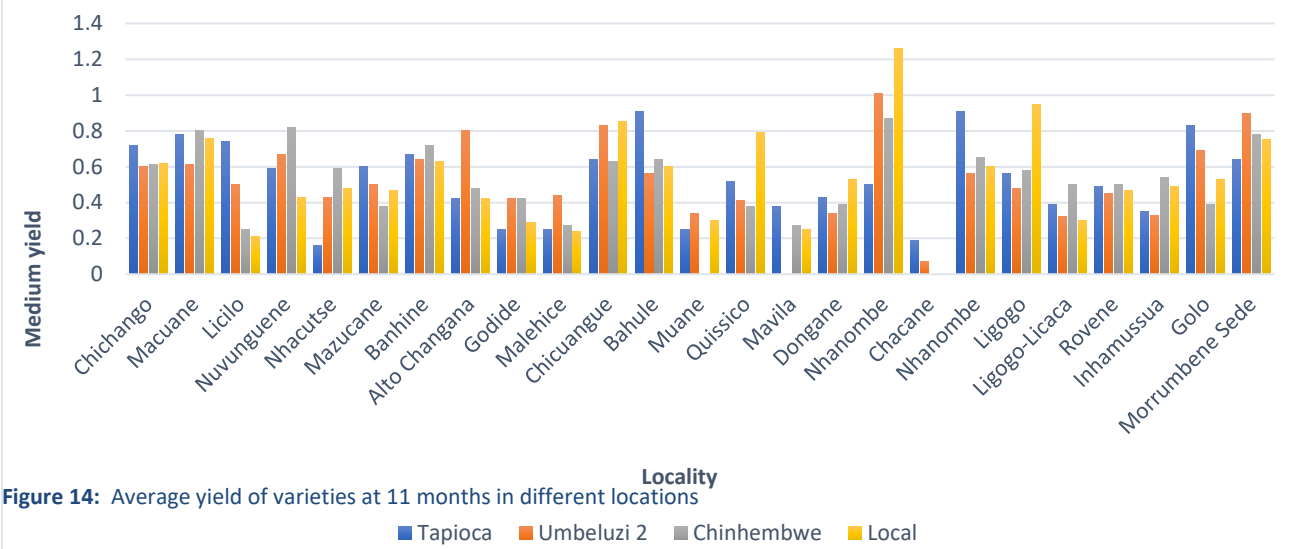


Figure 14: Average yield of varieties at 11 months in different locations

The low yields of the varieties (in some demo plots) were caused by the infestation of soil fungi that cause root rot. For example, in the district of Zavala (Mavila), root rot caused 100% losses in the roots of the Umbeluzi 2 variety and significant losses in other varieties. As it is a soil pest, it is difficult to control, but some measures can be taken to minimize infestation. Such measures are summarized in making deep plowing and harrowing, fallow land for a considerable period, crop rotation, among other practices. The project implementation focused on dissemination of technologies to enhance cassava productivity. However, lessons learned, and challenges faced take us to recommend that going into future investments there is need to focus on the Integrated Soil Fertility Management practices that will enable us to address increasing cassava yields in an integrated manner and ensure sustainable production of this crop and income generation to smallholder farmers.

c) Building capacity of Processors and Cassava Farmers by Community Agribusiness Entrepreneurs (CAEs) and Extension Officers

This project aimed to improve knowledge and skills of cassava actors which include seed-cutting producers, cassava producers and cassava processors on conducting business on seed, cassava roots and processed cassava derivatives as contribution to improve food security and incomes among smallholder farming families. The project conducted training on agribusiness and best recording practices for Extension officers, cassava processors and community agribusiness entrepreneurs (CAEs). The project also conducted a market study of cassava roots and derivatives, created linkage between cassava producers and processors to market and help on cassava derivative quality certification. As a result, a total of 2,840 cassava actors, 69% women, directly benefited from the project, and a total of 8,032 cassava farmers indirectly benefited.

The Eduardo Mondlane University (UEM) staff at the beginning of the project trained VBAs and Extension officers in business skills and best practices of cassava processing. The VBAs and the Extension officers had the responsibility for step down training to other groups of farmers and processors. However due to lack of resources some VBAs asked for assistance from PROSUL and PROSUL in turn contacted the UEM. PROSUL has been able to provide assistance in many areas including the selection of beneficiaries, participation in field days, supported IIAM for the delivery of clean planting material to farmers for planting material multiplication and facilitation of training.

About 831 of cassava farmers, 68% women, were trained by VBAs and Extensions officers during the implementation of the project. The number of training sessions and of participants was significantly reduced as a result of COVID-19 pandemic outbreak.

Table 7: Number of farmers and farmer groups beneficiaries from step down training on elaboration of business plan

Distrito	**Number of direct beneficiaries of step-down training on elaboration of Business plan.**				**Number of cassava farmers per district benefited from PROSUL assistance**
	Man	Woman	Total	Nr Group	
Massinga	31	66	98	32	766
Morrumbene	42	96	138	38	1,247
Jangamo	32	71	103	18	720
Inharrime	38	73	111	51	1,509
Zavala	39	65	104	34	1,599
Manjacaze	83	110	193	28	1,525
Chongoene	25	87	112	14	666
Total	**290**	**568**	**831**	**215**	**8,032**

Figure 15: Training events on the elaboration of business plans for VBAs and Extensions officers among other actors.

d) Strengthening Linkage among Cassava Value Chain Actors

The project organized 4 sessions of seminars with the aim of promoting the linkages between cassava seed cuttings, cassava roots producers, cassava processors and buyers. Due to COVID-19 pandemic the maximum number of participants allowed in each seminar session was 20. The first seminar session was held at the Faculty of Agronomy and Forestry Engineering on June 30th, 2020 and included the participants of FDA/PROSUL, Bindzu, INNOQ and Mozambique Good Trade. The other 3 sessions took place in Zavala, Inharrime and Jangamo districts. It was concluded at seminars that the cassava market is driven by (i) the price of the competitive products in the market, (ii) ensured good quality of products to get access and remain in the market, and (iii) contract commitment. A total of 77 VBAs participated at the seminar sessions of which 35% were women.

Figure 16: Seminar session in the Faculty of Agronomy and Faculty of Engineering (left Seminar room and right family photo of participants)

e) Cassava market study demand

The project conducted the cassava market demand study, led by BINDZU. The results show that the total official record of actual cassava demand (Industrial use and household consumption) for cassava roots in the southern part of Mozambique is 48,000 MT that correspond to USD 2 million per year at current price (MZN 33/Kg). If the same quantity is sold in the form of cassava derivatives, they can generate about USD 7.2 million. This amount is just 10% of the potential cassava roots production at southern part of Mozambique. The majority of cassava is produced by farmers for own consumption. The project is promoting the diversification of cassava roots with potential to be used in baking industry. If cassava roots start to be used in the baking industry this can replace the import of wheat flour by 10-20 % (corresponding to potential used of cassava roots of 300,000 MT). There is starch unit in the North of Maputo that intends to use cassava roots as raw material with demand for 60,000 MT per year. Cassava is processed to stable products such as rale using traditional procedures. The mechanized cassava units that are promoted in this project can handle 2 to 6 MT of cassava roots per day. Therefore, the 18 cassava units that are currently established can demand 6,000 to 9,000 MT of cassava roots corresponding to a production of 2,000 to 3,000 MT of rale. The potential demand of rale in southern part of Mozambique is around 30,000 MT per year that need about 90,000 MT of cassava roots. In conclusion, the potential demand of cassava roots is about 400,000 MT in southern part of Mozambique only. What is needed is to improve the market structure of cassava.

More than improving the market structure, the project has also identified the need to strengthen the cassava market by creating more sustainable and stable cassava markets such as DADTCO (but we fair cassava prices) and through integration of cassava flour into bakery industry. This requires further interventions touching on the need for policy reforms that will lead to push for the integration of the cassava flour.

3.0 IMMEDIATE IMPACT OF IDSST PROJECT

IDSST interventions generally had positive results that fed into the overall projects goal of the project. IDSST spurred a fair amount of improvements across the national seed value chains by building the capacity of private seed suppliers, government research and regulatory agencies, and seed producers, especially in Malawi and Mozambique. Through logistics and infrastructure support and public-private coordination, the project eased accessed constraints faced by smallholder farmers.

As a result, demand for certified seed has grown, with its use rising from 10% of total seed use in 2017 to more than 27% in 2021 in most of the project areas. Significantly, these efforts have also improved partnerships between private seed companies and public research and regulatory institutions.

In all the three countries, and working with partners, especially in the government and with programs funded by IFAD, the IDSST has been generally able to identify and invest in the best-fit soil fertility management technologies available for legumes and cassava. However, the project has not been able to scale them for maximum impact among project beneficiaries, in large part due to the very short duration given to the sub-grants awarded under the project as well as the COVID-19 pandemic.

Yield increment and awareness on good agronomic practices

From the evaluation of the project there was consensus that generally, in project areas, productivity has improved over time – especially for cassava in Mozambique, which improved from 4-7 t per ha to between 15 and 20 t per ha for the farmers in Inhambane and Gaza provinces. It is worth noting that cassava producers would need to achieve 15 t per ha to be commercially viable. This has been largely achieved with the four variants promoted by IIAM and KULIMA in Mozambique. In Malawi, groundnuts yield increased from 0.8-1t/ha to 1.5t/ha as shown in the graph below.

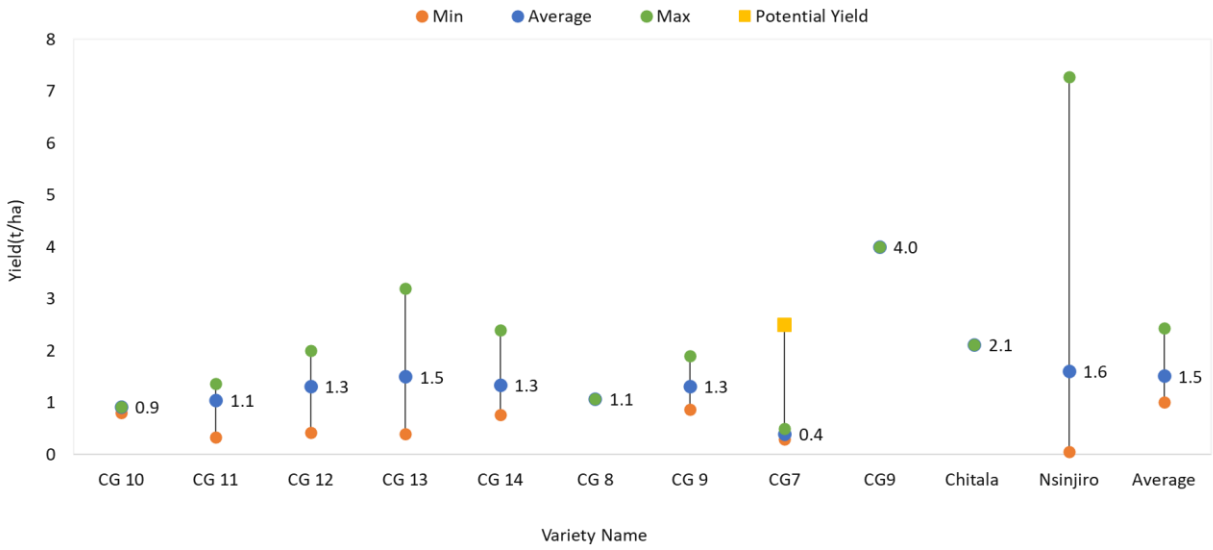


Figure 17: Average Yield from Demonstrations in Malawi (MT/Ha)

The project has been successful in demonstrating to farmers 100 percent yield increases using improved practices including the lime technology in barley cropping system in Amhara region of Ethiopia. However, the improvement metrics showed that the attainable crop legume yields are still quite low in Ethiopia.

By using blended fertilizers on improved teff variety ("*boset*"), some lead farmers have reported 250% yield increases (from traditional 0.7 t/ha to 1.8 t/ha). Other farmers have seen 20% increases in yields on their landholdings, especially for barley.

IDSST has also succeeded in entrenching this new approach and the knowledge to operate the new facilities with government institutions. This will help to disseminate the learnings from the project and encourage the use of context-, soil- and crop-specific fertilizer blends.

Agrodealer business growth and expansion. The project rapidly increased customer base and business volume for agrodealers. One of the key challenges that farmers face in the three target countries was access to high quality improved seed. In Malawi, the project was designed to address this challenge through multiplication of improved legumes seed by MUSECO in partnership with DARS. The latter produced breeder seed whilst the former multiplied pre-basic, basic and certified seed through its contact farmer producer groups. The project created farmer awareness of the new seed varieties mostly through mounting of demonstration plots, typically one "mother" demo site per selected section of the Extension Planning Area. It further strengthened agrodealer capacities to distribute the improved seed varieties through business training and linkages to both farmers and farm input suppliers.

Germplasm infrastructure investment. There was significant investment in infrastructure for germplasm in Mozambique. As a result of this, the project has been able to achieve the dissemination of improved varieties that possess desirable characteristics for the SHFs: resilient to adverse climatic conditions (droughts) and pests and diseases attacks. The project established irrigation system for germplasm: at IIAM Maputo for pre-acclimatization and the other in Umbeluzi with greater capacity than the old one, thus allowing to acclimatize more numbers of plants at any given time. Acquisition of reagents and other consumables allows IIAM to undertake virus cleaning and enhanced multiplication of improved varieties in-vitro. With greenhouses rehabilitation, there was 300+% in capacity, from 3,000 plants to 10,000, allowing IIAM to increase the number of seedlings per unit of time.

Compliance with quality standard in processing in Mozambique. After the end of the project, the processing units trained continued to produce the cassava flour and still complying with the quality standard. A supported cooperative (Josina Machel) under the IDSST project has been

inspected in mid-October and got approved for the standards for processing cassava. Meaning that the cooperative complies with the procedures for quality.

4.0 KNOWLEDGE MANAGEMENT (KM)

The planned knowledge management activities involved documenting the progress and early observations. The documentation of the results and best practices continued until the end of the grant despite travel restrictions and the curtailment of physical meetings due to the effects of the COVID-19 pandemic.

At the onset of the project, workshops were organized in each country to develop a knowledge management framework in collaboration with IFAD country teams, NARIs and relevant project stakeholders which provided guidance as to what type of learning should be documented from the sub-granting processes, outputs and outcomes of the sub-grants and how the learnings was to be captured, analyzed and disseminated. During the meeting, a formal presentation on Knowledge Management (KM) was given to the participants. The presentation was followed up by a series of discussions on key KM issues and activities for IFAD projects in each of the target countries.

The main output of the workshop was a KM framework that enables effective and successful knowledge gathering, sharing, application, and retention among partners and stakeholders.

Documentation of success stories

In Ethiopia, the process of knowledge documentation progressed well. Several field trips were made to ground-truth the good practices, success stories and processes identified through the study tools – questionnaire, key informant interviews and desk review of proposals and progress reports. The field visits were also opportunities for the field level experts to verify the shortlisted good practices and fill the gaps. These practices and other success stories were then subjected to validation by all the stakeholders before the information was documented in the publication. The best practices documented were subjected through tough criteria such as: complementarity, systematic, adaptive, accountable, professional integrity, gender sensitivity, and adaptability. These practices were documented from Amhara, Oromiya, SNNPR, and Tigray. One of the best ranked practice was selecting lead farmers for community training/technology dissemination using innovative approaches. There were several farmers who benefited from the lead farmer training.

Figure 18: Lead Farmers training fellow farmers

Some of the beneficiaries indicated that "*Now the community selects a lead farmer who has interest in agriculture, active farmer, educated (if possible), and someone the community listens to because of her/his knowledge of agriculture but not for any other reason. This is a major shift for us". In addition, "We're chosen by the community to do the first trials. I decided to try the bio-fertilizer technology after a 5-day long ToT offered to us by the project*," *said Belay Mariye who served as a lead farmer in Kobo woreda to run the trial.*

The ToT session serves to build the capacity of lead farmers via imparting relevant knowledge and skills on integrated soil fertility improvement technologies covering a range of topics around bio-fertilizer, blended fertilizer, conservation agriculture, and lime application in acidic soil treatment. The training was provided using soil experts from local government partner in the Woreda Agriculture and Rural Development Offices

Another success story was from *Wudassie, 26, a mother of 3 children from Bakael village in Tigray region. When ISFM was introduced to Taetay Maychew district by SHA in 2019, she was selected as LF to participate in on-farm technology demonstration. Wudassie received a 5 day-long training on ISFM. The training was provided at district level, 250km away from her village. She was breastfeeding at the time of training. She had to take a one and half year-old child with her to attend the program. "I was excited to participate in the training as a woman though I attended the session on and off because I was caught up with and distracted by the additional burden of tending to my little kid at the event. I made a decision however I didn't want to miss the opportunity".*

In Malawi, a stakeholders meeting was organized that included the AGRA partners and staff to share, discuss and validate the evidence that had been gathered and documented. The consultants also shared videos that they had documented. The outcome of that convening was

a review of documented success stories, best practices, and the key learnings from the IDSST implementation. These were included in the final peer-reviewed book.

Some of the stories documented included:

Reaping the Fruits of Improved Seed System

One of the beneficiaries for AGRA's strengthening seed and other farm Inputs distribution systems for improved food security and incomes of smallholder farmers in Malawi project is Chiutsi Farmers Club, a group of farmers found in Benga Section from Mtosa Extension Planning Area (EPA). Its members are from Jesitala Village, Traditional Authority Mwadzama in Nkhotakota District. Through the AGRA project's VBA approach, well-established farmers club select lead farmers who represent them in their communities. Sandram Msokasoka was identified as a potential lead farmer. MUSECO provided certified seed to Chiutsi Farmers Club for a one-acre land, on which the club cultivated CG-7 groundnuts and maize. The club harvested 300 Kgs of groundnuts and 1000 kgs of maize at the end of the season, compared to previous yields of 100Kgs and 510 Kgs for groundnuts and Maize, respectively. Following Sandram Sokasoka's success, MUSECO confirmed him as a Village Based Advisor (VBA). He has since received several trainings from MUSECO, including trainings on good agricultural practices, pesticide spraying and grain quality standards, which have helped him improve his farming techniques.

Figure 19: Mr. Sandram Msokasoka (VBA) working in a demonstration field for Chiutsi farmers club in Mtosa EPA

In Mozambique, the AGRA team organized several virtual meetings with the partners to discuss the learnings coming out of the IDSST implementation. Since the implementation started the

success stories were documented but more on awareness on the disease-free cassava. There are success stories that were included in the book on the IDSST, but mostly on the processes. An example of a success from the UEM grant was: ***Improved Cassava Flour Production Techniques for Competitive Markets***

Source: Dr. Lucas Tivana. Inharrime, Inhambane-Mozambique

Quality and standards are instrumental in business in the sense that farmers must be specific on what they are offering to the market because a cassava root should not be bitter today and sweeter tomorrow. Hygiene is key in any food processing including in cassava agro processing among smallholder farmers of Limpopo corridor, Mozambique. Under the IFAD and AGRA funded initiative the University of Eduardo Mondlane (UEM) implemented the "Scaling up cassava technologies for cassava value chain development in Limpopo corridor through business skill development" Among several topics of interest hygiene was given high priority given that farmers were targeting beyond their local markets. Clean and standardized cassava sub-products was the main message throughout the training. Several farmers benefited from the training.

Mr. Alfredo Samuel Gove, a cassava farmer since 1998, shifted from traditional methods to improved cassava processing techniques. He found the training to be instrumental for farmers willing to go beyond local markets. "When we used traditional methods of processing cassava our customers used to complain a lot about the cleanliness of our products, but with the training, we have been exposed to new techniques focusing on hygiene. Now we can say for sure that we are ready to go for higher markets", said Mr. Gove. Mr. Gove is leading a 37 members association called Josina Machel in Inharrime District, Inhambane Province, and owns about 15 hectares of land in which 10 are completely dedicated to cassava production. His association is well known in cassava flour production and with support from IDSST has a ready- to- implement business plan which includes current standards, branding, packaging, bar coding, etc.

4.1 Writeshops

The project organized a five - day write-shop in each country to brainstorm, discuss and to consolidate lessons learned from the field. The writeshops included the project staff both from IFAD, Country coordinating teams and AGRA as well as other relevant stakeholders including government officials, implementing agencies (NARIs, Agrodealers, seed and fertilizer companies, extension colleges) who provided input into the discussions and finally to the information being documented. During the writeshops, participants discussed the knowledge products and the appropriate audience for each product. Overall, the teams were pleased with the types of knowledge products such as, the process of engagement, analysis of availability of input and output markets, best practices, success stories, and lessons learned generated from the thematic areas.

The various knowledge management products documented culminated into a Book of Knowledge Management Products which was validated by all stakeholders in each of the 3 countries.

Figure 20: A cross section of participants attending a Knowledge Management Validation workshop in Malawi

In Ethiopia, one-week writeshop was organized in Addis Ababa that included participants from the Ministry of Agriculture staff (from the regions and the Woredas), IFAD, implementing partners and AGRA. The participants discussed the results and learnings from the IDSST implementation, validated and agreed what to be included in the Ethiopia chapter. After the

chapter was drafted, the team then met for half a day to review the chapter and gave a go-ahead on the content of the chapter.

In Mozambique, a writeshop workshop was organized that was attended by the implementing partners, Ministry of agriculture, farmers and other stakeholders. The participants discussed the results from the field, farmer experiences and agreed on what needed to be included in the Book. This was followed by a one-day to review the chapter.

4.2 Dissemination and Learning workshops

In order to facilitate sharing and learning,a learning workshop was organized in Malawi which brought together stakeholders from the 3 countries including IFAD led by Dr. Robson Mutandi. During the workshop which included field visits, participants appreciated the critical role played by the project in all three target countries. During the field visit participants appreciated the critical role played by agrodealers in delivering seed and soil health technologies to farmers.

Following the compilation of documented KM products into a book, dissemination workshops were also held in all the 3 target countries. The dissemination workshops strengthened the learning with stakeholders commending AGRA for compiling the lessons which will inform future programming. There is, however need to translate the book into national languages especially for Ethiopia and Mozambique.

Figure 21: A cross section of participants at the Learning Workshop in Malawi

5.0 MONITORING AND EVALUATION (M&E)

During the implementation period, AGRA technical teams held several virtual meetings with implementing partners to assess project implementation progress and achievement of key milestones/output indicators. The final evaluation of the project was commissioned to generate knowledge from the project experience. AGRA commissioned the Centre for Sustainable Development Initiatives (CSDI) to conduct the end of project evaluation. The evaluation is focused on the entire implementation period. The objectives were to:

- assess the overall program performance in relation to its objectives, and
- provide input into the new strategic directions or implementation designs/strategies of another phase should funds be available.

The evaluation effectively captured lessons learnt and provided information on the nature, extent and where possible, the effect of the IDSST project. The emphasis on lessons sought to understand what worked and what did not work as a guide for future planning, as well as scrutinizing other gaps and opportunities to be incorporated in future partnering arrangements.

Table 8: IDSST result dashboard

			Country Achievements				
Result Levels	**Indicators**	**Program Target**	**Malawi**	**Mozambique**	**Ethiopia**	**Overall Achivements**	**% of achivement**
Outcomes	Number of NARI personnel trained to enhance deliver input technologies	73	50	31	44	125	171%
a) Strengthen capacities of NARIs and rural agrodealers to support IFAD loan programs; b) Increased access to improved seed and soil technologies	Number of crop varieties promoted through NARS support	27	35	4	12	51	189%
	Number of companies producing certified seed of target crops in each country	2	2			2	100%
	Proportion of target farmer using improved seed and fertilizer in the target countries	50%	55%	24%	46%	125%	132%
	Value of IFAD loan support to key actors under this grant	$500,000					
	Number of beneficiaries of IFAD loan support under this grant	57,080	31,438	13,579	26,489	71,506	125%
	Percentage change in volume of agro-dealer operations from IFAD loan support programme	50%				0	0%
	Number of recommended solutions adopted by other actors across the 3 target countries	10	6	1		7	70%
	Value of investment leveraged towards IFAD programs	600,000			$900,000	900,000	150%
Output							
	Volume of certified seed produced (MT)	500	169			169	34%
	Quantity (MT) of Basic seed produced	200	388			388	194%
	Number of cassava cuttings produced	2,767,750.00		193,650		193,650	7%
	Number of shows organized to promote ISFM, CA practices and new varieties	5	4	2	2	8	160%
	Number of Agriculture research institutions supported	4	1	1	4	6	150%
	Number of seed company personnel trained on promotion of improved varieties	40	47			47	118%
	Number of agro-dealers trained to improve access to inp	40	61			61	153%
	Number of NARI technicians trained to support the promotion of resilient varieties	60		18	44	62	103%
	Number of extension officers trained from public and private sector to support the delivery of good agronomic	60	72	28	80	180	300%
	Number of communication materials produced	3	1	1	1	4	133%
	Number of policy briefs drafted	1	1			1	100%
	Number of farmer video clips distributed	1	1	1		2	200%
	Number of case studies documented	3	1	1		2	67%

6.0 LESSONS, CONCLUSION AND SUGGESTIONS FORWARD

Market-led adoption of project interventions, especially with regards to seed systems, is a key sustainability pathway. Adoption of project cropping systems has been satisfactory. However, the smooth implementation of the project was hampered by the onset of COVID 19 with governments imposing strict restrictions to curb the spread of COVID-19. For example, the 44-LaMotte mobile soil test kits for farmers could not be deployed immediately due to travel restrictions. Neither could farmers be trained on how to use the kits due to restrictions on public gathering. This though taught us the importance of integrated and innovative approaches such as incorporation of digital extension. Below are some lessons drawn moving forward.

- **Open agricultural policy in partnership engagement**: The open agricultural policy in Malawi accommodating development partners played a key role in the project. SAPP was instrumental in leading and engaging with the identified partners and departments under the MoA to understand the role they were expected to play and contribution to the IDSST project. The basis of IFAD – AGRA co-funding also played a critical role in enacting this partnership as both AGRA and IFAD had similar interests.
- **Identification of preliminary interventions**: AGRA's validation of preliminary intervention areas that were identified during the grant development phase, played a key role that enabled IDSST to identify the gaps in the loan programs' long-term targets of ensuring that appropriate agricultural technologies and GAPs are screened and adapted for each agro-ecology. IDSST, therefore, addressed the identified gaps and challenges.
- **Investment in public-private partnerships (PPP):** IDSST has demonstrated the importance of -PPP model in delivery of seeds and soil health technologies to farmers by, where enabling DARS, a public institution lead the production of breeder seeds to directly partner with private seed companies, MUSECO and Global Seeds which eased commercialization of legume varieties which were released by research a few years ago but could not be accessed by farmers. The sub-granting of private seed companies such as MUSECO realized increased production and distribution of high quality pre-basic, basic seed and certified seed respectively to the farming communities in the SAPP districts.

- **Creation of complete input supply chain with piloting of the VBA model:** The agro-dealer model proved successful due to the partnership which led to an increase in the number of seed producers, input supplies and distributors, thereby reaching more consumers. The supply chain link resulted in an increased number of agro-dealers stocking and providing a variety of farming inputs to smallholder farmers in remote areas.
- **Joint planning and review meetings are key to learning:** Sub-grantees and implementing partners in the IDSST-PPP model benefitted from the joint review meetings, monitoring

exercises, and AGRA's technical support and supervisions to strengthen weak areas of implementation. These meetings offered opportunities to share experiences among implementing partners.

The end of project evaluation concluded that the project was relevant and well-designed and had shown that IDSST interventions generally had fairly positive results that fed into the overall project's goal of a more competitive cassava, maize and legumes value chain in Malawi, Mozambique and Ethiopia, thus creating a measure of impact around the following two key areas:

- Increased efficiency of government research and development functions that has successfully supported seed and ISFM technology development, release, and dissemination
- Increased private sector actors' roles and capacity in developing and disseminating improved seed and fertilizer technologies.

IDSST spurred a fair number of improvements on seed systems, soil fertility technologies and the production system in general. The improvements have been visible across the national seed value chains by building the capacity of private seed suppliers, government research and regulatory agencies, and seed producers, especially in Malawi and Mozambique. Through logistics and infrastructure support and public-private coordination, the project eased the access constraints faced by smallholder farmers. As a result, demand for certified seed has grown, with its use rising from 10% of total seed use in 2017 to more than 27% in 2021 in most of the project areas. Significantly, these efforts have also improved partnerships between private seed companies and public research and regulatory institutions.

The IDSST was able to identify and invest in the best-fit soil fertility management technologies available for legumes and cassava. However, the project has been unable to scale them for maximum impact among project beneficiaries, partly due to the very short duration given to the sub-grants awarded under the project as well as the COVID-19 pandemic. However, the project was noted for the significant investments made in raising awareness on soil fertility and integration with improved seed systems.

Throughout, the project adopted the use of farmer-friendly technology dissemination mechanisms. The project disseminated yield enhancing technologies largely through mounting farmer-managed demonstration plots and field day events at those sites. This was largely achieved through the hundreds of demonstration plots established under IDSST. To improve soil health and farmers' productivity and incomes in the three countries, IDSST teams combined the promotion of certified seed use with intensive messaging through awareness campaigns and demonstration of ISFM technologies and their benefits. ISFM strategies centered on the

combined use of mineral fertilizers and locally available soil amendments and organic matter to condition the soils and in some cases, to replenish soil nutrients.

In terms of project efficiency and value for money, the evaluation considered the fact that IDSST was a “testing-of-proof-of-concept” project. Another contextual factor was that AGRA’s focus in the IDSST project was crop productivity, earmarking production, and distribution of early generation seed. The project, therefore, had limited resources in terms of budget and time, but ambitious reach.

Market-led adoption of project interventions, especially with seed systems, is a key sustainability pathway and the adoption of project cropping systems has been satisfactory. The interventions are likely to be continued by key stakeholders (farmers, seed companies and agrodealers) due to the demonstrated opportunities. Farmers have seen a strong market opportunity to grow some crops like soya bean and groundnuts, while agro-dealers see a large and growing market for farm inputs, seed, and fertilizer. In Malawi, seed companies under-delivered seed due to the high demand stimulated, hence there is a significant trigger for increased seed production.

The gains made in the IDSST project could be transitioned into the new IFAD investments; PROCAVA in Mozambique and TRADE in Malawi. In Mozambique, the IDSST project has ended but the field multiplication is continuing under PROCAVA. Furthermore, the project has paved the way for opportunities for innovation and scaling up lessons learned in other countries like Kenya and Rwanda.

It is also worth mentioning some of the cross-cutting issues in the three countries that the IDSST project brought to light. Firstly, the success of Public-Private-Partnerships established under the AGRA and IFAD collaboration led to partnerships with government, national agricultural research systems, seed companies, financial Institutions, international research organisations, farmers and farmers’ cooperatives in all the three countries. This proved the capability of AGRA as a convener, private sector partner, grantee capability builder, and implementation supporter. With the success of these partnerships, AGRA has proved to be an effective go-to partner for implementation support to effectively and efficiently deliver results.

7. ANNEX

A. IDSST End of project evaluation ..\..\Endline evaluation\IDSST draft final report Aug. 3 2021 CLEAN version (002).docx

B. IDSST Book of Knowledge Management