CIP INTERNATIONAL POTATO CENTER

CGIAR

REPORT

CGIAR Contribution to KULIMA Promoting Farming in Malawi: Improving the Access to and Use of Agriculture Research Innovations by Malawian Farmers

MARCH
2021

CGIAR Contribution to KULIMA Promoting Farming in Malawi: Improving the Access to and Use of Agriculture Research Innovations by Malawian Farmers

Second semi-annual progress report (1 July–31 December 2020)

March 2021

Submitted to:
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Submitted by:
International Potato Center (CIP)

Contract No: 1420-GIZ0

Funding Amount: € 2,959,500

Project Duration: 28 months (1 December 2019–31 March 2022)

Implementers: International Potato Center (CIP), Alliance Bioversity-CIAT, International Maize and Wheat Improvement Center (CIMMYT), World Agroforestry Center (ICRAF), International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), International Institute for Tropical Agriculture (IITA), and World Fish Center (WFC)

Principal Author: Akinwale Gbenga

Contact Information:
International Potato Center–Malawi
P.O. Box 31600 Lilongwe, Malawi
Tel: +265 999 678 889

Table of contents

List of tables

List of photos

List of figures

Acronyms

ADD	Agricultural Development Division
CA	Conservation agriculture
CBFs	Community-based facilitators
CCA	Climate change adaptation
CGIAR	Global Agricultural Research Partnership
CIAT	International Center for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Center
CIP	International Potato Center
COGs	Community outreach groups
EPA	Extension planning area
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FFS	Farmer field school
GIZ	Gesellschaft für Internationale Zusammenarbeit GmbH
IAA	Integrated agriculture aquaculture
ICRAF	World Agroforestry Center
ICRISAT	International Crop Research Institute for the Semi-Arid Tropics
IITA	International Institute for Tropical Agriculture
KULIMA	Kutukula Ulimi m'Malawi (promoting farming in Malawi)
M&E	Monitoring and evaluation
MT	Master trainer
NRM	Natural resource management
OFSP	Orange-fleshed sweetpotato
QPM	Quality protein maize
RAs	Result areas
RTC	Residential training center
SO	Strategic objective
WFC	World Fish Center

Project overview

This report summarizes the progress of implementing the CGIAR KULIMA[1] phase 2 project (1 July–31 December 2020). The 28-month project (1 July 2020–31 March 2022) is funded by the European Union (EU) through the Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) and is co-funded by the German Cooperation for the GIZ implementation component. It is a six-year EU-government of Malawi partnership that is being implemented by GIZ, the Food and Agriculture Organization of the United Nations (FAO), and a consortium of NGOs led by Self Help Africa. The International Potato Center (CIP) is coordinating the contribution of seven CGIAR (CG) centers under the coordination of GIZ:

- Alliance Bioversity–International Center for Tropical Agriculture
- International Maize and Wheat Improvement Center
- International Centre for Research in Agroforestry
- International Crop Research Institute for the Semi-Arid Tropics
- International Institute for Tropical Agriculture
- World Fish Center

This CIP-led component of KULIMA phase II is funded at €2,959,500.

KULIMA action objectives

The overall objective of the six-year KULIMA action is to promote sustainable agricultural growth to increase incomes, employment, and food security in Malawi in the context of a changing climate. The project has three specific objectives (SOs) with different result areas (RAs).

SO1: Agricultural productivity increased and production diversified in a participatory, sustainable, and climate change-resilient manner

RA 1.1: Improved organization and delivery of national research and extension services

RA 1.2: Supply system of appropriate inputs and related technologies set up and meeting the needs to ensure increased, diversified, and sustainable production

RA 1.3: Farmers mobilized and supported to boost their agricultural production

RA 1.4: Government efficiently supported to increase investment for irrigation development

SO2: Agricultural value chains developed or established and related income and employment opportunities created

RA 2.1: Affordable loans made available to private sector-managed, demand-driven agricultural investments and used by value chain actors for expanding operations, including smallholders' operations

RA 2.2: Value chain development plans for selected crops and other commodities developed and implemented, leading to increased, sustainable, and environmentally friendly growth in primary production, value-adding, and viable enterprises in the value chain

SO3: Agriculture sector governance is strengthened

RA 3.1: The wider public is better informed and consulted on key issues in agriculture

RA 3.2: Strengthened accountability role of the Malawian Parliament on agriculture and agriculture-related issues

1. *Kutukula Ulimi m'Malawi*, or Promoting Farming in Malawi.

In this project, CG centers are mainly contributing to SO1 of the broader KULIMA program that seeks to increase agricultural productivity and diversification through systematic deployment and upscaling of climate-smart agriculture technologies in a participatory and sustainable manner. Specifically, CG centers are contributing to the key RAs 1.1 and 1.2 of SO1, which focus on strengthening the organization and delivery mechanism of national agricultural research and extension services, in addition to improving the supply systems of appropriate information, knowledge, technologies, and inputs to smallholder farmers across the KULIMA districts.

1. Overall project progress and achievements

This report summarizes the activities undertaken and progress made during the second six months of implementing the KULIMA phase 2 project (i.e., 1 July–31 December 2020).

1.1 Executive summary of progress and achievements

Toward the end of the reporting period, implementation of project activity continued to gain momentum following the ease of several restrictions placed on field activities by the government and donor due to the outbreak of the COVID-19 pandemic. However, the implementation of some project activities was affected at the beginning of the reporting period due to the restrictions imposed by government and some CG centers on training and field activities. To keep the project on track during this period, a five-month contingency work plan that allowed working from home was developed with inputs from all the implementing partners (see Annex 1). Project activities implemented during the reporting period include (1) participatory technology evaluation; (2) review of study plot protocols; (3) harvesting and analysis of yield data from the study plots; (4) procurement and distribution of starter kits; (5) establishment of study plots; and (6) training and engagement of seed multipliers.

Through the implementation of these activities, the project made significant progress and achievements. Notable among the achievements made are highlighted as follows:

- **Procurement and distribution of inputs for the establishment of study plot at three residential training centers (RTCs) and 30 outreach locations**. Various inputs such as seed of different commodity crops, fertilizer, inoculant, stem/vine cuttings, and other protective chemicals were procured, packaged, and distributed by various CG centers in order to establish study plots across the three RTCs and 30 outreach stations. Additionally, starter kits of inputs of all the promoted technologies were procured, packaged, and distributed to the third cohort of 90 master trainers (MTs) for the training of community-based facilitators (CBFs).
- **Farmer participatory technology evaluation.** The results of participatory cassava technology evaluation carried out by IITA showed that all the improved cassava varieties (i.e., 'Sagonja', 'Sauti', and 'Mpale') outyielded the local variety 'Mbundumali' in all the locations except at Lissadzi RTC. However, farmers at most sites selected 'Mbundumali' and 'Mpale' as the most preferred varieties due to their mealiness and sweet taste as cassava in these areas is mainly grown for snacks and the fresh market. Similarly, ICRISAT carried out participatory technology evaluation for groundnuts varieties at Mulanje (Thuchila RTC) and outreach locations. The results obtained at Talandira farmer field school (FFS) showed that the CG 9 variety was most preferred by both men and women participants, followed by 'Kakoma' variety. The results of fertilizer tree technology evaluation conducted by ICRAF with 20 FFS groups also revealed farmers' preference for short-duration Tephrosia over long-duration Gliricidia. Overall, chemical fertilizer application remains the first option, compost-making and farmyard manure are second, and fertilizer trees and rotations are third. The results of aflatoxin contamination analysis carried out on Aflasafe-treated and control plots of maize and groundnuts across the three RTCs and outreach locations showed that Aflasafe reduced aflatoxin contamination by 61–100% (mean of 78.8%) in maize and by 69.8–94.4% (mean of 79.5%) in groundnut.
- **Study plot harvesting and yield assessment.** The harvesting of sweetpotatoes study plots at the three RTCs and outreach locations showed considerable variation in root yields across varieties and locations as well as response to fertilizer application. The highest root yields of 30.72 t/ha were recorded for 'Mthatha' variety that received fertilizer application, followed by

'Kadyaubwerere' variety that was planted without fertilizer application (28.64 t/ha) at Mzuzu RTC. Generally, the yields of orange-fleshed sweetpotato (OFSP) varieties ranged from 16.6t/ha to 34.5t/ha; 'Mathuthu' was the highest and 'Anaakwanire' was the lowest. Likewise, the yield analysis carried out for both soybean and cowpea study plots cross the three RTCs showed higher yields at Lisasadzi (1,183 kg/ha) and Thuchila (1,126 kg/ha) than at Mzuzu (384 kg/ha), and were also higher at the RTCs than at the FFS sites. Overall, the improved varieties with improved management practice (i.e., double rows, fertilizer, and inoculant) yielded 34.5–41.0% higher than the recycled seed with farmer practice (i.e., single rows, no fertilizer, and no inoculant). For cowpea, the highest yields were obtained from sole stands (896 kg/ha), yielding 38.5% higher than intercropped stands (551 kg/ha), based on IT82E16 performance. But where intercropped, 'Sudan 1' (690 kg/ha) and IT82E16 (621 kg/ha) yielded higher than 'Mkanakaufiti' (242 kg/ha). The groundnuts yield assessment carried out by ICRISAT at outreach locations at Lisasadzi and Thuchila RTCs showed best groundnut yield performance at Tigwirizane FFS, followed by Talandira FFS.

- **Developing sustainable seed systems.** A total of 176 community-based seed multipliers were identified, trained, and supported with basic seed and other inputs by various CG centers in order to produce seed of different commodity crops that are being promoted under the KULIMA project.

1.2 Detailed reporting on the project achievements

This section of the report describes detail achievements relating to activities under each objective, and crosscutting issues such as project coordination and monitoring and evaluation (M&E).

RA 1: Improved organization and delivery of national research and extension services

Main activity 1.1: Identify innovations/technologies available and adapted for each agro-ecological zone of Malawi

Sub-activity 1.1.1: Map existing innovations/technologies for each agro-ecological zone of Malawi, including an assessment of availability of innovations/technologies to determine possible gaps

Given that smallholder farmers often operate in complex and diverse cropping environments, it is important to continue to map integrated technology options to various ecologies that represent the variation in climate, soil, biotic conditions, and cropping. Hence, planning meetings were organized by GIZ and CIP, in collaboration with Agricultural Development Division (ADD), to review the existing technology mapping with the aim of addressing the current technology needs of the FFS groups. The meetings were held on 13–14 October in Blantyre RTC, 20–21 October in Kasungu RTC, and 29–30 October in Mzuzu RTC (Photo 1). The meetings deliberated on the following agenda items:

- Review progress, achievements, lessons, and challenges encountered during project implementation
- Discuss the completion of the training of the three cohort of MTs
- Sensitize the outreach groups on the integrated technologies that are available for their enterprises as well as assess the needs of the groups for these technologies
- Develop work plan of activity for the next season

The planning meetings ended with the development of a joint activity work plan for establishing study plots. The integrated technologies selected by each community outreach groups (COG) are listed in Annexes 2–4).

Photo 1. GIZ/CGIAR/ADD review and planning at Thuchila and Lisasadzi RTCs on 13 and 20 0ctober 2020, respectively.

Sub-activity 1.1.2: Develop integrated technology packages to be used for the training/capacity building in a learning-by-doing process

The project continued to review the existing integrated technology packages and crop-specific technologies to ensure that research issues and technology needs of farmers identified through the FFS learning process are adequately addressed by technology experts. One such technology needs that emerged from the COGs in Mulanje district was the need to have an integrated technology package on Striga management. Following this request, a study on field management of Striga was developed and incorporated into the research portfolio of the EU-funded DeSIRA project, which aims to develop climate-smart agricultural innovations in Malawi. Many other new technologies that were included in the technology package are (1) newly released crop varieties of potato and OFSP with various attributes such as high yielding, early maturing, and tolerant to major pest and diseases; (2) fish-feed formulation at 15% feed conversion ratio; (3) fish+maize+banana; and (4) fish+vegetables+ legumes; (5) fish+potato+sweet+potato+fruits. An integration study area with bananas is being established at Mpamba FFS in Nkhata Bay and at Ankadziwandani FFS in Thuchila in addition to the ones at Lisasadzi RTC, Tiyese integrated agriculture aquaculture study plot established in KULIMA phase 1.

Sub-activity 1.1.3: Develop a joint "strategic plan" for rolling out the innovations and technologies, including natural resource management/climate change adaptation (NRM/CCA) practices, to the three RTCs and 15 outreach locations

A two-day virtual review and planning meeting was organized on 11–12 August 2020. The meeting aimed to review progress, achievements, challenges, lessons learned, impacts of COVID-19 on the project implementation, and to agree jointly on the way forward. The meeting attracted various institutional stakeholders who are involved in project implementation as well as players from other sectors. A number of emerging issues were discussed (e.g., gender imbalance, site selection, study plot establishment, study plot maintenance and data collection, completion of MT training program, market linkage for seed multipliers, and agro-dealer training). The meeting ended with the following recommendations:

- The Food and Agriculture Organization of the United Nations (FAO) should address the issue of gender imbalance that exists among MT participants to ensure that at least 45% of women are involved.

- The project should step up the training of MTs to ensure that the 100% target is reached by the end of the project period, given that only 46% of MT trained has been reached so far.
- Sites for establishing study plots should be selected early.
- MTs should receive adequate technical backstopping on data collection
- Collaborate with MIERA and better consortium to create market linkages for the trained community seed producers.

As discussed above, the objective of the GIZ-CGIAR-ADD review and planning meetings was to review the progress and achievements, reflect on challenges and lessons learned, and plan for the completion of the training of the three cohort MTs. The meeting was held physically; all the COVID-19 precautionary measures were strictly followed. Many issues affecting project implementation were discussed, and the following recommendations made:

- Wage rates for government workers on the KULIMA project need to be harmonized, as it was noted that institutions use different rates.
- Study plot protocols need to be shared with the principals at the RTCs and MTs at outreach sites.
- Sites need to be selected early (by September), as delays may lead to allocation of marginal land as farmers would have assigned the land for other uses.
- Inputs need to be delivered by the end of October as rains start early in some parts of Blantyre ADD.
- Communication needs to be increased among the stakeholders through regular meetings.

Main activity 1.2: Train extension workers and lead farmers with the FFS approach to improve quality and accessibility of the national extension system

The training of the three cohort of MTs was suspended due to the COVID-19 pandemic. Some activities (e.g., review of training materials, technical backstopping of CBFs and FFS groups) were carried out during the reporting period, however.

Sub-activity 1.2.1: Develop technical content to be included in the FFS modules (innovation and technologies and NRM/CCA practices)

During the reporting period, the project continued to review and refine the MT training manuals to address all the issues that emerged from the training modules. For instance, during the GIZ-CGIAR-ADD review and planning meeting, it was highlighted that the training manuals developed for the MTs are too big and difficult to read and understand. Addressing this issue, the concerned CG centers began to review their training manuals to ensure that they are easy to read and understand. In addition, CIMMYT reviewed the protocol used for establishing and managing study plots. The number of pro-vitamin A maize varieties was increased from two to three. This was done to increase awareness for these varieties, which are still new in Malawi. The maize variety brochure was also revised to include all the pro-vitamin A maize varieties that have been released in Malawi.

Sub-activity 1.2.2: Train MTs on innovation and technologies (seed/input production and management) and NRM/CCA practices

During the reporting period, it was not possible to complete the training courses for the three cohorts of MTs. Not only were conversations still ongoing between FAO and the Ministry of Agriculture and Water Development on the actual date when the MTs will return to the RTCs, but the COVID-19 pandemic was a factor as well. Since then, the RTCs have remained closed, although FFS groups were guided on various project activities. For instance, FFS farmers were trained on biomass incorporation

at the time of both land preparation and fertilizer application. Activities for the fourth cohort of MTs were also partially implemented since the MTs are not yet on campus in the absence of the training schedule/curriculum.

Sub-activity 1.2.3: Acquire and provide the required quality inputs to be used for the practical training with establishment of trials in study plots (at RTCs, 15 outreach locations, and up to 80 training sites per season where MTs will be training CBFs)

PROCURE AND PACKAGE INPUTS FOR THE ESTABLISHMENT OF STUDY PLOTS. Prior to the establishment of study plots, inputs were procured and packaged by various CG centers for establishing technology study plots. Inputs procured included seed of various commodity crops, fertilizer, inoculant, stem/vine cuttings, and other protective chemicals. Highlights of inputs procured and distributed by each CG centers are as follows:

- **Alliance Biodiversity-CIAT** delivered common bean seed and NPK fertilizer for establishing study plots at the three RTCs and 30 FFS plots at the outreach sites as follows. Common bean varieties distributed were NUA 45, SER 124, CAL 143, SAA 20, and UBR92(25). Each FFS group received 5 kg of fertilizer and 2 kg each of the following bean seeds: NUA 45, Napilira, SAA20, and SER 124.
- **CIMMYT** procured the seed of five maize varieties and fertilizers for establishing study plots at both RTCs and outreach locations. Four of these maize varieties are nutrient dense: MH40A, MH43A, MH44A, and Chitedze 2 quality protein maize (QPM). The fifth variety, MH36, is a drought-tolerant hybrid maize.
- **ICRAF** carried out timely procurement and delivery of inputs to both the RTC and FFS to ensure that most FFS groups planted with the first rains. A total of 1,000 kg of Tephrosia seed and 2,200 assorted improved fruit trees (mango, citrus, and pawpaw) were sourced and distributed to farmers in 28 FFS. In addition, 20 bags of fertilizer (10 NPK, 10 UREA) and165 kg of maize seed were procured and distributed to the outreach centers and RTCs. ICRAF also distributed 6,120 Gliricidia and 1,250 Sesbania seedlings for intercropping.
- **CIP** procured and distributed seed of three potato varieties ('Chuma', 'Rosita', and 'Violet'); vine cuttings of nine OFSP varieties (i.e., 'Anaakwanire', 'Chipika', 'Kadyaubwerere', 'Kaphulira', 'Mathuthu', 'Mthetsanjala', 'Msungabanja', 'Royal Choice', and 'Zondeni'); vine cuttings of four white-fleshed sweetpotato varieties ('Kenya', 'Sungani', 'Nyamoyo', and 'Salera'); and fertilizer for establishing study plots at both RTCs and COGs.
- **ICRISAT** procured and packaged seeds of groundnut, pigeonpea, and sorghum, and delivered them to CIP, which in turn delivered the seeds to the target districts. A total of 127 kg of groundnut, 8 kg of pigeonpea, and 21 kg of sorghum seeds were distributed to cater for all the study plots in the 10 districts (Annex 5).
- **IITA** procured and packaged different inputs for establishing study plots. These were soybean seed ('Tikolore', 'Makwacha', 'Nasoko', and 'Recycled'); cowpea seed (IT82E16, 'Mkanakaufiti', and 'Sudan 1'); maize seed (MZ523); groundnut seed (CG 7); inoculant (Nitrofix); fertilizer (Super D, 23:10:5+6S+1Zn and urea); Aflasafe, and cassava planting materials (stems) (Photo 2).

Photo 2. Soybean (left) and cowpea (right) starter kits on 15 October 2020.

PROCURE AND DISTRIBUTE STARTER KITS TO THE CBFS. CIP, with support from other CG centers, procured and distributed starter kit inputs to 90 MTs to support the training of CBFs in all the 10 KULIMA districts (i.e., Chitipa, Karonga, Nkhata Bay, Mzimba, Kasungu, Nkhotakota, Salima, Chiradzulu, Thyolo, and Mulanje). Here, each MT is expected to train 30 CBFs/lead farmers through the technology study plots. The distribution was carried out in two phases. The first set of starter kit inputs was distributed on 4–22 November 2020. Packages of cereals and legume seeds of different crops, as well as other inputs such as GIZ-approved chemicals, inoculant, and fertilizers of different types, were distributed (Photos 3 and 4). The second phase was carried out from 8 December 2020 to 10 January 2021, and involved the distribution of planting materials of the vegetatively propagated crops and other inputs (e.g., fertilizers of different types) (Annex 6). Each MT received a complete set of all the planting materials that were distributed during the first and second phase (see Annex 7 for a list of MTs).

Photo 3. Vegetative propagated planting materials being delivered in Zombwe extension planning area (EPA) in Mzimba North on 6 January 2021.

Photo 4. An MT (Titus Nyirenda) inspects the starter kits in Bulala EPA, Mzimba South (left) and Nyungwe CBF (right) on 6–7 January 2021.

ESTABLISH STUDY PLOTS AT RTCS AND COGS. Before the study plots were established, land assessment and plot demarcation were conducted across the three RTCs and selected COG locations from 15 to 26 October 2020. The exercise involved allocation of plots to each CG center based on the number of center-specific technologies selected by each outreach location. This was done due to the limited land allocation at most outreach sites, especially in Thuchila and Mzuzu, where lands allocated by FFS groups were not adequate to accommodate all the technologies offered by the CG centers. The average size of the study plots ranges from 0.05 ha to 0.15 ha. An account of study plots established by each CG center are as follows:

- Alliance Biodiversity-CIAT established 55 integrated and crop-specific technologies across three RTCs and 29 outreach locations for the training of MTs and FFS groups. The study plots established include improved common bean varieties, integrated soil fertility management, and soil and water conservation.
- CIMMYT established 45 study plots across the three RTCs and 30 FFS sites (Annexes 8–10). The study plots established include maize variety + improved management technologies and maize-based conservation agriculture (Photo 5).
- CIP established 63 technology study plots (31 for potato-based and 42 sweetpotato-based technologies) across the three RTCs (i.e., Thuchila, Lisasadzi, and Mzuzu) and 29 COG locations (Photo 6). The potato-based study plot consisted of three released potato varieties (i.e., 'Chuma', 'Rosita', and 'Violet') with appropriate agronomic practices. Nine OFSP varieties (i.e., 'Anaakwanire', 'Chipika', 'Kadyaubwerere', 'Kaphulira', 'Mathuthu', 'Mthetsanjala', 'Msungabanja', 'Royal Choice', and 'Zondeni') as well as three white-fleshed varieties (i.e., 'Kenya', 'Sungani', and 'Nyamoyo') and one local ('Salera') were included in sweetpotato-based study plots. Some sweetpotato study plots also received fertilizer treatment to assess the effect of fertilizer application on their yields and agronomic performance (Annexes 8–10).
- ICRAF established 24 integrated and fruit tree technologies in all the three target RTCs and outreach locations (Photo 7). The technology study plot packages include Gliricidia–maize intercrop, Tephrosia–maize intercrop, Sesbania–maize intercrop, and fruit trees (Annexes 8–10)
- ICRISAT planned to implement five types of study plots at each RTC and surrounding outreach sites. During the planting time, insufficient space forced a change in the number of technologies. On average, study plots for groundnut and sorghum varietal comparison were established in outreach sites in Lisasadzi-Kasungu and Mzuzu. Overall, ICRISAT established 58 study plots of groundnut pigeonpea doubled-up technology, groundnut, pigeonpea, and sorghum varietal comparisons, and pest management across three RTCs and 29 outreach locations (Annexes 8–10).
- IITA established 76 study plots—22 on soybean, 16 on cowpea, 18 on cassava, and 20 on Aflasafe—representing 57.6.1% of the planned 132 study plots. The low number established was due to shortage of land at outreach sites to accommodate all the technologies offered (Annexes 8–10).
- WFC established 17 ponds in Mpamba under Mzuzu RTC, Ankadziwandani FFS (Thuchila RTC), three ponds at Tiyese (Lisasadzi RTC), seven ponds at Lusangazi (Mzuzu RTC), four ponds at Kavuzi (Mzuzu RTC), and three ponds at Thuchila. One hatchery was established at Thuchila RTC to enhance the seed supply systems, with three ponds to act as breeding ponds and conditioning ponds.

Photo 5. A cross-section of maize study plots in Mulanje and Kasungu, 27 and 28 December 2020, respectively.

Photo 6. Planting of study plots for potato at Thuchila and Mwawiwathu COG at Mphupira Village on 22 December 2020.

Photo 7. Healthy Gliricidia stumps of good tree density sprouting soon after removal and incorporation of green manure at land preparation (left) and biomass incorporation after planting at Tigwirizane FFS-Muhowa Village (right) on 28 December 2020.

Main activity 1.3: Supporting basic and applied research for addressing needs identified through FFS participatory research activities

During the reporting period, the MTs, CBFs, and FFS groups were engaged to assess and discuss the positive effects, economic benefits, and how the integrated technologies fit into farmers' technology needs and farming systems. The results of various participatory evaluation sessions conducted and farmers' technology preferences are highlighted below:

- Participatory cassava technology evaluation revealed that all the improved varieties ('Sagonja', 'Sauti', and 'Mpale') outyielded the local variety in all the locations except at Lissadzi RTC, where 'Mbundumali' recorded the highest root yields of 17.7 t/ha. However, farmers at most sites selected 'Mbundumali' and 'Mpale' as their most preferred varieties due to their mealiness and sweet taste. (Cassava in these areas is mainly grown for snack and fresh market, which does not favor the bitter varieties like 'Sagonja' and 'Sauti' despite their higher yields.)
- The pairwise ranking of groundnut varieties at Talandira FFS showed that CG9 was ranked tops by both male and female participants. 'Kakoma' was second to CG9, although male participants ranked it third.
- The results of aflatoxin analysis carried out on Aflasafe-treated maize and groundnuts revealed that Aflasafe reduced aflatoxin contamination by 61–100% (mean of 78.8%) in maize and by 69.8–94.4% (mean of 79.5%) in groundnut.
- The participatory fertilizer tree evaluation carried out by ICRAF showed that Gliricidia–maize intercropping was highly liked in Kasungu. On the other hand, Tephrosia–maize intercropping was highly preferred in Nkhata Bay and Mzimba as compared with Gliricidia. Farmers' preference on the tree technologies was on the short duration (Tephrosia) when compared with Gliricidia, due to the amount of biomass in the first years as well as land tenure. Overall, chemical fertilizer application remains the number one option, compost-making and farmyard manure is second, and fertilizer trees and rotations are third.
- Fish feed was produced at 15% feed conversion ratio with locally available ingredients, and it is being compared with the floating formulated feed imported from Zambia.
- The harvesting of sweetpotatoes study plots at the three RTCs and outreach locations showed variation in root yields across varieties and locations as well as response to fertilizer application. The highest root yields of 30.72 t/ha were recorded for 'Mthatha' variety, which received fertilizer application. This was followed by 'Kadyaubwerere' variety, which was planted without fertilizer application (28.64 t/ha) at Mzuzu RTC. Generally, the yields of OFSP varieties ranged from 16.6 t/ha to 34.5 t/ha. 'Mathuthu' recorded the highest and Anaakwanire the lowest.
- The yield analysis carried out for both soybean and cowpea study plots across the three RTCs showed higher yields at Lisasadzi (1,183 kg/ha) and Thuchila (1,126 kg/ha) than at Mzuzu (384 kg/ha). They were also higher at the RTCs than at the FFS sites. Overall, the improved varieties with improved management practice (double rows, fertilizer, and inoculant) yielded 34.5–41.0% higher than the recycled seed with farmer practice (single rows, no fertilizer, and no inoculant).
- For cowpea, the highest yields were obtained from sole stands (896 kg/ha), yielding 38.5% higher than intercropped stands (551 kg/ha), basing on IT82E16 performance. But where intercropped, 'Sudan 1' (690 kg/ha) and IT82E16 (621 kg/ha) yielded better than Mkanakaufiti (242 kg/ha).
- The groundnuts yield assessment carried by ICRISAT at outreach locations at Lisasadzi and Thuchila RTCs showed best groundnut yield performance at Tigwirizane FFS, followed by Talandira FFS.

- The information obtained from the technology evaluation exercise will be used to map the integrated technology options to areas of geographical adaption and technology needs of farmers during the next cropping season of 2021.

Sub-activity 1.3.1: Assess innovation adoption rates and adaptation needs (study).

PARTICIPATORY TECHNOLOGY EVALUATION. IITA conducted participatory cassava technology evaluation across three community outreach locations (Ankadziwandani at Thuchila and Tiyese and Mgwirizano at Lisasadzi) and two RTCs (Thuchila and Lisasadzi) from October to November 2020. No technology evaluation was conducted in Mzuzu as the plots were disturbed by animals. The objective was to enable farmers to participate in the evaluation of three improved cassava varieties ('Mpale', 'Sagonja', and 'Sauti') and one local variety ('Mbundumali') that are being promoted in the study plots. The evaluation comprised two components, researcher and farmer. The researcher evaluation involved quantitative root yield determination and disease and pest assessment. In this process, root yield (t/ha) was determined by multiplying weight of marketable roots harvested (kg) per plot by 10,000 m^2 and dividing by plot size (m^2) and 1,000 kg. Farmer evaluation involved subjective assessment by farmers of some prescribed attributes: plant vigor, root yield, root size, root attractiveness (appearance), root taste (raw and boiled), and mealiness. A total of 117 farmers (49 men, 68 women) participated in the evaluation. The farmers were grouped by gender (men and women) and were asked to assess the varieties for the above attributes. To avoid bias, the identities of the varieties were concealed until after the exercise was over. Cards were used for voting (one vote per person), and preference/ acceptability was determined by the number of votes cast for each attribute. The result of the evaluation revealed that all the improved varieties ('Sagonja', 'Sauti' and 'Mpale') yielded higher than the local variety ('Mbundumali') in all the locations except at Lissadzi RTC, where 'Mbundumali' recorded the highest root yields. Farmers at most sites, however, selected 'Mbundumali' and 'Mpale' as the most preferred varieties for the reasons already presented above (Annexes 11 and 12, Photo 8).

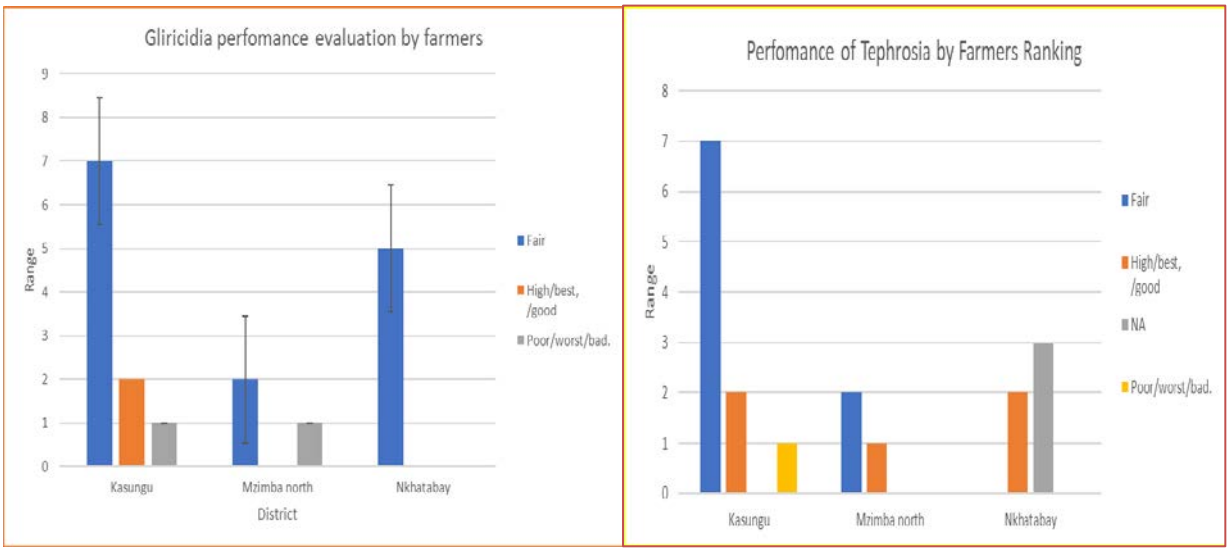
Photo 8. Farmers access planting materials of varieties of choice (left), and participatory evaluation of cooking quality of cassava varieties (right) on 18 November 2020.

Similarly, **ICRISAT** carried out participatory technology evaluation for groundnuts at Mulanje (Thuchila RTC) and outreach locations using pairwise ranking. During the process, each farmer was given three marbles to drop into a green plate that represents positive attributes of the technology under evaluation and another three marbles to put into a red plate that represents negative attributes of a

variety. Each variety had an equal chance of receiving one marble in either of the plates based on the perception of the farmers. With these three marbles, farmers had the liberty to put any number of marbles in a plate based on the positive and negative attributes. This implies that the plate with the highest number of marbles, either green or red, has a lot of positive or negative attributes. The process was done before and after lifting the groundnuts. After the field exercise, all the farmers were gathered to participate in a pairwise ranking of the technologies based on the selected attributes. The pairwise ranking was done by gender (see Annex 13 for results from the pairwise ranking at Talandira FFS). CG9 was ranked tops by both male and female participants. 'Kakoma' was second to CG9, although male participants ranked it third. Local variety 'Chalimabana' was second according to male participants alike, whereas female participants ranked it third.

ICRAF also carried out participatory fertilizer tree evaluation with 20 FFS groups in Kasungu and Nkhata Bay/Mzimba districts. A total of 193 people, including government extension staff and outreach center members, participated. It was observed that Gliricidia–maize intercropping was highly liked in Kasungu, whereas participants in Nkhata Bay and Mzimba indicated that the intercropping did not perform well (Figure 1). On the other hand, for the Tephrosia–maize intercropping shows that Nkhata Bay and Mzimba acknowledged that Tephrosia was highly preferred over Gliricidia. Preference on the tree technologies was on the short-duration Tephrosia when compared with Gliricidia due to amount of biomass in the first years as well as land tenure. Overall, chemical fertilizer application remains the number one option, compost-making and farmyard manure are second, and fertilizer trees and rotations are third.

Figure 1. Maize intercrop ranking (left) and Tephrosia–maize intercrop ranking (right).



CIMMYT provided winter drought-tolerant maize seed promotion packs to NGO partners for the winter study plots as part of an activity to promote drought-tolerant and nutritious maize varieties. The varieties included MH36, MH43A, and MH44A; 233 beneficiaries were reached (Photo 9).

Photo 9. MH 43A winter study plot in Nosa EPA, Nkhata Bay, on 10 September 2020.

WorldFish carried out feed formulation training at Thuchila RTC at Ankadziwandani FFS with 30 participants (17 women, 13 men). The feed was produced at 15% feed conversion ratio with locally available ingredients and is being compared with the floating formulated feed imported from Zambia. Participatory monthly monitoring of fish growth was also carried out at Ankadziwandani FFS. Aquaculture–banana integrated study was implemented at Ankadziwandani FFS in Thuchila in addition to the one established at Tiyese FFS at Lisasadzi RTC. Complete harvesting of fish at Tiyese fish farm was done in two main ponds of 118 kg of fish.

IITA carried out an aflatoxin contamination analysis of 14 maize and 13 groundnut samples from the Aflasafe-treated study plots during the 2019–2020 cropping season (Photo 10). The results revealed that Aflasafe reduced aflatoxin contamination by 61–100% (mean of 78.8%) in maize and by 69.8–94.4% (mean of 79.5%) in groundnut. **Given the USA acceptable limit of <20 ng/g, 61.5% of the groundnut samples from the treated fields were fit for human consumption, whereas only 15.4% of the untreated fields were fit for consumption.** On the contrary, all the maize samples, from both treated and untreated fields, were fit for consumption (Table 1).

Photo 10. Aflatoxin analysis in maize and groundnut samples in the Department of Agricultural Research Services/IITA Aflatoxin lab at Chitedze on 19 August 2020.

Table 1. Effect of Aflasafe on aflatoxin reduction in maize and groundnut in the 2019–2020 season

District	RTC/Outreach	Maize			Groundnuts		
		Treated (ng/g)	Untreated (ng/g)	Reduction (%)	Treated (ng/g)	Untreated (ng/g)	Reduction (%)
Thuchila	Nunkhire FFS	NA	NA	NA	2.0	36.0	94.4
	Tikondane FFS	0.0	6.0	100.0	6.0	41.7	85.6
Lisasadzi	Chingati FFS	2.2	7.6	71.1	3.2	10.6	69.8
	Sambafumu FFS	2.2	7.8	71.8	31.4	149.3	79.0
	Chamkoko FFS	2.7	8.2	67.1	18.0	61.4	70.7
	Chang'ona FFS	0.0	3.5	100.0	19.9	125.5	84.1
	Mgwirizano FFS	2.3	8.8	73.9	27.7	99.8	72.2
	Lisasadzi (RTC)	2.2	5.8	62.1	36.8	124.6	70.5
	Chikondi FFS	2.3	5.9	61.0	29.1	133.8	78.3
	Chipokolo FFS	0.0	4.1	100.0	19.6	149.5	86.9
Mzuzu	Limbanazo FFS	0.0	4.7	100.0	2.0	6.8	70.6
	Kanyenda FFS	2.4	7.9	69.6	25.7	117.9	78.2
	Mzuzu (RTC)	0.0	4.0	100.0	2.0	30.1	93.4
	Machaka FFS	2.9	7.6	61.8	NA	NA	NA
	Tayambapo FFS	2.1	5.9	64.4	NA	NA	NA
Mean		1.5	6.3	78.8	17.2	83.6	79.4

CARRY OUT PARTICIPATORY HARVESTING AND YIELD ASSESSMENT OF THE STUDY PLOTS. ICRISAT carried out yield assessment of groundnut varieties at outreach locations at Lisasadzi and Thuchila RTCs. The best groundnut yield performance was achieved at Tigwirizane FFS, followed by Talandira FFS (Figure 2). This variation was attributed to the differences in management besides site-specific conditions. The generally poor performance of all varieties at Talandira FFS was due to waterlogged condition of the field for a long period of time. At Ankadziwandani FFS, birds such as crows picked up the pods before maturity and harvesting. The bird damage was, however, periodic, and the 'Chalimabana' (a long-duration variety) was not damaged, thereby leading to its higher performance than either CG9 or 'Kakoma'. Yield performance at outreach sites at Lisasadzi RTC showed better yield performance of varieties at Tiyese FFS compared with the rest. This again can be due to differences in management and waterlogged conditions which happened at pod development stage (Figure 3). In contrast, yield performance at Lisasadzi and Thuchila RTCs showed no significant differences between varieties. There was generally optimal management that allowed the varieties to express themselves fully.

Figure 2. Performance of groundnut varieties at various sites in Mulanje district.

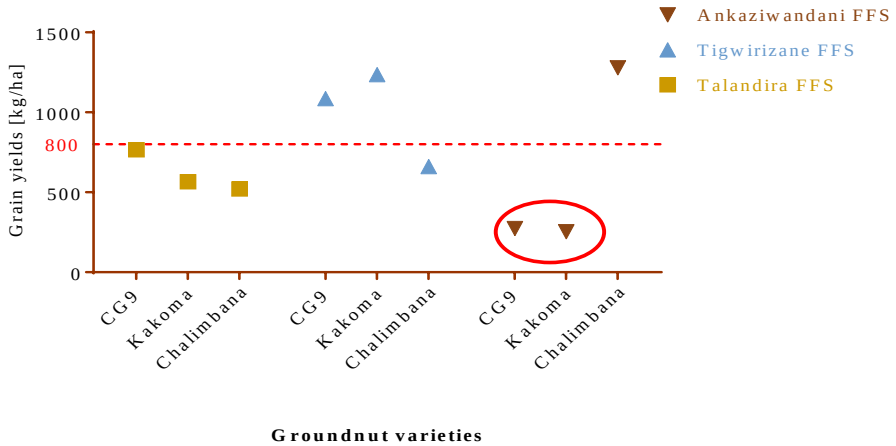
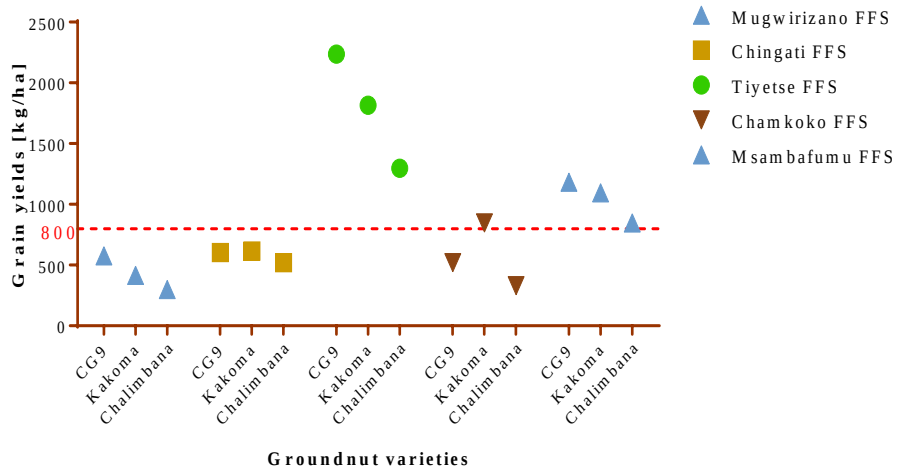
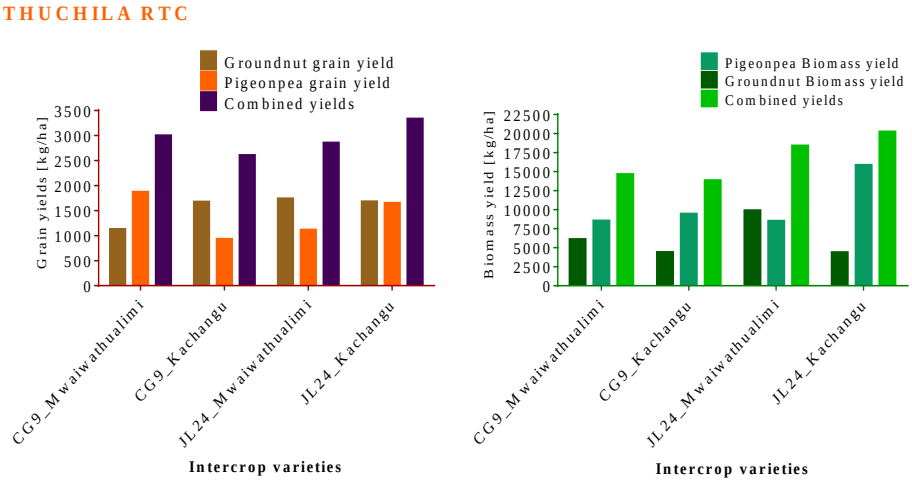


Figure 3. Grain yield (kg/ha) of groundnut varieties at various sites in Kasungu district.



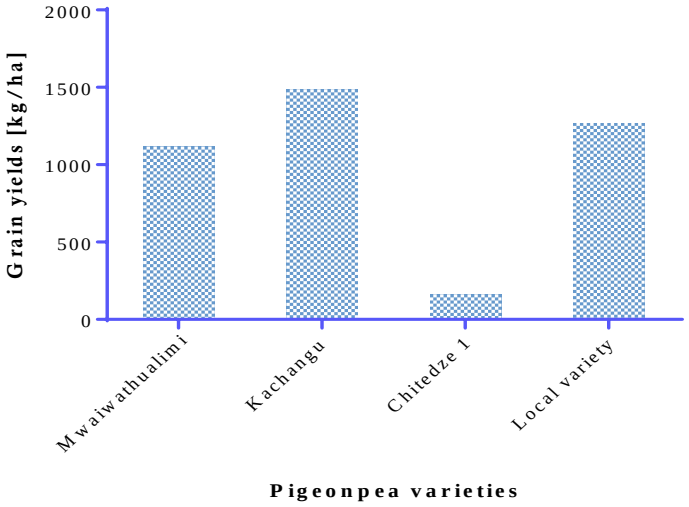
Groundnut pigeonpea doubled-up yield assessment. The objective of the groundnut and pigeonpea doubled-up system was to compare the performance of groundnut and pigeonpea in a legume intercrop system. In both cases, combined grain and biomass yield of the two crops were much higher compared with each single crop (Figure 4). This shows that the system is advantageous in increasing yield beyond what the two crops can achieve singly.

Figure 4. Groundnut and pigeonpea performance in a doubled-up legume system at Thuchila RTC in Mulanje.



Pigeonpea variety study plots yield assessment. The pigeonpea study plots were harvested by **ICRISAT** and the grain yield estimate was carried out. Figure 5 shows that grain yield of 'Kachangu' outperformed all the other two varieties ('Chitedze 1' and 'Mwaiwathualimi'). The poor performance of 'Chitedze 1' was attributed to high pest infestation, as the plots were not sprayed due to closure of the RTCs when this variety had reached flower-picking—a critical stage to control flower pests. The local variety, however, performed similarly with the improved variety 'Mwaiwathualimi'.

Figure 5. Yield performance of four pigeonpea varieties at Thuchila.



OFSP technology yield assessment. Fertilizer application is one of the technologies that is being promoted to increase the productivity of sweetpotato farmers under the KULIMA project. In this technology, six OFSP varieties were treated with fertilizer application against the control plots (without fertilizer). The results of the evaluation showed that average root yields differed across varieties and locations. There were also variations in response to fertilizer application among the six OFSP varieties promoted at both RTCs and outreach locations. At Mzuzu RTC, 'Mathuthu' variety (with fertilizer application) had the highest root yields of 30.72 t/ha, followed by 'Kadyaubwerere' variety (28.64 t/ha) without fertilizer application. The yields obtained were far higher than the national average of 18 t/ha. 'Mthetsanjala' and 'Msungabanja' varieties recorded low root yields of 3.46 t/ha and 8.40 t/ha when treated with fertilizer. The plots treated with fertilizer recorded average root yields of 19.26 t/ha for 'Kadyaubwerere' and 20.74 t/ha for 'Chipika'. However, the non-fertilizer-treated plots recorded 28.64 t/ha for 'Kadyaubwerere' and 22.22 t/ha for 'Chipika'. Both of these varieties showed negative response to fertilizer application when compared with non-fertilizer-treated plots. The poor response could be attributed to varietal differences in responding to fertilizer application. At Thuchila RTC, yield of 'Chipika' treated with fertilizer was the highest (68.2 t/ha). At Lisasadzi RTC, the highest yield was observed on 'Sungani', a white-fleshed variety (39.1 t/ha), followed by 'Mathuthu' OFSP variety (34.8 t/ha). The yield of OFSP varieties ranged from 16.6 t/ha to 34.5 t/ha; Mathuthu yielded highest and Anaakwanire the lowest. Results for outreach locations could not be properly analyzed due to inadequate data collection by the MTs. The results obtained on fertilizer response are preliminary and require more evaluations in the next season.

Soybean-based study plot. IITA carried out yield performance assessment for soybean and cowpea at the three RTC centers. The yields varied across locations and treatments, with the highest at Lisasadzi (1,183 kg/ha), then Thuchila (1,126 kg/ha), and lowest in Mzuzu (384 kg/ha). The yields recorded at RTCs were also higher than the ones obtained at the outreach sites, which reflects better field management at the RTCs than at the outreach sites. At Thuchila RTC, the mean yields across the sites showed that 'Tikolore' (1,189 kg/ha), 'Makwacha' (1,197 kg/ha), and 'Nasoko' (1,367 kg/ha) with improved management practice yielded much higher than the recycled seed with farmers' practice (752 kg/ha). This implies that by adopting the improved varieties with improved management practice, farmers would be getting 615 kg/ha (45.0%) of 'Tikolore', 437 kg/ha (36.8%) of 'Makwacha',

and 445 kg/ha (37.2%) of 'Nasoko' more than using recycled seed with farmers' practice. Similar results were obtained at Lisasadzi and Mzuzu. At Lisasadzi, 'Tikolore' yielded 1,296 kg/ha, 'Makwacha' 1,326 kg/ha, and 'Nasoko' 1,277 kg/ha. These yields were 463 kg/ha (35.7%), 493 kg/ha (37.2%), and 344 kg/ha (34.8%) higher than with the recycled seed (833 kg/ha). At Mzuzu the yields were generally lower than at Thuchila and Lisasadzi. But the trend in the performances of these varieties was similar: 'Tikolore' (486 kg/ha), 'Makwacha' (408 kg/ha), and 'Nasoko' (366 kg/ha) outyielded the farmers' practice (275 kg/ha) by 43.4%, 32.6%, and 24.9%, respectively (Annex 14). Overall, the improved soybean varieties with improved management practice yielded 34.5–41.0% higher than the recycled seed with farmers' practice, and these results are consistent with those recorded in 2019. Unfortunately, participatory technology evaluation for farmers to evaluate and appreciate the gains from using the improved varieties with improved management practices was done only at two sites at Lisasadzi as the project was interrupted by the COVID-19 pandemic travel restrictions. Nonetheless, 'Tikolore' was the most preferred (90.5%) at Chikondi outreach and, together with 'Makwacha' (46.2%), at Tiyese outreach (46.2%). The results are in line with the yield performance of the two varieties, although farmers also consider other attributes such as earliness of maturity and grain size in their selections (Annex 14).

Cowpea-based study plots. **IITA** carried out grain yield assessment on cowpea-based technology. The results revealed that at Lisasadzi, the grain yields differed greatly across sites, varieties, and cropping systems. In general, the yields were higher at the RTCs (1,296 kg/ha) than at the outreach sites (204–789 kg/ha). This reflects better plot management at the RTCs, as labor was not as big a problem as at the outreach sites which rely on membership cooperation that is occasionally difficult to get. The performances of most varieties at Thuchila and Mzuzu were not too impressive in most sites. Overall, the highest yields across the sites were obtained from sole plots of IT82E16 (896 kg/ha), yielding 38.5% more than intercropped plots (551 kg/ha), undoubtedly due to lower competition from the maize for the growth factors. However, the highest yields from intercropped plots were recorded from 'Sudan 1' (690 kg/ha) and IT82E16 (621 kg/ha), yielding over twofold more than 'Mkanakaufiti' (242 kg/ha). The two varieties ('Sudan 1' and IT82E16) were also the most preferred at Chikondi (91%) and Tiyese (50%) outreach sites, respectively (Annex 15).

Sub-activity 1.3.2: Conduct further research on selected innovations/inputs and related technologies for value chains addressed within SO2 that are within the mandate of the CGIAR in Malawi

Integrated technology package on Striga management was identified as one of the technologies that requires further research during the farmers' participatory technology evaluation in Mulanje district. Consequently, **CIMMYT** developed an integrated technology protocol to identify drought-tolerant maize varieties that are tolerant to Striga and to determine the effects of tillage practices like conservation agriculture and conventional tillage/practice on Striga infestation under the EU-funded DeSIRA project. The experiment is ongoing at Chitedze research station and 10 on-farm sites.

Sub-activity 1.3.3: Document and disseminate lessons learned about the spreading and adaptation of innovations and technologies from CG centers, including NRM/CCA practices, where applicable

In collaboration with Self Help Africa, CIMMYT compiled a success story from the seed systems activities that are being implemented with the NGO consortium. The story highlights the impacts from the winter study plots 9 (Annex 22). CIMMYT also developed a policy brief for pro-vitamin A maize as one the way of promoting it in Malawi. The design team is currently working on the document and will disseminate it once it is finalized. A maize variety description brochure was also updated during

the period under review to include some pro-vitamin A maize varieties that were recently released by the Department of Agricultural Services. The brochures will form part of the handouts for the MTs during their trainings; they will also be disseminated during other visibility events. IITA developed a success story on sustainable seed systems, as featured in the in GIZ quarterly newsletter. https://kulimamalawi.org/2020/08/11/tikule-kulima-miera-and-giae-joint-newsletter-for-august-2020/.

Sub-activity 1.3.5: Provide advisory services (as follow-up or on the application of provided innovations, including NRM/CCA practices) to (selected) producers and/or enterprises, based on demand and need (with a specific focus on women and young producers to level access to knowledge, based on a general assessment)

ICRAF provided extension advice/service through mobile phone to the CBFs at the outreach center on green manure incorporation. This was due to the restrictions on travel and the need to keep social distancing. It was, however, noted that in some FFS groups there was poor establishment of Tephrosia, which will mean little biomass to be incorporated into this year's growing season (Photo 11).

Photo 11. Biomass incorporation during land preparation at Chamkoko FFS, Lisasadzi EPA, on 13 November and 17 December 2020, respectively.

WFC provided technical guidance to the MTs and FFS in the following areas: (1) technical advice on the design of the hatchery that was being built under the seed supply systems; (2) visited Mpamba for technical guidance for establishing the study ponds during the renovation process to match with the IAA protocol; (3) technical advisory services to Thuchila RTC on how to overcome the challenge of declining water levels and participatory evaluation; (4) visited six outreach study plots to assess progress and advise on the next steps; and (5) made one advisory visit to Tiyese on partial harvesting, where 334 kg of fish were harvested. To date, 620 kg of fish have been harvested for sale, valued at approximately MK1.5 million.

RA 2: Supply system of appropriate inputs and related technologies set up and meeting the needs to ensure increased, diversified, and sustainable production

Main activity 2.1: Develop a sustainable system for production and distribution of quality planting material to producers in KULIMA

Sub-activity 2.1.1: Develop an integrated concept on a sustainable system for production and distribution of quality seed and planting material to producers within KULIMA (including the value chains addressed within SO2)

In this period, CGIAR continued to implement the integrated concept for sustainable seed supply systems developed for legumes, cereals, root and tubers, agroforestry trees, and fish. The concept combined different strategies used by different CG centers to meet the increase in demand for improved seed, planting materials, and other inputs by FFS groups.

Sub-activity 2.1.2: Support concrete partnerships to increase access to quality planting materials for producers

- **CIP** recruited, trained, built capacity, and consistently monitors the potato and sweetpotato multipliers in various KULIMA districts of Thyolo, Mulanje, Salima, Mzuzu, Nkhata Bay, Chitipa, Karonga, and Nkhotakota. In total, 44 seed multipliers (24 potato multipliers, 20 sweetpotato multipliers) from various districts were visited. Following the field-monitoring exercise, the team progressed with distribution of startup inputs to the newly recruited multipliers. Existing seed multipliers were also supplied with varieties that they did not have in their fields at the time of monitoring exercise was being conducted. The startup inputs, which included basic seed for potato varieties as well as fertilizer, were provided to the multipliers (Annex 18).
  - **Distribution of startup inputs for potato seed production.** Eleven potato seed producers from Mzimba, Nhatabay, Chitipa, and Mulanje districts benefited from the startup inputs. Six of them were existing multipliers who demanded potato varieties other than 'Violet', which they already have; five of the farmers were newly recruited. In total, 1,600 kg of seed, 750 kg of basal, and 750 kg of top-dressing fertilizers were distributed to cover an area of 2.2 ha (Annex 17).
  - **Distribution of startup inputs for sweetpotato vine production.** Sweetpotato vines were collected from the basic seed multiplier in Nkhata Bay, Limphasa EPA, and distributed to multipliers in Salima, Nkhotakota, and Kasungu. These are farmers who are actively multiplying vines from the last year's cohort. Vine multipliers were provided with different varieties of sweetpotato. A total of 100 bundles of sweetpotato vines were given to five vine multipliers to multiply seed on 0.5 ha of land (Annex 19).
- **ICRAF** identified tree farmer seed producers through the NGO consortium. ICRAF supported 292 farmers (177 for Tephrosia, 92 for Gliricidia, 23 for Sesbania seedbanks) during the season. The identified tree seed producers were provided with Tephrosia seed for planting during the 2020–2021 growing season. The 177 farmers identified to participate in the Tephrosia seed production received one pack each of 500 g of seed, enough to plant on 0.1 ha. The Gliricidia and Sesbania seed orchard were raised at ICRAF and distributed to farmers. (The final seedling quantities will be reported in the next quarter as distribution spilled into January 2021.) ICRAF contributed 50 kg of Tephrosia seed—enough to supply 100 farmers; this would be enough to cover a 10-ha seedling seed orchard. A total of 2,160 assorted improved fruit seedlings (mango, pawpaw, citrus, and guava) were procured and distributed to 94 CBFs across the three RTCs to establish fruit orchards (also referred to as fruit tree-mother blocks).
- **ICRISAT**. Following the identification of FFS and farmers to embark on seed production, ICRISAT and the Department of Agricultural Research Services conducted trainings on seed production with producers in all the 10 KULIMA districts that were engaged in the production of certified seed of its mandate crops. This year, a few farmers from the team that was trained last season were selected, requiring no further training.
- **Alliance Biodiversity–CIAT.** During the third quarter, ABC-Malawi will provide common bean seed packs to CBFs and seed multipliers for summer production as follows: 3-kg seed packs to CBFs and 32-kg seed packs to 30 seed multipliers. Additionally, 14 farmers were identified to

engage in certified seed multiplication in the 2020–2021 growing season. These farmers were provided with 32 kg each of NUA 45 basic seed (Annex 20).

- WFC trained three hatchery operators on design and general protocols (one in each of the RTCs at Thuchila, Lisasadzi, and Mzuzu). Additionally, 3,000 brood stock (2,000 females, 1,000 males) for the hatcheries was sourced and quarantined to observe any health risks at Mzuzu Research Station.

Sub-activity 2.1.3: Ensure production of quality planting materials according to requirements, their dissemination to FFS (starter-kits at three RTCs and 15 selected outreach locations)

IITA trained seed multipliers on quality seed production in November/December 2020 before the distribution of early generation seed. The training covered (1) agronomic practices (i.e., site selection, land preparation, varieties, seed selection, seed preparation, inoculant application, planting, fertilizer application, weed management, disease and pest management, and harvesting); (2) postharvest handling (i.e., threshing, grading, packaging, and storage); (3) recordkeeping; and (4) seed certification procedures and standards. The training involved interactive classroom lectures using PowerPoint presentations and hands-on practicals on soybean inoculant application and cassava seed selection, preparation, planting, and disease and pest identification and management. The training was conducted in small groups of farmers in compliance with the government's guidelines on COVID-19 preventive measures, which restricted the size of gatherings to no more than 10 and encouraged social distancing and masking, among other measures. Forty-three farmers (32 men, and 11 women) and 19 government/NGO consortium extension workers (12 men, seven women) were trained (Annex 21). All the seed multipliers were trained in seed multiplication in crops of interest. Soybean and cowpea seeds were distributed during the training except in Chitipa and Karonga, where the seeds were distributed later as the training was suspended in the two districts to make way for planting of the study plots in Thuchila and Lisasadzi, where the planting rains had started. A total of 708 kg of soybean seed for 8.7 ha and 101 kg of cowpea seed for 3.4 ha were distributed to 16 (11 men, five women) and nine beneficiaries (seven men, two women), respectively. Cassava-planting materials (stems) were also distributed from on 19–26 December 2020, following the stabilization of planting rains to allow for immediate planting. A total of 1,726 bundles of cassava stems for 13.2 ha, 931 bundles for 7.2 ha of 'Mbundumali', and 795 for 6.1 ha of 'Sagonja' were distributed to 18 beneficiaries (14 men, four women) in Mulanje, Chiradzulu, Mzimba, Salima, Nkhata Bay, Nkhotakota, Chitipa, and Karonga.

ICRISAT. During the reporting period, 300 kg of groundnut variety CG 9 and 10 kg of pigeonpea variety 'Mwaiwathualimi' had been provided to produce 3 ha and 1 ha, respectively. Details of the farmers producing seed will be provided in the next report once monitoring is completed.

Sub-activity 2.1.4: Provide assistance to MTs, CBFs, and selected community groups engaged in multiplication of planting materials

CIP provided Gibberellic acid to potato seed multipliers to help accelerate the sprouting process of those varieties that were not ready. In addition, Stella Chunga, in Kasungu, was provided with the treadle water pumps to facilitate irrigation of the seed.

Table 2 provides a summary of the project's M&E progress.

Table 2. M&E progress summary

Indicators	Center	Gender		Total Progress to Date	Explanation
		M	F		
RA 1.1: Improved organization and delivery of national research and extension services					
No. of existing innovations selected for each agro-ecological zone of Malawi.	Alliance Biodiversity-CIAT			3	Nutrient-dense common bean variety + improved management technologies, Common-based integrated soil fertility management technologies (mulching, soil & water conservation structures)
	CIMMYT			2	Maize variety + improved management technologies and maize-based conservation agriculture
	CIP			3	Sweetpotato variety+ improved management technologies, Potato variety + improved management technologies, Fertilizer blend for sweet potato
	ICRAF			3	Gliricidia–maize intercrop, Tephrosia–maize intercrop, Fruit trees
	ICRISAT			4	Groundnut variety + improved management technologies, Pigeonpea varieties + improved management technologies Pigeonpea and groundnuts intercropping, Sorghum + improved crop management technologies
	IITA			4	Cassava variety + improved management technologies, Soybean + improved management technologies, Cowpea + improved management technologies, Aflasafe + improved aflatoxin management technologies
	WorldFish			2	Integrate Agri-Aquaculture, Fish culture, Feed trials
	Total			**21**	
No. of integrated technology packages validated.	Alliance Biodiversity-CIAT			1	Integrated soil fertility management and water conservation.
	CIMMYT			1	Conservation agriculture (soil conservation, rotation, and legume intercropping
	CIP			0	
	ICRAF			1	Tree-based farming systems
	ICRISAT			1	Integrated pest and disease management
	IITA			1	Aflasafe + improved aflatoxin management technologies
	WorldFish			1	Integrate Agri-Aquaculture
	Total			**6**	
No. of training modules with technical content (including study plot protocols) developed on technologies and integrated packages.	Alliance Biodiversity-CIAT			1	Common bean production manual
	CIMMYT			1	Compilation of 8 brochures on conservation agriculture and maize varieties
	CIP			2	2 potato production training manuals; sweetpotato production training manual. The two manuals were for both seed and ware.
	ICRAF			1	Agroforestry modules training manual
	ICRISAT			1	Training guide for groundnut, pigeon pea, sorghum, and finger millet in Malawi
	IITA			4	Growing soybean in Malawi; Growing cowpea in Malawi; Cassava growing training manual; and Aflatoxin control using Aflasafe
	WorldFish			1	Fish farmers' training guide; pond aquaculture
	Total			**11**	
No. of MTs trained by technology or technology package					Not in this period
	Total			0	

Indicators	Center	Gender		Total Progress to Date	Explanation
		M	F		
No. of study plots established at 3 RTCs for technologies and technology packages.	Alliance Biodiversity-CIAT			9	3 study plots at each RTC
	CIMMYT			6	2 study plots at each RTC
	CIP			9	3 study plots at each RTC
	ICRAF			9	3 study plots at each RTC
	ICRISAT			12	4 study plots at each RTC
	IITA			12	4 study plots at each RTC
	Total			57	
No. of study plots established at outreach locations for technologies and technology packages.	CIAT			75	20 at Thuchira COGs, 30 at Lissadzi COGs, and 25 at Mzuzu COGs
	CIMMYT			35	12 at Thuchira COGs, 18 at Lissadzi COGs, and 5 at Mzuzu COGs
	CIP			64	21 at Thuchira COGs, 23 at Lissadzi COGs, and 20 at Mzuzu COGs
	ICRAF			43	12 at Thuchira COGs, 11 at Lissadzi COGs, and 20 at Mzuzu COGs
	ICRISAT			53	22 at Thuchira COGs, 21 at Lissadzi COGs, and 10 at Mzuzu COGs
	IITA			65	19 at Thuchira COGs, 29 at Lissadzi COGs, and 17 at Mzuzu COGs
	WorldFish			1	1 at Thuchira
	Total			**336**	
No. of starter kits provided to sites where MTs train CBFs	Third cohort 2020	58	32	90	Starter kit report
	Total	**58**	**32**	**90**	
No. of participatory technology evaluations conducted.	Alliance Biodiversity-CIAT			1	
	CIMMYT			0	
	CIP			0	
	ICRAF			1	
	ICRISAT			2	
	IITA			3	
	WorldFish			5	
	Total			**17**	
No. of farmers participating in technology evaluations.	Alliance Biodiversity-CIAT	55	78	123	Center, technology package.
	CIMMYT			0	
	CIP			0	
	ICRAF			193	
	ICRISAT				Not available
	IITA	49	68	117	
	WorldFish			93	
	Total			**526**	
No. of adapted technologies and technology packages described based on participatory evaluations.	ALL			5	Center technology package

Indicators	Center	Gender		Total Progress to Date	Explanation
		M	F		
RA 2: Supply system of appropriate inputs and related technologies set up and meeting the needs to ensure increased, diversified, and sustainable production					
No. of concepts on a sustainable system for production and distribution of quality seed and planting material for producers within KULIMA.	ALL			3	Center technology package
No. of partners involved in the development of concept and implementation of the seed system.	ALL			6	Center technology package
No. of multipliers trained in production of quality seed/ planting material/ seed.	Alliance Biodiversity-CIAT			34	
	CIMMYT			0	
	CIP			61	
	ICRAF			177	
	ICRISAT			177	
	IITA	32	11	43	IITA report
	WorldFish			3	
	Total			**257**	
No. of multipliers provided with startup materials and producing quality seed/ planting material.	Alliance Biodiversity-CIAT			48	Center, Value Chain, group, individual, gender.
	CIMMYT			0	
	CIP			22	
	ICRAF			177	
	ICRISAT			-	
	IITA	25	7	32	
	WorldFish			3	
	Total			**83**	
No. of inputs/ technologies covered in training package for agro-dealers.	Alliance Biodiversity-CIAT				Not in this reporting period
	CIMMYT				
	CIP				
	ICRAF				
	ICRISAT				
	IITA				
	WorldFish				
	Total				
No. of agro-dealers trained in inputs/ technology supply	None				Not in this period

2. Management issues

The CGIAR project component, managed by GIZ, consists of seven CG centers embedded in a wider program of complex and interdependent partnerships with FAO, a consortium of NGOs, and different government of Malawi departments. Naturally, implementing such an initiative requires intensive management, partnership development, communication, and coordination beyond simply implementing work plan activities.

This section highlights some of the management issue undertaking during the reporting period.

2.1 Coordination and visibility activities

- A two-day virtual review and planning meeting was held on 11–12 August 2020. The meeting aimed to review progress, achievements, challenges, lessons learned, impacts of COVID-19 on project implementation, and agree jointly on the way forward. The meeting attracted various institutional stakeholders who are involved in the project implementation as well as players from other sectors. Many emerging issues (e.g., gender imbalance, site selection, establishment of study plots, study plot maintenance and data collection, completion of MTs' training program, market linkage for seed multipliers, and agro-dealer training) were discussed.
- CIP/GIZ trained the technical staff of all the implementing partners. The training focused on the GIZ M&E framework and how the CGIAR contributed to the data flow in the framework. Consequently, tools were identified to harmonize data collection. The tool was incorporated and integrated into the management information system, which was being finalized by GIZ. The training was conducted on 29 September 2020.
- GIZ-CGIAR-ADD review and planning meetings were jointly organized by GIZ and CIP on 13–14 October at Blantyre RTC, 20–21 October at Kasungu RTC, and 29–30 October at Mzuzu RTC. The objective was to review the progress and achievements, reflect on challenges and lessons learned, and plan for the completion of the training of the three cohorts of MTs. The workshop was held physically with all the COVID-19 precautionary measures strictly followed.
- The FAO/GIZ/Blantyre ADD planning meeting organized by FAO on 30 November 2020 in Blantyre aimed to discuss the status of the suspended MTs course for the third cohort and plan for the completion of the same and plan for the fourth cohort of MTs course.
- A midterm review for the KULIMA project from March 2017 to 2020 was held at Wamkulu Palace, Lilongwe, on 16 November. The aim of the evaluation was to carry out overall independent assessment, at midterm of the implementation, of the performance of the projects, paying particular attention to the intermediate results measured against expected objectives. Also examined were the reasons underpinning such results and identify key lessons learned, conclusions, and related recommendations in order to improve current and future actions.

Other coordination and key activities underten during this period include:

- CGIAR center attended online training on sustainable seed system development organized by GIZ from 26 to 30 October 2020.
- Attended soil study workshop organized by Alliance Biodiversity-CIAT to disseminate the result of soil study carried out across the three RTCs.
- Reviewed and validated data collection and reporting tools for standardized routine reporting.

- Participated in the KULIMA PTC coordination meeting on 16–28 July 2020, to provide an update on project implementation to other KULIMA partners.

2.2 Management issues and challenges raised by CGIAR partners

- Implementation of some project activities due to government restrictions on travels and field activities.
- Poor fertilizer tree establishment and subsequent management in some FFS resulted in relatively low biomass production. Almost half of the FFS had moved to new sites, leaving the two-year-old established trees in old sites. As such, the farmers have been unable to see the biophysical changes, and can thus hardly appreciate the changes in soil fertility levels and subsequent impact on maize crop yields.
- Training of seed multipliers took longer as they had to be trained in small groups and on different days in compliance with government guidelines on COVID-19 prevention, which restricted the size of gatherings to no more than 10 and encouraged social distancing and face masking.
- Land shortage was a big challenge for the 2020–2021 study plots, as most outreach sites in Thuchila and Mzuzu could not accommodate more than two IITA technologies.
- In Thuchila, about 40% of the sites are on rented land and landlords usually repossess the land once annual crops are harvested. This forces premature harvesting of long-season crops like cassava, which takes almost a year before it is harvested.
- Damage and vandalism of cassava study plots by livestock (goats) and thieves continued to be a challenge. This partly led to premature (10 months after planting) harvesting of the study plots and writing off several of them.
- In some areas, fish-stocking densities technology study ponds faced a challenge of COVID-19 lock down. Moreover, siltation and poor site selection led to the pond drying out.

3. Planned activities for the next six months

- Monitor study plots and backstop MTs and CBFs on various project activities.
- Monitor and facilitate registration and inspection of seed farms for certification by the Seed Services Unit.
- Conduct participatory technology evaluations with members of the FFS.
- Apply Aflasafe in maize and groundnut study plots.
- Conduct a participatory technology survey for crop-specific and integrated technologies being promoted by CG centers.
- Conduct refresher training of agro-dealers.
- Complete third cohort of MT's training program.
- Carry out liming and stocking of outreach and hatchery.
- Distribute starter kits (fingerlings, lime, feed, etc.).
- Establish central and northern region hatcheries.
- Provide training in seed supply systems.

ANNEXES

Annex 1: Five-month contingency work plan for August–December 2020

KULIMA Contingency Work Plan from August to December 2020			Contingency Plan for Implementation	Deliverable	August				September				October					November				December			
Center		Activity			1	2	3	4	1	2	3	4		1	2	3	4	1	2	3	4	1	2	3	4
CIP																									
	A. Coordination																								
	A1	Complete the execution of subgrant agreements with CGIAR centers	To be implemented remotely via email	All subgrant agreements are fully signed with partners																					
	A2	Finalize funds disbursement to partners	Remotely via email	Funds disbursed																					
	A3	Organize virtual meeting with NGOs consortium on seed systems	To be implemented through virtual meetings and phone calls	Meeting is organized																					
	A4	Organize online seminar for KULIMA partners: GIZ grant guidelines/reporting requirements	Training to be conducted virtually through MS teams	Seminars are held																					
	A5	Participate in district ADD/GIZ planning meetings across 3 RTCs	Virtual and in-person meetings to be used where possible	Meeting attended																					
	A6	Participate in PTC meeting and present progress to date in implementation	Virtual meetings	All meetings are attended																					
	A7	Prepare technical and financial report and submit to GIZ	Remotely via email	Report prepared and submitted to GIZ																					
	B. Monitoring and Evaluation																								
	B1	Train CGIAR staff on M&E and financial reporting	Through virtual training meeting	Seminar held, tools shared																					
	B2	Finalize M&E data collection tools for Kulima phase 2	Activity to be done remotely																						
	B3	Review and validate data collection and reporting tools for standardized routine reporting	To be implemented remotely	Reporting tools reviewed and finalized																					

	C. Technical Assignments & Reporting																								
	C1	Complete the 3rd FFS trainings of MTs at the 3 RTCs and plan for the 4th cohort of MTs	Use digital training methods/in-person where possible	Training completed																					
	C2	Participatory technology evaluation survey to assess farmer's perceptions on technology and resulting adaptation needs	Through phone calls or data collection through MTs	Survey conducted and data analyzed for dissemination																					
	C3	Finalize the concept note for integrated seed systems	Activity will be done remotely	Concept note updated																					
		Collaborate with GIZ to conduct seed verification exercise to assess and validate the development of seed systems in the KULIMA districts.	Through phone calls or data collection through MTs/NGO consortium	Verification assessment carried out																					
	C4	Identify and train new seed/ vine multipliers	Virtual and in-person will be used depending on the situation	New seed multipliers trained																					
	C5	Winter seed production of potato and sweetpotato to produce potato seed and vines for establishing study plots	virtual/ In-person shall be used depending on the situation	Seed and planting materials produced																					
	C6	Site selection and plot demarcation at RTCs and various FFS outreach locations for the establishment of study plots	In-person by CIP staff/ MTs depending on the situation	Sites are selected																					
	C7	Procurement of seed and other inputs for establishing study plots	Virtual/in-person depending on the situation	Required inputs are procured																					
	C8	Procure and organize the deliveries of starter kits to graduated MTs for establishing study plots	In-person by CIP staff/ MTs depending on the situation	Starters kits are procured and distributed																					
	C9	Technical briefing of MTs on the study plot protocols across the 3 RTCs	Virtual/in-person depending on the situation	MTs are briefed																					
	C10	Establish study plots across the 3 RTCs and the selected outreach locations	In-person by CIP staff/ MTs depending on the situation	Study plots are established across RTCs and FFS locations																					

	D. Communication and Visibility																									
	D1	Participate in joint visibility activities (agricultural fairs displays, donor visits, events organized by partners such as GIZ, FAO, ADDs, NGOs)	Virtual/physical depending on the situation	Visibility activity attended																						
	D2	Develop and share communications/project briefs.	Will be done remotely	Success stories are developed																						
	D3	Coordinate with GIZ to produce magazines and posters on CGIAR technology packages for mass dissemination to farmers	Activity will be done remotely	Posters are developed and disseminated																						
Alliance Biodiversity-CIAT																										
	C. Technical Assignments and Reporting																									
	C1	Complete the 3rd FFS trainings of MTs at the 3 RTCs and plan for the 4th cohort of MTs	Use digital training methods/in-person where possible	Training completed																						
	C2	Hold a meeting with a land resources center department to produce a plan detailing soil and water conservation (SWC) structures to be mounted on RTC study plots and at selected outreach sites	Virtual/in-person depending on the situation	A plan of integrated soil fertility management and SWC technologies produced																						
	C3	Site selection and plot demarcation at RTCs and various FFS outreach locations for establishing study plots	In-person by CIAT staff/MTs depending on the situation	Sites are selected																						
	C4	Procurement of seed and other inputs for study plots	In-person depending on the situation	Required inputs are procured																						
	C5	Organize meeting with all project partners to share preliminary results of soil sampling and testing	Virtual	Results of analysis shared with partners																						
	C6	Conduct a qualitative study to understand performance of the previous season seed multiplication program	In-person by CIAT staff/ MTs depending on the situation	Assessment report produced																						

	C7	Identification and training of new seed multipliers	In-person by CIAT staff/ MTs depending on the situation	Seed multipliers identified and trained																						
CIMMYT																										
	C. Technical Assignments and Reporting																									
	C1	Monitoring winter study plots in collaboration with the NGO consortium	Remotely for CIMMYT staff/physical for NGO field staff on the ground	Monitoring report																						
	C2	Develop success stories on winter study plots	Remotely	Success stories developed																						
	C3	Develop communication policy brief on climate-smart agriculture	Desk work	Policy brief developed																						
	C4	Finalize MTs training for Mzuzu and Lisasadzi RTCs	Virtual training sessions	Training reports																						
	C5	Contribute to preparation of starter kits for the graduate MTs	Remotely																							
	C6	Site selection and plot demarcation at new FFS	Physically by the graduating MTs	Sites identified & Plots demarcated																						
	C7	Protocol training sessions for 4th cohort MTs	Virtual training sessions	Training reports																						
	C8	Procure study plots for the 2020/21 season study plots	Remotely	Inputs procured																						
	C9	Establish study plots in all RTCs and selected outreach sites	In person either by MTs or CIMMYT staff depending on situation	Demo plots established																						
ICRISAT																										
	C. Technical Assignments and Reporting																									
	C1	Facilitate seed sampling for laboratory certification	In-person compliance to all the safety and health precautionary guidelines	Seeds are certified																						
	C2	Finalize training of third cohort MTs at the 3 RTCs and plan for the 4th cohort	Training through Digital methods/ In-person where possible	Training of third cohort completed																						
	C3	Review curriculum for training of 4th cohort	Participate in curriculum development meetings in person/or digitally	Curriculum developed																						

	C4	Participate in finalization of concept note for integrated seed systems	In-person compliance to all the safety and health precautionary guidelines	Concept note updated																					
	C5	Inputs procurement and packaging according to types of study plots	In-person with compliance to all the safety and health precautionary guidelines	Seed and other inputs are procured and packaged																					
	C6	Consultation with partners for integration of activities	To be implemented via email or virtual meetings	Activities that require integration agreed on with respective partners																					
	C7	Seed preparation and packaging	Engage less than 10 casual workers with compliance to all the safety and health precautionary guidelines	Seed and other inputs are packaged according to trials and ready for dispatch																					
	C8	Land verification and preparation	In-person compliance to all the safety and health precautionary guidelines	Land is verified and prepared																					
	C9	Delivery of inputs for the establishment of study plots	In-person with compliance to all the safety and health precautionary guidelines	Inputs for study plots delivered to FFS outreach sites																					
	C10	Facilitate planting of study plots in outreach sites	In-person with compliance to all the safety and health precautionary guidelines	Study plots are planted in all outreach sites																					
IITA																									
	C. Technical Assignments and Reporting																								
	C1	Aflatoxin analysis of 2020 maize and groundnut grain samples from study plots	In-person, depending on situation	Data on aflatoxin levels in maize and groundnut																					
	C2	Review of protocols for IITA technology (soybean, cowpea, cassava, and Aflasafe/ Aflatoxins management) study plots	Remote (office)	Study plots protocols																					
	C3	Review training modules for IITA technologies	Remote (office)	Training modules for soybean, cowpea, cassava, and Aflasafe																					

	C4	Protocol briefing of MTs on establishment of study plots	Virtual/in-person, depending on COVID-19 situation	Knowledgeable MTs																						
	C5	Training of MT at RTCs in IITA technologies	Virtual/In-person, depending on COVID-19 situation	Trained MTs																						
	C6	Procurement and/or delivery of inputs (seeds, fertilizers, pegs, packaging materials, etc.) and starter kits to outreach sites	Virtual/in-person, depending on COVID-19 situation	Required inputs (seed, inoculum, Aflasafe, fertilizer, pesticides, etc.) ready																						
	C7	Site selection for study plots (RTCs and outreach) and multiplication of early generation seed	In-person by IITA staff/MTs, depending on COVID-19 situation	Sites for study plots and seed multiplication																						
	C8	Support MTs and outreach groups in land preparations, plot demarcation, and establishing the study plots (RTCs and outreach sites)	In-person by IITA staff/ MTs, depending on the situation	Study plots established at RTCs and outreach sites																						
	C9	Facilitate land preparation, plot demarcation, and establishing early generation seed at Lisasadzi	Virtual/in-person by IITA staff/MTs depending on the situation	Early generation multiplication fields																						
	C10	Conduct selected follow-up coaching, training, or advisory service for MTs based on demand	Virtual/in-person by IITA staff/MTs depending on the situation	Knowledgeable MTs																						
	C11	Conduct farmers participatory technology evaluation (for cassava at harvest)	In-person by IITA staff/ MTs, depending on COVID-19 situation	Desired varieties selected																						
	C12	Identification, selection, and registration of seed multipliers/farms	In-person by IITA staff/ MTs depending on COVID-19 situation	Registered seed multipliers/sites																						
	C13	Training of registered seed/ stem multipliers in quality seed production, including rapid multiplication (cassava), and recordkeeping; include subjects on certified, QDS/ planting material	Virtual/in-person, depending on COVID-19 situation	Trained seed multipliers																						
	C14	Procurement and delivery of parent seed and other inputs to the selected multipliers	Virtual/in-person, depending on COVID-19 situation	Parent seeds and other inputs available to seed multipliers																						

	C15	Registration and inspection of farmer (community-based) seed multiplication fields for certification by the Seed Services Unit	Virtual/in-person, depending on COVID-19 situation	Registered and inspected seed farms																						
	C16	Establishment of farmer (community-based) seed multiplication fields	Virtual/in-person by IITA staff, depending on COVID-19 situation	Farmer (community-based) seed farms																						
	C17	Attend seminars and meetings, including ADD/GIZ planning meetings, as required	Virtual/in-person depending on COVID-19 situation	Knowledge gained/ shared																						
	C18	Compile quarterly technical reports	Remote (office)	Quarterly reports																						
	D. Communication and Visibility																									
	D1	Participate in visibility activities (agricultural fairs displays, donor visits, events organized by partners such as GIZ, FAO, ADDs, NGOs)	Virtual/physical, depending on COVID-19 situation	Visibility activity attended																						
ICRAF																										
	A. Coordination																									
	A1	Participate in workshops/ meetings organized by GIZ (e.g. planning workshops with government partners)	Virtual meetings	Meetings attended																						
	A2	Participate in workshops organized by CIP to adapt integrated technology packages	Virtual meetings	Meetings attended																						
	A3	Participate in workshops to share results and assess adaptation needs based on farmers perceptions	Virtual meetings	Meetings attended																						
	A4	Participate in review and planning meetings (2/ year)	Virtual meetings	Meetings attended																						
	B. Monitoring and Evaluation																									
	B1	M&E visits at the 3 RTCs and outreach centers check tree stand status in preparation for the growing season	In-person visits depending on the situation	Report on tree stand status at RTCs and FFS locations produced																						
	B2	Review data collection and reporting tools	Technical staff to do it remotely	Reporting tools reviewed & shared as appropriate																						

	C. Technical Assignments and Reporting																								
	C1	Monitor study plot for establishment and management at 3 RTCs and 28 outreach groups (Year 1 and Year 2 groups)	In-person visits depending on the situation	Study plots are stablished across RTCs ant FFS locations																					
	C2	Support concrete partnerships for sustainable planting material supply system	Email/phone communications and virtual meetings	Report on meetings																					
	C3	Identify/support tree seed multipliers/planting material in KULIMA districts (in liaison with the NGO consortium)	Email/phone communications/ virtual; in-person where possible	Report on meetings																					
	C4	Input procurements and establishment of study plots at RTC and 30 outreach locations	Email/phone communications/ virtual; in-person where possible	Report on input procured																					
	C5	Study plot establishment at 3 RTCs	Email/phone communications/ virtual; in-person where possible	Report on study plots establishment																					
	C6	Participatory technology evaluation survey to assess farmer's perceptions on technology and resulting adaptation needs	To be done in person with at least 10 members per group	Report generated based on maize yield and tree performance																					
	C7	Training of FFS member in tree leaf biomass incorporation	To be done in person with at least 10 members per group	Report produced on no. of farmers trained and area to be incorporated with leaf biomass																					
	C8	Training groups/individual seed multipliers on tree seed production	In-person visits depending on the situation	Report on number of groups and individuals trained																					
	C9	Distribution of start up kits for seed producers	In-person visits depending on the situation	Report of quantity distributed																					
	D. Communication and Visibility																								
	D1	Participate in joint visibility activities (agricultural fairs displays, donor visits, events organized by partners such as GIZ, FAO, ADDs, NGOs)	Virtual/physical depending on the situation	Activity attended																					

	D2	Develop and share communications/project briefs	Email/phone communications/virtual	Reports shared																						
World Fish																										
	A. Coordination																									
	A1	Participate in district ADD/ GIZ planning meetings across 3 RTCs	Virtual/in-person to be used where possible	Meeting attended																						
	A2	Attend training with other CGIAR staff on M&E and financial reporting	Through virtual training meeting	seminar held																						
	A3	Attend online seminar for KULIMA partners: GIZ grant guidelines/reporting requirements	Attend virtual meetings	Seminars are held																						
	C. Technical Assignments and Reporting																									
	C1	Feed formulation training	In person	30 farmers trained																						
	C2	Assess farmer's perceptions on technology and resulting adaptation needs through participatory evaluations	In person	5 evaluations done																						
	C3	Outreach site selection for establishing study plots	In person	15 outreach sites selected																						
	C4	Hatchery establishment and procurement of materials	At least 1 hatchery established	1 seed multiplier established																						
	C5	Training and support to multipliers of seed/ planting material in KULIMA districts	In person	30 hatchery operators and seed multipliers trained																						
	C6	Prepare technical and financial report and submit to GIZ	Remotely through emails	Report prepared and submitted to GIZ																						

Annex 2: List of integrated technologies selected at Thuchira RTC and outreach locations

	Mother Study Plots at RTC	Baby Study Plots at Outreach Locations									
CGIAR	Integrated/Crop-specific Technology	Mchikumbe (new)	Ankadziwandani (old)	Mwaiwathu (new)	Tigwirizane (old)	Tipindule 2 (old)	Nunkhire (new)	Tikondane (old)	Tipindule 1 (new)	Talandira (new)	Tigwirizane (old)
CIP	Sweetpotato variety+ improved management technologies		X	X	X	X	X	X	X	X	X
	Potato variety + improved management technologies	X		X	X	X	X		X	X	
IITA	Cassava variety + improved management technologies		X	X	X	X					X
	Soybean + improved management technologies		X	X	X				X		X
	Cowpea + improved management technologies			X	X				X		
	Aflasafe + improved aflatoxin management technologies			X	X					X	
ICRISAT	Groundnut variety + improved management technologies	X		X	X	X	X	X	X		X
	Pigeonpea varieties + improved management technologies	X		X	X						X
	Pigeonpea and groundnuts intercropping		X	X	X			X		X	
	Sorghum + improved crop management technologies			X	X						X
Alliance Biodiversity -CIAT	Nutrient-dense common bean variety + improved management technologies	X		X	X						
	Common-based integrated soil fertility management technologies (mulching)			X	X						X
	Soil & water conservation (structures)			X	X						X
CIMMYT	Maize variety + improved management technologies	X	X	X	X	X		X	X	X	X
	Maize-based conservation agriculture			X	X						
ICRAF	Agroforestry fertilizer trees-intercrops		X	X	X		X				

Annex 3: List of integrated technologies selected at Lisasadzi RTC and outreach locations

	Mother Study Plots at RTC	Baby Study Plots at Outreach Locations									
CGIAR	Integrated/Crop-specific Technology	Nkhomba	Chingati	Kachilonga	Mgwirizano	Kanyenyezi	Chang'ona	Chimwemwe	Chamkoko	Chisomo	Kamwankhuku
CIP	Sweetpotato variety+ improved management technologies	x	x		x	x	x	x	x	x	x
	Potato variety + improved management technologies	x	x	x	x	x	x	x	x		x
IITA	Cassava variety + improved management technologies		x		x	x	x	x	x		x
	Soybean + improved management technologies	x	x	x	x	x	x	x	x	x	
	Cowpea + improved management technologies	x	x		x	x	x	x	x		x
	Alflasafe + improved aflatoxin management technologies	x	x		x	x	x	x	x		x
ICRISAT	Groundnut variety + improved management technologies	x	x		x	x	x	x	x	x	x
	Pigeonpea varieties + improved management technologies				x	x	x				x
	Pigeonpea and groundnuts intercropping				x	x	x				x
	Sorghum + improved crop management technologies				x	x	x	x			x
Alliance Biodiversity -CIAT	Nutrient-dense common bean variety + improved management technologies	x	x	x	x	x	x		x	x	x
	Common-based integrated soil fertility management technologies (mulching)	x	x	x	x	x	x		x	x	x
	Soil & water conservation (structures)	x	x	x	x	x	x		x	x	x
CIMMYT	Maize variety + improved management technologies	x	x	x	x	x	x	x	x		x
	Maize-based conservation agriculture	x	x	x	x	x	x	x	x	x	
WFC	Integrate agri-aquaculture			x					x		
	Fish culture, feed trials			x					x		
ICRAF	Agroforestry fertilizer trees-intercrops	x	x	x	x	x	x	x	x	x	x

Annex 4: List of integrated technologies selected at Mzuzu RTC and outreach locations

	Mother Study Plots at RTC	Baby Study Plots at Outreach Locations									
CGIAR	Integrated/Crop-specific Technology	Tata (old)	Kanyenda (new)	Mlele (old)	Tayambapo (new)	Lwanatonga (old)	Tiwonge (new)	Chilimbirano (old)	Machaka (new)	Limbanazo (old)	Temwanenge (new)
CIP	Sweetpotato variety+ improved management technologies	x	x	x	x	x	x		x	x	
	Potato variety + improved management technologies	x	x	x	x	x	x				x
IITA	Cassava variety + improved management technologies		x								
	Soybean + improved management technologies	x	x	x	x	x	x			x	x
	Cowpea + improved management technologies		x								
	Aflasafe + improved aflatoxin management technologies		x								
ICRISAT	Groundnut variety + improved management technologies	x	x	x		x	x	x		x	
	Pigeonpea varieties + improved management technologies										
	Pigeonpea and groundnuts intercropping										x
	Sorghum + improved crop management technologies										
Alliance Biodiversity-CIAT	Nutrient-dense common bean variety + improved management technologies	x	x	x	x	x	x	x	x	x	x
	Common-based integrated soil fertility management technologies (mulching										
	Soil & water conservation (structures)										
CIMMYT	Maize variety + improved management technologies	x	x	x	x	x	x	x	x	x	x
	Maize-based conservation agriculture										
WFC	Integrate agri-aquaculture						x				
	Fish culture, feed trials	x				x					
ICRAF	Agroforestry fertilizer trees-intercrops	x	x	x		x	x	x		x	x

Annex 5: Number of seed used to establish study plots at RTCs and outreach sites

Crop	Variety	Quantity (kg)
Groundnut	CG 9	23.1
	CG 13	19.8
	Chalimbana	23.1
Pigeonpea	Mwaiwathualimi	2.0
Sorghum	Pilira 3	2.5
	Pilira 4	2.5

Annex 6: List of starter kit inputs distributed by CGIAR centers to MTs/CBFs

Starter Kit Inputs Distribution	Crop/Input	Quantity per Pack	Responsible Center
First Phase (4th to 22nd November 2020)	CG 9	2 kg	ICRISAT
	CG 11	2 kg	
	Chitedze 1	300 g	
	Mwaiwathualimi	300 g	
	Pilira 1	300 g	
	Pilira 3	100 g	
	Pilira 4	100 g	
	NPK	1 kg	
	UREA	1 kg	
	Makwacha	1 kg	IITA
	Nasoko	1 kg	
	Tikolore	1 kg	
	Sudan1	500 g	
	IT 82 E16	500 g	
	Inoculant	50 g	
	NU 45, Napilira, SAE 123	3 kg	CIAT
	D- COMPOUND	4 kg	IITA/CIP
	MH 36	250 g	CYMMT
	MH 44A	250 g	
	MH 43A	250 g	
	CAP9001	250 g	
	QPM	250 g	
	Basal Dressing NPK	10 kg	
	Top Dressing (urea)	10 kg	
	Tephrosia	500 g	ICRAF
Second Phase (8th December, 2020 to 10th January, 2020)	Fruit tree seedlings	20 (5 each for the four types of fruit trees)	ICRAF
	Potato	3 varieties (packs enough for 10 X 10 plot)—approximately 330 tubers/pack of each variety	CIP
	Sweetpotato	6 bundles (2 each for the 3 sweetpotato varieties)	
	Super D	1 pack (6 kg)	
	CAN	1 pack (6 kg)	
	Cassava	4 bundles (1 bundle each for the 4 cassava varieties)	IITA

Annex 7: Names of the MTs who received starter kits inputs

	District	EPA	Name of MT	Gender	Contact
1	Chitipa	Lufita	Justwell Simfukwe	Male	888115060
2	Chitipa	Chisenga	Solomon Mbale	Male	888210949
3	Chitipa	Kavukuku	Wakisa shani	Male	881617834
4	Chitipa	Misuku	Kumbukani Simwaka	Male	882133311
5	Chitipa	Kameme	Malizgani Chiselu	Male	999202689
6	Chitipa	Mwmkumbwa	Baxter Msukwa	Male	997837594
7	Chiradzulu	Mombezi	Milliam Kapachika	Female	885502009
8	Chiradzulu	Mombezi	Grace Kwavale	Female	888589383
9	Chiradzulu	Thumbwe	Frank John	Male	999002180
10	Chiradzulu	Thumbwe	Chifundo Mwahara	Male	881654849
11	Chiradzulu	Thumbwe	Timothy Muonda	Male	992788684
12	Chiradzulu	Mbulumbuzi	Eggry Chimowa	Female	884473839
13	Chiradzulu	Mbulumbuzi	Janet Malemia	Female	999915803
14	Chiradzulu	Chisombezi	Eliza Kafunde	Female	999045631
15	Chiradzulu	Lisawo	Ruth Khonje	Female	999279627
16	Chiradzulu	Mbulumbuzi	Patrick Nambazo	Male	888697720
17	Chiradzulu	Thumbwe	Trevor Marrah	Male	999600355
18	Karonga	Mpata	Pease Kapira	Female	999769189
19	Karonga	Nyungwe	Kennedy Longwe	Male	993537176
20	Karonga	Vinthukutu	Machestone Sassa	Male	881862954
21	Karonga	Vinthukutu	Zebron Nyasulu	Male	999703747
22	Karonga	Kaporo South	Rose Kateta	Female	991886692
23	Karonga	Lupembe	Tawonga Mgala	Female	995534444
24	Kasungu	chamama	Thoko Msiska	Male	999090836
25	Kasungu	Chipala	Clara Chimgonda	Female	999480877
26	Kasungu	Chipala	Delipher kuyankhula	Female	992057172
27	Kasungu	Chulu	Lumbani Ng'ambi	Male	996887787
28	Kasungu	Chulu	George Mkwangwanya	Male	999642151
29	Kasungu	Kaluluma	Zakeyo Banda	Male	999369291
30	Kasungu	Lisasadzi	Patrick Lungu	Male	999205383
31	Kasungu	Mtunthama	Alice Banda	Female	884237222
32	Kasungu	Santhe	Nicholas matambo	Male	991217474
33	Mulanje	Thuchila	Linda Sakaza	Female	99979513
34	Mulanje	Thuchila	Freser Mwafulirwa	Male	882898432
35	Mulanje	Thuchila	Pemphero Soko	Male	999185014
36	Mulanje	Milonde	Daniel Muonjeza	Male	999438211
37	Mulanje	Milonde	Mary Kajaluka	Female	881074099
38	Mulanje	Mulanje Boma	Florence Lizimba	Female	884241346
39	Mulanje	Mulanje Boma	Hillary Chinganda	Female	888353769
40	Mulanje	Mulanje Boma	Judith Khobwe Momedi	Female	999922255
41	Mulanje	Msikawanjala	Noel Jere	Male	888464640

	District	EPA	Name of MT	Gender	Contact
42	Mulanje	Msikawanjala	Linda Phiri	Female	888698934
43	Mulanje	Msikawanjala	Joana Tandu Mgogo	Female	884049380
44	Mzimba North	Engucini	Jimmy Luhanga	Male	888639405
45	Mzimba North	Euthini	Malani Nyirenda	Male	884424400
46	Mzimba North	Malidade	Charles Chikondwa	Male	884004354
47	Mzimba North	Njuyu	Colin Mwenda	Male	888165661
48	Mzimba North	Zombwe	Alice Mshani	Female	994641994
49	Mzimba North	Emsizini	Hanna Sikwese	Female	881602372
50	Mzimba South	Bulala	Titus Nyirenda	Male	881111919
51	Mzimba South	Champhira	Chancy Mithi	Male	999701994
52	Mzimba South	Champhira	Bridget Phiri	Female	999380787
53	Mzimba South	Chikangawa	Zondani Nyangulu	Male	881448759
54	Mzimba South	Kazomba	Harvey Nyirongo	Male	
55	Mzimba South	Hora	Rbert Soko	Male	997116689
56	Nkhata Bay	Limhasa	Grace Mtenje	Female	99473020
57	Nkhata Bay	Chikwina	Levi Mkweu	Male	994177888
58	Nkhata Bay	Chintheche	Jona Duwe	Male	993982881
59	Nkhata Bay	Chitheka	Bright Kamanga	Male	996327727
60	Nkhata Bay	Kavuzi	Escollen Mnyenyembe	Male	999689989
61	Nkhata Bay	Tukombo	Tawonga Mphande	Female	885012408
62	Nkhotakota	Kasitu	Malingariro mkandawire	Male	884544526
63	Nkhotakota	Linga	Esau Chirwa	Male	888225660
64	Nkhotakota	Linga	Kenedy Msondoka	Male	999330437
65	Nkhotakota	Linga	Madalitso Banda	Male	999205385
66	Nkhotakota	Mtosa	Nancy Kamwendo	Female	888355132
67	Nkhotakota	Mwansambo	Jacqueline Zimphango	Female	882197877
68	Nkhotakota	Mwasambo	Salim Gabriel	Male	999635276
69	Nkhotakota	Nkhunga	Taonga soko	Female	994763527
70	Nkhotakota	Zidyana	Nixson Chulu	Male	999737280
71	Nkhotakota	Zidyana	Mozys Ngwira	Male	888894555
72	Salima	Chipoka	Emmanuel Sichali	Male	995561300
73	Salima	Katerela	Oliver Liwonde	Male	995002311
74	Salima	Katerela	Goliath Likoswe	Male	999674295
75	Salima	Makande	Daudi Mkanya	Male	884599328
76	Salima	Tembwe	Abdulrahim Mtcheka	Male	999383856
77	Salima	Chiguluwe	Prince Ngwira	Male	888883794
78	Salima	Chiguluwe	Watson Nyirenda	Male	999635370
79	Salima	Chiluwa	Joshwa Tenthani	Male	993019216
80	Salima	Matenje	Florence Kanjo	Female	999424812
81	Thyolo	Khonjeni	Chipiliro Muyaya	Male	881958606
82	Thyolo	Khonjeni	Ellard Kuse	Male	888603140
83	Thyolo	Masambanjati	Giveson Makoloni	Male	882288997

	District	EPA	Name of MT	Gender	Contact
84	Thyolo	Masambanjati	Innocent Nkhoma	Male	991500747
85	Thyolo	Matapwata	Bennie Livala	Male	888658065
86	Thyolo	Thyolo Centre	Mwaka Mbughi	Female	882358991
87	Thyolo	Thyolo Centre	Ennett Kondowe	Female	881107065
88	Thyolo	Dwale	Georgina Focus	Female	882372757
89	Thyolo	Dwale	Gloria Magumbwa	Female	999270262
90	Thyolo	Thekerani	Martin Andrew	Male	993778986

Annex 8: List of technologies established at Thuchila RTC and outreach locations

RTC	CGIAR Center	Technology Implemented	Name of Community Outreach Groups									
			Mchikumbe (new)	Ankadziwandani (old)	Mwaiwathu (new)	Tigwirizane (old)	Tipindule 2 (old)	Nunkhire (new)	Tikondane (old)	Tipindule 1 (new)	Talandira (new)	Tigwirizane (old)
Thuchila	CIMMYT	Maize variety + improved management technologies	X	X	X	X	X	X	X	X	X	X
		Maize-based conservation agriculture			X	X						
	ALLIANCE BIOVERSITY-CIAT	Improved common bean varieties	X	x	x	x	x	x	x	x	x	x
		Integrated soil fertility management	X	x	x	x	x	x	x	x	x	x
		Soil and water conservation										
	CIP	Potato variety	X		X	X	X	X	X	X	X	X
		Sweetpotato variety	X		X	X	X	X	X	X	X	X
		Sweetpotato fertilizer	X					X	X			
	ICRAF	Gliricidia–maize Interop	X		X	X	X	X			X	
		Tephrosia–maize Intercrop	X		X	X	X	X			X	
		Fruit trees										
	IITA	Soybean	X		X	X	X			X		
		Cowpea	X		X		X			X		
		Cassava		X		X		X			X	X
		Aflasafe	X				X	X	X		X	
	WFC	IAA + fish-stocking densities		X								
	ICRISAT	Doubled-up legume		x	x		x	x	X		x	X
		Groundnut varieties	X	x		x			X	x		X
		Pigeonpea varieties	X	x		x			X			X
		Sorghum varieties	x	x					x			x

Annex 9: List of technologies established at Lisasadzi RTC and outreach locations

RTC	CGIAR Center	Technology Implemented	Name of Community Outreach Groups									
			Nkhomba (new)	Chingati (old)	Kachilonga (New)	Mgwirizano (old)	Kanyenyezi (new)	Chang'ona (old)	Chimwemwe (ne0	Chamkoko (old)	Chisomo (New)	Kamwankhuku (old)
Lisasadzi RTC	CIMMYT	Maize variety + improved management technologies	X	X	X	X	X	X	X	X		X
		Maize-based conservation agriculture	X	X	X	X	X	X	X	X	X	
	ALLIANCE BIOVERSITY-CIAT	Improved common bean varieties	x	x	x	x	x	x	x	x	x	x
		Integrated soil fertility management	x	x	x	x	x	x	x	x	x	x
		Soil and water conservation	x	x	x	x	x	x	x	x	x	x
	CIP	Potato variety	X	X	X	X	X	X	X	X	X	X
		Sweetpotato variety	X	X	X	X	X	X	X	X	X	X
		Sweetpotato fertilizer		X		X						X
	ICRAF	Gliricidia–maize Interop		X		X		X		X		X
		Tephrosia–maize Intercrop		X		X		X		X		X
		Sesbania–maize intercrop								X		
		Fruit trees										
	IITA	Soybean	X	X	X	X		X	X	X	X	X
		Cowpea	X			X	X		X	X	X	X
		Cassava		X	X	X	X		X	X	X	
		Aflasafe	X	X				X	X	X	X	
	ICRISAT	Aphid control methods on groundnut										
		Groundnut varieties	X	X	X	X	X	X	X	X	X	X
		Sorghum varieties	X	X	X	X	X	X	X	X	X	X
		Pigeonpea varieties									X	
		Doubled-up legume										

Annex 10: List of technologies established at Mzuzu RTC and outreach locations

RTC	CGIAR Center	Technology Implemented	Name of Community Outreach Groups									
			Tata (old)	Kanyenda(new)	Mlele (old)	Tayambapo (New)	Lwanatoga (old)	Tiwonge (New)	Chilimbirano (old)	Machaka (New)	Limbanazo (old)	Temwanenge (New)
Mzuzu RTC	**CIMMYT**	Maize variety + improved management technologies		X		X		X		X		X
	ALLIANCE BIOVERSITY-CIAT	Improved common bean varieties		x	x	x	x	x	x	x	x	x
		Integrated soil fertility management		x	x	x	x	x	x	x	x	x
		Soil and water conservation			x		x		x	x	x	
	CIP	Potato variety	X	X	X	X	X	X	X	X	X	X
		Sweetpotato variety	X	X	X	X	X	X	X	X	X	X
		Sweetpotato fertilizer										
	ICRAF	Gliricidia–maize intercrop	X	X	X	X	X	X	X	X	X	X
		Tephrosia–maize intercrop	X	X	X	X	X	X	X	X	X	X
		Fruits										
	IITA	Soybean	X			X	X			X	X	X
		Cowpea		X				X				
		Cassava				X	X					
		Aflasafe	X	X	X			X	X		X	X
	ICRISAT	Pigeonpea varieties										
		Groundnut varieties	X	X	X	X	X	0	X	X	X	X
		Doubled-up legume										X
		Sorghum varieties										
		Fall armyworm control on sorghum										

Annex 11: Root yield and farmer impressions on growth and eating qualities of cassava roots at Thuchila RTC, Mulanje, in 2020

Attribute (Thuchila RTC)	Mpale	Sagonja	Sauti	Mbundumali
A. Researcher assessment				
1. Root yields (t/ha)	12.3	16.2	15.4	9.3
2. Root size (g/root)	340	292	303	333
3. No. of marketable roots /plot	47	72	66	36
4. Root no. (roots /plant)	3.4	5.1	4.1	3.3
B. Farmer assessment	Farmer ranking (1=Most preferred; 4=Least preferred)			
Plant vigor	4	1	2	3
Root yield	2	1	4	3
Root size	4	3	2	1
Root attractiveness (skin color)	2	3	3	1
Root taste (raw)	3	2	4	1
Root taste (boiled)	1	3	4	2
Root mealiness (boiled)	2	1	4	3

Annex 12: Root yield and farmer impressions on growth and eating qualities of cassava roots at Lisasadzi RTC, Kasungu, in 2020

Attribute – Tiyese	Mpale	Sagonja	Sauti	Mbundumali
A. Researcher assessment				
1. Root yields (t/ha)	5.7	11.2	13.3	17.6
2. Root size (g/root)	236	130	186	190
3. No. of marketable roots/plot	35	89	97	113
4. Root no. (roots /plant)	1.8	3.7	4.0	4.7
B. Farmer assessment	Farmer ranking (1=Most preferred; 4=Least preferred)			
1. Plant vigor	3	2	2	1
2. Root yield (Visual)	4	2	3	1
3. Root size (Visual)	3	2	4	1
4. Root attractiveness (outer skin)	3	4	2	1
5. Root taste (raw)	2	4	3	1
6. Root taste (boiled)	2	3	3	1
7. Root mealiness (boiled)	3	2	4	1

Annex 13: Pairwise ranking of groundnut varieties by farmers in Thuchila (Talandira FFS)

Attributes	CG 9		Kakoma		Local variety	
	Male	*Female*	*Male*	*Female*	*Male*	*Female*
Growth vigor	3	3	1	2	3	3
Vegetative color	3	3	1	1	3	3
Pod size	3	3	2	1	3	3
Pod filling	3	3	1	2	1	1
Early maturity	1	1	3	3	1	1
Market	3	3	2	3	3	3
Rainfall	3	2	3	3	1	1
Pests/diseases	3	3	1	2	1	1
Taste	1	1	3	3	2	3
Shelling	3	3	3	3	3	3
Total	26	25	20	23	21	22
Rank	1	1	3	2	2	3

Annex 14: Soybean mean grain yield across sites in Thuchila, Lisasadzi, and Mzuzu in 2019/2020

Variety/Management Practice	Thuchila		Lisasadzi		Mzuzu	
	Yield (kg/ha)	% increase	Yield (kg/ha)	% increase	Yield (kg/ha)	% increase
Tikolore (DR, fert. inoculant)	1,367	45.0	1,296	35.7	486	43.4
Makwacha (DR, fert. inoculant)	1,189	36.8	1,326	37.2	408	32.6
Nasoko (DR, fert. inoculant)	1,197	37.2	1,277	34.8	366	24.9
Local (SR, no fert. no inoculant)	752	0.0	833	0.0	275	0.0
Mean	1,126		1,183		384	

Annex 15: Cowpea grain yield performance at study plot at Lisasadzi in 2019/2020

Study plot/Outreach	Cowpea grain yield (kg/ha)			
	IT82E16 + Maize	Sudan 1 + Maize	Mkanakaufiti + Maize	IT 82E16 (Sole)
Thuchila				
RTC (study plot)	-	-	-	-
Tigwirizane FFS	481	577	241	-
Mean	481	577	241	-
Lisasadzi				
RTC (study plot)	1,306	1,306	694	1,878
Chingati FFS	381	762	38	952
Mgwirizano FFS	649	649	162	747
Kamwakhuku FFS	298	357	149	446
Tiyese FFS	772	702	351	1,404
Chipokolo FFS	185	185	74	370
Msambafumu FFS	667	444	222	889
Chakoko FFS	148	704	74	556
Chikondi FFS	549	1099	412	824
Mean	551	690	242	896
Mzuzu				
RTC (study plot)	-	-	-	-
Machaka FFS	462	308	154	-
Mlere FFS	240	220	60	-
Mean	351	264	107	-

Annex 16: Soybean grain yield performance in study plots and outreach sites in 2019/2020

Study Plot/Outreach	Soybean Grain Yield (kg/ha)			
	Tikolore	Makwacha	Nasoko	Farmer's Practice
Thuchila				
RTC (study plot)	2,698	2,540	3,016	1,746
Tigwirizane FFS	1,000	750	750	500
Tigwirizane FFS	1,924	1,443	1,203	722
Nukhire FFS	980	980	784	654
Ankaziwandani FFS	233	233	233	140
Mean	1,367	1,189	1,197	752
Lisasadzi				
RTC (study plot)	2,667	2,533	2,756	2,044
Chingati FFS	1,838	735	735	735
Mgwirizano FFS	816	1,020	612	408
Kamwakhuku FFS	855	855	812	513
Tiyese FFS	1,395	1,860	1,628	465
Chipokolo FFS	242	290	290	97
Msambafumu FFS	1,616	1,212	1,616	1,212
Chakoko FFS	725	725	725	483
Chang'ona FFS	1,543	2,701	1,929	1,543
Chikondi FFS	1,267	1,333	1,667	833
Mean	1,296	1,326	1,277	833
Mzuzu				
RTC (study plot)	706	824	753	400
Machaka FFS	144	251	180	144
Limbanazo FFS	417	292	208	167
Mlere FFS	316	175	175	105
Tata FFS	812	522	580	812
Chilimbirano FFS	496	496	331	165
Lwanatonga FFS	538	359	359	179
Tionge FFS	457	343	343	229
Mean	486	408	366	275

Annex 17: Startup inputs procured for potato multipliers

Input	Quantity	Detailed Description
Seed potato	1,600 kg	Various varieties
Basal fertilizer	15 bags	Super D fertilizer
Top dressing fertilizer	15 bags	CAN fertilizer
Sweetpotato seed	100-vine bundles	Sweetpotato vine bundles for various varieties

Annex 18: Startup inputs distributed to seed potato multipliers

Name	Gender	District	Variety	Area (ha)	Seed Qty (kg)	Basal (kg)	Top (kg)
Shadreck Mughogho	M	Chitipa	Zikomo	0.2	150	70	70
Amos Sichinga	M	Chitipa	Zikomo	0.2	150	70	70
Isreal Kapira	M	Chitipa	Mwai	0.2	150	70	70
William Ndovi	M	Chitipa	Mwai	0.2	150	70	70
Wisdom Kanyimbo	M	Chitipa	Mwai	0.2	150	70	70
Chimwemwe Mhango	M	Nkhata Bay	Thandizo	0.2	150	70	70
Custom Chamvula	M	Nkhata Bay	Zikomo	0.2	150	70	70
Raphael Chiumia	M	Nkhata Bay	Zikomo	0.2	150	70	70
Peter Mhango	M	Nkhata Bay	Mwai	0.2	150	70	70
Thomas Ngulube	M	Mzimba South	Violet/Rosita	0.2	150	70	70
Gift Webster	M	Mulanje	Chuma	0.2	100	50	50
Total				**2.2**	**1,600**	**750**	**750**

Annex 19: Startup inputs provided to sweetpotato vine multipliers

Name	Gender	District	Variety	Bundles	Area (ha)
Jack Mpani	M	Kasungu	Royal Choice	20	0.1
Mr Mbale	M	Kasungu	Msungabanja	20	0.1
Stella Chunga	F	Kasungu	Kaphulira,Msungabanja	20	0.1
Judith Kholowa	F	Salima	MTHetsanjala,Kaphulira	20	0.1
Abdullah Seleman	M	Nkhotakota	Royal Choice,Kaphulira	20	0.1

Annex 20: Farmers identified to engage in bean certified seed multiplication in 2020–2021 growing season L

Name of Grower	District	Farm/Estate	Bean Variety	Area (ha)	Status
Damiano Gumbo	Mzimbo	Champhira EPA	NUA 45	0.40	Basic
Ennet Nyirongo	Mzimba	Champhira EPA	NUA 45	0.40	Basic
Amon Kumwenda	Mzimba	Zombwe EPA	NUA 45	0.40	Basic
Morris Nyirenda	Mzimba	Zombwe EPA	NUA 45	0.40	Basic
Keegan Mkandawire	Mzimba	Zombwe EPA	NUA 45	0.40	Basic
Jeanie Kanyinji	Mzimba	Zombwe EPA	NUA 45	0.40	Basic
Rabecca Mwale	Mzimba	Zombwe EPA	NUA 45	0.40	Basic
Myson Chirwa	Mzimba	Chikangawa EPA	NUA 45	0.40	Basic
Juliana Soko	Mzimba	Chikangawa EPA	NUA 45	0.40	Basic
Delia Nyirenda	Mzimba	Eswazini EPA	NUA 45	0.40	Basic
Blessings Mphande	Mzimba	Eswazini EPA	NUA 45	0.40	Basic
Monasi Ng`oma	Kasungu	Mkanakhothi EPA	NUA 45	0.40	Basic
Mary Mwale	Kasungu	Mkanakhothi EPA	NUA 45	0.40	Basic
Ellen Ngoma	Kasungu	Mkanakhothi EPA	NUA 45	0.40	Basic

Annex 21: Farmers trained in community seed multiplication for cassava, soybean, and cowpea in 2020–2021

Venue	Date	District	Seed multipliers			Extension Staff		
			Males	Females	Total	Males	Females	Total
Thuchila RTC	27 Nov	Mulanje	4	1	5	2	0	2
		Chiradzulu	3	1	4	0	0	0
		Thyolo	2	1	3	0	0	0
Chinguluwe EPA	1 Dec	Salima	6	0	6	1	3	4
Linga EPA	2 Dec	Nkhotakota	5	1	6	1	1	2
Lisasadzi RTC	3 Dec	Kasungu	2	2	4	1	0	1
Mjinge EPA	4 Dec	Mzimba	2	2	4	0	1	1
Chintheche EPA	5 Dec	Nkhata Bay	1	2	3	2	0	2
Nyungwe	8 Jan	Karonga	4	0	4	3	1	4
Lufita	9 Jan	Chitipa	3	1	4	2	1	3
Total			**32**	**11**	**43**	**12**	**7**	**19**

Annex 22: Success story:

Benefits of Growing MH43A Maize Variety

Climate change poses a major and growing threat to global food security. Population growth and rising incomes in much of the developing world have pushed demand for food and other agricultural products to unprecedented levels. FAO has estimated that, in order to meet food demand in 2050, annual world production of crops and livestock will need to be 60% higher than it was in 2006. In developing countries, about 80% of the required increase will need to come from higher yields and increased cropping intensity and only 20% from expansion of arable land (FAO 2018).

Over 80% of people in Malawi are smallholders who entirely depend on agriculture. Gertrude Nankhonde is one of them. She is a widow who lives in Mwabati Village in the outskirts of Karonga town. She is 57 years old and lives with seven children and grandchildren: six females and one male. Her household thrives on farming. She grows maize, rice, cassava, and lately sesame.

"In 2002, when my husband died, marked the beginning of an avalanche of my problems," Gertrude recounted and added that she assumed the responsibility of taking care of the family. It was a tough ride.

Late in 2018, Gertrude joined a farmer field school, a concept currently being promoted by FAO under the KULIMA project.

"In one of our weekly meetings with our master trainer, we were given an opportunity to try a new variety of orange maize seed called MH43A. All other members of the school except me had allocated their dambo land to other crop enterprises. I had about 200 m^2 portion of land left and was selected to try the new maize variety on that land and I was supported with seed," she explained.

The seed was provided by CIMMYT, as part of its seed systems activities, to the NGO consortium implementing KULIMA-BETTER, which is led by Self-Help Africa as one way of promoting the drought-tolerant and nutritious maize varieties. CIMMYT is promoting climate-smart agricultural technologies in KULIMA; these include drought-tolerant maize varieties, nutritious maize varieties that are also drought tolerant, and conservation agriculture.

Gertrude planted the maize seed toward the end of June 2019.

"The master trainer and community-based facilitator encouraged me to plant one seed per planting station, a method popularly known as *Sasakawa*, and I did," she said. From her small portion of land, Gertrude harvested about 72 kg of maize which translates to 3,600 kg/ha.

Traditionally, most Malawians consume *nsima*, which is made from maize flour, as a staple food. Gertrude milled the maize she harvested into flour.

"Apart from the fact that MH43A maize is rich in vitamin A, *nsima* made from MH43A maize flour is tasty. My children and grandchildren liked it a lot such that they did not want me to prepare it from ordinary maize flour anymore. So, to ensure that I don't lose the flour I mixed the ordinary flour and the flour made from MH43A. The *nsima* prepared from the combination was still tasty. In addition, the *nsima* has a sweet aroma, unlike the ordinary kind made from white maize. It easily hardens when preparing, which essentially economizes flour. The variety is fast maturing and high yielding, too.''

Gertrude is one of the beneficiaries under the KULIMA-BETTER project being implemented in Chitipa and Karonga by Self-Help Africa. Other partners in the project include Action Aid Malawi, Plan International, Evangelical Association of Malawi, and Adventist Development and Relief Agency. CGIAR centers and GIZ are also part of this project. The goal is to increase resilience to food, income, and nutrition of smallholder farmers in Malawi.

Gertrude in her MH43A winter field on 10 September 2020.

Annex 23: KULIMA Phase 1 Project Brief
KULIMA Project: CIMMYT Component

End of Phase 1 Brief

Highlights:

- 180 MTs have been equipped with knowledge on all CIMMYT technologies being promoted in the KULIMA project.
- CIMMYT varieties provided a yield advantage of up to 61% compared with the local varieties.
- A total of 121 agro-dealers from all KULIMA districts trained on attributes of drought-tolerant maize varieties and linked to seed companies producing these varieties to ensure availability.

Maize study plots at Thuchira RTC in Mulanje. (PHOTO: PETER LUNGU; CIMMYT)

1. What was the problem?

Agricultural productivity and diversification in Malawi have been affected by declining yields, decreasing soil fertility, increasingly unreliable rainfall, poor agronomic and cultural practices, inadequate farmer knowledge and skills, poor food habits, and rapidly growing population among others. There is urgent need to invest in development and dissemination of sustainable, farmer-acceptable solutions to these challenges for a healthy and prosperous population in Malawi. Several technologies, innovations, and practices that can address these challenges have been developed and are officially released in Malawi, whereas others are under research and development and could be tested with farmers for applicability. However, many farmers and even extension service providers are unaware of the existence of some of these impactful technologies, or they lack the hands-on practice and exposure or the means to deliver them to the farmers.

2. What did we want to achieve?

CIMMYT is working with other CGIAR centers in the KULIMA project to contribute to increased agricultural productivity and diversified production in a participatory, sustainable, and climate-change-resilient manner. KULIMA is being implemented in collaboration with the government of Malawi, GIZ, FAO, and CGIAR centers.

CIMMYT has developed expertise, innovations, and technologies over time in maize and wheat research globally. This body of knowledge addresses challenges encountered by low-income farmers in the developing world, including food and nutritional insecurity, environmental degradation, economic development, population growth, and climate change.

In the KULIMA project, CIMMYT is making available their expertise and technologies to more people. In the first phase of the project, CIMMYT promoted drought-tolerant maize varieties: nutritious maize varieties which are also drought tolerant, mainly quality protein maize and pro- vitamin A maize varieties. Conservation agriculture was also promoted as a sustainable cropping system. These technologies were promoted using the study plots established through the FFS approach.

3. What have we achieved?

CIMMYT established 16 study plots in the three RTCs of Thuchila in Mulanje, Lisasadzi in Kasungu, and Mzuzu. One study plot was established at the RTC and five plots established in the satellite sites around Thuchira and Lisasadzi RTCs. Mzuzu RTC had three satelite sites. The study plots provided a platform for CIMMYT to disseminate technologies to the MTs as well as farmers in the KULIMA districts. They also facilitated training for the MTs, CBFs, and farmers.

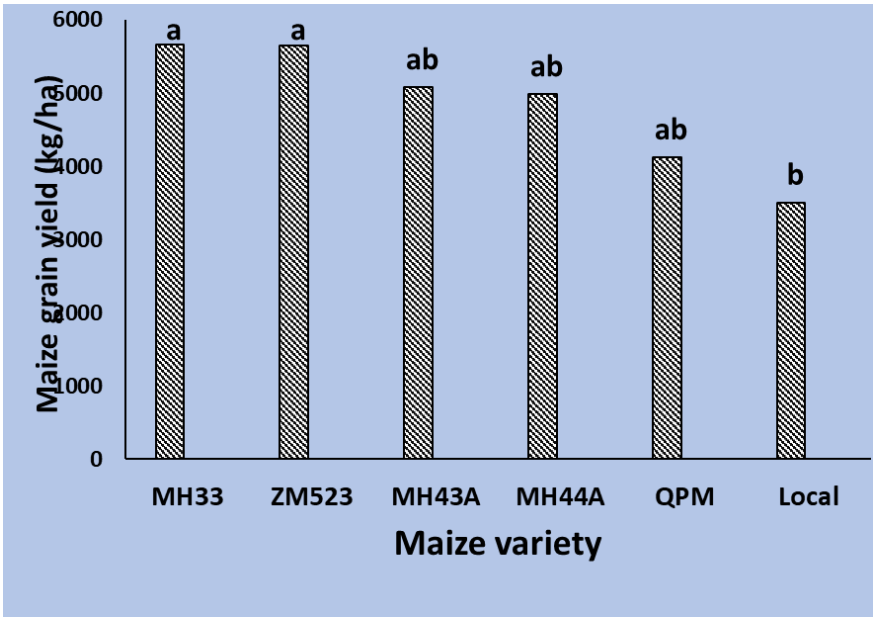
Ninety MTs, 90 CBFs, and 360 farmers were reached with CIMMYT technologies, namely drought-tolerant and nutritious maize varieties and conservation agriculture. CIMMYT also provided theoretical training on these technologies to 90 MTs from cohort 1.

Through collaboration with the project's NGO consortium, CIMMYT distributed 326 promotion seed packs of drought-tolerant and nutritious maize varieties to smallholder farmers.

The average grain yield for the CIMMYT varieties from the KULIMA study plots was 4,836 kg/ha, which was 63% more compared with the average national maize yield for the 2018–2019 season.[2] However, there was no significant interaction between cropping system and variety ($p = 0.725$), thereby suggesting consistent behavior of varieties under both conservation agriculture and conventional cropping. Maize yields from the two cropping systems were also not significantly different ($p = 0.586$), with average yields under conservation agriculture at 4,786 kg/ha compared with maize yields under conventional tillage (4,887 kg/ha).

[2] Agricultural productivity estimates survey data.

Maize grain yield by variety in KULIMA study plots in the 2018–2019 season.



There were significant varietal effects ($p = 0.006$). Lowest yields came from the local varieties, whereas the highest (numerically) came from MH33 and ZM 523. The least performing improved variety (quality protein maize) gave **18%** yield increase compared with local, whereas the best (MH33) increased yields by **61%.**

The good performance of the improved drought-tolerant and nutritious maize varieties has increased demand for these varieties among farmers. To ensure availability of seeds for these varieties in the local agro-dealer shops, which was cited as a challenge, CIMMYT trained 121 agro-dealers from the KULIMA districts on the attributes of the varieties and linked them with seed companies who are producing these varieties.

4. What are key lessons for the future?

CIMMYT's technologies have drawn a lot of interest among farmers in all the FFS where these technologies have been promoted. The demand for drought-tolerant and nutritious maize varieties has been created. To satisfy this increasing demand, CIMMYT should continue to provide technical support to the seed companies in production of early generation seed for the improved varieties. Collaboration with seed companies and agro-dealers should also be enhanced to ensure availability of quality seed in KULIMA districts

CIMMYT contacts:

Dr. James Gethi-Project Leader

E-mail: J.Gethi@cgiar.org

Mathinda Sopo-Project

CIP is a research-for-development organization with a focus on potato, sweetpotato and Andean roots and tubers. It delivers innovative science-based solutions to enhance access to affordable nutritious food, foster inclusive sustainable business and employment growth, and drive the climate resilience of root and tuber agri-food systems. Headquartered in Lima, Peru, CIP has a research presence in more than 20 countries in Africa, Asia and Latin America.
www.cipotato.org

CIP is a CGIAR research center

CGIAR is a global research partnership for a food-secure future. Its science is carried out by 15 research centers in close collaboration with hundreds of partners across the globe.

For more information, please contact CIP Headquarters, Av. La Molina 1895, La Molina Apartado 1558, Lima, 12 Peru.
+5-11-3496017 CIP-GnCOffice@cgiar.org www.cipotato.org

WWW.CIPOTATO.ORG