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Centre De Coordination De La Recherche Et Du Développement Agricole De L'Afrique Australe
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AGRICULTURAL PRODUCTIVITY PROGRAMME FOR SOUTHERN AFRICA (APPSA)



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LIST OF ABBREVIATIONS AND ACRONYMS

ATCC	Agriculture Technology Clearing Committee
AWP&B	Annual Work Plan and Budget
APPSA	Agricultural Productivity Program for Southern Africa
CA	Conservation Agriculture
CARS	Chitedze Agricultural Research Station
CCARDESA	Centre for Coordination of Agricultural Research and Development in Southern Africa
CGIAR	Consultative Group for International Agricultural Research
CIAT	International Centre for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Center
Co-PI	Co-Principal Investigator
COMESA	Common Market for East and Southern Africa
DAES	Department of Agriculture Extension Services
DARS	Department of Agriculture Research Services
EAAPP	Eastern African Agricultural Productivity Programme
FAO	Food and Agriculture Organisation
FAW	Fall Army Worm
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDA	International Development Association
IEC	Information, Education and Communication
IIAM	Instituto de Investigação Agrária de Moçambique (Agricultural Research Institute of Mozambique)
IITA	International Institute of Tropical Agriculture
IP	Innovation Platform
IPDM	Integrated Pest and Disease Management
ISM	Implementation Support Mission
ISTA	International Seed Testing Association
ITOCA	Information Training and Outreach Centre for Africa
KPI	Key Performance Indicator
M&E	Monitoring and Evaluation
MIS	Management Information System
MLND	Maize Lethal Necrosis Diseases
MS	Metallic Silos

MTR	Mid Term Review
NARS	National Agriculture Research Institutions
NGO	Non-Governmental Organisation
NPGRC	National Plant Genetic Resource Centre
PAD	Project Appraisal Document
PDO	Project Development Objective
PI	Principal Investigator
PST	Polyethylene Silo Tanks
RCoL	Regional Centre of Leadership
R&D	Research and Development
RF	Result Framework
SAAIKS	Southern African Agricultural Information and Knowledge System
SADC	Southern Africa Development Community
SCCI	Seed Control and Certification Institute
SGB	Super Grain Bags
SPGRC	SADC Plant Genetic Resource Centre
ToR	Terms of Reference
WG	Working Group
USAID	United States Agency for International Development
WB	World Bank
ZARI	Zambia Agriculture Research Institute

EXECUTIVE SUMMARY

This progress report describes key achievements during the project implementation period from 1 January to 31 December 2017. The project was in its 4th year of implementation.

Component 1: Technology Generation and Dissemination

To date the project has implemented 74 collaborative Research and Development (R&D) projects, 33 of which were focusing on technology dissemination. At the end of the 2016/17 cropping season, several R&D projects that were commissioned in 2013 (1st cycle) and 2014 (2nd cycle) were expected to be completed. Malawi completed 28 projects out of its total portfolio of 46 projects from 1st and 2nd cycles, while Zambia completed 18 projects out of its total portfolio of 46 projects. In Mozambique, none of the projects were completed. To date the RCoLs have generated 46 technologies [Malawi = 21; Mozambique=14 and Zambia=11]. A number of the seed varieties (beans, groundnut, maize and pigeon pea) are already being shared across countries, and also with non-APPESA countries like DRC, Lesotho, Swaziland and Zimbabwe. Phenotypic and molecular characterisation of local germplasm collected (rice, maize, cowpeas, bambara nuts, groundnuts, pigeon peas) continued in all countries, with some of the materials deposited in both the National Plant Genetic Resources Centre (NPGRC) and the SADC Plant Genetic Resources Centre (SPGRC). Crop improvement efforts across all commodities resulted in the pre-release of several promising genotypes. The countries are expecting to release 90 varieties by 2019 (Malawi - 42; Mozambique - 35 and Zambia - 13). Multiplication of certified seed of improved varieties continued in all 3 countries in partnership with seed growers associations and private seed companies. To date the dissemination projects have made available 278 improved technologies and management practices [149 seed varieties, 48 crop and water management practices, 72 post-harvest and 9 labour saving technologies]. The R&D efforts in the 3 countries have so far reached **1,407,100** direct beneficiaries, of which **22,590** are lead farmers.

Component 2: Strengthening of Regional Centres of Leadership

The RCoLs continued to invest in short-term capacity building efforts, with a total of 3,458 (2,117M; 1,341F) RCoL and Extension staff having been trained on various thematic areas. A total of 12,849 farmers (6,671M; 6,178F) were also trained in various thematic areas in 2017, bringing the total number of farmers trained to date to 31,982 (16,788M; 15,194F). To date long term training has been supported for 163 staff (97M; 66F), and out of these, 40 have completed their studies (Malawi =4, Mozambique=9 and Zambia=27). While general progress in institutional assessments was reported by the countries, the Change Management action plans are yet to be implemented. RCoLs' use of the regional M&E framework and harmonized reporting system has improved, but more efforts are required to ensure accuracy and quality reporting. Rehabilitation of existing research infrastructures, irrigation facilities as well as construction of new infrastructure and road networks progressed, although at a slower than required pace in some instances. There were significant delays in commencement of the construction work at the new rice RCoL in Mozambique. Notable progress was made by RCoLs in strengthening seed, regulatory and related services: Malawi developed a new Seed Policy, reviewed the Seed Act of 1996, drafted Seed Regulations and established a National Seed Commission and National Variety Release Committee. In Mozambique all legislation required for regional harmonization is now in place. Zambia drafted the harmonized seed legislation in alignment with the regional harmonized seed policy, and also finalised the harmonized national seed production regulations. Screening of all R&D projects and rehabilitation works for safeguards compliance, conducting trainings for staff and farmers, development of environmental management plans and undertaking safeguard

compliance monitoring visits are some of the key activities that were undertaken by the countries.

Component 3: Coordination and Facilitation

The Regional Result Framework and Indicator Reference sheet was finalised, indicator targets revised and shared with the World Bank. The revised target number of beneficiaries is 3,089,200. Governments of the APPSA implementing countries, the World Bank and CCARDESA participated in the 2nd mid-term review of the project which sought to take stock of project implementation progress to date; assess the likelihood of achieving the project development objective (PDO) and assess which interventions could be discontinued, scaled down or focused on during the remaining implementation period of the project. The second Regional Steering Committee meeting was held at the end of the 2nd MTR in early December. CCARDESA facilitated the development of 3 special R&D project proposals on (i) Fall Armyworm (*Spodoptera frugiperda*) management - led by Malawi; (ii) Socio-Economic Studies - led by Mozambique and (iii) Mechanization Technologies - led by Zambia. CCCARDESA and the World Bank continued supporting Angola and Lesotho with their preparations to join APPSA. The two countries are expected to be part of the APPSA family in 2018. The CCARDESA and WB team also visited Swaziland for APPSA discussions in September. It was agreed that the country would draft a concept note to share with CCARDESA and World Bank in early 2018. CCARDESA identified and engaged Information Training and Outreach Centre for Africa (ITOCA) to carry out short-term trainings for 201 scientists (61F:140M) in the 3 countries. The trainings covered a) Proposal development and resource mobilisation, (b) Statistical analysis, (c) Information repackaging for specific target audience and (d) Development of scientific products. Several success stories developed by the countries were shared on the CCARDESA platform –the Southern African Agricultural Information and Knowledge System (SAAIKS).

1. BACKGROUND

APPSA is a 6-year project (2013 – 2019) financed by the World Bank using a Specific Investment Loan (SIL) to the tune of US\$ 90 Million. Its objective is to increase the availability of improved agricultural technologies in participating countries in the SADC region through: (i) establishing Regional Centres of Leadership (RCoLs) on commodities of regional importance; (ii) supporting regional collaboration in agricultural research, technology dissemination, and training; and (iii) facilitating increased sharing of agricultural information, knowledge, and technology among participating countries. APPSA has three participating countries: Malawi which is focusing on maize-based farming systems, Mozambique on rice-based farming systems, and Zambia on food legumes-based farming systems (involving beans, cowpeas, groundnuts, pigeon peas, and soybeans). The Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA) is coordinating the project, which has the following key components:

Component 1 - Technology Generation and Dissemination

This component focuses on implementation of technology generation and dissemination activities associated with the commodities being targeted by the RCoLs (maize, rice, food legumes). The R&D activities are developed through a participatory process involving R&D scientists from the 3 countries, facilitated and coordinated by the RCoLs and CCARDESA. The collaborative R&D projects include a set of activities designed to ensure that technologies generated under APPSA are made available to farmers and other end users through various dissemination pathways. The technology dissemination activities also focus on promotion of improved technologies that were generated before commencement of APPSA.

Component 2 - Strengthening Regional Centers of Leadership

This component aims at raising the capacity of the countries to be the Regional Centres of leadership in the selected commodities through (a) human capital development and (b) improving the physical and infrastructure facilities including the information management and communication services. Across the RCoLs, human capital development includes supporting training at post graduate level and upgrading skills through short courses. The specific activities on improving the physical and infrastructure facilities vary across the RCoLs, depending on the specific needs of each RCoL. In general, improvement of infrastructure includes upgrading of research infrastructure (farm, laboratory, office equipment); information technology and knowledge management systems; improving administration and performance management systems; strengthening seed production capacity, seed regulatory functions, and related services.

Component 3: Coordination and Facilitation

Coordination and facilitation activities are undertaken at national and at regional levels. At the national level the key activities include planning and budgeting, management and administration, monitoring and evaluation, safeguards compliance, and regional engagement. At the regional level the type of support provided by CCARDESA broadly includes, Convening

regional strategic meetings, peer review and networking, technical backstopping, monitoring and evaluation, administration and management. The component also supports policy harmonisation and advocacy work (needs assessments, and policy dialogue or policy harmonization activities etc.) in key areas that affect R&D such as policies and legislation for intellectual property rights, operationalization of the SADC harmonized seed regulatory system, implementation of biosafety regulations, and similar topics.

2. PROGRESS OF IMPLEMENTATION

After a slightly late and erratic onset of the 2016/17 rainfall season, rainfall improved from December through January and February 2017, with over 200% of normal rainfall recorded in most parts of the three countries. Areas that had less than average rainfall were in the northern parts of Malawi and Mozambique. Overall, the above-average rainfall for the cropping season boosted agricultural production compared to the 2015/16 season, despite the damage due to armyworm infestation, particularly in Zambia and in Malawi. Zambia was the first country to report the outbreak of fall army worm in the SADC Region, and the Government was quick in deploying resources to contain the infestation.

2.1 Component 1: Technology Generation and Dissemination

In the 2016/17 cropping season, a number of projects that were commissioned during the 1st cycle (2013), were expected to be completed, including those that were given a 1 year no-cost extension of the implementation period. The implementation status of the R&D projects is summarised in Table 1 below. The detailed implementation status is provided in Annex 4.

Table 1: Implementation status of R&D projects during the 2016/17 growing season

Country	Cycle 1		Cycle 2		Cycle 3	
	Total #	# Completed	Total #	# Completed	# planned	# implemented
Malawi	22 (7)*	16	24 (7)	12	16 (7)	13
Mozambique	24 (8)	0	18 (7)	0	23 (5)	19
Zambia	26 (11)	7	20 (10)	11	23 (10)	20
Total	72	22	62	24	62	52

* The number in brackets indicates the number of projects which the country is leading in.

Malawi completed implementation of 28 sub-projects (11 in which it led) out of its total R&D portfolio of 46 projects in Cycles 1 and 2. Zambia completed implementation of 18 sub-projects (9 in which it led) out of its total R&D portfolio of 46 projects in Cycles 1 and 2. Thus, 31% of projects from the 1st cycle of implementation were completed by December 2017, and out of these, 5 were reported as completed across two countries (Malawi and Zambia). Similarly for the projects from the 2nd cycle of implementation, 39% of them were completed by December 2017, and out of these, 6 were reported as completed across two countries (Malawi and Zambia). None of the R&D projects being implemented by Mozambique were completed.

2.1.1 Technology Generation

The Maize RCoL implemented 21 technology generation projects which to date have generated 21 technologies [16 crop varieties and 5 agronomic practices]. In addition, applications for technology release of an additional 46 technologies are to be submitted to the Agriculture Technology Clearing Committee (ATCC) for review in February 2018. The 46 technologies are distributed across commodities as follows: 42 seed varieties, 2 agronomic practices and 2 post-harvest technologies. Out of the technologies generated, two rice varieties (Mpheta and Nanzolo) and one water management practice (irrigation scheduling for improved water use efficiency under maize) were recommended to the national Extension Service for dissemination.

The Rice RCoL implemented 29 technology generation sub-projects which to date have generated 14 technologies [2 rice varieties and 12 agronomic practices]. A total of 35 crop varieties [8 maize, 10 beans, 4 groundnut, 5 soya bean; 6 cowpeas and 2 rice] will be recommended for release in early 2019.

The Legumes RCoL implemented 46 technology generation projects which to date have generated 11 seed varieties as follows: 8 Legumes [5 Groundnuts (MGV-6, MGV-7, Lupande, Wamusanga and Wazitatu); 2 Beans (Lunga and Lungwe Bungu); 1 Pigeon Pea (Msekera Pigeon Pea Variety [MPV-2]); 1 Rice (Supa-MG); and 2 Quality Protein Maize varieties (GV682P and GV687P). An additional 13 varieties are at pre-release stage [rice=5, cowpea mutant genotypes=2, drought tolerant groundnut=1 and pigeon pea =5 varieties]. These have been submitted for national variety testing prior to release by the Seed Control and Certification Institute (SCCI).

2.1.1.1 Highlights of achievements under Maize

i. Germplasm collection

To date, Malawi collected 500 accessions, out of which 438 were characterised at phenotypic level. Mozambique collected 438 accessions, and 350 were characterised at phenotypic level. Zambia undertook phenotypic characterisation of 200 accessions, established 2 potential hotspot sites for the management of genetic diversity and duplicated 73 accessions at SPGRC. Molecular characterisation is yet to be finalised for all the collected accessions in all three countries.

ii. Crop Improvement

Tolerance to major storage pests

In Malawi, three hybrids (MACT-APPSA 15, MACT-APPSA 31 and MACT-APPSA 32) which are flint type, resistant to diseases, high yielding and with large grain size and preferred by most farmers who participated in variety selection were targeted for release. In Mozambique, five hybrids resistant to stem borer were selected for release. The preferred

hybrid is MACT-APPSA-Moz20 which has the following traits: twin cobbing, semi-flint and high yielding. In Zambia four hybrids (ZARI1508TX, ZARI1533DX, CKMNL150075 and CKMNL150076) which are tolerant to major storage pests were identified. These will be entered for 1st year variety testing at Seed Control and Certification Institute (SCCI).

MLND resistance

Malawi identified hybrid 16ML5 as resistant to MLND, while hybrids 16ML8, 6ML15 and 16ML32 showed partial resistance. Mozambique sent promising lines to the MLN quarantine regional site at CIMMYT Zimbabwe for verification and multiplication of MLN free seed of the parental lines. It is anticipated that 8 hybrids will be ready for release in the coming seasons. Zambia developed and sent ninety six (96) inbred (S3) lines to Kenya to determine tolerance to MLND.

Tolerance to striga

Testing of thirty five (35) maize hybrids for tolerance to striga continued in Malawi. Four hybrids and two open pollinated varieties were identified, and two of these will be proposed for release in February 2018. Mozambique selected seven varieties tolerant to striga: 2 hybrids, 2 OPVs, 1 pro-vitamin A and 2 QPM. In Zambia, the following hybrids (M1512-14, M1512-12, M1512-10, M1512-13, and M1512-5) and open-pollinated varieties (M1509-9, M1509-2, M1509-3, M1509-4, and M1509-10) which were identified as tolerant to striga are being subjected to on-farm evaluation in Eastern and Western provinces before being recommended for release.



Striga survey in Mozambique



On-station Striga infested trial in Malawi

Improving nutritional quality

Inbred lines for quality protein maize (QPM) and Pro-Vitamin A have been shared among the three countries to facilitate efforts to develop maize varieties with improved protein quality and enhanced levels of beta-carotene, Iron and Zinc. In Malawi the four entries that were preferred by the farmers had the following traits: - deep orange colour, double cobbing, poundable, drought tolerant and long cobs. These are the most likely candidates for release. Mozambique screened 446 lines for adaptability, out of which 235 elite lines

were identified for further development. Zambia released two quality protein varieties (GV682P and GV687P) with yield potential of 8-10 T/ha.



Some promising hybrids selected by farmers during PVS in Malawi

iii. Pest and Disease management

Fall Armyworm (FAW) Management

In the 2016/17 growing season, maize in the three countries and the SADC region at large was hit by an incursion of the Fall Armyworm which originates from South America. The three implementing countries jointly developed a project proposal on FAW management. Malawi commenced research work centred on (a) evaluation of seed dressing (coating) insecticides to control the pest and (b) evaluation of selected foliar insecticides for FAW control. The preliminary results showed effectiveness of controlling fall armyworm at the following insecticide application rates:

INSECTICIDE	RECOMMENDED DILUTION RATE (ml /litre or g/litre)	DOSE PER 16-LITRE SPRAYER	DOSE PER 20-LITRE SPRAYER
Steward 150 EC	1ml/litre	16ml	20 ml
Belt 480 SC	0.3ml/litre	5ml	6 ml
Proclaim Fit	0.5g/litre	8g	10 g
Chlorpyrifos 480 EC	1ml/litre	16ml	20 ml
Decis Forte	0.2ml/litre	3.2ml	4 ml
Deltanex 25 EC	0.8ml/litre	12.8ml	16 ml



Maize treated with Belt 480 SC in Malawi



FAW-damaged maize in Zambia

The work on evaluation of selected foliar and seed treatment insecticides for FAW control in maize will continue in all three countries. In addition, work will be undertaken to determine the effect of conservation agriculture on FAW infestation and damage in maize and also searching for local FAW natural enemies and establishing their colonies.

iv. Post-harvest management

Work on evaluation of the effectiveness of small scale metal silos (MS), polyethylene silo tanks (PST) and Super Grain Bags (SGB) as alternative improved storage structures for Maize, Rice and Cowpea continued in Mozambique and Zambia. In Zambia, all three storage methods were found to be very effective in controlling storage pests (weevils and large grain borer). The effectiveness was 88%, 76% & 65% for MS, PST and SGB respectively, compared to the traditional methods of grain storage. The improved storage methods also retained grain quality for more than 6 months of storage. Similar results were observed in Mozambique where 30 artisans were also trained in production of small metal silo production. Following a successful training, 200 silos were produced for use by the farmers.



MS and SGBs at Umbeluzi Research Station



Farmers appreciating maize from SGBs

In Malawi work on ensuring safe, high quality and market-attractive maize flour for human consumption continued with the evaluation of two types of hammer mills. Recommendations on use of modified hammer mills and hardened beaters were developed, and are earmarked for release in 2018.

v. Soil/water management

One irrigation technology (irrigation scheduling to improve maize water use efficiency) was released in Malawi.

2.1.1.2 Highlights of achievements under Rice

i. Germplasm collection and characterization

Since project inception, Malawi has collected a total of 300 germplasm accessions, characterized 230, and duplicated 49 for safety at the SPGRC. Mozambique collected 310 accessions, characterized 259 at phenotypic level and 130 at molecular level. Additional collection of wild and upland rice germplasm particularly from Niassa and Sofala provinces is planned in order to improve representative accessions held at the National Gene bank. About 250 new accessions were deposited in the National Plant Genetic Resources Centre and 150 new accessions were duplicated at the SPGRC. A total of 45 farmers and 22 Extension staff were trained on germplasm collection, on-farm conservation and participatory assessment of rice diversity. Seven posters on plant genetic resource awareness, landrace diversity, collection strategies, ex-situ conservation were produced. Zambia collected and conserved 175 germplasm accessions at the gene bank, 185 were characterised at phenotypic level and 30 at molecular level. About 30 accessions were made available to potential users and 91 were duplicated for safety conservation at the SPGRC. The accessions will be accessible for use in the rice breeding programme. Six potential sites for in-situ conservation of rice landraces were identified, while a total of 80 farmers are participating in on farm conservation of rice genetic resources.

ii. Crop improvement

- Malawi released two rice varieties (Mpheta and Nanzolo) with potential grain yields of 7 t ha⁻¹. About 300 kg of pre basic seed of both varieties were produced for seed multiplication.
- Mozambique identified 2 drought-tolerant lines (ZM30-68 and ZM30-81) for promotion in lowland areas under rainfed conditions.
- The activities on improving rice productivity in saline soils and drought prone areas resulted in the selection of 3 varieties by farmers through participatory process. Seed of each variety was multiplied at various locations to facilitate uptake of the varieties.
- Seven varieties in Mozambique (Chupa, ITA 312, Limpopo, Nene, C4-63, Mocuba and Muceba) were purified. After they were certified pure, seed of the varieties was multiplied.

- In Zambia, the identified three promising varieties (IR10L121, IR13N144, and IR95624-B-160-3) were submitted to Seed Control and Certification Institute for further evaluation.

iii. Management Practices

- Four technologies on integrated rice management practices were evaluated in Malawi, and will be recommended to the ATCC for release in 2018. These are: (i) compost from rice hulls and cattle manure, (ii) compost manure from top soil and cattle manure, (iii) compost manure from chicken manure and top soil and (iv) compost manure from three quarters rice straws and one quarter cattle manure. In Mozambique, a fertilizer application recommendation for growing Simão, Nene and Tumbeta varieties is expected to be made from the fertilizer trials.
- One technology on improving surface irrigation drainage water reuse for rice production in Malawi was generated.
- The project on improving rice productivity through the introduction of rice – duck based farming system procured and increased the number of local duck species to 600, after which they distributed them to 80 farmers for multiplication. Farmers that commenced use of the system, which entails use of *Azolla* and Muscovy ducks as bio fertilizer and for the control of weeds and pests of irrigated rice reported that the cost of fertilizer use was reduced by 30% under the system.



One of the Lead farmers receiving ducks

iv. Strengthening seed delivery

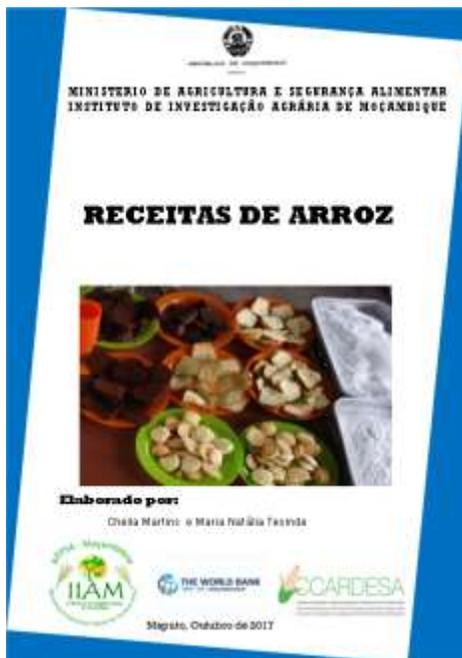
In Zambia the project on strengthening rice seed delivery supported 3 farmers to grow 1.5Ha of basic seed. 178 farmers (92F) were trained in entrepreneurship. In order to increase volumes of improved seed varieties for rice, 177 seed growers were registered for seed production on 210.6 Ha. 549 MT of certified seed have been produced to date.



Breeder seed multiplication at Lifuwu Research Station, Malawi

v. Value addition

In Mozambique, 5ha of rice crop from Makassane, Mziva, Huwa was milled to produce rice flour, which was used to prepare 20 rice recipes which were evaluated by farmers in the different areas. More evaluation will be undertaken in 2018.



Rice recipe booklet



Evaluation of rice baked products in Mozambique

2.1.1.3 Highlights of achievements under Legumes

The focus crops are Beans (*Phaseolus vulgaris*), Soybean (*Glycine max*), Pigeon pea (*Cajanus cajan*), Groundnut (*Arachis hypogea*), Cowpea (*Vigna unguiculata*) and Bambara nut (*Vigna subterranean*).

i. Germplasm collection

The intervention aims to prevent the loss of food legumes germplasm and to broaden the genetic base of food legumes so as to address the farmers' needs for increased productivity, crop resilience to changing environments as well as farmers' preferences. In Mozambique ex situ conservation and agro-morphological characterization of food legume germplasm was done during the reporting period. One hundred and fifteen (115) accessions of cowpea, groundnut and bambara nuts were deposited in the National Plant Genetic Resources Centre, while 100 accessions were sent to SPGRC for safety duplication. Zambia collected 159 accessions (62 cowpea, 16 pigeon pea and 81 Bambara nuts) which were characterised morphologically. Phenotypic characterisation of 30 bean varieties was also undertaken.

ii. Crop improvement

Groundnuts

- Out of the 3 varieties with multiple disease resistance that were identified in Zambia, one was tested on farm and submitted to SCCI for pre-release testing. Breeders' seed of 8 multiple disease resistant varieties was increased to 30T through partnership efforts with USAID-Profit+, IITA, ICRISAT and 17 out growers for Msekera Seed UNIT.
- Malawi identified seven lines with superior performance in low soil fertility and drought prone areas (ICGV-SM series -08565, -08535, -08528, -08556, -03530, and ICGV 14788 and ICGV 00331), and these will be included in future breeding programmes. In Mozambique, application for release of varieties identified as tolerant to low soil fertility and drought will be done by April 2018. A manual for groundnut production was prepared for training of extension staff.
- Drought tolerant varieties (ICGV SM 01514, ICGV SM 01711) were pre-released in Zambia
- Information on methods for reducing aflatoxin contamination in groundnuts was generated, packaged and distributed for use by extension staff and farmers in Malawi.

Beans

- Three varieties with high yield and improved biological nitrogen fixation identified in Malawi (KG 27-15, KG 22-11, and KG 22-18).
- Three bean varieties (CIM-ALS-FeZn08-6-2, CIM-ALS-FeZn08-16-6, and NUA 56) with high Fe and Zn content, resistant to angular leaf spot and common bacterial blight and preferred by farmers in Malawi to be proposed for release in 2018.



Participatory Bean Variety Selection in Malawi

- Two bean varieties with high marketability, namely Lundazi (red kidney) and Lusaka yellow were released in Zambia.
- Work on developing high yielding and bruchid resistant bean varieties produced seven (7) varieties that have shown resistance to bruchid and wide adaptability traits in Malawi. These are; Nyambitira, Namtupa, Chitedze Bean 1, Chitedze Bean 2, Chitedze Bean 3, Chitedze Bean 4, and Chitedze Bean 5.
- There are five (5) promising drought tolerant genotypes that were selected by farmers in Malawi and these are; CAL 96, DRK 47, G 738, G 1939 and SAA 20 with CAL 96, with yields ranging from 600 kg ha⁻¹ to 992 kg ha⁻¹. These are earmarked for release.



Promising drought tolerant Bean varieties in Malawi

- Under the same project in Mozambique, the following bean varieties have been earmarked for release; DRK 47, CAL 96, MR 13557-16-7, VTTT 924/2-4-2-1. Similarly in Zambia, the following six varieties: CAL 143, Sugar 131, VTTT 924/4-4, A197, VTTT 923/10-3 and NUA 459 are earmarked for release.



Released legume varieties in Zambia

Cowpeas

- In Mozambique seed multiplication of IT 16, IT 18 and other promising lines was undertaken in order to guarantee foundation, pre- and basic seed. Seed of preferred varieties was given to the seed company for multiplication to ensure adequate seed of new improved varieties.
- Zambia pre-released two high yielding cowpea varieties (LT 11-3-3-13) and large seeded (BB 8-1-5-2). In addition, three mutant lines (LT 11-5-2-2, BB 7-9-7-5 and BB 14-16-2-2) that were identified as being tolerant to bruchid were further evaluated on farm and screened for protein content. The materials were shared with Malawi.

Soya bean

- In Malawi, 4 soya bean genotypes (1 vegetable [AVSB0308] and 3 grain [TGX 1990-46F, TGX 1990-111FN and TGX 1995-5FN) that are high yielding, resistant to major diseases and with preferred market traits were identified, and will be recommended for release.
- Five (5) soybean promising genotypes that are more adapted to different agro ecological zones in Mozambique (TGX 1963-3F, TGX 1987-62F, TGX 1987-38F, BRS GO 8360, BRS 257) were selected and will be recommended for release after the VCU trial to be conducted in 2018.

Pigeon peas

- Pigeon pea lines with high yield and showing some resistance to fusarium wilt were selected in Malawi: short duration genotypes (ICEAP 01101/1, ICEAP 01103/1, ICEAP 87091); medium duration genotypes (ICEAP 01106/1, ICEAP 87105, ICEAP 00604/1).
- Pigeon pea varieties Muthawajuni (early maturity); ICEAP and MPPV 2 (medium maturity) were pre-released in Zambia.

iii. Management Practices

Integrated crop management options which include one seed per planting station, row planting, fertilizer application and bean stem maggot (BSM) control were demonstrated on-farm in low soil fertility and drought prone areas. In Mozambique, promising genotypes were shared with private seed companies (Dengo Comercial, Phoenix Seed, Klein Karoo Seed Marketing, Companhia Zembe and Bonimar Comercial) for multiplication. A Bean Production Manual was developed and shared with Extension, Farmers and other stakeholders. Malawi evaluated and selected for release 5 bean seed varieties.

iv. Strengthening seed delivery

The initiative aimed at increasing volumes of improved seed varieties for groundnut, common bean, pigeon pea, soybean and cowpea for access by smallholder farmers in the three countries. In Malawi - 25 MT of basic seed of improved varieties was made available to farmers, while in Mozambique basic seed of four varieties was availed to seed producers. 350 tons of certified seed were multiplied and made available in the seed markets in the central region of Mozambique. In Zambia, in the 2016/17 season 380.6 Ha of common bean, cowpea, groundnut and soya bean were grown. Six farmer groups were linked to sources of basic seed, seed markets and certification services, while nine agro-dealers were trained and linked to seed growers in Petauke. To date 649 seed growers have been trained in basic seed production, while 255 were trained in entrepreneurship. Basic seed has been distributed to the trained producers through seed growers associations such as Pachepache, Minga, Kapiri and Tiwine for multiplication. To date, 204 MT of certified having been produced and the area under seed multiplication continued to increase. A success story on Pachepache seed growers association was shared on the Southern African Agricultural Information and Knowledge Management System (SAAIKS) platform by CCARDESA in 2017. In Malawi 33 staff and 183 farmers were trained in seed production, while Mozambique trained 46 farmers, 13 officers and 5 agro dealers. Sustainable stakeholder linkages both from the informal and formal seed sectors were created in all countries.

2.1.1.4 Highlights of achievements under Cassava

This is a new commodity that was approved under cycle 3 in 2016. However, most of the cassava projects commenced in 2017. The focus is on addressing pathogens in cassava culture; germplasm collection, characterisation and conservation; evaluation of cassava genotypes tolerant to abiotic stress as well as cassava quality, processing and utilization.

The projects' progress was as follows:

i. Germplasm collection

In Mozambique a total of 289 cassava accessions were collected from Maputo, Gaza, Inhambane, Sofala, Zambezia Nampula and Niassa provinces and established at Nampula Research Station. The 56 cassava accessions that were collected in Maputo were established at Umbeluzi Research Station. The germplasm will be characterised using morphological and molecular markers.

ii. Crop improvement

Work on evaluation of cassava genotypes tolerant to abiotic stress commenced in Mozambique with the planting of twenty two drought and disease tolerant genotypes sourced from Uganda, Tanzania, Malawi and Kenya. Field trials to assess interaction of genotype by environment (G x E) for cassava yield traits were established at Umbeluzi, Chokwe, Nhacoongo, Mocuba, Liupo and Nametil site.



G x E field trial establishment in Nhacoongo



G x E field trial, Liupo site

Cassava experiments to evaluate tolerance to disease were established in 7 districts (Angoche, Moma, Monapo, Nacala velha, Gile and Alto Molocue).

2.1.1.5 Highlights of achievements under Conservation Agriculture (CA)

The CA work focused on improving soil fertility, weed control using herbicides, evaluating of pests and diseases, maize-legume intercropping, testing the effectiveness and acceptability of mechanized raised bed preparation as well as creating local capacity in the use of small 4 wheel tractors. In Mozambique, at least 37 extension staff and 8,000 farmers were trained in CA practices. Learning materials (1 poster, 2 Leaflets, 1 scientific paper) were developed. Three maize varieties (Matuba, PRI601 and Sussuma) showed good resistance to pests and diseases, and will be recommended for uptake under CA systems. Five water and labour saving technologies were tested in a participatory approach with farmers and extension staff. About 45 extension officers were trained in these new technologies. An Innovation Platform was established to address mechanization under CA.



CA demonstration site preparation

The experiments on disease and pest build-up under CA observed buildup of the following across the three countries: (i) **Pests** [Stem borer, Maize leafhopper and Termites]; (ii) **Diseases**: [Leaf blight, Rust striped leaf and Leaf and ear rot]; (iii) **Weeds**: [Striga sp. and Alectra sp.].

The benefits of biochar (produced from on-farm crop residues) on nutrient retention and crop yields were successfully demonstrated in Zambia. The biochar technology was exhibited at the Zambia International Trade Fair in Ndola, and also broadcast on radio and TV.

The project on evaluation of full CA trade-offs under partial CA and traditional farming systems concluded that adoption of Partial CA system would increase production and productivity in smallholder agriculture with a magnitude that is not significantly different from full CA systems.

In Malawi and Zambia, farmers appreciated and approved the use of herbicides to control weeds under CA as they observed for themselves that weed infestation levels were quite low in the herbicide plots compared to the plots under conventional agriculture. Success stories on farmers testing new conservation farming technologies were shared across the countries. In Malawi, a female lead farmer was featured in a success story following her successful piloting of the sustainable farming methods and shared what she had learnt with more than 80 other farmers. The success story was also shared by CCARDESA on the SAAIKS platform.



Farmers assessing herbicide effect under CA in Zambia.

2.1.2 Technology Dissemination

The project disseminates improved technologies that were developed by the respective NARS prior to APPSA inception, but were never fully disseminated, and also technologies generated under APPSA. The technologies are disseminated through the following pathways: demonstrations, field days, agricultural shows, fairs, print and electronic media. Dissemination activities are carried out in collaboration with a range of partners, including farmers, farmers' organizations, extension agents, seed companies, and NGOs. Key technologies being disseminated cover improved seed varieties, agronomic/crop husbandry practices; post-harvest storage and agro-processing.

Through the 10 dissemination projects implemented by Malawi, sixty two technologies were disseminated as follows: 55 seed technologies [maize=10, beans=12, pigeon pea=7, cowpeas=3, rice=9, groundnuts=8, soybean=4 and sorghum=2]; and 7 agronomic and crop management practices (Annex 5). Mozambique implemented 36 projects with a

dissemination component, and have to date disseminated 115 technologies: 51 seed varieties [maize=6, rice=10, legume=23, pigeon pea=4, beans=8, cowpea=9, soybean=2, sorghum=6, cassava=6]; 19 agronomic and crop management practices and 45 post-harvest storage and agro-processing technologies (Annex 6). Zambia, through the 19 dissemination projects has to date disseminated 91 technologies, distributed as follows: improved seed varieties (43); improved agronomic practices (14); integrated pest management (1); improved processing technologies (27) and improved labour saving technologies (6) (Annex 7).

Notable progress in dissemination of agro-processing technologies was recorded during the implementation period. Agro-processing of five legumes was successfully promoted in Malawi and Mozambique, where farmers were equipped with knowledge on processing of the target legumes, and are now actively engaged in processing the products for sale as well as for improving family nutrition. The technologies included processing of Bambara nut, soybean and pigeon pea flour, which was further used to prepare several dishes such as porridge, cakes, biscuits, milk and other by-products. More suitable agro-processing technologies for beans and cowpea were also identified. A success story on legume agro-processing in Mozambique was shared on SAAIKS platform.



Different grain legumes



Soybean products in Mozambique



P. pea palatability test in Malawi



Farmer training in agro-processing in Mozambique

2.1.2.1 On-farm Demonstrations

For the majority of farmers, “seeing is believing.” On-farm demonstrations therefore serve as an effective method of making farmers aware of new possibilities. Under APPSA, small demonstration plots, usually not more than 0.1 ha, provide a backdrop on which to demonstrate appropriate technologies. The field demonstrations are established by project staff in collaboration with farmers to validate and demonstrate new technologies. During the reporting period, **1,420** demonstrations (Malawi = 390; Mozambique = 249 and Zambia = 781) were established across the countries.

2.1.2.2 Field days

The major role of field days is to introduce farmers, agricultural professionals, extension agents and other key stakeholders to new farming technologies and techniques. It is therefore imperative to encourage key stakeholders to attend and participate in these farmer oriented learning platforms.

Field days were conducted across projects in all three countries, and were attended by key government officials and other key stakeholders in the farming industry. In Malawi **763** field days were conducted, and were attended by 23,316 farmers (F10, 492; M12, 824). In Mozambique **198** field days were conducted, and were attended by 3,682 farmers (F1, 878; M1, 804). In Zambia, **401** field days were conducted, and were attended by 57,775 farmers (F34, 665; M23, 110).



Malawi



Field day in Mozambique



Field day in Zambia

2.1.2.3 Agricultural shows/Fairs

In Malawi, several technologies under APPSA were showcased at the National Agriculture Fair which was held in Blantyre. The technologies showcased included among others new rice varieties, pro vitamin A Maize. During the World Food Day celebration, APPSA showcased orange maize, a hand-held fertiliser applicator being evaluated by APPSA and the two new rice varieties (Mpheta and Nazolo) which were released by the Project. In Mozambique, rice germplasm and other APPSA technologies were showcased to 76 people including policy makers, extensionists, researchers and media personnel at IIAM–Headquarters during the Presidential visit in February 2017. In Zambia the project on up-scaling improved soybean production and utilization conducted several food fairs which were attended by 2,036 farmers and at which 17 technologies on soybean processing and utilization were demonstrated.

2.1.2.4 Print and Electronic media

Across the three countries, the project continued with the production of brochures, pamphlets, posters, Policy briefs, training manuals, booklets, scientific and other technical publications. Other knowledge transfer tools employed by the project included radio and television programmes. In Malawi, APPSA facilitated the dissemination of information through MBC TV and airing of radio documentaries on Fall Army Worm Management. In Mozambique, the project on promotion and dissemination of improved rice technologies had a radio program “Alo produtor” which was translated to 5 different local languages (Cena ,Chuabo, Nharinga, Macua and Quoti) and aired in the districts where the project was being implemented. In Zambia, 1500 brochures, 50 T-shirts and 1000 leaflets were printed for distribution during the trainings on MLND symptom recognition and management. Seventeen radio programs were broadcast on the National Radio Station Channels One and Two, covering a number of legume technologies. A video documentary covering soya bean production, upland rice varieties, bean seed multiplication was also produced and aired on the National Television, the Zambia National Broadcasting Corporation, ZNBC Channel 1.

2.2 Component 2: Strengthening Regional Centres of Leadership

Activities under this component are expected to result in strengthened capacity for RCoLs to coordinate agricultural research and development. The focus is on (a) upgrading of research infrastructure including physical infrastructure, farm, laboratory, and office equipment; and information technology and knowledge management systems; (b) improving administration and performance management systems; (c) developing human capital including by providing scientific training at the post graduate level and by upgrading skills through short courses or targeted training; and (d) strengthening seed production capacity, seed regulatory functions, and related services.

During 2017 the RCoLs reported the following progress:

2.2.1 Upgrading of research infrastructure

Maize RCoL

- Civil works (rehabilitation of existing research infrastructures, rehabilitation and construction of new irrigation facilities, construction of new infrastructure and construction of road networks) at Bvumbwe and Kasinthula Research stations commenced on 10th July 2017, and are expected to be completed by 10th April 2018.
- Evaluation report for construction of infrastructure (Office Building; Laboratory complex; Conference hall and road network) at Chitedze Research Station was submitted to Office of the Director of Public Procurement for endorsement. Civil works are expected to commence in early 2018.
- Goods (farm inputs for the 2017/2018 season, protective wear, IT Equipment, laboratory reagents and equipment, stationery and consumables), were procured through local purchase orders.



Rehabilitation of the irrigation system

Rice RCoL

- Rehabilitation of more than 24 buildings and other structures (dormitories, houses, threshing floors, warehouses, laboratories, greenhouse, machinery sheds) was done at Umbelúzi, Chókwe, Sussundenga and Lichinga Research Stations as well as at Nametil and Nampula Agronomic Posts was undertaken as per schedule, with the exception of Nampula and Nametil.
- With the significant delays in commencement of rehabilitation of irrigation works at 3 research stations (Umbeluzi, Chokwe and Nampula), the deadline to start the rehabilitation work was set at April 2018.
- Construction of the Namacurra Irrigation Scheme was significantly delayed as the cost per Ha in the tender document was way beyond the permissible rate of around \$ 12 000 per ha. Efforts were made to revise the costs so that the tender could once again be submitted for a No Objection. Once the irrigation system has been completed, the total area to be under irrigation will be as follows: 23.5 ha (flood), 14.5 ha (sprinkler) and 7.5 ha (drip).



Rehabilitated Administration block at Sussundenga

- Title Deed for the establishment of the new RCoL - Namacurra Research Station on 52 ha was secured. Construction is expected to commence in May 2018, and is expected to be completed within 16 months.

Legumes RCoL

- Bidders were selected for the rehabilitation of soil chemistry laboratories at Mount Makulu and Kabwe Research Stations, irrigation system at Kabwe Research station and box wire fencing of research fields at Kabwe Research, National Irrigation Research and Msekera Research stations. The works will commence in 2018.
- The RCoL procured 3 buses and 10 land cruisers for ZARI research stations and the University of Zambia- School Of Agriculture; street lighting systems for Mt Makulu and Kabwe Research station; equipment, furniture, computers and laptops for various ZARI stations.
- Accomplished installation of box wire fencing at the de-silted dam at Mount Makulu Research Station, research fields at Mochipapa Research Station and Mount Makulu Research station.
- Design and construction of the conference centre at Mount Makulu Research Station was initiated with counterpart funds.
- Installation of irrigation system is almost complete at Mount Makulu Research Station, while installation at Kabwe Research Station is yet to commence.



2.2.2 Human Capital Development

APPSA supports staff training at undergraduate and post graduate levels to address identified skills gaps. The long-term trainings covered various disciplines that include agronomy, general agriculture, plant breeding, social science, irrigation engineering, biotechnology, environmental science and plant protection. The majority of scholarships are in agronomy, followed by plant breeding.

The training target by year 6 is **177**(113M; 64F), disaggregated by RCoL as follows: Maize - 44 (22M; 22F), Rice - 17 (10M; 7F) and Legumes 116 (81M; 35F). By 30 June 2017, APPSA had supported training of **154** staff (88M; 66F). An additional 9 scholarships were offered between July and December 2017, bringing to **163** (97; 66F) the total number of staff supported for long-term training to date. To date **40** (Malawi =4, Mozambique=9 and Zambia=27) have completed their studies as shown in table 2 below.

Table 2: Long term training of RCoL staff and partners as at December 2017

Country	PhD		MSc		BSc		Diploma		Sub-Total		Grand total
	F	M	F	M	F	M	F	M	F	M	
Malawi	4	7	8	11	5	4	0	0	17	22	39
Completed	0	0	0	2	0	2	0	0	0	4	4
Mozambique	2	5	5	6	2	10	0	0	9	21	30
Completed	1	0	0	1	2	5	0	0	3	6	9
Zambia	3	10	14	23	20	16	3	5	40	54	94
Completed	0	1	2	2	6	9	2	5	10	17	27

APPSA also supports upgrading of skills through short courses or targeted training and scientific exchanges within the RCoLs and selected implementing partners. During the reporting period, a total of **3,458** (2,117M; 1,341F) RCoL and Extension staff was trained on various thematic areas as shown in table 3 below. To date, a total of **8,960** (5,947M: 3,013F) staff has been trained.

Table 3: Short term training of RCoL and Extension staff

Thematic areas	Number of Staff Trained					
	Jan - Dec 2017			Cumulative totals to date		
	Male	Female	Total	Male	Female	Total
<ul style="list-style-type: none"> - Statistical analysis, - Information repackaging for specific target audience (knowledge translation), - Development of scientific products - Proposal development and resource mobilisation, - Data collection, management, and interpretation, - Information development and packaging, - International certification in applied evaluation, - Seed storage and marketing, - Germplasm collection and conservation, - Harvest and post-harvesting technologies, agro-processing of legumes, - Cassava disease management procedures, - Technique for rapid multiplication of cassava cuttings, - Use of diseases resistant maize hybrids and inbred lines etc. - Environmental and Social safeguards 	2,117	1,341	3,458	5,947	3,013	8,960

During the 2016/17 cropping season, emphasis was given to training of farmers in the thematic areas indicated in table 4 below. Across the 3 RCoLs, a total of **12,849** farmers (6,671M; 6,178F) were trained in 2017, while the cumulative number of farmers trained to date is **31,982** (16,788M; 15194F).

Table 4: Short term training of Farmers

Thematic areas	Number of Farmers Trained					
	Jan - Dec 2017			Cumulative totals to date		
	Male	Female	Total	Male	Female	Total
<ul style="list-style-type: none"> - On-farm demo layouts - Participatory selection of preferred maize and legume seed varieties - Participatory assessment of rice and legume germplasm diversity - Entrepreneurship seed production - Seed storage and management - Data collection on pre and post-harvest - Implementation of conservation agriculture (raised beds construction Scoring of major maize diseases) - On-farm germplasm conservation - Agro-processing technologies for legumes (beans and cowpea) - Environmental and social safeguards 	6,671	6,178	12,849	16,788	15,194	31,982



Training of Extension staff on dissemination of food legumes in Malawi



Training of Farmers Seed Associations on seed production in Mozambique

2.2.3 Strengthening seed, regulatory and related services

During the regional seed workshop which was convened by CCARDESA in March to discuss the seed harmonisation process in SADC and COMESA regions, focusing on progress made by APPSA vis-à-vis effective implementation of the seed policy harmonisation process, the following actions were agreed on:

- I. Awareness creation to minimize legal impediments should be initiated by national stakeholders, with support from regional communities through workshops, policy briefs targeting National Seed Authorities, policy makers, Seed Trade Association, Customs officials, Seed Producers & Seed Inspectors;
- II. Alignment of national legal frameworks to the SADC/COMESA Seed Harmonisation Policy to be spearheaded by national seed authorities.
 - a. Lobbying and advocacy for alignment by the National Seed Trade Association
 - b. Ensuring effective participation by the private sector in the alignment process;
- III. Preparation of policy briefs on Seed Harmonisation System and sharing with policy makers and politicians to fast track the revision of national seed laws to enhance seed trade;
- IV. Ensuring commitment by countries to joint listing of crop varieties on regional seed catalogue(s) and ensuring effective participation of emerging seed companies through collaboration with and facilitation by NARs and CGIAR centres;
- V. Facilitation of simultaneous release of varieties in two countries to assume regional status and testing of the Seed Harmonisation System across borders;
- VI. Development and implementation of awareness campaign action plans with assistance from the SADC Seed Centre, COMESA (for COMESA countries) and CCARDESA.



Official opening of the seed workshop by the CCARDESA Acting ED Dr Simon Mwale

Notable progress has been made in strengthening seed, regulatory and related services across the three RCoLs. Malawi sanctioned a seed certification system to ensure production of high quality seed of improved crop varieties for the farming community. They further developed a new Seed Policy (1993), reviewed the Seed Act of 1996, drafted Seed Regulations and aligned standards to both SADC and COMESA regional protocols. Both the Policy and Seed Bill are awaiting Cabinet approval. A National Seed Commission and National Variety Release Committee have been established to managed seed regulatory issues and varietal release. DARS also identified the need to update the pest list to include Maize Lethal Necrosis Disease (MLND), Fusarium oxysporum TR4 (banana) and Fall Army Worm (FAW).

Mozambique reported that all legislation required for regional harmonization is now in place, and the Seed Department is being strengthened so that it can support the harmonisation process. A survey of the IIAM capacities at the zonal centers (human, equipment and infrastructures) will be undertaken to identify the most promising areas to focus in basic seed production.

In Zambia, efforts to support domestication of the SADC seed regulations continued. Aligning of the Plant Variety and Seeds Act to the SADC and COMESA protocols is being undertaken by the Seed Control and Certification Institute (SCCI). It is expected that the regulations will be signed and implemented by mid-2018. Zambia continued with sensitization efforts of seed industry stakeholders (seed inspectors, seed traders, ministry of Commerce, Zambia Revenue Authority, Governmental departments and agro dealers) on harmonized seed laws, and facilitated the listing of 23 crop varieties on the SADC and COMESA variety catalogues.



Training of seed growers in Malawi



Training of seed growers in Mozambique

2.2.4 Communication and Knowledge Management

Realizing the importance of effective communication to all program partners, CCARDESA facilitated the drafting of a Regional Communication Strategy which aims at providing communication support for the APPSA program both among collaborating partners and between the programme and its stakeholders. CCARDESA shared the draft Strategy with the countries for comments, which have since been incorporated in the revised document to be shared with the countries. Most of the communication methods and tools proposed in the strategy are already being implemented by the project.

Establishment of a core knowledge repository by each RCoL for the specific commodity is one of the ways that were suggested for promoting visibility of RCoLs. To facilitate the process, CCARDESA developed and shared with the countries the Guidelines for establishment of virtual libraries. In December 2017, the countries reported that the process is under consideration and will be implemented in 2018.

Through generation of success stories, project visibility has been enhanced. The success stories which were developed and shared with CCARDESA and the World Bank generated interest not only on the continent but in other regions as well. The following success stories were uploaded on the CCARDESA platform – the Southern African Agricultural Information and Knowledge System (SAAIKS):

- *APPSA Grooms Successful Lead Farmer To Promote Conservation Agriculture in Malawi*
- *Farmers Benefit from Improved Rice Varieties in Malawi*
- *Bean Processing Enhances Food Security and Income in Mozambique*
- *Soybean Products Generate Income for Smallholder Farmers In Mozambique: The Story of Mrs Isaltina Aly Trigo*
- *Blacksmith Returns to Farming in Zambia*
- *Groundnut Seed Production Saves Farmers Against Falling Prices of “White Gold” in Petauke in Zambia*
- *Pache Pache Seed Growers Receive a Shot in The Arm in Zambia*
- *Scaling up Smallholder Soybean Productivity in Zambia*

Other stories are in the pipeline for publication through the SAAIKS platform.

Besides success stories, awareness of project activities and outputs was also enhanced through radio and television broadcasts as well as use of the print media in the respective countries. Mozambique aired the radio program “Alo produtor” on rice technologies in five vernacular languages. A documentary on improved rice varieties was produced both in Malawi and in Zambia. Other topics covered by the documentary produced by Zambia included the Scientific Conference, the role of research in enhancing agriculture production and productivity; soya bean production as a soil improvement and income generation crop; APPSA support in human capital development. Articles in the print media include "Fall Army Worm's Last Meal", “Better days for Pigeon peas farmers” in Malawi and “Government APPSA promotes new rice varieties” in Zambia. Other documentaries produced in Malawi focused on infrastructure development for Bvumbwe and Kasinthula Research Station, Fall Army Worm Management and the DARS Annual Review and Planning Meeting.

2.2.5 Environmental and Social Safeguards

Screening of all R&D projects for safeguards compliance and conducting trainings for researchers, extension staff and farmers are some of the key activities that were undertaken by the countries to ensure environmental and social safeguards compliance. The negative social and environmental impacts that were identified following the screening of R&D proposals in Malawi included gender imbalance, conflicts over use of local water resources, health hazard to workers and communities, soil erosion, increased exposure to agrochemical pollutants, reduced water quality, siltation of water courses. The environmental management plans for the research stations being rehabilitated in Malawi were developed, and safeguard compliance monitoring visits undertaken. Similarly in Mozambique, all rehabilitation works were subjected to environmental and social safeguards screening process. Trainings in environmental and social safeguards were conducted for project staff in the zones. Zambia conducted training in fire-fighting, first aid and general occupational safety for 51 members of staff at Kabwe and Mount Makulu Research Stations. Efforts to carry out disposal of obsolete chemicals as well as disposal of obsolete radiation equipment were initiated. Training in radiation safety was done for 12 ZARI staff.



Training in Environmental and Social Safeguards in Niassa (Mozambique)

2.3 Component 3: Coordination and Facilitation

Under APPSA, CCARDESA takes the lead in coordinating regional activities and providing technical assistance to regional implementation in the areas of convening strategic meetings, establishing a platform for knowledge exchange, information sharing and networking; technical backstopping, monitoring and evaluation, policy harmonization and advocacy (where it falls within the mandate of CCARDESA or together in partnership with other SADC institutions), training and dissemination. National level coordination and management is done by the APPSA Secretariats.

During the reporting period, the following progress was made:

2.3.1 Monitoring and Evaluation

CCARDESA convened an M&E Working Group meeting in Johannesburg in March to finalise the Regional Result Framework indicators, targets and indicator reference sheets as per first mid-term review (MTR) recommendations. Standardized templates for end of project reporting, exchange visits, field monitoring visits as well as research protocol were also developed and shared. Following the finalization of the Regional Result Framework, RCoLs were requested to submit their revised RF targets which were then consolidated by CCARDESA and shared with the World Bank.

During the 2nd MTR in Mozambique, the World Bank facilitated a virtual M&E WG meeting to allow team members from Malawi who were not present in Mozambique to take part in the discussion. The WG meeting agreed on the following:

- Fast track development of project MIS (CCARDESA, Mozambique and Zambia)
- Preparation of Success Stories by March 2018. One story developed per country to cover one technology/variety developed, released in at least two countries, commercialized, become available in market, used by farmers.
- Briefing of new M&E staff and coordinators on APPSA operational issues implementation
- Evidence-based results reporting on PDO indicators
- Commence preparation for Impact Evaluation of technology generation & dissemination
Update of reported progress for results frame indicators
- Strengthen Results verification
- Inconsistent application of indicator definitions across countries to be avoided

The countries continued with implementation of the APPSA common monitoring framework. They also undertook performance assessments of cycle 2 R&D projects to determine their completion status since the 3-year implementation period would end at the end of the 2016/17 cropping season. Projects that were due to close and those that needed no-cost extension were identified. Malawi compiled lead farmer profiles and established the GIS coordinates for all R&D project sites. Zambia finalised its baseline survey report, while Mozambique engaged a consultant to conduct the baseline study. Preliminary results of the study were presented to government officials in July 2017, and the final report is expected in 2018. All countries undertook national monitoring visits as per previous recommendations, and continued to engage some independent scientific reviewers to ensure improvement in the quality of R&D efforts. The M&E teams also supported capacity building of R&D Scientists in M&E issues, project documentation and preparation of some success stories.

2.3.1.1 Implementation Support Mission (ISM)/ Mid-term review (MTR)

The support mission which was undertaken between May and July aimed at taking stock of progress in project implementation and results achieved to date. Due to limited funds, CCARDESA managed to participate only during the Malawi ISM. While some progress in implementation was noted, there was a general concern that some key activities were behind schedule. The consolidated project performance rating across the three countries was “*moderately unsatisfactory*”, mainly because of delayed implementation progress and delayed results reporting.

Between November and December 2017 CCARDESA facilitated the second mid-term review, whose key objectives were to: take stock of project implementation progress to date; assess the likelihood of achieving the project development objective (PDO); assess which interventions should be discontinued, scaled down or focused on during the remaining implementation period of the project. CCARDESA engaged independent reviewers for the evaluation, and the review findings were presented during the regional wrap-up meeting which was attended by all three countries.

Some of the key MTR Recommendations were:

- M&E should be strengthened
 - There is need for investing in technical backstopping/ rigorous monitoring and timely procurement of project inputs, fund flow management
 - Use of standardized formats for data collection and analysis as well as ensuring scheduled dissemination of KPI results.
 - Engage an independent firm to conduct the impact evaluation study
 - Improve Communication and lessons learning
- Project execution
 - Outsource some of the activities to cover more ground and produce results, e.g.
 - Off season production of seed
 - Engage consultants (procurement; communication)
 - Redirect resources to high impact activities
 - Fast track implementation of cycle 3 and 4 R&D projects, and continue paying attention to collaboration; timeliness of activities; quality of science and dissemination of outputs
- Harmonization of seed policy - *Regional variety release*
 - National Institutes should seriously consider piloting the regional registration and fast track the regional release of APPSA varieties
 - Explore ways in which public private partnerships can be enhanced in maintaining the varieties in the regional (SADC / COMESA) catalogue.
 - There are some technologies that are doing very well without the process of harmonization, e.g. Pro-vitamin A maize varieties. APPSA should learn from these in order to facilitate regional seed trade.
- Partnerships
 - APPSA should place special focus in the remaining two years on establishing viable partnerships with the private sector along the various stages of the value chain. This is expected to help create demand for APPSA supported technologies.
 - Collaboration with various extension institutions (private and public) across the three countries be given special attention in order to ensure technology dissemination and target reach.
- RCoL Strengthening
 - In the remaining two years of project implementation each participating country should place more focus and emphasis on strengthening its RCoL mandate.
 - Regionally facilitated capacity building for R&D processes and applications should continue, including mentorship by seasoned scientists.
 - Following the Institutional Assessments conducted by each RCoL, robust Action Plans should be put in place to address the identified gaps.

2.3.1.2 Management Information System (MIS)

During the first quarter of 2017 a call for Expression of interest to develop the Regional MIS was issued through the CCARDESA website, and six technical proposals from the SADC region were received. The proposals were reviewed and the three firms that were shortlisted were requested to submit their financial proposals. However, due to unavailability of adequate funds and other technicalities, the process was put on hold. The lack of a project management system is a major shortcoming that needs to be addressed as a matter of urgency. During the previous support missions it has been emphasized over and over again that a successful request for the second phase of APPSA will need to be accompanied by robust evidence gathered, documented and analysed through a reliable monitoring and reporting system. CCARDESA was thus urged to fast track the development of a regional MIS to address the current M&E shortcomings. The activity will be implemented in early 2018.

Malawi established its MIS which is fully functional, although there are challenges caused by intermittent power supply. DARS key staff was trained on how to use the system. Development of a module for lead farmer profiles to be incorporated into the MIS is also underway. Mozambique has not yet commenced efforts to establish the MIS. Zambia started work to develop an automated MIS working with AKVO, an open source web-based M & E platform. Progress on the development is expected in 2018.

APPSA Malawi also facilitated the development of the DARS website and webmail facilities (www.dars.mw and www.dars/webmail.mw).

2.3.2 Regional Short-term trainings

One of the recommendations made by the Implementation Support Missions in the past was to identify skills gaps and build the required capacity. A capacity needs questionnaire for APPSA scientists was administered through survey monkey and the following five priority areas were identified:

- 1) Information repackaging for specific target audiences (knowledge translation)
- 2) Development of scientific product
- 3) Statistical planning, analysis and error reducing techniques
- 4) Proposal development and resource mobilization
- 5) Value chain analysis

Initially, the trainings were planned to take place at regional level, but the three countries proposed that the trainings be conducted in-country to facilitate participation of more scientists in the trainings. Due to limited budgets for the training fees, countries were requested to choose two courses each. CCARDESA then identified and engaged

Training Schedule

Country	Course	Dates
Malawi	Information repackaging for specific target audience (knowledge translation)	11 - 13 Sept
	Proposal development and resource mobilisation	2 - 5 Oct
Mozambique	Statistical analysis	18 - 21 Sep
	Development of Scientific Products	27-29 Sept
Zambia	Statistical analysis	29 Aug -1 Sept
	Development of Scientific Products	19 - 21 Sept

Information Training and Outreach Centre for Africa (ITOCA) to carry out the trainings as per the following schedule:

A total of **201** (61F:140M) scientists were trained on the four priority areas as follows;

- (i) Proposal development and resource mobilisation [**31** – 9F:22M),
- (ii) Statistical analysis [**57** – 18F:39M],
- (iii) Information repackaging for specific target audience (knowledge translation) [**79** – 28F:51M],
- (iv) Development of scientific products [**34** – 6F:28M).



Malawi training



Zambia training

2.3.3 APPSA Expansion

CCARDESA and the World Bank team held meetings with Angola, Lesotho, and Swaziland to discuss prospects of the countries joining APPSA. During the meetings it was clarified that it is still possible to include additional countries in R&D collaboration, even though the current phase of the project is more than halfway through the project implementation period. For Angola and Lesotho, significant progress was made in undertaking the project preparation process, and they are expected to join APPSA in 2018. During the discussions in Swaziland in September, it was agreed that the current project design is largely flexible and could accommodate more components that are within Swaziland's national investment plans as proposed by key stakeholders. The mission agreed that Swaziland would conduct national stakeholder consultations on proposal development. The Government would also mobilise a proposal development team from the university, government agencies and departments to develop a concept note to be shared with CCARDESA and the World Bank in early 2018.

2.3.4 Financial Management

The 2017 Workplan Budget for CCARDESA was \$883,564. By 31 December, \$312,282 had been utilised, representing a utilisation rate of 35.3%. The low expenditure was due to delayed disbursement of funds by the implementing countries to CCARDESA Secretariat, which resulted in most activities being either cancelled or postponed to 2018.

In Malawi, cumulative expenditure to date was US\$14,283,562.00 [Component 1 - 4,609,990; Component 2 - 5,578,179 and Component 3 - 4,095,393], giving a financial absorption rate of 52%. Component 1 had the lowest absorption rate of 41%, which was due to delayed implementation of some projects, while some projects were terminated. Component 2 expenditure improved (51%) due to commencement of infrastructure development at two research stations. Mozambique had an annual budget of US\$7,570,226 [Component 1 - 3,391,105; Component 2 - 3,052,137.21 and Component 3 - 1,126,984). The absorption rate was (38%) on average, with component 2 having the lowest absorption rate due to delays in implementation of planned activities. Zambia had an annual budget of US\$8,000,000 (Component 1 - 3,000,000; Component 2 - 3,160,000 and Component 3 - 1,840,000). The project utilised US\$5,997,687, translating to 75% absorption rate. The low expenditure rate of 50% under Component 1 was a result of closed projects and some that experienced minor delays and did not take off as planned.

The overall cumulative expenditure rates across the countries fall below the expected expenditure levels at this point in time of project implementation. Concerted efforts are required to ensure full fund utilization by project end.

3. KEY CONSTRAINTS

Some of the key challenges were:

- There were adverse effects of poor mid-season rainfall distribution on crop performance. The outbreak of fall arm worm in some project sites across the three countries also affected crop productivity.
- Lack of communication and collaboration among scientists continues to be a challenge which in some instances has caused poor performance of some projects, leading to their premature termination.
- Incomplete, inconsistent and delayed reporting is still a challenge that needs to be addressed by all RCoLs. There is also under reporting on the achieved outputs. The second Midterm review raised concern on the same highlighting that the reporting is not evidence-based, which makes it difficult to demonstrate project impact.
- Project implementation challenges that should have been addressed as the project evolved still continue to beleaguer the project. Key among them is the issue of delayed procurement of inputs and late disbursements of funds for R&D work.
- Despite the experience of going through three cycles of R&D preparation, significant delays were still observed in the preparation and launching of two special projects under cycle 4, namely the Socio-economics and Mechanization projects. By the end of the reporting period the projects were yet to be launched. These projects are addressing very crucial R&D issues. It is envisaged that the information generated

from these projects will help guide the impact assessments of the project. It is therefore crucial that the studies are conducted timeously.

- The general low utilization of funds and slow implementation of civil works under Component 2 across the countries is cause for concern. The expectation is that the works should be completed, including the warranty period, within the project implementation period.
- Unavailability of adequate funds at CCARDESA at the beginning of the year delayed implementation of planned regional activities, the majority of which had to be deferred to 2018 because the countries disbursed the money late.

4. LESSONS LEARNT

- Interdisciplinary and interactive planning, coupled with continuous performance evaluation of activities is a requisite for successful project implementation.
- The involvement of experts from Universities and CG centres, etc. in project activities enhances learning, quality of R&D efforts and achievement of expected outputs.
- The national reviews, Implementation Support Mission and MTR reflections benefited the three countries through identification of strong and weak areas of implementation.
- Involvement of Procurement in the R&D project work plan and budgeting process is crucial as this facilitates early planning and accurate procurement of resources necessary for timely implementation of project activities.
- Farmer exchange visits between project sites were very crucial in helping farmers to learn how others were managing the trials/demonstrations. They became more aware of their own skills and capacities, and were able to better manage their demonstration plots.
- Late submission of progress reports renders them ineffective for forward planning.

5. RECOMMENDATIONS

- Project management should take necessary action to ensure that the recurring problem of lack of communication and collaboration among scientists is fully addressed.
- Timely, balanced, accurate and objective reporting should be encouraged by management. Progress reflection and reporting should be properly planned for in order to avoid a last minute rush to comply with reporting schedule, thereby compromising on quality of input into progress reporting.
- There is need to use the agreed PDO level indicator Result Framework when report.
- RCoLs should fast track implementation of the special projects (Cycle 4) to ensure their timely and successful implementation. Implementation of civil works under component 2 should also be expedited.

- There is need to prioritize dissemination interventions and for more systematically target release of technologies across countries so that impact and achievement of the PDO can be demonstrated.
- RCoLs should continue documenting and sharing project success. These can be shared with a wider audience through the Southern Africa Southern African Agricultural Information and Knowledge System (SAAIKS).
- The need to finalise establishment of management information systems (MIS) at country and regional levels cannot be overemphasized.
- RCoLs need to ensure that disbursements to CCARDESA are done timeously to facilitate implementation of agreed regional activities.

Annex1: Aggregate PDO Level Achievements as at 31st December 2017

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
1. Total number of improved technologies that are being made available to farmers and other end users ¹	<input type="checkbox"/>	No.	27 ²	191	76	27	88	72	115	91	277	The summary of technologies across the three countries include (“on-the shelf” and APPSA generated) : 149 seed varieties, 46 agronomic practices, 1 integrated pests management, 1

¹ From the agriculture perspective, the term ‘technology’ refers to the tools, methods or machinery that are used primarily or entirely in order to support agricultural enterprise. There are many categories of agricultural technologies within the production to marketing value chain, and these include mechanical (tractors, combines, power tiller, thresher, milling machine, pliers, hoe, spade), biological (new seed varieties), chemical (fertilizers, pesticides, herbicides), agronomic innovations (new management practices) etc. In all cases the application of agricultural technologies aims to increase production and productivity in a cost effective or efficient way, and the level of agricultural production or productivity is guided by the technology that is being used in farming.

The indicator refers to the technologies developed and/or promoted by the Project. “Availability” will be measured by whether farmers have access to the improved technologies (e.g., improve seed varieties, inputs, knowledge about improved management practices etc.) developed by any of the regional APPSA R&D Project. Data will be collected by surveys of local input markets and local extension / advisory programs. If a technology is found to be available in at least 40% of the local outlets/ advisory service providers in a given administrative district targeted by the dissemination project, then it is considered “available to farmers and other end-users”.

² Baseline, In Course (beginning of Year3 and Year 5) , Final

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
												water management, 8 post-harvest storage facilities, 64 agro-processing techniques (legume, rice and cassava recipes) and 9 labour saving technologies practices.
- # of improved seed varieties:		No.	27	144	55	23	66	55	51	43	148	
• Maize ³		No.	10	46	24	5	17	12	12	9	33	
• Rice		No.	9	20	8	6	6	9	10	4	23	
• Legumes		No.	20	78	23	12	43	34	23	22	79	

³ Including Sorghum

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
• <i>Casavava</i>		No.	0	0	0	0	0	0	6	7	12	
- <i># of improved agronomic, pest, disease, and water management practices</i>		No.	0	31	17	2	12	15	19	15	49	
- <i># of improved post-harvest storage, labor-saving, and processing technologies</i>		No.	0	16	4	2	10	2	45	33	80	
2. Percentage of Lead Farmers in targeted areas who are aware of an improved technology promoted by the Project	<input type="checkbox"/>	%	0	75	80	80	65	41	NR	NR	41	Mozambique completed the survey but the report is being translated to from Portuguese to English.

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
												Although Zambia completed their Baseline survey, they did not report on this indicator.
- Male		%	0	56	34	65	70	NR	NR	NR	NR	Not reported
- Female		%	0	44	66	35	30	NR	NR	NR	NR	Not reported
3. Number of technologies generated or promoted by the Project in one participating country that are released or promoted in another participating country		No.	0	36	15	7	14	18	28	5	51	These are supposed to be technologies that are being shared across countries. However, countries continue to provide incorrect report

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
												on this indicator. These are; 26 seed varieties, 7 agronomic practices and 11 agro-processing technologies (recipes).
- # of improved seed varieties		No.	0	27	12	6	9	11	10	5	26	
• Maize		No.	0	8	4	1	3	4	0	-	4	
• Rice		No.	0	6	3	2	1	3	2	-	5	
• Legumes		No.	0	12	5	2	5	4	8	-	12	
• Cassava		No.	0	0	0	0	0	0	0	-	0	

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
- # of improved agronomic, pest and disease, and water management practices		No.	0	5	2	1	2	0	7	0	7	
- # of improved post-harvest storage, labor-saving and processing technologies		No.	0	4	1	1	2	0	11	0	11	
4. Number of direct beneficiaries ⁴ ('000)	☒	No.	0	3,089.20	936.00	900.00	1,253.20	453.36	492.35	461.58	1,410.29	This number of beneficiaries includes those individuals who were the direct recipients of technical

⁴ "Direct beneficiaries" refers to the persons (e.g. Lead Farmers, contact farmers, other farmers and their dependent family members living in the same household) in the project target region who in the first instance utilize project outputs (i.e., knowledge, improved materials and technologies) AND their immediate household members that are benefiting from the research outcome (i.e., the utilization of the research output). Household members are included in the beneficiary count of dissemination projects as the project is intended to bring changes in their livelihood too.

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
												cooperation aimed at strengthening their capacity to undertake development tasks that are directed at them.
- of which Lead Farmers(number)		No.	0	19.20	12.00	2.00	5.20	5.45	8.37	8.77	22.59	Represents a group of innovative and successful farmers within the local community who are committed to training their fellow farmers on agriculture methods and technologies.

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
- of which other farmers(number)		No.	0	3,070.00	924.00	898.00	1,248.00	447.91	483.58	452.78	1,384.27	These are follower farmers who learn from the Lead Farmers. However, these figures do not cover farmers reached through road shows and electronic media.
- of which female (%) ⁵	<input checked="" type="checkbox"/>	No.	0	37	50	30	30	NR	61	NR		Malawi and Zambia did not report on this part of the indicator.
Intermediate Result 1:Improved collaborative technology generation and dissemination around priority farming systems												

⁵ Measures % women of total number of Lead Farmers and Follower Farmers

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
5. Number of collaborative research and development projects under implementation	<input checked="" type="checkbox"/>	No.		98	30	36	32	22 (65)	21 (65)	32 (65)	74	Malawi leads in 22 and collaborating in 43; Mozambique leads in 21 and collaborating in 44; Zambia leads in 32 and collaborating in 33. Angola was expected to implement 16 (lead in 3) but none of the projects commenced during the period under review.
• <i>Technology generation</i>		No.		61	25	18	18	13	10	18	41	

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
• <i>Technology dissemination</i>		No.		37	5	18	14	9	11	13	33	
6. Percentage of collaborative research and development projects completed	<input type="checkbox"/>	%		65	80	40	75	48	0	28		A total of 46 sub-projects have been closed. Malawi closed 28 (cycle 1: 15; cycle 2: 13) out of 65 sub-projects. Mozambique: all 65 sub-projects are on-going. Zambia closed 18 (cycle 1:7 and cycle 2: 11) out of 65 sub-projects.
• <i>Technology generation</i>		%		63	75	40	75	33	0	15		
• <i>Technology dissemination</i>		%		58	60	40	75	46	0	58		

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
7. Total number of technologies generated ⁶	<input type="checkbox"/>	No.		110	43	20	47	21	14	11	46	<p>Malawi generated 21 technologies: 16 seed varieties (8 Maize, 2 rice and 6 Legumes); 5 agronomic.</p> <p>Mozambique generated 14 seed varieties (2 rice) and 12 agronomic practices as well as pest and diseases.</p> <p>Zambia generated 11 seed varieties, (2 maize, 1 rice and 8 legumes).</p>

⁶Nutrition-related technologies will be flagged.0

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
- <i>improved varieties newly released</i>		No.		73	30	16	27	16	2	11	29	
• <i>Maize</i>		No.		25	12	4	9	8	0	2	10	
• <i>Rice</i>		No.		15	5	5	5	2	2	1	5	
• <i>Legumes</i>		No.		33	13	7	13	6	0	8	14	
• <i>Cassava</i>		No.		0	0	0	0	0	0	0	0	
- <i>improved agronomic, pests /disease, and water management practices developed and formally recommended to the national</i>		No.	0	27	11	2	14	5	12	0	17	

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
<i>extension services</i>												
- <i>improved postharvest storage, processing, labor saving technologies developed and formally recommended to the national advisory services</i>		No.	0	10	2	2	6	0	0	0	0	
8. Total number of improved technologies formally recommended by the national research center and subsequently formally		No.	0	97	43	7	47	3	115	0	118	Malawi recommended 3 technologies (2 rice varieties and 1 irrigation scheduling). Mozambique recommended 115 technologies:

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
promoted by the advisory services ⁷												51 seed varieties (6 maize, 10 rice, 23 legumes, and 6 cassava); 19 agronomic & water management practices as well as 45 post-harvest and processing technologies. Zambia: not reported.
- # of improved varieties		No.	0	62	30	5	27	3	51	0	54	
• Maize		No.	0	22	12	1	9	0	6	0	6	

⁷ The dissemination process will need some time before technologies are becoming available to farmers in a sustained and affordable way. Given the limited duration of APPSA it will be useful to monitor “progress on the dissemination pathway” as a measure that provides early evidence about whether the project is on track in terms of reaching intended dissemination results as established in the PDO results indicator 1 ; “formally promoted” refers to district level or higher.

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
• <i>Rice</i>		No.	0	12	5	2	5	2	10	0	12	
• <i>Legumes</i>		No.	0	28	13	2	13	0	23	0	23	
• <i>Cassava</i>		No.	0	0	0	0	0	0	6	0	6	
- <i># of improved agronomic, pest and disease, and water management practices</i>		No.	0	27	5	2	14	1	19	0	20	
- <i># of improved postharvest storage, processing and labor saving technologies</i>		No.	0	8	8	0	6	0	45	0	45	
9. Percentage of APPSA funded R&D dissemination		%	0	32	30	5	60	52	NR	0	52	Only Malawi reported on this indicator.

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
projects integrated in existing and/or newly established innovation platforms												Mozambique: not reported.
Intermediate Result 2: Improved technical capacity to lead0 national and regional research and dissemination agenda												
Improved human capacity 10. (a) Number of clients (research and advisory a (service staff) days of training (% female)	<input checked="" type="checkbox"/>	No. (%)	0	4,682 (28)	412 (25)	2,100 (30)	2,170 (30)	6,158 (39)	1,844 (42)	1,066 (37)	9,068	The RCoLs spent 9,068 days on short term training of staff. The topics are mentioned under # 10 (b)
Type of training: - <i>management and leadership training</i>		No.	0	1,550	100	1,000	450	993	1,000	NR	1,993	
- <i>training in administrative processes (incl. FM, HR, Procurement,</i>		No.	0	1,370	120	700	550	210	60	NR	270	

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
<i>M&E, safeguards)</i>												
- <i>technical research and dissemination training</i>		No.	0	1,762	192	400	1,170	4,955	784	NR	5,739	
10.(b) Number of staff trained per research center (% female)	<input type="checkbox"/>	No. (%)	0	205 (35)	47 (45)	70 (30)	88 (30)	2,399 (42)	844 (30)	215 (37)	3,458 (84)	The RCoLs trained 3,458 staff, of which average of 84% were female. The topics included: Data collection, statistical analysis and management, information development and packaging, international certification in applied

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
												evaluation, seed storage and marketing, germplasm collection and conservation, harvest and post-harvesting technologies, agro-processing of legumes, Cassava disease management procedures, Technique for rapid multiplication of cassava cuttings, Use of diseases resistant maize hybrids and inbred lines etc.

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
Type of training: - <i>management and leadership training</i>		No.	0	58	15	25	18	23	0	52	75	
- <i>training in administrative processes (incl. FM, HR, Procurement, M&E, safeguards)</i>		No.	0	59	12	22	25	460	60	55	575	
- <i>research-and dissemination related technical training</i>		No.	0	85	20	20	45	1,916	784	108	2,808	
11. Total # of funded scholarship holder that have successfully completed long term training		No.	0	73	25	5	43	4	9	20	33	33 staff have completed their training. Malawi (2 MSc and 2 BSc); Mozambique (1PhD, 1 MSc and 7BSc);

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
												Zambia (1PhD, 4MSc, and 15BSc,). Zambia also have 7 Diploma graduates which increases the total number to 40 .
- # of PhD		No.	0	8	5	0	3	0	1	1	2	
- % female		%		23	40	0	30	0	100	0		
- # of MSc		No	0	29	12	5	12	2	1	4	7	
- %female		%		35	35	40	30	0	0	50		
- # of BSc		No.	0	36	8	0	28	2	7	15	24	
- % female		%		27	50	0	30	0	0	40		
Improved infrastructure capacity 12. Level of success in completing the		Category	0	Fully on track	Fully on track	Fully on track	Fully on track	Not on track	Generally on track	NR		The three countries reported substantive delays with regards to the

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
planned procurement cycle for research equipment ⁸												procurement of research (especially laboratory) equipment.
13. Level of success in completing the planned procurement cycle for research facility construction and rehabilitation		Category		Fully on track	Fully on track	Fully on track	Fully on track	Generally on track	Generally on track	NR	Generally on track	Malawi commenced rehabilitation and construction in 3 research stations. Mozambique renovated 24 buildings and irrigation systems.

⁸ *Fully on track* (less than 5% of the planned activities for infrastructure construction/ rehabilitation works is delayed); *Generally on track with minor delays* (5% - 20% of the planned activities for infrastructure construction/rehabilitation works is delayed); *Not on track – significant delays*, (21-50% of the planned activities for infrastructure construction/rehabilitation works is delayed); *No on track – substantial delays* (more than 50% of the planned activities for infrastructure construction/ rehabilitation works is delayed); based on project expenses accounted for.

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
Improved organizational & institutional capacity 14. Institutional review completed and Change Management Action Plan is in place ⁹		Y/N		Y	Y	Y	Y	Y	N	NR	N	Only Malawi and Mozambique completed their Institutional Assessment reports. Mozambique is still finalizing the Action Plan.
15. Overall implementation performance of change management action plan ¹⁰		Score (1-5)		4	4	4	4	1	1	2	1.3	The countries have not submitted the Action plans to CCARDESA, thereby making it difficult to make a follow-up on the implementation

⁹ informed by an external institutional and science quality assessment

¹⁰ 1= unsatisfactorily 2= moderately unsatisfactorily 3= moderately satisfactorily 4= fully satisfactorily 5= outstanding

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
												status. Zambia: not reported.
Intermediate Result 3: Effective structures and systems for regional collaboration and R&D management												
Regionally harmonized M&E 16. Performance of APPSA participating institutions in using a regional M&E framework and harmonized reporting system ¹¹		Score (1-5)	N/A	5	5	5	5	3	3	3	3	There is no strict adherence to reporting on the PDO indicators as stipulated in the Regional RF. Concerted efforts to ensure accuracy in reporting are required. Mozambique: not reported.
Regionally harmonized Quality Assurance of Science		Score (1-5)	N/A	4	4	4	4	3	3	3	3	RCoLs are complying with quality assurance

¹¹ 1 = unsatisfactorily 2= moderately unsatisfactorily 3= moderately satisfactorily 4= fully satisfactorily 5= outstanding

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
17. Compliance of the participating institutions with the regional scientific quality assurance mechanism												monitoring tools when conducting national monitoring. The tools focus on quality of science, meeting project objective, timeliness, M&E and adherence to Safeguards. However, there is still inconsistency in reporting, non-compliance with agreed reporting templates and reporting timelines.

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
Regional Policy harmonization 18. Participating country alignment with the SADC Regional Policy on Harmonization in the seed sector ¹²		Score (1-2)	TBD	2	2	2	2	2	2	1	1.7	Malawi: Seed Policy is currently with the Office of President and Cabinet (OPC), awaiting cabinet approval. Mozambique: Seed Policy framework and Regulations have been harmonized. Zambia is still awaiting approval. However, the RCoLs comply with seed certification

¹² Assesses level of adherence to SADC (i) variety release system, (ii) seed certification system, and (iii) phytosanitary measures for seed

Project Development Objective: Increase the availability of improved agricultural technologies in participating countries in the SADC region												
PDO Level Results Indicators	Core	Unit	Baseline Original Project Start (2013)	Regional Y4 Target	Y4 RCoLs Targets			Cumulative Actual Values as at December 2017				Comments
					MW	MZ	ZM	MW	MZ	ZM	Total	
												system and phytosanitary measures for seed.

Annex 2: CCARDESA APPSA Work Plan Implementation

Activity	Status
Component 1: Technology Generation and Dissemination	
1.1 Regional Strategic Meetings	
1.1.1 Facilitate a dialogue in regional seed policy and regulatory issues	<ul style="list-style-type: none"> – CCARDESA convened a two day regional seed workshop in March. During the two day workshop, countries had the opportunity to share experiences, including sharing good practices and challenges and gaps in complying with regional protocols and procedures. Action points for the different stakeholders (RCoLs, CCARDESA, SADC Seed Centre and COMESA) were agreed upon as indicated under “Strengthening seed, regulatory and related services”. – Malawi and Zambia drafted and shared action plans on key activities to support the seed harmonisation process. Most of the activities will be implemented once the revised Seed Policies have been approved.
1.1.2 Facilitate documentation of technologies and scaling out approaches	This was planned to be achieved through conducting a regional workshop on technology dissemination with all specialists. However, national workshops were proposed instead so that countries would have adequate consultations with stakeholders regarding consolidation of the information. To date, countries have submitted the lists of technologies, and partial descriptions.
1.1.3 Convene a scientific conference to share and document APPSA research outputs with broader groups of APPSA stakeholders and partners	The scientific conference which was planned for October 2017 was deferred to 2018, with the concurrence of the countries.
1.1.4 Regional Steering Committee Meeting	The meeting was conducted on 8 th December 2017, with the participation of key steering committee members. The minutes will be shared in January 2018 as requested by the meeting participants.
Component 2: Strengthening of RCoLs	
2.1 Technical Backstopping and Networking	

Activity	Status
2.1.1 Facilitate exchange visits for Scientists	A template for scientists exchange visits was developed and adopted by RCOLs for use by scientists. The form details the procedure to be followed when scientists wish to undertake exchange visits, modalities of the exchange visit and the reporting requirements.
2.1.2 Facilitate knowledge sharing and transfer of agricultural technology across national boundaries (study tours)	This activity was postponed to 2018 due to inadequate funds.
2.1.3 Create awareness about APPSA Programme in other SADC countries	<ul style="list-style-type: none"> – CCARDESA and the World Bank (WB) have made progress in engaging the governments of Angola, Lesotho and Swaziland who expressed interest to join the APPSA initiative. – Visits to the 3 countries were undertaken to hold further discussions with the senior officials in the Ministry of Agriculture on prospects of the three countries joining APPSA. Support to draft the project proposals was provided for Angola and Lesotho, and they are likely to join in the 2018/2019 cropping season.
2.2. Monitoring and Evaluation	
2.2.1 Develop a Management Information System (MIS)	<ul style="list-style-type: none"> – A request for Expression of Interest was issued through the CCARDESA website and six proposals were received from the region. The top 3 proposals (technical) were requested to submit financial proposals following which the overall evaluation was done. – The selection process of a Firm to carry out the assignment reached the stage of contract negotiation. However, the Procurement Office recommended that CCARDESA engages an external Software development Expert and M&E Expert to assist during the negotiation process. Finalisation of this process was delayed by late availability of funds. This will be prioritised in 2018.
2.2.2 Convene Regional M&E and Communication working group meetings	One meeting was convened in March 2017 to finalise the regional M&E documents by incorporating the MTR recommendations. The ‘second’ meeting was held during the mid-term review.
2.2.3 Undertake joint Implementation Support Missions (Government, World Bank, CCARDESA)	<ul style="list-style-type: none"> – The first Implementation Support Mission for 2017 took place between May and July. However, CCARDESA could not participate during the ISM in Mozambique and Zambia due to inadequate funds. – The second Midterm review which sought to take stock of project implementation progress to date; assess the likelihood of achieving the

Activity	Status
	<p>project development objective (PDO) and assess which interventions could be discontinued, scaled down or focused on during the remaining implementation period of the project. took place between 26 November and 7 December 2017.</p> <ul style="list-style-type: none"> – Both missions reviewed progress made across the three project components, regional priorities up to 2019, regional research transformation post 2019 and a possibility of Phase II of the project.
2.2.4 Facilitate commodity meetings	This activity was suspended due to time and funds constraints. Countries conducted national planning and review meetings.
2.2.5 Finalise Communication and Knowledge Management Strategy	This will be finalised in 2018.
2.3 Facilitate Information sharing platforms	
2.3.1 Maintain APPSA Webpage	The APPSA webpage is currently under review to align it to the CCARDESA knowledge sharing platform – the Southern African Agricultural Information and Knowledge System (SAAIKS) to facilitate better navigation of information.
2.4 Out-scaling and knowledge management	
2.4.1 Support establishment of core knowledge repository by each RCoL for the specific commodity	CCARDESA developed and shared guidelines for developing digital libraries with the RCoLs in April. The purpose of the guidelines was to provide a basis for conceptualizing digital libraries for each RCoL. During the regional steering committee meeting the countries reported that the work would commence in 2018.
2.4.2 Develop and distribute APPSA knowledge products via SAAIKS	<p>CCARDESA received knowledge products from the implementing countries which were edited, packaged and uploaded onto the SAAIKS platform. The nine success stories that have been shared on SAAIKS so far are:</p> <ol style="list-style-type: none"> i. Farmers benefit from improved rice varieties in Malawi, ii. Bean Processing Enhances Food Security and Income in Mozambique, iii. Blacksmith Returns to Farming (Zambia), iv. APPSA Grooms Successful Lead Farmer to Promote Conservation Agriculture in Malawi, v. Groundnut Seed Production Saves Farmers Against Falling Prices of “White Gold” in Petauke (Zambia),

Activity	Status
	<ul style="list-style-type: none"> vi. Farmers Benefit from Improved Rice Varieties in Malawi, vii. Pache Pache Seed Growers Receive a Shot in the Arm (Zambia), viii. Scaling up Smallholder Soybean Productivity in Zambia ix. Soybean Products Generate Income for Smallholder Famers in Mozambique: The Story of Mrs Isaltina Aly Trigo
Component 3: Coordination and Facilitation	
3.1 Training and workshops	
3.1.1 Facilitate short term Trainings for scientists (as per training needs assessment)	<ul style="list-style-type: none"> – CCARDESA engaged the Information Training and Outreach Centre for Africa (ITOCA) to conduct four in-country trainings (two per country) out of the five priority areas that were picked from the survey monkey. These were: <ul style="list-style-type: none"> i. Information repackaging for specific target audiences (knowledge translation) ii. Development of scientific product iii. Statistical planning, analysis and error reducing techniques iv. Proposal development and resource mobilization – A total of 201 (61F:140M) scientists and dissemination experts were trained in the three countries. – The Value chain analysis training was deferred to 2018.
3.1.2 Facilitate capacity building in Agricultural Innovation Platform As a Tool for Development Oriented Research	This activity could not take place as planned due to insufficient funds at CCARDESA. However, the second Regional Steering Committee meeting agreed that this training should be canceled.
3.2 Policy Harmonisation and Advocacy	
3.2.1 Facilitate joint submission of varieties to the regional variety release system	During the regional Seeds Workshop held in March, it was agreed that APPSA could facilitate the testing and release of varieties in at least two countries, thus meeting the requirements of registration in the SADC seed catalogue for any released varieties. RCoLs are making efforts to support the joint submission of varieties to the regional variety release system.
3.3 Facilitation of actions to improve institutional functioning	

Activity	Status
3.2.1 Conduct a study on options for autonomy for RCoLs	Terms of Reference were developed and shared with the RCoLs for their input. However, the study was cancelled during the second Regional Steering Committee meeting in December 2017.

Annex 3: List of R&D Projects (All Cycles)

Cycle 1 (2013)

PROJECT CODE	PROJECT TITLE	Lead Country
MAIZE		
MZ-P01-2013	Improving nutritional quality in maize in Mozambique, Zambia and Malawi	Mozambique
MZ-P02-2013	Disseminating improved maize varieties and agronomic practices among smallholder farmers	Zambia
MZ-P03-2013	Development and improvement of inbred lines tolerant to major storage pests	Zambia
MZ-P04-2013	Improvement of integrated maize / dairy production systems	Malawi
MZ-P05-2013	Improvement of post-harvest management practices in maize	Malawi
MZ-P06-2013	Development of maize varieties resistant to major diseases in Mozambique, Malawi and Zambia	Mozambique
MZ-P07-2013	Screening and promotion of striga tolerant maize varieties in Malawi, Mozambique and Zambia	Malawi
MZ-P08-2013	Maize germplasm collection and characterization for climate change adaptation	Malawi
MZ-P09-2013	Improving water use efficiency in maize production	Malawi
RICE		
RC-P01-2013	Rice germplasm collection and characterization	Mozambique
RC-P02-2013	Development of improved rice varieties	Mozambique
RC-P03-2013	Enhancing productivity of improved rice varieties through the development of integrated crop management practices	Mozambique
RC-P04-2013	Promotion and dissemination of improved rice technologies for sustainable production	Mozambique
C-P05-2013	Strengthening rice seed delivery system for enhanced production among smallholder farmers	Zambia

LEGUME		
LG-P01-2013	Improving bean productivity in low soil fertility and drought prone areas	Mozambique
LG-P02-2013	Developing bean varieties for high Fe and Zn with resistance to ALS and CBB	Zambia
LG-P03-2013	Adaptation and promotion of bruchid resistant bean varieties in Malawi, Mozambique, and Zambia	Malawi
LG-P04-2013	Improving groundnut productivity in low soil fertility and drought prone areas of Mozambique, Malawi and Zambia	Mozambique
LG-P05-2013	Breeding groundnut Varieties for multiple disease resistance, for quality and food market access in Mozambique and Zambia	Zambia
LG-P06-2013	Strengthening food legume seed delivery systems in Malawi, Mozambique, and Zambia	Zambia
LG-P07-2013	Up-scaling improved soybean production and utilization for enhanced nutrition and income generation	Zambia
LG-P08-2013	Developing high yielding soybean varieties that are resistant to major diseases and with preferred market traits	Zambia
LG-P09-2013	Developing high yielding varieties and sustainable management practices for improved cowpea production	Zambia
LG-P10-2013	Development and promotion of improved pigeon pea varieties for increased and sustainable production	Malawi
LG-P11-2013	Enhancing dissemination of food legume based technologies for increased production	Zambia
SORGHUM		
SG-P01-2013	Promoting the adoption of improved management practices for increased Sorghum production in Zambia	Zambia

Cycle 2 (2014)

PROJECT CODE	PROJECT TITLE	Lead Country
MZ-P10-2014	Investigating the occurrence of Maize lethal Necrosis Disease in Malawi, Mozambique and Zambia	Malawi
MZ-P11-2014	Improving maize productivity and family income through cow's animal traction and organic fertilizer	Mozambique
MZ-P12-2014	Improving and Sustaining Maize and Cowpea Productivity and Production among Smallholder Farmers in Malawi and Mozambique	Mozambique
MZ-P13-2014	Improving maize and bean yields through the increased farmer accessibility to integrated disease and pest management (IPDM) technologies for major pests and diseases of maize and common bean in Malawi, Mozambique and Zambia	Malawi
RICE		
RC-P06-2014	Participatory evaluation of improved rice varieties to increase productivity in Malawi, Mozambique and Zambia	Malawi
RC-P07-2014	Improving rice productivity in saline soils and drought prone areas	Mozambique
RC-P08-2014	Improving Surface Irrigation Drainage Water Reuse for Rice Production	Malawi
RC-P09-2014	Improving Smallholders Rice Productivity and Livelihood through Introduction of Rice – Duck based Farming System in Mozambique and Malawi	Mozambique
LEGUMES		
LG-P12-2014	Evaluation and dissemination of improved cowpea varieties in Mozambique and Zambia for enhanced food security, family nutrition and income	Mozambique
LG-P13-2014	Efficacy of soil amendment with agricultural lime in reducing aflatoxin contamination in groundnuts in Malawi and Zambia	Malawi
LG-P14-2014	Development of common bean and cowpea with aluminum tolerance	Zambia
LG-P15-2014	Enhancing agro-processing and market access of food legume products for smallholder farmers in Zambia, Malawi and Mozambique	Zambia
LG-P16-2014	Screening common bean varieties with improved biological nitrogen fixation for yield and quality	Malawi

PROJECT CODE	PROJECT TITLE	Lead Country
LG-P17-2014	Enhancing utilization and marketability of groundnut /bambarra nut through processing and improved post-harvest practices	Zambia
LG-P18-2014	Development of common bean and cowpea with bruchid tolerance	Zambia
MULTIPLE CROPS		
MC-P01-2014	Enhanced resilience to seasonal dry spells in rainfed soya, maize and upland rice using silicon-based fertilizer	Zambia
MC-P02-2014	Evaluation of pesticide residues in legume and cereal cropping systems in Zambia, Malawi and Mozambique	Zambia
MC-P03-2014	Improving grains storage structures for smallholder farmers in Mozambique and Zambia	Mozambique
MC-P04-2014	Reducing Mycotoxin Contamination of Maize, Groundnuts and Beans to Improve Food Safety Enhance Health and Trade	Zambia
CONSERVATION AGRICULTURE		
CA-P01-2014	Herbicide weed control and performance among smallholder farmers practicing Conservation Agriculture	Zambia
CA-P02-2014	Developing conservation agriculture maize-legume systems for smallholders farmers in Malawi, Mozambique and Zambia	Mozambique
CA-P03-2014	Improving Soil Fertility and Reducing Green House Gas Emissions using Biochar in Conservation Agriculture	Zambia
CA-P04-2014	Evaluation of trade-offs of tradition and partial adoption of CA systems for improved food security and incomes	Zambia
CA-P05-2014	Disease and Pest Challenges in Maize Production under Conservation Agriculture Cropping Systems: What do we learn?	Malawi

Cycle 3 (2016)

PROJECT CODE	PROJECT TITLE	LEAD COUNTRY
MAIZE		
MZ-P14-2016	Promoting use of modern multipurpose hand-tools both for planting seed and applying fertilizer, and maize sheller as part of smallholder-farm mechanization in Malawi and Zambia	Malawi
MZ-P15-2016	Development and diffusion of an on-spot fertilizer applicator for smallholder farmers in Mozambique and Zambia	Zambia
MZ-P16-2016	Development of maize varieties tolerant to drought and heat by use of double haploid technology as a mitigation to climate change in Malawi, Mozambique and Zambia	Malawi
MZ-P17-2016	Establishing core collections of example varieties and drought tolerance thresholds for maize to promote SADC seed trade.	Zambia
MZ-P18-2016	Assessment solar drying for reducing post-harvest losses in maize – a case of rural smallholder farmers in Malawi and Zambia	Malawi
RICE		
RC-P10-2016	Dissemination of rice production technology to women in rural families and supplementation of rice sub-products in orphan children in Mozambique, Malawi and Zambia	Mozambique
LEGUME		
LG-P19-2016	Scaling up of high yielding cowpea varieties and technologies in Mozambique, Malawi and Zambia	Mozambique
LG-P20-2016	Use of pigeon pea and sorghum crop residues in goats feeding	Mozambique
LG-P21-2016	Improving seed availability of high yielding and resilient groundnut varieties in Mozambique, Malawi and Zambia	Mozambique
LG-P22-2016	Phenotypic and molecular characterization of common bean varieties released in Malawi, Mozambique and Zambia	Malawi
LG-P23-2016	Enhancing the International Competitiveness of Small to Medium Sized Legume and Cereal Processing Enterprises through Facilitating the Adoption of Quality Assurance (QA) programs	Malawi
LG-P24-2016	Development and Dissemination of a Manually Operated on-the-ridge Planter of Food Legumes	Malawi
LG-P25-2016	Promoting Cowpea Productivity and Production through high Phosphorous use efficiency Cowpea Cultivars in Zambia, Mozambique and Malawi	Zambia
LG-P26-2016	Development of a cowpea based weaning food	Zambia

PROJECT CODE	PROJECT TITLE	LEAD COUNTRY
LG-P27-2016	Multi-Crop food legume germplasm collection and characterization in Malawi, Mozambique and Zambia	Zambia
LG-P28-2016	Harnessing and unlocking the potential of local cowpea diversity for improved livelihoods of farmers along the Zambezi and Rift Valleys in Malawi, Mozambique and Zambia	Malawi
CONSERVATION AGRICULTURE		
CA-P06-2016	Evaluating sustainable intensification opportunities for improved labor productivity using mechanized conservation agriculture in central Mozambique and Malawi(SIMECMM)	Mozambique
CLIMATE SMART AGRICULTURE		
CS-P01-2016	Optimizing maize- cowpea intercropping systems productivity and water use resilience to climate change in Zambia and Mozambique	Zambia
CS-P02-2016	Mainstreaming climate smart agriculture through sustainable solar- powered micro-irrigation for sustainable small scale business development	Zambia
CASSAVA		
CV-P01-2016	Pathogens limiting cassava culture in Angola, Mozambique and Zambia: epidemiology and integrated pest management measures.	Angola
CV-P02-2016	Molecular characterization of released cassava in varieties and selected clones in Angola, Mozambique and Zambia	Zambia
CV-P03-2016	Cassava germplasm collection characterisation and conservation in Angola, Mozambique and Zambia	Angola
CV-P04-2016	Evaluation of cassava genotype tolerant to abiotic stress in Angola, Mozambique and Zambia	Angola
CV-P05-2016	Cassava quality, processing and utilization: The influence of the variety and environment	Zambia
SORGHUM		
SG-P02-2016	Strengthening the Sorghum seed delivery for enhanced production among smallholder farmer in Mozambique and Zambia	Zambia

Special Projects (2017)

No.	PROJECT TITLE	PI and Co-PI	LEAD COUNTRY
1	Enhancing National and Regional Capacity in Fall Armyworm (<i>Spodoptera frugiperda</i>) Management and Research in Malawi, Mozambique and Zambia	PI: Donald Kachigamba - DARS - MW Co-PI: Prof. CarvalhoEcole - IIAM - MZ Co-PI: Gilson Chipabika - ZARI - ZM	Malawi
2	Drivers to Technology Adoption and Profitability for Cereals and Food legumes in Mozambique and Zambia	PI: Ms. Isabel Siteo Cachomba - Center for Socio Economic Studies, Agriculture Research Institute - MZ Co-PI: Ms. Helen Kasalu - ZARI - ZM	Mozambique
3	Development and adaption of appropriate mechanization technologies for selected crops in smallholder production	PI: c/o Dr Dickson Ng'uni - ZARI - ZM Co-PI:	Zambia
Total			77

Annex 4: Implementation status of cycle 1 & 2 R&D projects in 2017

Cycle 1 (2013)

PROJECT CODE	PROJECT TITLE	Lead country	Malawi	Mozambique	Zambia
MAIZE					
MZ-P01-2013	Improving nutritional quality in maize in Mozambique, Zambia and Malawi	Mozambique	<i>Will close on 30 June 2018</i>	<i>Not reported</i>	<i>Closed</i>
MZ-P02-2013	Disseminating improved maize varieties and agronomic practices among smallholder farmers	Zambia	<ul style="list-style-type: none"> • <i>Closed on 30th June 2017</i> • <i>Integrated into dissemination</i> 	<i>1 year no-cost extension</i>	<i>Closed</i>
MZ-P03-2013	Development and improvement of inbred lines tolerant to major storage pests	Zambia	<i>Will close on 30 June 2018</i>	<i>1 year no-cost extension</i>	<i>1 year no-cost extension</i>
MZ-P04-2013	Improvement of integrated maize / dairy production systems	Malawi	<i>Close on 30 June 2017 (non-reporting)</i>	<i>n/a</i>	<i>1 year no-cost extension</i>
MZ-P05-2013	Improvement of post-harvest management practices in maize	Mozambique	<i>Closed on 30th June 2017</i>	<i>1 year no-cost extension</i>	<i>Substantive delay</i>
MZ-P06-2013	Development of maize varieties resistant to major diseases in Mozambique, Malawi and Zambia	Mozambique	<i>Will close on 30 June 2018</i>	<i>1 year no-cost extension</i>	<i>1 year no-cost extension</i>
MZ-P07-2013	Screening and promotion of Striga tolerant maize varieties in Malawi, Mozambique and Zambia	Malawi	<i>Will close on 30 June 2018</i>	<i>1 year no-cost extension</i>	<i>1 year no-cost extension</i>
MZ-P08-2013	Maize germplasm collection and characterization for climate change adaptation	Malawi	<i>Closed on 30th June 2017</i>	<i>1 year no-cost extension</i>	<i>1 year no-cost extension</i>
MZ-P09-2013	Improving water use efficiency in maize production	Mozambique	<i>Closed on 30th June 2017</i>	<i>1 year no-cost extension</i>	<i>1 year no-cost extension</i>

				(poor performance)	
PROJECT CODE	PROJECT TITLE	Lead Country	Malawi	Mozambique	Zambia
RICE					
RC-P01-2013	Rice germplasm collection and characterization	Mozambique	<i>Closed on 30th June 2017</i>	<i>1 year no-cost extension</i>	<i>Closed</i>
RC-P02-2013	Development of improved rice varieties	Mozambique	n/a	<i>1 year no-cost extension</i>	<i>1 year no-cost extension</i>
RC-P03-2013	Enhancing productivity of improved rice varieties through the development of integrated crop management practices	Mozambique	<i>Closed on 30th June 2017</i>	<i>1 year no-cost extension</i>	<i>Closed</i>
RC-P04-2013	Promotion and dissemination of improved rice technologies for sustainable production	Mozambique	<ul style="list-style-type: none"> • <i>Closed on 30th June 2017</i> • <i>integrated into a dissemination program by DAES</i> 	<i>1 year no-cost extension</i>	<i>Closed</i>
RC-P05-2013	Strengthening rice seed delivery system for enhanced production among smallholder farmers	Zambia	<ul style="list-style-type: none"> • <i>Year 1 of implementation</i> • <i>Will close on 30 June 2019</i> 	<i>1 year no-cost extension</i>	<i>1 year no-cost extension</i>
LEGUME					
LG-P01-2013	Improving bean productivity in low soil fertility and drought prone areas	Mozambique	<i>Closed on 30th June 2017</i>	<i>1 year no-cost extension</i>	<i>1 year no-cost extension</i>
LG-P02-2013	Developing bean varieties for high Fe and Zn with resistance to ALS and CBB	Zambia	<i>Closed on 30th June 2017</i>	<i>1 year no-cost extension</i>	<i>2 year no-cost extension</i>
LG-P03-2013	Adaptation and promotion of bruchid resistant bean varieties in Malawi, Mozambique, and Zambia	Malawi	<i>Will close on 30th June 2019</i>	<i>1 year no-cost extension</i>	<i>2 year no-cost extension</i>

PROJECT CODE	PROJECT TITLE	Lead Country	Malawi	Mozambique	Zambia
LG-P04-2013	Improving groundnut productivity in low soil fertility and drought prone areas of Mozambique, Malawi and Zambia	Mozambique	<i>Closed on 30th June 2017</i>	<i>1 year no-cost extension</i>	<i>1 year no-cost extension</i>
LG-P05-2013	Breeding groundnut Varieties for multiple disease resistance, for quality and food market access in Mozambique and Zambia	Zambia	n/a	<i>1 year no-cost extension</i>	<i>1 year no-cost extension</i>
LG-P06-2013	Strengthening food legume seed delivery systems in Malawi, Mozambique, and Zambia	Zambia	<i>Closed on 30th June 2017</i>	<i>1 year no-cost extension</i>	<i>1 year no-cost extension</i>
LG-P07-2013	Up-scaling improved soybean production and utilization for enhanced nutrition and income generation	Zambia	<i>Closed on 30th June 2017</i>	<i>1 year no-cost extension</i>	<i>1 year no-cost extension</i>
LG-P08-2013	Developing high yielding soybean varieties that are resistant to major diseases and with preferred market traits	Zambia	<i>Closed on 30th June 2017</i>	<i>1 year no-cost extension</i>	<i>2 year no-cost extension</i>
LG-P09-2013	Developing high yielding varieties and sustainable management practices for improved cowpea production	Zambia	<i>Will close June 2019 (missed 1 season)</i>	<i>1 year no-cost extension</i>	<i>2 year no-cost extension</i>
LG-P10-2013	Development and promotion of improved pigeon pea varieties for increased and sustainable production	Malawi	<i>Closed on 30th June 2017</i>	<i>1 year no-cost extension</i>	<i>1 year no-cost extension</i>
LG-P11-2013	Enhancing dissemination of food legume based technologies for increased production	Zambia	<ul style="list-style-type: none"> • <i>Closed on 30th June 2017</i> • <i>integrated into a dissemination program by DAES</i> 	<i>1 year no-cost extension</i>	<i>Closed</i>
SORGHUM					

SG-P01-2013	Promoting the adoption of improved management practices for increased Sorghum production in Zambia	Zambia	n/a	<i>1 year no-cost extension</i>	<i>Closed</i>
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Cycle 2 (2014)

PROJECT CODE	PROJECT TITLE	Lead Country	Malawi	Mozambique	Zambia
MAIZE					
MZ-P10-2014	Investigating the occurrence of Maize lethal Necrosis Disease in Malawi, Mozambique and Zambia	Malawi	<i>Will close on 30th June 2019</i>	<i>Minor delays</i>	<i>1 year no-cost extension</i>
MZ-P11-2014	Improving maize productivity and family income through cow's animal traction and organic fertilizer	Mozambique	<i>Will close on 30th June 2018</i>	<i>Minor delays</i>	<i>n/a</i>
MZ-P12-2014	Improving and Sustaining Maize and Cowpea Productivity and Production among Smallholder Farmers in Malawi and Mozambique	Mozambique	<i>Closed on 30th June 2017</i>	<i>Minor delays</i>	<i>2 year no-cost extension</i>
MZ-P13-2014	Improving maize and bean yields through the increased farmer accessibility to integrated disease and pest management (IPDM) technologies for major pests and diseases of maize and common bean in Malawi, Mozambique and Zambia	Malawi	<i>Terminated On 30 March 2017 (poor performance)</i>	<i>Minor delays</i>	<i>1 year no-cost extension</i>
RICE					
RC-P06-2014	Participatory evaluation of improved rice varieties to increase productivity in Malawi, Mozambique and Zambia	Malawi	<i>Closed on 30 June 2017</i>	<i>Minor delays</i>	<i>2 year no-cost extension</i>
RC-P07-2014	Improving rice productivity in saline soils and drought prone areas	Mozambique	<i>Terminated on September 2017 (non-reporting)</i>	<i>Minor delays</i>	<i>n/a</i>

PROJECT CODE	PROJECT TITLE	Lead Country	Malawi	Mozambique	Zambia
RC-P08-2014	Improving Surface Irrigation Drainage Water Reuse for Rice Production	Malawi	<i>Closed on 30 June 2017</i>	<i>Terminated</i>	<i>n/a</i>
RC-P09-2014	Improving Smallholders Rice Productivity and Livelihood through Introduction of Rice – Duck based Farming System in Mozambique and Malawi	Mozambique	<i>Will close on 30th June 2018</i>	<i>Minor delays</i>	<i>n/a</i>
LEGUMES					
LG-P12-2014	Evaluation and dissemination of improved cowpea varieties in Mozambique and Zambia for enhanced food security, family nutrition and income	Mozambique	<i>n/a</i>	<i>Minor delays</i>	<i>2 year no-cost extension</i>
LG-P13-2014	Efficacy of soil amendment with agricultural lime in reducing aflatoxin contamination in groundnuts in Malawi and Zambia	Malawi	<i>Closed on 30th June 2017</i>	<i>n/a</i>	<i>Closed</i>
LG-P14-2014	Development of common bean and cowpea with aluminium tolerance	Zambia	<i>Closed on 30th June 2017 (poor collaboration)</i>	<i>n/a</i>	<i>Closed</i>
LG-P15-2014	Enhancing agro-processing and market access of food legume products for smallholder farmers in Zambia, Malawi and Mozambique	Zambia	<i>Terminated (poor performance)</i>	<i>Minor delays</i>	<i>2 year no-cost extension</i>
LG-P16-2014	Screening common bean varieties with improved biological nitrogen fixation for yield and quality	Malawi	<ul style="list-style-type: none"> • <i>Closed on 30th June 2017</i> • <i>integrated into a dissemination program by DAES</i> 	<i>Minor delays</i>	<i>1 year no-cost extension</i>
LG-P17-2014	Enhancing utilization and marketability of groundnut /bambara nut through processing and improved post-harvest practices	Zambia	<i>Terminated (poor performance)</i>	<i>Minor delays</i>	<i>Closed</i>

PROJECT CODE	PROJECT TITLE	Lead Country	Malawi	Mozambique	Zambia
LG-P18-2014	Development of common bean and cowpea with bruchid tolerance	Zambia	<i>Will close on 30th June 2018</i>	<i>n/a</i>	<i>1 year no-cost extension</i>
MULTIPLE CROPS					
MC-P01-2014	Enhanced resilience to seasonal dry spells in rainfed soya, maize and upland rice using silicon-based fertilizer	Zambia	<i>Will close on 30th June 2018</i>	<i>n/a</i>	<i>Closed</i>
MC-P02-2014	Evaluation of pesticide residues in legume and cereal cropping systems in Zambia, Malawi and Mozambique	Zambia	<i>Will close on 30th June 2018</i>	<i>Substantive delays</i>	<i>Closed</i>
MC-P03-2014	Improving grains storage structures for smallholder farmers in Mozambique and Zambia	Mozambique	<i>n/a</i>	<i>Minor delays</i>	<i>Closed</i>
MC-P04-2014	Reducing Mycotoxin Contamination of Maize, Groundnuts and Beans to Improve Food Safety Enhance Health and Trade	Zambia	<i>Closed on 30th June 2017</i>	<i>Minor delays</i>	<i>Not taken off</i>
CONSERVATION AGRICULTURE					
CA-P01-2014	Herbicide weed control and performance among smallholder farmers practicing Conservation Agriculture	Zambia	<i>Will close on 30th June 2019</i>	<i>Minor delays</i>	<i>Closed</i>
CA-P02-2014	Developing conservation agriculture maize-legume systems for smallholders farmers in Malawi, Mozambique and Zambia	Mozambique	<i>Closed on 30th June 2017</i>	<i>Minor delays</i>	<i>Closed</i>
CA-P03-2014	Improving Soil Fertility and Reducing Green House Gas Emissions using Biochar in Conservation Agriculture	Zambia	<i>Will close on 30th June 2018</i>	<i>n/a</i>	<i>Closed</i>
CA-P04-2014	Evaluation of trade-offs of tradition and partial adoption of CA systems for improved food security and incomes	Zambia	<i>Closed on 30th June 2017</i>	<i>n/a</i>	<i>Closed</i>

PROJECT CODE	PROJECT TITLE	Lead Country	Malawi	Mozambique	Zambia
CA-P05-2014	Disease and Pest Challenges in Maize Production under Conservation Agriculture Cropping Systems: What do we learn?	Malawi	<i>Closed on 30th June 2017</i>	<i>Minor delays</i>	<i>Closed</i>

Annex 5: Technologies being made available to farmers - MALAWI

CROP VARIETIES							OTHER TECHNOLOGIES	
CEREALS			LEGUMES					
MAIZE	RICE	SORGHUM	BEANS	PIGEON PEAS	GROUNDNUTS	SOYA BEAN	AGRONOMIC PRACTICES	LABOUR SAVING
Chitedze 2 QPM	NERICA 4	Pilira 1	Chitedze 3	Sauma	Nsinjiro	Tikolore	Types of compost manure recommended for rice farmers <ul style="list-style-type: none"> Compost manure made from pulverized rice hulls/bran and cattle manure Compost manure made from top soil and cattle manure Compost manure made from top soil and chicken manure Compost manure made from rice straw and cattle manure 	Hand fertilizer applicator Legume jab planter
MH 26	Kayanjamalo	Pilira 2	Chitedze 4	Mwaiwathu Alimi	CG7 varieties	Makwacha		
MH 31	Mpheta		Chitedze 5	Chitedze 1	CG9	Nasoko		
ZM 623	Nanzolo		Mnyambitila	Chitedze 2	CG10	PAN1867		
Peacock 10	Faya 14 M 49		Napilira	Chitedze 2	CG11	COWPEAS	Rates of applying compost manure <ul style="list-style-type: none"> Compost from pulverized rice hulls/bran and cattle manure 3.5 tons ha-1 Compost manure from top soil and cattle manure 5.1 tons ha-1 Compost manure from top soil and chicken manure 5.4 tons ha-1 Compost manure from rice straw and cattle manure 4.7 tons ha-1 	
MH30	Macasane		Kholophethe	Kachangu	Baka	IT827-16		
DKC9053	Mukuba		NUA 45	ICP187-105	Kakoma	Sudan 1		
DKC8030	Lifuwu		NUA 59	ICPL93026	CG12	Nkanakaufiti		
Chitedze 2 QPM	NERICA 3		Namtupa				Rates of applying compost manure per plot (0.1 ha) <ul style="list-style-type: none"> Compost manure from pulverized rice hulls/bran and cattle manure 350 kg Compost manure from top soil and cattle manure 510 kg Compost manure from top soil and chicken manure 540 kg Compost manure from rice straw and cattle manure 470 kg 	
CAP9001			Maluwa					
			Chitedze 1				Method and time of applying compost manure <ul style="list-style-type: none"> Compost manure should be applied after levelling the field in readiness for transplanting. The compost manure is broadcast evenly in the whole plot using hands. 	
			Chitedze 2					
							Water management <ul style="list-style-type: none"> Alternate furrow irrigation for maize production. 	

Annex 6: Technologies being made available to farmers – MOZAMBIQUE

Annex 7: Technologies being made available to farmers - ZAMBIA

Crop Varieties being Disseminated through R & D Projects							
CEREALS							
MAIZE	RICE	SORGHUM	CCASAVA	LEGUMES	AGRONOMIC PRACTICES	AGRO-PROCESSING	LABOUR SAVING
<p>Pro-vitamin A, drought and Low "N" tolerant maize varieties</p> <ul style="list-style-type: none"> • MMV409 • ZM421 • ZMS402 • GV421 • GV635 • GV638 • GV664A • GV665A • GV662A 	<ul style="list-style-type: none"> • Supa • Kilombero • NERICA 1 • NERICA 4 • Lowland aromatic rice • Upland disease resistant rice • Properly characterised rice varieties 	<ul style="list-style-type: none"> • Kuyuma • ZSV 36R • WP13 • Sima • Zamseed 16 • ZSV 36 R 	<p>Descriptor of Cassava Raw materials for end users & consumers</p>	<p>Beans</p> <ul style="list-style-type: none"> • Lyambai • Lukupa • Lwangenji • Mbereshi • Kabulangeti <p>Groundnuts</p> <ul style="list-style-type: none"> • MGV5 • MGV4 • Katete • Chishango • Natal Common <p>Soybeans</p> <ul style="list-style-type: none"> • Lukanga • Kafue • Dina <p>Pigeon Pea</p> <ul style="list-style-type: none"> • Mwaiwathu Alimi • ICEAP 00040 • ICEAP 00020 • ICEAP00554 • ICEAP 000557 <p>Cowpea</p> <ul style="list-style-type: none"> • Bubebe • Lutembwe • Msandile • Namuseba 	<p>Maize</p> <ul style="list-style-type: none"> • Legume-Maize rotation • Minimum tillage • Herbicide use in maize production <p>Legumes</p> <ul style="list-style-type: none"> • Herbicides and Pesticides/Fungicides/ use in legumes crop production (Phorates, Zamwipe, Abemectin, monocrotoforce etc) • Tillage practices in Legume crop production • Fertiliser use in legumes crop production at recommended rates • Improved Cowpea Cultural Practices • Inoculation in soybeans • High Phosphorous use efficiency in Cowpea • Improved adherence to recommended planting specifications <p>Sorghum</p> <ul style="list-style-type: none"> • Fertilizer application • Early cultivation & crop residue incorporation • Sorghum-Legume Rotation • Crop Residue incorporation <p>PEST MANAGEMENT</p> <ul style="list-style-type: none"> • Integrated pest management under CA 	<ul style="list-style-type: none"> • Driers – Cowpeas and Bean leaves • De-hullers–all legumes (Cowpeas and Beans) • Grinding Machines • Energy Efficient Cookers (Jikos) <p>Soybean products</p> <ul style="list-style-type: none"> • Soya snacks • Soya Tobomutwe • Soy Maheu • Soya biscuits • Soya Chiwaya • Soya fritters (fried and baked) • Soya mince • Soya eggs • Soya cake • Soya bread • Soya milk • Soya scones • Soya porridge with Moringa • Soya porridge with banana • Soya sausage • Soya bean nshima, Stock feed <p>Rice recipes / products</p> <ul style="list-style-type: none"> • Cakes & Pie • Biscuits & Rice Milk • Enriched porridge <p>Cassava</p> <ul style="list-style-type: none"> • Composite flour for bread & biscuits; Nshima • Cassava Chips & Gari • Poutry Feed 	<ul style="list-style-type: none"> • On-Spot fertiliser applicator • Solar powered Micro Irrigation System • Multipurpose too (Planter and fertiliser applicator) • Maize sheller • Adapted Tunnel Solar dryers for Maize • Adapting manually operated planter for planting food legumes

Annex 8: Technologies being shared with other countries by ZAMBIA

Maize varieties (In collaboration with Harvest Plus)

- (i) GV671A - Malawi, Zimbabwe & Zambia
- (ii) GV664 – Malawi, Zimbabwe, DRC & Zambia
- (iii) GV6672 – Malawi, Zimbabwe, DRC & Zambia

Groundnut varieties

- (i) MGV-6 – Malawi, Mozambique & Zambia
- (ii) MGV-7 – Malawi, Mozambique & Zambia
- (iii) Lupande – Malawi, Mozambique & Zambia
- (iv) Wazitatu – Malawi, Mozambique & Zambia
- (v) Wamusanga – Malawi, Mozambique & Zambia

Pigeon Pea

- (i) MPP-2 – Tanzania & Zambia
- (ii) Mwaiwathu alimi– Malawi & Zambia

Beans

- (i) Lyambai (CAL 143) – DRC, Lesotho, Malawi, Mozambique, Swaziland, Zimbabwe and Zambia.
- (ii) Chambeshi (A197) – Malawi and Zambia.
- (iii) Kalambo (VTTT923/10-3) – Mozambique and Zambia.
- (iv) Mbereshi (NVA 45) – Lesotho, Malawi, Mozambique, Swaziland, Zambia and Zimbabwe

Agronomic & cultural Practices

- (i) Double row planting for groundnuts – Malawi, Mozambique & Zambia
- (ii) Tied ridge water harvesting technology – Malawi & Zambia