USAID FROM THE AMERICAN PEOPLE	**Resilient Agricultural Markets Activity** **Beira Corridor**	LAND O'LAKES VENTURE37

RAMA-BC Project Final Evaluation Report

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List of Acronyms and Abbreviations

ADPP	Ajuda de Desenvolvimento de Povo para Povo (Development Aid from People to People)
BCC	Behavior Change Communication
CAPI	Computer Assisted Personal Interviewing
CDRs	Campos de demonstração de resultados (Demonstration Plots)
CITT	Centro de Investigação e Transferência de Tecnologias para o Desenvolvimento Comunitário (Center for Research & Technology Transfer for Community Development)
CSA	Climate Smart Agriculture
DUAT	Direito do Uso e Aproveitamento da Terra (Land Use Rights Document)
FAW	Fall Army Worm
FGD	Focus Group Discussion
FtF	Feed the Future
HHH	Household Head
IAC	Instituto Agrario de Chimoio (Institute of Agronomy of Chiomoi)
IIAM	Instituto de Investigação Agrária de Moçambique (Mozambique Agricultural Research Institute)
IPM	Integrated Pest Management
ISPM	Instituto Superior Politécnico de Manica (Higher Polytechnic Institute of Manica)
KII	Key Informant Interview
LOP	Life of Project
MFF	Model Family Farm
NCBA CLUSA	National Cooperative Business Association CLUSA International
OFSP	Orange Fleshed Sweet Potato
RAMA-BC	Resilient Agricultural Markets Activity – Beira Corridor
SDAE	Serviço Distrital de Actividades Económicas (District Economic Activity Service)
UEM	Universidad Eduardo Mondlane (University of Eduardo Mondlane)
USAID	United States Agency for International Development

UTM	Universal Transverse Mercator
VC	Value Chain
VSLA	Village Savings and Loan Association

EXECUTIVE SUMMARY

Project Overview

Land O'Lakes Venture37 has just completed implementation of the six-year USAID Feed the Future, Resilient Agricultural Markets Activity - Beira Corridor (RAMA-BC) in Mozambique, running from December 2016 to October 2022. The RAMA-BC project's goal was to equitably increase agricultural productivity and climate resilience for smallholder farming families in the Beira Corridor. The project had four interrelated components. The first was to carry out behavior change communication campaigns on resilient agriculture, gender and nutrition, and market information through community radio, SMS and local service providers. The second was to set up Model Family Farms in the project areas to demonstrate resilient agricultural practices to community members. In the third, RAMA-BC worked with private sector partners to provide sustainable extension services and appropriate inputs to smallholder farmers to be able to carry out resilient agriculture. In the fourth, it worked to strengthen the market system through promoting applied research on climate smart agriculture (CSA), establishing connections to technical services, inputs and buyers and access to financial services, including establishing and strengthening VSLAs in the target farming communities. The project initially starting work in the Tete and Manica provinces, but shifted to Sofala and Manica for the final 3 years of the project. The crops of focus by the end were maize, cassava, sweet potato, cowpea, pigeon pea, jack bean, lab lab, and coffee. Major emphasize was also put on mobile corrals for livestock, IPM/biopesticides, and vermi-composting to act as an organic alternative to chemical fertilizer. In the final 2 years of the project sweet potato and cassava cuttings were distributed to 17,000+ farmers in Sofala province, and this constituted the vast majority of project beneficiaries in those years.

Final Evaluation Methodology

Three different key data sources were collected, analyzed and triangulated to provide the findings of this report.

This included quantitative data from several surveys, qualitative data from KIIs and FGDs conducted as part of this evaluation, and secondary reports from partners of RAMA-BC which were published in the last few years of the project. A quantitative survey of 231 program farmers and 132 control farmers in districts across Manica and Sofala provinces, focused on maize, pigeon pea and cowpea, was conducted to collect data on knowledge and adoption of targeted improved practices as well as land area and yields, which were physically measured by enumerators. A smaller survey with in-field measurements was also conducted with 183 recipients of cassava and sweet potato cuttings in Sofala province to determine land area planted in these crops, and a much smaller survey of 20 multiplication plots was done to measure yields per variety.

Generally data was cleaned and averages were taken for key variables, and this was extrapolated to the total population of relevant beneficiaries in a given category from the participant registration database.

On the qualitative side, 15 FGDs were conducted in 8 different communities (generally 1 male and 1 female FGD per community) with 133 total participants. Also,18 KIIs were conducted with partners who worked with RAMA-BC, including private companies (mostly input suppliers), educational institutions, research institutions, and the SDAE government extension agency. To analyze these results answers were grouped per key evaluation question and then similar answers were tallied and tabulated to determine most common themes. The sales data for companies was also generated from these KIIs and extrapolated to all companies served by the project.

Secondary source data that was consulted and also triangulated with the other data as part of this evaluation included: the RAMA-BC program team Impact report, the MozTarget Adoption Study, 3 UEM student theses on the effect of intercropping and planting timing on pest control, ISPM soil studies, a Universidad Zambeze study on the effects of mobile bovine corrals on maize yields, and IIAM studies on intercropping demonstration plot results and socio-economic survey results of farmers in the communities with those plots.

Key Findings

- **Substantial Yield Impacts:** The project seems to have helped farmers achieve a substantial increase in yields of maize (of 74%-183% depending on the comparison used), cowpeas (67%-251%), and pigeon peas (22%-143%). The yields achieved in the final year of the project all far exceeded the project targets, with 3.09 tons/ha for maize (206% of target), 0.9 tons/ha for cowpea (214% of target), and 1.37 tons/ha for pigeon pea (913% of the target).
- **Sizeable Adoption Impacts:** The RAMA-BC project seems to have had a significant impact on producer adoption of CSA practices, with 18 times higher adoption of any CSA practice among program participants versus control farmers. Overall, 91% of program farmers had adopted at least one of 5 specific targeted CSA practice prioritized by the project and measured in the survey. This exceeded the project' target by 153%. Land area per person increased (+162% by the most conservative measure), but total hectares under improved practices was only 61% of the target, at 25,900 ha for 38,325 producers. This was because of substantial overlap in application of practices on the same land.
- **Sales Impact for Companies but not Farmers:** Largely driven by these company sales, total sales of supported farmers and companies was $19,679,098 across LOP, 376% of the project target. Sales increased for private company partners by 197% per company on average, from 2019-2020 to 2020-2021; this seems to be at least partly due to RAMA-BC support, with marketing, grants which were used to boost staff or logistical capabilities, and assistance in acquiring some key inputs. The impact of RAMA-BC on farmer sales was less clear. By the measure in which we have the most confidence, for maize farmers saw increased sales of 105% (since midterm), but for cowpea this was -54% and for pigeon pea it was -8%, respectively. Qualitative data, which suggests that low prices are a major problem for farmer and this exacerbated when production is high, and which makes no mention of any market access and price-bolstering support from RAMA-BC, also supports the conclusion that RAMA-BC had little or no impact on increasing farmer sales.

- **Expanding farmer access to savings:** The project seems to have helped establish VSLAs in many rural communities that did not previously have them, and farmers reported in FGDs that they found them very helpful, were benefiting from increased savings as well as small loan access, and would continue them after the project was over. Unfortunately, the MEL evaluation team did not collect enough quantitative data on the VSLAs to substantiate conclusions about number of beneficiaries, amount of savings or loans or what was done with that money.
- **Impacts on Educational & Research Institutions:** RAMA-BC led partner institutions to introduce or strengthen their CSA curriculum for students, and to train over 1,500 students on CSA using observational unit demo plots, and to employ 60+ interns on CSA-related work. They also conducted research and pilot projects that would not have occurred without RAMA-BC support. Several very interesting findings came out of this work including measurements of the yield and profitability impacts, as well as the pest control effects, of intercropping, the fact that vermi-compost boosted yields and soil fertility and also could be sold very profitably, and the positive impact of mobile bovine corrals on maize yields and gross margins. All the partner institutions said that they would continue the curriculum changes and a lot of the new CSA research focus after the project ended.

Recommendations for Future Projects

- Use field demonstrations at the community level and practical trainings in the field as the primary marketing tool, as it is the most convincing to producers. Also continue radio campaigns and flyers with images, but deemphasize, SMS messaging and social media campaigns.
- Do more to scale-up mobile bovine corrals and vermi-composting, as these innovations were found to have substantial impacts. Work to ensure that affordable inputs as well as technical assistance can be available on these methods to more small businesses and producers.
- Disseminate the findings from RAMA-BC on yield impacts of using CSA, and of the particular sponsored research, more widely to a variety of stakeholder, but especially to farmers, to help them better understand the benefits of CSA
- Expand CSA promotion work to more value chains, particularly horticulture and tree crops.
- Do more applied research, input access support, and training of farmers for using improved seed, IPM, and crop rotation, as these were the least adopted practices for RAMA-BC program participants.
- Continue to support and expand VSLAs, but also go beyond this and do more to increase farmer incomes through market access programs and interventions to help them increase their prices, to among other things increase their purchasing power for improved seed
- Try to support the seed sector to produce and sell affordable short-cycle and drought-resistant seed through a market systems approach. Avoid giving away free or heavily subsidized seed, as this hurts the private seed companies and hampers their expansion.

BACKGROUND

RAMA program description

Land O'Lakes Venture37 has just completed implementation of the six-year USAID Feed the Future, Resilient Agricultural Markets Activity - Beira Corridor (RAMA-BC) in Mozambique. The RAMA-BC project's goal was to equitably increase agricultural productivity and climate resilience for smallholder farming families in the Beira Corridor. From December 2016 to October 2022 RAMA-BC supported local producers to increase their agricultural productivity, profitability, and resilience through the adoption of sustainable and accessible resilient agricultural technologies. RAMA-BC has partnered with relevant private sector actors to test and develop business models that provide information, consulting services, inputs, market linkages and access to finance to target producers.

The RAMA-BC project accomplished its goal through four interrelated components. The first component was to carry out behavior change communication campaigns on resilient agriculture, gender and nutrition, and market information through community radio, SMS and local service providers. The second component was to set up Model Family Farms in the project areas to demonstrate resilient agricultural practices to community members. In the third component, RAMA-BC worked with private sector partners to provide sustainable extension services and appropriate inputs to smallholder farmers to be able to carry out resilient agriculture. In the last component, it worked to strengthen the market system through promoting applied research on climate smart agriculture (CSA), establishing connections to technical services, inputs and buyers and access to financial services, including establishing and strengthening VSLAs in the target farming communities.

RAMA-BC also partnered with educational institutions, establishing Observation Units, where students could observe the effect and practice of different intercropping configurations on a 1-hectare plot. RAMA-BC also engaged educational institutions through internships. RAMA-BC produced a package of CSA manual, technical briefs, videos on a wide range of CSA topics that were shared with education institutions and used in their curricula. Other education institutions conducted research on intercropping, FAW, mobile bovine corrals, and vermicomposting. RAMA-BC also engaged with the Mozambican Agrarian Research Institute (IIAM) on monitoring the impact of intercropping on demonstration plots.

The project was initially implemented in Manica and Tete Provinces, but following the devastation of Cyclone Idai, starting in October 2019, RAMA-BC began implementation in Sofala Province, stopped working in Tete Province, and started working in Sussundenga district (specifically Dombe administrative post) in Manica Province, but stopped working in Manica District. Since October 2019, RAMA-BC has been implemented in nine FtF districts in the Beira Corridor's area of influence: Gondola, Chimoio, Barué, Sussundenga, Vanduzi, Macate in Manica Province; Nhamatanda, Buzi and Dondo in Sofala Province.

RAMA-BC also changed its value chain focus throughout the project. Feed the Future withdrew from Mozambique as a priority country in 2018, so the 7 value chains (bananas, soya, pigeon pea, sesame, common bean, cowpeas and groundnuts) that were initially the focus of RAMA-BC were no longer mandatory. This allowed RAMA-BC to not only explore value chains in livestock, root crops, coffee, vermicomposting. Once the regulations around Value Chains were relaxed by USAID, RAMA-BC started a series of innovations in these new value chains:

- **Livestock:** Mobile corrals, where cattle, poultry or pigs had their movement controlled in a free ranging, rotational grazing environment to regenerate the soil and promote animal productivity and health at low capital and input cost
- **New Root Crops:** Cassava and Orange Fleshed Sweet Potato that are more productive, better tasting, shorter cycle and disease resistant
- **Vermicomposting:** This processes turns organic waste into valuable fertilizer in an urban environment and with companies in the vegetable and coffee VC

Purpose of the final evaluation

LAND O' LAKES Venture37 conducted a Final Internal Assessment with the aim of evaluating project results in terms of objectives and targets over the 6 years of RAMA project implementation and capturing lessons learned and best practices. The key purposes of this assessment were as listed below:

- Compare the achievements of the project output and outcome indicators with the indicator targets, as described in the results framework and indicator table.
- Use secondary reports from IIAM, UEM, ISPM soil studies and UniZambeze mobile corrals presentation, to triangulate activity results.
- Identify factors that contributed to and/or inhibited success.
- Capture results of cassava distributions.
- Assess how women and men benefited differently from the activity.
- Document best practices in project implementation
- Identify lessons learned throughout the activity with an emphasis on identifying key strategies, methodologies, focusing on areas that could be applied to similar programming.
- Provide recommendations to strengthen future or similar projects.

Profile of RAMA-BC Areas of Implementation

Country Overview

The agricultural system in Mozambique primarily comprises low-productivity subsistence farming and requires new technology and investment to sustain long-term growth. The mainly agrarian population in the Beira Corridor grapples with widespread damage to their productive assets, raising concerns over food security and the sustainability of agriculture-based livelihoods. As a result of Cyclone Idai in early 2019, over 100,000 homes

of largely resource-poor households were destroyed, and 711,000 ha of crops ruined; the livestock that survived the storm lack access to grazing and risk disease as they move through the region and congregate in dry areas. In Chimoio District alone, local authorities reported that more than 451,300 ha of agricultural land have been destroyed, comprising 65% of the total crops in the Province.

Increasing agriculture's productivity, particularly of smallholder farmers, has enormous potential to contribute to large-scale poverty alleviation and reduced levels of malnutrition of the country. There is a lack of reliable data, but World Bank data from 2011 shows that for the main staple, maize, yield in the country was 1,293 kg/ha; IIAM (2013) has estimated that the yield is about 1 MT/ha. Constraints to agriculture productivity include low adoption of productivity-enhancing inputs and technologies. Less than 20% of all farmers use improved maize seed (19.6% in Manica and 19.9% in Tete). Mozambican farmers use less than 5 kg/ha of chemical fertilizers and very few use irrigation. Farmers also have limited access to rural extension services, restricted access to financial services, degradation of natural resources (particularly soil and water sources), and poor infrastructure. Climate-related impacts such as droughts, floods and cyclones present a substantial risk to agriculture and sustainable livelihoods, contributing to food insecurity among the poor. In addition, an inadequate land rights system reduces the efficiency of land use, as farmers do not want to invest if they are not sure of their ownership of the land.

Manica Province

Manica is situated in the central interior area of the country. It has an area of 61,661 sq. km and a population of 1,945,994. To the north is the province of Tete; to the south the provinces of Inhambane and Gaza; to the east the province of Sofala; and to the west Zimbabwe. The province of Manica has one of the highest altitudes in the country and is the source of many of the rivers that flow east towards the Indian Ocean. The capital is Chimoio, an important economic center of the province. The main ethnic groups are the Shonas, Senas and Ndau. According to the Agricultural Census of 2015, the cultivated areas in Manica comprise 370,835 ha involving 218,138 farms. The main crops cultivated in the province among the selected value chains are maize, cowpea and pigeon pea, contributing to about 10% of the national production of these crops. Farmers also produce sorghum, cassava, beans, and various horticultural crops. The poverty rate was 72% as of 2008. Manica province was served during all 6 years of the RAMA-BC project.

Sofala Province

Sofala Province is located in the center of the country, its capital is the port city of Beira, bordered to the northeast by the Zambeze River, to the south by the Save River, separating the Province of Inhambane, to the West with the Province of Manica, to the North with the Zambézia and Tete Provinces across the Zambezi River and to the East with the Indian Ocean. Sofala Province, with a total area of around 68,018 Km^2, with 13 Districts, has 2,150,770 inhabitants and a population density of 24 inhabitants/Km^2. Maize is the most commonly cultivated crop in the province, followed by sorhum, cotton, cassava, oil crops and cowpeas. The poverty rate was 68% as of 2008. Of the three provinces served, Sofala province the

hardest-hit by Cylone Idai in 2019 as it is on the coast and the others are located more inland; over 715,000 ha of farmland was flooded. Sofala was served for the last 3 years of the RAMA-BC project.

Tete Province

Tete has an area of 100,724 sq. km and a population of 2,648,948. Tete is the capital of the province, located near the River Zambezi. The central economic sector is coal mining (centered in Moatize). Throughout Tete, there is a high rate of self-employment (76.7%) concentrated in agriculture and other rural pursuits (83%). Private sector firms—80% of which are micro- and small-scale—account for one in ten employed people. According to the 2015 Agriculture Census, the cultivated area in Tete is 636,074 ha, involving 374,161 farms. The main ethnic groups are the Senas and the Manyungwe. Millet, common bean, maize and peanut are the main crops cultivated in the province, contributing to 26%, 25%, 12% and 10% of the national production, respectively. The poverty rate was 60% as of 2008. Tete province was served only during the first 2 years of the RAMA-BC project.

METHODOLOGY AND IMPLEMENTATION

Research Approach

The final internal evaluation used mixed quantitative and qualitative methods. Quantitative data came from surveys conducted of farmer beneficiaries, while qualitative data was collected via key informant interviews (KIIs) and focus group discussions (FGDs) with a purposely selected sample of farmers and relevant stakeholders.

In addition to the primary qualitative data collected through surveys, KIIs, and FGDs, the evaluation also used secondary reports and data from special RAMA-BC studies completed during the duration of the activity. This included data from IIAM, UEM, and the Climate Smart Adoption and Behavior Change Study completed in July 2021, to support the findings and conclusions and recommendations.

The chart below summarizes the questions used to design data collection tools that were used to collect data from beneficiaries, project staff and other stakeholders. The results of the evaluation are presented by stakeholder (producers, private companies, research and educational institutions), but in each of those sections we make an effort to answer the evaluation questions relevant to the given stakeholder using whatever data sources related to the content of the question.

CRITERIA	EVALUATION QUESTION
Relevance	• To what extent were the project's approaches (intercropping, minimum tillage, promotion of root crops, vermicomposting in an urban environment) to improve resilient agricultural technologies relevant to smallholders? • How do extension approaches using the RAMA-BC model made by the private sector through grants meet the needs of these companies? • To what extent has the Resilient Agriculture model been relevant for RAMA-BC partner educational institutions? What is the impact of the technical package (CSA manual, technical briefs, videos, audio) that the project left behind? • To what extent are the mobile pens approach developed by the project relevant to producers?
Result	• To what extent have the RAMA-BC BCC approaches helped or influenced smallholders to adopt improved resilient agricultural technologies? • To what extent have improved technology approaches to resilient agriculture led to increased agricultural productivity for smallholders in target value chains? Have producers been able to increase their sales value through RAMA-BC approaches? • What impact has the Observation Units, internships and technical packages had on students and universities? • How did the activities of the project promote improved inputs (seeds) affect the volume and value of sales of RAMA-BC partner companies? • What impact has the promotion and marketing of cover crop/green manure seeds carried out by seed companies in increasing the adoption of improved practices of resilient agriculture by smallholders? What impact and importance has the research facilitated by the project through partners (IIAM, UEM, UniZambeze) had for advocacy for improved good practices in resilient agriculture. • What was the impact of the social media interaction that the project was employed (Agrilinks, YouTube etc.) in the dissemination and publicity of the project activities. • How have the distributions of improved varieties of cassava and sweet potato carried out by the project contributed to the adaptation and resilience of the target communities? Did the gender approaches used by RAMA-BC help to empower women for decision-making at various levels? • To what extent have producers who adopt mobile corrals reduced their costs? • What were the external and internal factors that affected the RAMA-BC in achieving the expected results or objectives? • Are there producers or companies that did not participate in RAMA-BC activities, but were affected (positively or negatively) by its implementation? • Did the project have any good/bad results that were not foreseen?
Sustainability	• Which RAMA-BC approaches are most likely to continue after finishing the project? • To what extent have community radio stations been sensitized so that they can broadcast RAMA-BC programs after the end of the project? • To what extent will the public and private sector continue to use RAMA-BC's model of resilient agriculture implementation? • To what extent have educational institutions continued the resilient model of agriculture in their curriculum?

Registration Data Tool Design

Registration data was analyzed and used to calculate numbers of project participants, and these totals were multiplied by survey data on land area per farmer, adoption rates, etc. to calculate final indicator totals such as total land area under improved practices and total adopters of improved practices.

The registration of individual participants and companies was done at each technical assistance training with Model Family Farms and demonstrative plots of partners. The field facilitators filled in the Training registration form with the details of the training and linked the people/partners who receive the support. As the Model Family Farms and Partners implemented activities at their farms and demonstration plots, they also completed the Participant Register and Training Register and sent them to field facilitators on a monthly basis. For companies that did not implement demonstration plots and that only worked in the business area, they were registered just at the beginning of their partnership with RAMA.

Farmer Surveys Tool Design

Quantitative data for the maize, cowpea and pigeon peas value chains were collected from a sample of farmers in treatment and comparison areas who had participated in activities at model family farms. There was a single monthly producer data collection survey used for all three target value chains.

The tool included questions designed to measure project outcome indicators and were kept the same as at baseline, to allow accurate comparison of results but added questions to capture how participants were supported by the project. The tool was revised and refined twice before data collection. A review was carried out by the technical field team and the Venture37 headquarters team, and the second refinement was made after carrying out a field test with farmers. The questionnaire contains the following main sections: Farmer Demographics, Farm Size, Production and Sales, CSA, Decision Making. The final questionnaire is in Annex X.

Quantitative data for the cassava and sweet potato value chains were collected only from a random sample of producers who benefited from the distribution of these crops by the project. The questionnaire only had questions about adopted areas and yield.

Quantitative Survey Sampling Method

Monthly Farmer Survey with MFF Participants

In the final year of the project, the monthly survey of farmers was carried out on the basis of a random sample of farmers growing maize, pigeon pea, and cowpea in the districts of Gondola, Chimoio, Barué, Sussundenga, Vanduzi, and Macate in Manica Province and Buzi, Dondo, and Nhamatanda in Sofala Province. The survey did not include farmers in Tete province because there were no new project activities happening in Tete in the final year of the project. The study collected data from both treatment areas and comparison areas which had been established at baseline.

Table 1. Sample size for monthly farmer of MFF participants

District	*Treatment Group*				*Control Group*			
	pigeonpea	cowpeas	maize	Total	pigeonpea	cowpeas	maize	Total
Dondo	14	14	14	42	5	5	5	15
Buzi	14	14	14	42	5	5	5	15
Nhamatanda	7	7	7	21	5	5	5	15
Sofala Province	35	35	35	105	15	15	15	45
Barué	7	7	7	21	5	5	5	15
Gondola	7	7	7	21	5	5	5	15
Chimoio	7	7	7	21	5	5	5	15
Macate	7	7	7	21	5	5	5	15
Sussendenga	7	7	7	21	5	5	5	15
Vanduzi	7	7	7	21	5	5	5	15
Manica Province	42	42	42	126	30	30	30	90
Total	**77**	**77**	**77**	**231**	**45**	**45**	**45**	**135**

For monthly data collection, standard random sampling was used in each value chain. Each value chain has its own sample. A statistically relevant sample was estimated, as much as possible, where each technician would accompany 21 treatment farmers and 15 control farmers

The sample size for the treatment areas was 231, covering 9 districts, of which 105 were interviewed in Sofala and 126 in Manica. The distribution by district was based on an estimate of the number of producers that could be assisted with this data collection methodology, therefore, in districts where there are two technicians, the sample is larger. The table above shows the distribution of the sample by value chain for each district. In the comparison areas, a total of 135 farmers were surveyed in the comparison areas. The selected areas are communities within the target districts where the project have no intervention.

Root Crop Survey

For cassava and sweet potato crop land area data, a random selection was made based on a deliberate sample of beneficiary producers in the province of Sofala, in the districts of Dondo, Buzi and Nhamatanda, which are the districts where this material was distributed.

Table 2. Planned vs. actual sample size for root crop land area survey

District	Planned			Actual		
	Cassava	Sweet potatoes	Total	Cassava	Sweet potatoes	Total
Dondo	42	42	84	32	59	91
Buzi	42	42	84	33	37	70
Nhamatanda	21	21	42	13	11	24
Sofala Province	105	105	210	78	107	185

As shown in the table above, the planned sample size for the root crop survey was 210, covering 3 districts, of which 105 were interviewed for cassava and 105 interviewed for sweet potato. The distribution by district was based on an estimate of the number of producers that could be assisted with this data collection methodology, therefore, in districts where there are two technicians, the sample is larger. Unfortunately, the survey team had trouble finding farmers and were not able to reach the full sample size for cassava, and especially had a shortfall of surveyed farmers in Nhamatanda compared to the plan.

For the yield estimations for cassava and sweet potato, these data were collected separately from a much smaller sample. Yields were measured directly by enumerators for all varieties multiplied for the farmers who assisted with multiplication of the cuttings prior to distribution to the wider populace. Data was collected from 12 fields of cassava and 8 fields of sweet potato that still had crop in the field after the harvest of cuttings was complete, and which the farmers continued cultivating through to the end of root harvest.

Quantitative Survey Implementation

Training and pre-test

The training and pre-test took place from the February 23-25 2022 in the province of Manica. This training was given by the RAMA-BC MEL Manager and Specialist at the RAMA-BC office in the city of Chimoio.

During the training, data collectors were trained on the objectives of the monthly data collection tool, UTM application for measuring areas, and the proper way to sample crop yields. On the last day of training a pilot test was carried out in a community in the treatment area to test the questionnaire. That same day, the team held a debrief to address issues identified during testing and make necessary changes to the monthly data collection questionnaire.

Twelve project field facilitators were trained who assumed the role of enumerator; these were supervised by the MEL Manager and Specialist.

Data collection process

Quantitative data collection began in March 2022 and was carried out throughout the entire agricultural season, with enumerators visiting the selected producer every month to collect data related to what was happening that particular month. This survey collected quantitative data throughout the crop cycle to track the application of improved practices for the target value chains (cowpea, pigeon pea and maize). Land size per crop was physically measured by the enumerators using the UTM area measurement application, and enumerators worked together with farmers to directly harvest 25 m^2 and weigh the production for extrapolation to the entire area of the producer's farm. This data collection method is thought to be very effective as it allows data to be collected at the time each practice is being adopted, giving shorter times for farmer recall data and enabling real observations by enumerators, reducing errors.

The cassava and sweet potato crop area measurement survey was also performed using the UTM area measurement application directly on the farm of the beneficiaries selected for the survey, and yields were measured directly by enumerators using harvest box measurements of 3 small plots in each field, with yields average together and extrapolated to a full hectare.

In this research, the sample size initially proposed for the monthly data collection survey from MFF participants in the treatment areas was 231 farmers covering the nine project districts, of which 126 in Manica and 105 in Sofala. For the cassava and sweet potato value chains, the initially planned sample consisted of 105 producers for each of the value chains. Table 6 shows the number of farmers surveyed by district for each value chain and how this compares to the planned sample. Although these figures were generally set as goals, the sample was collected from random farmers per district, not stratified by crop. Thus, the differing proportions of reflect how common production of that crop was in the given geographic area. This over-representation of Nhamatanda and Gondola relative to the other was due to the fact that interns selected to assist with the project were located these areas.

Table 3: Monthly Farmer Survey of MFF Participants, planned versus actual sample								
District	*Planned*				*Realized*			
	Pigeonpea	Cowpeas	Maize	Total	Pigeonpea	Cowpeas	Maize	Total
Dondo	14	14	14	42	7	7	8	22
Buzi	14	14	14	42	0	0	22	22
Nhamatanda	7	7	7	21	14	14	14	42
Sofala Province	35	35	35	105	21	21	44	86
Barué	7	7	7	21	7	7	7	21
Gondola	7	7	7	21	14	14	14	42
Chimoio	7	7	7	21	6	6	7	19
Macate	7	7	7	21	7	7	7	21
Sussendenga	7	7	7	21	7	7	7	21
Vanduzi	7	7	7	21	0	8	13	21
Manica Province	42	42	42	126	41	49	55	145
Total	**77**	**77**	**77**	**231**	**62**	**70**	**99**	**231**

Qualitative Data Collection Design

Qualitative data were collected through focus groups discussions (FGDs) and key informant interviews (KIIs). Farmers within the treatment areas were included in FGDs. In each district, two focus groups were held, one with only men and the second only with women. This approach was used to capture the distinctions and similarities of each gender to share relevant information.

Table 4: Planned Number FGDs by Location		
District	***Number of FGDs***	
	Males	***Females***
Macate	2	2
Barué	2	2
Nhamatanda	2	2
Buzi	2	2
Total	8	8

The KIIs were conducted with actors on the production side of the target value chains. According to the type of key informant (educational institutions, input supply companies, research institutions and government), specific questionnaires were developed and applied. The FGD and KII guides are presented in Annex 3. The general content includes questions about their knowledge and observations of climate change as well as cropping patterns and farmer needs, how the actor worked with RAMA, what they felt was effective and ineffective in the project, things that they changed in their own work because of RAMA, changes they observed in farmer adoption of CSA because of RAMA, and what they felt would continue. Some questions were included directly to answer the evaluation questions listed above. For the private company actors, details were asked about their sales to include in indicator calculations of sales totals.

Qualitative Data Collection- Implementation

Qualitative data collection took place in Manica and Sofala from the beginning of September 2022 for a period of 2 weeks. The FGDs and KIIs were administered by the MEL Manager and Specialist.

The team completed 18 KIIs in both provinces against the 20 initially proposed. The team sought to interview key stakeholders in the project's value chains and partners, but some stakeholders were not available during the data collection period. Table 5 below provides more details on the types of informants interviewed, while Annex 4 contains a complete list of respondents.

Table 5: Number of interviews per actor in the value chain

Actors in the value chain	Planned	Realized
Government (SDAE)	2	2
Input suppliers	9	7
Research, innovation and new technology providers	3	3
Educational institutions	5	5
Private production company	1	1
Total	20	18

Focus group discussions

The team performed 15 FGDs out of the 16 originally planned; two groups per district in the 4 selected districts (Nhamatanda and Buzi in Sofala province and Macate and Barué in Manica province), one with women and the other with men. This was in accordance with what was initially proposed, with the exception of Buzi, where the number of people present would not have been representative once separated by sex. All FGDs were performed in the treatment areas and the number of participants ranged from five to 10. Appendix 5 contains a list of the FGDs performed.

Analysis

Quantitative results for the indicator table were calculated by combining analysis of multiple data sources. First, data from the Monthly Farmer Data Collection for MFF participants was used to determine variables like the percent of respondents who could explain key CSA practices, the percent of respondents adopting various improved practices, the yields of maize, pigeon pea and cowpea, sales made on those crops, the hectares per farmer under various improved practices for those crops, and the women's decision making index score. Then, for the adopter and hectare indicators, the percentages and per-farmer averages were multiplied by the LOP total of unique registered farmers participating in the MFF component to get the total adoption figures.

The Monthly Farmer Data Collection survey was the only source for some indicators, like women's decision-making index, yields and sales (which were only reported for maize, cowpea and pigeon pea), and % of farmers who could describe CSA practices. But in Year 6 for the indicators like total number of adopters and total hectares under improved practices, we also added in numbers for those farmers who received sweet potato and cassava cuttings from the RAMA program. The source of these data were the registration list showing total people who received those root vegetable materials, multiplied by averages taken from a field measurement survey of root vegetable recipients, or yield data from the fields of the farmers who multiplied those crops for RAMA-BC.

Finally, for sales and adopter and hectare adopted data of private companies, these data came from the KIIs with a sub-sample of those companies. The average land area with improved practices and the average sales were then extrapolated to the total number of company employees registered as participants in the given year. For change over time, we looked at both the extrapolated total change for all active companies and the per-company average, but we also compared a few companies' changes one by one if we had data from them across years.

For any calculations we show below for program vs. control comparisons it came only the results of the Monthly Farmer Survey on MFF participants. To analyze impact, we compared both the difference for these variables in Year 6 for Program vs. Control and as well as the average for Year 6 program participants vs. previous year's program participants using the same survey done in other years. Generally, we consider the program vs. control comparison to be a more accurate representation of impact, though, because it eliminates confounding factors like inclusion of different geographies, survey methodologies or weather conditions across years.

For analysis of qualitative data, the key results of the KIIs and FGDs as well as secondary source reports were parsed out of the raw transcripts and reports by evaluation question and cross-tabulated using Excel to see the key patterns. Then we compared the answers found from these sources to the answers from the quantitative data for any question where the given question contained answers from multiple of these sources. The secondary sources referenced included the "Impact Report" written by the RAMA technical team in 2022, the Adoption Study conducted by MozTarget in 2021, two reports (from 2020 and 2022) by IIAM on the results of Demonstration Plots that they operated, a 2022 report by

Universidad Zambeze on the effect of the mobile bovine corrals, and a four reports (2019-2020) by UEM students on the effects of maize-legume intercropping on pest control, and results of ISPM soil analysis done on intercropped demo plots at two different times.

Limitations

During the implementation of the Final Assessment, the team faced the following challenges:

- The sample of all qualitative surveys was smaller than ideal, given who was available to sample for each crop. This was especially problematic for the sweet potato and cassava farmer surveys, and most particularly for the yield survey which had very small sample size. Unfortunately, the sample the methodology we used, with actual field measurements and harvest boxes, would have not been feasible with a much larger sample.
- At the time interviews were conducted with key informants, mainly the input suppliers, many of them were not available due to the fact that it was peak input sales time (October) and so they were very busy doing their sales work. We had to extrapolate data from only 8 businesses, which might affect the validity of the result. Also, we probably should have done KIIs with a few additional institutions like more government extension service representatives and radio station managers; since we did not, this limits our availability to comment on project impacts on the government extension system and radio programming.
- The main quantitative survey used was focused on the MFF participants and focused only on three crops (maize, cowpeas, and pigeon peas). We did not ask farmers more generally about CSA practices that they might have applied to other crops, and we did not deliberately sample farmers to ask about some key technologies like mobile corrals or vermicompost, and we did not collect independent MEL data on quantitative results from VSLAs, like number of members, amount of loans distributed or small businesses supported. Also, though there was a small quantitative survey to measure land area and yield of the distributed root crops, we did not ask in either those surveys or in the FGDs directly about farmer's opinions about the impact of these crops. As a result, we are not able to fully comment on the impacts of some of these interventions. Even the women's empowerment index questions were only asked on the MFF participant survey, not on the root crop survey, even though root crop recipients were the highest proportion of those served in the final year, so it might not be representative of the full population.
- All the data collected for this final evaluation, both in quantitative surveys and qualitative interviews, focused on Manica and Safala provinces because those were the key target areas for the final years of the project. However, we had to extrapolate some of that data to participants across the full 6 years and full area served by RAMA-BC, including Tete province, in order to generate LOP totals, which may have led to some biased results. Also, the numbers in the baseline and midterm evaluations to which we compare our final evaluation results were drawn from samples in Manica and Tete provinces, so is it not fully accurate to compare them. In our analysis we tried to compensate for this limitation by comparing the treatment vs. control results from our final data collection, since both of those took place in the Manica and Safala provinces, and so the control group is in a way a more representative "baseline" for the areas served in the final years of the project.

FINAL EVALUATION FINDINGS

MAJOR OUTPUTS OF THE PROJECT

Farmers Served

RAMA-BC, through its activities, reached 41,409 participants in its entirety during the lifetime of the project, across the 3 provinces (Manica, Sofala and Tete) of implementation. The project managed to reach more participants in Sofala (23,788) in relation to the other provinces, due to the fact that in Sofala a large part of the beneficiaries were producers who received cuttings of cassava and sweet potato, which was a less intensive intervention that could more easily be extended to larger numbers of people. In the case of Tete, where the number of participants is notable low (4,027), this is due to the fact that the project lasted only two agricultural seasons, with implementation discontinued in this province for strategic reasons; that is, after Cyclone Idai disproportionally damaged Safala province, RAMA-BC leadership decided to pivot to support farmers there who were suffering severely from the effects of climate change.

Table 6: Number of Beneficiaries by Province, Sex and Age

Province	Beneficiaries by sex		Beneficiaries by Age		Total
	Male	Female	15-29	30+	
Manica	7,270	6,324	4,842	8,752	13,594
Safala	11,208	12,580	4,908	18,880	23,788
Tete	1,977	2,050	1,327	2,700	4,027
Total	**20,455**	**20,954**	**11,077**	**30,332**	**41,409**

Table 7: Type of beneficiary

Type of beneficiaries	Number of beneficiaries
Producer	38,325
Private companies	586
Civil Society (Students)	2,054
Government	444
Total	**41,409**

As shown in the table above, most of the project participants were producers (38,325 or 93% of the total). This included those who benefited from training and demonstrations on CSA practices at MFFs, those who received cassava and/or sweet potato cuttings, members of VSLA groups, participants in gender and nutrition activities, and those who tested mobile corrals with support of the project. The project also reached students from RAMA-BC partner educational institutions, and employees and owners of seed companies that were partners in the project, animal breeders, and government through training in CSA agricultural practices, animal husbandry and corral management. furniture, and business.

Companies Served

The project worked with 62 companies throughout its implementation, supporting technical assistance such as training in marketing, business planning, stock management, sales registration and other business-related matters. Most assisted companies (44) were located in the province of Manica where the project implemented its activities across all 6 years. Sofala province had the fewest companies supported by the project, due to the fact that there were several climatic events and there were several emergency projects donating seeds to small producers, which made it difficult for seed companies to stay in this region. As an example, Venture37 implemented its emergency project MIRAR in the province of Sofala, in the same districts where RAMA-BC was implementing its activities.

Table 8: Total companies served by province

Province	Companies served
Manica	44
Sofala	3
Tete	15
Total	**62**

The majority of the companies (57) working with RAMA-BC received technical assistance, including training in CSA and how to integrate it into their work, facilitated partnerships to acquire improved seed or other CSA inputs, and training to improve business planning and practices. RAMA-BC also supported 5 companies by granting grants to establish Model Family Farms so that these companies could market their seeds while demonstrating CSA agricultural practices for small producers. In total the project awarded US $78,285 for these small projects.

Table 9: Total companies served by type of support received

Type of support received	Companies	Value granted (USD)
Technical assistance	57	
Grant beneficiary	5	$78,285
Total	62	$78,285

Total number of events

Throughout the life of the project, a total of 2,192 awareness events were carried out, through radio programs, radio spots, community dialogues, lectures, cooking demonstrations, video projections, posters and field days. These events were aimed at raising people's awareness of the various approaches promoted by the project and thus contributing to behavior change.

The province of Manica (1,371) presented more events than the others because implementation occurred there across all 6 years, and because there are more districts in Manica than in the other provinces, and the events are implemented by district. The province of Tete (227) had the lowest number of events due to the fact that it had less time to implement project activities and also contains fewer districts.

Table 10: Number of Awareness Events by Province

Province	Number of events
Sofala	594
Tete	227
Manica	1,371
Total	**2,192**

Project Indicator Table Results

Table 11 below shows the life of project indicator targets compared to actual achievements. Most indicator targets were achieved, with many far exceeded. One exception was indicator #8 on women's decision making; only a 23% increase was achieved in the index measuring this variable, 77% of the target increase of 30%.

The other exception was for #6, total hectares under improved practices, which only reached 25,900 ha by the final year of the project, versus the 42,474 ha target (61% achievement). The difference here is partially due to the fact that in later years of the project the list of improved practices that farmers were asked about and which counted on this indicator was shortened (to focus on the main practices emphasized by RAMA-BC) compared to baseline, which was used to set the targets. It is also worth emphasizing that the 25,900 ha total is the estimated hectares adopted in the 2021-2022 season only, it is not a sum across all years; if the hectares adopted each year were sum then the total would be 94,828 ha and far outweigh the target.

The results for these indicators will be discussed in more detail in some of the following questions, which will go through the findings by key evaluation question. Full results including disaggregates can also be found in Annex 1.

Table 11: Project Indicator Life of Project Targets vs. Results					
	Indicator		**LOP Target**	**LOP Actual**	**% target achieved**
1	(EG.3.2-24) Number of individuals in the agriculture system who have applied improved management practices or technologies with USG assistance		$5,229,309	$19,679,098	376%
2	(EG.3-10,11,12) Yield of targeted agricultural commodities among program participants with USG assistance	Pigeon pea	0.15	1.37	913%
		Cowpea	0.42	0.9	214%
		Maize	1.5	3.09	206%
3	Percentage of farmers that can accurately recite improved techniques and technologies		87%	96%	110%
4	(EG.3.2-24) Number of individuals in the agriculture system who have applied improved management practices or technologies with USG assistance		24,600	37,642	153%
5	(EG.3.2-28) Number of hectares under improved management practices or technologies that promote climate risk reduction and / or natural resources management with USG assistance		16,758	22,653	135%
6	(EG.3.2-25) Number of hectares under improved management practices or technologies with USG assistance.		42,474	25,900	61%
7	(EG.3.1-14)Value of new USG commitments and private sector investment leveraged by the USG to support food security and nutrition		$65,430	$248,674	380%
8	Percentage increase in women's decision-making index over household decisions related to agriculture and income use		30%	23%	77%
9	Number of events held for the awareness and market information campaign		1,654	2,192	133%
10	(EG.3-2) Number of individuals participating in USG food security programs		28,894	41,409	143%
11	Number of for-profit private enterprises, producer organizations, water user associations, women's groups, trade and business associations, and CBOs receiving USG food security-related organization development assistance		61	62	102%

IMPACT ON FARMERS

Relevance of RAMA-BC Activities to Farmer Needs

The baseline evaluation found that 93% of target farmers were already being affected by climate change, particularly droughts and irregularity of rains, while only 48% of them were aware of climate change, and only 30% of them were aware of CSA practices to adapt to the effects of climate change. Thus, bringing the farmers knowledge of the effects of climate change and deliberate CSA practices that they could do to adapt to its effects was highly relevant to farmers.

The baseline also shows that only 13% of the target farmers were in savings groups and only 7% had savings in banks, whereas 75% saved at home and 15% said they did not manage to save any money. Thus, the work that RAMA-BC did to establish VSLAs was highly relevant to the farmers. This was reflected in their statements from the FGDs; In 12 out of 15 FGDs the participants said they RAMA-BC had formed a VSLA in their community. In all of those the participants said that most of them had joined and that they found it very helpful to access small loans and to ensure they made savings. All said that they would stay active members of the VSLA after RAMA-BC ended.

Analysis of the KIIs with educational, research and government institutions showed that they thought the biggest needs of farmers were: technical assistance or extension to teach them good agricultural practices including CSA (6/9 KIIs), access to improved seed (5/9), access to other inputs (3/9), irrigation materials (1/9) and market access (1/9). This did tend to match with the focus areas of RAMA-BC, which were most heavily on increasing farmer knowledge, followed by increasing access to planting materials for climate-resilient crops and varieties, but did not include much on irrigation or market access.

Analysis of the FGD results shows that the RAMA-BC project brought some solutions very relevant to farmer needs, especially around production and savings access, but did not address their challenges around input access and especially market access as effectively.

The main challenges faced by farmers as mentioned in the FGDs included:

- Production issues: All 15 groups said they had some type of production problem, and all were in come way linked to climate change. 10 mentioned drought, 7 mentioned excessive rain at certain times during the growing season which spoiled the crop, 3 mentioned pests (of which 2 specifically said FAW was the problem), 1 mentioned lack of quality affordable seed, and 2 mentioned high weed pressure
- Marketing issues: 14/15 mentioned this, though 1 group said they had no marketing problems. Of these, 9 groups said that that prices are set by buyers (and they have no negoting power) and are thus unpredictable and usually low, 6 groups that markets are far away and transport is difficult or expensive, and 5 groups that they have trouble finding buyers, especially for their legume crops. Several of the FGDs specifically mentioned that prices were often low because there was an oversupply of certain crops, suggesting that increasing production would not be the only solution for them.

When asked how RAMA-BC helped them to overcome their key challenges, participants in most FGDs focused on how they helped them to better understand and successfully implement CSA practices (13/15) and 3 of those specifically mentioned that the practices helped increase production. Specific practices called out as part of this included: intercropping techniques (4), proper sowing methods (4), soil coverage and organic fertilization practices (3), not burning residues (3), pest control (2). Separate from production, some things mentioned were helping them to access savings through VSLAs (5/15), helping them to access seeds of new crops and varities (4/15) and teaching them that you can actually eat lablab leaves (2/15). Not a single group said that RAMA-BC helped them with market access, which was one of their key challenges, so this seems to be the weakest area of project impact; this also lines up with the fact that we did not observe significant increases in sales per farmer over time due to RAMA-BC. The only positive change related to marketing was that in 1 FGD, that RAMA-BC convinced them not to sell all their legumes as cash crops but to keep some for consumption, and they found this to be a good strategy. It also seems that the goal of increasing farmer access to inputs had only partial success, since so few FGDs mentioned it, and in fact in 1 FGD they specifically said that RAMA did not bring them increased inputs access and they wished that it had.

Only a very small sample of farmers participated in the mobile bovine corral trials (15 through a project with CITT in Manica), so the relevance of this would not have been evident from FGD results. But an analysis of this trial by Universidad Zambeze suggested that this method could also be highly relevant to producers, and KIIs with 3 different institutions also mentioned that is was highly impactful and should be scaled further. Specifically, the Universidad Zambeze study found that using fertilization from the mobile corrals increased yields of maize the same amount (actually, slightly more) compared with using inorganic fertilizer, but that gross margins were much higher ($952 vs. $836) because of lower input costs; this was in addition to improving soil fertility levels and reducing disease rates in the cattle. Unfortunately, no qualitative data was gathered from farmers who participated in the trial, but these results suggested that they would greatly appreciate the ability to increase productivity while reducing input costs both on cattle feed and fertilizer.

The distribution of improved cassava and sweet potato cuttings to farmers, done particularly in Sofala province in the final years of the project, likely was also highly relevant to farmer needs, though we have weak evidence to support this due to flaws in our evaluation methods. In the FGDs, only 2/15 specifically mentioned that they appreciated this service, but it was not explicitly asked about. We still believe the relevance of promotion of these crops was higher than this suggests because outside evidence showed that before RAMA-BC increasing numbers of were producing tubers as a food alternative to maize and rice due to declining cereal yields and because root crops are more tolerant of drought and poor soils, but they were doing this on a small scale and with low-yielding varieties. Thus, RAMA-BC's distribution of high-yielding varieties of these crops was relevant in helping to increase yields and land area under production of the crops. It also contributed to improved dietary diversity and nutrition, particularly since the varieties of sweet potato distribution were orange-fleshed sweet potatoes (OFSP) with high levels of vitamin A. This is very relevant to Mozambique, where two-thirds of children aged 6 to 59 months are deficient in Vitamin A. Also, we believe that the

distribution of these root crops helped to increase women's income and empowerment, since women tend to be the ones selling these crops on the market.

Overall, our evaluation found that the most relevant and appreciated RAMA-BC activities were those which involved increasing farmer awareness of how to increase their soil fertility, resilience to climate change effects, and productivity without the need for outside inputs; this includes intercropping (which increased production, reduced the burden of weeding and helped naturally with pest control, reducing the need to purchase chemical pesticides), minimum tillage and leaving residues in place without burning, soil fertility practices like green manures and mobile corrals (which reduced the need for expensive inorganic fertilizer), proper sowing techniques.

Effects on Adoption

Quantitative Results- % Adoption

Across all of several different methods of analyzing the results, RAMA-BC appears to have had a large and significant effect on the adoption of climate smart agricultural practices.

Table 12 below shows the percent adoption of sampled farmers from the quantitative Monthly Farmer Survey data tool which was used at baseline and across all year of the project. Unfortunately, the precise practices asked about in each survey were slightly different over time, with some practices asked on the baseline and midterm surveys that did not make it onto the final (about irrigation, optimal water use, timely planting and application of inputs), and some on the final which were not asked in previous surveys (row planting, calculated overall CSA practices use). Another confounding factor is that both the baseline and midterm data drew on participants in Manica and Tete provinces, but the final data drew on participants in Manica and Safala provinces. So likely there was an initial difference in Tete vs. Safala that is confounding the results.

But for those practices that were asked on both the baseline and final, there was a clear increase for all, especially for integrated pest management, for which adoption increased from 1% to 56.3% of respondent, then use of permanent ground cover (from 9% to 66.7%) and recommended spacing (from 15% to 75.8%). Use of intercropping went up by over 3 times, and use of both minimum tillage and improved seed more than doubled. The low percent change for "any practice" is due to the fact that the full list of practices considered at baseline was longer than the list considered at final and because of the difference in provinces from baseline to final.

If you look at differences in the program vs. control areas just within the final year survey, the impact on adoption seems dramatically higher. For many of the practices nearly 0% of the control farmers were adopting. This is surprising considering that adoption of these practices for control farmers was higher at both baseline and midterm, which calls into question the way that the survey was conducted—perhaps those control figures

are artificially low. Likely the true % difference in adoption because of the RAMA project lies somewhere in between the two calculations of final vs. baseline and program vs. control.

Table 12: Adoption Impacts for Model Family Farm Participants (maize & legume crops)

Practice	Program Participants			Control farmers		% difference	
	Baseline	Midterm	Final	Midterm	Final	Final vs. baseline	Program vs. control at final
Any practice	94.0%	80.6%	94.4%	44.0%	14.5%	0.4%	551%
Any CSA practice	not calculated	not calculated	90.0%	not calculated	4.6%	can't calculate	1,857%
Improved seed	22.0%	26.0%	52.4%	12.4%	4.6%	138.2%	1,039%
Minimum tillage	26.0%	not asked	70.1%	not asked	0.01%	169.6%	700,900%
Intercropping	13.0%	9.1%	59.7%	6.4%	0.01%	359.2%	596,900%
Row planting	not asked	not asked	74.5%	not asked	0.01%	can't calculate	744,900%
Recommended spacing	15.0%	1.7%	75.8%	0.0%	0.01%	405.3%	757,900%
Permanent ground cover	9.0%	14.8%	66.7%	10.6%	0.01%	641.1%	666,900%
Integrated pest management	1.0%	1.3%	56.3%	0.8%	9.9%	5530.0%	469%
Crop rotation	21.0%	43.1%	34.2%	21.5%	0.01%	62.9%	341,900%

Quantitative Results- Hectares under improved practices per farmer

As shown in Table 13 below, if you just compare the reported hectares under improved practices for the program vs. control farmers in the Final (Year 6) survey, the impact of the RAMA program looks very large, as the difference is 1.06 ha vs. only 0.05 ha for control. Unfortunately, we do not have data broken down in this way from the baseline, though we do have it from the midterm evaluation. Because at the midterm the values for control farmer hectares under improved practices were larger than at baseline, so it is more conservative to use those figures as the basis for

comparison. Even when this is done so, the increases in hectares per farmer under improved practices are very large: over 6 times higher for improved see, permanent ground cover and IPM, and 1.6 times higher across all CSA practices.

Table 13: Changes in Hectares Under Improved Practices Per Farmer

Practice	Midterm survey		Final Year survey		% change	
	Control	Program	Control	Program	Final year program vs. Midterm control	Final vs. Midterm for program
Any CSA	0.403*	1.014*	0.05	1.06	162%	4%
Improved seed	0.06	0.43	0.05	0.44	642%	3%
Minimum tillage	0.27	0.63	0.00	0.74	174%	17%
Intercropping	0.31	0.78	0.00	0.56	81%	-28%
Row planting	0.364*	0.858*	0.00	0.91	150%	6%
Permanent ground cover	0.11	0.29	0.00	0.81	638%	180%
Correct spacing	0.28	0.66	0.00	0.99	254%	50%
IPM	0.08	0.11	0.00	0.61	665%	457%
Crop rotation	0.05	0.25	0.00	0.29	472%	14%

*For "Any CSA" the values were not directly calculated, but we have estimated as the practice with the highest adoption (intercropping) increased by 30% in order to provide some means of comparison. Similarly, "Row planting" has not been explicitly asked about at at midterm, so we assume it to be 30% higher than those applying correct spacing.

Even if you compare the program result for the final versus midterm it suggests that average hectares under adoption increased in the intervening years, especially in IPM (457%) increase and permanent ground cover (180%). This either suggests that those practices were strongly emphasized starting in Year 4, or that there was a difference in how the survey was conducted. However, for intercropping the hectares declined by 28%, likely because of the difference in provinces included in the sample at Midterm (Manica and Tete) vs. at Final (Manica and Safala), and for some other practices there was little change.

Quantitative Results- Disaggregation by Province, Age, and Sex

Table 14 below shows the disaggregation by province as well as age and sex of the farmer participant, for percent adoption, hectares per farmer and percent land area for the different improved practices of interest. Looking at the disaggregates, we see the largest difference by province, with smaller variations by sex and age.

Table 14: Final Year Program Participant Adoption Results by Province, Sex, and Age

Disaggregate category		Any improved practice	Improved seed	Any CSA practice	Min tillage	Inter-cropping	Row planting	Permanent soil cover	Spacing	IPM	Crop rotation
Percent of Farmers Adopting Improved Practices											
Province	**Manica**	99%	48%	98%	85%	66%	77%	72%	83%	61%	36%
	Safala	87%	60%	77%	45%	50%	71%	58%	63%	48%	31%
Sex of participant	**Female**	94%	53%	91%	75%	58%	78%	66%	75%	59%	41%
	Male	94%	51%	89%	65%	61%	71%	68%	76%	53%	27%
Age of participant	**15-29**	100%	45%	97%	79%	61%	76%	64%	88%	64%	33%
	30+	93%	54%	89%	69%	60%	74%	67%	74%	55%	34%
Average Hectares Under Improved Practice per Farmer											
Province	**Manica**	1.04	0.39	1.03	0.83	0.57	0.76	0.90	0.95	0.46	0.31
	Safala	1.37	0.54	1.10	0.61	0.54	1.15	0.68	1.05	0.84	0.24
Sex of participant	**Female**	1.21	0.48	1.11	0.81	0.56	1.02	0.80	1.05	0.76	0.37
	Male	1.11	0.41	1.00	0.66	0.57	0.78	0.82	0.93	0.45	0.19
Age of participant	**15-29**	0.68	0.20	0.62	0.44	0.33	0.52	0.53	0.78	0.34	0.13
	30+	1.24	0.49	1.13	0.78	0.60	0.97	0.85	1.02	0.66	0.31
Average Percent Land Area Under Improved Practices											
Province	**Manica**	81%	38%	80%	79%	54%	69%	67%	80%	48%	29%
	Safala	82%	38%	66%	40%	35%	69%	42%	60%	43%	15%
Sex of participant	**Female**	82%	38%	75%	69%	43%	71%	54%	72%	49%	28%
	Male	81%	38%	74%	60%	52%	67%	62%	72%	43%	19%
Age of participant	**15-29**	72%	38%	69%	72%	50%	69%	61%	87%	49%	24%
	30+	83%	38%	76%	63%	47%	69%	57%	70%	45%	23%

When looking at differences by province, we see that the percent of people adopting nearly every individual practice and overall improved practices is higher in Manica than Safala, by 10-40% points depending on the practice, with an overall average of 21% difference for any CSA practice (98% in Manica vs. 77% in Safala). This is not surprising given that Manica received RAMA project interventions over a longer period of

time (6 years vs. 3 years) and received a higher intensity of interventions (more awareness raising events, more supported seed companies). The only exception to this is that in Safala a higher proportion of people reported adopting improved seed. This likely reflects the fact that the sample of farmers in Safala included proportionally more maize farmers than in Manica (51% vs. 37%) than an actual higher overall adoption of seed. The results for hectares of adoption are a bit more mixed but also generally support this narrative—for several practices the average hectares adopted per farmer is higher in Safala than Manica, but the portion of land under the practices is always the same or higher for Manica. The only reason for the higher ha/farmer numbers in Safala was because total land size under the crops of interest was higher in that province (1.57 ha vs. 1.28 ha).

When looking at differences by sex, we see that women adopted some practices like minimum tillage, row planting, IPM and crop rotation substantially more than men, both in terms of percentage of adopters and proportion of land area adopted. On the other hand, adoption is not significantly higher among men than women for any practices by any of the three measures. This suggests that the RAMA project effects had a slightly larger effect on women; since specifically targeting women was a goal of the project, this suggests the project was somewhat successful in that goal.

When looking at differences by age the story is not as simple. It appears that younger farmers adopted some practices in higher proportions and on a higher percent of their land-- minimum tillage, improved spacing and IPM. On the other hand, a higher portion of older farmers adopted improved seed, though land area under seed was the same for both age groups. This might suggest that youth have higher willingness to try new things or higher energy for labor-intensive practices, while older farmers likely adopt more improved seed because they have more money to afford this expensive input. Interestingly, average land size in hectares was always higher for older farmers than younger, even where the percentage of land was lower, but this is because older farmers own more total land. Also interestingly, a larger portion of younger farmers adopted CSA and general improved practices, but older farmers had a higher proportion of their land area under the practices.

Quantitative Results- Total Adopters & Hectares

Table 15 below shows the indicator results (also presented in the project indicator table in Annex 1) for total smallholder producers' adoption of and hectares under improved practices promoted by RAMA by the final year of the project. The figures for cowpeas, pigeon peas and maize come from the same monthly farmer survey for which results are shown above, multiplied by the total unique participants in the model family farm program until year 6. But for the sweet potato and cassava numbers, as well as the overall figures by practice and demographic category, this also includes farmers who adopted improved sweet potato and cassava cuttings when RAMA distributed those (mostly in year 6).

Table 15: Total Adoption Indicator Results for Smallholder Producers

Disaggregation	Adopters of improved practices	Number of hectares under improved practices
TOTAL	**37,396**	**23,484**
Male	17,928	10,519
Female	19,372	12,965
15-29	9,083	4,211
30+	28,216	19,273
Maize	8,675	12,899
Cowpeas	5,746	4,039
Pigeon Peas	5,313	5,708
Sweet potato	9,264	472
Cassava	8,136	366
Crop genetics	28,118	9,248
Cultural practices	19,804	22,358
Pest and disease management	12,037	11,786
Soil related fertility and conservation	13,837	15,931
Any Climate Smart Ag	36,492	21,369

As can be seen here, there were a higher number of total female adopters than male adopters, and substantially more of the older farmer adopters than the young farmers. Both of these figures are driven by the higher proportions of women and older farmers who participated in the project. For crop, the highest number of adopters were those with sweet potato improved cuttings, and cassava is also rather high, but those both have very low numbers of hectares adopted, as the land area planted to those crops is very low. By far the highest crop in terms of hectares under improved practices, with over half the total hectares at 12,899. This make since, as maize is the most important crop economically across most of the served area. The results also show that overall 36,492 RAMA participants adopted improved CSA practices, across 21,369 ha of land. There was some adoption outside of CSA practices (i.e. of some improved cultural practices that we did not count in this category, like row planting and crop rotation) but as expected because of the CSA-focus of RAMA, the vast majority of adopters and land under improved practices fits into the CSA categorization.

Qualitative Results on Adoption

In 2021 the independent contracted firm MozTarget conducted focus group discussions with 55 farmers in two different districts—Barue in Manica province and Buzi in Safala province-- in which they asked detailed questions about adoption of CSA practices promoted by RAMA-BC. The findings of that survey, shown in Table Z below, were generally in line with the findings of the quantitative survey shown above, with a few exceptions. For example, this qualitative data shows a major adoption gap between Barue and Buzi (which can proxy for Manica and Safala provinces), which is also seen in the final quantitative data. Percentages overall for minimum tillage and improved seed adoption are general identical between the qualitative and quantitative results. But the percent reported adoption is almost double for row planting and 13 times higher for integrated pest management in the quantitative data. This might be explained by the additional year of project activities between data collection periods or the geographic differences in the sample, but more likely the way that IPM (and possibly row planting) was interpreted in the quantitative survey was broader than in this qualitative survey. On the other hand, intercropping adoption is much higher in these qualitative results than in the quantitative results. Here is it possible that the difference is due to the fact that this qualitative survey asked about any crops at all, while the quantitative survey focused on particular crops per farmer (maize, cowpea or pigeon pea) that were related to the Model Family Farm plots.

Generally, this suggest that the real impact on intercropping adoption may have been higher than suggested by the quantitative results, but that the effect on IPM was likely exaggerated.

Table 16: Adoption of CSA practices by FGD Participants in 2021 MozTarget Adoption Study

District	Intercropping	Minimum tillage	Improved seeds	Stop burning	Row planting	Living ground cover	Ground mulch	Integrated pest control
Barue	89%	86%	71%	75%	64%	39%	18%	7%
Buzi	93%	63%	44%	15%	11%	4%	4%	0%
TOTAL	91%	75%	58%	45%	38%	22%	11%	4%

Another secondary source, the IIAM Final Report in 2022, included results of a survey of 354 RAMA participants across 5 districts and found the following in terms of adoption: Minimum tillage is the practice currently used by the largest number of producers (89%), followed by maize and pigeon pea intercropping (88%), residue retention (75%), improved seed (69%), and maize and lab lab intercropping (46%). The practices used by a smaller number of producers are maize and jack bean intercropping (26%) and bio-pesticides (27%). These figures are generally in line with our final evaluation quantitative findings and add additional information, since our survey did not ask about particular intercrop combinations.

Qualitative research (more FGD and KIIs) was also conducted by the RAMA MEL team themselves as part of this final evaluation, with most FGDs conducted in September 2022 and KIIs done in October 2022. The results on adoption from this were not quantified as precisely as in the MozTarget study, but instead the mention of a practice was tallied by FGD and KII, with the following results:

- Generally, most groups said that they adopted techniques like minimum tillage (15/15, though in one they emphasized on only part of the field) and intercropping (15/15 with no reservations) and found these easy, as it actually reduces their labor time (less tillage, less weeding) and cost and can help improve production. Mulch was also mentioned frequently (12/15 groups), but none mentioned having any reservations about it.
- Many groups mentioned specific intercrop techniques and combinations that they learned about and began adopting because of RAMA. That is, many previously did some intercropping, but RAMA taught them how to do it properly with rows and spacing to optimize yields, and taught them about intercropping with new legumes like pigeon pea and lablab which they had never tried before.
- 12/15 groups mentioned adopting row planting with proper spacing, while another said only partially adopted and 2 did not mention it. But a few groups called this one out as one of the more difficult practices.
- While many groups mentioned using improved seed (11/15 with no reservations notes, 2 with some reservations saying part of the field only, or that some could not afford) and 2 said they did not adopt. Even among the adopting groups several mentioned that there was often a barrier for some farmers to afford the improved seed.
- Practices which groups mentioned adopting less frequently included: green manures/living cover (7/15 groups), biological pest control (8/15). A few (4/15) mentioned not burning their residues.
- The practice adopted the very least (only mentioned in 1/15 groups) was "ideal planting date." One group went so far as to note that there is no ideal planting date, that this is impossible to know because of climate change. No explicit information was asked about access to or use of weather data shared by RAMA (to help determine new ideal planting date), but the fact that no farmers mentioned it suggests that no or very few farmers received it.

Effects on Yields

Quantitative Results- Yields:

As shown in Table 17, the results of the final year quantitative survey suggest a significant increase in yields from baseline to final, as well as for program vs. control in the final year survey, for all key targeted crops. Actually, in contrast to the results for adoption, the program vs. control at final comparison here actually gives more conservative results than the program final vs. baseline comparison. Final year yields are even higher than that of midterm yields, but this is likely due to unfavorable weather conditions in the mid-term year. The comparison of final to previous years is also confounded by the fact that the provinces in the survey were not the same over time.

Table 17: Yields (tons/ha) of selected crops

Crop	Results Over Time					% Difference	
	Baseline	Midterm Control	Midterm Program	Final Control	Final program	Program vs. Control at Final	Program Final vs. Baseline
Maize	1.09	0.49	0.55	1.78	3.09	74%	183%
Pigeon Pea	0.39	0.66	0.46	0.82	1.37	67%	251%
Cowpea	0.37	0.17	0.25	0.74	0.9	22%	143%
Sweet potato	n/a	n/a	n/a	4.4	8.5	93%	can't calculate
Cassava	n/a	n/a	n/a	17.97	46.55	159%	can't calculate

The program vs. control comparison in the final year is likely the most accurate representation of the yield impact of RAMA (as it holds constant the survey methodology, geographic areas surveyed and the seasonal weather conditions), and it suggest that RAMA-BC helped bring about a 74% increase in maize yields, 67% in pigeon pea yield and 22% in cowpea yields.

Sweet potato and cassava yield data came from a different source which presented the average local yields of these crops vs. the average yields for the improved varieties that were distributed to farmers. This suggests RAMA-BC helped to increase sweet potato yields by 93% and cassava yields by 159%.

Quantitative Results- Yields Disaggregated by Province, Sex, and Age

Table 18 below shows the average yields for cowpea, maize and pigeon pea from the monthly farmer survey taken on MFF participants in the final year of the project, disaggregated by sex, age and province. It shows that there were significant differences in the yield impacts for some of these groups the impact per crop was still positive for all disaggregate groups, with one exception (cowpeas for women, which saw no change)

Most dramatically, the yield increases for 18-29 year olds were much higher (134-228%) than that of 30+ year olds (51-62%) on average. This was probably due largely to the fact that the younger control farmers had much lower yields, so there was more room for improvement, but might also have been because younger farmers applied CSA practices in higher proportions.

For sex, we see that the relative impact varied by crop. Women in the program had lower cowpea yields than men, and their apparent impact vs. the control group was negative (statistically zero), whereas men in the program had 62% higher yields than the control. Pigeon pea yield differences for program vs. control were also larger for women (+98%) versus men (+46%), but program women still had lower yields than men. And by

contrast, women in the program had higher maize yields than men, but actually a lower percent change versus the control (+54% for women vs. +82% for men).

When looking by province, we see that Safala had higher yields for both legume crops and lower yields fo maize than Manica, both for program and control farmers. But each province generally saw a higher proportional increase for program vs. control for the crops in which their baseline yields were lower—Safala saw the larger increase for maize (+112% vs. only +62% for Safala), while Manica had the larger increase for Pigeon pea (+101% vs. 46% for Safala). The cowpea yield change was very similar for both provinces (+16% and +26%).

Table 18: Disaggregated Yield Differences for Program vs. Control Farmers in Final Year

Disaggregate		Program			Control			% Change Program vs. Control		
		Cowpea	Maize	Pigeon pea	Cowpea	Maize	Pigeon pea	Cowpea	Maize	Pigeon pea
Province	Manica	0.64	3.43	1.18	0.55	2.12	0.59	16%	62%	101%
	Safala	1.66	2.52	1.87	1.32	1.19	1.28	26%	112%	46%
Sex	Female	0.87	3.13	1.52	0.88	2.03	0.76	-2%	54%	98%
	Male	1.05	2.90	1.31	0.65	1.59	0.87	62%	82%	51%
Age group	18-29	0.69	3.45	1.14	0.29	1.33	0.35	134%	159%	228%
	30+	0.98	2.95	1.47	0.77	1.81	0.87	27%	63%	70%

Qualitative & Secondary Source Results- Yields:

Qualitative findings from the 15 FGDs conducted as part of this final evaluation also substantiate the finding that RAMA helped to contribute to higher yields by increasing adoption of various improved practices. Every single group mentioned seeing yield improvements from their improved practices, though a few noted that the yield impact might was lower or unclear for pigeon pea because you start harvesting it when it is still green and then over a long period, or because it is attacked by rodent pests. Unfortunately, very few gave any clear details on numerical improvement per crop.

When asked about yields, some groups emphasized which practices they observed leading to increased yields. Out of the 15 groups, 8 of them mentioned improved planting methods (row planting, lower seed rate, fewer seeds per hole), 4 of them mentioned cover/cover crops, 1

mentioned minimum tillage and 1 mentioned improved seed. This does not necessarily represent the reality the practices' contributions to yield increases; we would expect that improved seed would have a much higher contribution, so this is a bit surprising. However, it might be that improved planting got the most attention because more farmers adopted it due to RAMA and were surprised by the significant improvements that they saw.

A few other secondary sources do make efforts to estimate the yield impact of different CSA practices.

IIAM wrote a report in 2022 that shared the results of an intercropping trial conducted on the demonstration plots (CDRs) that they helped to implement. Those plots tested the yield impact of three different legume intercrops with maize in two different communities, in Barue and Nhamatanda districts. The results, seen in Table 19 below, shows a substantial benefit of intercropping on maize yields (+11-26% over the maize-only control) and an even larger increase in total yields on the plot with both crops (+68-84%).

Table 19: Maize and Legume Intercrop Yields from IIAM Trials in 2 Districts (Barué and Nhamatanda) 2020/21 - 2021/22 Season

Intercrop configuration	Maize yield (tons/ha)	% Maize yield change vs. control	Intercrop yield (tons/ha)	Total (Maize + intercrop) kg/ha	% Total yield Increase vs. control
Maize + Jackbean	3.61	+24%	1.74	5.35	+84%
Maize + pigeon pea	3.23	+11%	1.79	5.02	+73%
Maize + Lab- lab	3.67	+26%	1.24	4.91	+68%
Control (maize only)	2.91	--	0	2.91	0%

These trials also found that one reason for increased yields was that intercropping reduced weed pressure. A greater number of weeds was found in the control treatment, with 79 species, and a smaller number was observed in the associated treatments. When the live cover plants reached a shading capacity of 66.8% (Jack bean), 56.7% (pigeon pea) and 39.7% (Lab lab), their efficiency in controlling weeds was above 65% in relation to the control. In addition to contributing to yield increases, this weed control also reduced the labor burden and cost for farmers of weed control work.

Other evidence shows that these yield boosts are also partially the result of increased nutrient levels in the soil due to intercropping with legume. ISPM conducted soil analysis of the soil under the various maize-legume intercrop combination versus a maize monocrop in October 2022, taking

40 samples from 8 intercropping trials in 3 districts of Manica and Safala provinces. Result are shown in Table 20, below. Overall the largest effect was on nitrogen level in the soil, which increased by 84% on average for all intercrops, though lab lab had the largest effect. Phosphorous levels also increased by a sizeable 34% with intercrops, and this was highest with jackbean.

Table 20: ISPM Soil Analysis Results from intercropped demo plots

Treatment	Organic Matter %	Ph	N mg/kg	P mg/kg
Conventional	0.70	6.21	9.61	26.87
Maize + lablab	0.75	6.18	77.68	30.76
Maize + pigeon pea	0.73	6.04	65.39	45.93
Maize + jackbean	0.65	6.18	62.63	52.92
Outside field	0.65	5.99	12.69	29.96
All intercrops	**0.71**	**6.13**	**68.57**	**43.21**
All conventional	**0.68**	**6.10**	**11.15**	**28.42**
% difference	**5%**	**1%**	**84%**	**34%**

In addition to the yields changes estimated above, which were generated by the general promotion of intercropping, improved seed, minimum tillage and other standard CSA practices, we also have estimates of the productivity impacts of mobile livestock corrals, which RAMA supported mostly at the research level and at scale-up to just 15 farmers. A study by a researcher at Universidad Zambeze, completed in 2022, estimated the impact of these pens. The study involved a controlled test of no fertilization, inorganic fertilizer, and organic fertilization from cow manure from mobile corrals in 2 locations (FEARN in Chimoio and RAMA-BC observational area near Vanduzi city. Yields were statistically the same for the corral treatment and the inorganic fertilizer treatment at 5.2 tons/ha, 88% higher than the 3 tons/ha for the control.

Effects on Sales

Quantitative Results- Sales:

Table 21 below shows the comparison of calculated average sales per crop, as calculated using data from the “monthly farmer data collection” survey. Data was not collected on sales for sweet potato and cassava recipients, so those are omitted here.

One would expect that with higher yields there would also be higher sales, but there seems to potentially have been a misalignment in how this question was measured year to year, which makes this difficult to analyze. In the final survey analysis, this was calculated as the kg sold times the price earned per kg, if the farmer reported selling the crop in the month prior to the survey. It is likely that this does not represent the full value of sales for the full year, since sales of many crops happen over several different months. This evaluator was not aware of how baseline sales were calculated, but it suspected that they represent a longer period of time, which is they are higher than the final year sales for all crops. A more accurate comparison should be with the midterm sales, and the midterm report suggest that it use the same calculation methodology. However, even using this metric we see a decrease in sales for the 2 legume crops and only maize has an increase (of 105%). This is surprising and likely indicates some kind of an error, given that yields were higher for all 3 crops in the final data than in the midterm data.

Given these confusing results, it is likely more accurate to use the difference between program vs. control in the final year survey to estimate the impact of RAMA on sales. This suggests that maize sales increased by 373%, pigeon pea by 26% and cowpea by 32%. It is interesting to note that while the yield and sales increases for cowpea are fairly similar, the yield increase for pigeon pea is much higher than that of sales (perhaps because most pigeon pea is consumed and not sold, or a mismatch in timing of sales for pigeon pea vs. when the survey was conducted). On the other hand, for maize the yield increase is much lower than the sales increase. This could indicate that where yields are lower the farmers are selling very little because they still are barely reaching household demand, so with the 74% increase in yields they generated a surplus and were able to sell a large amount of that for the first time, leading to the 374% increase in sales.

Table 21: Comparison of Average Sales (USD) for those who sold each crop

Crop	Sales (USD)/farmer					% Difference	
	Baseline	Midterm Control	Midterm Program	Final Control	Final program	Program vs. Control at Final	Program Final vs. Midterm
Maize	$201	$71.40	$64.17	$27.81	$131.41	373%	105%
Pigeon Pea	$55	no data	$18.77	$13.72	$17.33	26%	-8%
Cowpea	$79	$32.19	$27	$9.34	$12.36	32%	-54%

Quantitative Results- Sales Disaggregated by Province, Sex and Age:

Table 22 below shows the money earned in sales per farmer who sold each crop for program and control, and the comparison between them, disaggregated by province, sex and age group.

Results by province show that there was a significant measured impact on sales per farmer in Manica for cowpea and maize, but it was actually negative in Safala. As for pigeon pea, no one sold in Safala so the difference for program vs. control could not be calculated, and it was slightly negative (statistically no difference) for Manica.

Results by sex show that women saw a much higher apparent impact on sales for cowpea than men (in fact, it was slightly negative for men) but lower for maize and pigeon pea (with the pigeon pea difference negative for women). The maize sales impact was positive for both sexes, though, at a respectable +129% for women but a massive +678% for men.

Results by age show that young farmers had a proportionally higher increase for program vs. control for cowpea, but a lower one for maize, though both were positive and large for maize. Similar to the results by province, pigeon pea sales results showed that no young farmers sold it, and for those 30+ the average sales difference was negative.

All of these disaggregate results are somewhat untrustworthy and inconclusive because they were calculated on a very small sample size (especially for pigeon pea) since only those who actually sold any of the crop were included in the calculations.

Table 22: Disaggregated Average Sales (USD) for those who sold each crop in final year

Disaggregate		Program Sales (USD)/farmer			Control Sales (USD)/farmer			% Difference Program vs. Control		
		Cowpea	Maize	Pigeon Pea	Cowpea	Maize	Pigeon Pea	Cowpea	Maize	Pigeon Pea
Province	Manica	$17.98	$182.72	$17.33	$9.77	$34.01	$18.76	84%	437%	-8%
	Safala	$3.94	$9.04	No sales	$8.32	$15.42	$7.68	-53%	-41%	can't calculate
Sex	Female	$16.10	$74.48	$14.01	$7.74	$32.55	$17.28	108%	129%	-19%
	Male	$9.30	$193.76	$22.32	$10.40	$24.90	$9.45	-11%	678%	136%
Age	15-29	$15.60	$375.80	$35.08	$7.02	$137.28	No sales	122%	174%	can't calculate
	30+	$11.79	$100.07	$10.88	$9.91	$22.34	$13.72	19%	348%	-21%

Qualitative Results- Sales:

As mentioned above in the section on relevance, there was no evidence from FGDs that suggested the project helped at all with market access or with increases in sales. And the fact that in several FGDs participants mentioned that prices are low often precisely when production is high suggests that the increases in yields brought about by RAMA-BC did not necessarily lead to increased sales. Unfortunately, this topic was not explicitly discussed in any of the FGDs or KIIs, so we cannot make any very solid conclusions about it. Generally, we have to conclude based on the limited information we have from the FGDs and the mixed quantitative results that RAMA-BC did not have a major impact on sales, and that this was one of its weak areas.

On the other hand, we also have weak evidence to suggest that farmers may have increased their profits because of RAMA-BC, primarily by reducing their costs; we did not collect any quantitative data on this from farmers themselves, but in several FGDs the participants mentioned how RAMA-BC helped them to do practices which saved them labor time or costs on external inputs like inorganic fertilizer. Also, in the Universidad Zambeze study on mobile corrals for cattle, they calculated that mobile corrals had a very high gross margin value (61,423 MNZ or $952), versus (53,968 MNZ, or $836) for inorganic fertilization, due to cost savings from not purchasing expensive chemical fertilizer. Unfortunately, this practice was not scaled up to a large number of farmers during the life of the project.

Effects on Women's Empowerment

The primary way that the project measured its effect on women's empowerment was through changes in the women's decision-making index. In the survey, respondents were asked about whether women had any involvement in decision making, with the choices of 1) no involvement; 2) consulted, but not involved in the final decision; or 3) joint or final decision-maker. Decisions asked about included:

- Inputs bought for crop production;
- Crop type to grow;
- Technologies and practices to use in the production and harvest of crops;
- Use of income from sale of crops.

The index is a scale of 0 to 1. Each decision was weighted uniformly (0.25) and if women make decisions totally or jointly, they would receive the total value; if they were consulted, they would receive ½ the value (0.125); and if they were not involved at all, they would receive a 0.

Findings generally showed an increase in this score over time, suggesting women's decision making power improved somewhat: it increased 23% overall from baseline to final, and 15% specifically in Manica province, which had data across all periods. When comparing the program vs. control group scores just in the final year, the apparent increase was even higher: 37% overall, with major difference by province-- 31% in Manica and 51% in Safala. This larger gap in Safala might be related to the fact that the major RAMA-BC intervention in that province in the final 2 years of the project was root crop improved cutting distributions, an intervention primarily targeted at women. Given that Safala was not

included in the baseline and perhaps the largest change occurred there, that would explain why they apparent change is larger via this metric than the baseline vs. final metric.

There seems to be a slightly larger increase in women's decision-making power for youth participants in the project. Ironically, those in female headed-household seemed to have a lower sore than those in male-headed households in program areas. This is likely an error, caused by the fact that sex of the HHH was not asked explicitly on the farmer survey, but was derived by matching names to the farmer registration list; it is likely that there were erroneous matches and that the final calculated average is not accurate. The values at midterm are likely more accurate, where the index score is much higher for female headed household in both areas, but is not much different in program vs. control areas, whereas the program does seem to have an impact on women's decision-making in male headed-households

Table 23: Women's Decision Making Index Score Results

Disaggregate group		Baseline	Midterm		Final		% Change	
			Program	Control	Program	Control	Final Program vs. Control	Program Final vs. Baseline
Province	Manica	0.687	0.793	0.773	0.793	0.604	31%	15%
	Safala	not included	not included	not included	0.746	0.494	51%	can't calculate
Sex of HHH	Female	not reported	0.949	0.996	0.749	0.623	20%	can't calculate
	Male	not reported	0.67	0.719	0.838	0.530	58%	can't calculate
Age	15-29	not reported	not calculated	not calculated	0.795	0.542	47%	can't calculate
	30+	not reported	not calculated	not calculated	0.772	0.571	35%	can't calculate
OVERALL		**0.632**	**0.745**	**0.78**	**0.775**	**0.567**	**37%**	**23%**

The fact that women represented a higher proportion of total participants and adopters of improved practices than men, as discussed in earlier sections of this report, also is a positive indication that RAMA-BC was successful in focusing on women. Yield results were less conclusive, but generally showed that women had higher increases than men for some crops but far lower for maize, so the project effect benefitted men disproportionately more than women for this key crop.

In FGDs women and men reported similar answers on questions of CSA knowledge, adoption and yield effects from RAMA-BC, and they all said that women had equal access to project activities and benefits when compared to men. Unfortunately, the FGD questions did not ask women explicitly if they felt more empowered in decision making or any other way because of the project. Participants two different FGDs (in Chingdu and Honda Cruz, in Barue district), mentioned that they found intercropping and living tillage to be easiest for them to adopt, and they reported that it reduced the number of times that they had to weed their fields, which they particularly appreciated since women tend to do more of the weeding work.

Expected Long-term Effects & Sustainability

Based on the results of FGDs and KIIs, the practices promoted by the project which farmers are most likely to continue after the end of the project include: intercropping, minimum tillage, and ground cover (mulch or living cover), and row planting. The most likely legume intercrop that farmers will continue using is pigeon pea, as the familiarity with and market access for it are relatively high, while for jack bean they are not yet familiar with it due to its preparation process and lack of market.

Evidence suggests that VSLA groups will continue even without the project: 12 out of 12 FGS where a VSLA had been formed by RAMA-BC members reported that they would continue the VSLA after the project ended, because they had already seen the benefits of being part of these groups, including helping them to save money and to access small loans (especially women). Though it was not verified by the evaluation team, the program team reported that RAMA-BC supported VSLAs helped to establish 320 women-owned businesses, aided by $137,570 in loans. This might be true, but surprisingly no FGD participants made mention that the VSLAs that they worked with helped them to start businesses.

We have limited evidence about the future of the cassava and sweet potato varieties promulgated by RAMA-BC, because there was not explicit quantitative or qualitative data collected from farmers on this topic. However, some informal conversation with farmers suggested that farmers who have used them in their fields and homes said that they appreciated the varieties because they were drought tolerant, disease resistant, nutritious, and tasty, making them an option attractive. Because of this we think it is likely that the varieties will be saved, multiplied and passed on by those who receive them, thus increasing cultivated areas of these varieties in the future.

At a smaller level, those institutions and farmers who participated in the mobile bovine corral and vermi-composting work indicated that they will continue and expand these without support of RAMA-BC because of the high impacts that they saw in terms of production and cost savings, so we would expect that more and more farmers over time might have access to and adopt these technologies.

IMPACT ON PRIVATE BUSINESS

Relevance of RAMA-BC Activities to Needs of Private Business Partners

From the baseline evaluation, we knew already that the formal seed sector in Mozambique is hampered by fake seeds on the market, lack of trust in agricultural traders by seed companies, and free or subsidized seeds that undermine demand. Seed companies have a great challenge in selling their seeds to small producers, since most of their customers are NGOs and the Government who buy seeds to donate to small producers.

We also directly asked partner companies what their major challenges were in KIIs. The key challenges mentioned included: having difficulty meeting customer demand for some products because of production limitations (4/7 companies said this), though by contrast, some others (2/7 companies) mentioned that weak and inconsistent demand for their products is an issue, lack of access to loans to expand their businesses (3/7), transportation (3/7), fake seed sold by agrodealers that is cheaper than theirs and lower quality but even sometimes use their brand (3/7), and agrodealers who buy their products on credit not paying it back (3/7). One specifically mentioned that they have trouble with adequate demand because farmers do not want to purchase expensive seed, especially since they often get it for free from projects.

RAMA-BC activities addressed most of these challenges. It directly supported on marketing to increase demand, and it helped companies to access basic seed and other inputs to increase their production. It also provided some direct grants to several businesses, which helped them to afford expansion or to improve their transportation access. The project did not directly address the challenges with agrodealers selling fake seed or paying back their loans, but some of the business practice coaching was used to help improve the business practices of agrodealers, which should have indirectly helped with these issues.

In the KIIs the companies were also asked what changes they made specifically because of RAMA. Most of them (6/7) mentioned having business strategies and plans, stock control, accounting systems, and other management best practices before RAMA-BC, but said that they updated, consolidated or improved these practices with RAMA-BC, adopting some of their recommendations and sharing with others including the agrodealer networks they work with to sell inputs. Many (5/7) of them mentioned that CSA training for themselves and their agrodealer networks increased their interest in and improved their ability to market CSA products, and 5/7 also mentioned that RAMA's direct support for marketing, especially through support of field days but also through radio programming and flyers with images, was important for increasing demand and thus sales. Many specifically mentioned Also 5/7 mentioned that RAMA-BC helped them to acquire seed for sale, including of drought tolerant varieties of maize and of legume crops like lab-lab and jack bean, and said that this was helpful in helping them meet the growing demand among producers for these seeds and in increasing their sales. 2/7 mentioned that RAMA helped them to pay for increased human resources like hiring technicians and buying motorcycles to enable field visits.

All companies said that they were aware of RAMA-BC's behavior change marketing campaigns, as they gained new customers who specifically mentioned them. Field days were found to be the most effective marketing tools by almost all key informants (13 mentioned all in positive way), both businesses and other institutions (educational, research, government). Mixed reviews were given for radio (5 positive, 2 negative) and brochures (2 mentioned positive, 1 negative, 2 neutral), and social media was generally not seen as effective (2 mentioned negatively, 1 neutral) because it does not reach most farmers.

RAMA-BC has partnered with some community radios in 11 districts (3 in Sofala, 5 in Manica and 3 in Tete) to spread awareness messages about improved CSA farming practices and other project approaches. We unfortunately did not do any KIIs or quantitative data collection with radio stations, but informal conversations by program staff found that the community radio stations were fully aware of the importance of the RAMA-BC messages for the population and that they would continue the programs broadcast in partnership with RAMA-BC in the future, as these programs had helped them to gain more listeners.

Effects on Sales

Quantitative sales value data from RAMA-BC partner companies were analyzed based on samples of project partner companies and this was extrapolated to the number of companies the project worked with each year/season. Figure 1 below shows the value of sales for each season of project implementation total for all private company partners, whereas Figure 2 shows the average per company partner, which is important to look at since the number of partners varied from year to year. It is notable how these sales grew each season, with the exception of the second agricultural season where sales dropped, particularly per company (in that year there were also the highest number of partners, at 41, versus 25-27 in all other years). It is important to note that in years 1-2 the project was implementing its activities in the provinces of Manica and Tete, while from year 3 onward project dropped Tete province and worked instead in Manica and Sofala provinces.

Sales rose in the 2019-2020 season due to the fact that there was a weather event (Cyclone Idai) in Sofala province and a part of Manica province, where there were many emergency projects donating seeds.

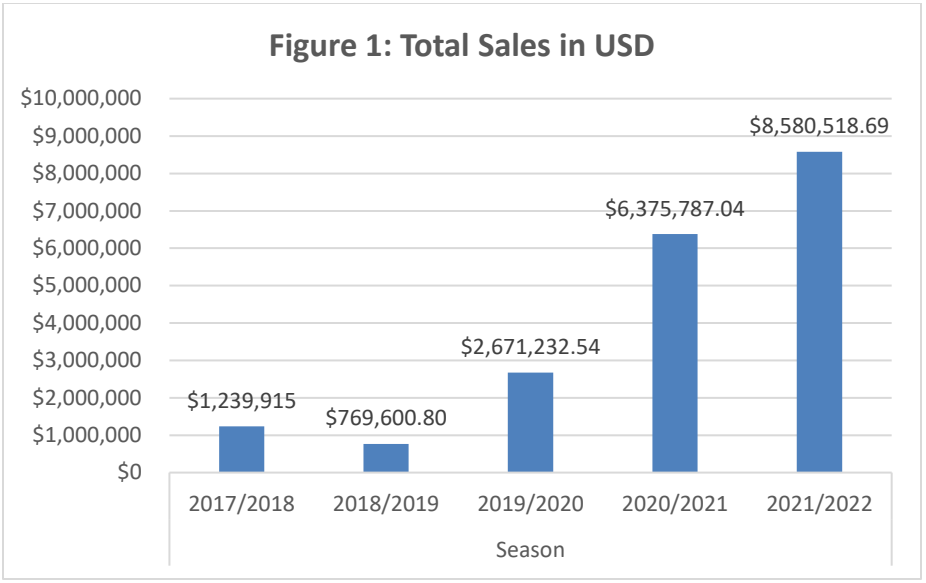


Figure 1: Total Sales in USD
$10,000,000
$9,000,000
$8,000,000
$7,000,000
$6,000,000
$5,000,000
$4,000,000
$3,000,000
$2,000,000
$1,000,000
$0
$1,239,915
$769,600.80
$2,671,232.54
$6,375,787.04
$8,580,518.69
2017/2018
2018/2019
2019/2020
2020/2021
2021/2022
Season

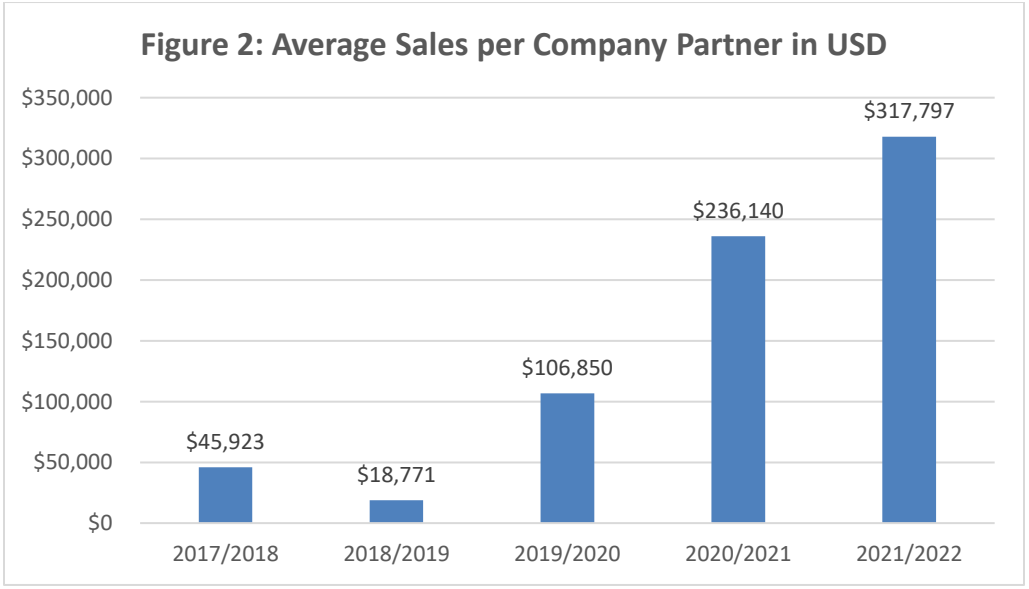


Figure 2: Average Sales per Company Partner in USD
$350,000
$300,000
$250,000
$200,000
$150,000
$100,000
$50,000
$0
$45,923
$18,771
$106,850
$236,140
$317,797
2017/2018
2018/2019
2019/2020
2020/2021
2021/2022

It is unclear how much RAMA-BC contributed to these increases in sales, though through KIIs and other evidence we do know that at least a portion can be directly attributed to the project. The project provided 2,882 packets of intercropped seeds to agro-dealers that were sold for a total of $45,572. These maize and leguminous kits were sold specifically in the province of Manica, in the districts of Barué, Vanduzi, Sussundenga and Chimoio. In KIIs the companies in those areas mentioned that the demand for the intercropping kits was substantial and increased over time, with demand largely created from demonstration fields and field days, plus radio ads and flyers, sponsored by RAMA-BC. The project also measured $1,830 in sales of 122 tons of vermi-compost (this was for companies but also other institutions that sold it), though this clearly did not make up a large portion of total sales in the chart above.

Sustainability and Long-term Impacts on Business

All 7/7 companies interviewed in KIIs said that they would continue the systems and practices that they started with RAMA-BC after the project ended, though many were not that specific about which practices they were referring to. Several companies (4/7) mentioned that they would continue to sell the new legume seed varieties, though one of those (Simao Januario) specified that he would change to selling them separately from maize, not together in a kit with maize and legumes as was done under RAMA-BC. Another partner, Phoenix Seed, is currently cultivating improved varieties of lab lab and jack bean on 300 ha and said that they will continue this in the future without RAMA-BC support.

We also believe evidence shows RAMA-BC successfully introduced vermi-composting as a new product to Mozambique and that production will continue and scale up over time. RAMA-BC supported the private company Café de Manica to make vermi-compost as well as 3 other institutional partners (ADPP, CITT-Barue and ISPM), and all of these organizations said in KIIs they that they plan to continue its production for use on their own land (on coffee plantations in the case of Café de Manica) and for sale to other farmers. Partners specifically praise the vermi-compost because it is natural, easy and cheap to make, can help with waste management (a particular benefit in urban areas where this is a problem), and provides and affordable alternative to conventional inorganic compost which can help to attract many producer clients. It has proven particularly suitable for high-value crops such as coffee and macademia and can be a profitable product especially if produced by a small business.

IMPACT ON EDUCATIONAL, RESEARCH & GOVERMENT INSTITUTIONS

Educational Institutions

Through KIIs, all the Educational Institution partner actors reported that the work done with RAMA_BC support will have lasting impacts in increasing their teaching of CSA practices. Four out of five of these institutions (80%) said that they did not previously have a specific subject on

climate-adapted agriculture in their curriculum, and now they are exclusively using material provided by RAMA-BC as content in its classes to teach its students. All of these 5 institutions have stated that they will continue to use the materials from RAMA-BC (videos and CSA manuals) in their classes.

In KIIs, representatives of three of the five educational institutions (66%) said that the observation units were useful for their students to learn about agricultural practices adapted to the climate through the demonstration fields and field days carried out. These observation units served as a research topic for trainee students to research more about the efficiency of the intercropping to increase maize yield, as well as the efficiency of the intercropping in controlling the fall armyworm. On average, the institutions reported that 300 people (mostly students and teachers, but in some cases members of surrounding communities) attended field days and learned from the demonstrations and trials at the observational unit fields across the life of the project.

Four different institutions reported in KIIs that they sponsored internships related to CSA as part of the RAMA-BC project, with an average of 16 interns per institution. They said that these interns gained knowledge of CSA practices (in particular, worm composting and mobile corrals were mentioned by a few of the institutions) and gained skills that will increase their competitiveness in the job market.

Universidad Zambeze specifically stated that RAMA-BC increased the level of knowledge within their institution on CSA, with the teachers who were linked to the project reaching a higher level of expertise on CSA practices and the students, through the internships, gaining experience to compete in the job market. UniZambeze also said that because of RAMA-BC they will continue and deepen their work on CSA, including with an up-coming webinar on climate change.

ISPM, as another example, stated that because of RAMA-BC they added CSA as a discipline of study. Students at that institution also continue to do research on mobile corrals and worm composting for their dissertations and scientific publications. ISPM also said that they benefitted from their work on vermicomposting in material ways as well, and will continue producing it after RAMA-BC ends, because they use it for the crops they cultivate on site and also sell it for added revenue.

In many partner institutions the curriculum is in the process of being revised to better incorporate CSA as a formal subject matter of study. Those organizations which worked on worm composting said that they will continue even without the project because it helps to reduce costs in the purchase of fertilizers. The Universidad Zambeze said that the mobile cattle corrals project was a good experience and created interest in students to carry out further research based on the use of mobile pens.

Research Institutions

Partnerships with educational institutions and research institutions supported important research related to CSA techniques and practices adapted to the local environment. IIAM supported demonstration plots in communities of different intercrops and measured the results to find out the yield effects, plus conducted surveys of farmers in those communities to learn about their exposure to RAMA-BC work and particularly their opinions about the different intercrops tested in the demo plots. Research with UEM evaluated the effect of cultural methods like planting date and intercropping on maize yield and fall armyworm control, via three different student theses. Universidad Zambeze research focused on the effects of mobile bovine corrals on maize yield, soil fertility and gross margins. RAMA-BC also partnered with the government's agricultural extension service, SDAE, which set up 11 CSA/intercropping demonstration plots of their own for a fifth season, after the RAMA-BC project ended.

In KIIs, all of these institutions said that they were only able to set up these plots and conduct this research because of the support of RAMA-BC, and that they planned to continue working on research on these same topics after the end of the project. For the partners which were both research and educational institutions (Universidad Zambeze, ISPM and UEM), they said that because of the project many students were able to complete their dissertation work, and that they had published several scientific papers.

The main work conducted by UEM with support of RAMA-BC was on environmentally-friendly pest control. One outcome of the research was to find a quantifiable impact of intercropping with legumes on pest control, in particular FAW. One UEM study tested 4 different intercrops vs. monocropped maize, found that intercropping reduced FAW infestation by 6-20% and increased yield/decreased losses. The best effect was seen with maize + jackbean (though pigeon pea was also high and not statistically different than jackbean), with 24.9% infestation only and 2.02 severity and 1.67 tons/ha yields, versus control with 44.6% infestation, 3.48 level severity and yield of 1.04 tons/ha. Another UEM study found that planting at the ideal time can also help reduce pest infection. It tested sowing in 3 different periods (Nov, Dec, Jan) and found the lowest caterpillar infestations were observed in the November sowing (48.3%), causing lower yield losses (8.9 %). Infestation levels were highest with January sowing (95.9%) and this also had highest yield losses (57.1%). They also compared to a treatment with chemical pesticides applied and found that the infestation and losses was similar for November planting without chemicals, so farmers can plant early and avoid losses and save money on chemical application.

With support of RAMA-BC, IIAM conducted research on vermi-composting, minimum tillage, mulch in vegetable,s and intercropping. They sponsored and followed up on results (both measured productivity and farmer opinions) of different maize-legume intercrop combinations. Results of this research are shown earlier in this report and were generally very positive, showing higher maize yields, much higher total yields, and dramatically increased gross margins for intercropping vs. mono-cropped maize. They also found that the "best" intercrop varies by community.

The work which Universidad Zambeze conducted research with support of RAMA-BC that included a study of intercropping sorghum with legumes, demonstration field over various other CSA practices, and a study of mobile bovine corrals on maize yields, compared to inorganic fertilizer (results have already been mentioned earlier in this report).

The ISPM work sponsored by RAMA-BC included work on vermi-composting, mobile bovine corrals, and soil analysis of these practices as well as intercropping. They found a significant impact of intercropping on soil nitrogen (N) and phosphorous (P) levels, as mentioned earlier in this report, shown in Table 20. They also found that vermicompost had 80 times more key macronutrients (N and P, also potassium) than normal soil in Manica province.

The results of the research itself is an important outcome of the RAMA-BC project, as the findings have already begun to be disseminated by partners of RAMA-BC, and they have said in KIIs that they will continue to disseminate these findings in the future.

Biggest Strengths and Weaknesses of RAMA-BC

The following list of key strengths and weaknesses of the project was derived from a triangulation of answers from explicit questions asked on KIIs and FGDs, reports from the RAMA-BC program team, and the quantitative analysis of farmer surveys for which results were shared earlier in this report.

Major Strengths:

- Field demonstrations, field days used for marketing, and practical trainings at model farms or demo plots were very powerful ways to convince farmers and other actors of the value of the CSA practices as well as how to execute them correctly (14 different KIIs mentioned this). Marketing through this method (also combined with radio and flyers, which were somewhat successful) did lead input companies to see an increase in demand for CSA product like drought resistant seeds and maize-legume seed kits.

- Promotion of and training on intercropping, supported by evidence from research trials, helped farmers to increase adoption of this practice but also to execute it in a way that was more successful, with row planting and proper spacing, and to try intercropping with crops that they had not previously, particularly maize-pigeon pea and maize-jack bean. Farmers came to appreciate this form of intercropping as it increased yields but also decreased work on weeding.
- The establishment of VSLAs in many communities was successful, attracting many new members who had not previously been a member of a similar association, and helping them to increase savings and access to loans.
- Worm composting and mobile corrals were found to be very promising innovations by all those who were involved with them, but one partner, SDAE, was disappointed that they were not scaled up to more farmers during the life of the project.

Weaknesses:

Note that our evaluation team unfortunately did not probe deeply on some of the problems reported in KIIs, so some are lacking in detail that would have been useful to acquire.

- The project did not provide specific activities to help farmers to address their problems with market access (finding buyers, but more importantly earning good prices), which meant there was not a measureable increase in sales per farmers because of the project, and by the end many farmers still reported that they could not afford improved seed or other CSA inputs.
- A few partners were disappointed in some aspects of their communication and coordination with RAMA-BC. For example, ADPP said they would have liked to receive regular reports of results, of adoption and other metrics, and wanted RAMA to facilitated visits of their staff to farmers, but this did not happen. The company Emilia Commercial reported that there were some clauses that were foreseen in the MOU and that were not honored in their entirety.
- There were some problems with timing of execution. CITT reported that staff training happened late which caused a delay in activity implementation. ADPP mentioned that cassava cuttings in multiplication fields were apparently planted at the incorrect time, as mentioned by ADPP
- Some planned aspects of the project were not executed due to difficulties including financial limitations. For example, CITT Bandula said their partnership with RAMA did half of what was expected; they had planned an entire project on urban agriculture and backyard vegetable gardens which did not come to fruition. ISPM said that they did not have successful demonstration plots of conservation agriculture/minimum tillage methods as originally intended, also because of lack of financial resources. IIAM said that they would have liked the project to provide more fundings to cover transport of IIAM technicians to field locations.

- A few partners said that RAMA-BC should have done more to promote and market improved (especially short-cycle and drought-tolerant) seed varieties (K2 Company and Agroservice companies), including by sponsoring more field technicians focused on this area and emphasizing varieties more during field days.
- A few partners mentions seed quality issues. For example, the input supplier Ismail Assane reported that they returned some seed kits supplied by K2 and Pheonix with help of RAMA because they were not in the optimal condition and they feared germination would be low. Universidad Zambeze said that the seed varieties chosen for demonstration plots were not very effective.
- Using SMS messaging and social media to promote CSA adoption was deemed by a number of partners as the least effective market method; they said that many rural producers could not be reached via these methods. One (Pheonix seed company) also said they thought radio was not that effective, as some people don't have radios, and they wanted RAMA-BC to do more support for training of agro-dealers in marketing.
- Practices which RAMA-BC promoted but which were not that successful in term of convincing farmers to adopt included: bio-pesticides and IPM (farmers need more awareness to create behavior change), use of compost (farmers were only using on high value crops like vegetables and on small areas), and mobile corrals because the project only sponsored a pilot with few beneficiaries.
- The MEL system did not properly plan to measure some key aspects of the program in a rigorous way, which meant that conclusions on this evaluation are weak in many areas. Data on root crop beneficiary impact was lacking, with low sample size for the area measurement survey and no data on yields in farmer-fields, % of each variety that was distributed and planted, second-season savings per variety, sales of these crops, or farmer qualitative opinions about the cassava and sweet potato materials they received. More direct quantitative and qualitative data should also have been collected on the outputs and outcomes of the radio marketing campaigns, extension service support activities, and VSLAs.

External Factors Affecting RAMA-BC Performance

RAMA-BC aimed to increase the agricultural productivity of smallholders through the use of CSA improved agricultural practices. During its implementation there were some internal and external factors that influenced the achievement of its objectives:

- Mozambique is one of the most vulnerable countries in the world to the effects of climate change, and ironically this situation has actually delayed the adoption of CSA practices, since some degree of stability is required to create a normal adoption curve. Specifically, in the province of Sofala throughout the 3 years of the project, many producers declared that they lost their crops before harvest, preventing them from seeing the benefits of adopting CSA farming practices and techniques taught by RAMA BC, especially in Buzi district. Some Buzi

farmers who were initially project participants ended up dropping out because they were forced to move to safer areas after being affected by heavy rains and winds. This same situation of recurrent losses of the base crop such as maize was fundamental for the adoption of tuber crops such as cassava and sweet potato of improved varieties promoted by RAMA-BC, yet it also made it difficult to gather data on these crops and to generate a cycle of more and more farmers seeing the benefits and adopting over time.

- In some cases, the same farmers divide fields into plots to apply practices recommended by different projects, leading to partial or even slower adoption of CSA practices, despite the relatively high level of awareness and knowledge. This corroborates with the results obtained in which 96% of the producers have knowledge and are aware of the advantages of CSA practices, and 91% of the participants are already applying the same CSA practices, but this is on a relatively low area (25,900 hectares) of land, below the project's target of reaching 42,474 hectares.

CONCLUSIONS

Summary of Key Findings

- The RAMA-BC project seems to have had a significant impact on producer adoption of CSA practices, with 18 times higher adoption of any CSA practice among program participants versus control farmers, and increases of 62% at the lowest to 55 times at the highest for adoption increases of individual measured practices from baseline to final for program participants. Overall, 91% of program farmers had adopted at least one of 5 specific targeted CSA practice prioritized by the project and measured in the survey. This exceeded the project' target by 153%.
- The project also increased land area under improved practices. Total hectares under improved practices was only 61% of the target, at 25,900 ha for 38,325 producers, but this still represented a sizeable increase in ha per farmer under improved practices if you compare program vs. control (an increase of 20 times if you used data from the final survey for the control, +162% if you used mid-term as the control).
- The project also seems to have helped farmers achieve a substantial increase in yields of maize (of 74%-183% depending on the comparison used), cowpeas (67%-251%), and pigeon peas (22%-143%). The yields achieved in the final year of the project all far exceeded the project targets, with 3.09 tons/ha for maize (206% of target), 0.9 tons/ha for cowpea (214% of target), and 1.37 tons/ha for pigeon pea (913% of the target). Yield effects of the root crop distributions are less clear, as limited measurements from multiplication fields suggest increases of the new over local varieties, but no yield data was collected from beneficiary farmer fields.
- The project exceeded its target for sales, but this was largely driven by sales of the private sector. The impact of RAMA-BC on farmer sales was less clear. For maize, when comparing program vs. control sales per farmer there was a 373% increase, and when comparing program final to midterm result there was a 105% increase. However, for cowpea and pigeon pea the program vs. control difference was much smaller (32% and 26%, respectively) and there was a negative difference if program final vs. midterm results were compared (-54% and -8%, respectively). Furthermore, when compared to baseline sales there seemed to be significant declines for all three crops, though this was likely due to a difference in how the sales were measured (what unit, what time period) so we can't make a solid conclusion. But qualitative data, which suggests that low prices are a major problem for farmer and this exacerbated when production is high, and which makes no mention of any

market access and price-bolstering support from RAMA-BC, also supports the conclusion that RAMA-BC had little or no impact on increasing farmer sales.

- The project does seem to have helped its private company partners, particularly the 27 core partners active from year 3 onwards, to increase their sales (by 197% per company on average, from 2019-2020 to 2020-2021), by supporting them with marketing, grants which were used to boost staff or logistical capabilities, and support in acquiring some key inputs. Largely driven by these company sales, total sales of supported farmers and companies was $19,679,098 across LOP, 376% of the project target.
- Access to and adoption of improved seed did increase because of the project, 138% from baseline to final, or 10 times if comparing final program vs. control. However, FGD results suggested that many farmers still were not able to afford improved seed, and it was not among the impacts of the program emphasized by participants. Instead, they tended to emphasize how the project brought them awareness of and technical knowledge on how to implement some key CSA practices that did not require any outside inputs and in fact helped them to reduce their costs while boosting yields and resilience to climate change, including intercropping with legumes, row planting with proper spacing, minimum tillage, and permanent ground cover.
- RAMA-BC led partner institutions to introduce or strengthen their CSA curriculum for students, and to train over 1,500 students on CSA using observational unit demo plots, and to employ 60+ interns on CSA-related work. They also conducted research and pilot projects that would not have occurred without RAMA-BC support. Several very interesting findings came out of this work including measurements of the yield and profitability impacts, as well as the pest control effects, of intercropping, the fact that vermi-compost boosted yields and soil fertility and also could be sold very profitably, and the positive impact of mobile bovine corrals on maize yields and gross margins. All the partner institutions said that they would continue the curriculum changes and a lot of the new CSA research focus after the project ended.
- The project seems to have helped establish VSLAs in many rural communities that did not previously have them, and farmers reported in FGDs that they found them very helpful, were benefiting from increased savings as well as small loan access, and would continue them after the project was over. Unfortunately, the MEL evaluation team did not collect enough quantitative data on the VSLAs to substantiate conclusions about number of beneficiaries, amount of savings or loans or what was done with that money.
- Very little information was collected by the MEL evaluation team directly about the activities related to extension system support. We know only that 444 government employees were registered as taking part in RAMA-BC activities across the life of project, and we have 1 FGD from the SDAE which mentions that they received technical CSA training and shared it with farmers, but we did not collect anything more substantial than that, so it is difficult to make conclusions about impact.

Recommendations for Future Similar Projects

- Use field demonstrations at the community level and practical trainings in the field as the primary marketing tool, as it is the most convincing to producers. Also continue radio campaigns and flyers with images, but avoid, or at least deemphasize, SMS messaging and social media campaigns.
- Do more to scale-up mobile bovine corrals and vermi-composting, as these innovations were found to have substantial impacts. Work to ensure that affordable inputs as well as technical assistance can be available on these methods to more small businesses and producers.

- Disseminate the findings from RAMA-BC on yield impacts of using CSA, and of the particular sponsored research, more widely to a variety of stakeholder, but especially to farmers, to help them better understand the benefits of CSA
- Expand CSA promotion work to more value chains, including doing more to continue and further scale the cassava and OFSP interventions (and to make sure to measure their results rigorously, including studying yields, sales and seed saving in farmer fields), but also adding other crops. Several partners suggested that horticulture crops should be the next top priority. Perennial and tree crops like coffee and agroforestry species should also be emphasized.
- Do more applied research, input access support, and training of farmers for using improved seed, IPM, and crop rotation, as these were the least adopted practices for RAMA-BC program participants. Note that the top barrier for using improved seed is inability to afford it, but for the other two it is more related to lack of knowledge, and adjust project intervention to address these needs.
- Continue to support and expand VSLAs, but also go beyond this and do more to increase farmer incomes through market access programs and interventions to help them increase their prices (cooperatives to boost negotiating power, control farming schemes offering a higher price for higher quality produce, support on transport to access better markets, etc.) to improve their livelihoods and boost their purchasing power of improved seeds and other key inputs.
- Try to support the seed sector to produce and sell (ideally on credit, and at affordable prices, and across a wider geographic area) short-cycle and drought-resistant seed through a market systems approach. Avoid giving away free or heavily subsidized seed, as this hurts the private seed companies and hampers their expansion.
- When working with input suppliers and other private sector businesses, include targeted fostering of key businesses (like multipliers of key seed varieties), more trainings of agrodealers in their network, assistance setting up management systems for agrodealers, facilitate more connections between businesses, offer milestone-based grants to fund expansion.
- Also work to try to introduce and scale irrigation solutions like pumps and drip irrigation, given the problems with drought, and to do more applied research and generate trainings and/or weather forecasting and alert systems for farmers to help them learn the new optimal timing for production in the context of climate change.

ANNEXES

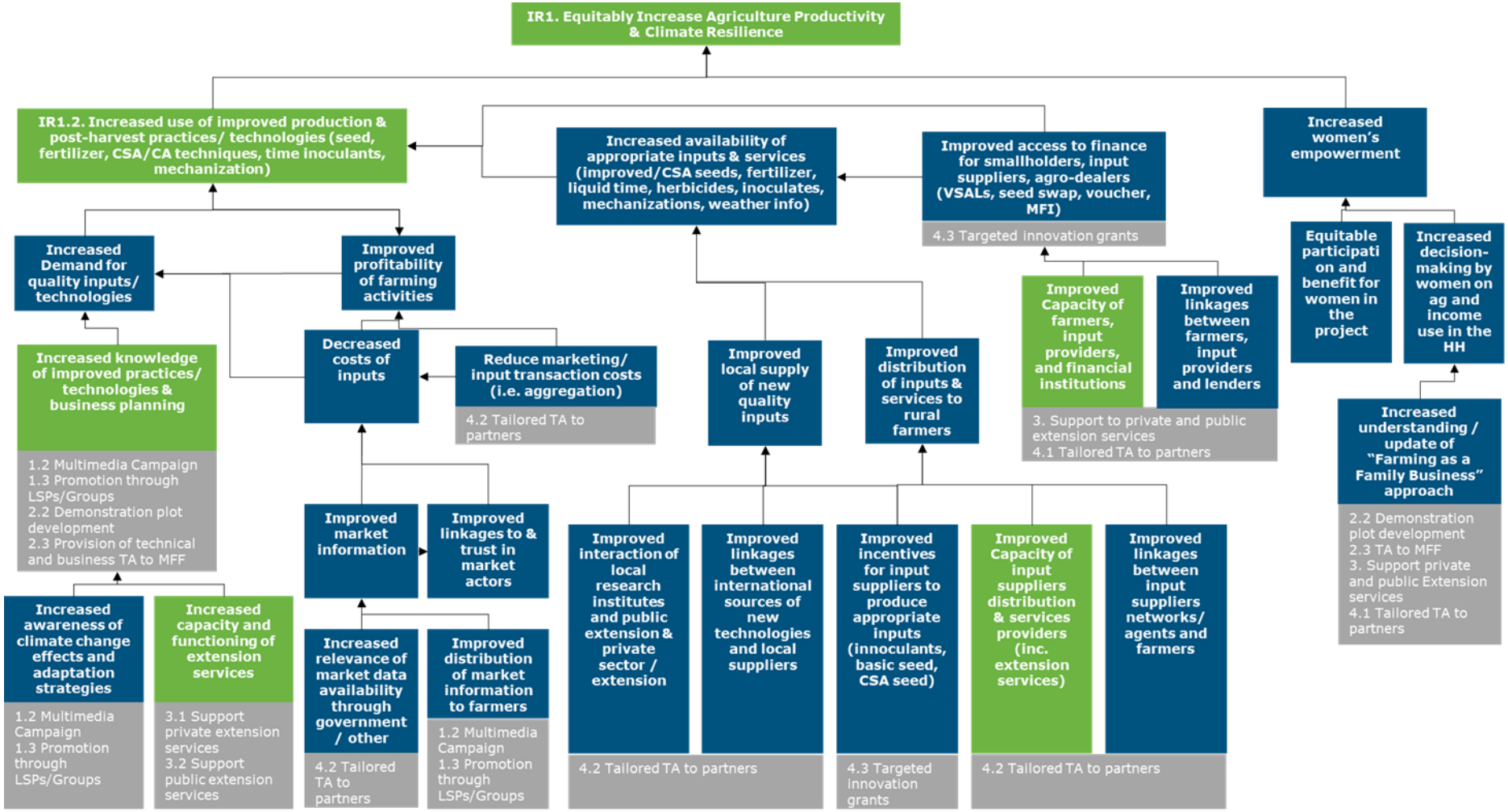
Annex 1: Project Indicator Table

#	Indicator	Unit	Disaggregation [1]			Baseline		Final Evaluation	
						Year	Actual	Year	Actual
1	(EG.3.2-26) Value of sales of farmers and firms receiving USG assistance	USD	Total			2017	$688,141	2022	$19,679,098.38
			Pigeon Peas	Total		2017		2022	$5,367
				Smallholder	Male	2017		2022	$3,966
					Female	2017		2022	$3,406
					15-29	2017		2022	$1,730
					30+	2017		2022	$3,633
			Cowpeas	Total		2017		2022	$3,058
				Smallholder	Male	2017		2022	$2,308
					Female	2017		2022	$1,196
					15-29	2017		2022	$983
					30+	2017		2022	$1,179
			Maize	Total		2017		2022	$33,619
				Smallholder	Male	2017		2022	$16,531
					Female	2017		2022	$17,468
					15-29	2017		2022	$9,134
					30+	2017		2022	$21,732
			Inputs: Seeds and Planting Materials	Total		2017		2022	$19,637,054.07
				Firm Micro	Male	2017		2022	
					Female	2017		2022	
					15-29	2017		2022	
					30+	2017		2022	
2	(EG.3-10,11,12) Yield of targeted agricultural commodities among program participants with USG assistance	MT / HA	Pigeon pea	Total		2017	0.39	2022	1.37
				Smallholder	Male	2017		2022	1.29
					Female	2017		2022	1.45
					15-29	2017		2022	1.14
					30+	2017		2022	1.47
			Cowpeas	Total		2017	0.37	2022	0.9
				Smallholder	Male	2017		2022	1.01
					Female	2017		2022	0.81
					15-29	2017		2022	0.69
					30+	2017		2022	0.98
			Maize	Total		2017	1.02	2022	3.09
				smallholder	Male	2017		2022	2.99
					Female	2017		2022	3.22

					15-29	2017		2022	3.45
					30+	2017		2022	2.92
#	Indicator	Unit	Disaggregation [1]			Baseline		Final Evaluation	
						Year	Actual	Year	Actual
3	Percentage of farmers that can accurately recite improved techniques and technologies	%	Total			2017	49%	2022	96%
			Fri	Male		2017		2022	95%
				Female		2017		2022	96%
			Age	15-29		2017		2022	100%
				30+		2017		2022	95%
4	(EG.3.2-24) Number of individuals in the agriculture system who have applied improved management practices or technologies with USG assistance	#	Total			2017	0	2022	37,642
			Smallholder Producer	Male		2017		2022	17,928
				Female		2017		2022	19,372
				15-29		2017		2022	9,083
				30+		2017		2022	28,216
				Maize		2017		2022	8,675
				Cowpeas		2017		2022	5,746
				Pigeon Peas		2017		2022	5,313
				Sweet potato		2017		2022	9,264
				Cassava		2017		2022	8,136
				Crop Genetics		2017		2022	28,118
				Cultural practices		2017		2022	19,804
				Pest & disease Management		2017		2022	12,037
				Soil fertility and conservation		2017		2022	13,837
				Climate Adaptation		2017		2022	36,492
				Climate Mitigation		2017		2022	36,492
			People in private sector	Male		2017		2022	334
				Female		2017		2022	180
				15-29		2017		2022	195
				30+		2017		2022	319
				Marketing and distribution		2017		2022	
5	(EG.3.2-28) Number of hectares under improved management practices or technologies that promote climate risk reduction and / or natural resources management with USG assistance	#	Total			2017	0	2022	22,653
								2022	
								2022	
								2022	
#	Indicator	Unit	Disaggregation [1]			Baseline		Final Evaluation	
						Year	Actual	Year	Actual
6	(EG.3.2-25) Number of hectares under improved management practices or technologies with USG assistance.	#	Total			2017	0	2022	25,900
			Crop land	Male		2017		2022	12,089

				Female	2017		2022	13,811
				15-29	2017		2022	5,129
				30+	2017		2022	20,771
				Crop genetics	2017		2022	10,380
				Cultural practices	2017		2022	23,642
				Pest and disease management	2017		2022	11,786
				Soil related fertility and conservation	2017		2022	15,931
				Climate mitigation	2017		2022	22,653
				Climate adaptation	2017		2022	22,653
7	(EG.3.1-14) Value of new USG commitments and private sector investment leveraged by the USG to support food security and nutrition	USD	Total		2017	$0	2022	$248,674
			Private sector partner leveraged		2017		2022	$61,955
8	Percentage increase in women's decision-making index over household decisions related to agriculture and income use	%	Total		2017	0%	2022	23%
9	Number of events held for the awareness and market information campaign	#	Total		2017	0	2022	2,192
10	(EG.3-2) Number of individuals participating in USG food security programs	#	Total		2017	0	2022	41,409
			New		2017		2022	41
			Male		2017		2022	20,158
			Female		2017		2022	21,251
			15-29		2017		2022	11,349
			30+		2017		2022	30,060
			People in Government		2017		2022	444
			People in USG assisted firms		2017		2022	586
			People in civil Society		2017		2022	2,054
			Producer: Smallholder		2017		2022	38,325
11	Number of for-profit private enterprises, producer organizations, water user associations, women's groups, trade and business associations, and CBOs receiving USG food security-related organization development assistance	#	Total		2017	0	2022	62
			Type of organization	Private enterprise	2017		2022	62
				Production tion organizations	2017		2022	0
				Women's groups	2017		2022	0
				CBOs	2017		2022	0

Annex 2: Theory of Change



Annex 3: Focus Group Discussion Guide

Focus Group Discussion FARMERS - Mozambique Resilient Agriculture Markets Activity (RAMA) - Beira Corridor
Internal Final Assessment

Introduction Good Morning Good Afternoon! My name is... We were commissioned by Land O'Lakes which is implementing the USAID-funded resilient agriculture programme, to carry out a study to understand the current situation of the Pigeon pea, Maize, and cowpea value chains, as well as the performance of new varieties of cassava and sweet potato. Thank you very much for your time. I would like to ask your permission to interview you, this should take about 50 min. Please note that the responses given in this survey are for analysis purposes and the final results shared with the public will not be presented individually, ensuring the anonymity of the information you give us. We'll record the conversation, but it's so I make sure you don't miss anything we're talking about. If you don't want me to record, I can turn it off. Before starting can you introduce yourself?	
Main Questions	**Probe questions**
Warm 1. What kind of crops do you cultivate on your farms?	• Why do you grow these crops?

Agriculture training *First I want to talk to you about any farming training you received.* 1. Have you received any training in agricultural production? please explain	• Whose, when, what themes? Which crops? • How do you think training benefits you and your farming practice?
2. Have you received specific training on climate change mitigation? please explain	
3. What are the most effective training methods for you? Why?	
4. Are there any difficulties that (men/women) specifically face in accessing training? Using what you learn through training?	What suggestions do you have for mitigating these challenges?
5. Are there any topics in which you want to learn more about agricultural production and climate change mitigation?	

Media *Now I want to talk to you about your radio listenership* 1. Does anyone in the house listen to the radio?	**If yes, explore follow-up questions** • Which seasons? • What kind of programmes? • What time of day do you usually listen to the radio? • Have you heard any messages about the CSA USAID RAMA project?

Climate Smart Agriculture *Now I want to talk to you about your experience with climate change.* 1. Have you heard of climate change?	• Explain the terms 'climate change' and 'Climate Smart Agriculture' if they are not familiar with it.

2. How do you think it's affecting your farm and family, if at all?	
3. Have you heard of climate-smart agriculture, practices that can help mitigate the effects of climate change?	• What types of practices have you heard about? • Can you describe these improved practices?
4. Which of the improved practices related to climate-smart agriculture do you do? Why or why not?	• Prompt with the improved practices. Start with the practices mentioned in #3. Then go on to additional ones to ask if they do them. Ask about each on in turn. Enquire about adoption for each value chain promoted by the project ○ minimum tillage ○ Intercropping with legumes ○ Permanent ground cover (mulching or use of cover crops) ○ simple soil fertility analysis (pH, organic matter) ○ Correct crop spacing for different crops ○ optimal planting date for the target crop ○ Integrated pest control ○ Use of improved seed (i.e., short season)
5. As women/men, which of the improved practices do you find easier to implement? Which are more difficult to implement? Why?	Why is CSA easier than conventional agriculture? Why more difficult?
6. Have you noticed any changes in your productivity (Yields in Kgs/tons per hectare) since you started adopting any of these CSA practices?	• What changes have you seen? • Why do you think they are happening?
7.	

Farm and Crops *Now I want to talk to you about your farm, the crops you grow and the practices you use.* 1. What are the most important crops you grow?	• Why are these crops most important?
2. Typically per year how many kgs do you harvest from these crops?	• Verify for each value chain (maize, pigeon peas, cowpeas)
3. What challenges did you face last year in agricultural production? please explain	Any there specific challenges for women?
4. What inputs and services do you use for your agricultural activities? What are available?	Ask about each in turn and follow up with – do you use this? Why/Why not? Is it available? Where? • Improved Seeds (for this; do you feel they are of good quality?) • Mechanization • Water/irrigation • Finance • Extension services •

5. Do you (as men/women) find it more difficult to access these inputs? Why?	

Cereal consumption and Sales *Now I want to talk to you about using your crop production (sales, consumption)* 1. Do you do any processing of your crops on your farm?	• Why do you process? • What value chains do you process?
2. Please tell me a little about your crop sales. What crops do you sell and what do you consume?	• Why sell some and consume others?
3. Where do you typically sell your crops? Why?	
4. What challenges have you faced over the past year or two in selling your crops? Please explain	

Savings Groups *Now I want to talk to you about Savings Groups* *1.Do you know what a savings group is?*	
2. Do you have a savings group in your community? If so, do you know how many groups there are?	
3. Are you part of any savings group?	•When did you become a member? Why?
4. What is your group's interaction with the animator?	How often does the group meet the animator?
5. What benefits have you seen from being part of a savings group?	
6.What is your goal in becoming a member of a savings group?	
7. Even if the RAMA-BC project ends, will you still be a member of the savings group? Why or why not?	

Ideas for the project *Finally, I want to talk to you about the challenges you are facing on your farms and your thoughts on how the activities of this project have benefited you.* 1. Based on the challenges in production, sales and extension services you described above, how has the project supported farmers like you?	
2 Were there any gender-related challenges/barriers that you noticed that affected (men/women) participation in project implementation? Please explain.	
3. Would you be able to continue adopting CSA practices even after the project ends? Why or why not?	

We've reached the end of our questions. Is there anything else we haven't covered that you'd like to discuss, ask or suggest? If yes, please feel free to do so.
Thank you very much for your time.

Annex 4: Key Informant Interview Questionnaires

Key Informant Interviews - Input Providers - Mozambique Resilient Agriculture Markets Activity (RAMA) - Beira Corridor - Internal Final Assessment

Good Morning Good Afternoon! My name is... I am a Land O Lakes employee working for the USAID-funded RAMA-BC project. I am doing interviews to understand the impacts and lessons-learned of the RAMA project on agricultural productivity and climate resilience, particularly in the values chains targeted by the project (Maize, Cowpea, Pigeon pea, Cowpea, Lab lab and jackbean, orange sweet potatoes, cassava and coffee). I want to ask you questions about how you may have worked with the RAMA project and more generally in those value chains and/or on climate smart agriculture. Are you available for an interview? All responses you provide are confidential and data will be analyzed together and never individually. Thank you for your cooperation.

Reference

interview date	
research reference number:	
community / village name	
Institution Name	
GPS coordinates	LAT: RECORD:

general profile

- name of interviewee _____
- Position in the business_____
- Years employed in the business _____
- Year business established _____
- Sex of owner of business: _____
- Number of full-time equivalent employees in 2022: _____males, _____females
- Contact: Mobile: _____email: _____

Products / Services

First I want to ask about the products and services your business provides

1. In what geographic areas do you work?

2. What are the products and services that your business has provided in the geographic areas where you work with RAMA that fit into the following categories:
    - *a.* Seed, fertilizer or other inputs for a targeted value chain (maize, pigeon pea, cowpea, lab lab, jackbean, coffee, sweet potato, cassava)
    - *b.* Extension services related to one of those crops and/or climate smart agricultural practices
    - *c.* Mobile livestock kraals or another climate smart livestock product
    - *d.* Materials related to vermicomposting, minimal tillage (i.e. herbicides), green manures/cover crops

Tell me each product that fits these criteria one by one and tell me the volume that you sold in Sept 2021-Sep 2022 as well as your total sales earnings. If you do not have any records, give me at least a rough approximation of your sales and how popular a given product/service was

Products/Services offered in target value chains and/or related to Climate Smart Agriculture	**Products/Services in the target areas of the RAMA-BC project**		
	Sales Volume/Quantity (Kg or Unit)	sales value (MZN)	Generally how popular was the product? (Very high demand, High demand, medium, low demand, very low demand)

Total value of sales in the RAMA area			

3. What distribution models do you use to sell the products to your customers?

4. Do you know how many customers you have? If not, can you give an estimate on the percentage?

Genre	Female___ Male ___
Client Type	Small farmers ___ Medium farmers ___ Large farmers ___ aggregators ___

5. Are you interested in expanding your customer base? Are there any types of customers you need to invest in to reach greater demand? What kind of investments would you make?

6. What are the challenges your company faces in providing products/services to these target value chains? Are there challenges specific to any value chain? ? Please describe, and try to distinguish between any supply-side challenges (hard to get adequate amount of quality products to sell) vs. demand-side challenges (inadequate demand for some products).

7. What opportunities do you see in each value chain, and/or in climate smart agriculture generally?

8. If you provide extension services to farmers, what model extension services are used? (For example: Demo fields? Training at your shop? Training in the field?)

9. Do you have any employees specifically allocated to contact/work with farmers?
    a. If yes, how many?
    b. What kind of assistance do they give to farmers?
    c. What is the purpose of their interaction with farmers?

Perceiving and acting on climate change

12. Have you witnessed any signs of climate change? Can you describe the changes?
    a. What effects do you believe these changes can have?
    b. Have you witnessed any effects on the agricultural sector due to these changes?

13. Have you adjusted your product/service offering to accommodate changes in climate that will make your customer more resilient to climate change? What have you done?
    a. What have been the challenges and successes in these approaches?

Participation in the RAMA Project

14. Did your business -work with the RAMA project in the last several years? If yes, what was your role? What support did you receive from RAMA, and how did you use it?

15. What has been the impact of the RAMA project on your work, if any?
    a. Did you start offering any new crop seeds or other products because of RAMA? Did you start promoting climate smart agricultural practices?
    b. Will you continue any of those changes in the future, now that the RAMA project is ending? If you started selling new products/services because of RAMA will you continue to sell those? Why or why not?

16. Does your organization have the following? If so, when did you start using each of these organizational approaches? Did you start using any of them because of the RAMA project?
    a. business plans
    b. production plan (inventory control)
    c. Marketing strategy
    d. record keeping
    e. monitoring
    f. Use/management of inbound agents
    g. Use of financial products
    h. Accounting systems

17. Did you participate in any awareness/behavior change campaigns with RAMA, to promote certain crops or climate smart agriculture practices to farmers? If so, describe how you participated.

18. Were you aware of any other promotional campaigns done by RAMA (community radio ads, SMS messages, social media campaigns)? If so, did you observe that any of your clients were aware of them? Did they seem to have an effect on the demand for any of your products/services?
    a. What strategies or elements of the advertising campaigns do you think were most effective? Least effective? Explain why you think this.

19. Did you receive any grants or outside support from other organizations other than RAMA? What did you do with that support? How would you compare the usefulness and impact of that support vs. the support of RAMA?

20. Do you have any feedback on how RAMA could have improve their work with your business?

21. Any other comments you want to make?

Key Informant Interviews - Research Institution - Mozambique Resilient Agriculture Markets Activity (RAMA) - Beira Corridor - Internal Final Assessment

Good Morning Good Afternoon! My name is... I am a Land O Lakes employee working for the USAID-funded RAMA-BC project. I am doing interviews to understand the impacts and lessons-learned of the RAMA project on agricultural productivity and climate resilience, particularly in the values chains targeted by the project (Maize, Cowpea, Pigeon pea, Cowpea, Lab lab and jackbean, orange sweet potatoes, cassava, and coffee). I want to ask you questions about how you may have worked with the RAMA project and more generally in those value chains and/or on climate smart agriculture. Are you available for an interview? All responses you provide are confidential and data will be analyzed together and never individually. Thank you for your cooperation.

Reference

interview date	
research reference number:	
community / village name	
Institution Name	
GPS coordinates	LAT: RECORD:

General profile

- Name of interviewee _____
- Position on the institution _____
- Years at the institution _____
- Contact: Mobile: _____email: _____

1. What is the mission of this institution?

2. In what areas do you operate?

Research

3. Does your institution do any research on of the Maize, Cowpeas, Pigeon peas and Jackbean, cassava, sweet potato Lab lab or coffee value chains? If yes, list and describe them
4. Have you carried out any research related to climate change and its impact on agriculture, or climate-smart agriculture techniques (especially minimum tillage, inter-cropping, mobile kraals for livestock, and vermicomposting)? If yes, describe the research objectives and results
5. How does your institution come up with their ideas for research?

Products / Services

6. What products/services does your research institution provide in the Maize, Cowpeas, Pigeon peas, Jackbean, lab lab, cassava, sweet potato or coffee value chains and/or in climate smart agricultural practices? (please list and describe them)?
    a. How does your research inform the products and services you provide?
    b. How do you advertise/disseminate the products/services?
    c. What are your focus customers for the products/services?

7. From your research, are you aware of any new promising (profitable and/or climate smart) innovations (products or services) that could benefit the value chains RAMA focused on for this project? If so, please list and describe them and their expected impact

8. What are the challenges you face in your institutions when you carry out research? Any particular challenges related to the value chains you refer to?

9. Do you do any work directly/collaborate with farmers to understand their issues or test new innovations with them?

    a. If so, please describe how you collaborate with them

    b. If yes, can you tell us more about the most important challenges that farmers are facing in inputs, techniques? What support do you think they need?

Perceiving and acting on climate change

10. Have noticed any signs of climate change in this area? Can you describe the changes?

11. Have you been witnessing any effects on the agricultural sector due to these changes?

12. How have you changed your research, or product/service offerings due to climate change, if at all?

13. What best practices have you used or seen other organizations use to help farmers mitigate climate change?

14. Does your organization plan to start, continue or expand climate smart agriculture or climate change mitigation research and dissemination project in the future? If so, please describe some of the plans for some of these initiatives including their goals and rough timelines.

Participation in the RAMA Project

15. Did you work with the RAMA project in the last year?
    a. If yes, what was your role?
    b. What support did your organization receive from RAMA as far as you are aware?

16. Are there any projects or initiatives that would not have happened except for RAMA support? If so, list those projects and describe what they were able to do because of RAMA support.

17. Do you have any feedback on how RAMA could have improve their work with your institution?

18. Any other comments you want to make?

Key Informant Interviews - Government - Mozambique Resilient Agriculture Markets Activity (RAMA) - Beira Corridor - Internal Final Assessment

Good Morning Good Afternoon! My name is... I am a Land O Lakes employee working for the USAID-funded RAMA-BC project. I am doing interviews to understand the impacts and lessons-learned of the RAMA project on agricultural productivity and climate resilience, particularly in the values chains targeted by the project (Maize, Cowpea, Pigeon pea, Cowpea, Lab lab and jackbean, orange sweet potatoes, cassava, and coffee). I want to ask you questions about how you may have worked with the RAMA project and more generally in those value chains and/or on climate smart agriculture. Are you available for an interview? All responses you provide are confidential and data will be analyzed together and never individually. Thank you for your cooperation.

Reference

Type of interviewee (educational institution, regional agricultural agency office, etc.)	
Interview date	
Research reference number:	
Community / village name	
Institution Name	
GPS coordinates	LAT: RECORD:

General profile

- Name of interviewee _____
- Position
- Sex of interviewee
- Sex of the director/head of the institution: _____
- Geographic Area of responsibility (if applicable): _____
- Years at the institution _____
- Contact: Mobile: _____email: _____

1. What are the primary crops grown in your region?

2. Have you seen any changes in the types of crops produced in recent years?
    a. If yes, what are the changes?
    b. What do you think motivated these changes?
    c. Do you see any changes associated with climate change? Please describe.

3. Have noticed any signs of climate change on agriculture in your region? Can you describe the changes?

4. What do you generally think are the biggest needs of the smallholder farmers in your area? How does climate change adaptation/resilience fit into this?

5. What do you know about climate-smart agricultural practices? (Allow the respondent to list) Where did you learn about them?
    a. minimum tillage,
    b. Intercropping with legumes
    c. permanent ground cover (mulch or use of cover crops)
    d. dispersed shade / agroforestry
    e. simple soil fertility analysis (pH, organic matter)
    f. Correct crop spacing for different crops
    g. optimal planting date for the target crop
    h. Integrated pest control
    i. Use of improved seed (i.e., short season)
    j. Planting climate-smart crops of varieties (drought-resistant or short season varieties; tree or other perennial crops; root or legume crops that need less water and soil fertility)?

6. Which of these practices and crops do you believe to be the most promising (i.e. can help with climate resilience but also be profitable)? Why?

7. What practices on the list do you think farmers are familiar with? Which crops and practices are they most likely to adopt and why? Which are they least likely to adopt, and why not?

8. Is your organization/institution involved in any kind of campaign to promote the adoption of climate-smart agricultural practices (before or separate from any work done with support of RAMA)? If yes, what actions were taken?

9. **Government organizations only:** What is the involvement/specific actions of the government more generally (including outside you specfic division) to promote adoption of climate- smart agricultural practices?

Read: The objectives of the RAMA project are to increase production and climate resilience among smallholder farmers by promoting the adoption of climate-smart crops and agricultural practices. The project particularly focused on a few key value chains – maize, lablab, jack bean, cowpea, pigeon pea, sweet potato and cassava. But it also more generally promoted CSA practices (such as intercropping, minimal tillage, green manure/cover crops, etc.) through Family Farm Model vermicomposting, mobile cattle pens, and cassava and sweet potato multiplication fields.

Activities implemented to achieve this objective included behavior change campaigns (through community radio, SMS, social media) to promote CSA practices, establishment of Family Farm Model to demonstrate CSA practices for smallholders, support to input providers to help them increase the offering of extension products and services related to target value chains and CSA in general, and support research and educational institutions to promote learning about CSA.

10. Did your organization work with this project? If so, what was the nature of the collaboration with RAMA (provided advice, participated in promotional campaigns, received monetary or other support from RAMA, etc?)

11. What specific changes to the work of your organization occurred because of working with RAMA, if any?

    a. Do you expect to continue doing this (or similar approach) after the project ends? Why or why not?

12. Did you observe that smallholder farmers in your region learned about climate-smart crops and practices because of RAMA? Did you observe if any of them already increased adoption of any products because of RAMA? If so, which strategies did you think were the most effective in promoting adoption (radio ads, SMS, social media campaign, model family farms, etc.) and why?

13. Did you observe any effect of the RAMA project on increased supply of climate smart services and products from input supply businesses? If so, describe the effect that you observed.

14. Generally, which of the RAMA activities do you believe to have been the most successful vs. the least successful? Provide details to explain your answers for each.

15. Which of the activities do you think that the farmers or businesses will continue after the project? Which are they unlikely to continue without project support? Why?

Special questions for Educational Institutions:
10. Prior to working with RAMA, did you institution have curricula or other initiatives related to Climate Smart agriculture? If so, describe

11. Did your institution implement any of the following initiatives supported by RAMA to promote climate smart agriculture? If so, describe how many students participated/were exposed to the initiative, the impacts of the initiative and whether you will continue it in the future now that the RAMA project is ending

Initative	How many students participated?	Specific outcomes or impacts	Will you continue this in future? How?
Observational Units (1 ha demo farm)			
Internships			
Climate Smart Ag curriculum materials (CSA manual, technical briefs, videos)			

12. What challenges did you face in implementing these initiatives?

13. What were your lessons learned on how to best teach about climate smart agriculture in the future?

Annex 5: Details on Focus Group Discussion Implementation

#	District	Date	Gender	# of participants
1	Barue	19/9/2022	Male	6
2	Barue	19/9/2022	Male	16
3	Barue	20/9/2022	Female	8
4	Barue	20/9/2022	Female	6
5	Buzi	28/9/2022	Male	4
6	Buzi	28/9/2022	Female	11
7	Buzi	29/9/2022	Male and Female	12
8	Nhamatanda	24/9/2022	Female	7
9	Nhamatanda	24/9/2022	Male	7
10	Nhamatanda	27/9/2022	Female	10
11	Nhamatanda	27/9/2022	Male	6
12	Macate	22/9/2022	Female	10
13	Macate	22/9/2022	Male	9
14	Macate	23/9/2022	Female	10
14	Macate	23/9/2022	Male	11

Annex 6: List of Key Informant Interviews

#	Institution	Type of institution
1	CITT-Bandula	Government
2	CITT-Barué	Government
3	SDAE Báruè	Local leaders and government staff
4	SDAE Buzi	Local leaders and government staff
5	Emilia Comercial	Input Suppliers
6	Multimoz	Input Suppliers
7	Agrodealer Simão Januário	Input Suppliers
8	ADPP	Educational institution
9	IAC	Educational institution
10	Phoenix Seeds	Input Suppliers
11	ISPM	Input distributor agents
12	Agrarian Institute of Marera	Educational institution
13	UniZambeze-Chimoio	Educational institution
14	IIAM	Research, innovation and new technologies providers
15	K2	Input suppliers
16	Agro Serve	Input suppliers
17	Agrodealer Ismael Assane	Input suppliers
18	Café de Manica	Private coffee production company