CIMMYT MR
International Maize and Wheat Improvement Center

SIMLESA
SUSTAINABLE INTENSIFICATION OF MAIZE-LEGUME CROPPING SYSTEMS FOR FOOD SECURITY IN EASTERN AND SOUTHERN AFRICA

Australian Government
Australian Centre for International Agricultural Research

The SIMLESA Monitoring, Evaluation and Learning Report (2010-2017)

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ETHIOPIA KENYA MALAWI MOZAMBIQUE TANZANIA AUSTRALIA THE UNIVERSITY OF QUEENSLAND AUSTRALIA QAAFI Queensland Alliance for Agriculture and Food Innovation CIAT Centro Internacional de Agricultura Tropical ASARECA Transforming Agriculture for Improved Livelihoods ARC LNR ILRI

Introduction

The Sustainable Intensification of Maize-Legume Cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA) is a multi-stakeholder collaborative research program managed by the International Maize and Wheat Improvement Centre (CIMMYT) and implemented by National Agricultural Research Systems (NARS) in Kenya, Tanzania, Ethiopia, Malawi and Mozambique with backstopping inputs from other partners like QAAFI, ASARECA, ILRI, CIAT and ARC in South Africa. SIMLESA is supported through grants provided by the Australian Centre for International Agricultural Research (ACIAR). The program focuses on leveraging science and technology to develop and deliver technological and institutional innovations in relation to maize-legume production systems. In turn, it is envisaged that these will make significant measurable positive changes in the livelihoods of all categories of smallholder farmers.

The main thrust of the SIMLESA program is increasing farm-level food security, productivity and incomes through promotion of maize-legume intercropping systems, in the context of reduced climate risk and change. Through participatory research and development with farmers, extension agencies, non-governmental organizations, universities and agribusinesses along the value-chains, the program aims to improve maize and legume productivity by 30 percent and to reduce the expected downside yield risk by 30 percent on approximately 650,000 farm house holds by 2023.

The Monitoring, Evaluation and Learning (MEL) Unit is one of the critical components of the SIMLESA Program Management team. Before June 2015, when SIMLESA internalised the administration of MEL issues through the recruitment of a Monitoring, Evaluation & Learning Specialist, ASARECA was responsible for all SIMLESA monitoring and evaluation activities. The recruitment of the MEL Specialist saw the generation of a comprehensive MEL Framework and the creation of an Indicator Tracking System feeding into a SIMLESA database. The MEL Unit has continued to keep track of program performance across the SIMLESA countries updating indicators in the Indicator Tracking System as well as updating figures in the database. There has been more participation in MEL activities at country level since the internalisation of SIMLESA MEL which at the end of the day has seen the building of more capacity at that level. It is against this background that MEL activities across the five core SIMLESA countries became more pronounced to inform program implementation and assisting the donor to keep track of their investment.

The Rationale of the SIMLESA MEL Report

The compilation of this brief report is a follow up to the first Monitoring and Evaluation report which was done by ASARECA in 2014, articulating SIMLESA outputs and outcomes during that time. This current report seeks to do the same but also acknowledging the 2015 Mid Term Review (MTR) observations on the need to strengthen MEL activities with more focus on what effects (outcomes) SIMLESA has brought to the small holder farmers. It is also opportune to gauge the program outcomes at this level since the program is less than two years before it ends.

The purpose of this brief is therefore to inform stakeholders about SIMLESA program performance, more importantly the work done to keep track of the donor investment.

SIMLESA Achievements

During the last seven years, SIMLESA identified and implemented best fit technologies for different communities to achieve the greatest possible impact in an efficient and cost effective manner. The first phase, (Phase 1 – 2010 to 2014) was largely pilot while current phase (Phase II – 2014 to 2018), has seen SIMLESA has devising strong scaling out approaches to ensure its sustainable intensification technologies reach out to thousands of farmers in its areas of operation. The sustainable intensification scaling out approaches are articulated in the diagram below:

The SIMLESA Road to Many

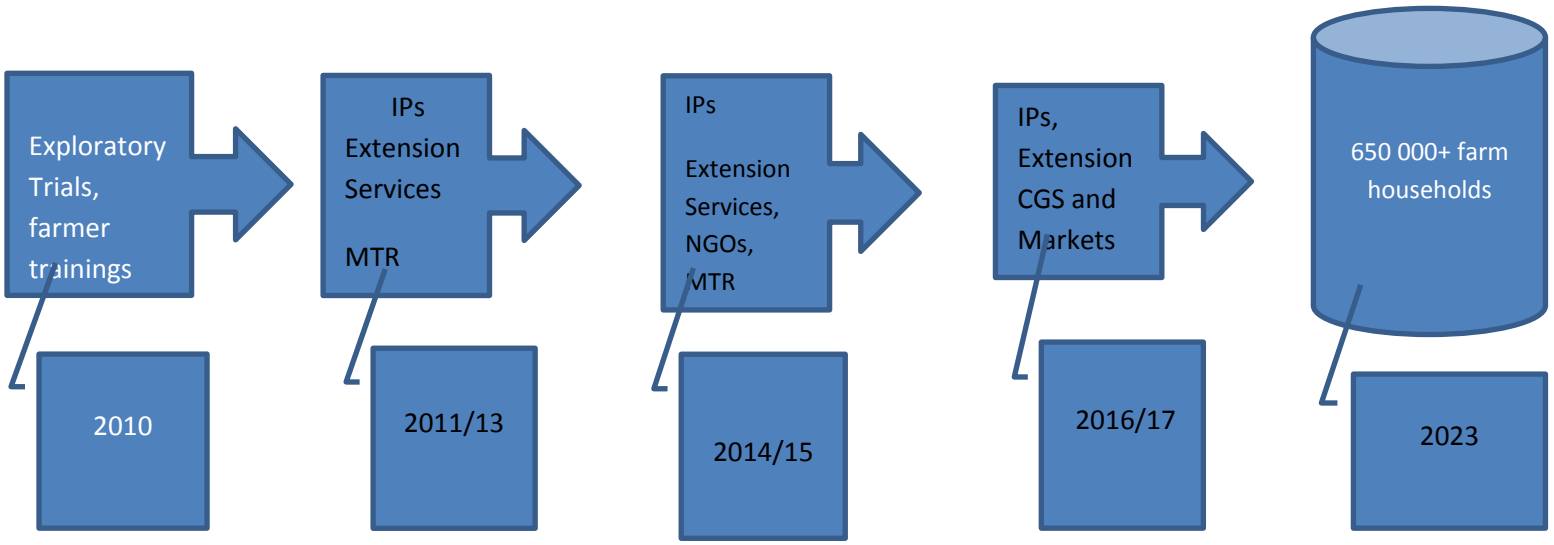


Figure 1: The schematic representation of the SIMLESA journey

To achieve the best results, the SIMLESA program has had to channel the wealth of experiences and lessons learned from phase I and take them into successful implementation strategies and plans for the second phase. Program-wide synergies were built around shared analysis, common research questions, coordinated communities of practice and learning supported at the program level.

At objective level ,SIMLESA Phase 1 (2010-2014) was characterised by the following activities:

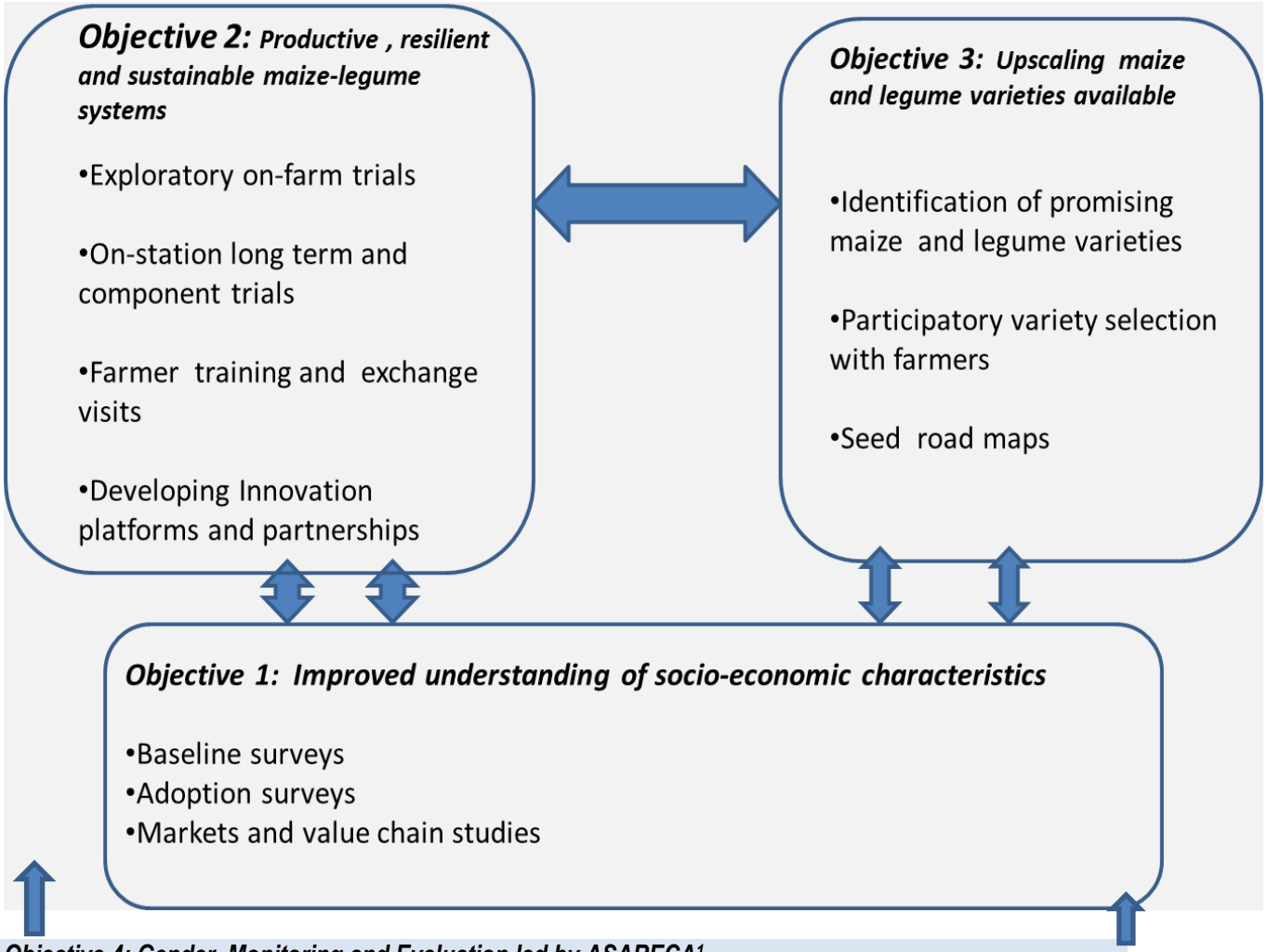


Figure 2: Phase 1 objectives and the activities

The baseline surveys gave the program management team a good understanding of the agronomic position of the selectected communities before SIMLESA. This enabled the benchmarking of indicators before SIMLESA and then track the changes happening due to SIMLESA acknowledging that some of the changes cannot be attributed to SIMLESA only.

[1] Association for Strengthening Agricultural Research in Eastern and Southern Africa

[2] Agricultural Research Council, South Africa

At objective level SIMLESA, Phase 2 (2010-2014) was characterised by the following activities:

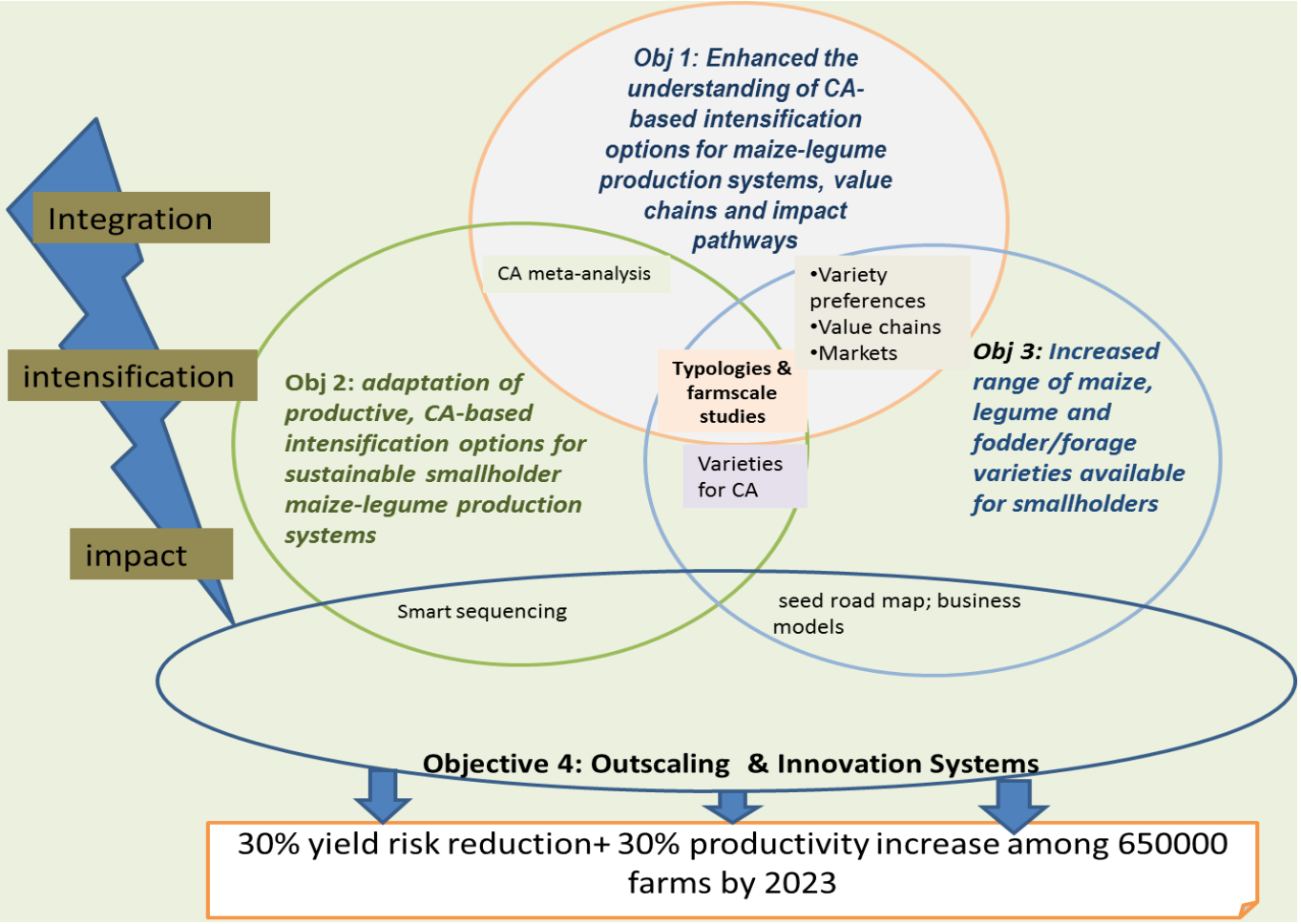


Figure 3: Phase 2 objectives and the activities

The program managed to score a number of achievements at output, outcome and impact levels .

The SIMLESA achievements at output level :

- Five baseline surveys were conducted in all the five core SIMLESA countries to get an understanding of the agronomic situation of the sites before the adoption of the sustainable intensification (SI) technologies to benchmark program performance. A total of 4, 600 randomly selected households (3, 840 males, 760 female headed households) in 38 districts were interviewed.
- 508 research villages/communities were characterized for demonstrating and evaluating technologies during SIMLESA-1 and 2. Work is still in progress to populate a web-based database of CA-based intensification options. The MTR noted that it is critical to have a common understanding of what the database contain, and how it will be accessed and interrogated, so there is also some work revolving on the nature of the database.
- Adoption monitoring surveys were carried out in each country in 2013 involving 16, 860 farm households and updated in 2016.
- A total of 265 farming communities compared to a target of 188 were selected in the maize/legumes farming systems in different agro ecologies within SIMLESA countries including the spill overs, Uganda (16) and Rwanda (5) accounting for an overall program achievement of 130%. In Ethiopia for example, 8 communities were selected with 24 conservation agriculture exploratory trials established in 24 villages but a follow up exercise in 2014 revealed that there were 22 additional villages that had a

component of CA driven by SIMLESA. This is an indication that the technologies were spreading beyond the initial experimental sites, which is in tandem with the program design as far as scaling up and out plans are concerned.

- A total of 168 communities characterized on socio-economic and biophysical profiles against a target of 74, thus accounting for 227% achievement. The details at country level are as follows:

Table 1: SIMLESA communities characterised on socio-economic and biophysical profiles

Country	Ethiopia	Kenya	Tanzania	Malawi	Mozambique	Total
Target	17	15	20	11	11	74
Achievement	54	72	20	11	11	168

- A total of 492 out of 327 targeted exploratory trials were established, characterized and evaluated and farmers are using them by end of 2014. These trials include 116 in Ethiopia, 48 in Kenya, 231 in Tanzania, 51 in Malawi and 46 in Mozambique
- The numbers of SIMLESA trials per country are shown in the figure below:

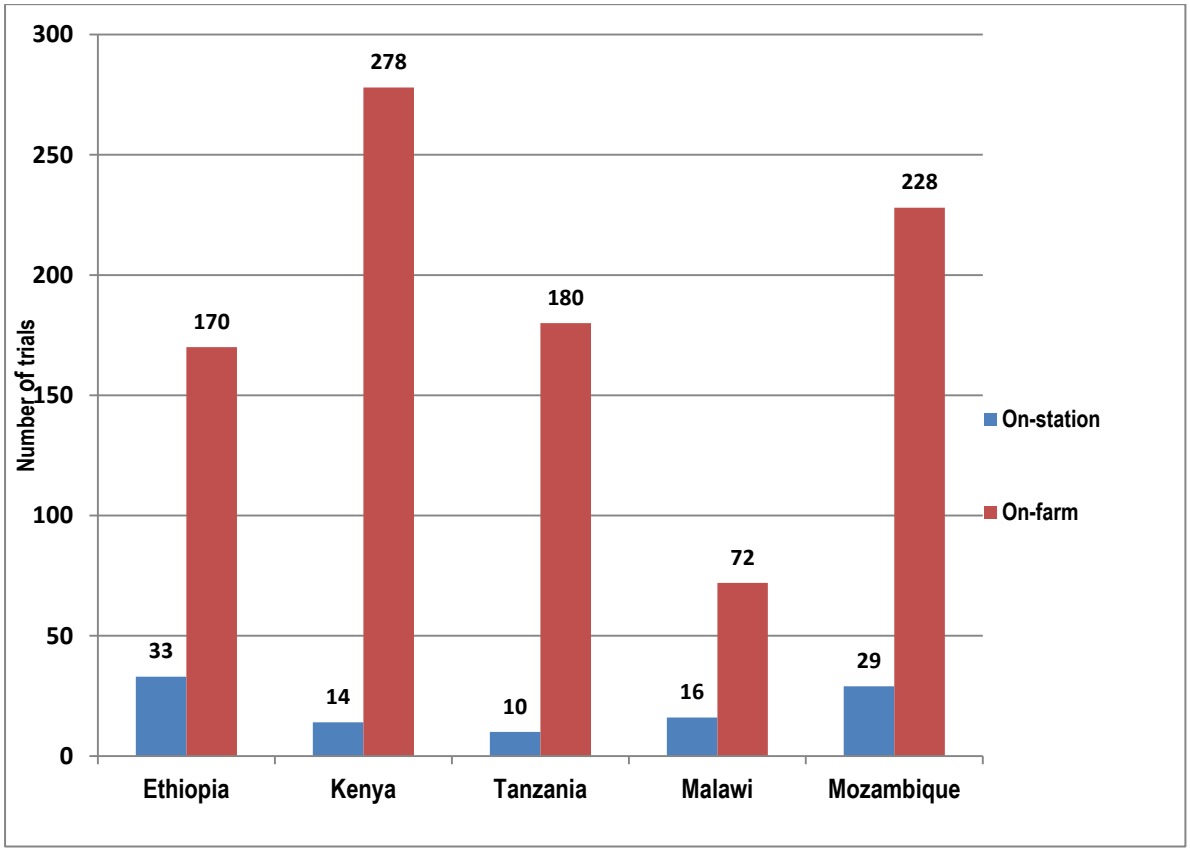


Figure 4: Number of SIMLESA trials established

- A total of 268 and 378 maize and legume on farm Participatory Variety Selection (PVS) were conducted where best performing maize and legume varieties that met famers' preferences were selected and scaled up by partner companies. The legume trials were distributed as follows across countries:

Table 2: Number of Legume trials on PVS by country

Country	Ethiopia	Kenya	Tanzania	Malawi	Mozambique	Total
Number of legume trials	119	52	40	87	80	378

- Over 500 varieties have been evaluated on-farm and on-station
- The program performed well in the development of stress tolerant varieties among the SIMLESA countries. Out of a target of 63, 97 stress tolerant varieties were identified, accounting for 154% achievement.
- A total of 58 Innovation Platforms were established to assist in scaling out of SI technologies, help productive interaction of farmer groups, partners, extension, research and local businesses in sharing farming experiences at community level and viable marketing of agriculture produce for maximum benefits. The distribution of innovation platforms at country level is as follows:

Table 3: Number of SIMLESA Innovation Platforms by country

Country	Ethiopia	Kenya	Tanzania	Malawi	Mozambique	Rwanda	Uganda	Total
Number of sites	7	5	5	6	4	5	2	32
Number of AIPs	20	9	10	6	6	5	2	58

- Toward the end of 2016, the program managed to select 19 partners (12 competitively and 7 commissioned) to drive the scaling out initiative under the Competitive Grants Scheme (CGS). Details of the selected partners and expert mix (knowledge management, seed multiplication and extension services) are shown below:

Table 4: Selected CGS partners in each country

Country	Farmer Ass.	ICT	NGO	Media	Seed	University	Church org.	Level
Kenya	Secondary partners esp. AIP	Secondary partners – QAAFI, Mediae		Mediae ltd.	Freshco Seed Co.	Egerton	NCCK	County
Malawi	NASFAM	Sec. partner – QAAFI, FRT		Farm Radio Trust (FRT)				National
Mozambique	UCAMA	ISPM, QAAFI	AgriMerc ODS	ISPM	Secondary partners	ISPM		National
Tanzania	MVIWATA	Secondary partner – QAAFI, CABI	RECODA	Secondary partner	SATEC	Secondary partner – Sokoine Uni.		National
Ethiopia	7 scaling out partners were commissioned because of their strengths in extension work[3]							

- A cumulative total of 65 students, 42 students pursuing Masters of Science degrees and 23 PhD students at African (Ethiopia, Kenya and South Africa) and Australian universities in SIMLESA partner countries, were being supported under SIMLESA. Details at country level are shown below:

[3] ***Names of the commissioned partners:*** *East Shewa , East Wollega, Hadiya, Sidama, West Arsi, West Gojjam and West Shewa*

Table 5: Number of PhD and MSc supported students through SIMLESA

#	Country	PhD	Country University	MSc	Country University
1.	Kenya	3	Kenya	1	Kenya
2.	Mozambique	2	Australia	2	South Africa
3.	Rwanda	-	-	1	Kenya
4.	Ethiopia	2	Ethiopia	18	Ethiopia
5.	Ethiopia	12	Australia	9	Ethiopia-Only research funded
6.	Malawi	3	Australia	2	Malawi
7.	Tanzania	1	South Africa	9	Tanzania
Totals		**23**		**42**	

- SIMLESA has managed to produce science outputs which include 122 publications, 52 posters 15 policy briefs and various communication products including national level media coverage, national, regional and international conferences, participation by partners.

The SIMLESA achievements at outcome level:

The adoption monitoring survey revealed that 91% (57% males and 34% females) of the targeted 258 493 farmers had adopted[4] at least one sustainable agricultural intensification (SAI) practice promoted by the project by December 2016. The commonly adopted SAI practices in all the 5 SIMLESA countries were drought tolerant maize varieties, maize legume rotation, maize legume intercrop and timely planting. The least adopted SI technologies were crop residue retention particularly in the crop-livestock mixed farms of east Africa, and improved legume varieties in Mozambique due to market constraints. The project used a combination of scaling out strategies to achieve this outcome which include multi-stakeholder platforms; media mainly radio programs, private-public partnerships, lead farmer approach, farmer field schools, field days, exchange visits, and demonstration.

Table 6: The trend of estimated Adopters of SIMLESA technologies by country, farm households

Year		Targets	Ethiopia	Kenya	Tanzania	Malawi	Mozambique	Total	*Source*
1	**2010/11**								
2	**2011/12**	13,680							
3	**2012/13**	24,624	3,800	3,467	3,287	2,226	5,789	18,569	
4	**2013/14**	44,323	10,454	13,600	9,843	4,440	8,641	46,979	*Adoption Monitoring Survey*
5	**2014/15**	79,782	18,817	24,480	17,717	7,992	15,554	84,560	*Projections*
6	**2015/16**	143,607	33,871	44,063	31,891	37,639	26,069	173,633	*Projections*
7	**2016/17**	258,493	47,437	63,870	34,960	51,097	38,057	235,422	*Adoption Monitoring Survey*

[4] An adopter is this case is a farmer who has used a technology for more than one year in at least 25% of his/her cultivated land

- One of the spill over countries, Rwanda has a estimated cumulative figure of 7, 590 farmers in the 2016/17 season.
- The program had witnessed an average yield increase of 30-60% from conservation agriculture-based sustainable intensification exploratory on-farm and on-station trials. Field days, exchange visits and innovation platforms have continued to improve knowledge transfer, which has led to increase in yield of both maize and legumes**.** The average productivity at SIMLESA sites at country level are as follows:

Average maize and legume yields before and after in the host and nearby communities	**Ethiopia**	**Kenya**	**Tanzania**	**Malawi**	**Mozambique**	**Rwanda**	**Uganda**	**SIMLESA Average**
Average maize yield (t/ha) before SIMLESA (baseline)	1.7	1.6	1.8	1.2	1.4	2.0	1.8	1.8
Current average maize yield (t/ha)	5.1	4.5	3	3.8	4.5	6.0[5]	4.0	4.4
Current average legume yield (t/ha)[6]	2.0	1.8	2	1.5	1.2	2.5	1.0	1.5

- SIMLESA has witnessed farmers enjoying labour savings of aroud 50% by adopting sustainable intensification technologies particularly zero tillage, use of herbicides and crop rotation.

SIMLESA achievements at Impact level.

The SIMLESA overall goal is to increase food security and incomes at household and regional levels and foster economic development in Eastern and Southern Africa. This should be achieved through improved productivity from more resilient and sustainable maize-based farming systems through sustainably increase the productivity of selected maize-based farming systems in each target country in Eastern and Southern Africa by 30% from the 2009 average by the year 2023. At the same time reduce seasonal down-side production risks by 30%. The program has made strides through the following transitory impacts acknowledging that the end of project evaluation will give a more comprehensive picture at impact level:

Risk Impacts

Stochastic dominance was used to rank alternatives according to their risk characteristics. It identified technologies that are dominating, that might be used by risk averse smallholder farmers in the different agro-ecological settings. The cumulative distributions of conservation agriculture alternatives are to the right of the conventional practice indicating that they provide higher yields under most conditions than the conventional practice for both high and low potential areas of Malawi. The conventional practice shows more risk relative to using conservation agriculture variants in the two contrasting agro-ecological setting. For the food security objective, the CA maize-legume intercropping and CA maize legume rotation have 50% probability of producing 2000kgs of maize grain per hectare compared to the conventional practice in both the low potential and high potential areas respectively. In all the five countries crop variety and species diversification are the common risk-adaptation strategy employed.

[5] Rwanda has higher yield per hectare not because of the soils but because on intensive use of fertilizers and use of improved seeds on small pieces of land.

[6] *The baseline average yield for legumes was less than 0.5t/ha across all countries and is grown on very small plots*

In the low potential regions of southern minimum tillage alternatives combined with stress tolerant maize varieties is the dominant strategy for coping with climate risk.

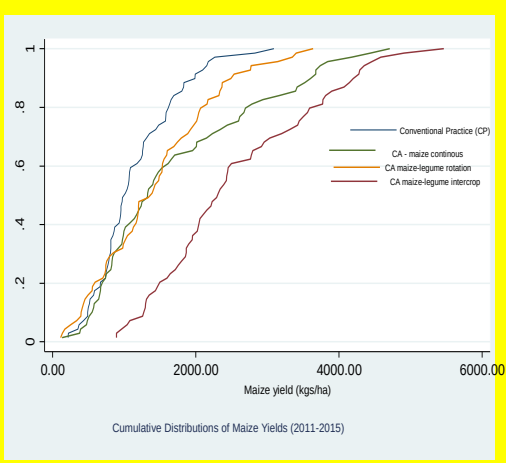


Figure 5: Low potential

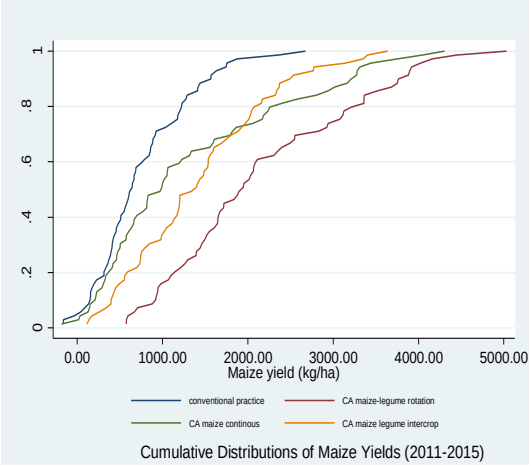
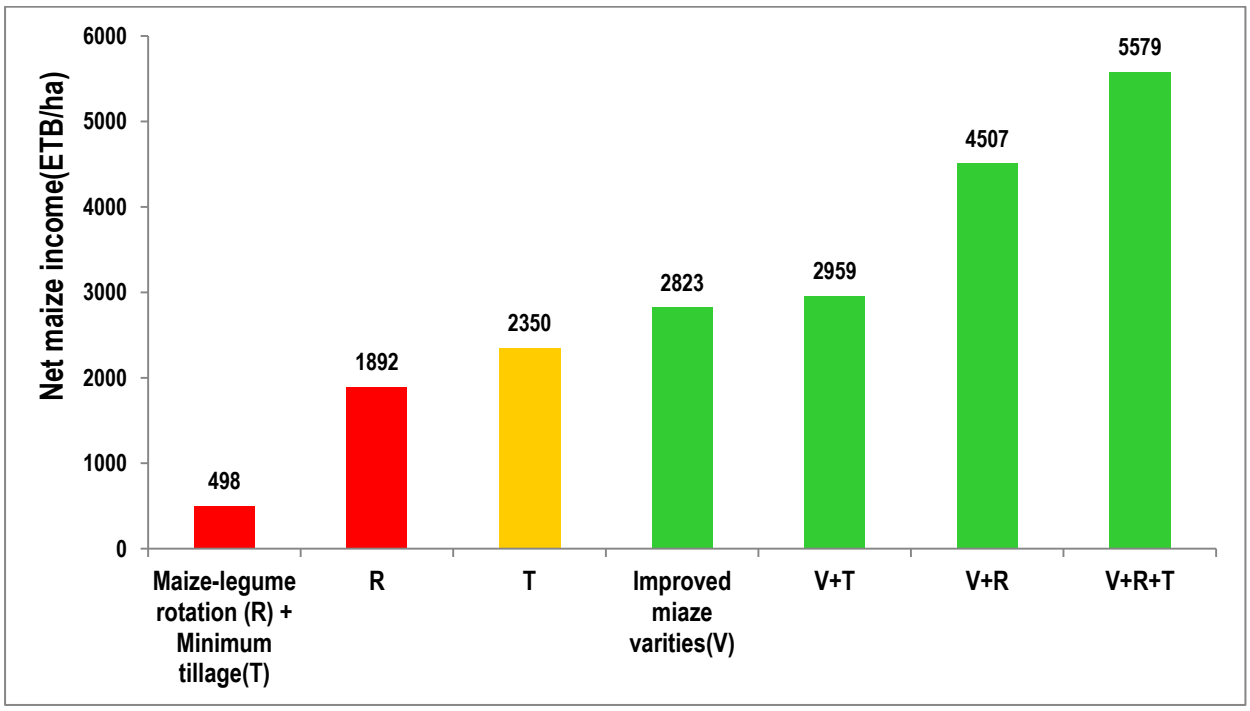


Figure 6 : High potential

Income impacts

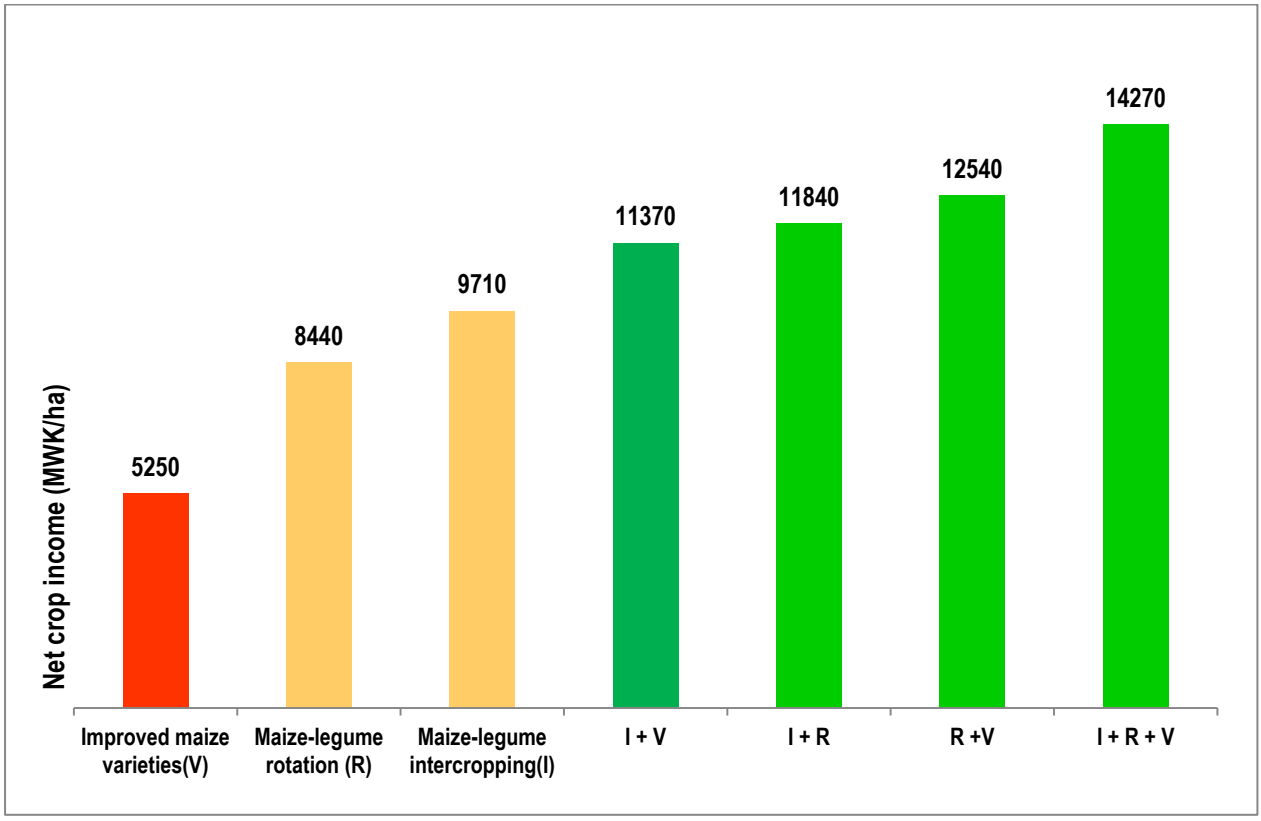
Impact of CA based technology on Maize income in Ethiopia from survey data



Source: Kassie et al. (2015), Journal of agricultural Economics

The Ethiopia results on sustainable intensification mix have shown that adopting improved varieties, maize-legume rotation and minimum tillage gives the maximum net maize income. This combination is a significant contributor to the overall goal of improving income security for the small holder farmers.

Impact of CA based technology on Maize income in Malawi from survey data



The Malawi results indicate that a combination of SI technology is likely to bring higher net income.The higher the sustainable intensification mix, the higher net income from maize.

Policy Impacts

From the results of SIMLESA-1, the program was in a position to identify the different elements of CA-based sustainable intensification practices that promise and may be adopted by farmers in the long run. There is a rich set of evidence from SIMLESA and related research which can now be used to engage policy makers. It is the results of analyses that eventually show impacts on incomes, poverty, equity, and the environment that can be used to influence policy makers and other public and private sector players of the merits of supporting widespread CA adoption. Towards this end SIMLESA organised a high level ministerial-level Policy Conference at the end of October 2015 in collaboration with ASARECA. The high level meeting outlined key policy action points for sustainable intensification in Eastern and Southern Africa. At the end of the two day meeting, the ministers represented produced a joint communique pledging policy support for the sustainable intensification practices in ESA.

Challenges observed from an MEL perspective

a) The flow of data from the SIMLESA countries has not beeen as as good as the sytem requires. In that regard data management needs to be improved at country level. This can assist the MEL system to avail real time data
b) There are activitieson the revised logframe which are still lagging behind despite the MTR recommendations to have these acclerated, for example evaluation of crop-livestock interactions, feed demand and supply options in 6 farming systems, through quantitative and participatory data collection is still outstanding.

Empirical lessons learned from SIMLESA

1. Those farmers belonging to groups had a higher chance of adopting sustainable intensification technologies. This was evidenced in Ethiopia where farmers belonging to innovation platforms were mostly adopting crop diversification and minimum tillage and in Kenya where the use of improved varieties and fertilizer was mostly adopted by famers belongs to a group.
2. Farmers who were near markets were more likely to adopt. This was confirmed in Ethiopia where proximity to the market was the main determinant of the adoption of crop diversification and use of manure while in Tanzania the adoption of crop diversification and minimum tillage were a function of market proximity
3. Adopting individual practice benefit farmers but a combination of technologies :

- Led to highest income
- Reduced fertilizer use, without yield penalty
- Lowered cost of risk (downside risk)

4. Adoption of improved varieties improves food security, autonomous consumption
5. For conservation agriculture to succeed (Kenya) alternative feed sources are needed. Crop residue is a valuable multi-use resource.

The SIMLESA MEL future focus

Based comprehensive and deployable MEL plan shared with NARES and other partners, the MEL unit gears itself to scale up the tracking of indicators especially outcome and impact indicators acknowledging that there is only one year before the program ends. While there is an impressive number of AIPs that have been established, an impressive number of new crop varieties being supported, and several baseline and adoption monitoring studies completed, there is need for more analysis of what the "numbers" of each of these, and other deliverables mean in terms of impact pathways, new knowledge and the SIMLESA objectives. Through the learning framework, questions such as to how SIMLESA has impacted on the capacity and actions of national agencies, beyond numbers trained, lessons learnt by CIMMYT and national partners from implementing such a complex multi-country program need to be explored especially at this stage of the program. This would enable the SIMLESA experience to inform the design and implementation of future R4D programs.

The tracking of CGS activities is another core focus of SIMLESA MEL documentation particularly the opportunity to link small holder farmers to viable markets. The work done by Agrimerc and UCAMA based on what was observed during the MEL visits in southern Africa, Mozambique in particular should provide a good starting point on how best practices on market linkages can be replicated for the benefit of the farmers.

Conclusion

Since 2010, SIMLESA has managed to identify best bet technologies which are compatible with climate change. During the reporting period over 40 improved maize seed varieties and 64 legume varieties across the five program countries were developed. Participatory variety selection techniques were used in selecting improved best seed varieties. Yield advantages of 30 - 60 percent were noted for these new varieties as compared to the existing commercial varieties. Improved agricultural inputs were complemented by good farming practices. For example conservation agriculture. A total of 235, 422 farm households were influenced to take up at least one sustainable intensification technology during the initial seven years of the program against a target of 258,493 farmers. The program is well on track in terms of attainment of desired milestones and deliverables at the end of its life cycle though there are some activities which are lagging behind.

When the program entered its second phase on July 1, 2014, it focused more on scaling out of new technologies which enhances food productivity in Africa. That phase witnessed that the involvement of various key stakeholders is of paramount importance. New research partners such as the Internationall Livestock

Research Institute ((ILRI) and the International Center for Tropical Agriculture (CIAT)) and a streamlined role for ASARECA and ARC added value and enhanced program deliverables For example, the program started focusing on participatory research and development with farmers, extension agencies, non-governmental organizations, universities and agribusinesses along the value-chains, to ensure sustainable agriculture development in Africa. SIMLESA-II continued to focus on developing and adapting CA-based sustainable intensification options that meet the needs of smallholder farmers. This generates new evidence on their benefits under smallholder farmer conditions in terms of productivity, stability, profitability and sustainability

A Competitive Grant System (CGS) to allocate SIMLESA resources at country level to accelerate scaling out activities by non-NARS partners started at the end of 2016. Monitoring, Evaluation and Learning visits to some SIMLESA countries particularly in southern Africa have shown huge benefits beyond scaling out. Market linkages have been strengthened to ensure that small holder farmers benefit in the whole value chain.