

THE SIMLESA Bulletin

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

 **CIMMYT**^{MR}
International Maize and Wheat Improvement Center



Australian Government

Australian Centre for
International Agricultural Research

SIMLESA annual meeting reveals many successes, gears up for phase II

Johnson Siamachira



As part of the meeting, participants visited three farmers in Kasungu District who are involved in on-farm trials assessing conventional farming practices, conservation agriculture with no herbicide application, conservation agriculture using herbicides and conservation agriculture including maize-legume rotations.

More than 60 researchers and representatives of donors, seed companies, national agricultural research systems (NARS), and non-governmental organizations from Africa and Australia gathered in Lilongwe, Malawi, during 6-8 April for the sixth SIMLESA annual review and planning meeting. SIMLESA undertook this meeting to discuss the project's progress and achievements, share the lessons learned during the last six years, and deliberate over better ways to implement phase II activities (2014-2018).

"The Program Steering Committee (PSC) recognizes the hard work of all participants and especially the dedicated scientists in the national programs. SIMLESA is on track to deliver significant impacts in the next two years," said Eric Craswell, PSC co-chair.

The Mid-Term Review (MTR) conducted last year was also very favorable: "SIMLESA (I and II) is a complex program with many partner countries, agencies, science disciplines, and objectives. Despite that complexity, the MTR found the program on the whole to be well-managed by CIMMYT, and the NARS partners had a strong sense of ownership of the program. It was very evident that the whole SIMLESA team is determined to meet the objectives of the program, to contribute and to work as a team.

Mulugetta Mekuria, SIMLESA project leader, highlighted the 2015 MTR recommendations, which indicate that SIMLESA should rebalance plans and activities of all program objectives and various program-wide themes; ensure that the science which underpins the development of sustainable intensification packages and policy dialogue is completed and published in extension reports and peer-reviewed literature; and refocus its monitoring and evaluation processes, communication plans and gender activities.



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To achieve these changes, each country and the program as a whole should prepare, within the approved budget, a revised work plan extending to the end of SIMLESA II. The program would then be able to make an informed decision on what to prioritize and what needs to be phased out.

Established in 2010 and funded by the Australian Centre for International Agricultural Research (ACIAR), SIMLESA has as its primary objective to improve food security for 650,000 small farming households by increasing food production and incomes of vulnerable but commercially viable farmers by 2023. SIMLESA Phase II activities will conclude in June 2018.

Participants discussed key issues in phase II, as per MTR recommendations, concluding that the overall focus should:

- consolidate activities during 2016-2018, with no new activities implemented during the remaining life of the program;
- document scientific outputs for all the research conducted and synthesize the lessons learned;
- given the available remaining resources, streamline the logframe activities and develop a revised workplan;
- scale-out available technologies in collaboration with partners; and
- redesign the livestock component to align it with SIMLESA objectives.

On behalf of the Minister of Agriculture and Food Security, the Ministry's principal secretary Bright Kumwembe officially opened the meeting and said, "The SIMLESA project has targeted increasing farm-level food security and productivity in the context of climate risk and change. The program has become a model to many regional and sub-regional collaborative projects that address agricultural intensification. In this respect, the challenge to NARS lies especially in developing technologies, information and knowledge that sustainably increase agricultural productivity and at the same time reduce down-side risks."

John Dixon, ACIAR principal advisor/research program manager, cropping systems and economics, said the 2015 SIMLESA Mid-Term Review had highlighted the commitment to the program by national partners. "This gives us the opportunity to rebalance plans, focus on areas that can be brought together and synthesize results. Now is the time to scale-up by taking our research to farmers through extension, non-governmental organizations and farmers' associations – moving from doing to handing over the research."

As part of the meeting, participants visited three farmers in Kasungu District who are involved in on-farm trials assessing conventional farming practices, conservation agriculture with no herbicide application, conservation agriculture using herbicides and conservation agriculture including maize-legume crop rotations. One of the farmers, Dyles Kasawala, managed to improve soil fertility in her fields, increase her maize yield and better her household food security. Farmers in this area are engaging in agro-processing activities, such as extracting oil from groundnuts, to add value to their farming enterprises.



Participants of the SIMLESA Annual Review and Planning Meeting in Lilongwe Malawi, 6-8 April 2016.
Photo: Johnson Siamachira/CIMMYT.

Message from the project leader

The Sustainable Intensification of Maize-Legume Cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA)'s power lies in the strength of its partners. This bulletin is a means to share our exciting and important work, but also to show how we combine for greater impact in key strategic areas.



Mulugetta Mekuria,
CIMMYT - SIMLESA project leader

SIMLESA held its annual review and planning meeting on 6-8 April in Lilongwe, Malawi. Various reports at the meeting alluded to the many successes that SIMLESA had achieved during the last year. SIMLESA undertook this meeting to discuss the project's progress and achievements, share the lessons learned during the last six years, and deliberate over better ways to implement phase II activities (2014-2018).

The meeting highlighted the 2015 SIMLESA Mid-Term Review recommendations, which indicate that SIMLESA should rebalance plans and activities of all program objectives and various program-wide themes; ensure that the science which underpins the development of sustainable intensification packages and policy dialogue is completed and published in extension reports and peer-reviewed literature; and refocus its monitoring, evaluation and learning processes, communication plans and gender activities.

Elsewhere in this issue we report on how partnerships are proving effective in Malawi in outscaling SIMLESA technologies. The program is working with World Bank funded projects, government projects as well as other bilateral development donors. The National Farmers Association of Malawi (NASFAM), for example, is using SIMLESA scaling out approaches to reach out farmers beyond the program's operational areas and spreading out the community benefits. We only hope that the 2016/2017 agricultural season would be better, with less stress tolerance to agricultural activities.

The year 2016 is proving to be yet another exciting period as the Competitive Grants Scheme was rolled out to scale out new sustainable intensification options, technologies and practices. With the grants, farmers, researchers and the private sector will benefit from SIMLESA research outputs generated through our work on sustainable intensification of maize-based systems.

Gender integration in SIMLESA is also taking a critical role, reflecting the priority to integrate gender in all areas of our program of work. For example, SIMLESA initiated exciting work to assess women's empowerment in agriculture through gender case studies. This is also extensively covered in this bulletin.

On behalf of SIMLESA family, I would like to thank all participating countries that have allowed us to work with farmers and other partners in the region.

I am grateful to the SIMLESA Project Steering Committee, Project Management Committee, ACIAR and CIMMYT, who gave SIMLESA the financial and technical support as well as other resources to carry its work.

Mulugetta Mekuria



SIMLESA Strengthens Monitoring, Evaluation and Learning

Sebastian Gavera

It is now more than a year since SIMLESA established a Monitoring, Evaluation and Learning (MEL) Unit taking care of tracking program performance in an institutionalized manner.

Before this arrangement, ASARECA gave MEL training and technical support. The establishment of an embedded MEL unit in SIMLESA has led to strengthening of MEL activities and prominence of MEL work in line with the desire to have some kind of a dashboard which keeps track of program performance in terms of both efficiency and effectiveness in a routine and robust approach.

A number of initiatives have been engaged to improve and build up from the initial work started by ASARECA with the compilation of Monitoring, Evaluation and Learning Framework for the SIMLESA Phase II project being the first priority. The ultimate focus is to develop and document compelling outcome and impact success stories and foster institutionalization and internalization of learning processes in liaison with the communications specialist.



For starters, it is encouraging to note that the MEL Unit was quick to respond to the October 2015 SIMLESA Mid-Term Review (MTR) observation which called for a comprehensive and deployable MEL Plan despite the fact that MEL of SIMLESA Phase II is extremely challenging in view of the complexity and scope of the program. The compilation of the plan was rigorous and consultative, soliciting the technical input of CIMMYT Headquarters staff in Mexico, and ACIAR – before adopting it as final. The plan articulates MEL in four areas: Performance Monitoring Plan, Evaluation Plan, Learning Plan, and Reporting Plan.

Performance Monitoring Plan: The SIMLESA Performance Monitoring Plan is meant to ensure effective and efficient performance-based monitoring of the program. This was developed after a thorough review of relevant project documents, particularly the logical framework in the program proposal. It is supported by an excel-based indicator tracking system which account for indicators across the five countries to build a program picture.

Presenting a learning platform: SIMLESA acknowledges that learning is very critical to the success of the program. Here, Smallholder Malawian farmer Dyles Kasawala, in her conservation agriculture plot. Photo: Johnson Siamachira/CIMMYT.



SIMLESA Strengthens Monitoring, Evaluation and Learning

Continued

Evaluation Plan: This plan seeks to provide information that is credible and useful, enabling the incorporation of lessons learned into decision-making processes and project improvement. This involves a systematic and objective assessment of the project, its design, implementation and results. The SIMLESA evaluation approach is guided by the Theory of Change (TOC), and the performance measurement plan. It involves data collection, analysis and development of findings, consultation and validation of the findings, development of conclusions and recommendations and reporting.

Learning Plan: SIMLESA acknowledges that learning during the complete period of the project is critical to ensure its successful implementation. Knowledge is therefore generated to assess progress toward results and to improve the implementation of the project. The fact that SIMLESA has sites in five different countries provides an opportunity for the countries to share experiences and best practices to facilitate effective and efficient program implementation.

Reporting Plan: The reporting plan ensures the facility to systematically report on the results of on-going performance and evaluation, and that reporting commitments are met against the agreed times. This acts as evidence of program implementation.

Informed by the annual review and planning meeting held on 6-8 April 2016 in Lilongwe, Malawi, which sought to realign and prioritise activities based on the available resources including time before June 2018, the MEL managed to compile a revised logframe. The revised logframe has been couched in such a way that although activities have been streamlined, the program has to achieve its original goal. MEL has just taken the tight tracking of the impact pathways so that the program maintains its relevance, effectiveness, efficiency and sustainability.

Looking ahead, the MEL unit plans to continue employing innovations for strengthening the systems so that there is almost real time reporting on indicators. Tools have been shared with MEL country focal persons to facilitate this initiative. There are plans to carry out some assessment of functionality of the innovation platform using the Group Maturity Index approach so that they can be properly advised to be sustainable.

Sebastian Gavera is SIMLESA Monitoring, Evaluation and Learning Specialist.

Enhancing integration, innovation and impact

Johnson Siamachira

Considered a flagship program, SIMLESA technologies are being adopted by other governments, non-governmental organizations and donors, as a framework for sustainable intensification. The program has significantly contributed to the generation and adoption of user-preferred maize and legume varieties, and has provided information and knowledge that improve system productivity and profitability of target farming systems.

Program activities also led to the identification of maize varieties compatible with intercropping systems, water conservation and labour savings from conservation agriculture technologies, while superior maize and legume yields from rotations in conservation agriculture were realized in all five SIMLESA countries in Eastern and Southern Africa. The positive impacts of conservation agriculture based sustainable intensification practices on risk, incomes and the environment were also analysed and disseminated, while innovation platforms contributed to scaling-out best bet technologies. Since its establishment in 2010, SIMLESA had by December 2015, worked with 173,733 farming households adopting sustainable intensification practices against a target of 143,607 - accounting for a 121 % achievement.

Farmers desperately need these new practices to face the challenges coming their way, according to SIMLESA partner, Total Land Care (TLC). TLC Zonal Manager and Land-Use Specialist, John Chisui said, "Climate change has played a role (in farmers' acceptance)," he explains. "People can see that under conservation agriculture, the crop do much better, compared to conventional agriculture."

Housed in the Ministry of Agriculture and supported by the Food and Agriculture Organization of the United Nations (FAO), Malawi's National Conservation Agriculture Task Force now aligns extension efforts, research, and messaging for conservation agriculture. Because the practices are complex and knowledge intensive, it is crucial to coordinate extension.

SIMLESA is working with World Bank funded projects, government projects as well as other bilateral development donors. The national farmers' association, NASFAM, is using SIMLESA scaling out approaches to reach out farmers beyond SIMLESA operational areas and spread out the community benefits.

Matthias Mkangeni, a smallholder maize farmer in Chinguluwe Extension Planning Area in Salima District in Malawi, was used to the traditional way of farming that his family has practiced for generations. It requires clearing a plot of land and burning all the remaining

plant residue on top of the soil to get a clean seed bed for crops. However, as demand for land increases, this can fuel deforestation and deplete nutrients in the soil if land is not given enough time to regenerate.

Through TLC, SIMLESA-Malawi has been working with farmers like Mkangeni to adapt sustainable intensification practices like conservation agriculture to his circumstances. He is adopting the technologies as a follower farmer, learning from SIMLESA lead farmers, and other farmers in his area. In addition to TLC, other organizations who have taken up SIMLESA-supported technologies in the area include the Malawi Lake Basin Project. In the remote areas of rural Malawi, where Mkangeni's farm is located, conservation agriculture-based farming systems have significant benefits during dry spells in a region where farmers have no access to irrigation and purely depend on rainfall for their harvest. In the 2015/2016 cropping season, Mkangeni harvested his best maize yield of 25 bags of 50 kg maize in the last four years thanks to employing sustainable intensification practices – intercropping maize and cowpeas. His previous yields averaged 10 bags per season. Other farmers' crops were reduced to near ashes by the drought which ravaged Southern Africa in the 2015/2016 season. "I feel a sense of relief, as I now know a number of agriculture techniques that I can use on my farm. I know my family will be food secure and I don't have to worry like before," he continues.



With assistance from SIMLESA and other partners, farmers like Mkangeni are learning to practice conservation agriculture, or innovation agriculture, a cropping systems based on the principles of reduced tillage systems, keeping crop residues on the soil, and diversification through rotation or intercropping maize with other crops. Conservation agriculture approaches can mean the difference between farmers being able to feed their families or having to go hungry.

For Mkangeni, traditional farming practices are now history. As a follower farmer, he says he has learned the benefits of not burning off the moisture and nutrient-dense plant residue in his soil.

In Malawi, an estimated three million people are in need of urgent humanitarian food assistance due to this year's drought. But some will escape hunger, among them 400 smallholder farmers in Salima District, who have begun using conservation agriculture.

Malawi presents a good case for conservation agriculture. Few farmers have livestock, so crop residues can be kept on the fields instead of going for fodder.

Matthias Mkangeni(right), a smallholder maize farmer from Salima District, Malawi, says he has learned the benefits of not burning off the moisture and nutrient-dense plant residue in his soil. Photo: Johnson Siamachira/CIMMYT.



SIMLESA Competitive Grants Scheme Launched in Ethiopia

SIMLESA launched the Competitive Grant Scheme (CGS) in Addis Ababa, Ethiopia on the 20 May 2016 to scale out new sustainable intensification options, technologies and practices.

The launch, held at the Ethiopian Institute of Agriculture Research (EIAR) consisted of options that included new maize and legume (including forage legume) varieties, conservation agriculture-based practices, and soil fertility management technologies. This launch marked the beginning of rolling out of CGS in SIMLESA operational areas. SIMLESA II is rolling out the CGS to scale out and up tested/ validated technologies and practices by partners that include non-governmental organizations, extension services, private seed companies, farmers' unions and other relevant partners. The launch was attended by Australian Centre for International Agricultural Research (ACIAR) representatives led by Dr John Dixon, EIAR Director Dr Fentahun Mengistu, leading the Ethiopian delegation while Dr Mulugetta Mekuria led the CIMMYT team which included Dr Michael Misiko, (Objective 4 leader) and CGS focal person in SIMLESA, among other participants.

Before the official launch, SIMLESA National Coordinator Dr Bedru Bashir and his team made presentations showcasing evidence and capacity on the work they have been doing since the inception of the SIMLESA program. The presentations and the discussions that followed confirmed that the Ministry of Agriculture in Ethiopia had the capacity to implement the scaling out activities for the new sustainable intensifications options. Research focal persons were tasked to liaise with Dr Misiko and agree on the targets for the CGS up to 2018 before signing the documentation spelling out how the process was to be rolled out.

Expressions of Interest were advertised in June in the SIMLESA partner countries as well as on the SIMLESA website. By mid-August 2016, Ethiopia and Kenya SIMLESA teams were expected to sign collaborative agreements with selected partners and disburse the competitive grant funds.

Are Structured Value Chains Possible Or Necessary? Some Highlights from Ethiopian and Kenyan Maize and Legume Markets

A core pillar of sustainable agricultural intensification is farm level financial viability. This in turn hinges on well-functioning agricultural markets and value chains. This brief comes to the conclusion that the near absence of key elements of structured value chains in Ethiopian and Kenyan maize and legume markets implies limited profitable business opportunities in these more formalized market activities. It also highlights four important principles for policy and research aimed at facilitating value chain development.

Food markets in Sub-Saharan Africa are projected to grow exponentially in the coming decades. Modern value chains with dependable and transparent information systems, quality standards, storage facilities, supportive financial credit and other services are important if expanding food markets brought about by urbanization are to turn into successful agribusiness and development opportunities.

Despite the potential of African agricultural markets to capture the demands of a growing urban consumer class, the evidence base on the performance of these markets is still relatively thin. It is therefore important to document the emerging trends to identify opportunities and impediments to the growth and development of modern value chains in these staple crops markets. Market surveys were hence carried out in 2013 under the Sustainable Intensification of Maize–Legume Cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA).

The surveys were undertaken among maize and legume traders in Kenya and Ethiopia. These markets were selected to coincide with the catchment markets for maize and legumes in the zones where the International Maize and Wheat Improvement Center (CIMMYT) and partners implemented the SIMLESA project. The project focuses on generating information on production options, value chains and policy ideas that can be used by farmers, extension agencies, development organizations, and agribusinesses along the maize–legume value chains in a comprehensive package to achieve sustainable intensification. In total 275 and 106 maize and/or legume traders were interviewed in Ethiopia and Kenya respectively.

Characteristics of maize trade enterprises in Ethiopia and Kenya

The evidence of modernization and structured trade in the maize and legume markets in the two countries was summarized in terms of the following parameters: contract-based transactions, service delivery, price information systems, and standardization and quality differentiation. The aim is to show frequency of contract-based transactions compared to spot markets, the availability of auxiliary services from market intermediaries, the nature of the price dissemination system and the grading and quality assessment system.

Frequency of contract-based transactions

Limited contract-based transactions are likely to imply the predominance of spot markets. In both Kenya and Ethiopia, the survey found that the majority of traders operated within a limited locality: In Ethiopia, 94% of maize and legume traders operate primarily in local villages and towns while in Kenya, the incidence is 72% and 79% for maize and legume traders respectively. This situation is partly due to the small and micro size of most businesses.

Transactions based on contracts were nearly absent in either trader-supplier or trader-buyer relationships. In Kenya, only 9.4% of traders had a supply contract with farmers while in Ethiopia, only 0.4% of the traders. Buyer contracts were slightly more prevalent; at least 12.3% of the traders in Kenya and 4% of those in Ethiopia reported having a buyer contract. The evidence of few contract-based transactions may be symptomatic of unstructured transactions in many maize and legume markets in both countries. The localized nature of many of businesses suggests that local traders are not be able to exploit markets further afield compared to other intermediaries.

Service delivery

The second trend revealed by the survey was that the localized nature of grain markets is accompanied by limited market services reaching farmers from traders. This is a significant finding because farmers are the traders' main suppliers followed by wholesalers and rural assemblers or business partners. Only a minority of traders offered any of the services that may support greater and structured participation of farmers in maize and legume markets. There is limited provision of credit or other auxiliary market services. In Kenya, 16% compared to 15% of traders reported availing storage services to farmers; about 2% in both countries also offered agro-advisory/extension services; while only 5% in Kenya and 2% in Ethiopia offered grain pickup and delivery services. Only traders in Kenya (about 15%) reported having risk-sharing arrangements with their suppliers.

Price information systems

Modern markets rely on equitable information access provided through publicly accessible common outlets. In many places in Kenya and Ethiopia there are limited formal public price information systems. For many traders, conversations with fellow traders, agents and brokers are still the main source of market information. Alternatively, price discovery occurred at the market place in the course of negotiations. The latter is a feature of spot markets. The thrust being that gathering market price information is mainly a private undertaking for traders. A publicly accessible price information system appears exceptional rather than the norm in both countries.

In terms of price discovery and settlement, the results showed the predominant price settlement for the traders (74% in Ethiopia and 44% in Kenya) was through negotiations between traders and their business partners (sellers or buyers). Just about 38% of traders relied on common-knowledge market prices during the transaction to pay farmers in both eastern and western regions of Kenya. In Ethiopia 23% of the traders relied on published prices by trader associations.



Visiting a smallholder farmer's maize-groundnut plot in western Kenya: Where willingness to pay is dictated by consumer preferences, markets will pay the price for higher quality products while producers will decide their willingness to participate in these structured markets based on cost-benefit analysis.

Standardization and quality differentiation

An important issue is that in the absence of standardized quality determination and arbitration, prices in informal market systems are often not based on quality differentials. This is because the various “grades” are not openly known nor are they assessed using standardized procedures. In many markets in Kenya and Ethiopia, grading and standardization are limited to the buyer making visual inspection during the buying process. The result is lack of standardization which means that the prices charged are impossible to compare on the basis of quality differentiation.

Sixteen different attributes were assessed for their level of importance in influencing pricing decisions when purchasing maize or legumes. In each case no attribute was considered by more than 12% of the traders as “very important” in affecting prices in either country. Without a common and widely accepted minimum set of attributes, which set the quality and price of maize, it may be difficult to develop systems like group marketing, warehouse receipt systems and commodity exchanges. For example if farmers are to form marketing groups to bulk and transport to larger markets, their members must bring together grain of fairly uniform and specific quality as demanded by the market. Without a common set of standards the arrangement is likely to collapse.

Note that both countries have formal standards for grain and legumes, however, the issue seems to be lack of enforcement or application of the formal quality and grade assessment methods established by various authorities such as National Cereals and Produce Board, Kenya Plant Health Inspectorate and Kenya National Bureau of Standards or the Ethiopian Commodity Exchange.

Implication: Is value chains modernization always a good thing?

Will the development of contracting and other forms of formalization always lead to equitable outcomes for smallholder market participation? Where willingness to pay is dictated by consumer preferences, markets will pay the price for higher quality products while producers will decide their willingness to participate in these structured markets based on cost-benefit analysis. It is possible to

strike a middle ground with those able to achieve the demands of premium markets and those able to serve the low income market segments. The equity implications of this scenario are not immediately obvious.

Conclusions and lessons for sustainable intensification research and policy

The fact that the elements of structured grain markets are largely missing in maize and legume markets in Ethiopia and Kenya suggests that there are few viable business opportunities in these formalized systems, otherwise businesses would have developed around them. Moreover, the dynamism of the less structured markets with their low entry barriers, offer a more level playing field for many small traders and farmers to participate in these markets. The flexibility of less structured markets is also critical in meeting diverse consumers’ needs and preferences. On balance, the advantages of more structured markets are neither straightforward nor a foregone conclusion.

This survey highlights four important issues for policy on value chain development and for further research: First, price information systems based on widely accepted quality definitions are needed in maize–legume value chains to support quality based pricing. Second, agricultural market development policy should focus on improving infrastructure for auxiliary services such as, forward sales, transportation, post-harvest handling and grading. Third, options for reducing the length of value chains or enabling farmers to be more fully integrated into wider markets should be explored. Fourth, future research should focus on determining the business case and development gains from such measures as standardized grades and quality, contracting and vertical integration.

These issues are derived from a policy brief that was prepared by Paswel Marenya of the International Maize and Wheat Improvement Center (CIMMYT) with support from Adam Bekele of the Ethiopian Institute of Agricultural Research, Melkassa Research Station, Adama, Ethiopia and Martins Odendo of the Kenya Agricultural and Livestock Research Organization (KALRO), Kakamega, Kenya. For further information contact Paswel Marenya: P.Marenya@cgiar.org - ASARECA

Enhancing market capabilities of smallholder farmers in crop livestock integrated farming systems

Linking smallholder farmers to viable crop and livestock markets remains a key step in fostering their participation in mainstream economic activities. Across the Eastern and Northern Regions of Tanzania, SIMLESA is engaging in new market opportunities and taking steps in improving incomes from crop livestock integration. Through the project, smallholder farmers are working together to increase crop and livestock productivity, improve access to markets for inputs and products.

Dairy and beef production plays an important economic and nutritional role in the lives of many Tanzanian farm households. Many more farmers would keep a dairy cow or expand their herd if they had access to year-round cattle feeds.



Enhancing market capabilities of smallholder farmers in crop livestock integrated farming systems

Although certain regions have the potential for significant beef and dairy production, smallholder livestock farmers often lack the requisite skills, knowledge, and access to markets to commercialize their enterprises and significantly raise household income. This challenge however, gives local farmers an immediate marketing advantage, if they can become efficient producers.

To address this challenge, SIMLESA partner, the International Livestock Research Institute and field technicians have conducted joint meetings to work out a detailed activity plan on scaling promising forage innovations in the Mbulu and Karatu districts. The current situation shows that the main feed resources for livestock are natural pastures, crop residues and cereal by-products. There is strong seasonal availability of natural pastures with plenty of pastures in the wet seasons (March to June) and extreme pasture shortages in the dry season (July and October) often of poor quality. Crop residues is the main source of feed in the dry season. But, they are not well managed. Often, farmers allow livestock to graze crop residues in-situ. Farmers commonly use abundant cereal by-products for supplementation although they lack the knowledge on how to mix the ingredients at farm level.

As a result the team resolved to initiate:

- Introducing and promoting improved forages.
- Interventions to enhance harvesting, management and use of crop residues on farms
- Capacity development strategy to support the two interventions

Work plans and research protocols for these activities are under development.

Afterwards, based on the recommendations from the midterm review, ILRI-SIMLESA forage/fodder team has made a series of discussions with partners on how to strengthen the livestock component and meet the evolving needs of the program. Accordingly, the activity plans were revised to address the recommendations of the reviewers. This included:

- use of whole farm modelling approach to conduct scenario analysis around different livestock intensification trajectories and probable success of different livestock innovations,
- scaling forage innovations,
- establishing local forage seed systems, and
- postharvest handling and utilization of feed resources to cope with feed calendar deficit

Unlocking legume seed production in Africa

Legumes account for up to 25% of crop production in smallholder systems, and are an important source of livelihoods and incomes. Production of legume seeds, which are open pollinated, does not attract meaningful commercial investments due to difficulties in recovering production costs.

Adoption of legumes is often hampered by poor seed supply. Majority of smallholders obtain legume seed from open grain markets or by recycling the previous year's harvests. Smallholders produce their own seed because private sector involvement in legume seed markets is underdeveloped. Farmers and community-based organizations multiply and sell small quantities of quality declared seed of improved varieties to other farmers within a restricted zone, with minimal formal quality control. Often, the initial seed originates from the formal seed system.



Cowpeas: Legume crops are important components in African farming systems as smallholder farmer Msamantha Rashidi(right) and husband Shaibu Rashidi, of Salima District in Malawi, are experiencing. Photo: Johnson Siamachira/CIMMYT

Legume crops are important components in African farming systems. In addition to providing dietary foods, they provide cash income to smallholder farmers.

Legumes also improve soil fertility through nitrogen fixation. Major legume crops include cowpeas, field beans, soybeans, pigeon peas and groundnuts. These crops are important in eastern and southern Africa, but their production is limited by low adoption of the new and more productive varieties.

Legumes are generally produced in informal semi-structured seed systems involving individuals or communities offering relatively cheaper and readily available seed. This system constitutes about 60-80% of the total seeds used, but lacks support in knowledge, skills and incentives for quality control and hence is not attractive to private sector investors.

What agricultural policy can do

Recognize and integrate the informal seed system as it is being transformed to a more formal system. Seed system actors should be trained to improve the quality of seeds they produce.

Quality declared seed for crops that are not adequately covered under the formal system should be recognized where applicable. This can be through delegation of quality assurance among seed inspectorate agencies, seed companies, NGOs, research or government enterprises.

Encourage private sector investment in the seed sector. Governments should provide institutional support to develop new and improved varieties; provide quality assurance; upgrade laboratory and market infrastructure; enforce regulations and contracts; and simplify procedures.

The apex national research organizations, public universities, international centres and seed companies should take charge of variety testing and development because they have the capacity, human resources, skills, physical facilities and access to international genetic resources of many crops.

Seed multiplication should be left to seed companies, small independent producers or those contracted by seed companies, who can meet the stringent, mandatory requirements legislated for the production of certified seed.



Countries should implement the harmonized regional seed regulations in the ASARECA, the Common Market for East and Southern Africa (COMESA) and the East African Community (EAC) regions to speed up cross-border seed movement across common borders. For example, member countries should take advantage of multiple releases to increase access to quality bean seed by farmers through the cross-border seed business.

Seed entrepreneurs should carry out market research on locally preferred genotypes, popularize preferred varieties and train farmers on their agronomy and post-harvest management.

National agricultural research systems should support variety development, production of breeder/foundation seed and provide information on new varieties, support seed production enhancement, and finance variety maintenance activities.

Enhancing fertilizer use in Eastern and Southern Africa

Fertilizer use in Eastern and Southern Africa is extremely low at around 10 kg per hectare against a global average of 100 kg per hectare.

Inherently low soil fertility, coupled with nutrient mining by crops, leaching and soil erosion have resulted in negative nutrient balances averaging about -62kg of nutrients per hectare per year. Of the three essential elements in fertilizers, nitrogen and phosphorus are the most affected.

Research has shown high response of crops to fertilizer, especially nitrogen and phosphorus. However, the relatively high cost of fertilizers, combined with low agronomic efficiency, makes the use of fertilizers unprofitable in Sub-Saharan Africa. For example, between 1980 and 2004, the ratio of world nitrogen prices to world crop prices averaged 1 to 4.5.

The ratio is generally lower for rice and higher for maize because rice is more expensive than maize in global markets and higher in Africa than elsewhere. The high cost of fertilizer in Africa is driven by many factors including the lack of own manufacturing facilities, storage and blending facilities; poor rural infrastructure; a limited dealer network; small market size; over product differentiation; limited bulk procurement, high freight, port and handling charges; seasonal fluctuations in demand, bulkiness and the high cost of finance.

Declining soil fertility, particularly nitrogen and phosphorus, is a major cause of low crop productivity in Sub-Saharan Africa. For example, almost 80% of African countries are confronted with nitrogen scarcity or nitrogen stress problems. Forty percent of the cost of fertilizer in Eastern and Southern Africa is due to transport from ports of entry to the farmers. For land locked economies, poor port handling infrastructure and trade barriers further add to the cost of fertilizer with additional costs to the nearest border point estimated at US\$

50-100 per ton. Low access to credit by actors along the fertilizer value chain further affects demand and supply.

This is exacerbated by low returns to fertilizer use arising from use of inefficient production methods and low nutrient and water use efficiency. Crop response to fertilizer is often improved by the use of complementary soil and water management practices such as tied ridges, crop residues and organic manure. What agricultural policy can do

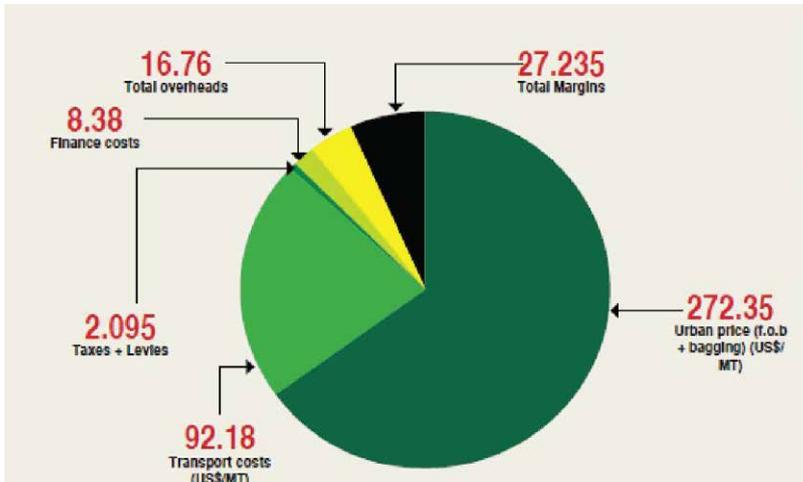
Harmonize the quality and quantity standard specifications for fertilizer across the region. Enhance product quality assurance and truth in labelling in the fertilizer sector by encouraging use of smaller pre-labelled packs, strengthening the inputs inspectorate arm of government, and building capacity for self-regulation in the private sector.

Improve the logistics of fertilizer distribution by investing in more efficient port and customs operations, better road and rail networks and functional retail distribution networks with rural outreach.

Enhance access to credit and financing to enable importer to stock fertilizer, which helps to stabilize prices during periods of high demand while enabling new entrants and hence competition in the sector.

Streamline the fertilizer tax regime to provide incentives for sustained private sector investment. Whereas taxes for regional trade have been harmonized, Value Added Tax (VAT) is still variable and a cause for non-uniform fertilizer prices across the region.

Use smart subsidies to enhance participation of smallholders who would otherwise be excluded from fertilizer markets.



Extension agents should train farmers in sustainable intensification practices validated under SIMLESA that combine nutrient and water use efficiency, to increase returns to fertilizer use and enhance soil health.

Extension agents should foster technology-transfer support through technology transfer advisories and agro-dealers using well-tested manuals, guidelines, demonstrations, and a range of other media.

Researchers should establish fertilizer recommendation by crop and agro-ecological zones and provide expertise towards reducing over product differentiation in the fertilizer market.

SIMLESA Technologies Gaining Ground in Mozambique

Maria da Luz, Custodio Jorge, Angelo Cumbane and José Chiocho



Women also participating at a field day in Cabango, Mozambique, March 2016. Photo: Jefias Mataruse/CIMMYT.

Since 2010 researchers and extension agents have been working with farmers in Mozambique in the implementation of the SIMLESA program.

In Macate District, smallholder farmers are setting demonstration plots with different technologies promoted by the program and other outscaling partners. SIMLESA aims to assess conservation agriculture practices for maize and legume-based farming systems in Sub Saharan Africa and having them widely adopted.

Farmers have the opportunity to test different practices promoted, particularly the use of improved maize varieties, legumes, crop rotation, intercropping, herbicides, minimum tillage, and residues on their plots.

In the 2015/2016 agricultural season, the number of participant farmers hosting the demonstration plots increased significantly and there a number of new farmers joining the project in Macate District.

In January 2016 researchers and extension officers visited a total of 25 farmers (16 men and 9 women) hosting demonstration plots in Macate. During the visit, the team verified the stage of preparation of the newly selected plots for demonstrations and the stage of development of the planted plots.

It was found that the majority of the visited farmers had been working with SIMLESA for two to four years and were experienced in managing demonstration plots. About 10 farmers joined the project in the 2015/2016 farming season. Out of these, some had already planted and others had their plots selected or prepared and waiting for the rains to plant.

Adelino António joined the project this season. He joined the program because he observed and liked what other SIMLESA farmers in his community were doing and the improved maize productivity they achieved each year. For him, the use of improved maize seed and fertilizers improved maize yields significantly.



Addressing crop-livestock production challenges

Alfred Micheni



The new Brachiaria technologies will be immediately tested/demonstrated at all the six mega demonstration hubs supported by SIMLESA. In the picture, a mega demonstration plot in Kyeni in eastern Kenya. Photo: Alfred Micheni/KALRO.

In seeking for collaboration with other organizations involved in development and promotion of agricultural technologies, SIMLESA project scientists in Eastern Kenya recently held a meeting with the Biosciences Eastern and Central Africa-International Livestock Research Institute (BeCA-ILRI) Hub scientists.

The meeting was held at the Kenya Agricultural and Livestock Research Organization (KALRO-Embu) with the main purpose of seeking ways of collaboration, particularly in addressing crop/livestock production challenges under conservation agriculture farming systems.

KALRO-Embu Centre Director, Dr. Patrick Gicheru and BeCA-ILRI Hub Director, Dr. Apollinaire Djikeng, graced the meeting. The day's discussion majored on inclusion of Brachiaria grasses in the value chain commodities addressed by the SIMLESA project. The team visited a farmer's field and Kathuri Mega Demonstration Hub in Kyeni SIMLESA site. The two farms have been testing and promoting SIMLESA project's technologies since October 2010.

Brachiaria grasses are adapted to low rainfall and poor soils, the main challenges limiting food production in SIMLESA sites. In addition, the grasses produce high amount of biomass within a short time. They are also palatable and nutritious to livestock -increasing milk and meat production.

Dr. Gicheru noted: "The grasses can therefore be used for feeding livestock while farmers use maize residues for mulching their croplands in response to one of the conservation agriculture principles; crop residue retention on the soil surface".

The two teams agreed on stronger collaboration links where future joint activities may be conducted with shared technological synergies. Approximately six kilograms of Brachiaria seed was provided by BeCA-ILRI scientists for various soil, ecological and community acceptability, and consequently wider promotion to crops and livestock farmers within and beyond SIMLESA sites.

The Kyeni farmers and the KALRO-Embu SIMLESA scientists agreed to include Brachiaria grasses in the list of technologies meant to improve crop/livestock interaction under conservation agriculture technologies in Eastern Kenya. This means the new Brachiaria technologies will immediately be tested/demonstrated at all the six mega demonstration hubs supported by SIMLESA project in Eastern Kenya. A mega demonstration hub is a new model or a center where agricultural technologies and innovations are promoted to farmers through demonstrations.

The centers link farmers with researchers, agro-input suppliers, credit providers and markets from within and beyond a given hub. The hub is a plot more than one acre which a community member, or school provides on behalf of the community. Most of the activities in a given hub are carried out by the members of the area's innovation platform (IP) initiative. Normally, the IP initiative is made of SIMLESA technology testing and promoting farmer group, agricultural research institutions, individual farmers, agricultural extension providers and other relevant stakeholders. Apart from being a focal point for scaling-out new technologies, the hubs are also used for testing new crop varieties, conservation agriculture practices, seed bulking and distribution to other farmers.



Pathways for the Intensification of Agriculture in Eastern and Southern Africa

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Sustainable development is at the top of the most challenging tasks facing humanity, and agriculture, being the largest business in the world has a key role to play. The largest potential for the sustainable development of agriculture exists in parts of the world where most of the population is involved in small scale farming (up to 90%), and where the demand for food and levels of poverty are the largest e.g. Sub Saharan Africa. However, given the large diversity of agro-ecological, socio-economic and market conditions smarter approaches are required to guide the investments and interventions that are more likely to be adopted to bridge the gap between present and intensified levels of farm production. Here we propose that solutions to the problem are more likely to originate from a better harmonisation of biophysical assessments of what is possible with socio-economic assessments of what is feasible, in the intensification of agriculture in Eastern and Southern Africa. Here we demonstrate how socio-economic data from a household survey across three eastern and southern Africa countries can be combined with a whole farm biophysical model, to identify likely pathways for agriculture intensification across highly diverse agro-ecologies and socio-economic settings.

A whole farm model was parameterised from survey data for: household land area available, number of fields, levels of soil fertility for each field, heads and type of livestock, crop rotation, as well as management of soils, crops and livestock. Synthetic climate records (MarkSim V2 model http://www.ccafs-climate.org/pattern_scaling/ i.e. 99 years, baseline 2013), and a whole farm model derived from linking APSFarm (Rodriguez et al., 2011) and LivSim (Rufino et al., 2009) were used to calculate the potential for intensification of each household. A stepwise increase in the use of fertilisers and feed supplement was used as driver for the intensification of crop and livestock production. These interventions are not prescriptive, but were used to understand the likely behaviour of highly contrasting households to the increased availability of two key resources, i.e. nutrients and feedstock.

Household composition data from the survey was then used to derive the relationship between the likelihood (down side risk) that a household wouldn't produce enough food to satisfy its energy (KJ/year) requirements, and the potential for intensification i.e. difference in household energy production between the high and low inputs scenarios.

Three likely pathways for intensification are hypothesised, (i) households that after intensification are likely to remain food insecure; (ii) households that are likely to be exposed to a high risk pathway; and (iii) households exposed to low risks as they reduce production gaps and move towards a "comfort" zone i.e. low chance of being food insecure after the intensification potential has been significantly reduced (Figure 1). In Figure 1 the baseline situation i.e. present farmers' situation as per baseline survey, is hypothetically represented by the red circles. The baseline survey data was also used to derive a simple predictive model (multinomial log lineal models) of the likelihood that a particular farm would fall within a particular intensification pathway. All statistical analysis was performed using R (R, 2014).

This is a significant methodological improvement over previous attempts that only modelled single case study farms instead of whole populations of households and their representativeness across a whole continent. The analysis was produced for four agro-ecologies in Ethiopia, and two in Kenya, and Zimbabwe. Given the volume of work here we only present results for one of the three analysed countries, 672 households from Ethiopia.

In Ethiopia intensification of agriculture is likely to meet the food energy requirements of more than 60% of the surveyed farmers (Figure 2). However, the proportion of food secure households varied across the four studied agro-ecologies. The Sub-humid region (i.e. Gumuz) appears to be the most challenging with only 49% of the households to be food secured after intensification. The Humid region (i.e. Bako) was the most promising with 68% of the households likely to achieve food secured. We also show how household socio-economic characteristics were associated to each of the pathways in Figure 2. For the Humid and CRV regions low risk pathway households had larger values of biophysical drivers e.g. land sizes, tropical livestock units, and use of inputs in cropping. However for the Sub humid and Semi dry regions relationships between pathways and socio-economic characteristics were less clear.

continued

Discriminating low risk and high-risk pathway households across the different regions can help target interventions or technologies requiring contrasting levels of investment. For example the selection of interventions for high-risk pathway households are likely to require better understanding of sources and impacts of risk, as well as factors that might limit adoption e.g. farmers' attitudes to change, investment and consequent changes in risk exposure. A Canonical Discriminant Analysis (CDA) was used to identify the most important socio-economic attributes at separating the three hypothesized pathways. These attributes included number of tropical livestock units, the household consumption equivalent, the region, and the percent of off-farm income. These variables and their interactions were then used in a Multinomial logistic model as predictors of their pathway membership. The analysis of deviance for the Multinomial model indicated that farm size and region were the most important individual terms in the model; while region by farm size, and consumption equivalent by farm size the most significant interaction terms.

We used the fitted multinomial model to study the sensitivity of the predicted probability for any household to fall within a particular pathway, as a function of the observed range of values of farm size, and other household characteristics. Results indicated that for the Humid and Central Rift Valley, households of more than 4ha were likely to fall within the low risk pathway. For the Sub Humid region, households having values of consumption equivalent higher than 4 had more than 50% chance be in the food insecure pathway.

We conclude that bio-physical and socio-economic assessments can be combined to (i) identify likely pathways for the intensification of agriculture; (ii) used simple characteristics of resource poor households that could be used to predict the likely pathway a household is likely to follow; (iii) and ex-ante quantify the likely benefit of innovations that are more likely to fit bio-physical and socio-economic settings. These results are likely to be useful in research for development projects that aim to better target innovations among the highly diversity of households found across eastern and southern Africa and elsewhere.

Acknowledgements.

The Australian Centre funded this research for International Agriculture Research (ACIAR) www.aciar.gov.au.

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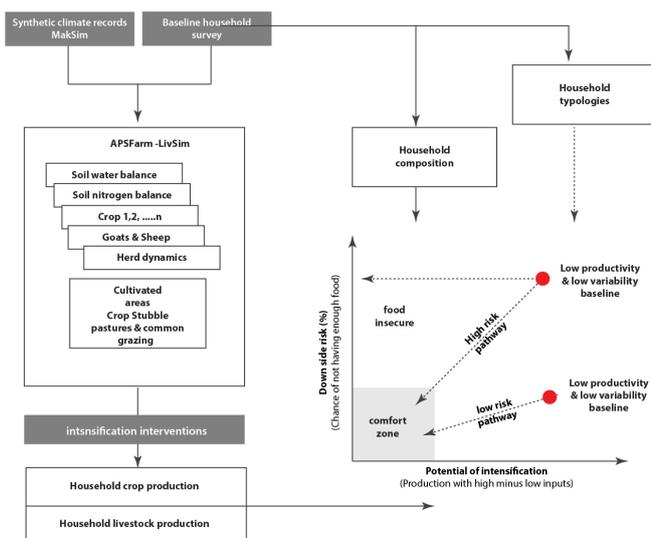


Figure 1. Analysis framework and hypothesised pathways for the intensification of agriculture, i.e. households that after intensification are likely to remain food insecure; households that are exposed to a high risk pathway to reduce food production gaps; and households exposed to low risks as they reduce production gaps are reduced, and move towards the “comfort” zones i.e. low chance of being food insecure after the intensification potential has been significantly reduced

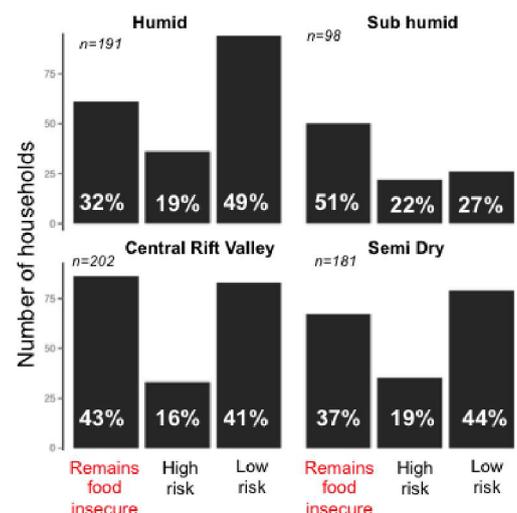


Figure 2. Percentage of households across the four study regions that fall within each of the the proposed pathways for intensification in Figure 1, i.e. households that are likely to remain food insecure after the intensification took place; households that are exposed to high risk during the intensification process; and households that can be intensified at a low risk.



About CIMMYT

CIMMYT - the International Maize and Wheat Improvement Center - is the global leader on public funded maize and research, and on farming systems that include these crops. Headquartered near Mexico City, CIMMYT works with hundreds of partners throughout the developing world to sustainably increase the productivity of maize and wheat cropping systems, thus improving global food security and reducing poverty. CIMMYT is a member of the CGIAR Consortium and leads the CGIAR Research Programs on MAIZE and WHEAT. The Center receives support from national governments, foundations, development banks and other public and private agencies.



SIMLESA Geographic Focus Map



About SIMLESA

The International Maize and Wheat Improvement Center's Sustainable Intensification of Maize–Legume Based Cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA) project was launched in 2010. Funded by the Australian Centre for International Agricultural Research (ACIAR), SIMLESA aims to improve the livelihoods of small-holder farming communities in Africa through productive and sustainable maize–legume systems and risk management strategies that conserve natural resources. It is managed by CIMMYT and implemented by partners in Ethiopia, Kenya, Malawi, Mozambique and Tanzania. From gains and lessons learned in these project countries, there are benefits for three spillover countries — Botswana, Rwanda and Uganda.

Through participatory research and development with farmers, extension agencies, non-governmental organizations, universities and agribusinesses along the value chains, the project aims to improve maize and legume productivity by 30 percent, and to reduce the expected downside yield risk by 30 percent for an approximate additional 650,000 farms by 2023.

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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



ILRI International Livestock Research Institute