

# SIMLESA

Sustainable Intensification of  
Maize-Legume Systems for Food Security  
in Eastern and Southern Africa

## Building Productive, Resilient & Sustainable Maize- Legume Cropping Systems in Africa : Achievements and lessons.

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*on behalf of Team SIMLESA*

*Australia - Africa  
Agricultural Research Symposium  
20 - 21 March 2018*

*Southern Sun Mayfair Hotel Nairobi, Kenya*



Ethiopia



Kenya



Malawi



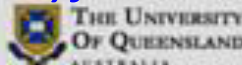
Mozambique



Tanzania



Australia



THE UNIVERSITY  
OF QUEENSLAND  
AUSTRALIA



ICRISAT  
International Crops Research Institute for the Semi-Arid Tropics



PASARECA  
Partnership for Agricultural Systems and Resilient Ecosystems



ARC + LNR  
Agriculture Research Council of South Africa - Land Use Research Network



ILRI  
International Livestock Research Institute



CIAT  
Centro Internacional de Agricultura Tropical

# The problem

*Market failure and lack of enabling institutions support the idea of empowering communities along economic corridors*

Policy; collective action through IPs; CGS to initiate scaling

Weak institutions, low prices, high costs, lack of the right inputs at the right time in the right place

Strong need to sell crops at harvest time

*Large diversity of household situations, significant trade-offs between limited resources (labour, cash, land, biomass); need for diversification of livelihoods*

Low yielding rainfed systems, low return to labour

**Lack of incentives & capacity to invest in costly & uncertain technologies**

Seasonal poverty & malnutrition

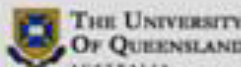
- Working with CA and farmers' resources
- Seed systems

*SI increased food availability though smaller farms and large households likely to remain food insecure*

Medium to high climate variability, high vulnerability, high risk aversion, and lack of labour

Crop production confined to the rainy season

Diversification into cash crops and livestock

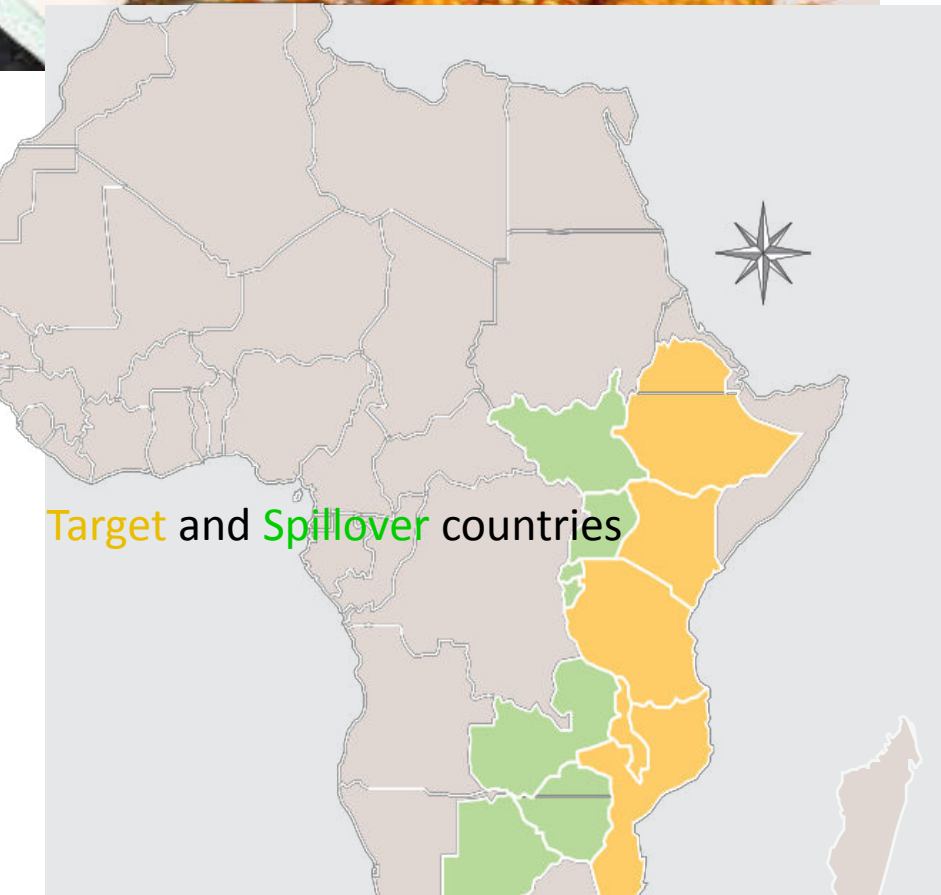




- Executed by CIMMYT with financial Grant from ACIAR
  - Phase 1-2010-2013
  - SIMLESA2 2014-2018

## PARTNERS-NARS

- EIAR, KALRO, DRD,DARS , IIAM, spill over NARO,RAB, DAR
- Regional/International
- QAAFI, ARC, ASARECA, ILRI ,CIAT
- - CCARDESA(phase2),



Target and Spillover countries



## Approaches

## Vision of Success

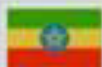
**3+3- Is**  
**INTEGRATION**  
**(SYSTEMS)**  
**INNOVATION**  
**PLATFORMS**  
**IMPACT**  
**ORIENTATION**  
Information  
Inputs  
Institutions/policy  
Complimentary  
projects: DTMA,  
TL-II  
ACIAR/AIFSC- AP,  
ZIMCLF, FACASI,  
TF-ICRAF

To increase maize and  
legume yields by 30%  
while sustaining the  
environment through:

- Conservation agriculture practices
- Improved maize and legume varieties
- Development of markets and value chains, from input supplies to output markets.

To reduce downside yield  
risks by 30%

To benefit 650,000 farm  
households within 10 years.



Ethiopia



Kenya



Malawi



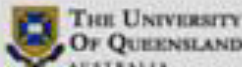
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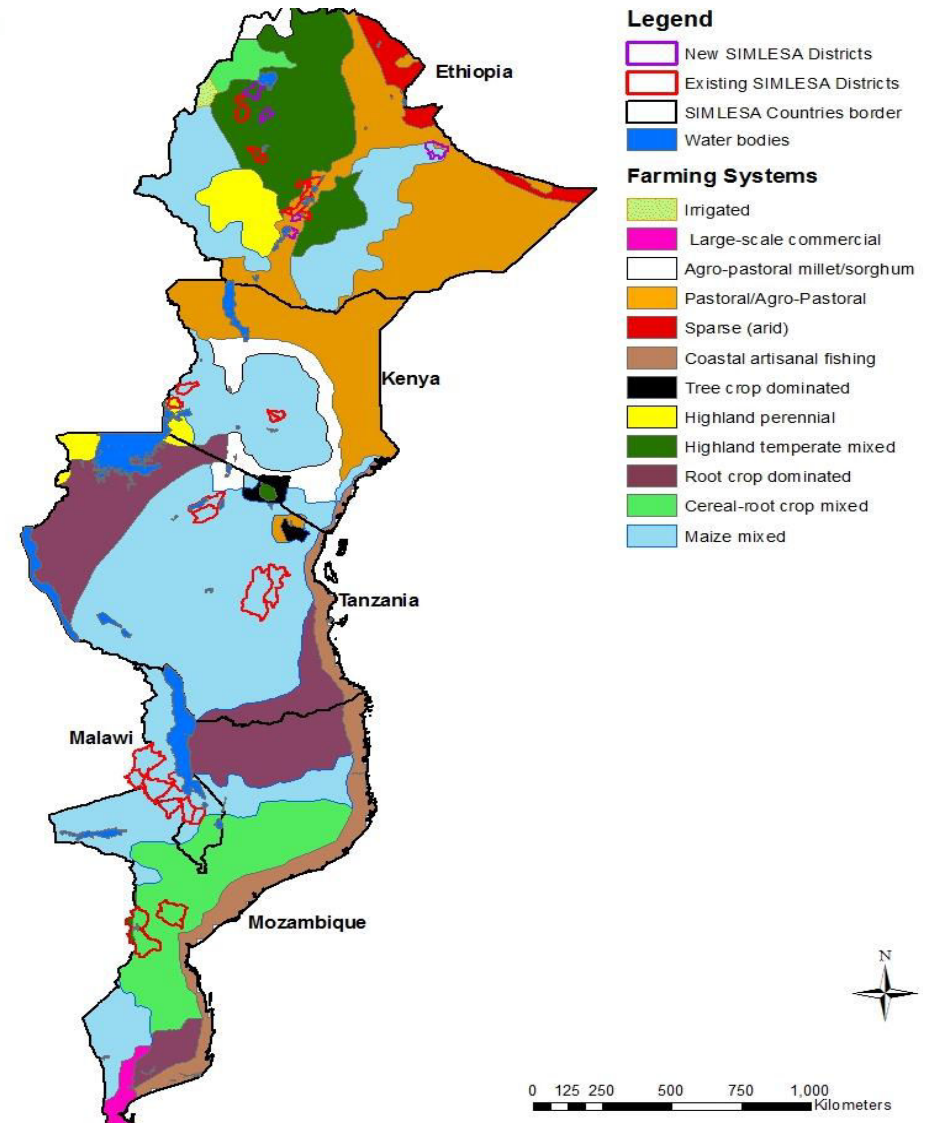
# SIMLESA countries

## Major farming systems in:

Ethiopia  
Kenya  
Tanzania  
Malawi  
Mozambique

And three spill-over countries

Botswana  
Rwanda  
Uganda





# Where have we come from?

2010-2012

- Farming systems characterization; baseline surveys; CA options relevant to target agro-ecologies in each country
- On-station long-term and on-farm exploratory trials
- Participatory variety selections and seed road maps

2012

- Mid term review; financial analysis, risk analysis
- Selection of varieties compatible for SI options
- Realization of the need for smart sequencing of technologies
- House hold typologies for each farming system developed

2014-18

- Scalable options rolled out
- Scaling out guides developed
- Increased Scaling out through AIP and partnerships
- End of phase 1
- Increased emphasis on sustainable intensification
- 
- Objective 4 Scaling out initiated as stand-alone



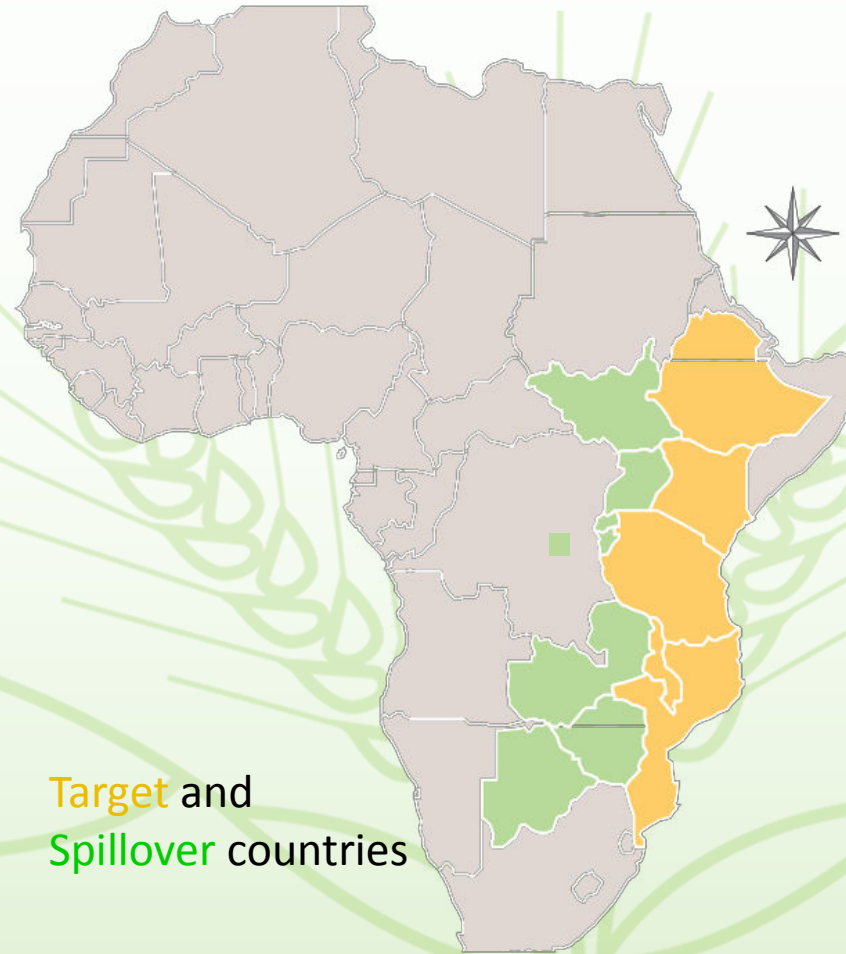
## The SIMLESA process

- Recognition of the diverse nature of farming systems and households and the need for best fit interventions
- Applying Farming systems research framework
- Focus on food security crops: maize and legumes; crop-livestock integration
- Empowerment of our partners: Local partners contribution to identification of best bet systems for each target agro-ecology, managing own thrusts and capacity building
- Scaling based on innovation systems approaches



# SIMLESA - Achievements

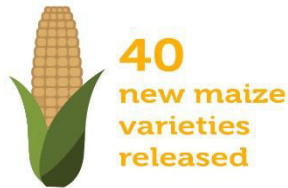
- characterized the maize-legume production and value chain systems in the study sites
- tested promising smallholder maize-legume cropping systems;
- Attempted to increase the range of maize and legume varieties available for smallholders;
- Piloted scaling out by developing and employing local innovations plat forms and now launched CGS
- Facilitated a strong capacity building of agricultural research partners.



Target and  
Spillover countries



## On-farm and on- Station agronomic trials PVS conducted



SIMLESA, in collaboration with other programs, facilitated the release of 40 new maize varieties many of which were specifically selected for their drought tolerance and some of which were selected for their phenotypic characteristics suitable for maize-legume intercropping in conservation agriculture systems.



Considering the importance of legume in food security and plant based protein nutrition of many families, SIMLESA co-sponsored participatory varietal selections (PVSs) sessions involving 378 legume varieties. A total of 64 varieties across the five program countries positively met PVS team's criteria and therefore were acceptable for official release.

## The Scientific impacts

- This helped to understand productivity, soil quality and soil moisture conservation trends.
- Adoption of sustainable intensification practices increased the average baseline maize yield from 1.8t/ha to 4.4t/ha ; legumes from 0.5t/ha to 1.5t/ha for across the project countries.

**Socio-economic datasets from more than 5000 households and 508 villages across the five project countries**  
**Household typologies for technology targeting developed by QAAFI an partners**

**130**  
**peer reviewed journal articles published**

# Yield impacts

- Across ESA, results clearly demonstrate yield benefits from the use of rotations in CA based SI systems
  - with maize yield increases averaging 1.5t/ha
    - With yield increase for legumes average 0.8t/ha
  - Reduction of down size yield risk by 45%





# Germplasm for climate smart farming systems

## Stress tolerant maize and legumes

More than 50 new drought  
tolerant maize varieties have  
been released.

Stress varieties of cow pea,  
pigeon pea, beans..



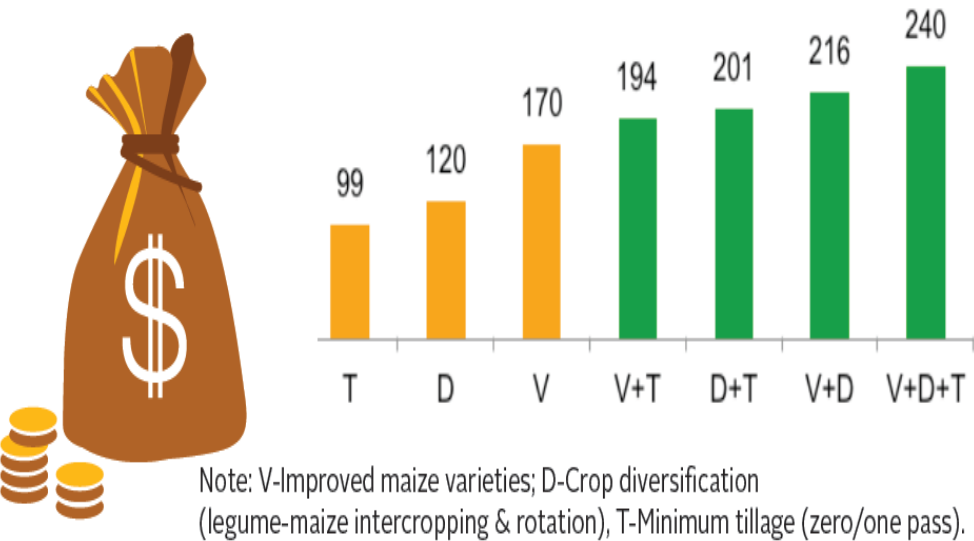


- Under SI practices: Selected hybrids yielded 30-40% more under drought and 20-25% under optimum conditions
- Farmers saved labour 50% for other economic activities
- Farmers realized increased from 2.5 to 4 tons/ha maize
- Legumes yields Increases from 1.5 to 3 tons/ha in Tanzania and Kenya.

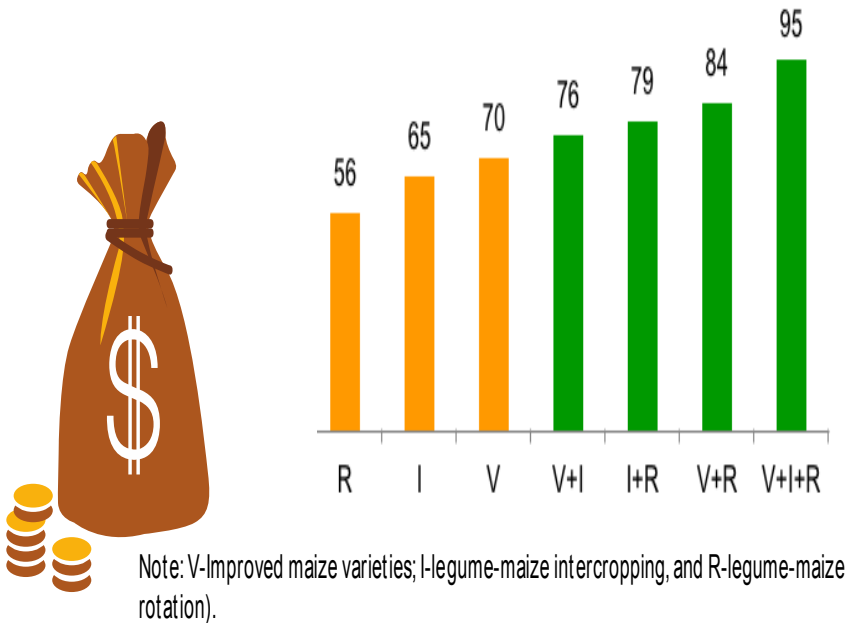


# Impact: Financial benefits

Additional income from adoption of multiple Sustainable Intensification Practices (SIP) in Ethiopia [in USD/ha]



Additional income due to multiple adoption of SIPs in Malawi (in USD/ ha)

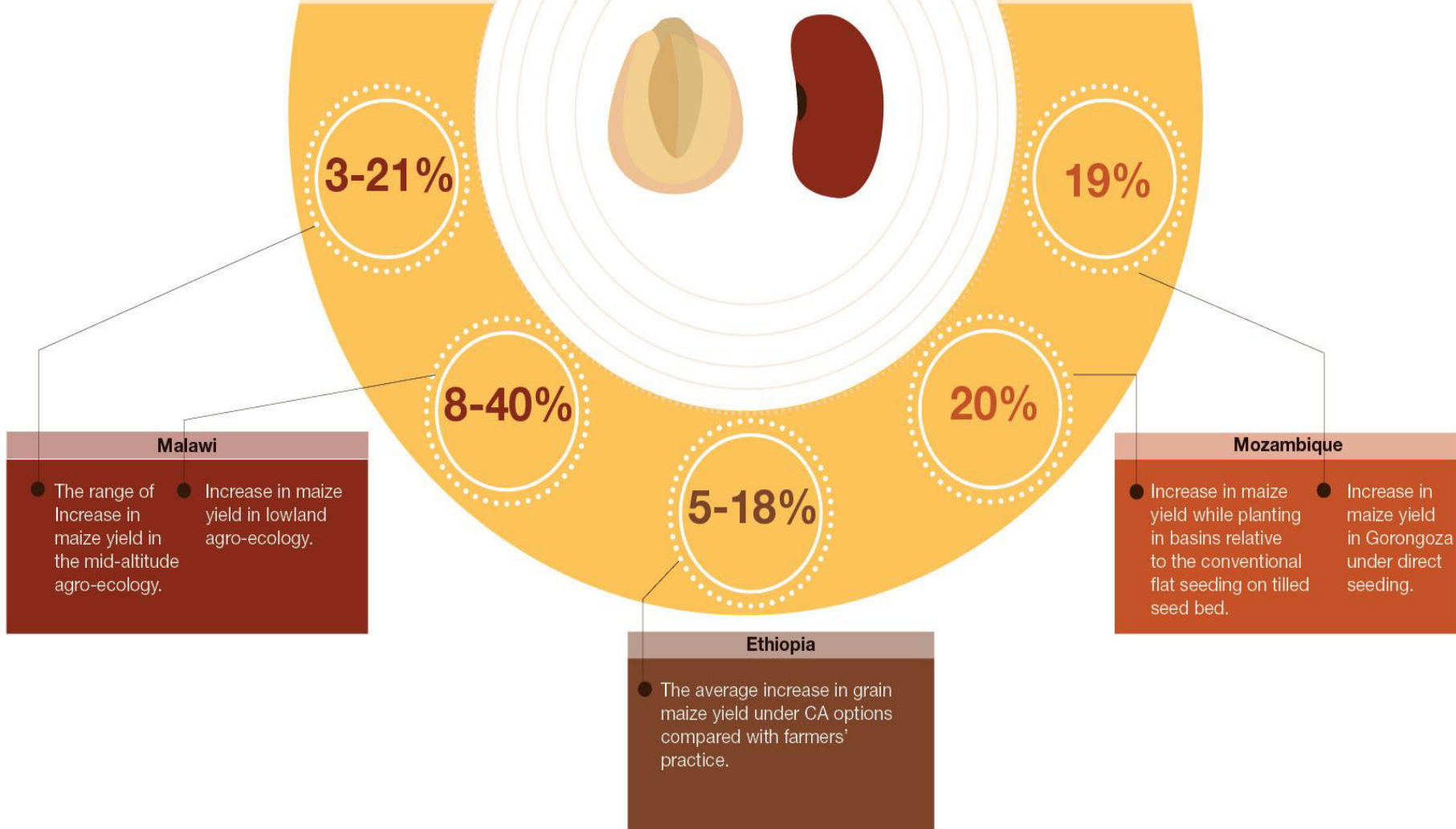


With larger benefits when multiple innovations are adopted

# A brief snapshot: some key research from SIMLESA

## Is there a value proposition in CA for famers?

The productivity (yield) advantages of CA compared to farmer practices has been demonstrated in research done the SIMLESA project. For example,





# Institutional and capacity building



**58**  
innovation  
Platforms  
established

A total of 58 Innovation Platforms were established to assist in scaling out of sustainable agricultural intensification (SAI) technologies and viable marketing of agricultural produce for



**20**  
policy  
briefs  
published

The project has been determined to reach out to the policy community with the publication and dissemination of more than 20 policy briefs. These were disseminated at project annual meetings and other gatherings.



**Regional  
Policy  
Summit  
held**

A regional policy summit was held in October 2015 which resulted in the signing of a Ministerial Communique by five countries (Ethiopia, Kenya, Tanzania, Mozambique, Rwanda) committing to the mainstreaming of SIMLESA results in their countries' agricultural policies.



**19**

partners  
selected to  
drive scaling  
out initiative

Toward the end of 2016, the program managed to competitively select 19 partners to drive the scaling out initiatives under the Competitive Grants Scheme (CGS).

In 2016/season CGS Partners communicated SIMLESA messages and reached a large number rural households in the project communities-  
202 828 farmers- Extension Message-Demo plot, field days, exchange visits, farmer training  
3 528 321- Media (Radio, TV, SMS, newspapers)

**235,000 farmers have adopted various sustainable intensification practices**

SIMLESA contributed to the training of

- 65 MSc and PhD NARS scientists. With strong support of ADS, QAAFI, Australian Universities and ARC - South Africa).
- Trained more than 3,000 agricultural scientists in the maize and legume production value chains and
- engaged more than 40,000 farmers (almost half of them women) through farmer field days and exchange programs

# Impact: Capacity Development and science output

- Graduate Training -23 PhDs 22 MSc (ADS and ACIAR and ARC, scholarships)
- On the job trainings for NARS partners in Australia, South Africa and in country
- Strong Science outputs -122 publications 52 posters 15 policy briefs, training manuals
- various communication products including national level media coverages at NARS,
- National, regional and international conference, participation by partners

# On-site soil methods training and assessment (QAAFI)





# Impact: Gender Integration to R4D activities

## What was achieved:

- Leadership and coordination skills for GFP strengthened
- Identification of core activities for gender integration
- Development of M&E Indicators
- Gender capacity strengthening strategy developed by ARC
- Gender in Communication



## Households headed by women



## Households headed by men



**9.6%** ← Chronic Food Insecure → **4.9%**

**43%** ← Food Secure → **58%**

**12%** higher chance of  
transitory food  
insecurity

## Estimated Cumulative (2012-2017) Adopters of SIMLESA technologies by country

| Country      | Target         | Males          | Females       |  |
|--------------|----------------|----------------|---------------|--|
| Ethiopia     | 61,005         | 39,843         | 7,594         |  |
| Kenya        | 51,957         | 29,229         | 51,957        |  |
| Tanzania     | 51,957         | 24,290         | 10,670        |  |
| Malawi       | 46,787         | 27,690         | 23,407        |  |
| Mozambique   | 46,787         | 27,156         | 10,901        |  |
| <b>Total</b> | <b>258,493</b> | <b>148,208</b> | <b>87,213</b> |  |

[11](#) The estimation of adopters is based on the adoption rates of the 2016 Adoption Monitoring Survey.. An adopter is defined as one who at least have practiced one or more of the recommended practice for more than one year on at least 25% of his/her cultivated land (**SIMLESA ME&L 2017**)



# Scaling out SI practices: Competitive Grants scheme

| Country          |                       | Target reach | Current reach | % achieved | Est. % adoption |
|------------------|-----------------------|--------------|---------------|------------|-----------------|
| Ethiopia         | Hadiya Zone           | 53,140       | 52,902        | 99%        | 30              |
| Kenya            | University (Egerton)  | 30,000       | 18,050        | 60%        | 25              |
|                  | TV (Mediae)           | 2,000,000    | 3,654,000     | 183%       | 15              |
| Mozambique       | Business (AgriMerc)   | 50,000       | 36,020        | 72%        | 30              |
| Tanzania         | Farmer Org. (MVIWATA) | 50,960       | 26,498        | 52%        | 30              |
| All CGS partners |                       | 2,938,010    | 4,110,180     |            |                 |



## Some Empirical Lessons : *Returns and impact*

1. Adopting individual practice benefit farmers but suites of technologies :
  - Led to highest income
  - Reduced fertilizer use, without yield penalty
  - Lowered cost of risk (downside risk)
2. Adoption of improved varieties of maize and legumes
  - Improves food and nutrition security
3. For conservation agriculture to succeed (crop livestock production systems)
  - alternative feed sources are needed-new forage crops being promoted
  - Crop residue is a valuable multi-use resource



Ethiopia



Kenya



Malawi



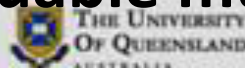
Mozambique



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Africa



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Agriculture and  
Livestock Research  
Network



ILRI  
International Livestock  
Research Institute



CIF  
Center for International  
Forestry Research

# Impact: Partnerships

- NARS empowered and driving program activities
- Significant capacity development (PhD, MSc, etc)
- New integrative systems modelling tools
- Web tools, statistics and R MOOC & Innovative ICTs
- Co-investment from NARS, QAAFI
- Synergisms across investments (FACASI, ZimClif, Adoption Pathways, USAID, BMGF)



## SIMLESA Ownership by partners ensuring Sustainability

- SIMLESA is considered as a model for Effective partnerships, Multi-stakeholder collaboration with a potential for co investment by various development partners/donors
- Communique signed by 5 Ministers of Agriculture endorsing SIMLESA
- NARS empowered and enabled to operational decisions on program activities and thrust
- NARS receive a relatively higher funds compared to other projects
- Capacity development is central to SIMLESA

# SIMLESA soils manual and ACIAR Household diversity monograph



## SIMLESA Soil Manual

Simple protocols and resources for rapid  
field soil testing in Africa

Caspar W Roxburgh, Stuart Irvine-Brown, Ben  
Harms, Joseph X Eyre, and Daniel Rodriguez



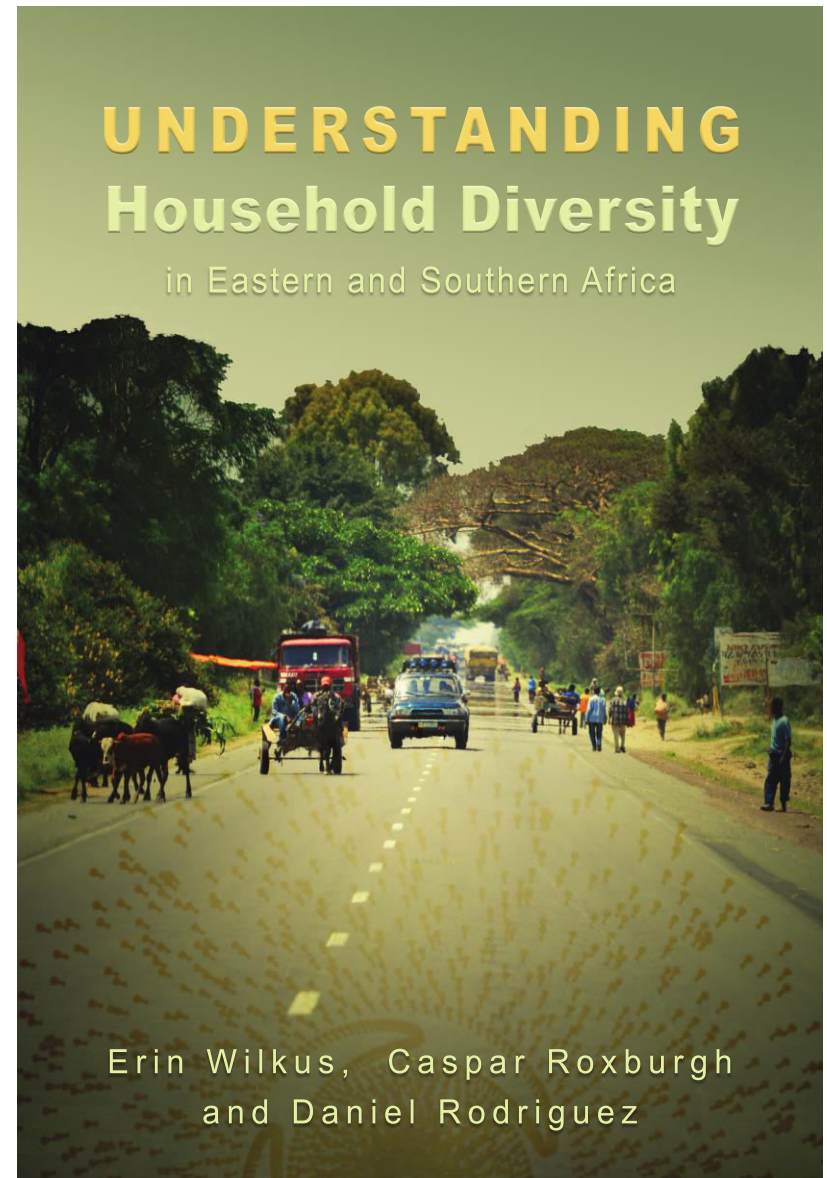
Queensland Alliance for  
Agriculture & Food Innovation



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



Australian Government  
Australian Centre for  
International Agricultural Research



## UNDERSTANDING Household Diversity

in Eastern and Southern Africa

Erin Wilkus, Caspar Roxburgh  
and Daniel Rodriguez





## Lessons on SI from SIMLESA

Four critical aspects of SI which require particular attention:

- systems research & development – beyond disciplinary components;
- From incremental to transformational system
- innovation systems bridging research and scaling out;
- policies, institutions and business partnerships; and
- monitoring and evaluation of sustainable intensification systems.



# Acknowledgment; SIMLESA Partners SIMLES HOST FARMERS AND COMMUNITIES rs ACIAR AND CIMMYT

