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

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

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The University Of Queensland AUSTRALIA

QAAFI Queensland Alliance for Agriculture and Food Innovation

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Perspectives on Prospects and Constraints to Adoption of SIMLESA Technical and Institutional Innovations in high and low Potential areas of Kenya

C. Nkonge, A. Micheni, G. Ayaga, M. Odendo, C. Ndinya, C. Murithi and B. Rono

Presented at the SIMLESA End of Project External Review and Stakeholders Meeting Held at Addis Ababa, Ethiopia on 5-9 March 2018

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Presentation Format

Introduction

Prospects of the various Objectives

Adoption of SIMLESA technologies and practices

How SIMLESA's outputs contribute to Kenya's development strategy and priorities

Constraints

Way forward

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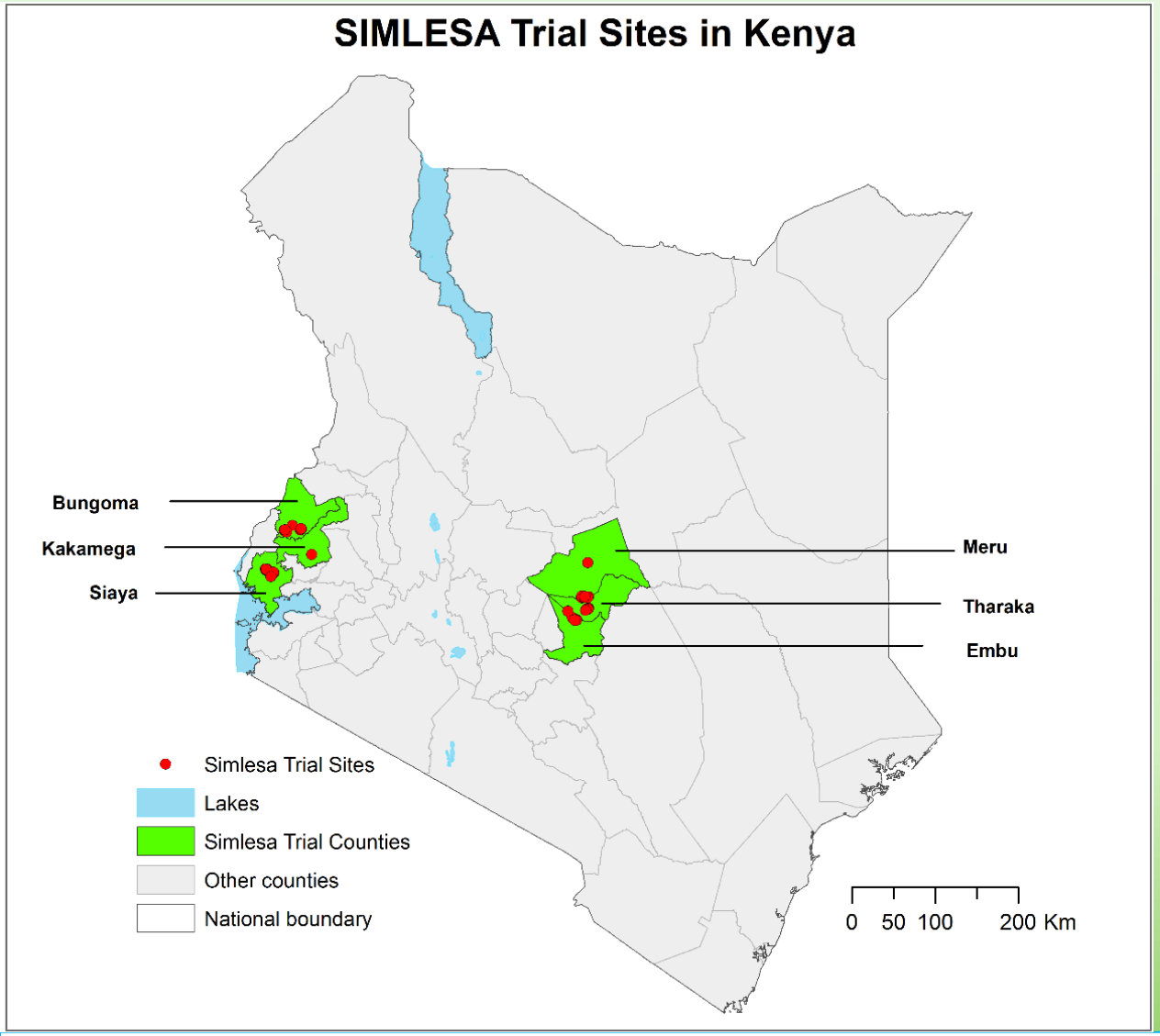
Introduction



1. High & reliable rainfall, lower temperatures (UM_{3-4}) aez – High Potential

Upper Meru & Embu – eastern Kenya
Bungoma –western Kenya

2. Lower & erratic rainfall, higher temperatures (LM_{3-4}) aez- Low Potential

Lower Meru & Tharaka – eastern Kenya
Siaya- western Kenya

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Overall objective

Increase maize-legume productivity by 30% & Reduce production risk by 30% in one decade, reach 1,500 communities and benefit 100,000 farm households.

Specific Objectives

1. To characterize maize-legume value chain and identify constraints and options for field testing./ To enhance the understanding of CA-based intensification options for maize-legume production systems, value chains and impact pathways.
2. To test and adapt productive, CA-based intensification options for smallholder maize-legume production
3. To increase the range of maize, legume and fodder/forage varieties available to smallholders
4. To support development of innovations systems and scaling out modalities
5. Capacity building to increase the efficiency of agricultural research today and in the future

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Objective 1
Maize-Legume Farming Systems Characterization

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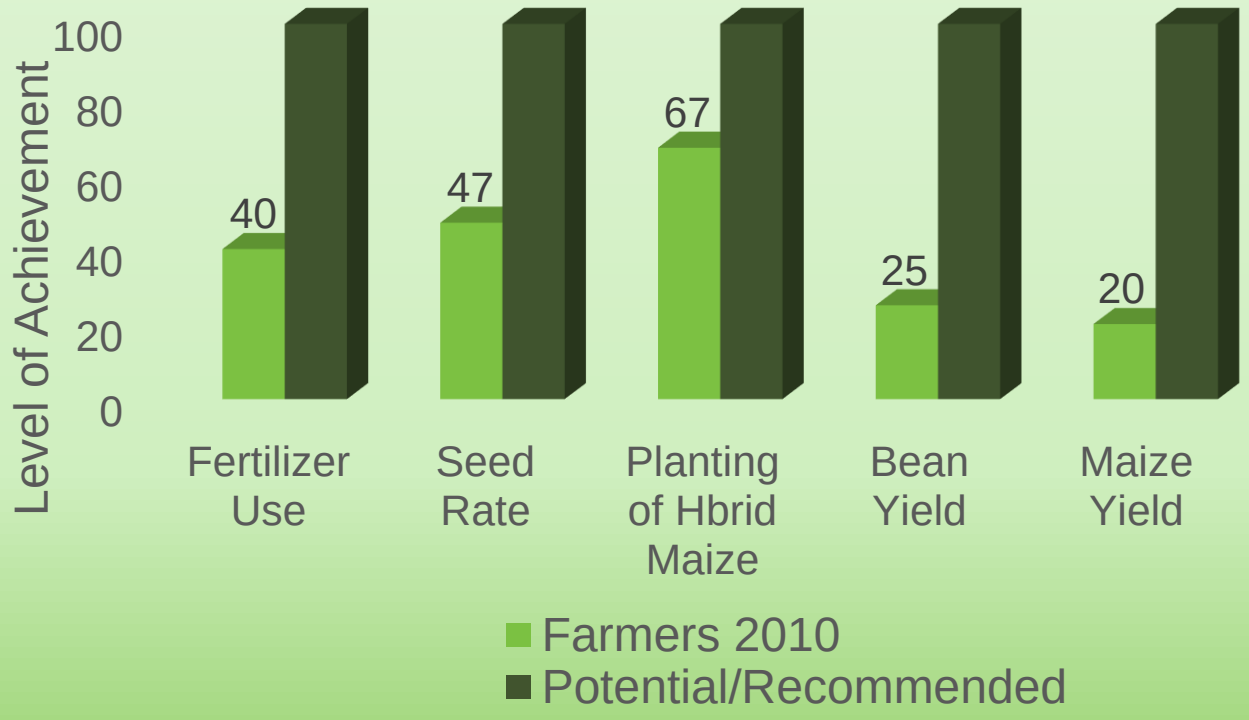
Maize-legume production and value chain systems characterization

- 8 communities characterized for demonstrating and evaluating technologies through FGD and key informant interviews involving 302 women and 301 men farmers
- Comprehensive household, plot and village level data collected from 613 households (494 men-and 119 women-headed) in 88 communities and used to for the characterization
- Constraints, opportunities and options for field testing identified, documented and used by Objectives 2 and 3.
- Benchmarks and baselines (crop varieties, fertilizers use, crop yields ..) to guide areas of SIMLESA program intervention and against which the SIMLESA program interventions/progress could be evaluated were generated and documented.
- From analysis of survey data 6 farm typologies were defined for targeting CA based technologies and practices

Major Findings of Baseline Survey



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Objective 3
Participatory Varieties Selection (PSV)

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Varieties identified & evaluated through PVS	Varieties endorsed by farmers for different agro-ecological zones
Newly released maize varieties - 45	**14 Varieties** **UM($_{3-4}$):** KH500-39E; KH500-38E; H520; KH635A; PHB 30G19; PHB P2859W; H529; Embu 226; KSTP 94; DK 8031 **LM($_{3-4}$):** Embu 225; KDV 5; KDV 6; KSTP 94; KDV 1
Newly released legume varieties - 42	**24 Varieties** **UM($_{3-4}$): Beans -** KK8; KK15; KAT X69; Chelalang; KK Rosecoco 194; Embean 14; Ciankui; Tasha; KK Red Bean 16; Mwitemania **LM($_{3-4}$): Soya beans -** SB 19. **Pigeon pea -**; KAT60/8; ICEAP 60/8; ICEAP00554; ICEAP OO850; ICEAP 00040; ICPL87091; Kendi; Ndombolo. **Groundnuts -** CGV 99568; ICGV 90704 & ICGV-SM-12991; **Cow peas -** M66; K80; KVU-27-1.
Newly released fodder varieties - 12	**7 Varieties** *Calliandra Calothyrsus*, *Molus alba* (mulberry) and *Leucaena trichandra*, *Brachiaria brizantha* (Toredo), *Brachiaria brizantha* (Piata).Green Leaf and Silver leaf Desmodiums

Varieties preferred due to different characteristics. Preferred varieties put under seed road maps to produce adequate seed for farmers.

Objective 3, Participatory Varieties Selection (PSV)

Phase 1

Maize and Legume Varieties tested in collaboration with farmers

Selection for high yielding and stress tolerant varieties

Phase 2

Maize, Legume and Pasture/Fodder Varieties tested in collaboration with farmers

Source of Varieties Tested

Variety	Source
1. Maize	KALRO, DTMA, CIMMYT, SEED COMPANIES
2. Beans	KALRO, EGERTON UNIVERSITY,
3. Pigeon Pea	KALRO, ICRISAT
4. Soya Beans	KALRO
5. Groundnuts	KALRO, ICRISAT
6. Cow peas	KALRO
7. Pasture & Fodder varieties	KALRO, ILRI

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Objective 2
Best Bet CA Based Agronomic Practices

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CA Practices selected and tested by farmers: All 3 methods were preferred

Tillage method	Preparation	Weed control	Residue mgt.
Zero tillage (ZT) (eastern & western Kenya)	Only seed and fertilizer holes made	Herbicides used as needs be	Over 75% retained on the soil surface
Furrows & ridges (eastern Kenya) **For more drier aezs**	Furrows/ridges made at the start, - and maintained thereafter with minimal repairs	Herbicides used as needs be	Over 75% retained on soil surface
Zero tillage + Desmodium as cover crop (western Kenya) **For farmers with livestock**	Only seed and fertilizer holes made	Herbicides used as needs be	Over 75% removed from the plots

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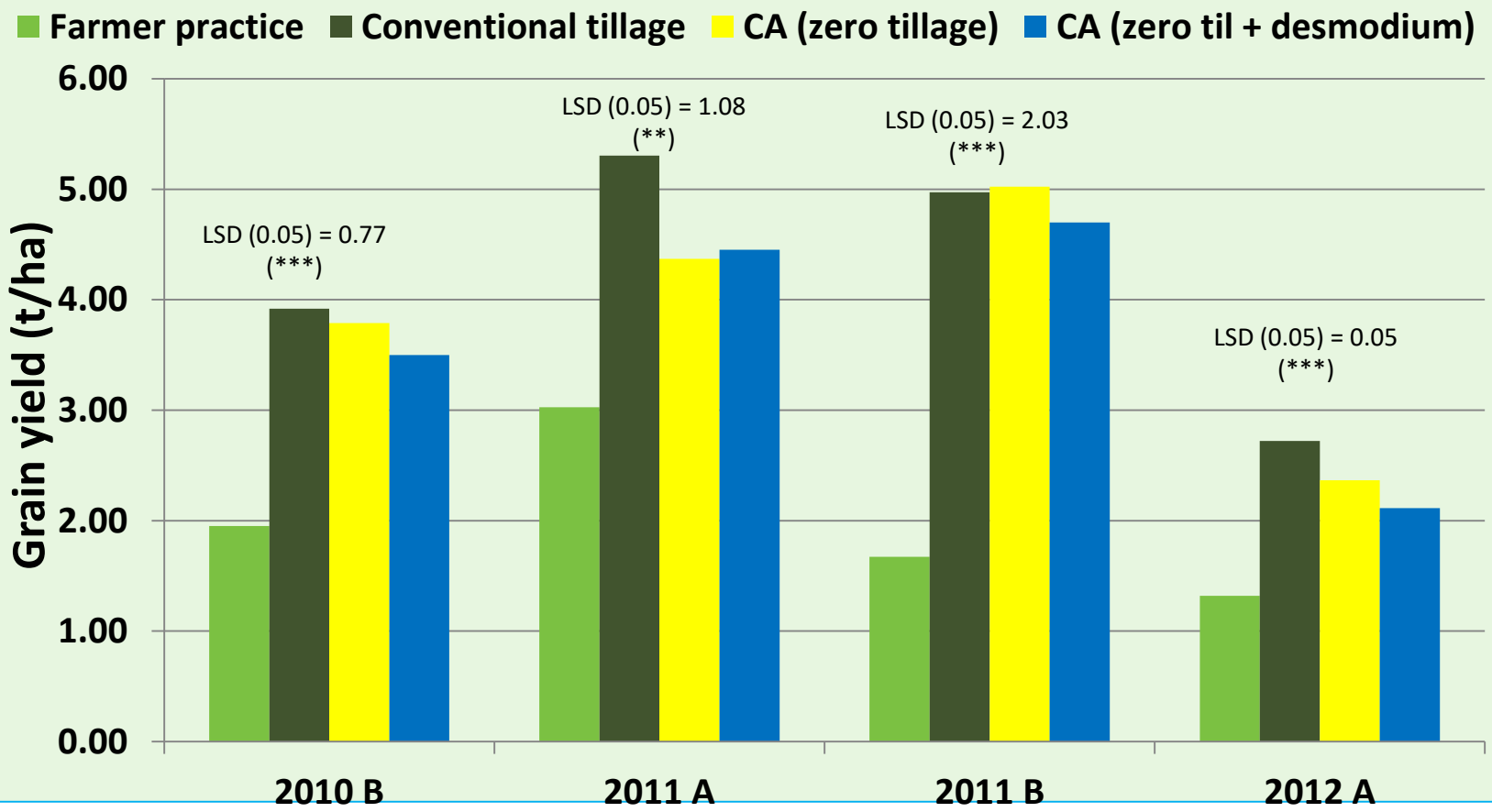
1.1 Effect of Tillage method on Maize yield across seasons - Siaya



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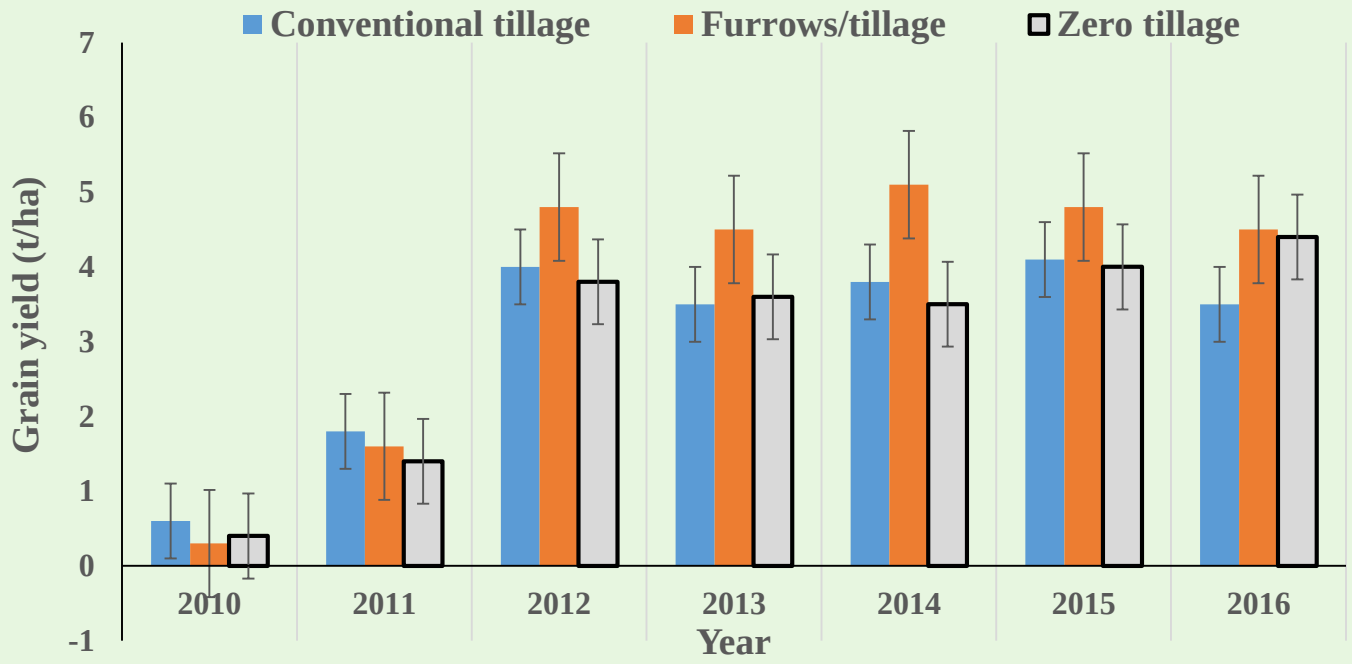
1.2 Effect of tillage methods on average annual maize grain yield in Eastern Kenya SIMLESA sites.



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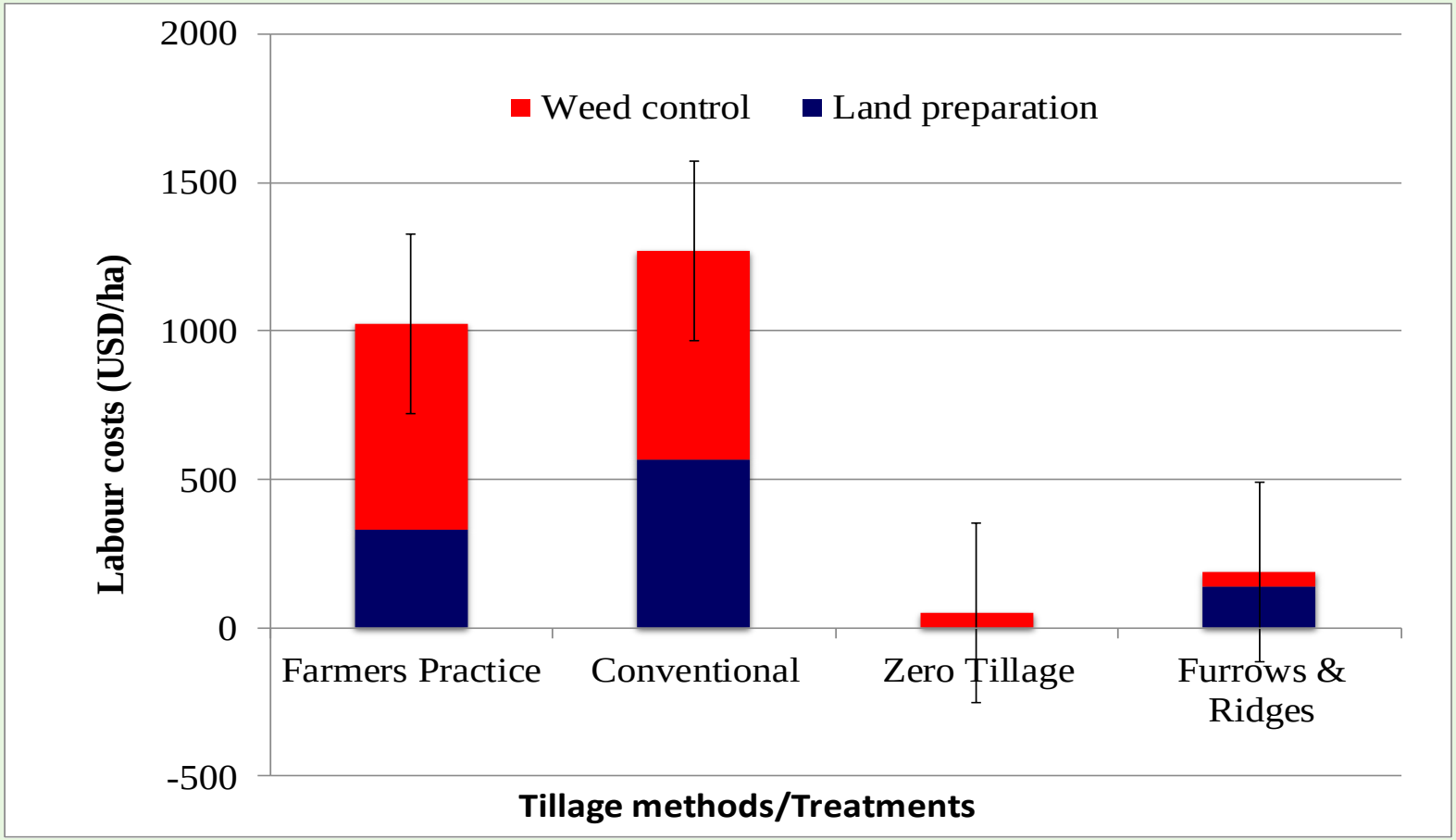
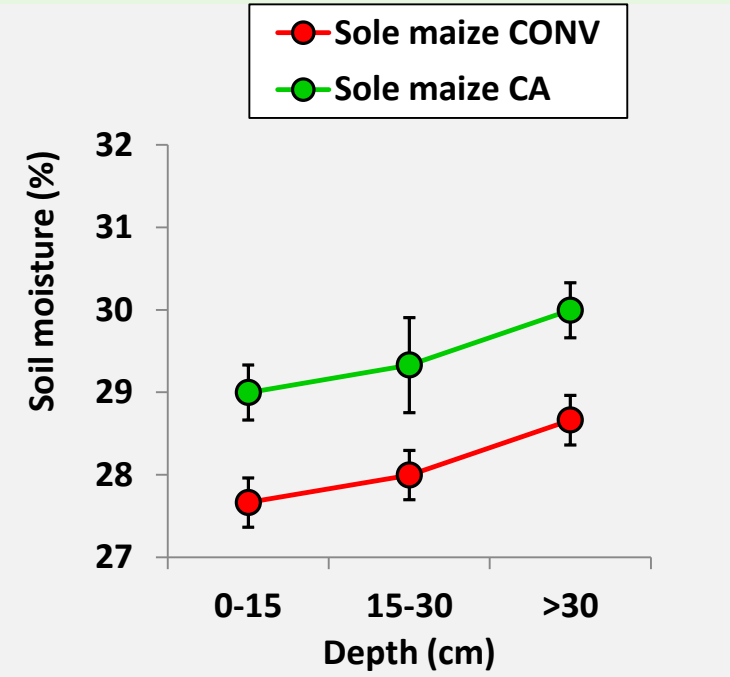
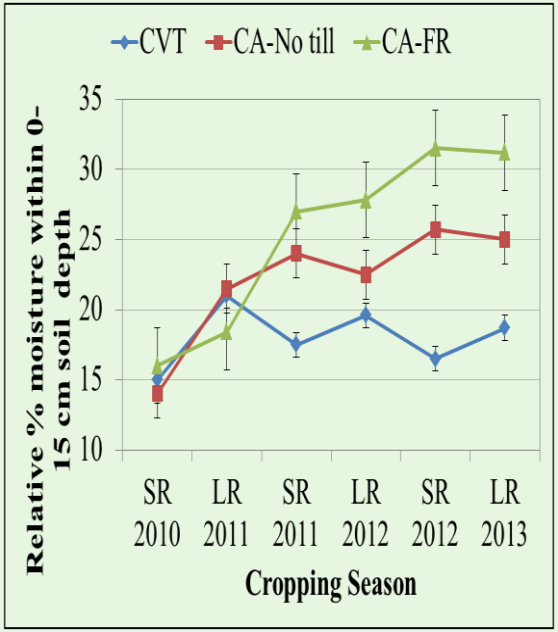
2. Effect of tillage method on labour costs in Eastern Kenya



3. Effect of Tillage method on Soil Water.





Key
CA = Zero Tillage
CVT= Conventional Tillage
FR= Furrows and Ridges
SR= Short rains
LR=Long rains

Soil water under sole maize Crop in western Kenya

Soil water at harvest in eastern Kenya

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Other effects of Conservation Agriculture options

4. Furrows and ridges resulted in significantly higher water use efficiency as compared to conventional or zero tillage in eastern Kenya.

5. In western Kenya plots in which residue was retained were shown to have utilized more water by crop than where residue was removed.

6. The initial soil bulky density (1.17 kg m^{-3}) in 2010 was significantly reduced by adoption of furrows/ridges (FR) tillage practice by 2016.

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Objective 4

Development of innovations systems and scaling out modalities

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Innovation Platforms

- The IPs support experimentation, technology evaluations and scaling out of proven technologies and practices
- A total of 11 Innovation Platforms were formed out of which 10 are functional
- More than 40 partners are members of innovation platforms from 2013.
- Partners include farmers, governmental organizations, seed companies, NGOs, CBOs, credit and input suppliers, crop insurance, traders and faith based organizations.

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Adoption of SIMLESA technologies and Practices

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- Adoption surveys carried out in 2011/2012 and in 2015

- Adoption surveys carried out to assess the level of adoption of SIMLESA technologies and practices

- Survey carried out by Adoption Pathways project in collaboration with SIMLESA scientists

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2011/2012 Adoption Survey Major Findings (eastern Kenya)

Technology	Use of technology 2010 (Baseline survey)	Use of technology 2012 (Adoption Survey) n=4503 (farmers attending shows)
1. Furrows and ridges	1%<	58%
2. Zero tillage	1%<	38%
3. Embean 14	1%<	75%

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Management Practices Awareness and Use within the project sites 2015

Practice	Runyenjes (n=150)	Imenti South (n=311)	Meru South (n=334)	Combined (N=795)
Furrows & Ridges	22	13.2	18.6	17.1
Fertiliser Use	14	19.6	16.2	17.1
Manure Use	16.7	16.7	14.1	15.6
Herbicide Use	7.3	15.7	12	12.6
Terracing	9.3	9.7	8.1	8.9
Minimun/ Zero tillage	8.7	4.8	9.3	7.4
Residue Return	6.7	6.4	8.4	7.3

Crop varieties awareness and use within the project sites 2015

Variety	Runyenjes (n=110)	Imenti South (n=272)	Meru South (n=312)	Combined (N=694)
DK 8031	20	21	16.8	18.9
Em-Bean 14	30	12.1	10.4	14.1
KAT B1	2.7	16.5	15.2	13.7
KK 15	10	15.1	12.1	13.1
KDV 6	1.8	6.6	16.7	10.4
Embu Synthetic	19.1	7.4	4.5	7.9
KH500-39E	10	7.7	6.7	7.6
KDV 1		4.8	6.7	4.9

Constraints to adoption to technical and institutional innovations

- Frequent lack or shortage of seed of some of the varieties (Embean 14)
- Lack of markets or low prices especially at harvest time
- Frequent lateness to the government subsidized fertilizers
- In western Kenya the problem of low yields of beans has not been solved.
- Striga weed remains a big challenge to many farmers of western Kenya
- Shelling of groundnuts is a challenge to farmers due to lack of suitable implements
- Mis-match of work plans between some partners and SIMLESA team members

How SIMLESA's outputs contribute to Kenya's development strategy and priorities

Some Important National Policies and Strategies

1. Vision 2030,
2. National Climate Change Response Strategy (NCCRS), 2010;
3. Agriculture Sector Development Strategy (ASDS) 2010-2020
4. The Agriculture (Farm Forestry Rules, 2009).
5. National Climate Change Action Plan (NCCAP) 2013-2017;
6. **Kenya Climate Smart Agriculture (CSA) Strategy 2017 – 2026**

CSA aims to achieve three main objectives namely

1. Sustainably increasing agricultural productivity and incomes.
2. Adapting and building resilience to climate change.
3. Reducing and/or removing greenhouse gas emissions, where possible.

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SIMLESA's outputs

1. Use of herbicides to replace use of tractor or draught animals which minimizes greenhouse gas (GHG) emissions.
2. Zero or furrow tillage results in higher soil moisture crops which is beneficial in low rainfall areas.
3. Residue retention leads to more soil carbon.
4. Lower labour costs leads to conserving of resources
5. Soil bulk density significantly reduced in CA
6. Soil organic carbon increasing in CA although not yet significant

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Way Forward

- Appropriate small scale mechanisation to support CA based technologies, increase and reduce drudgery.
- Mainstream policy to support and advance CA based agricultural and livestock technologies for sustainability.
- Support in group dynamics and development of IPs and/or pilot policy communities at all levels, (community, regional and national levels) to effectively support policy formulation using evidence from research.
- Support in linkages between projects and institutions carrying out similar CA based research/extension for synergy, efficient use of resources and sharing of knowledge and innovations.
- Need to support coordination at the highest level possible with adequate authority to ensure that CA based technologies are developed and implemented harmoniously.

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Way Forward continued-----

- Yield of maize and Beans on SIMLESA collaborating farmers and neighbours is 3 and 4 times more than other farmers. Need to scale this at corridor and higher levels for increased impact
- Continue maintaining already started on-farm and on-station CA based trials to generate more data
- Encourage youth, men and female farmers to invest in CSA and CA farming systems
- Build further linkages: Encourage participation of NGOs, projects, Counties and farmer groups
- Strengthening the LIPs, -have more actors and more agricultural product value chains
- Seek fund to support LIPs

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Way Forward continued-----

- With partners: Out-scale the program accrued technologies within and outside the initial project sites
- Support capacity building for all,- farmers, scientists and other partners on specific topics: seed systems, post-harvest and CSA/CA farming systems
- Finalize the on-going Ph.D program
- Continue documenting the past work and on-going work
- Summarize technical gains into farmer friendly leaflets
- Support the CGS providers to advance with impact

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ASARECA

ARC (South Africa)

Trial farmers

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