



*Better lives, better planet
through livestock*

Crop-livestock mixed systems: Integrated climate interventions and scaling - lessons from the Africa RISING program

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Training program organized by WU-ILRI-HU for PhD students and postdocs on “The Future of Tropical Livestock Systems”.

ILRI
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LIVESTOCK RESEARCH
INSTITUTE



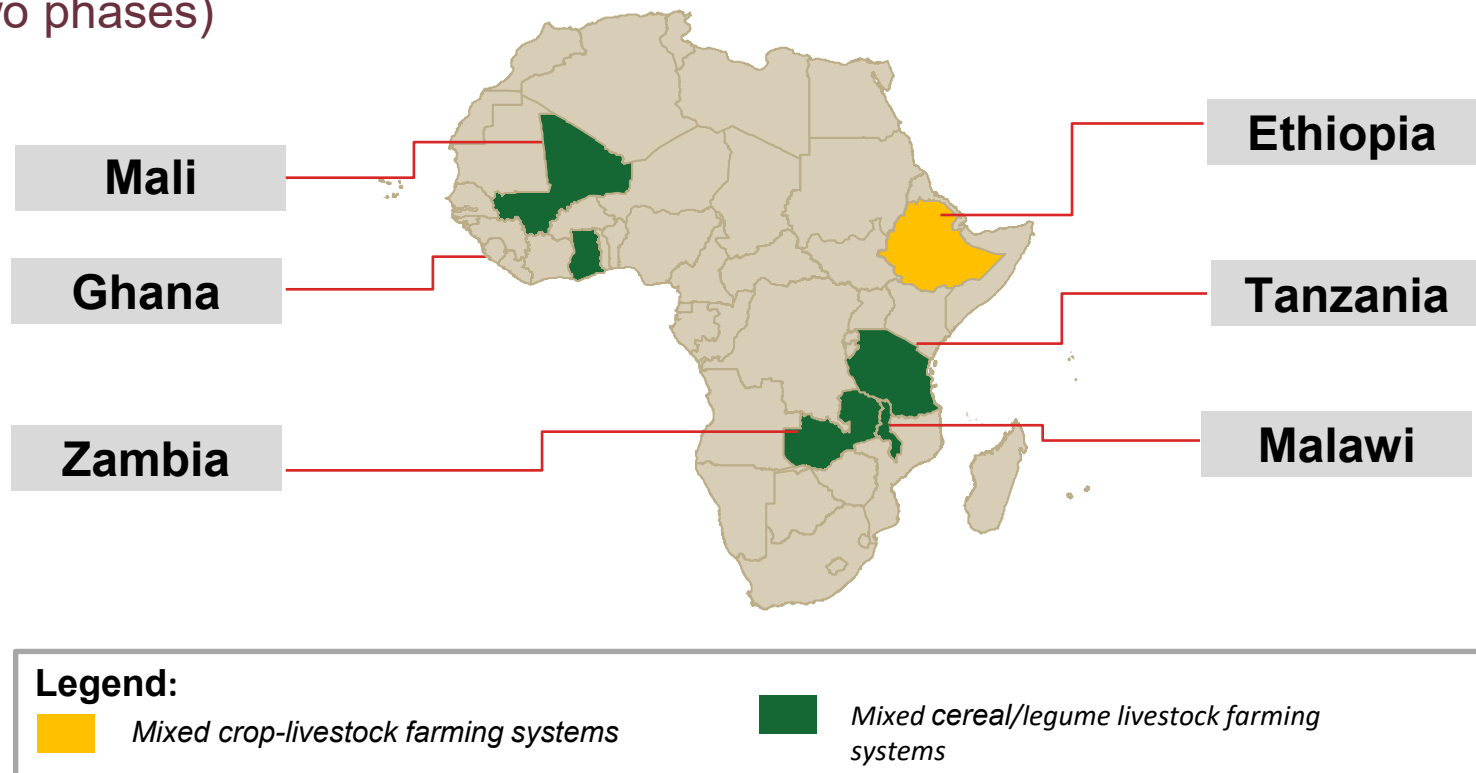
Content of the presentation

- Focus and Geographic Coverage
- Action Research Approaches
- Tools and Methods for Constraint Diagnosis, Systems Analysis and Performance Evaluation
- Priority Research and Development Challenges
- Integrated and Complementary Thematic Groups and Interventions
- Scaling Integrated Solutions through Partnerships
- Key Lessons and Implications for Future Programs
- Journal Articles for Further Reading

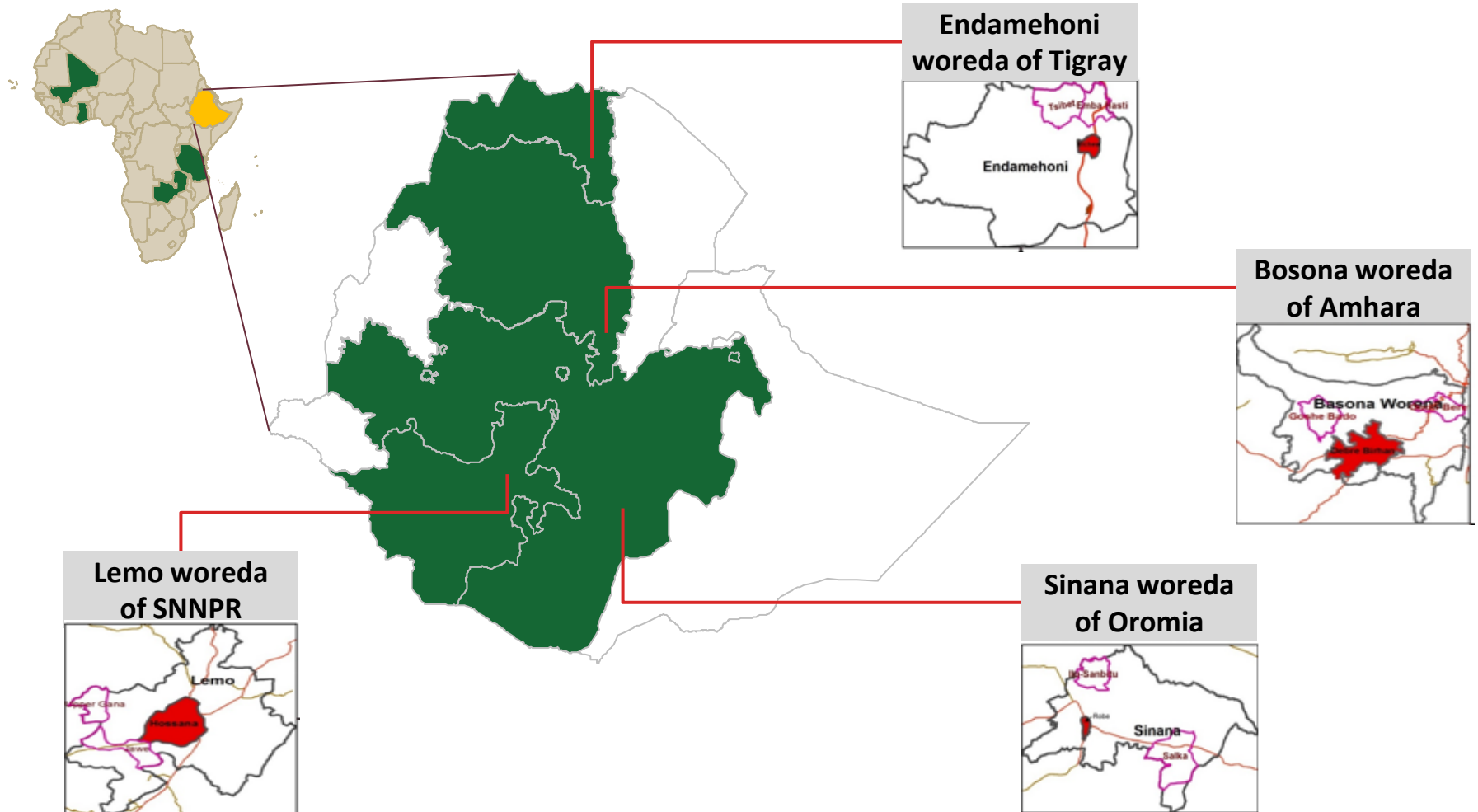
Africa RISING: Focus and Geographic Coverage

- One Program with four Projects
- Funded by USAID through the FtF initiative
- Sustainable Intensification (SI), multi-disciplinary action research and facilitation of wider scaling are the core research for development agendas of the program.

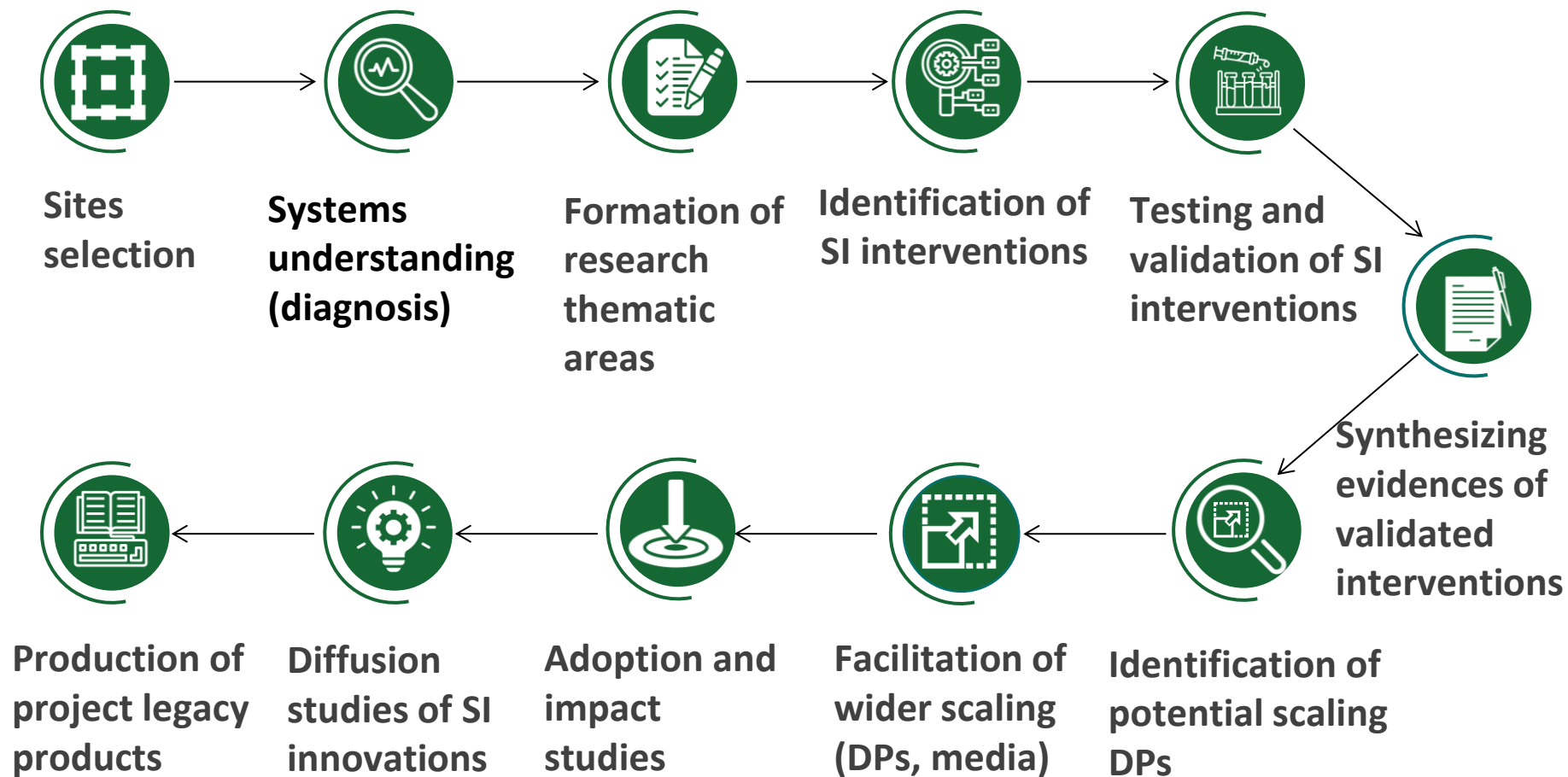
AR program managed to operate in six African countries for over 10 years (two phases)



AR project sites in Ethiopia



AR Action Research Approaches

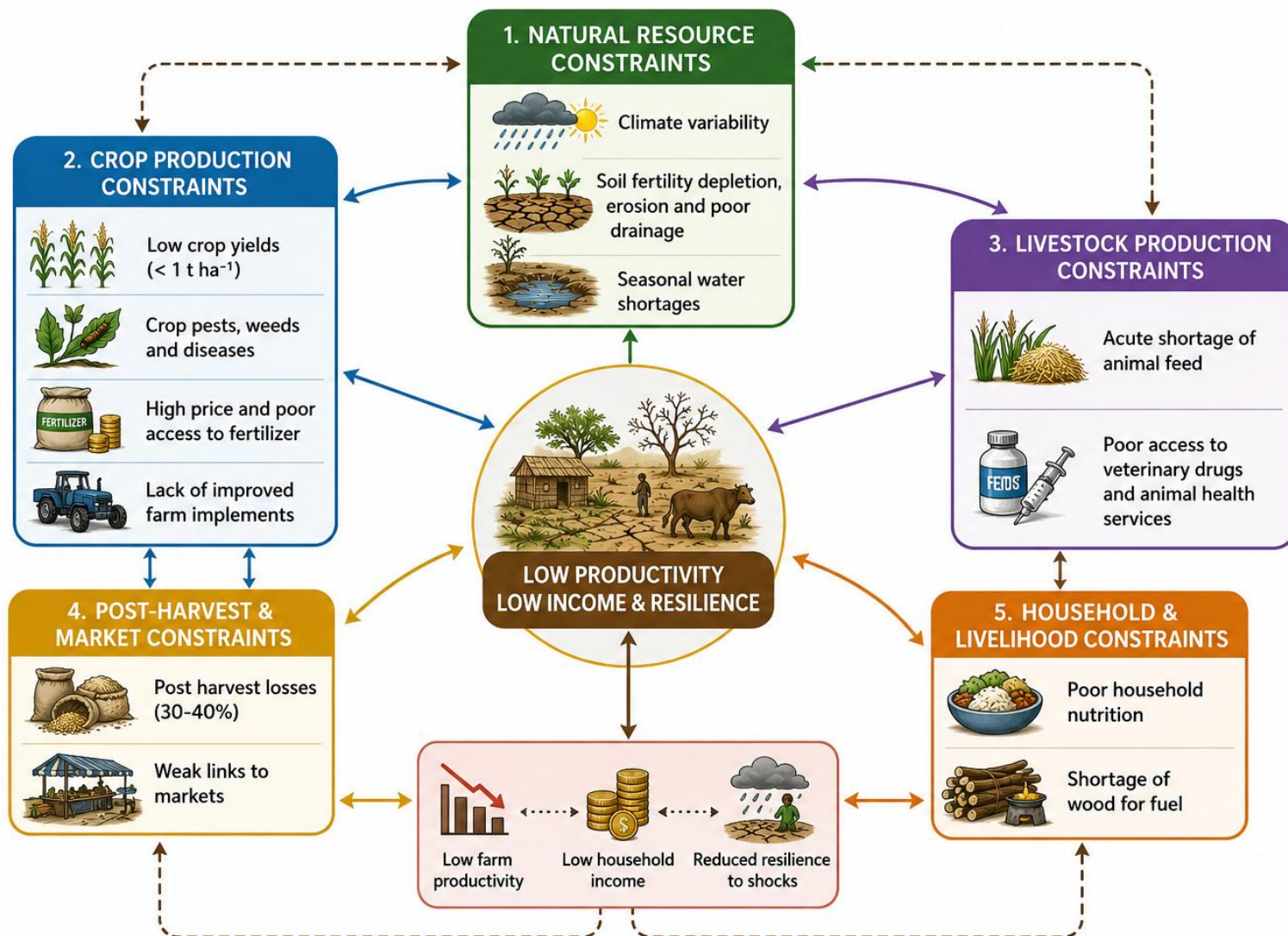


Cross-cutting: Capdev, IPs, Partnership

Tools and methods for systems analysis, constraint diagnosis, and performance evaluation

Tools / Methods	Stage	Purpose
Rapid Telephone Survey (RTS); SLATE Livelihood Survey; Participatory Community Analysis (PCA)	Field Data Capture	Rapid collection of baseline and participatory information
IMPACTlite household characterization; AKT5 agro-ecological knowledge tools; Women's Empowerment in Agriculture Index (WEAI)	Household, Knowledge and Social Diagnostics	Understand household conditions, local knowledge systems, and intra-household power dynamics
G-FEAST; TECHfit; RHoMIS; SIAF; FarmDESIGN	Systems Analysis and Farm Modeling	Analyze farm performance, resource flows, and system optimization scenarios
Market and value chain studies; Return on Investment (RoI)	Market and Economic Intelligence	Assess market linkages and economic viability
Scaling readiness / scaling scan	Scaling Readiness	Evaluate potential for scaling and expansion

Priority Research and Development Challenges



Integrated and Complementary Thematic Groups and Interventions



Feed and forage interventions:

Fodder tree

Forage grass

Herbaceous
legumes /grass
mixture

Feed trough



- Introduced and validated different feed and forage technologies to improve livestock productivity.
- Generated biophysical and socioeconomic data under on-farm environment - example
 - Biomass yields from AR validated forage crops are making significant contributions to fill feed gaps (oat/ vetch- 12 t DM ha⁻¹; fodder beet- > 20 t DM ha⁻¹; tree lucerne, 4-7 t DM ha⁻¹).
 - Supplementation of oat/vetch mixture and fodder beet have increased milk yield from 30–50%.
 - Feeding trough and storage shed have reduced feed wastage from 30- 50%.

Improved crop varieties and management practices:



Crop varieties

Introduced and evaluated over 127 improved crop varieties (cereal, pulse, oil, potato and enset varieties) through PVS and crowdsourcing approaches.



Yield Achieved

Obtained significant yield increase (%) under PVS as compared to the national average crop yield (CSA, 2021): bread and durum wheat (52- 89%), faba bean (90%), malt and food barley (120-132%), field pea and lentil (83-111%), chick pea and linseed (36-83%) and potato (171%).



High value fruit trees:



Varieties

Introduced and validated 5 avocado and 2 apple (Anna and Princissa) varieties.

Fruiting

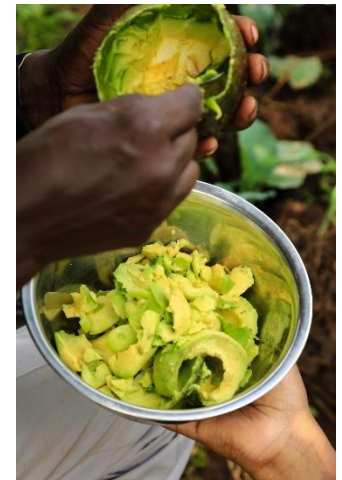
Avocado varieties provide fruits in less than 2 years with variation across varieties and sites.

Yield

Fruit yield per avocado tree ranges from 50 kg for Ettinger to 181 kg for Nabal.

Quality Test

Quality (test, shelf life and oil content) for avocado varieties is:
Hass > Ettinger > Fuerte > Reed > Nabal.

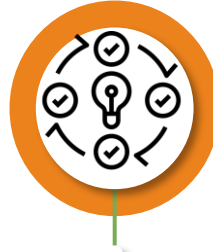


Soil fertility management:



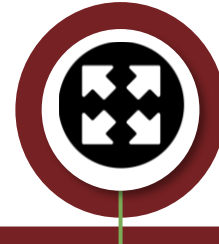
Field trials

- Conducted landscape based on-farm fertilizer trials and identified site-specific nutrient sources and rates for wheat following the 5R principles of nutrient stewardship.



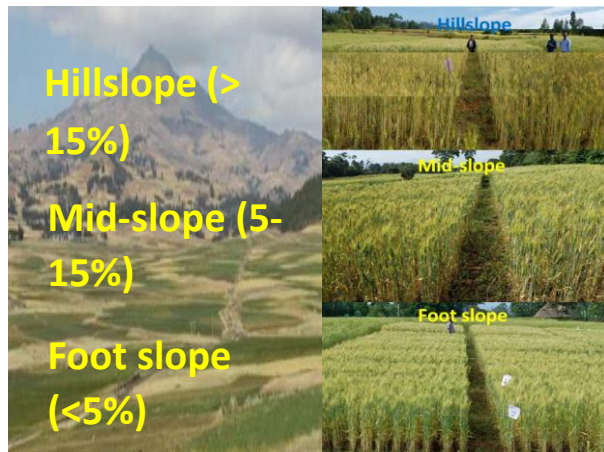
Validation

- Validated the right nutrient sources and rates and ISFM practices for wheat production using a Decision Support Tool (DST).



Catalyzation and Impact

- This research has catalyzed a new national initiative to fine-tune previous fertilizer recommendations.



Small-scale based mechanization options:



Introduced two-wheel tractor and accessories (plough, planter, reaper, thresher, sheller, water pump and trailers)



Reduced cost of farm operations as compared to conventional farm practices- Example: Cost for wheat thresher = USD 200 ha⁻¹ without mechanization vs 90 ha⁻¹ with mechanization



Created jobs for service providers in Africa RISING operational areas

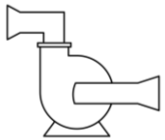
Water management and application:



- Introduced and validated **water harvesting, lifting and delivery technologies** in AR project sites.



- Rainwater **harvesting ponds** attracted farmers to **diversify high value crops** around home- gardens.



- **Water lifting technologies** have enhanced farmers capacity to **irrigate high value crops**.



- Farmers guided by **wetting front detectors** able to **increase irrigated fodder dry biomass** by **14%**.

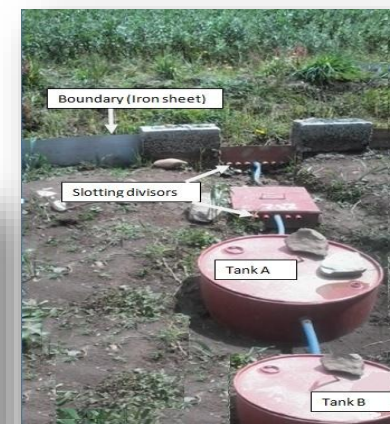


Landscape/watershed management:

Implementation of **integrated SWC practices** at landscape scale have **reduced soil loss by over 75%** in the AR watersheds.

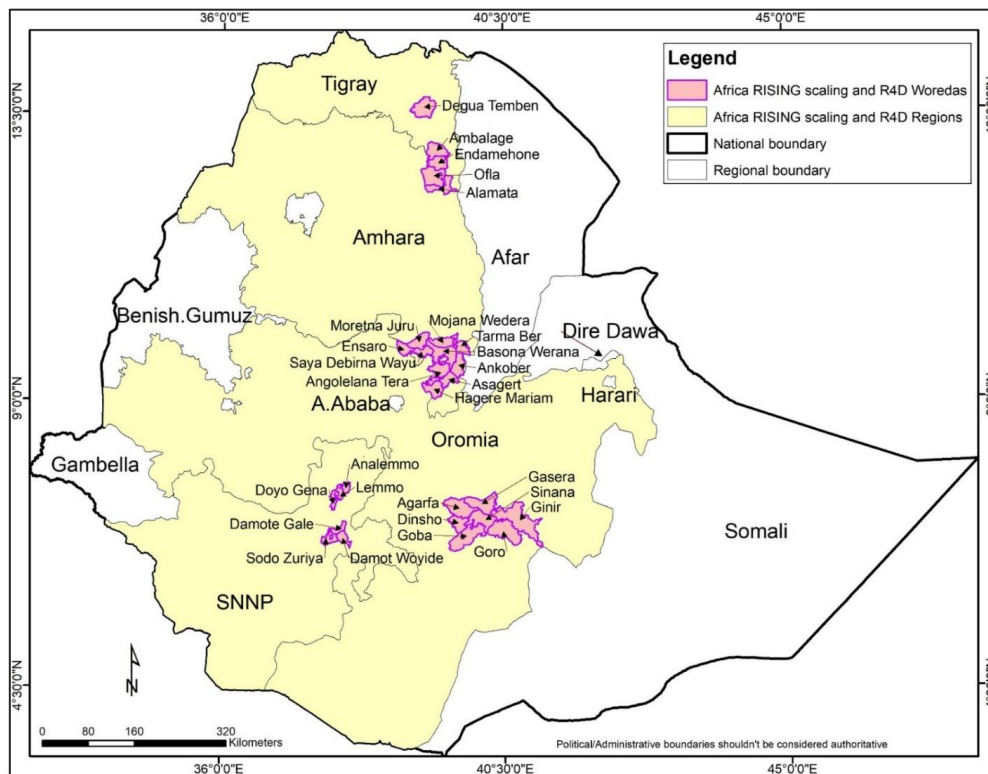
Management practices implemented in cultivated fields have **reduced soil loss by 87%** as compared to non-treated fields.

A **treated landscape in Basona AR site** has shown an **increase in baseflow by up to 35%**, which improves irrigation in downstream locations.



Scaling Integrated Solutions through Partnerships

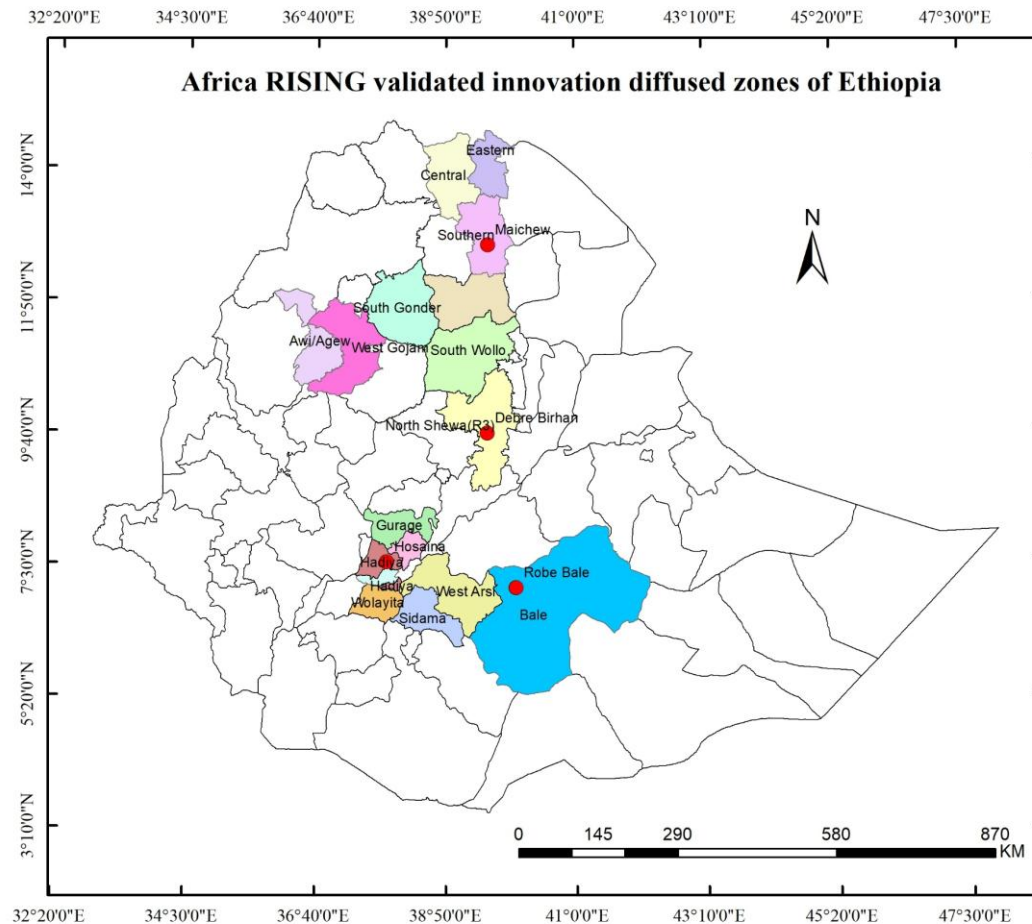
- Scaling of validated solutions/options through partnership development approach.
- Facilitated through capacity building programs, media engagement (community radios and mobile blast) and seed revolving supply arrangements.



- In phase II (Oct 2016-2022) the AR project in ETH reached to 11 zones and 36 woredas.



Diffusion of Africa RISING integrated solutions in different admin zones and region of Ethiopia

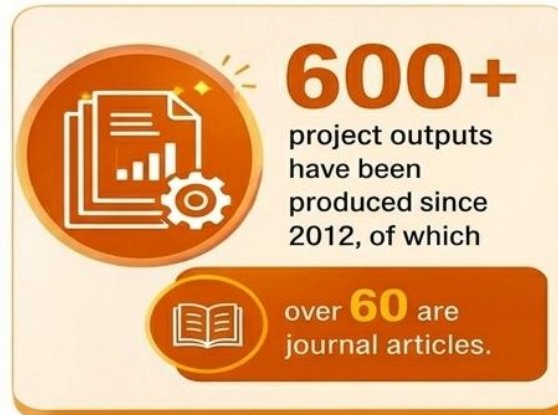
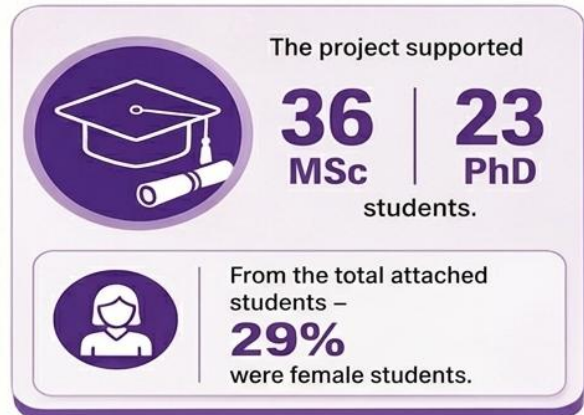
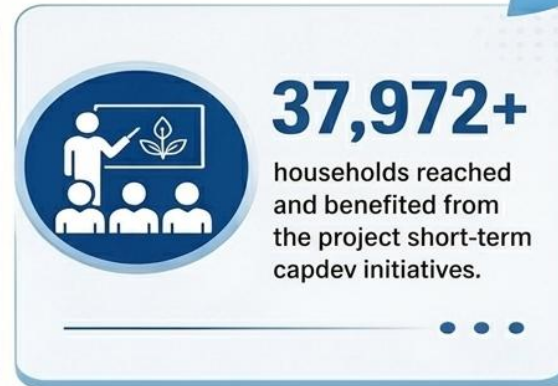


Legend

- Demonstration sites
- Southern Tigray Zone
- Central Tigray Zone
- Eastern Tigray Zone
- Sidama Zone
- Selti Zone
- Gurage Zone
- Hadiya Zone
- Kembata Tenbaro Zone
- Wolayita Zone
- South Wollo Zone
- North Wollo Zone
- North Shewa Zone
- South Gondor Zone
- West Gojjam Zone
- West Arsi Zone
- Bale Zone
- Awii Zone
- Innovation non-diffused zones



Major Contributions of AR project



Key Lessons and Implications for Future Livestock and Related Research for Development Programs

KEY LESSONS FROM AFRICA RISING

Lessons for Future Tropical Livestock Systems

LESSON 1



Strong Partnerships

Partnerships are essential to move forward and bring desired impacts of project interventions.

LESSON 2



Capacity Development

Identifying committed scaling partners and equipping them with skills ensures wider dissemination.

LESSON 3



Robust M&E Systems

Well-planned M&E schemes and data repositories simplify documentation and tracking.

LESSON 4



Integrated Systems

Research requires co-identification, co-design, co-implementation, and systematic evaluation.

LESSON 5



Stepwise Adoption

Validated solutions must be adopted incrementally after farmers confirm long-term profitability.

Examples of stepwise integrated solutions adoption in Central Ethiopia region



Example of a farm with integrated solutions in Central Ethiopia region



The collage features a variety of logos for organizations involved in agricultural research, development, and education. Key organizations include:

- WACHEMO UNIVERSITY**: Logo featuring a book and a gear.
- MAJIDA WALABU UNIVERSITY**: Logo with a sun and a building.
- DEBRE BIRHAN UNIVERSITY**: Logo with a book and a gear.
- HAWASSA UNIVERSITY**: Logo with a book and a gear.
- ARARI**: Logo with a green plant and a cow.
- SARI**: Logo with a book and a gear.
- SOS SAHEL ETHIOPIA**: Logo with a green plant and a person.
- SUNARMA**: Logo with a sun and a mountain.
- Ethiopian ATI**: Logo with a sun and a mountain.
- IZQGO**: Logo with a tree and a person.
- Send a Cow**: Logo with a cow and a person.
- World Vision**: Logo with a person and a cross.
- RAYA BEER**: Logo with a green plant and a gear.
- inter aide**: Logo with a blue and white design.
- DASHEN BEER**: Logo with a green plant and a gear.
- ICRISAT**: Logo with a green plant and a gear.
- CIMMYT**: Logo with a green plant and a gear.
- ICARDA**: Logo with a green plant and a gear.
- ILRI**: Logo with a green plant and a gear.
- OROMIA SEED ENTERPRISE (OSE)**: Logo with a green plant and a gear.
- HUNDEE**: Logo with a green plant and a gear.
- IWM**: Logo with a green plant and a gear.
- COOPI**: Logo with a green plant and a gear.
- ALLIANCE**: Logo with a green plant and a gear.
- CIAT**: Logo with a green plant and a gear.
- IFPRI**: Logo with a green plant and a gear.
- AMHARA BUREAU OF AGRICULTURE**: Logo with a green plant and a gear.
- AGRICULTURE BUREAU OF AGRICULTURE**: Logo with a green plant and a gear.

Journal Articles for Further Reading

- 1) Research for Development Approaches in the Mixed Crop-Livestock Systems of the Ethiopian Highlands. Front. Sustain. Food Syst: Sec. Land, Livelihoods and Food Security. Volume 7 – 2023. <https://doi.org/10.3389/fsufs.2023.1080725>
- 2) Systems-oriented Innovation towards Sustainable Smallholder Mixed Farming. npj Sustain. Agric. 4, 5 (2026). <https://doi.org/10.1038/s44264-025-00114-9>.
- 3) Feed and forage development in mixed crop–livestock systems of the Ethiopian highlands: Africa RISING project research experience. Agronomy Journal, 2021;1–17. <https://doi.org/10.1002/agj2.20853>
- 4) Redesigning traditional weed management practices in faba bean fields to optimize food-feed production in the smallholder system. Agronomy Journal. 2021;1–11. <https://doi.org/10.1002/agj2.20779>
- 5) Assessing smallholder sustainable intensification in the Ethiopian highlands. Agricultural Systems 194:103266. <https://doi.org/10.1016/j.agsy.2021.103266>
- 6) Overcoming constraints of scaling: Critical and empirical perspectives on agricultural innovation scaling. PLoS ONE 16(5): e0251958. <https://doi.org/10.1371/journal.pone.0251958>
- 7) Scaling agricultural innovations: A systematic assessment with implications for pluralistic extension, The Journal of Agricultural Education and Extension, Volume 32, 2026 - Issue 2. <https://doi.org/10.1080/1389224X.2025.2501971>
- 8) Women farmers' participation in the agricultural research process: implications for agricultural sustainability in Ethiopia. International Journal of Agricultural Sustainability, Volume 17, 2019 - Issue 2. <https://doi.org/10.1080/14735903.2019.1569578>
- 9) Multilevel innovation platforms for development of smallholder livestock systems: How effective are they? Agricultural Systems, Volume 189. <https://doi.org/10.1016/j.agsy.2020.103047>

