International Conference on Sustainable Animal Agricultural for Developing Countries (SAADC 2023)

SUSTAINABLE ANIMAL AGRICULTURE FOR A SUSTAINABLE TOMORROW

SIDE MEETING
Interdisciplinary approaches to support food safety, market access, genetic improvements, and climate change in livestock

Vientiane, 24 November 2023
Sustainable smallholder crop-livestock systems: farm diversification and intensification as pathways to development

Anthony Whitbread., K. Mekonnen, M. Gebreyes, J. Hammond, M. van Wijk, N. Worou E.J., Joseph, S., Kumar, S.
Smallholder farmers currently provide most of the meat, milk and eggs AND staple cereals in LMICs

- **1.7 billion people** derive some livelihood from livestock; over half a billion depend on livestock
- **Livestock are fundamental** to many economies; provide income, jobs, and supporting risk mitigation
- Livestock are the basis for **farm sustainability**, integrated livestock-food farms make food crop farming even possible for many in the Global South – circular bioeconomy in action!

![Share of total livestock-derived foods produced by small farms in 2010](chart)

- **Farms of less than 20 hectares provide:**
  - Nearly 50% of the world’s livestock and cereals,
  - and close to 70% of the livestock and cereals in emerging and developing economies

**Did you know...**
Livestock are integral to ‘circular bioeconomy’ which is the basis for most livestock production in LMICs
Sustainable intensification-diversification of smallholder crop-livestock systems: a win-win-win-win

+++ Livelihoods, nutrition and the environment +++

1. Crop residues, forages as **feed sources** and fertilizer/cover.
2. Livestock contributions to **resource use efficiency** for the whole farm system e.g., through nutrient cycling and exploitation of a range of agro-ecological niches
3. The contribution of livestock to household **nutrition**
4. Demand for livestock products drives **markets and agribusiness**
Smallholder agriculture – households as complex systems

Livestock sales

Straw & residues

Household

Non-farm activities

Labour

Resources

Cattle

Goats

Other livestock

Food & cash crops

Manure

Forages

Animal draught

Animal transport

Farm activities

Farm labour
Bioeconomic analysis (IAT) –Zimbabwe

S1 Baseline situation: US$ 188

S2 Fertilize Maize:
- Crop GM increase by ca. US$ 200
- ALSO increase Livestock GM by US$ 70
- Total HH GM increase by US$ 270

S3 = S2 + commercial supplementary feed fed to livestock US$ 424

S4 = increase groundnuts 1.0ha using local varieties. US$ 456
S5 = S4+ CG7 groundnuts for local varieties US$ 529
S6 = increase farm gate price of groundnuts by shelling locally US$ 613

S8 = improved market access (both cattle and goats) US$ 902

S11 = improved market access goats only US$ 1052
S12 = improved market access cattle only US$ 868

S13 = S1 Baseline + access to livestock markets alone US$ 206

c/ van Rooyen et al.
Significant outcomes after 10 years

• Price of animals increased $8 in 2006 – $60 to $80 in 2015.
• Price incentives drove investments in housing, feeding and vet inputs
• Investments reduced, mortalities and increased animal condition
• Markets reacted by paying for quality further driving investments

• Large abattoirs showed interest and reduced transactions costs
• NGOs started establishing sale-pens
• NGOs promoted fodders to reduce dry season mortalities and fatten animals for markets
• Forage seed markets developed.

c/ van Rooyen et al.
Overview of the Africa RISING Project – a remarkable example of diversification and intensification as pathways to development

• Africa RISING was a multidisciplinary and integrated research USAID project that focused on the Sustainable Intensification (SI) of mixed farming systems.

• Focus areas: Climate smart development, gender integration, improved nutrition, inclusive agricultural sector growth, private sector growth, research and capacity building.

• The project used a variety of approaches to improve smallholder farming systems, including:
  – Farm systems analysis
  – on-farm research to develop and test new technologies
  – innovation platforms
  – policy advocacy
  – capacity development.

• The project reached over 455,000 beneficiaries with validated technologies
• >600 project outputs since 2012, including 51 journal articles.
Africa RISING innovations: Examples
a) Feed and forage innovations

 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 forage crops 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 increased milk yield from 30–50%.
- Feeding trough and storage shed have reduced feed wastage by 30-50%.
b) Improved crop varieties and management practices

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

Yield increase c/w national crop yield: bread and durum wheat (52-89%), faba bean (90%), malt and food barley (120-132%), field pea and lentil (83-111%), check pea and linseed (36-83%) and potato (171%).
## C) High value fruit trees

<table>
<thead>
<tr>
<th>Varieties</th>
<th>Fruiting</th>
<th>Yield</th>
<th>Quality Test</th>
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<tbody>
<tr>
<td>Introduced and validated 5 avocado and 2 apple (Anna and Princissa) varieties.</td>
<td>Avocado varieties provide fruit &lt;2 years</td>
<td>Fruit yield per avocado tree ranges from 50 kg for Ettinger to 181 kg for Nabal.</td>
<td>Quality (test, shelf life, oil content) for avocado var.: Hass &gt; Ettinger &gt; Fuerte &gt; Reed &gt; Nabal.</td>
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Financial Return on Investment – cost benefit ratio of 7.8

A 10-15% increase in annual household income, over the 455,000 households engaged. Total cost $19M, direct benefit $146M. Some practices were more financially valuable (e.g. wheat), some more synergistic (e.g. feed troughs), or environmental (e.g. watershed restoration).

The scaling phase (post 2016) achieved the big returns in terms of impact. This underlines the importance of continuing to scale these validated technologies.

Method: The impact and adoption of promoted technologies was established using household surveys in 2018 and 2022, in reference to program records, and productivity impacts cross-checked with experimental data where available. The value of production gains was converted to USD$ in purchasing power parity (PPP) taking 2021 as the reference year. Mean increases in farm income were then extrapolated to the project and scaling kebeles according to adoption rates. No indirect or future benefits are included.
Potential for scaling Africa RISING Innovations

- Africa RISING scaling reach: 455,000 beneficiaries
- Scaling partnership development
  - Mapping and recruiting development partners
  - Training development partners on AR validated technologies
  - Embedding AR validated technologies in partners operations
- Awareness and demand creation
  - Training of public and NGO extension staff
  - Reaching farmers through community radio
  - Dissemination of technical notes and extension manuals
- Strengthening technology multiplication and delivery
  - Scanning and sourcing planting materials from national pool
  - Multiplying seeds with seed producing farmer cooperatives
  - Financing through project seed fund, revolving schemes, farmer
1. **Markets** (esp. livestock) can drive on farm investments into technologies, inputs, management.

2. **Integration** of dual-purpose germplasm (cereals and legumes) and forages can provide multiple product options and tactical decisions.

3. A **farming systems perspective** helps to identify the potential for layered-multi-livelihood approaches which bring real systems change.

4. Climate adaptation, livelihood resilience, circularity (incl. GHG) and nutrition are linked and the 4x wins.

5. Scaling requires longer term layered investments by donors and governments.
THANK YOU
Analysis of the net effects of intensification via AfricaRISING technologies showed improvements in agricultural production, household economy, human welfare, and social indicators. This analysis adapted the SIAF framework.