# Africa RISING in Tanzania

## Creating Sustainable Systems for Agriculture

Country brief - August 2022

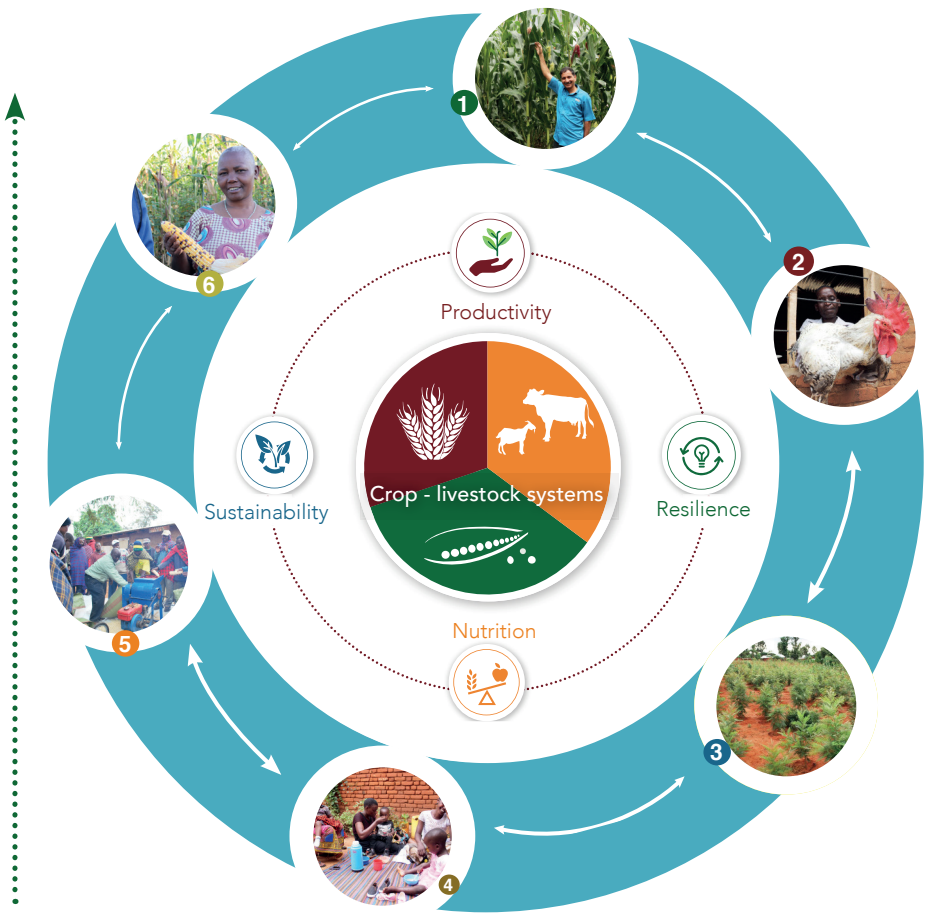
## Outcomes

| | |
|---|---|
| Technologies validated | 36 |
| Farmers worked with to validate technologies | 10,025 |
| Farmers scaled with various technologies | 131,015 |
| Long-term trainings | 8 PhD's & 21 MScs |
| Graduates | 15 |
| Number of development partnerships | 52 |

## Research-in-development scope

1. **Cropping systems**
   - Varieties
   - Cropping systems management
2. **Livestock systems**
   - Feeding
   - Housing
3. **Natural resource management [NRM]**
   - Soil & water management
   - Fertilizers
4. **Human condition**
   - Nutrition
5. **Mechanization**
   - Post-harvest handling
   - Geospatial models
6. **Social condition**
   - Gender
   - Social economics

*Appropriate technologies are integrated within and across the components above.




## Technology delivery

**Sustainable intensification domains**
- Productivity
- Environment
- Economic
- Human condition
- Social

**Collaboration**
- CGIAR centers NARS
- Farmers
- Private sector
- Universities
- Extension services
- Government agencies

**Capacity building**
- Short term training
- Post-graduate training [MSc, PhD]
- Exchange visits
- Farmer field days

## Africa RISING's theory of change

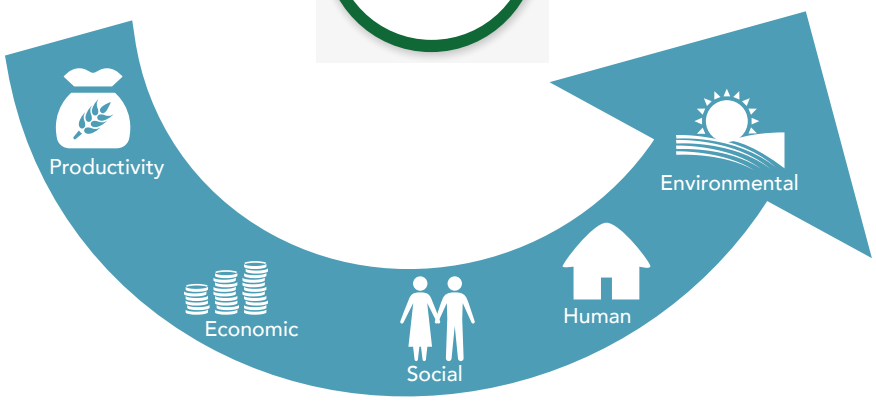
Demand-driven research identifies,adapts, validates and deploys sustainable intensification innovations

Better efficiency increases production

So rural households get more from the same amount of land – without compromising the needs of future generations to enhanced livelihood outcomes

Providing a range of options increases system sustainability

And improved income flow means better household nutrition and increased human capacity, leading to enhanced livelihood outcomes




Multiple sustainable intensification domains **in an enabling policy environment** result in long-term equity and viability

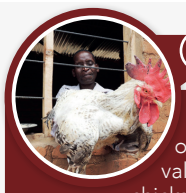
## 1 Cropping systems

### Varieties

- A stress-resilient and early-maturing groundnut variety - Nalinje 2015 that has a yield advantage of 63.8% and a gross margin benefit of 51% compared to landraces was released and can now be accessed by farmers. Three other varieties (Kongwa 724, Kongwa 560, and Kongwa 319) which have a yield advantage of 64 - 120% over the most common commercial variety (Mnanje) have also been proposed for commercialization.
- Sorghum varieties Gambella 1107, IESV 23010 DL, and IESV 92028 DL with average grain yield advantage ranging from 304 – 561 kg/ha over commercial variety controls have been proposed for commercialization.
- Three highly nutritive and drought-tolerant quality protein maize varieties that offer a grain yield advantage of 20-40% under random drought conditions over the local varieties have been recommended for release.
- Of the 80 hybrids evaluated for tolerance to Maize Lethal Necrosis (MLN), 8 hybrids had over a 100% yield advantage under natural MLN conditions compared to commercially farmer-favored hybrid checks.
- Through Community Seed Banks (CSBs), 6114 farmers have been reached with improved seed for newly released varieties of pigeonpea, pearl millet, and sorghum.
- Bean-pigeonpea intercrop the Doubled-up legume produces up to 1.7 t ha-1 of beans and 2 t ha-1 of pigeonpea, in a good season. Double-up legume has more income for a farmer than the common intercropping systems.
- Spanish groundnut, Kongwa 560 (ICGV-SM 05650) has high vigor compared to the local check variety. This confirms the fact that promotion of short-duration genotypes is the best option while targeting delivery of medium-duration varieties should be done mainly for high potential subecologies.

### Cropping systems management

- Good agricultural practices (GAP) in vegetables ensured farmers had a yield advantage of 128%, a gross margin advantage of 131%, and a 75% reduction in pesticide use.
- Maize–gliricidia–pigeon pea intercropping improved grain yield by 33–50% and gross margins were 4 times higher than maize monoculture.
- Sorghum–pigeon pea intercropping using improved varieties increased grain yield by over 50%, and gross margins were two times higher than the local practice that entails use of local varieties.
- Maize yield after double legume increased more than the intercropping while nitrogen fixed increased to 60 kg/ha with double up .
- Farmers acknowledge the *Mbili-Mbili* innovation as significant with profitability advantages and household food security.The innovation has different crop maturity periods and provides farmers an equivalent of at least US$ 155 ha-1 per season more revenue than conventional maize-pigeonpea systems.



## 2 Livestock systems

### Feeding

- A vegetable leaf-based chicken feed ration validated with farmers increased survival rate of chicks by 12.5%, growth rate by 47%, egg production intensity by 26.7%. Feed costs were also reduced by 50% and the profit margin was 3 times higher when compared to free-range chickens.
- Introduction of improved Napier grass varieties (ILRI -16835 and Kakamega 2) increased biomass yields by 33–80% and feed quality (crude protein) by 43–45%.
- A crop residue-based feed ration validated with farmers increased milk production by 2–3 liters per day.

### Housing

- Improved housing structure prototypes for chickens validated with farmers increased the survival rate of chicks by 3.5%.

### Mechanization

- The Forage chopper machine reduced labour time and burden by 37% and feed wastage by 25%.

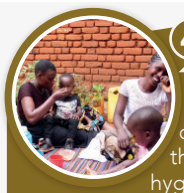
## 3 Natural resource management (NRM)

### Soil & water management

- In situ rainwater harvesting methods like ripping and tied ridges, helps farmers in semi-arid areas to reduce runoff by more than 11%, get better their yield by 86 - 160% and as a result have higher gross margins between 14–21 times higher than conventional tillage.
- Planting fodder grass and legume fodder like Napier, Desmodium or Lablab on contours in an 1100 mm rainfall ecology reduced soil erosion on farmer's fields by between 20 – 60%, increased maize yields by 15 – 25%, and increased moisture storage by between 31 – 58%.
- Introducing Napier, Napier + Desmodium, and Napier + Lablab on contours in maize fields in a 1100 mm rainfall ecology increased maize yield by 15, 22, and 25%, respectively; reduced erosion by 25, 45, and 60%, respectively; increased moisture storage by 31, 57, and 58%, respectively; and resulted in net income increases of 10, 15, and 30%, respectively.
- A study was conducted to determine the productivity and resilience benefits of the Gliricidia-based cropping system. Data shows annual fuelwood production from Gliricidia shrubs increases over the years, the situation which assures farmers with on-farm produced fuelwood hence household fuelwood self-reliance. Meanwhile, 30 000 seedlings of Gliricidia Sepium have been produced and distributed to farmers in partnership with lead farmers and scaling partners (LEAD foundation and Farm Africa).
- Tied ridges have the potential of harvesting and conserving rainwater and providing moisture to maize crops for longer periods, resulting in increased chlorophyll content. The technology can reduce soil loss update to 88%.
- Rip tillage increased maize grain yield (and calories) by about 21%, with no significant maize variety interaction. Factors such as higher soil water retention in the rip-tilled plots and consequent better water use efficiency (averaging 10.4 kg grain/mm rain for RT vs. 8.5 kg grain/mm rain for CT) contributed to the higher grain yields. On average, the gross margin increased from USD 1324 to 1600/ha.

### Fertilizers

- Farmers who were mineral fertilizer skeptics, have had a change of heart after results showed that that correct application guaranteed a maize grain yield increase ranging from 22 – 444% (depending on agro-ecology) and better gross margins of between 102 – 1435 USD/ha.
- Correct application of farmyard manure by farmers resulted in a maize grain yield increase of between 46 - 65% with gross margins ranging from 12 - 388 USD/ha. Combining manure (3 t) and P (10 kg/ha) as Minjingu Mazao increased maize grain yield by 123–283% in the highlands, 33–181% in the mid-altitudes, and 24–199% in the lowlands of northern Tanzania.
- Integrating micronutrient beyond the normal NPK fertilizer recommendation can significantly increase maize production.



## 4 Human condition

### Nutrition

- Introduction of an integrated nutrition package that addresses health (breast feeding, personal hygiene, food safety) and nutrition practices (food groups, food preparation) led to a 75% decline in diarrhea in children by day 21 of the regime, reduced their exposure to aflatoxin by 82%, completely eliminated wasting, and increased dietary diversity by 150%.
- Traditional vegetable recipes introduced to communities resulted in a 119% increase in per capita vegetable consumption and a 60% increase in vegetable consumption diversity.
- Consumption of complementary food developed from locally available foods decreased underweight and wasting by 100% in 6-24 months old children.

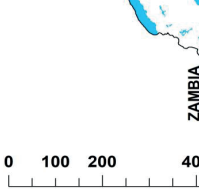
## 5 Mechanization

### Postharvest handling

- By using diesel-driven and mechanical maize shellers, farmers shell 690 kg per hour compared to 69 kg per hour through manual shelling techniques.
- Use of Grainpro™ collapsible dryer envelopes by farmers cut grain losses by about 32 kg/ton, reduced quantity of impurities and moldy grain by 30% and 42% respectively, reduced grain damage by 44% and cut downthe drying period for grain by 28%.
- Hermetic storage using PICs bags reduced grain loss by more than 85%.

### Geospatial models

- The project has validated and applied 2 geospatial tools - Impact based Spatial Targeting Index (IBSTI) and the Extrapolation Suitability Index (ESI) to identify (through generated maps) areas with potential risks associated with scaling-out beyond the environmental conditions encountered in the trial sites.
- Mapped the magnitude of climate change and variability and hotspots of land degradation to guide spatial targeting of climate smart technologies in Tanzania.



## 6 Social condition

### Gender

- The gender team successfully piloted integration of gender-transformative processes for technological change in Africa RISING sites in Malawi and Tanzania from October 2021 until February 2022. Results from the pilot studies will feed into a manual titled "Participatory tools for gender-transformative experimentation and decision-making around agricultural technologies" that is to be published in 2022.

### Social economics

- Maize and legume markets result in higher income and food security for farm households, 5% dietary diversity, and the income of maize (348,474 TZS), legume at (182,352 TZS). Economists recommend; incorporating the joint adoption of sustainable intensification practices such as improved maize& legumes, and legume intercropping to enhance the well-being of smallholder farmers.

## Africa RISING East and Southern Africa Project Action Districts in Tanzania




CGIAR

FEED THE FUTURE The U.S. Government's Global Hunger & Food Security Initiative

USAID FROM THE AMERICAN PEOPLE

ILRI INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

IFPRI INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

IITA Transforming African Agriculture

Partners:

ACDI VOCA · CIAT · CIMMYT · CRS · ICRISAT · IITA · TARI · World Vegetable Center · World Agroforestry Centre · WAGENINGEN UNIVERSITY & RESEARCH

The Africa Research In Sustainable Intensification for the Next Generation (Africa RISING) program comprises three research-for-development projects supported by the United States Agency for International Development as part of the U.S. government's Feed the Future initiative. Through action research and development partnerships, Africa RISING is creating opportunities for smallholder farm households to move out of hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base.The three projects are led by the International Institute of Tropical Agriculture (in West Africa and East and Southern Africa) and the International Livestock Research Institute (in the Ethiopian Highlands). The International Food Policy Research Institute leads an associated project on monitoring, evaluation and impact assessment.

For more info. please contact:


| | |
|---|---|
| Dr. Fred Kizito<br>Manager, Africa RISING West Africa and East Southern Africa Projects<br>Email: f.kizito@cgiar.org | Dr. Mateete Bekunda<br>Chief Scientist, Africa RISING East and Southern Africa Project<br>Email: M.Bekunda@cgiar.org |