

Sustaining Food Security through Agricultural Research in Tanzania: The Role of TARI



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East Africa Food-Energy-Water (FEW) Conference



Eden Highland Hotel
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Transforming Agriculture



Overview - Tanzania Agriculture

Sector contribution







Eeconomic growth



GDP Contribution 26.9%



Raw materials: 65%



Forex =30%



Employment = 61.5%



61.7 mi 23 mil 12 mil

Water Security



Resilience to CC



Food for Increasing population

1967





WHAT SHOULD NATIONAL RESEARCH INSTITUTES (NARs) DO

NARs are not academic institutions

Question to all of us (30 seconds)

Are there people who use your findings to improve their livelihoods?





Role of TARI as NARS (National Agricultural Research System)





1. Driving innovation

2. Capacity
Building and
Training

3. Technology Dissemination:
Bridges the gap between research institutions and farmers,



Role of NARS in Agricultural System



4. Policy Support and Strategic Planning

5. Collaboration and Networking

6. AddressingEmergingChallenges,

7. Resource
Management and
Conservation



NARS central to achieving agricultural productivity, food security, and rural development. By driving innovation, supporting policy, and connecting research with practice, it plays a key role in shaping the future of agriculture.



Tanzania Agriculture Research Institute (TARI)



Who we are ???

 A semi-autonomous body under Ministry of Agriculture, Established in 2016, Responsible for conducting, regulating, promoting and coordinating agricultural research activities in Tanzania.

Our Vision

To be the Institute of Excellence for Agricultural Research in Tanzania and Beyond

Our Mission

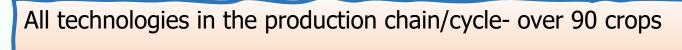
To **generate** knowledge and **develop** agricultural **technologies, disseminate** the technologies; **inform policy** for improving **productivity**, food and nutrition **security**, environmental **sustainability** and **economic** growth



Our roles



Research and Technology development



Variety/seed 2) Agronomic practices 3) Value addition 4) Nutritional value 5)Mechanization
 Markets 7) Soil Health;

Technology transfer and p/artnership



- Dissemination of innovative technologies (variety etc),
- ii. Monitor released technologies
- iii. Partner with local and International organization
- iv. dentify challenges that needs research

Policy Guidance



Fact based advise for policy making



How are we operating?

TAR Transforming Agriculture

- i. HQ-3 departments and 6 units
- ii. Centers: 17 centers
 with specific
 mandate Distributed
 based on Agroecological zone
- iii. Sub-centres and experimental stations 18 experimental centers

S/N	Center	Location/ Region	Year of Establishment	Mandate
1	Maruku	Kagera	1939	Bananas and beans
2	Ukiriguru	Mwanza	1932	Cotton and roots and tubers
3	Hombolo	Dodoma	1972	Dryland crops (sorghum, millet) and climate change
4	Uyole	Mbeya	1968	Round potato, agricultural engineering, beans, maize and pyrethrum
5	Kifyulilo	Iringa	1986	Round potato, beans, maize, wheat and tea
6	Tumbi	Tabora	1930	Agro-forestry
7	Selian	Arusha	1979	Beans, Wheat and Barley, Legumes
8	Kibaha	Pwani	1970	Sugarcane
9	Mikocheni	Dar es Salaam	1979	Coconut and Biotechnology
10	Naliendele	Mtwara	1972	Cashew nuts, oilseeds: groundnuts and sesame
11	Mlingano	Tanga	1934	Soils and Sisal
12	Tengeru	Arusha	1978	Horticulture
13	Ifakara,	Morogoro	1963	Rice
14	Dakawa	Morogoro	1984	Rice
15	Makutupora	Dodoma	1978	Grapes
16	Ilonga	Morogoro	1943	Lowland maize, grain legumes, sunflower, sorghum and millets and Post-harvest Management
17	Kihinga	Kigoma	2020	Oil palm



Our Business Process

Crop improvement (seed ands Seedlings)

- Breeding: (variety develop & Maintanance)
- Germplasm conservation
- (Seeds, in-situ and ex situ)
- Variety purification and maintanance
- Seed bank and genebank
- EGS production
- 90 + crops

Soil & Agro-Environmnment

- Soil survey and analysis
- · Soil mapping
- · Soil suitability
- Soil conservation
- Fertilizer recommendation
- Agrometeorology
- Agro-environment footprint

Marketing

- · Value chain analysis
- Marketing inteligence
- Market access

Value addition

- Processing
- Product quality
- Product variety
- Product marketability



Tech. Transfer

Policy

Field management

- Pest (Insects, weeds, birds and rodents)
- Diseases (Viral, bacterial, nematodes)

Farming techniques (Spacing, tillage, rotation, harvesting)



Mechanization

Drought and mechanical Cultivation, planting, weeding, agro-inputs, harvesting



Irrigation management

- Irrigation methods
- · Water use efficiency
- Rainwater harvesting (in-situ/ex –situ)
- Head water and Tailwater



Biotechnology applications

- Traditional
- Mordern (Confined and Monitoring



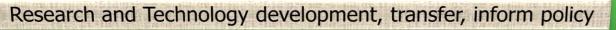
Applied computing

- Medelling
- · Precision agriculture
- · Digital agriculture
- Monitoring

Harvest and pos-harvest

- Harvesting
- crop cleaning, drying, sorting, grading, packing shelling, curing, milling, fumigating
- Crop storage (Cold/dry/wet)

Transforming Agriculture



What Has Been Done by TARI

 Development of improved crop varieties (high-yielding, drought- and pest-resistant)



- Training and extension services delivered to farmers
- Research conducted across 7 agroecological zones





TARI - MAJOR ACHIEVEMENTS IN THE PAST FIVE YEARS

1. DISCOVERY OF VARIOUS TECHNOLOGIES

- √ New varieties of seeds increased from 38 to 52.
- ✓ Improved production techniques increased from 19 to 30
- ✓ Pest control technologies increased from 12 to 39
- ✓ Discovery of 2 machines (one for planting cotton and another for planting and applying fertilizer on wheat)

2. SEED PRODUCTION

- ✓ Increase of 787 tons of breeder seeds from 342.5 tons
- Production of seedlings worth TZS 5 billion and distribution to farmers free of charge
- ✓ Collection and expansion of the gene bank from 28,600 to 36,692 seed accessions

3. TECHNOLOGY TRANSFER

- ✓ Increase in collected technologies from 220 to 343, the process of digitizing them initiated
- Improvement of 8 technology transfer centers and an increase in the number of people reached with education from 22,500 to 36,000



5. PROVIDING POLICY ADVICE TO THE GOVERNMENT

- ✓ Development of subsidy programs and removal/reduction of certain agricultural levies
- ✓ Rapid response to the onion disease outbreak in the Ruaha area, Iringa
- ✓ Research on Bacterial Leaf Blight (BLB) in ricegrowing areas
- ✓ Detection of Banana Bunchy Top Virus (BBTV) and production of disease-free seedlings

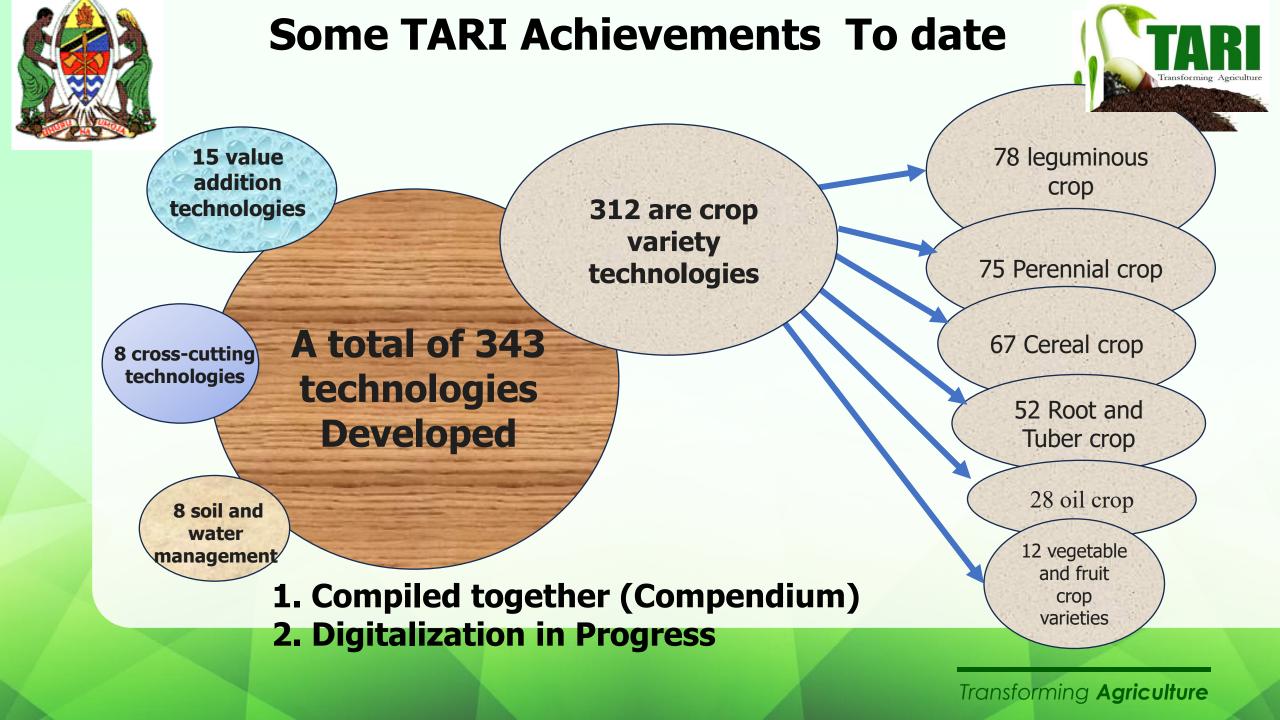
4. CONSTRUCTION OF RESEARCH INFRASTRUCTURE

- ✓ Expansion of 300 hectares, reaching a total of 2,084 hectares of irrigation at 17 centers = TZS 25.8 billion
- ✓ Construction of a large bioscience laboratory (bioscience center) and 3 laboratories for seed production using tissue culture
- Construction of a large gene bank and 11 seed storage warehouses

Policy Guidance

Technology development

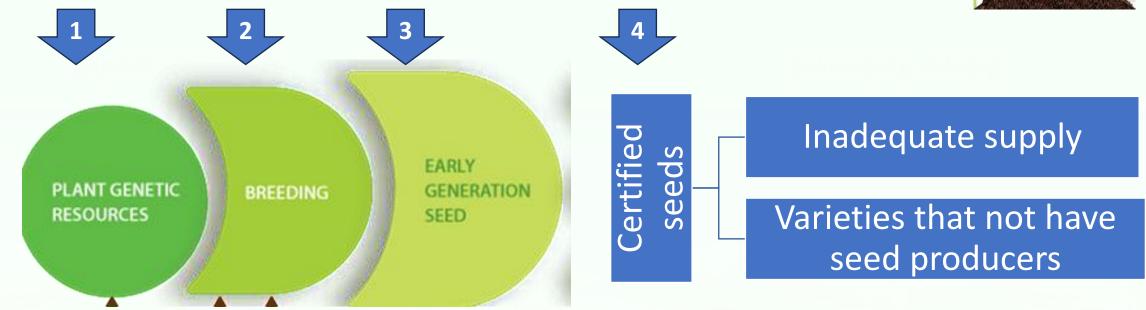
Technology transfer





A: Crop improvement and Seed system







Promotion/disseminations



Research on seed system performance





Germplasm Conservation



By April, 2024 TARI

Total of 28,977 germplasms

- Rice (1,798), Sorghum (248), pear millet (41), millet (215),
- Wheat (57), grape (36), Banana (157), beans (355), cassava (433), Cashew (22,773), maize (342), burley (313), sweet potatoes (212), round potatoes (6), sugarcane (142), coconut (7), pyrethrum (380), oil palm (3), Samsam (555), cotton (828), avocado (62) and fruits and medicinal crops (14)





Crop improvement





Crop	varieties	Name	MWAKA
Grapes	5	TARIZAB1, TARIZAB2, TARIZAB 3, TARIZAB 4 na TARIZAB 5	2023
Wheat	2	TARI-WHEAT1 na TARI-WHEAT2	2022
Rice	3	TARI-RIC1, TARI-RIC2 na TARI-RIC3	2022
Beans	5	TARIBEAN1, TARIBEAN2, TARIBEAN3, TARIBEAN4 na TARIBEAN5	2021
Sugercane	6	TARISCA1, TARISCA2, R570, R85/1334, N36 na N47	2021
Banana	4	TARIBAN1, TARIBAN2, TARIBAN3 and TARIBAN4	2021
Sorghum	2	TARISOR1 na TARISOR2	2021
Millet	1	TARI-FMI	2020
Sunflower	2	TARI-NAL2019 na TARI-ILO 2019	2020
Cassava	5	TARI-CASS1, TARI-CASS2, TARI-CASS3, TARI-CASS4 na TARI-CASS5	2020
Sweet potato	5	TARI-SP1, TARI-SP2, TARI-SP3, TARI-SP4 na TARI-SP5	2020
Maize	2	UH6305 na UH615ST	2020
Total	42		































Seed and seedling production



Production of seeds in tones

Year	Breeder seeds	Pre basic	Basic	Certified	Total
2020/2021	11.889	72.183	110.798	286.36	481.23
2021/2022	19.665	221.077	158.125	827.005	1225.872
2022/2023	13.92	118.69	150.67	59.2	342.48
Tota	45.474	411.95	419.593	1172.565	2049.582

Production of Seedlings

Yaear	Idadi ya Miche	value(TZS)
2020/2021	15,765,013	23,647,519,500
2021/2022	7,998,784	19,996,960,000
2022/2023	10,766,504	26,916,260,000
Total	34,530,301	70,560,739,500

Production of seedlings for 2024/25 by April 2025

S/N	crop	Amount distributed to farmers		
1	Sisal (Seedlings)	2,644,000		
2	Oil palm (seedling)	584,225		
3	Pyrethrum seeds	974		
4	Cashew nuts (seedlings)	1,200,000		
5	Korosho (seeds)	59,000		
6	Coconut (Seeslings)	120,000		
7	cloves (seedlings)	300,000		
8	Grapes (seedlings)	500,000		
9	Avocado (Seedlings)	201,100		
10	Banana (Seedlings)	1000		
	Total			

Early generation seeds



Certified seeds



seedlings



Landraces Conservation



Traditional/ Landraces

By April 2024

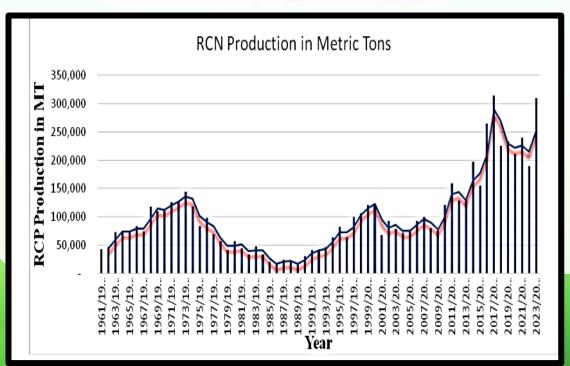
- Purification of 70 varieties of landraces
- Rice (54), Ocra (2 pusa and Sawani), Tomato (2 tanya and tengeru), Amaranthus (2 - akheri na nguruma) and beans 10
- Undertakes community seedbank programme in collaboration with TFS and VPO



Some specific examples Cashew Nuts







Improved Seeds are only from TARI

- 62 improved varieties available
- More than 17 region grow Cashew
- Increase From 6 for the past 10 years
- Contributed to Production Increase: 315,000MT 2023 to > 400,000 2024



Sisal technologies developed

Sisal varieties

- H.11648 (Only produced by TARI and Widely Used)
- H.1300
- Mlola 1.
- Other hybrids

Conserved at the gene bank for evaluation and testing

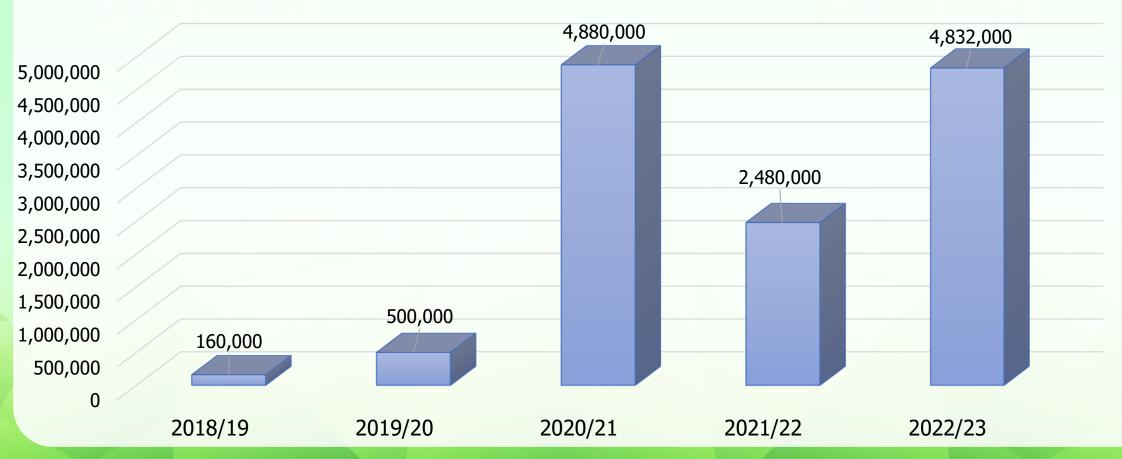




Sisal Seedling Production and Distribution



Number of Sisal Seedlings produced By TARI Mlingano



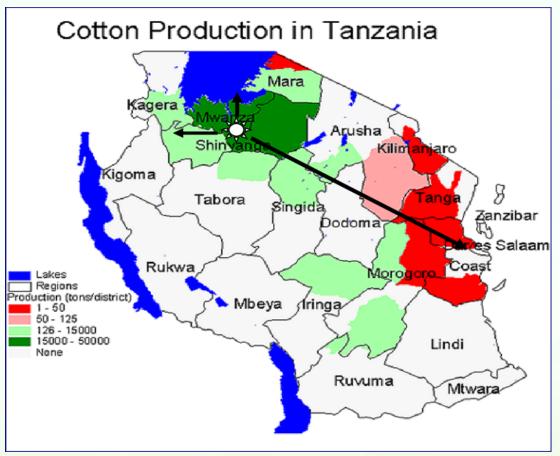
A total of 13,360,000 distributed in 3 years (2020/21 -2023/24) in 1336ha.



Cotton



- UKM 08: The Only Cotton grown variety Produced by TARI
- Grown all over cotton growing areas of Tanzania





Oil Palm



- Crossing for Tenera seeds (DXP
- Pre germinated Seeds Production and Distribution





e) Clove Seedlings Production for distribution in 2025



Around 700,000 seedlings produced

 > 250,000 has been distributed in Morogoro Region and Tanga

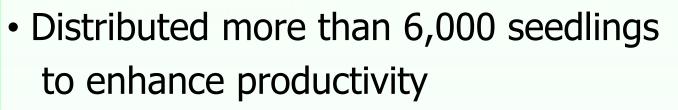




Banana



Over 500 farmers received TARIBAN banana seedlings.



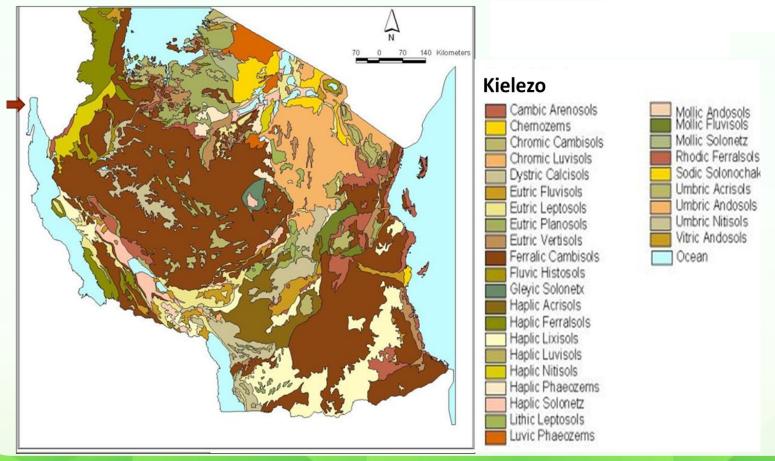




B. Soils

TAB Transforming Agriculture

Maps showing — Status of soils i) High soil variability



Enhanced GoT decision making on the distribution of Soil Testing Kits to extension officers all over the country



Mapping - Soil pH Soil VIWANGO VYA pH NA AFYA YA UDONGO, TANZANIA **Acid/Alkaline High pH Alkaline** Low pH Soils **Acidic** need Soils **Gypsum** need ANZIBAR lime ES SALAAM Few areas with medium to high The country is dominated alkaline soils medium to high acid soils **UFUNGUO** particularly in the North Mii Mkuu INDI MTWARA Makao makuu va Mkoa Eastern part of the Viwango vya pH pH<5.4 Asidi ya Kiwango cha Juu country pH 5.5-6.5 Asidi ya Wastani pH 6.6-7.3 Uwiano sawa wa Asidi na Alkali pH 7.4-8.4 Alkali ya Wastani

35

Kipimio: 1:7,000,000

40

pH<8.4 Alkali ya Kiwango cha Juu

Maeneo ya Hifadhi

30



C: Mechanization.



- Rafiki planter for cotton planting
- Tested for planting sunflower in the regions of Morogoro, Dodoma, Singida, Simiyu, Shinyanga, and Mwanza, where it has shown great success.





C: Water management



- SRI
- Mat nursery







D: Digital Agriculture

- Kilimo Thabiti App
- In collaboration with weather impact, farmers get wather information on their hand set







E: Value addition





Cashew kernels



cashew butter



Cashew apple wine



Cashew bars



Cashew apple snack



Cassava flour
Iransforming Agriculture



F: Biotech application

Contained research on Casava Mosaic Virus ata TARI- Mikocheni,









Biotech application



Confined field trial for drought Tolerant and pest resistant maize at TARI-Makutopora





Regulatory Framework for GMO



- Agricultural policy 2013
- Biotechnology policy 2010
- Environmenta Policy 2021 and Environmental management act, Cap 191
- Section 69 : Safe use of modern Biotech
- Principles as per Biosafety regulation, 2009
 - (Precautionary Principle)
 - (Preventive Principle)
 - (EIA/Risk Assesment/Social Economic Assessment)
 - (Liability and Redress)
- Presence of (Guidelines and Manuals)

Biotech controversy?











Controversy due to business rivals



G: TARI Partnerships



TARI has established numerous partnerships with various national and international organizations. The exact number of partnerships may vary over time, as new collaborations emerge and existing ones evolve. Several key partnerships, including:

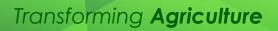
- i. International Institutes (such as IITA, IRRI, AfricaRice)
- ii. **Regional Networks** (e.g., ASARECA)
- iii. Government Agencies (e.g., Countries Ministry of Agriculture)
- iv. Development Partners (e.g., Norwegian Institute of Bioeconomy Research, Alliance of Bioversity International and CIAT)
- v. Private Sector Partners (in seed production and agricultural innovation
- vi. Local Research Institutes (e.g., Zanzibar Agricultural Research Institute)
- The total partnerships MoU signed exceed 100 in number, spanning both formal and informal collaborations.
- TARI is known to have strong collaborations in diverse fields of agricultural research and development, including crop improvement, climate-smart agriculture, and capacity building.











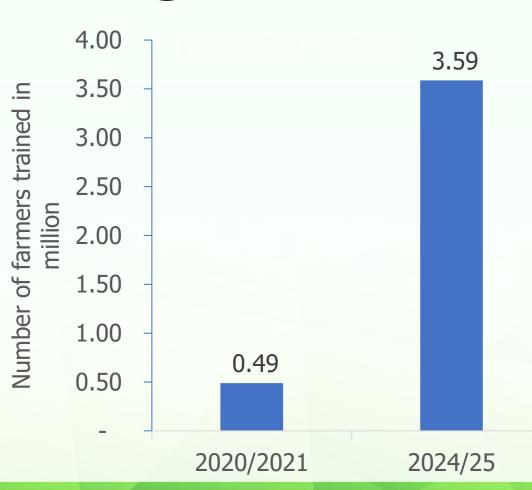




Facilitate Knowledge and Technology Exchange



- Facilitating TARI centres to deliver knowledge to stakeholders-farmers and extension agents
- Monitor adoption of improved varieties
- Establishing and equipping the 8 Agritech hubs
- Demand creation activities (seed/seedling distribution)





Future Plans for TARI



- Expand research on:
 - Emerging pests/diseases
 - Climate change impacts
 - Market-oriented crops
- Strengthen:
 - Public-private partnerships
 - Farmer participation
- Improve technology dissemination and adoption





Recommendations / Way Forward



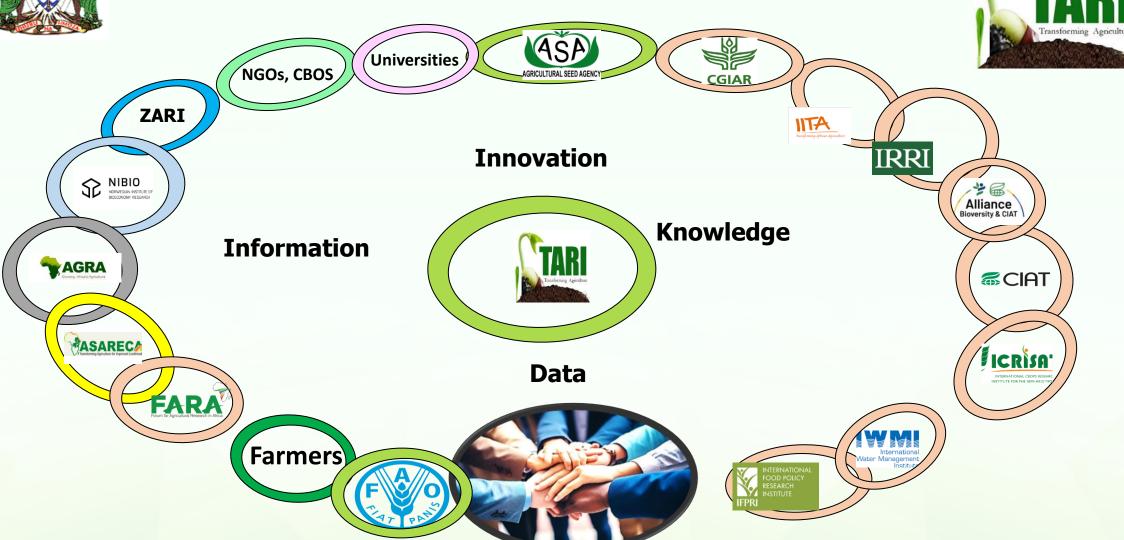
Continued investment in research infrastructure

- Capacity building for researchers and extension workers
- Strengthening of data-driven decision-making
- Emphasize youth and women in agricultural innovation



Thank You





... ... Improvement Requires a Robust Knowledge and Partinership