NARO

ANNUAL REPORT

2024-2025

Building a Resilient Food System

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This Annual Report presents performance highlights and achievements of the National Agricultural Research Organisation for the Financial Year 2024/2025. The information contained herein is intended for public information, policy reference, and institutional accountability. While every effort has been made to ensure accuracy of the information presented in this report, NARO does not accept responsibility for any errors or omissions.

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Message from the Chairman, NARO Governing Council

Agriculture remains a firm cornerstone of Uganda's economy and its importance is expected to continue because of the increasing population and food security demands. Agricultural research plays a critical role to ensure agricultural transformation to support food and income security, and agro-industrialisation.

In the Financial year 2024/2025, NARO intensified its focus on interventions that directly address national development priorities outlined in the National Development Plan III (NDP III). NARO's strategic alignment with overarching frameworks ensures that its research outputs are impactful.

As a governing council, we are committed to ensure an enabling policy environment and guide investment. We approved the new NARO Strategic Plan (2025/26-2029/30), the Annual Workplan, Budget Framework Paper and Ministerial Policy Statement for FY 2025/26. We also approved nine (09) policies and strategic documents. These include: the Transport and Fleet Management Policy; Environmental and Social Safeguards Policy; Planning, Monitoring, Evaluation and Accountability(PMEA)Policy; Grants Management Guidelines; Revised Council Charter; Plant Variety Replacement Strategy; Feed Production Commercialization Model; and a proposal to establish the National Sugar Research Institute. We further appointed new advisory committees to provide technical guidance for PARIs.

On behalf of the NARO governing council members, I extend our sincere gratitude to His Excellency the President and Government of Uganda for the commitment towards supporting agricultural research. The progress made has been due to unending invaluable support. We continue to pray for increased and sustainable investment to cover the remaining research and development gaps to have a comprehensive economic impact. Further, I convey my great appreciation to development partners and collaborators that have walked the transformative journey with NARO throughout the years. Finally, I thank the Director General, Management and staff of NARO for their dedication and consistency in delivering a successful FY 2024/2025.

Looking ahead, we committee to continue to champion policies that promote agricultural innovations, enhance linkages to industry and extension services

Dr. William Olaho-Mukani,

Chairperson, NARO Governing Council

Message from the Director General

The Financial Year 2024/25 represented a defining chapter in the transformation of agricultural research in Uganda. The year was marked by purposeful delivery of research outputs, strengthened institutional governance, and renewed commitment to accountability and impact. NARO made deliberate strides to position itself as a results-driven, standards-compliant, gender responsive research institution and a centre of excellence in the region. Its work remains firmly anchored on the national development priorities focusing on food and nutrition security, climate resilience, agro-industrialization, and export competitiveness.

NARO applied advanced cutting-edge research tools to generate outputs in crops, livestock, fisheries, forestry, natural resources, soils, biotechnology, and mechanization. Notably, NARO released new climate-resilient varieties, expanded livestock vaccine innovation starting with the Anti-Tick Vaccine (NAROVAC®), strengthened aquaculture technologies, improved trees and avocado genetic resources, and deployed biological solutions against invasive species and export-limiting pests. These innovations are designed not only to advance scientific knowledge, but to deliver practical solutions that reduce risk, improve productivity, and enhance livelihoods for farmers and value-chain actors. This focus reflects our mission of innovating for sustainable agricultural transformation.

NARO operated under a Mid-Term Expenditure Framework (MTEF) allocation of UGX 175.87 billion, representing the highest level of Government investment in agricultural research to date, compared to UGX 164.44 billion in FY 2023/2024. NARO expresses sincere appreciation to the Government of Uganda for this increased commitment, which has strengthened the Organisation's capacity to deliver impactful research and innovation.

Equally important was the progress made in strengthening internal systems, governance, and institutional credibility. The Organisation undertook key reforms in planning, performance management, data systems, human resource and policy frameworks to improve efficiency, transparency, and value for money. These included, among others, development of a new Strategic Plan 2025/26-2029/30, new policies and guidelines, and the new NARO human resources' structure that was approved by the Ministry of Public Service with an establishment of 1242 staff.

As NARO transitions into the implementation of NDP IV and its new Strategic Plan, this Annual Report provides a comprehensive account of our performance, challenges, and lessons learned during the FY 2024/25. Looking ahead, NARO will focus on enhancing systems that enable scale and impact while ensuring compliance with national and international standards. Further NARO commits to delivering inclusive, climate-smart, and market-responsive technologies, with deliberate focus on youth, women, and underserved communities.

On behalf of NARO Management, I express my sincere appreciation to the Government of Uganda, Cabinet and State Ministers in MAAIF, the NARO Governing Council, our development partners, and NARO staff for their stewardship, support and unwavering commitment. To all our stakeholders, we reaffirm our commitment to serve you and to transform agriculture through research that delivers measurable impact.

We innovate for sustainable agricultural transformation!

Dr. Yona Baguma

Director General, NARO

NARO at a glance

NARO is an agency of the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) established in 1992 under the 1992 statute, and reforms made by the National Agricultural Research Act of 2005.

Mandate: To coordinate and oversee all aspects of public-funded agricultural research in Uganda. The mandate includes undertaking research and development in all aspects of agriculture including crops, livestock, fisheries, forestry, agro-machinery, natural resources and socioeconomics.

Vision

A competitive society supported by a dynamic agricultural research innovation system

Mission

To innovate for sustainable agricultural transformation

Goal To increase total factor productivity and access to agricultural research products and services for inclusive growth.

Our strategic objectives

- Increase production and productivity-enhancing agricultural technologies and innovations.
- Increase generation of quality-enhancing and loss-reducing harvest, post-harvest and storage technologies and innovations
- Increase market and industry responsive value-added agro-based products and services.
- Enhance access and sustainable utilisation of improved agricultural technologies and innovations.
- Strengthen institutional capacity to undertake and coordinate agricultural research

NARO In Uganda

NARO has a Governing Council with Committees of the Council as its specialised organs, a Secretariat for its day-to-day operations, and supporting advisory committees for the sixteen (16) semi-autonomous Public Agricultural Research Institutes (PARIs) spread across the country.

Seven (7) PARIs are National Agricultural Research Institutes (NARIs) with a mandate to conduct research and generate technologies of national strategic importance, while nine (9) are Zonal Agricultural Research and Development Institutes (ZARDIs) conducting adaptive and applied research, promoting technologies and providing outreach services required in the different agro-ecological zones of Uganda.

- Westnile farmlands
- Northen farming system
- Northen Moist famlands
- Lake Albert cresent
- Eastern Highlands
- Lake Victoria Cresent
- Western Range lands
- South Western Highlands

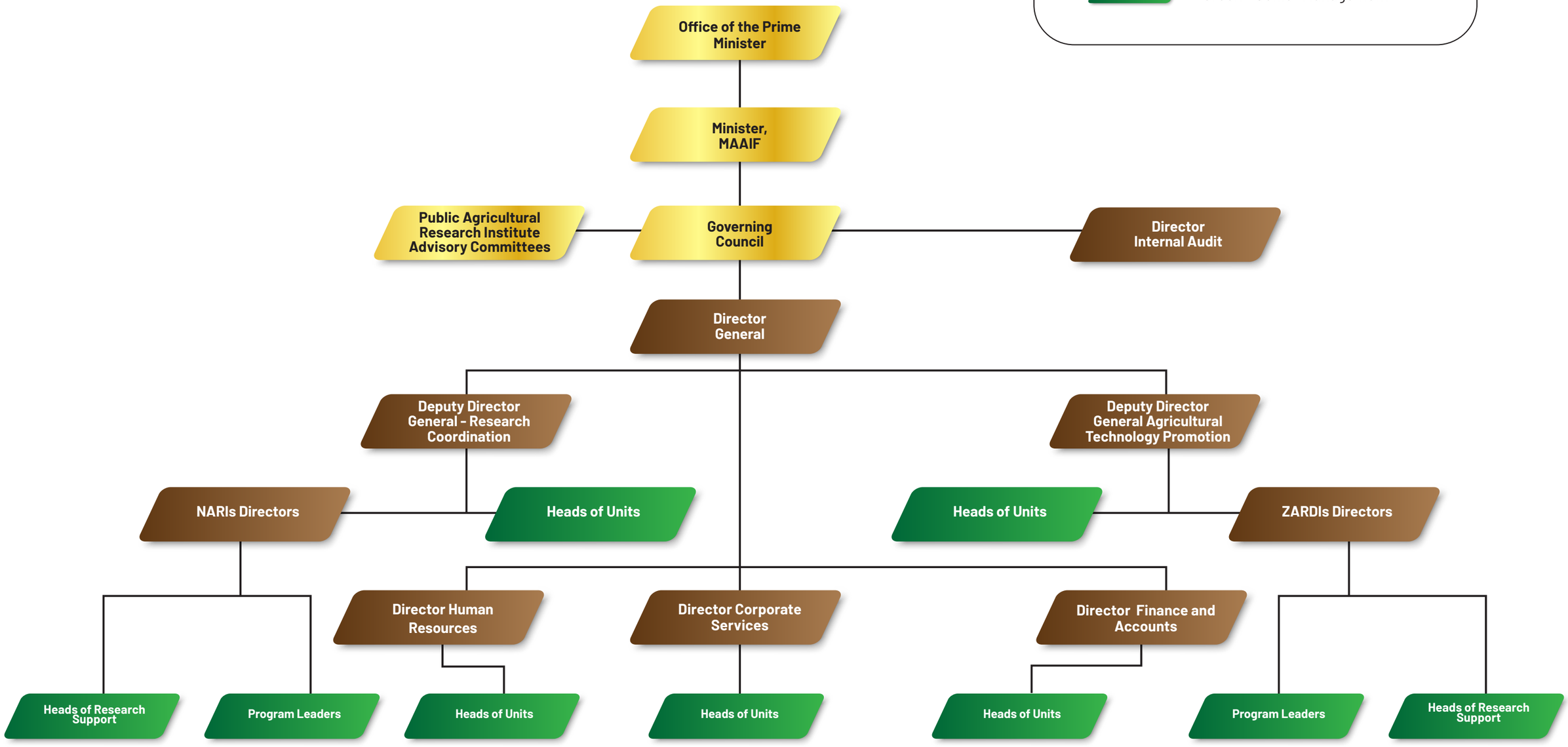
NARO Secretariat

1. NaCRRI
2. NARL
3. NaFORRI
4. NaCORI
5. NaFIRRI
6. NaSARRI
7. NaLIRRI
8. Mukono ZARDI
9. Kachwekano ZARDI
10. Mbarara ZARDI
11. Rwebitaba ZARDI
12. Bulindi ZARDI
13. Abi ZARDI
14. Ngetta ZARDI
15. Nabuin ZARDI
16. Buginyanya ZARDI

NARO Governance and Management Structure

Background colours:

- Gold - Governance
- Brown - Top Management
- Green - Senior Management



2024/2025 NARO Achievements

Infrastructural Capacity Enhancement

- Goat Research Facility at NaLIRRI-Maruzi, Apac
- Queen Bee Rearing Facility at NaLIRRI- Maruzi
- Vaccine Administration Block at NaLIRRI-Nakyesasa
- Aflasafe laboratory and production line equipped at NaLIRRI, Nakyesasa
- Calf/Heifer Barn at NaLIRRI-Nakyesasa
- Over **2,500 ha** of research land secured and titled across multiple sites

Livestock improvements

- Improved local chicken: Attains market weight of 2.5 kg within 6 months
- Goats: F1 Kalahari-Mubende cross reaches 20 kg in 7 months vs 30 kg for Mubende at 18 months
- Beef cattle: F1 Ankole-Brahman cross reaches 156 kg compared to 90 kg in pure Ankole in 6 months
- Anti-tick vaccine facility remodeled and fully equipped

Human Capacity Enhancement

- **1,242** staff positions from 1,180 under institutional restructuring
- **43** staff supported for postgraduate studies

Fisheries improvement

- New hatchery protocol improved *Labeo victorianus (Ningu)* larval survival by **20%**
- Lake Albert Biodiversity Atlas developed: A comprehensive resource of the fish species habitat, and ecological features of the lake

Crop technologies released

- 4 disease-resistant and chipping potato varieties
- **3** high-iron and zinc-rich finger millet varieties
- **1** Disease Resistant Banana Variety Released (NAROBAN 6)
- **2** protein-rich porridges commercialized by industry

Forestry Improvement

- Cashew genebank established

2024/2025 NARO Achievements

Soils Management Advancement

Masaka soil map improved from **1:250,000 to 1:50,000**

20 crop-suitability maps to guide land-use planning developed

3 fertilizer formulations for maize, coffee & beans

Plant Genetic Resources Conservation

5,439 crop accessions in gene banks compared to 2,483 in 2023-2024

Invasive Species Management

Biocontrol strategies for Congress weed and Kariba weeds deployed, reducing infestation by **>60%** in target areas

Technology Promotion and Transfer

1 patent obtained for AI model for FMD prediction

8 trademarks filed

3 new seed companies licensed, bringing total to 26

194,331 kg of Early Generation seed distributed leading to production of 5.38 million kg

52 parish-level demonstrations across the 9 agro-ecological zones

Strides in Increasing Production and Productivity

NARO'S new potato varieties poised to transform farms, factories, and the future of Uganda's food industry

For years, processors have imported tons of potato because local varieties could not satisfy industrial needs, and Uganda lost billions in import costs.

On the rolling slopes of Kabale, where mist settles gently on the hills every morning, farmers have a familiar story to tell, one of hard work, and the constant battle against a relentless enemy: the late blight potato disease. For decades, this disease has swept through potato fields lie wildfire, destroying crops, eating into family incomes, and leaving farmers at the mercy of unpredictable harvests.

This is a scenario that echoes across the potato-growing highlands of Kisoro, Kapchorwa, Bundibugyo, and parts of Sebei and Zombo. But the FY2024/2025 marked a turning point. A quiet revolution unfolded in Uganda's potato gardens, led by NARO with the release of four breakthrough potato varieties: NAROPOT7, NAROPOT8, NAROPOT9, and NAROPOT10.

What makes these varieties special is not only their resilience or productivity, but also the fact that they were developed with the market, the farmer, and the processor in mind.

For the first time in Uganda, potato breeding was guided by: What processors need (high dry matter, uniform size, crisping quality); what farmers want (disease resistance, high yields, shorter maturity); what the nation demands (reducing imports and strengthening agroindustrialisation). For years, processors have imported tons of potatoes because local varieties could not satisfy industrial needs. Farmers grew what they could, processors bought what they must, and Uganda lost billions in import costs. Currently, Uganda

spends over USD 9.8 million annually on

potato importation for making chips and French fries.

Each of the new varieties tells its own story:

NAROPOT 7: *The early maturing performer*

With a yield potential of 30.2 tonnes per hectare and a maturity period of just 90-100 days, NAROPOT 7 is the variety farmers are already calling "the moneymaker." Its high resistance to late blight allows farmers to drastically cut costs on fungicides, savings that translate directly into higher incomes.

NAROPOT 8: *The processor's favourite*

Boasting 22.1% dry matter content, this variety is a dream for crisp and chip manufacturers. Its stable performance, across mid-high altitude regions, makes it a dependable choice for farmers and processors alike.

NAROPOT 9: *The yield champion*

At 31.4 tonnes per hectare, NAROPOT9 is the highest yielder in the new line up. Its consistency in both quantity and quality is already making it the preferred option for contract farming arrangements.

NAROPOT 10: *The industrial powerhouse*

This variety stands out with an extraordinary 28.1% dry matter content, a trait rarely found in local potatoes. With a longer maturity period (100-120 days) and strong disease resistance, NAROPOT10 is expected to anchor Uganda's aspirations for a competitive potato-processing industry.

New Foxtail Millet and Banana varieties for improving Food and Nutrition Security

In the race to boost Uganda's crop productivity and build climate resilience, scientists at NARO are developing crops to withstand drought, pests and diseases while improving nutritional value.

The productivity gap for major staples food crops in Uganda is glaring. Millet, for example, despite its high nutritional value, remains underutilized because of low yields and poor quality. This underscores the urgency to accelerate the generation and delivery of high-yielding, climate-resilient, and more nutritious crop technologies. In response to these gaps, in addition to potato, NARO developed and released new varieties for foxtail millet and banana.

Foxtail Millet: Foxtail millet is a protein-rich and iron-dense cereal crop that is early maturing and drought resistant. It was introduced to Uganda through the FAO-China-Uganda South-South Cooperation project to improve food and nutrition security in most parts of the country. The new varieties reposition millet to reclaim its place especially given the increasing challenges of climate change. What was once considered a "survival crop", is now a driver of nutrition-sensitive agriculture and a foundation for value-added products like fortified flour and snacks.

	• **Name:** NAROFOMILL 1 • **Maturity:** 80-85 days • **Nutrition content:** Protein – 11.9 g/100g, Iron – 25.1 mg/kg, Zinc- 15.9 mg/kg • **Average Yield:** 1.8 t/ha
	**Name:** NAROFOMILL 2 **Maturity:** 75-80 days **Nutrition content:** Protein – 11.72 g/100g, Iron 21.28 mg/kg, Zinc 17.55 mg/kg **Average Potential Yield:** 1.8 t/ha
	• **Name:** NAROFOMIL 3 • **Maturity:** 85- 90 days • **Nutrition content:** Protein – 11.4 g/100g, Iron – 16.7 mg/kg, Zinc- 13.2 mg/kg • **Average Yield:** 1.7 t/ha

Banana: Bananas remain Uganda's most widely consumed staple. The country has the world's highest per-capita consumption of 200-400kg per year. Local consumption is estimated at over 70% with exports valued at USD 6.36 million but growing.

NARO's research is keeping up with the demand by developing the desired varieties and promoting appropriate production management systems as well as value addition. NAROBAN 6, a variety released his year has increased yield and diseases resilience, which will ensure that banana remain the heart of national food security and household incomes.

NAROBAN 6

- Bunch weight: 45-54Kg
- Average yield: 44 tons per hectare per year
- Tolerant to nematodes and banana weevils
- Resistant to Fusarium wilt and Black Sigatoka
- Has a life span of more than 10 years, depending on management

NARO and JICA Edged Closer to Releasing New Aromatic Rice Varieties

Uganda is inching closer to a major agricultural breakthrough as scientists finalize testing of new aromatic rice varieties set to replace the popularly imported Basmati and Supa rice.

The innovation has been driven by the soaring demand for aromatic rice, which sent researchers at NARO racing to deliver homegrown Basmati and Supa varieties that can match imported grain in quality, aroma, and yield.

The new varieties, developed under the Promotion of Sustainable Rice Development (ECO-PRiDe) Project and funded by the Japan International Cooperation Agency (JICA), signal a turning point that could boost farmer incomes, strengthen food security, and save the country billions spent annually on rice imports.

Dr. Jimmy Lamo, a rice breeder and Leader of the Cereals Program at NARO, said the varieties also address long-standing challenges faced by rice farmers in Uganda.

"These aromatic varieties dominate the market, but the ones currently grown in Uganda are highly susceptible to disease and give low yields," Dr. Lamo noted, adding: "We have now developed improved lines using resistant parent lines. They are under advanced testing across six locations including Doho Irrigation Scheme in Butaleja."

Dr. Lamo revealed that farmers, millers, and value chain actors have participated in cooking and milling evaluations before approval is delivered by the Ministry of Agriculture, Animal Industry and Fisheries and the National Variety Release Committee.

Dr. Kisho Miyamoto, the Chief Advisor for the Eco-PRiDe project, said they were leveraging on Japan's more than 2000 years' experience in rice production to enhance production and production in Uganda. He said the project was also facilitating young researchers to undertake studies at different Japanese universities.

The project is using the Musomesa Field School approach to strengthen the research-extension continuum and localize farmer learning.

The Rise of Poo Women's Group in Maracha District

Rice production, once a novelty, has become a thriving enterprise in West Nile

In the quiet hills of Kojimori Sub-county, Maracha District, a quiet revolution is reshaping women's lives; one grain at a time.

Until recently, rice was virtually unknown in this part of West Nile. Fields were dominated by cassava and millet, while rice was viewed as a crop for distant wetlands. But through the Eco-PRiDe Project, led by the National Crops Resources Research Institute(NaCRRI) in partnership with Abi ZARDI and the local government, rice has become both a new livelihood and a symbol of empowerment.

At the heart of this transformation is the Poo Women's Group; a determined collective of women farmers who joined NARO's innovative Musomesa Field School (MFS), a Uganda tailored version of the Farmer Field School model that emphasizes learning-by-doing and peer teaching. Working alongside NARO scientists and local leaders, the women established upland rice demonstration plots, learning about improved varieties, agronomic practices, and post-harvest handling. Their hard work paid off.

Within just one season, the group's yields doubled, and rice once a novelty became a thriving enterprise. Several women have since been certified as community-based Musomesa instructors, training their peers in nearby villages. "We are no longer just growers; we are teachers and businesswomen," says Ms. Irean, one of the group's founding members.

Building on their success, the women have expanded into value addition by producing rice flour, snacks, and even rice wine. These products are now sold in local markets, schools, and community fairs making the investment venture more profitable enterprise. The income has enabled many women to pay school fees, improve their homes, and invest in farm inputs.

NARO is now guiding the group toward certified seed production and agribusiness development, ensuring that their gains become sustainable. What began as a pilot demonstration has grown into a story of resilience, knowledge, and self-reliance; proof that when science reaches women, entire communities thrive.

Breeding climate-smart wheat and barley for import substitution

With a new generation of wheat and barley varieties in the pipeline, Uganda stands on the brink of a new era of cereal self-reliance.

Uganda's growing demand for wheat and barley, driven by rapid urbanization, population growth, and expanding agro-processing industries, continues to outpace domestic production. As a result, the country remains heavily dependent on wheat imports, exerting sustained pressure on foreign exchange reserves and exposing national food systems to global market volatility. This situation has been exacerbated by the current disruptions in global wheat supply chains arising from the war in Europe.

The national self-sufficiency for wheat stands at a paltry less than 5% with the huge deficit of 650,000 metric tons met by imports valued at US$ 450 million, annually. Currently, wheat in Uganda is mainly grown in highland areas with challenges including obsolete varieties and poor seed systems. In addition, the vast agro-ecological variations remain largely untapped.

Even with the above imports, 90% of the millers operate at 50% of the installed capacity because of limited supply. The regional markets in neighbouring countries present more opportunities for Ugandan wheat. Wheat by-product is also a key input to the rapidly growing animal feed industry.

Through research collaborations with International Center for Agricultural Research in the Dry Areas (ICARDA) and Center for Maize and Wheat Improvement (CIMMYT), scientists at the NARO are addressing the above challenges through intensive breeding programs. They are developing climate-resilient, industry-preferred wheat and barley varieties capable of thriving in Uganda's mid- and low-altitude zones. This intervention is laying the foundation for import-substitution and an export-ready grain economy.

Expansion of wheat production to warmer production zones

Locally bred wheat varieties promise to contribute UGX 160 billion annually through increased farmers' incomes and import cost reduction of up to 50%.

- 5 promising heat-tolerant wheat varieties were under national performance trials;
- 38 promising elite wheat lines were selected and advanced into late-stage evaluations to identify candidate varieties: priority attributes include resistance to new yellow-rust race (PstS16) and Ug99 variants of the wheat rust;
- 20 stress-tolerant lines were selected for lowlands; and
- 15 high-yielding lines were selected for highlands.

Barley varieties to support import substitution

Release and scale-up of NARO varieties could raise production from 6,000–8,000 MT to 20,000–25,000 MT per annum; increase import substitution to an estimated value of UGX 20 billion annually and a gross value estimated at UGX 60 billion annually.

- Two NARO-bred barley lines were submitted for release; and
- Three elite malting barley lines from South African Barley Breeding Institute (SABBI) were under multi-locations evaluation.

NARO preserving Uganda's Gem; Coffee

In a coffee plantation, diversity is the key to optimal yields, therefore farmers are advised to grow at least five (5) varieties on a farm

Uganda is Africa's second-largest coffee exporter and the global leader in Robusta production. Coffee remains one of the

country's most valuable exports and a key source of income for millions of smallholder farmers.

This position has however been threatened by an enemy, the infamous Coffee Wilt Disease (CWD). This lethal fungal disease is caused by the fungus *Fusarium xylarioides* and has in the last 30 years devastated Uganda's Robusta coffee sector, causing over $1 billion in losses and significantly reducing export volumes until 2020. The disease causes rapid wilting, tree death, and up to 90% loss in some plantations, forcing widespread abandonment of farms.

Thanks to NARO, the story has taken a positive turn since the introduction of the famous Kituza-Robusta coffee variety series, commonly known as the ***"KR series"***.

The Kituza Robusta (KR1–KR10) coffee varieties are high-yielding, Coffee Wilt Disease (CWD)-resistant clones developed by the National Coffee Research Institute (NaCORI). These clones are tailored for better cup quality, large beans, and drought tolerance.

NARO KR8 - NARO KR10 are the most recent, improved, and vigorous varieties. Released with enhanced vigour to combat devastating wilt outbreaks, these varieties offer high yields (approximately 3,700 kg per hectare) and are tolerance to leaf rust. KR10 has shown strong performance in dry conditions, particularly when grafted.

Access to planting materials and propagation:

To increase farmers' access to clean planting materials, over 500 certified nursery operators spread across the country have been trained by NARO, to multiply the cloned materials via vegetative methods, including tissue culture and mini-cuttings.

It is important to note that diversity is key to achieve optimal yields, farmers are therefore advised to grow at least five (5) varieties on one farm in addition to carrying out recommended agronomic practices. Growing many varieties improves pollination and reduces the risk of the effects of climate change, while growing one variety is likely to accelerates inbreeding hence affecting yield potential and overall quality.

Biological breakthroughs to combat Black Coffee Twig Borer

Management of the Black coffee twig Borer remains a national priority and researchers are committed to deliver solutions.

In Uganda's coffee fields, a silent enemy has been eating away at the country's most prized export. Tiny but destructive, the Black Coffee Twig Borer (BCTB) burrows deep into coffee stems, leaving behind hollow twigs, wilted branches, and heavy yield losses. Its stealth, rapid spread, and ability to reproduce without mating have made it one of the most difficult pests to control in tropical coffee systems.

For the smallholder farmers who produce nearly 80% of Uganda's coffee, conventional control methods have proven both costly and ineffective. Synthetic pesticides are expensive, environmentally risky, and largely ineffective against a pest that hides inside plant tissues. Recognizing this urgent threat, NARO scientists pioneered a biological control breakthrough that is redefining pest management in Uganda's coffee landscapes.

By shifting from chemicals to biological control, this innovation helped safeguard Uganda's US$ 1.14 billion coffee industry, which supports 1.7 million smallholder households. The approach aligned with the National Coffee Roadmap, which targets production of 20 million 60-kg bags annually by 2030.

Towards a healthier, greener coffee future

NARO has advanced fungal-based biological control as a long-term, environmentally sound solution to the Black Coffee Twig Borer (BCTB). The fungi disrupt the borer's symbiotic ambrosia fungus, offering sustained pest suppression.

- 3 effective fungal strains were identified to control BCTB
- A spore-based biopesticide was tested in farmers' fields, paving the way for commercialization.

Harnessing nature's own defenders

Beyond fungi, NARO harnessed beneficial insects to strengthen ecosystem-based pest control. When combined with fungal biocontrol, it formed a sustainable integrated pest management (IPM) package that is expected to reduce pesticide use, lower production costs, and improve soil and ecosystem health.

· Predatory ants were evaluated as a natural enemy for BCTB

· Six organic baits were tested to attract and multiply native ant populations. Sugarcane husks and molasses proved most effective, reducing twig damage by up to 20%.

Research boosting competitiveness of Ugandan Tea

Uganda's tea sector is rich in potential yet constrained by low productivity, fluctuating quality, and limited value addition.

While tea remains a major export earner and livelihood source in Uganda, its performance has been held back by poor quality, declining soil fertility, and inconsistent in processing.

Recognizing this, the National Development Plan III (NDP III) and the Agro-Industrialization Programme Implementation Action Plan (AGI-PIAP) identified tea as a strategic commodity under the industrialization drive. To unlock its potential, scientists intervened not only by conducting research to raise yields, but also to improve quality, climate resilience, and competitiveness along the value chain.

NARO's research efforts have gone beyond breeding to building innovations around value addition. Through partnerships with the Uganda Tea Development Agency (UTDA), private estate processors, and international research institutions, researchers were focusing on value addition products to increase productivity while complying with international quality standards and targeting niche markets.

- One (1) purple tea line and three (3) elite green tea germplasm lines introduced and evaluated under Ugandan field conditions. Priority attributes included: high yield potential, drought tolerance, and superior quality.
- A tea sensory evaluation and biochemistry laboratory established at Rwebitaba ZARDI.
- 195 tea genotypes tested for flavour, aroma, biochemical and organoleptic quality. Physiochemical profiles developed based on consumer preferences and export standards.
- Four (4) ready-to-drink (RTD) tea beverage prototypes developed in collaboration with agro-processors. The innovations targeted urban consumers and niche export markets.

Safeguarding the future of food through plant genetic conservation

In an era of changing climatic conditions and fragile food systems, the foundation of Uganda's

agricultural resilience lies in the diversity of its crops.

NARO is leading the conservation of Uganda's crop diversity by protecting the genetic foundation of food security, nutrition, and sustainable agriculture. By conserving plant genetic resources and strengthening breeding pipelines, scientists are building resilience against climate change, pests, diseases, and market shocks.

Through systematic conservation and use of plant genetic resources, NARO has secured raw materials for future crop improvement and innovation. The goal is to safeguard national biodiversity, accelerate development of climate-resilient varieties, reduce breeding costs, and strengthen Uganda's long-term food system resilience.

Preservation of Uganda's crop diversity

NARO has been conserving and managing the nation's biological wealth at the Plant Genetic Resources Centre (PGRC); ensuring that both farmers and breeders have access to diverse, climate-resilient and locally adaptable materials. This genetic repository forms the backbone of Uganda's national breeding programmes.

- 5,439 accessions of crops and plant wild species were conserved. The collections include beans, sorghum, rice, soybean, maize, finger millet, pearl millet, forages, peas, bambara nuts, pumpkin, and *Solanum* species.

Unlocking new opportunities through sustainable use of the plant genetic resources

Beyond conservation, NARO has used these plant genetic resources as drivers for innovation and economic transformation. Neglected and underutilized crops such as bambara nuts, pearl millet, pigeon peas were optimised for niche markets through organised production and value addition. These efforts have strengthened agro-industrialization by supplying resilient raw materials for agro-industries.

Advancing nature-based crop protection through microbial innovations

Through harnessing beneficial fungi and bacteria, NARO is building a new generation of bio-chemicals that enhance productivity, reduce environmental risk and support safer food systems.

Crop losses from fungal diseases, plant parasitic nematodes, and insect pests continue to undermine farmers' yields. Conventional chemical control methods are often expensive, environmentally risky, and increasingly ineffective due to resistance development. Recognizing this challenge, NARO has invested in systematic evaluation of beneficial microbial strains to build a pipeline of locally developed biological crop protection products that will lower reliance on synthetic fungicides and pesticides.

Through laboratory screening, screenhouse validation, and field testing, scientists are laying the foundation for a resilient, eco-friendly crop protection industry that supports productivity, food safety, and sustainable intensification.

Microbes for high-impact disease control screened

- 5 promising microbial strains evaluated; 4 fungal and 11 bacterial, to identify effective candidates for crop protection
- Strains tested for management of banana black Sigatoka and sorghum anthracnose.
  Candidate strains tested for management of sweetpotato weevils.
- Microbial solutions evaluated for reduction of mycotoxin contamination in maize.

Plant parasitic nematodes managed in root and tuber crops

NARO researchers commenced studies to identify and validate bio-nematicide strains that protect underground yield potential and improve tuber quality. Microbial research is targeting nematode suppression in yam, sweetpotato, potato, and cassava.

From laboratory to field validation

NARO established protocols for mass production of selected microbial strains and produced enough microbial formulations for experimental trials. This transition from laboratory screening to field validation marked a critical step toward commercial-ready biological crop protection products.

- Lead microbial strains identified for bio-pesticide product development.
- Product profiles developed to guide commercialization pathways.

Skeepon: Climate-Smart Innovation to Stabilize Crop Production

Uganda's agriculture is increasingly exposed to climate variability characterized by prolonged dry spells, erratic rainfall, and rising temperatures.

Climate shocks such as prolonged dry spells, erratic rainfall and rising temperatures, have reduced crop yields, shortened growing seasons, and increased the risk of crop failure, particularly in rain-fed farming systems dominated by smallholder farmers.

To address this challenge, NARO conducted multi-season scientific evaluations of Skeepon, a plant bio-stimulant designed to improve crop tolerance to drought and heat stress. Developed by *AC-Planta Inc*. in Japan, the technology activates natural stress-tolerance mechanisms within plants, enabling them to survive adverse environmental conditions while maintaining productivity.

The technology works by activating natural metabolic pathways within plants that trigger drought and heat tolerance responses. By mimicking physiological stress signals, the product stimulates internal plant mechanisms that enable crops to maintain productivity under water-limited conditions.

Following controlled experiments and field trials across several agro-ecological zones, NARO generated strong scientific evidence demonstrating that the technology enhances crop survival, vegetative growth, and yield performance, particularly under drought and heat stress conditions. The product has since been registered by the Ministry of Agriculture, Animal Industry and Fisheries, confirming compliance with national regulatory standards.

Scientific validation of climate-smart plant resilience technology

Multi-season trials were conducted across representative agro-ecological zones: including Namulonge, Serere, Ngetta, Kamuli, and the coffee-growing belt. Results consistently demonstrated improved crop establishment, enhanced vegetative growth, delayed stress symptoms, and increased yields in drought-prone environments.

The trials compared treated and untreated plots under research-managed and farmer-managed conditions.

- Up to 23% yield increase in maize compared to untreated controls
- Over 200% yield improvement in tomato under severe drought conditions in some trial sites
- 85–90% survival rates for treated coffee seedlings plots compared to less than 40% in untreated plots

From Research to Deployment

With regulatory registration secured and strong scientific evidence generated through NARO trials, the technology has transitioned from research validation into commercialization. Through scientific validation and strategic partnerships, NARO is strengthening Uganda's capacity to deploy climate-smart agricultural innovations that stabilize crop productivity, improve farmer resilience, and support national food security under changing climatic conditions.

- Skeepon registered by MAAIF as a plant growth regulator for use in Uganda
- Research collaboration established between NARO and AC-Planta Inc.
- Multi-season validation conducted under research and farmers' field conditions
- Technology positioned for deployment in drought-prone production systems
- Continued monitoring and adaptive research conducted to guide responsible scale-up

Forestry Research: Greening Uganda through science and innovation

NARO is driving a science-led forestry revolution that conserves and manages vital forestry and tree resources (both flora, fauna, and above and below ground) for climate resilience,

improved livelihoods and economic growth.

Uganda's forest cover is declining at an alarming rate (2.5%) annually, driven by population pressure, agricultural expansion, charcoal production, and climate stress. This degradation threatens not only biodiversity and ecosystems, but also rural livelihoods, food security, and the country's long-term climate resilience. In response, NARO deployed science-driven forestry research to reverse this trend; combined geospatial technology, biotechnology, agroforestry, and genetic conservation to sustainably manage forest ecosystems and lay a foundation for a resilient green economy.

Tree seedlings multiplication and agroforestry dissemination scaled up

NaFORRI has generated and distributed high-value tree seedlings for timber, fuel, poles, fruits, nuts, fodder and other environmental applications. The products from these seedlings have both subsistence and commercial demand.

- Over 80,000 multi-purpose seedlings for timber, fruit, fodder, nut, medicinal, ornamental, and agroforestry species produced and distributed
- Tree species disseminated include Hass avocado, jackfruit, cashew nut, macadamia, and popular timber tree species.
- Enhanced soil fertility and sustainable rangeland management through agroforestry species such as *Faidherbia albida* and *Calliandra calothyrsus*.
- Promoted landscape restoration and climate resilience through community and school-based tree planting initiatives.
- Contributed to urban landscape restoration and environmental aesthetics through ornamental tree planting.
- Integrated environmental education into schools through participatory agroforestry initiatives.

Research for value addition and sustainability of trees species

Sustainable tree germplasm management ensures long-term tree and forest productivity, and ecosystem health. NaFORRI contributed to this effort by conserving genetic diversity, improving pest resilience, and facilitating the rapid distribution of high-quality, climate-adapted germplasm. This is ongoing, and some notable efforts include:

- Genetic profiling of Hass avocado established using DNA sequencing. Results have identified the true-to-type Hass avocado for further multiplication;
- Value-addition to jackfruit flakes into jam, cookies and other products;
- Adaptive trials for macadamia and cashew nut in different agroecological zones; and
- 132 accessions of Cashew tree genetic resources conserved by establishing a 5-acre field gene bank in Kifu research forest

Well-maintained macadamia and cashew adaptive trials in Kifu and Bukedea.

Ex-situ conservation of priority tree species

- Expansion of the arboretum at Kifu Research Forest by 4-5 ha has strengthened ex-situ conservation efforts;
- Four (4) new species (*Zanthoxylum gilletii*, *Bridelia micrantha*, *Alangium salvifolium* and *Cedrela odorata)* were introduced increasing the number of tree species in the arboretum to 56; and
- *ex-situ* conservation efforts also targeted high-value tree species such as shea nut, sandalwood and avocado.

Namata (White) variety | Kananansi (Yellow) variety | Namusaayi (Red) variety

Jam products developed from jackfruit

Transforming Citrus Production through the Village Model Approach

As climate variability intensifies and market demands grow, citrus farmers in Eastern Uganda are shifting from subsistence orchards to commercially managed enterprises.

Citrus remains one of Uganda's most promising high-value crops, particularly in the Teso sub-region. Yet baseline assessments revealed a major productivity gap: average yields stood at just 28.45 kg per tree compared to the optimum 100–200 kg per tree annually. Soil fertility decline, disease pressure, prolonged droughts, and poor post-harvest handling limited farmer incomes and market competitiveness.

In response, NARO, through the KOPIA-supported Citrus Model Village Project, has demonstrated how integrated, science-led interventions can turn low-yielding orchards into productive, market-oriented systems.

The Village Model integrated pest and disease management, soil fertility restoration, water conservation, post-harvest technologies, and market development within structured farmer groups. The result is a replicable pathway for raising productivity and incomes at scale.

Restoring orchard health through science-based pest management

Pests and diseases had severely constrained citrus productivity across model villages. The project has trained farmers and promoted integrated pest and disease management combining scouting, orchard hygiene, pruning, and regulated agrochemical use.

• Up to 40% reduction in the disease incidence (*Pseudocercospora* sp.) over two seasons under regulated chemical regimes;

- Over 97% adoption of disease management practices by project farmers and 70% by secondary beneficiaries; and
- Residue analysis confirmed chemical levels remained far below international safety limits, ensuring consumer safety.

Soil fertility management to boost citrus productivity

Soil assessments showed low organic matter, low phosphorus, and moderate acidity, conditions that significantly constrained yields of citrus trees.

The Village Model emphasized restoring soil health and moisture retention by:

- Adoption of basins, trenches, mulching, manure application, and runoff water harvesting
- Application of fertilizers. Fertilizers response trials demonstrated highly significant yields differences across NPK rates ($P<0.001$). Highest yields were recorded at 555.6 kg NPK per hectare for young trees.

Deployment of soil water management decreased wilting of citrus trees during dry seasons by 7.14 % against the control treatment, which is equivalent to a 57.3% reduction in citrus loss.

From yield gains to income growth

Production gains translated directly into improved farmer incomes. These gains were reinforced by farmer-to-farmer extension, with 3,710 farmers directly trained and over 5,000 reached through secondary dissemination. By mid-2025:

- Citrus yields increased by 220%;
- Farmer incomes improved by 268%; and
- Farmers sold up to 635 metric tonnes within a single season in the third year of implementation.

Post-harvest quality and market systems strengthened

Beyond production, the Village Model addressed fruit quality and value addition. Through the Village Model delivery pathway, citrus production in Teso has moved from fragmented practices to coordinated, science-backed management systems. The approach demonstrates how integrated research, structured farmer organization, and market linkage can close productivity gaps and position citrus as a competitive, income-generating enterprise for Uganda's agro-industrial future.

- Trained farmers in sorting and grading improved compliance with market standards;
- Chitosan coating extended shelf life and improved fruit size and juice content; and Cottage processing of juice, marmalade, and concentrates created alternative market streams during bumper harvests.

Citrus farmers visiting research facility

Farmers' group showcases its seed diversity to the awarding team

Promotion of Climate Resilience and Biodiversity Conservation through Seed Fairs, Seedbanks and Agroforestry

Seed fairs and seedbanks provide opportunity for farmers to exchange indigenous and locally adapted seed and knowledge to support biodiversity conservation and sustainable use.

NARO, through Mukono Zonal Agricultural Research and Development Institute (MUZARDI) and in collaboration with the Food and Agriculture Organization (FAO), implemented two significant initiatives aimed at strengthening food security, preserving agricultural biodiversity, and building climate resilience in Uganda.

As part of the conservation efforts MUZARDI organized seed fairs in the districts of Nakasongola, Nakaseke, Kayunga, and Luwero under the theme: *"Celebrating Diversity: Preserving Our Agricultural Heritage through Local Seeds."* The events brought together over 400 participants, including farmers, researchers, seed companies, and media representatives.

At the seed fairs and seedbanks, farmers showcased and exchanged indigenous and locally adapted plant seed, as well as sharing knowledge and experiences, to support biodiversity conservation and sustainable use. Farmers and farmer groups competed by presenting their best seed collections and agricultural practices and best exhibitors were recognized by awarding them with agricultural supplies. Farmers were trained by an expert from Plant Genetic Resources Centre on how to prolong seed viability during conservation.

Agroforestry, which is key for climate change mitigation and adaptation, was promoted by MUZARDI working with National Forestry Resources Research Institute(NaFORRI)with financial support from FAO. The intervention included information dissemination through radio talk shows, and establishing tree seedlings multiplication nurseries in Nakaseke, Nakasongola, Kayunga, and Luweero Districts. A total of 635 farmers were trained in nursery establishment and management at five (5) community trees nurseries.

Dr. Boaz Odoi, a senior research officer at NAFORRI, advised farmers to have nursery beds oriented in an East-West direction to ensure that seedlings receive the optimal shade, especially during the early stages of growth.

Farmers appreciated the hands-on training sessions, as they allowed them to practice the techniques of using locally available materials like poles, grass, and banana fibres for establishing trees nurseries and potting tree seedlings.

The agroforestry tree species selected by farmers for multiplication included Eucalyptus (GU8, GU7 & GU), *Maesopsis eminii* (*Omusizi*), *Grevillea*, *Albizia chinensis* (*Albizia*), *Chrolia* (*Omugavu*), fruit trees (mango, avocado, orange, guava, jackfruit, pawpaw), and other high-value species like Cocoa, Soursop (*Ekitafeeri*), *Prunus africana* (*Entasesa*), and *Cinnamomum verum* (*Mudalasin*). These seedlings have been made available at MUZARDI.

Grassroot seed fairs, seedbanks and tree nurseries have enhanced indigenous seed conservation, promoted farmer-to-farmer seed plus knowledge exchange, and reinforced science outreach to strengthen stakeholders' networks that are crucial for long-term agricultural resilience.

Farmers learning tree seedlings grafting

Pushing Back Invasive Species

Congress weed (Source: Lucidcentral.org)

Kariba weed (Source: Weed Australia)

For years, Uganda's farmlands, wetlands and waterways have been battling invasive enemies: Congress weed and Kariba weed. NARO scientists have struck back by harnessing the power of biology to reclaim Uganda's ecosystems.

First recorded in Uganda decades ago, Congress weed (*Parthenium* sp.) is now among the world's ten most destructive weeds. It causes severe dermatitis and respiratory irritation in humans, reduces milk production in livestock, and contaminates pastures with a toxic compound called *Parthenin*.

The aquatic Kariba weed, on the other hand, forms thick mats that clog waterways, suffocating fish, blocking transport, and cutting communities off from clean water and irrigation.

According to Uganda's National Invasive Species Strategy and Action Plan (NISSAP, 2023), the country loses an estimated USD 80.6 million (UGX 287 billion) annually in agricultural productivity due to invasive species; a threat that demanded an urgent, innovative response. NARO scientists have struck back by harnessing the power of biology to reclaim Uganda's ecosystems.

NARO's Biological Control Breakthrough

NARO has tested biological control as a sustainable alternative to costly and harmful herbicides.

- NARO mapped invasive weed infestations in 41 districts across five regions.
- 23,500 *Cyrtobagous* weevils were released in infested zones of Lake Kyoga and River Kafu to control Kariba weed. It is anticipated that this intervention will restore water access for over 3.5 million people in lakeside and riverine communities.
- Nine farmer groups trained in Kariba weed control.
- *Zygogramma bicolorata* beetles were reared to control Congress weed.
- Eleven farmer groups trained to use the beetles for Congress weed management.
- Community breeding facilities were established in Pader District to decentralize production of the biological controls.

Soils and Fertilizers: Building the Foundation for Productive Farms

For too long, soil fertility was managed by guesswork; today, science is putting precision back into Uganda's farms.

Mapping Uganda's soils for productivity

To close a long-standing knowledge gap that constrained effective land management, NARO developed high-resolution soil and crop suitability maps. These maps are guiding land use decisions, fertilizers blending, and crop placement, ensuring farmers plant the right crops in the right soils.

- 20 crop suitability maps developed for various crops including maize, beans, sweet potato, cassava, and pineapple at a scale of 1:50,000 compared to previous 1:250,000 maps. Application of the maps recommendations is estimated to raise yields by 30–50%.

Balancing fertility through better formulations

Recognizing that productivity begins with balanced soil nutrition, NARO scientists have revised national fertilizers formulations to address widespread micronutrient deficiencies. Balanced formulations are expected to reduce fertilizer costs and improve nutrient-use efficiency thus building more resilient and productive soils over time.

New fertilizers blends developed include increased levels of zinc, copper, and boron, which are critical elements in fertilizers. Maize field results showed reduced application rates from 250 kg/ha to 150–185 kg/ha while maintaining or improving yields.

Engineering Innovation To improve productivity and reduce drudgery

As most farmers in Uganda still rely on hand hoes, NARO's engineers are leading a quiet revolution to support farm mechanisation by developing affordable, farmer-friendly technologies.

NARO is leading a quiet revolution in farm mechanisation by developing affordable, farmer-friendly technologies that reduce drudgery and raise productivity for smallholders. By transforming labour-intensive farming into efficient, profitable enterprises, engineers are helping farmers grow more, lose less, and earn better.

NARO engineers have developed low-cost field mechanisation, post-harvest technologies, and quality-enhancing equipment. The latter aims to improve products quality, which strengthens the competitiveness of Uganda's agro-industry.

Reduced drudgery through smart mechanization

NARO has developed and refined a simple, low-horsepower motorised weeder that reduces weeding time per acre by up to 70%. This technology significantly reduces drudgery for women and youth, freeing time for education, family, and alternative enterprises management. Its wide adoption is estimated to save farmers over UGX 120 billion annually and raise yields by 15–20% through timely weeding.

Improved product quality and reduced post-harvest losses

NARO has strengthened farm and processing efficiency through next-generation machines that improve quality, reduce waste, and raise farm incomes:

- A second-generation coffee pulper with 91–98% pulping efficiency was developed to improve bean quality and reduce rejection rates. The machine produces cleaner beans that are likely to fetch higher export prices
- A multi-crop commercial hybrid solar dryer that maintains stable temperatures of 50–80°C was developed for safe, uniform drying. If adopted by 5,000 cooperatives, the dryer could save 15,000 metric tons of produce annually worth UGX 45 billion, while reducing aflatoxin and microbial contamination.
- A commercial bean thresher that reduces threshing time by over 80% was developed to reduce post-harvest losses by up to 20% and improves seed quality and safety.

NARO's newest research Institute in the offing: NARO starts a National Sugar Research Institute (NSRI)

Sugar is an important and strategic commodity that contributes to the national economy of several countries in Africa.

NARO has operationalized the National Sugar Act, 2020 by establishing a National Sugar Research Institute that is in the final stages of take-off. NARO has also established collaboration with Mauritius Sugar Research Institute and Uganda Sugar Manufacturers Association to support this initiative.

Research activities have started at the Bulindi ZARDI as part of a plan to establish a full-fledged institute in Bunyoro sub-region with two satellite stations at NARO stations in Kitgum and Mayuge districts. The new institute has been mainstreamed in current and upcoming NARO planning and budgeting processes, including recruitment plan.

Sugar is one of the leading agro-industries in Uganda contributing about UGX 250 billion in gross income. It accounts for a saving of more that USD 600 million as import substitution and contributes to more than 5% of national GDP. In addition, the industry contributes to the social service such as health, education, roads and power infrastructure and creates about 15% of employment in agriculture.

The major source of sugar in Africa is sugarcane, although sugar beet is gaining momentum in the region. A total number of licensed factories in Uganda is 43, of which 16 are operational, with an installed capacity of 52,150 tons of cane (TCD) per day. This installed capacity translates to production 1,250,000 MT of sugar per year if fully operational. However, the factories are operating below installed capacity at 56% and producing 700,000 MT of sugar per year because the supply of sugarcane is inadequate and current varieties are low yielding with low brix content.

It is anticipated that the National Sugar Research Institute will generate significant outcomes that will include increased and stabilized sugar production from improved varieties of sugarcane with higher yield and brix content of more than 13% compared to less than 10% in the current varieties.

Progress towards Sugarcane improvement

- Suitability mapping conducted for targeted production zones;
- 82 local and regional sugarcane germplasm assembled at Bulindi ZARDI;
- Study conducted to identify sugarcane pests and disease; and
- Products profiles developed to guide breeding and germplasm testing.

Advancing livestock health, breeds and nutrition

NARO is leading the development of a climate-smart livestock sector by improving how animals are bred, fed, and protected from disease.

Through integrated health innovations and generation of climate-resilient breeds and pastures, scientists are addressing key constraints across the cattle, goats, pigs, and poultry sub-sectors. The goal is to raise livestock productivity by at least 40%, reduce disease losses, and build a resilient, self-reliant livestock sector for Uganda.

Breakthroughs in livestock disease control

NARO is developing new vaccines, diagnostics, and disease management tools. NARO has developed Africa's first anti-tick vaccine, which offers long-term protection against multiple tick species. In Uganda, the increased burden of ticks and tick-borne diseases amounts to approximately US$ 1.1 billion (UGX 3.8 trillion) annually.

NARO's approach has also integrated vector control, surveillance, and epidemiological research that strengthens early warning and rapid response. These pipeline innovations aimed to strengthen Uganda's herd and position the country as a regional hub for animal health products.

- NARO has concluded the development of the NAROVAC Anti-Tick Vaccine
- NARO is expanding its vaccine portfolio to include FMD (serotypes A and O), African Swine Fever (ASF), and poultry diseases such as Newcastle and Gumboro.
- Uganda's first GMP-compliant vaccine facility has been established at NaLIRRI, Nakyesasa.
- 1 patent obtained for AI model for FMD prediction

Resilient breeds for better productivity

NARO has reshaped animal breeding by integrating locally adapted genetics with elite exotic germplasm to produce cattle, goats, and pigs that perform better under Uganda's changing conditions.

- F1 Ankole-Brahman crosses reached weight of 156 kg compared to 90 kg in pure Ankole in 6 months. On-going research on Ankole × Sahiwal cross breeding also focused on for better weight gain and feed efficiency.
- Viking Jersey-Holstein Friesian crossbreds had increased milk productivity from 6–8 litres to 20–25 litres per cow per day while they maintained heat tolerance.
- F1 Kalahari-Mubende cross gained 20 kg in 7 months vs 30 kg for Mubende at 18 months
- Improved local chicken attained market weight of 2.5 kg within 6 months compared to achieving same weight in 12 months.
- Disease-tolerant crossbred pigs under on-farm evaluation were assessed for smallholder adaptability and feed efficiency.
- Apiculture research improved bee genetics and hive management. Priority attributes were increased honey yields, pollination, and export potential.
- A national livestock biobank was established to safeguard indigenous genetics.

Pastures that withstand climate vagaries

Behind every productive herd is reliable feeding system. Research on climate-resilient forages with high biomass yields and enhanced nutritional value has gained momentum and is expected to sustain herds during prolonged dry seasons.

- Seven (7) new climate-resilient forage (*Brachiaria*, *Chloris gayana*, and Napier hybrids) were tested for better yields, nutritional value and drought tolerance.
- Seed multiplication was expanded for demanded forages and pastures
- Feed processing and preservation was scaled out through on-farm demonstrations of silage and hay-making.

NARO's anti-tick vaccine to the rescue

NARO has developed Africa's first anti-tick vaccine

Ticks are not merely a farm nuisance. They are one of the most economically destructive constraints to livestock production globally. Conservative estimates place global losses from ticks and tick-borne diseases between USD 13.9–18.7 billion annually. In Uganda alone, losses exceed USD 1.1 billion each year, with tick control consuming nearly 80% of total cattle disease management costs

For over a century, farmers have fought this battle largely with chemicals; spraying, dipping, hand-picking, bush burning. Yet widespread misuse and overuse of acaricides have steadily produced resistant tick populations. Chemicals that once worked reliably now demands higher frequency, higher cost, and often delivers diminishing returns.

It is within this context that NARO, through NaLIRRI, developed NAROVAC® Anti-Tick Vaccine (ATV1); Uganda's first protein-based anti-tick vaccine.

This innovation is slowly moving from controlled research to farmers' evaluation. Following successful confined field trials demonstrating up to 95% reduction in tick infestations, the vaccine is entering farmer herds as the extended field trial phase rolls out.

To date, more than 7,000 heads of cattle have been vaccinated in 20 districts as a precursor of the extended field trials planned across the country. These included districts stretching from the

dry rangelands of Kazo and Kiruhura to the lake corridor districts of Hoima, Kakumiro and Masindi, and onward to central and eastern Uganda.

The objective of this phase was both scientific and strategic: to generate real-world data on effectiveness under zero grazing, paddock, and open grazing systems; to evaluate immunity transfer from vaccinated dams to calves; to measure impact on tick-borne disease prevalence; and to refine long-term vaccination regimes.

But what was emerging from the field is more than data. It was hope and validation.

In Hoima, one farmer described years of spraying weekly, sometimes without visible improvement. Animals scratched until tree stumps were stained with blood. When the vaccine was first administered, he worried. The ticks did not disappear instantly. He contacted the scientists, concerned that nothing was happening. He was reminded that unlike chemicals, NAROVAC® works gradually; stimulating antibodies that disrupt tick feeding and reproduction over time. Within weeks, he observed weakened ticks drying and falling off. Six months later, spraying had reduced to once per month. Animal health and body condition improved. The farm moved from crisis management to controlled stability.

In Kazo, where drought cycles intensify tick proliferation, the impact is measured in numbers. Before vaccination, two to five animals could fall sick daily. Monthly treatment costs exceeded two million shillings. East Coast Fever management alone could cost UGX 150,000–300,000 per animal. Milk revenue was frequently redirected into drugs. There were moments when one cow was sold to treat another. Since vaccination, East Coast Fever cases have not returned among vaccinated herds. The farmer estimates savings of between UGX 6–8 million. Milk production has stabilized at 300–400 litres daily in season. The herd is no longer a cycle of emergency expenditure; it is an asset once again.

Safety and integrity

A key pillar of farmer acceptance is safety assurance.

Research has confirmed that NAROVAC® is safe for animals, humans, and the environment. Milk and meat from vaccinated animals are safe for consumption, with no harmful residues and no withdrawal period required. There are no adverse effects on fertility, pregnancy, or physiological parameters.

Regulatory oversight has equally been stringent. Development of the vaccine was conducted under supervision of the National Drug Authority, Uganda National Council for Science and Technology, National Biosafety Committee, Institutional Animal Care and Use Committees, and independent clinical inspectors.

Institutional repositioning

The Anti-Tick Vaccine platform has been elevated to a Programme accompanied by deliberate strengthening of human and technical capacity. NARO has consolidated and expanded this multidisciplinary team; not as isolated recruitments, but as part of a structured effort to demonstrate institutional readiness.

In preparation for vaccine manufacturing, facility has been improved to comply with international Good Manufacturing Practice (GMP) standards. Quality Assurance and Regulatory Affairs functions were strengthened to ensure deviation management, change control, audit preparedness, and documentation integrity. Engineering systems including HVAC, water purification, environmental monitoring, and utilities management were reinforced to support validated cleanroom operations.

The Programme's multidisciplinary structure with demonstrable competence, improved infrastructure, systems and documentation represent institutional readiness.

Positioning NAROVAC® from national innovation to regional vaccine economy

As extended field trials continue to demonstrate farm-level impact across Uganda, this financial year marked a deliberate shift in strategic thinking: positioning NAROVAC® not only as a national livestock health intervention, but as a regional economic asset.

A comprehensive East African Regional Market

Intelligence (REMI) assessment was undertaken to evaluate export readiness and market potential across Kenya, Tanzania, Rwanda, and South Sudan. The findings confirm that NAROVAC® enters the regional space at a moment of structural opportunity.

Within the East African Community (EAC), East Coast Fever alone accounts for approximately USD 1.1 billion in annual losses. Livestock contributes over 40% of agricultural GDP in many countries in the region, meaning the persistence of ticks is not merely a veterinary concern; it is a macroeconomic constraint.

Heavy dependence on chemical acaricides has triggered widespread resistance across the region. The pattern observed among Ugandan farmers that is rising chemical costs, declining efficacy, and environmental exposure, was mirrored across the EAC. This convergence of resistance and disease burden creates a clear demand opening for an integrated, immunity-based solution. In addition, the shared tick ecology, transboundary livestock movement, and established trade corridors further strengthen a case for harmonized regional vaccination strategies.

The production capacity of the new cGMP-compliant facility is projected at approximately 18 million doses annually by 2030 with an in-built expansion system. This capacity represents long-term export potential and positions Uganda as a reliable supplier to the broader region.

NAROVAC® therefore represents more than a livestock health tool for Uganda. It is a vehicle for reducing foreign exchange expenditure on imported veterinary biologics and a foundation for Uganda's emergence as a veterinary biopharmaceutical manufacturing hub for EAC.

Strengthening Foot-and-Mouth Disease Control through Regional Vaccine Innovation

Effective control of FMD requires vaccines that are matched all circulating outbreak strains because immunity to one serotype does not confer protection against others.

Foot-and-Mouth Disease (FMD) remains one of Uganda's most economically significant transboundary animal diseases, affecting cattle, goats, sheep, and pigs. Four circulating serotypes (O, A, SAT-1, and SAT-2) continue to cause outbreaks that reduce livestock productivity, impose substantial containment costs on farmers and government and disrupt regional trade.

Effective control requires vaccines that are matched to circulating outbreak strains, as immunity to one serotype does not confer protection against others.

During the Financial Year, the National Livestock Resources Research Institute (NaLIRRI), in collaboration with Egyptian partners, achieved a major milestone in Uganda's FMD control efforts by successfully producing the SAT-1 antigen for incorporation into a quadrivalent vaccine tailored to Uganda's epidemiological context.

The SAT-1 virus used in the process was isolated from field samples collected in Kamuli District through collaboration with the National Animal Diseases Diagnostic and Epidemiology Centre (NADDEC).

- SAT-1 outbreak strain isolated through national surveillance systems Inactivated SAT-1 antigen successfully produced at NaLIRRI laboratories
- Strengthened Uganda's technical capacity in antigen production, virus handling, tissue culture, diagnostics, vaccine research and laboratory infrastructure development.
- Antigen exported for further processing under current Good Manufacturing Practices (cGMP)
- 15 million doses of quadrivalent FMD vaccine secured for Uganda in FY 2025/2026
- SAT-1 component incorporated into MEVAC's formulation to ensure protection against circulating Ugandan strains

This milestone demonstrates how strategic regional collaboration, combined with national research capacity, can accelerate progress in controlling priority livestock diseases. By aligning vaccine development with circulating outbreak strains, NARO is strengthening livestock health, supporting trade competitiveness, and contributing to long-term food security and economic resilience.

Developing Uganda-Specific African Swine Fever Vaccine Solutions

While pork is a popular animal protein in Uganda, African Swine Fever disease has devastated pig production.

African Swine Fever (ASF) disease continues to threaten Uganda's rapidly growing pig sector, causing near-total herd losses, trade disruptions, and significant income shocks to smallholder farmers. Since it is a viral disease, the best solution is vaccination.

NARO, through the National Livestock Resources Research Institute (NaLIRRI), has made progress in development of an efficacious African Swine Fever vaccine tailored to Ugandan virus strains. Scientists have built a nationally grounded vaccine development pipeline designed to strengthen biosecurity, protect farmer livelihoods, and reduce dependence on external vaccine technologies.

Progress in ASF virus characterization and vaccine development pipeline

NARO's animal virology team has strengthened Uganda's laboratory capacity to isolate, characterize, and prepare ASF viruses for candidate vaccine formulation. This work formed the foundation for future live-attenuated or inactivated vaccine development pathways.

- 16 new ASF virus isolates were identified from Gulu, Mubende, and Luwero districts bringing the total to 21 positive ASF viruses reported in Uganda
- 6 virus isolates were successfully grown in cell culture and prepared for vaccine formulation steps
- 6 virus samples were sequenced to enable molecular characterization and phylogenetic analysis
- Multiple virus titers were established to support downstream vaccine cloning or inactivation experiments

National capacity for long-term ASF control built

Beyond immediate vaccine candidate preparation, NARO has strengthened long-term research capacity in molecular virology, genomics, and disease surveillance. This included expanding Uganda's national virus repository and ensuring that vaccine development efforts were aligned to recent outbreak strains (2020–2023).

- Soft tick colony were established to support genotype X ASF investigations and disease ecology studies
- DNA extraction and PCR-based molecular diagnostics were conducted to confirm circulating genotypes
- Collaboration framework were developed with international partners to broaden swine disease control research
- Foundational laboratory preparations were completed for gene deletion or virus inactivation experiments

Through this structured and incremental approach, NARO positioned Uganda to develop a home-grown solution to one of the most devastating livestock diseases. While ASF vaccine development remains scientifically complex, the progress made strengthens Uganda's preparedness and reinforces NARO's commitment to protecting the livestock sector through research-driven innovation.

From Grass to Grace: How NARO's Pasture Technologies Transformed Women's Lives in Sseguku

Sseguku Twekembe Women's Group in Ssabagabo, Wakiso District, transformed their lives after embracing an unlikely enterprise: pasture seed production. Formed in 2018 with only 15 members, the group initially struggled to survive on borrowed land, growing food crops that barely met household needs.

Their breakthrough came when NARO Livestock Researcher, Dr. Jolly Kabirizi, introduced them to pasture seed production. "We were hesitant because pasture farming wasn't something we thought could bring in money," recalled founding member Monica Nansicombi Kiseka. But with NARO's training, seeds, and technical support, the women began producing Lablab and Calliandra. When the first harvest matured, NARO bought the Lablab seed at UGX 4,000 per kilogram. "Harvesting day became the happiest day for us," Kiseka said. "It was proof that we had made the right choice."

Betty Kyewalabye, a group member, reported that pasture farming changed her dairy enterprise. "I had a NAADS cow but struggled with feeding it. Learning to grow pasture was a game changer," she noted. Her income enabled her to expand to three dairy cows, yielding 20 litres of milk daily, while manure sales and briquette-making provided additional earnings.

Poultry keepers also benefited, earning higher prices for eggs with deep yellow yolks. "Our eggs fetched UGX 700, compared to UGX 300 before," Kiseka added.

As earnings rose, the group formed the Sseguku Twekembe Women's Savings Group, increasing weekly contributions from UGX 2,000 to UGX 20,000 and providing loans for school fees and business expansion. By end of FY2024/24, the 40 members were strong, they ran multiple enterprises including animal production and catering services. "Pasture seed farming was our stepping stone," Kiseka said. "We are proof that with the right support, women can transform their communities."

Unlocking the fisheries industry through feed and breeding innovations

As demand for affordable animal protein rises and capture fisheries decline, Uganda's scientists are supporting transformation of aquaculture from a smallholder survival activity into a modern, thriving industry.

Uganda's fisheries sector is central to food security, employment, industrial growth, and export earnings. By March 2025, fish and fish products generated export earnings of about USD 177.7 million. Capture fisheries have declined due to overfishing, pollution, climate stress, and habitat loss.

Ugandans consumed far more fish than the natural waters can sustainably supply, making aquaculture critical to the country's protein security and agro-industrialization agenda. As a result, Uganda has set an ambitious target to raise aquaculture production to 1,000,000 tonnes by 2030. Nile tilapia and African catfish dominate production, with tilapia contributing up to 70% of farmed fish. However, two major constraints continue to limit growth: the high cost of feeds and limited access to quality fingerlings.

Stronger fish breeds for healthier ponds

NARO has strengthened Uganda's aquaculture base through selective breeding and improved hatchery technologies that deliver faster-growing, more resilient fish. These efforts have reduced production cycles, improved survival, and raised farm profitability.

- Second-generation (F_2) Nile tilapia line developed with improved growth, feed efficiency, and resilience.

- Fingerlings multiplication of the improved lines scaled-up in various agro-ecological zones to strengthen access to quality fingerlings nationwide.

Rescuing Ningu from extinction

On the shores and river deltas of Lake Victoria, River Sio and River Kagera, the once-abundant Ningu (*Labeo victorianus*) was on the verge of extinction; driven to the brink by overfishing, pollution, and invasive species. NARO has made progress towards reversing this decline through domestication of a culturally important fish species. This will expand Uganda's aquaculture species base beyond Nile tilapia, Mirror carp, and Catfish.

Through research, larval survival has increased from 40% to 60%, marking a major step toward domestication. Improved fry survival supports conservation, restocking and farmers' production.

Smart preservation and conservation of the blue biodiversity

Beyond production, NARO has strengthened post-harvest systems and safeguarded aquatic biodiversity.

- NARO engineers have developed a heat-pump drier prototype for hygienic, energy-efficient drying of Mukene and other small fish; the technology preserves nutritional quality, extends shelf life, and boosts incomes for women and youth in fish-processing communities.

- NARO has compiled the Lake Albert Biodiversity Atlas, documenting 77 fish species; 14% of recorded species are endemic, providing a critical baseline for conservation, research, and lake restoration.

Affordable feeds for profitable aquaculture

Feeds account for up to 70% of production costs. Dependence on imported feeds exposes farmers to volatile prices and drains foreign exchange. In response, NARO scientists have developed locally formulated feeds and efficient feeding technologies to cut costs and raise productivity.

- Two nutrient-balanced feed formulations and a feeding regime for Nile tilapia were developed using local by-products (rice bran, sunflower seed cake, oil palm kernel, coffee husks, and brewery waste).

Increasing market access and competitiveness

Turning science into market-ready food products

In an era where food security, public health, and job creation are central to national development, agricultural science must not stop at the farm. It must reach the consumer.

As Uganda advances toward agro-industrialization and improved nutrition outcomes, NARO has moved beyond primary production to develop value-added food innovations that translate research into products on market shelves. Research has diversified agricultural innovations into nutritious, affordable, and commercially viable products for households and industry.

Protein-Rich Porridge: Fighting Hidden Hunger

For millions of Ugandans, especially children and rural households, porridge is more than breakfast; it is a daily nutritional foundation. Conventional maize-based porridge often lacks adequate protein and other micronutrients. NARO has developed two nutrient-enhanced porridge prototypes that replace 30% of maize flour with high-value ingredients. Both formulations have retained the traditional taste and affordability while significantly increasing nutritional value.

- Iron and Zinc rich bean-based porridge fortified with plant protein has been developed to support muscle growth and child development; and
- Pumpkin-based porridge with enhanced provitamin A and antioxidants has been developed to boost both nutrition and natural colour

Both products have been taken up for commercial production by ECOFAP and SAWA companies demonstrating successful technology transfer from research to agroindustry.

Breakthroughs in Aflatoxin Control for Safer Food and Trade

To restore confidence in Uganda's grain markets and safeguard public health, scientists are

confronting one of agriculture's most dangerous invisible threats - **aflatoxins**.

Aflatoxin compounds, produced by fungi in poorly dried or improperly stored grains, silently contaminate maize, groundnuts, sorghum to mention a few. They have eroded farmer incomes, triggered exports bans, and endangered consumer health.

Each year, Uganda loses an estimated UGX 120 billion in rejected grain exports due to aflatoxin contamination. Chronic exposure is linked to liver cancer, impaired immunity, and childhood stunting, making aflatoxin control both an economic problem and a public health priority.

NARO has taken steps to address the problem by developing sustainable solutions that removes aflatoxins from the food chain and restore Uganda's reputation in regional and international trade.

Building Uganda's capacity to produce Aflasafe

A major milestone in FY 2024/25 was functionalizing the Aflasafe inoculum production laboratory at NaLIRRI, Nakyesasa. This milestone marked Uganda's transition from dependency on imports to domestic production of Aflasafe.

- The facility equipped with state-of-the-art production equipment;
- A complete Aflasafe production line installed;
- Raw materials assembled, sufficient to produce 50 metric tons (MT) of aflatoxin-mitigant products;
- 500 MT of mitigant products sourced to supplement domestic supply during scale-up; and

- Eight NARO staff trained in Aflasafe production.

Quality, Safety, and International Compliance

Global competitiveness requires adherence to international standards. The aflatoxin biopesticide facility commenced operations under GMP-aligned quality assurance systems, with documentation and traceability protocols in place. The Uganda National Accreditation Services (UGANAS) was engaged to accredit the laboratory; a step that will enable international recognition of Uganda's Aflasafe products and facilitate export compliance.

Driving Commercialization and Uptake by Farmers

Scientific breakthroughs must reach farmers to create impact. NARO developed a comprehensive *Aflatoxin Mitigant Commercialization Strategy* to guide production, distribution, private-sector engagement, and national scale-up.

In FY 2024/25:

- 407 stakeholders (252 men, 155 women) — including farmers, processors, and exporters — were trained in aflatoxin risk management and product application.
- Two (2) advanced aflatoxin biocontrol solutions were developed and are pending evaluation for scale-up.
- A rapid aflatoxin detection kit was refined and submitted for patent registration with the Uganda Registration Services Bureau (URSB). The rapid detection kit represented a breakthrough toward affordable, field-level diagnostics; empowering farmers and traders to test grain before it enters markets.

Restoring horticultural exports through innovative false codling moth management

NARO proved that sustainable pest management can deliver export-quality produce without chemical overload.

Uganda's horticulture sector once stood as a rising export success story. But the emergence of False Codling Moth (FCM) and pesticide residue violations threatened to reverse those gains.

In 2022 alone, 36 consignments of chili and pepper were intercepted by the European Union due to pest infestations and breaches of Maximum Residue Limits (MRLs). The result was restricted access to premium markets, shrinking export earnings, and declining international confidence in Uganda's fresh produce. NARO has introduced interventions to reverse that trend. Uganda's horticultural exports have not only recovered; they are becoming smarter, safer, and more competitive.

Biological Solutions Take Centre Stage

Following a 2023 Presidential directive to urgently address horticultural export rejections, NARO launched a coordinated national response.

- Researchers mapped chili and pepper production systems across Uganda's five (5) agro-ecological zones; central, eastern, northern, southern, and western and 75 registered exporters and packhouses were identified**;**
- Six (6) biological control agents against False Codling Moth were tested on-farm. These include *Cryptophlebia leucotreta granulovirus (CrleGV), Bacillus thuringiensis, Beauveria bassiana, Metarhizium anisopliae and Azadirachtin;*
- Three (3) commercial chili varieties (African Bird Eye, Cayenne, and Habanero) have undergone over 10-months evaluation in Central and Eastern Uganda;
- Four (4) solutions (*CrleGV, Bacillus thuringiensis, Azadirachtin,* and garlic extract) have achieved over 75% reduction in FCM infestation, performing as effectively as synthetic pesticides and fully compatible with IPM systems.

From research trials to trade wins

Scientific validation alone was not enough, NARO translated research into practical export compliance tools. For Uganda's horticulture industry, this marked a turning point toward restored compliance and renewed market confidence.

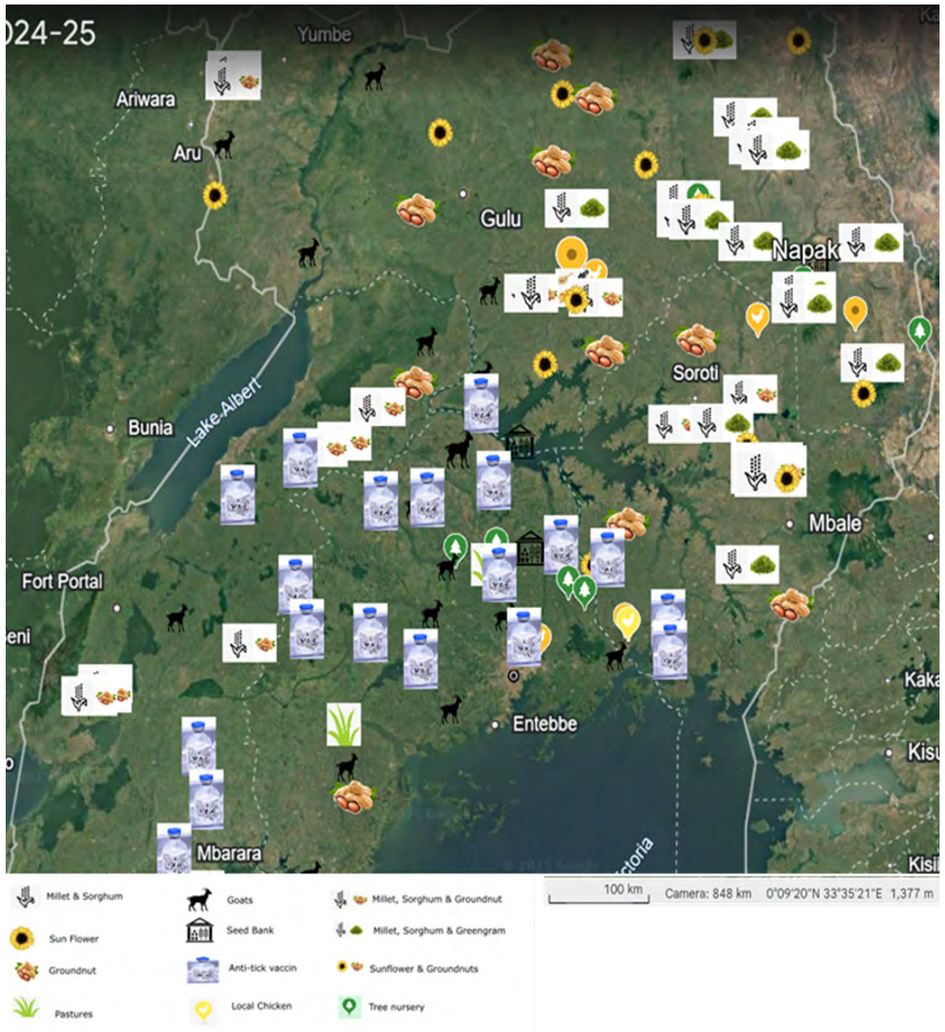
- Standard Operating Procedures (SOPs) for False Codling Moth management were developed;
- 30 ToTs and 4 additional specialists were trained to use the SOPs;
- Defined spray intervals were established;
- Improved sorting and packhouse protocols were developed;
- Integrated pest surveillance measures were put in place;
- 10 FCM demonstration plots were established — 6 in Central and 4 in Eastern Uganda;
- 150 farmers were trained (93 central, 57 eastern) using the demos;
- 75 registered exporters were mapped across five (5) agro-ecological zones and scheduled for training to use the SOPs; and
- 500 kg of chili**,** produced under NARO guidelines, were exported to Sweden, the United Kingdom, and the Middle East without rejection for Food Contact Materials (FCM) or Maximum Residue Limits (MRL) violations.

Zonal Research, Technology Promotion and Transfer

Harnessing Regional Strengths to Drive National Transformation

NARO's strength lies not only in its laboratories, but in its nationwide presence. Through a zonal research approach anchored in nine agro-ecological zones, NARO has ensured that technologies disseminated in specific areas are tailored to local climates, farming systems, and market realities.

From the Lake Victoria Crescent to the drylands of Karamoja and the highlands of Kigezi and Elgon, regional institutes have translated science into practical solutions thus strengthening food security, building climate resilience, revitalizing export value chains, and transforming livelihoods.



Lake Victoria Crescent Zone

Intensive mixed farming, youth enterprises, and urban-market integration

Located within Uganda's most populated and commercially vibrant agricultural corridor, Mukono Zonal Agricultural Research and Development Institute (MUZARDI), through its stations at Ntawo, Mukono district and Kamenyamiggo, Lwengo district, has strengthened high-value crops production, poultry enterprises, and youth-led agribusiness to meet an expanding urban demand.

Its interventions focused on nutrition-sensitive agriculture, climate-smart technologies, and linking farmers to reliable markets. By integrating seed systems, enterprise development, and capacity building, the zone has seen transformation of some peri-urban and smallholder farms into profitable, resilient enterprises.

Key Achievements (FY 2024/25)

- 15,000+ farmers reached through field schools, seed fairs, and demonstrations;
- 21,200 vegetable seedlings distributed (Sukuma wiki, onion, cabbage, tomato);
- 47,000+ improved coffee seedlings (KR1–KR10) distributed;
- 144 farmers and extension agents trained in coffee establishment and management;
- One community seedbank and five trees' seedlings multiplication nurseries established and used to train 635 farmers;
- 9,000 eggs hatched; 2,000 chicks of improved local chicken supplied to youth cooperatives;
- A database for 2,453 chicken value chain actors maintained;
- 5 climate-smart poultry technologies were piloted with 15 model farmers; and
- 500+ university interns and other youth trained in urban agribusiness management

Lake Albert Crescent Zone

Climate resilience for western Uganda's mixed farming systems

Serving a region that is increasingly affected by erratic rainfall and soil degradation, Bulindi ZARDI in Hoima district is advancing climate-smart crops, improved pastures, and soil-restoration practices. Through large-scale demonstrations and adaptive trials, the institute is equipping farmers with technologies that stabilize yields, enhance feed security, and restore soil health in western Uganda's mixed crop-livestock systems.

Key Achievements

- 5+ acres of climate-smart crop demonstrations were established;
- 10 improved pasture varieties demonstrated for year-round feed security;
- Drought-tolerant maize, millet, soybean, and bean varieties were distributed; and
- Local chicken and Mubende goats were disseminated

Mid Northern and Northern Zone

Revitalizing coffee for northern Uganda transformation

In northern Uganda, Ngetta ZARDI, through its stations in Lira and Kitgum districts, has rebuilt a market-oriented coffee value chain by strengthening access to elite planting materials and farmer training. Through demonstration gardens and community-based extension, the institute has positioned coffee as a viable income driver in the Lango and Acholi sub-regions.

Key Achievements

- 1-acre Robusta coffee mother garden was maintained;
- 200+ farmers and 500 students were trained through six (6) field activities; and
- Nursery networks and extension services were empowered in Lira, Kitgum and surrounding districts.

Southern Rangelands Zone

Integrated crop, livestock, and aquaculture innovation

In Uganda's western drylands, Mbarara ZARDI in Mbarara City has delivered integrated solutions across coffee, dairy, feed systems, and aquaculture value chains. By linking genetic improvement, value addition, and farmer training, the institute has enhanced productivity while strengthening resilience and agro-industrial potential.

Key Achievements

- 40,000+ KR-series coffee seedlings were distributed;
- 2 dairy starter culture prototypes (ghee and yoghurt) were developed;
- 30 Jersey calves were produced under improved breeding systems;
- Black Soldier Fly technology was introduced through feed innovation platform;
- 5,000 Tilapia fry was distributed; and
- A fish sausage prototype was tested with 40 fish farmers.

Western Rangelands

Elevating tea and strengthening mixed farming systems

Rwebitaba ZARDI, through its stations in Rwebitaba and Kyembogo villages has continued to anchor tea research and mixed farming innovation across the Rwenzori and Tooro sub-regions. By advancing drought-tolerant tea clones, improving soil fertility practices, and strengthening seed and pasture systems, the institute has enhanced export competitiveness of Ugandan tea, while safeguarding food security.

Key Achievements

- 5 elite drought-tolerant tea clones were validated in preparation for release;
- 25% yield increase for tea was recorded under site-specific fertilizer trials;
- 62 farmers and factory technicians were trained in tea value addition;
- 38 acres were established and maintained for seed multiplication for major food crops including beans, maize, cassava and sweetpotato;
- 1,745 kg of beans and 2,063 kg of maize were distributed;
- 180 bags of Napier grass and 130 bags of Pakchong pasture were distributed to livestock farmers; and
- Refugee and host-community farmers supported with planting materials for beans, maize, cassava, sweetpotato and pasture.

Southwestern Highlands

Reviving Uganda's potato industry

In the cool highlands of Kigezi, Kachwekano ZARDI, through its Kachekano and Kalengyere stations, has rebuilt Uganda's potato seed system by advancing research on pests and disease control while integrating industry desired traits. By improving access to clean seed and supporting value addition, the institute revitalized a crop central to both household food security and agro-industrial growth.

Key Achievements

- 70,000+ potato minitubers were produced and distributed;
- 11 acres of pre-basic and basic seed fields was established and maintained;
- 50 tons of high-grade seed were produced from elite varieties; 15,000 additional plants were generated through rapid multiplication;
- Control options for potato cyst nematodes were identified and evaluated; and
- Protocol for industrial potato starch extraction was advanced for publication.

Eastern Highlands Zone

Strengthening seed systems and Elgon highlands resilience

Serving the Busoga, Busigu and Bugweri subregions, Buginyanya ZARDI through its Buginyanya, Bulegeni and Ikulwe stations, has strengthened cereal grain productivity, Arabica coffee expansion, and agroforestry systems. The institute aimed to support sustainable intensification in mountain farming systems.

Key Achievements

- 1 Quality Protein Maize (QPM) hybrid was developed (Q160121);
- 2 non-QPM maize hybrids (CEL 8 & CEL 9) were advanced for on-farm field testing;
- 2.8 tons of certified maize and bean seed produced and distributed to farmers;
- 30,000 Arabica coffee seedlings were distributed to 64 farmers;
- 2 community seed banks were established for beans, soybean and maize;
- 82,000+ tree seedlings produced

through community-supported nurseries;

- 469 farmers trained (56% men, 44% women) in tree nursery management; and
- UGX 4.12 million earned by one Farmer Field School from tree seedling sales.

Northeastern Drylands

Resilience for arid and semi-arid communities

In Karamoja and Teso sub-regions, Nabuin ZARDI in Nabilatuk district has driven advances in livestock breeding, improved pasture systems, agroforestry, and diversified crop demonstrations tailored to harsh dryland conditions. These interventions have strengthened herd productivity, restored landscapes, and expanded income opportunities in some of Uganda's most climate-vulnerable districts.

Key Achievements

- Kalahari goats was introduced in Napak and Nakapiripirit;
- 31 Kalahari–East African goat kids were produced;
- 50 cows were inseminated with Tyrolese Gray semen for genetic improvement:
- 14 crossbred calves were born and are undergoing evaluation;
- 9+ acres of improved pasture were established and maintained;
- 300+ farmers received improved forage materials;
- 22,000 tree seedlings were distributed for agroforestry integration;
- 100+ university interns were trained in apiary and agribusiness; and
- 1,067 farmers were trained using crops and pasture demonstrations.

West Nile farmlands Zone

Innovation platforms supporting inclusive growth

In Uganda's northwestern frontier, Abi ZARDI in Arua City has contributed to accelerating agricultural transformation through multi-stakeholders' innovation platforms that connect research, farmers, processors, and markets. The institute has strengthened access to drought-resilient crops, improved livestock systems, and supported agribusiness development to stimulate inclusive growth.

Key Achievements

• 25 goat meat processors were trained in better breeds and biosafety and biosecurity;
• Aquaculture technologies were disseminated under ACP–EU Innovation Fund;
• Drought-tolerant sorghum varieties multiplied and distributed to farmers; and
• Germplasm for goats, forage, and horticultural crops was maintained to support future genetic improvements.

Technology Promotion and Transfer

NARO continued to advance a strong technology promotion and transfer agenda that positioned agricultural research outputs where they matter most among farmers, industry players, and development partners. Through strengthened intellectual property systems, commercialization pathways, and large-scale technology dissemination, NARO ensured that innovations move beyond laboratories and demonstration plots to markets, homes, and enterprises where they generate real value.

Protecting Ideas, Powering Innovation

In 2024/2025, we made major strides in securing NARO's intellectual property, an essential foundation for commercialization. Eight (8) trademarks were developed and filed for some of NARO's flagship prototypes including: fish feed, the NAROVAC anti-tick vaccine, jackfruit wine, jackfruit cookies, jackfruit jam, green tea, sweet potato wine, and cassava glue. Each of these trademarks represents a future product line, a potential business, and a new revenue stream for Uganda's bioeconomy.

Five patents were also developed and filed. One of them, the machine learning model predicting Foot and Mouth Disease outbreaks, was officially granted. Others progressed through examination stages including: a slow-release fertilizer, a chimeric anti-tick vaccine molecule, a cassava whitefly mitigation technology, and an aflatoxin detection kit.

Alongside these protections, NARO strengthened the policy environment by reviewing the NARO IP Policy (2017), developed geographical indication protocols for coffee and potato, and supported the finalization of Plant Variety Protection regulations. These steps ensured that NARO's innovations are not only protected but positioned for strategic partnerships, co-development, and investment attraction.

Turning Prototypes into Market-Ready Products

Technology incubation remained a central pathway for transforming research outputs into commercial-grade products. Innovators received guidance on process flow designs, quality assurance systems and labelling requirements that necessary for national certification. As a result, two (2) fish feed products were successfully registered with UNBS. Beyond product refinement, NARO built commercialization capacity across the ecosystem. Through 38 virtual IP advisory sessions, more than 250 innovators, SMEs, civil groups, and researchers were trained on IP management, branding, and commercialization strategies. Twenty (20) innovators under the *Greening chicken value chain Project* benefited from mentorship on product development and marketing. These efforts nurtured a growing culture of innovation readiness, giving SMEs and researchers the tools needed to compete in regulated and commercial markets.

From Research Fields to Farmer Fields – Scaling Improved Seed

Seed commercialization remained a cornerstone of technology transfer. Ten licensed seed companies reported. NARO generated UGX 628 million in revenue from royalties, commitment fees, and foundation seed sales. Three additional companies that is Crown Seed, Home Harvest, and Ujamaa Seeds were licensed, bringing the number of licensed seed companies to 26.

To fast-track adoption of newly released hybrids, NASECO and Home Harvest signed licensing agreements for NAROMAIZE 63 and 64. Production of breeder seed was scaled up, yielding 450 kg of NAROMAIZE 63 and 350 kg of NAROMAIZE 64. Eleven tonnes of assorted foundation seed were also produced and distributed.

A groundbreaking milestone was achieved with the first-ever public call for the commercialization of potato varieties, NAROPOT 7, 8, 9, and 10. The Directorate of Agricultural Technology Promotion coordinated initial seed multiplication, and 80,000 mini-tubers were produced. This marked a historic moment for vegetatively propagated crops entering NARO's commercial route.

Partnerships that Move Technologies Closer to People

Strategic partnerships remained central to NARO's technology promotion strategy. New and strengthened collaborations with cultural institutions, including Buganda, Bunyoro, Busoga, and Tooro, resulted in the establishment of demonstration farms and learning spaces across Uganda. Through these platforms, 51,240 farmers and end users were exposed to improved varieties and best practices in cassava, coffee, bananas, urban farming, and agroforestry.

Memoranda of Understanding were completed for Tieng Adhola and Obwenengo BwaBugwe Kingdoms, setting the stage for structured agricultural transformation within these regions.

Additional partnerships were formalized with Delight Uganda, Divine Organic Foods, Dr. Ian Clarke, Royal Plants, and Busitema University. These linkages strengthened commercialization efforts, value addition, seed systems, and farmer engagement under a coordinated Public–Private–Academic model.

Taking Science to the People — Shows, Expos & Farm Clinics

NARO scaled technology showcasing and visibility campaigns throughout the year. NARO used National Agricultural Shows and various national and regional exhibitions/expos including World Food Day, the UMA Expo, Harvest Money Expo, BUCADEF Expo, the Eastern Uganda Agricultural Show at Awoja Riverside, and Farm clinics at Buginyanya ZARDI and KaZARDI to reach over more than 170,000 people and showcase over 100 agricultural technologies.

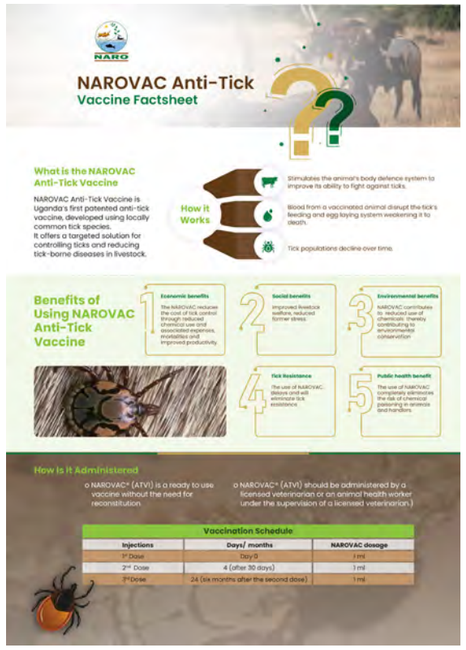
Fifty-two technology demonstration sites were established in strategic community locations across the nine

agro-ecological zones as reported in the *Regional Strength* article.

These platforms positioned NARO as a consistent and trusted source of appropriate and improved agricultural technologies, knowledge, information and practical solutions for farmers and agro-industry.

Championing Promotion of the NAROVAC Anti-Tick Vaccine

The Directorate of Agricultural Technology Promotion coordinated promotion of the roll-out NARO anti-tick vaccine. This first phase of engagements focused on creating awareness among NARO staff and media practitioners as well as sensitization meetings that brought together 118 representatives of the Uganda Veterinary Association, district veterinary officers, Parish Development Model leaders, MAAIF, academia, private sector, civil society organizations and regulatory agencies.



These engagements were used to capture feedback that was used to improve product packaging, communication materials and roll out strategies.

Digital Innovation – Using Data to Power the Next Frontier

NARO continued to strengthen digital systems that support smart agriculture. A unified dataset for cattle weight estimation was developed leading to machine-learning models capable of accurately predicting live weight without a scale. A feed optimization model was also trained to help farmers develop cost-effective, balanced rations using local ingredients. Additionally, a mobile application for anti-tick vaccine promotion, verification, and user feedback was developed.

A centralized NARO Data Bank System was built and validated, and scientists at the National Agricultural Research Laboratories and National Crops Resources Research Institute were trained to use it. These digital tools reflect NARO's growing leadership in data-driven agriculture and innovation.

Preservation of Knowledge and Expansion of Information Access

To strengthen knowledge management, more than 10,000 documents, including personnel files, manuals, theses, and reports, were digitized and indexed across PARIs. Over 500 new entries were added to the NARO E-Library and InfoHub, improving accessibility to scientific publications.

In scholarly publishing, Volume 23 (Issues 1 and 2) of the *Uganda Journal of Agricultural Sciences* was produced, and a new Editorial Board was inaugurated in line with the UJAS Strategy.

Strengthening institutional capacity and governance

Strengthening Agricultural Research Infrastructure

NARO made strategic investments in the development and enhancement of specialised research infrastructure

Uganda's agricultural transformation depends on modern, well-equipped research systems that can turn science into solutions for farmers. In FY 2024/25, NARO made strategic investments to expand and upgrade specialised research infrastructure. The focus was on laying a stronger foundation for livestock productivity, vaccine innovation, and apiculture development.

Goat Research Facility

In Apac district, the newly completed Goat Research Facility at Maruzi, home to the NaLIRRI, was fully operationalised. With a holding capacity of 600 goats, the facility enabled controlled breeding, performance evaluation, and disease surveillance for small ruminants, especially in Uganda's semi-arid cattle corridor. This facility marked a new era for goat genetic improvement and adaptive research that will contribute to increased meat and milk productivity, enhanced resilience to drought, and better incomes for livestock farmers.

Queen Bee Rearing Facility

In Maruzi, NARO also completed a Queen Bee Rearing Facility with a capacity of 200 improved beehives. The facility has capacity to produce superior queen bees and high-quality colonies needed to strengthen apiculture across Uganda. With 1.2 million households engaged in beekeeping and an annual honey market valued at UGX 120 billion, this facility has a lot of potential. When optimally used the facility will substantially increase honey yields, enhance pollination for crops, and reduce dependence on imported colonies thus positioning Uganda as a leader in bee genetics and pollination services in the East African region.

Vaccine Administration Block

In Wakiso district, the Vaccine Administration Block at Nakyesasa was operationalised providing the central infrastructure for the roll out of NARO's anti-tick vaccine. The block, fully compliant with National Drug Authority (NDA) standards, will manage vaccine registration, batch release, quality assurance, and post-administration monitoring. It will be used to ensures full traceability of every vaccine dose, guaranteeing safety and transparency. The block is expected to also serve as a governance hub for Uganda's growing veterinary vaccine industry thus supporting the commercialisation of locally produced vaccines.

Calf and Heifer Barn

Adjacent to the vaccine block, NARO has completed a Calf/Heifer Research Barn that houses trial animals under controlled conditions for long-term studies. This facility provides the precision and consistency needed for large-scale vaccine trials, which supports advanced research in vaccine efficacy, nutritional interventions, and disease resistance. The barn bridges laboratory research with on-farm application thus helping to fast-track the rate at which innovations reach farmers.

Laboratory accreditation

NARO has embarked on accreditation of her laboratories to improve data management, speed of diagnostics, efficiency of laboratory processes and product safety. During FY 2024/25, priority was given to accreditation of laboratories at NARL to ISO/IEC 17025:2017 standard. Efforts focused on calibration of critical laboratory equipment, appointment of Laboratory Manager, training of lab staff, development of required SOPs, and internal audits by the accreditation body. Accreditation of NARO laboratories is envisaged to save the government and private sector significant foreign exchange previously spent on out-of-the-country outsourcing of lab services.

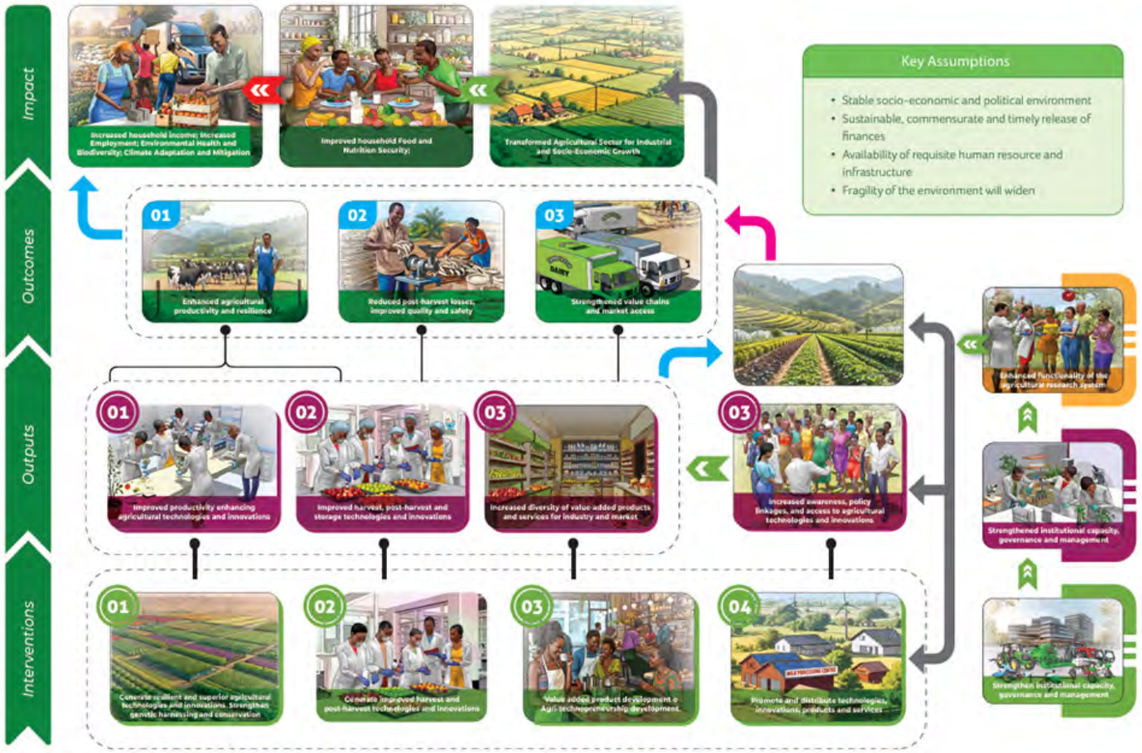
Mothers' nursing centre

A mothers' nursing centre (breastfeeding rooms) at workplaces is a global health recommendation from the World Health Organization (WHO) and UNICEF, as well as the National Gender Policy (2007). In response, NARO has established a dedicated nursing area at the NARO Secretariat. This nursing area expected to enables working mothers to balance professional responsibilities with optimal infant feeding practices.

Charting the Next Frontier: NARO's Strategic Plan 2025/26–2029/30

In FY 2024/2025, NARO developed and approved its third Strategic Plan (2025/26–2029/30) to guide or shape the future of Uganda's agricultural research.

This strategic direction marked a bold, innovation-driven phase anchored in national aspirations under Vision 2040 and NDP IV, as well as regional and global frameworks such as the EAC Vision 2050, AU Agenda 2063, the CAADP Compact, and the UN Sustainable Development Goals. It involve consultations with various stakeholders' categories to ensure that Uganda's next generation of agricultural transformation is built on science, competitiveness, resilience, and inclusive growth.



National Planning Authority

Uganda Vision 2040

Regulation 26(3)

CERTIFICATE

Certificate of Approval of a Decentralized Development Plan

The Authority has reviewed the Development Plan of **NATIONAL AGRICULTURAL RESEARCH ORGANIZATION** and is satisfied that the Development Plan complies with the National Planning Authority Act, 2002, the National Planning Authority (Development Plans) Regulations, 2018, the National Development Plan and guidelines issued by the Authority.

Dated this 22ND **day** JULY **of** 2025

Charles Oleny Ojok
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Planning for Development

Human resource management and development

NARO has institutionalized measures that boost staff morale and well-being and enhance overall human resource performance.

Human resource management (HRM) is crucial because it manages the organization's most valuable asset: its employees. It ensures a skilled and motivated workforce by handling recruitment, training, and retention. Effective HRM fosters a positive workplace culture, aligns employee goals with business objectives, and ensures compliance with labour laws, all of which drive productivity, efficiency, and long-term success.

During FY2024/25, NARO made significant progress in strengthening its human resource base through institutional restructuring, targeted recruitment and staff development.

Under the institutional restructuring exercise, NARO expanded its staff establishment from 1,180 to 1,242 positions. In line with this, the organisation recruited 33 new staff members, including 6 Directors, 6 Research Officers, 6 Technicians, 13 Administrative Officers, and 2 Support Staff. In addition, 26 Research Officers and 8 Administrative Officers were promoted, reaffirming NARO's commitment to staff growth, motivation, and career progression.

NARO also invested heavily in capacity development by supporting 43 staff members to pursue postgraduate studies: 37 at PhD level (23 male and 14 female) and 6 at Master's level (4 male and 2 female). This initiative was pivotal in cultivating a highly skilled research workforce and nurturing the next generation of leaders.

By the end of the financial year, NARO maintained a total staff strength of 767 employees: 23 Directors (22 male, 1 female), 251 Research Officers (182 male, 69 female), 156 Technicians (102 male, 54 female), and 337 Support Staff (204 male, 133 female). Overall, the workforce comprised 510 male and 257 female employees, reflecting an approximate male-to-female ratio of 2:1. During the same period, 17 staff members resigned from service, while 22 retired upon reaching the mandatory retirement age.

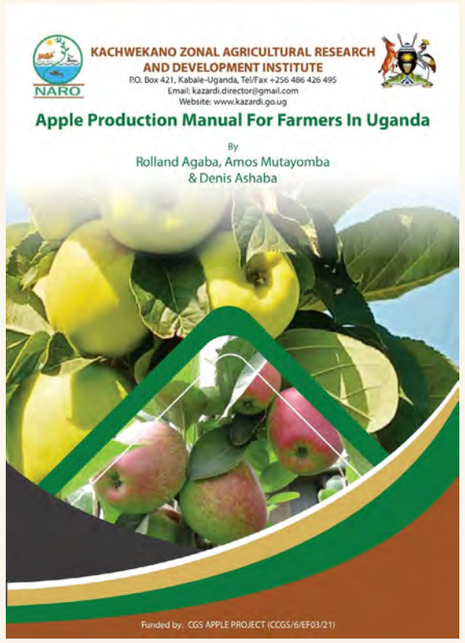
In terms of staff welfare and compliance, NARO ensured full adherence to the government pay structure and timely remittance of all statutory obligations, including NSSF, gratuity, and compensation benefits. The organisation also provided a comprehensive welfare package encompassing medical insurance, emergency health support, ex gratia payments, funeral insurance, and capacity-building opportunities. These measures contributed significantly to promoting staff morale, well-being, and overall productivity.

Competitive Grant Scheme (CGS) Research Performance – FY 2024/2025

During FY 2024/25, NARO implemented 33 Competitive Grant Scheme (CGS) Cohort VI projects across seven (7) NARIs, six (6) ZARDIs and the National Health Laboratory. The scheme continued to drive innovation in priority commodities such as coffee, cocoa, fish, cattle, macadamia, cashew nut and Hass avocado, as well as strategically important crops including apples, bamboo, pigeon pea, tomatoes, sorghum and medicinal cannabis.

Under crop and horticulture research, significant outputs were registered including biochemical and pharmaceutical profiles of medicinal cannabis, tissue culture and hydroponic protocols, improved entomopathogens for managing the Black Coffee Twig Borer, and new value-added products from pigeon pea, apples and tea. Research further yielded cellulose nanoparticles, nano-fertilizer prototypes, shelf-stable tomato products, a biomass-based hybrid solar dryer, cocoa fermentation technologies, a coffee-based antifungal cream, and bio-herbicides for Striga control. Apple value chain development was strengthened through MSIPs and cooperatives established in four districts.

Livestock research advanced understanding of pig health challenges, with PRRSV transmission modelled and pathogens associated with the Porcine Respiratory Disease Complex characterized. Reproductive efficiency improvements were realized through validation of heat detection kits and Ovsync-based protocols. Additionally, livestock waste was converted into high-value products such as biomethane, bioelectricity, briquettes, feed and detergents.



Financial Performance for FY 2024/25

NARO's annual budget for FY 2024/25 was funded through direct budget support from government of Uganda under GoU recurrent, development and non-tax revenue (NTR) as well as external financing especially for off-budget projects.

NARO (Vote 142) approved initial budget amounted to of UGX 176.001 bn excluding external/ donor funding and this comprised of wage UGX 43.462 bn., non-wage UGX 97.489bn and development UGX 30.050bn.

By the end of the financial period, GOU had released a total of 176.001 bn out of which UGX 175.910 bn was utilized representing an absorption rate of 99.95% as detailed in the table 1 below.

The total percentage released to the Vote stood at 100% of the budget compared to the previous FY 2023/24 where release was 98.80%.

While the actual out turn for NTR was UGX 6.237 bn as compared to the annual target of 7.331 bn, representing 85.08% performance. This performance was largely attributed to improved mobilization and collection measures by management.

The Organization implemented a total of two hundred eighteen (232) off budget projects supported by different development partners. During the period NARO received total of UGX 45.900bn. This external funding initiative by development partners supported NARO to implement some activities in execution of her research mandate.

Table I Summary of the various categories of funding, annual projections, releases, expenditure and related performance percentage

Funding Category		Approved Revised Budget	Budget Released	Release Spent as at 30th June 2025	% Budget Released	% Release Spent
Recurrent	Wage	43.462	43.462	43.462	100.0	100.00
	Gratuity	10.866	10.866	10.866	100.0	100.00
	Non-Wage	86.624	86.624	86.602	100.0	99.97
Dev't.	Project 1560-Maruzi	5	5	4.996	100.0	99.92
	Project 1619-Retooling	28.462	28.462	28.450	100.0	99.96
	Contributions to International Organizations	1.5	1.5	1.5	100.0	100.00
	Ext. Fin.	0	0	0	0.0	0
GoU Total		175.914	175.914	175.876	100	99.98
Total GoU + Ext Fin (MTEF)		175.914	175.914	175.876	100	99.98
Arrears		0.087	0.087	0.087	100	100.00
Total Budget		176.001	176.001	175.963	100	99.98
Grand Total		176.001	176.001	175.963	100	99.98

Statement on internal Audit

As NARO continued to implement her mandate, the internal audit function provided essential oversight by evaluating the effectiveness of internal controls, risk management systems, and governance structures. These audits were instrumental in promoting transparency, ensuring compliance with regulatory frameworks, and safeguarding the proper use of public resources ensuring improved service delivery and the overall performance of NARO. NARO generated 6 Audit reports on asset, procurement, NTR, value for money, compliance, 9 months budget performance review, risk human resource and systems. Furthermore, validation of management actions on issues raised by OAG, IAG/PSST was undertaken.

NARO undertook three (03) special intervention audit on anti-tick vaccine manufacturing processes, relocation to Maruzi and Competitive Grant Schemes. Governance and oversight audits, financial management and compliance audits, Risk-focused audits, operational and special intervention audits and Special audits. Additionally, NARO's capacity was strengthened by 15 audit staff acquiring skills in Continuous Professional Development (CPD) and innovative audit techniques such as risk-based auditing, ICT audit, performance audit, and forensic investigations

Vaccine Manufacturing Facility at Nakyesasa

In accordance with Article 163 (4) of the constitution, the auditor general independently audited NARO's financial statements for the year ended 30th June 2024 and his opinion is as follows:

SECTION 1: REPORT OF THE AUDITOR GENERAL ON THE FINANCIAL STATEMENTS OF NATIONAL AGRICULTURAL RESEARCH ORGANISATION FOR THE FINANCIAL YEAR ENDED 30TH JUNE 2025

THE RT. HON SPEAKER OF PARLIAMENT

Opinion

I have audited the financial statements of National Agricultural Research Organisation (NARO) for the financial year ended 30th June 2025, which comprise the Statement of Financial Position as at 30th June 2025, the Statement of Financial Performance, the Statement of Changes in Equity, and the Statement of Cash Flows, together with other accompanying statements for the year then ended, and notes to the financial statements, including a summary of significant accounting policies.

In my opinion, the accompanying financial statements of the National Agricultural Research Organisation for the financial year ended 30th June 2025 are prepared, in all material respects, in accordance with Section 49 of the Public Finance Management Act (PFMA), Cap. 171, and the Financial Reporting Guide, 2024, as issued by the Accountant General.

Basis for Opinion

I conducted my audit in accordance with the International Standards of Supreme Audit Institutions (ISSAIs). My responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of my report. I am independent of the Agency in accordance with the 1995 Constitution of the Republic of Uganda, the National Audit Act (NAA), Cap. 170, the International Organization of Supreme Audit Institutions (INTOSAI) Code of Ethics, the International Ethics Standards Board for Accountants (IESBA) Code of Ethics for Professional Accountants, and other independence requirements applicable to performing audits of Financial Statements in Uganda. I have fulfilled my other ethical responsibilities in accordance with the IESBA Code and in accordance with other ethical requirements applicable to performing audits in Uganda. I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my opinion.

Key Audit Matter

Key audit matters are those matters that, in my professional judgment, were of most significance in my audit of the financial statements of the current period. I have determined that there are no key audit matters to communicate in my report.

Emphasis of Matter

Without qualifying my opinion, I would like to draw the readers' attention to the following matters which have been disclosed in the financial statements of NARO;

1.1 **Outstanding domestic arrears**

Section 20 (2) of the Public Finance Management Act, Cap. 171 states that a vote shall not take any credit from any local company or body unless it has no unpaid domestic arrears from a debt in the previous financial year, and it has the capacity to

NARO EVENTS

NARO Director General, Dr. Yona Baguma. Leads a delegation on a visit to BGI Group in Shenzhen, China, a key partner in the development of perennial rice.

Prime Minister of Lesotho, The Right Honorable Sam Matekane, visited NARO to explore areas for knowledge exchange and strengthening bilateral collaboration.

NARO Director General Dr. Yona Baguma, explains the unique benefits of black rice to the Vice President, Maj.(Rtd.) Jessica Alupo and Minister for Agriculture, Hon. Frank Tumwebaze, during the World Food Day 2024 celerations in Serere.

NARO Governing Council Members inspect tea research at Rwebitaba ZARDI in Fort Portal.

Farmers learn best production practices for goat rearing during a Farm Clinic organised by NARO in partnership the Daily Monitor at Kabale

NARO EVENTS

NARO hosted the Permanent Secretary and Senior Management Team of the Ministry of Public Service to showcase groundbreaking achievements and technologies.

President Yoweri Museveni appreciates value-added coffee products showcased at the NARO exhibition stall during the International Labor Day celebrations in Fort portal City.

The USAID Mission Director, Daniele Nyirandutiye visited NARO on a tour of the agency's contribution to agricultural research and development

NARO signs MoU with Mbarara University of Science and Technology and Toorov Kingdom, fostering research, technology transfer, and community transformation.

NARO technologies shared with cultural leaders

Legacy Profiles

Dr. Samuel Katambi Mugasi: The Voice of the Farmers in NARO's Governance

Dr. Samuel Katambi Mugasi served on the Governing Council for twelve years, bringing with him more than three decades of experience in agricultural development, monitoring and evaluation, and public sector leadership. His appointment to the Council in 2012 was anchored in law. The 2005 NAR Act required that the head of the national extension body sits on the NARO Council to ensure that research and extension remained properly linked. He was appointed because he was the Executive Director of the National Agricultural Advisory Services (NAADS).

Trained as an Agricultural Economist, Dr. Mugasi brought an economics angle that drives agricultural transformation. But perhaps more importantly, he understood farmers. Throughout his tenure including two consecutive terms as Chair of the Users' sub-committee, he consistently focused on ensuring that research priorities address real and urgent needs of farmers.

He recalls raising concerns about cassava farmers who were struggling with Cassava Brown Streak Disease and facing severe shortages of clean planting materials. He brought forward the growing frustration among livestock farmers dealing with acaricide resistance and the escalating burden of tick-borne diseases; concerns that have since contributed to the intensified research efforts leading to the development of the anti-tick vaccine. He saw himself as the voice of the farmers, ensuring that research remained responsive, practical, and impactful.

During his tenure, the Council played a significant role in strengthening the visibility by supporting forming partnerships with media houses. This strategic emphasis on visibility yielded results, elevating NARO's public profile and reinforcing trust in its work. The Council also advocated for increased budget allocation for capacity development including training scientists, expanding research infrastructure, and sustaining long-term programs. For him, these gains were essential for positioning NARO as a competitive and future-ready institution.

As he reflects on his time on the Council, he emphasizes that NARO must continue positioning itself as a solution provider. Relevance, he argues, depends on listening carefully to farmers, strengthening socio-economic research, and linking scientific innovation to business realities on the farm. He speaks of the need to integrate climate change solutions and groundbreaking innovations such as the anti-tick vaccine to respond directly to the most pressing farmers' challenges.

Dr. Mugasi's legacy within NARO is one of governance grounded in field realities, persistent advocacy, and an unwavering belief that research must ultimately improve livelihoods.

Dr. Sylvester Dickson Baguma: From field science to regional research leadership

Dr. Sylvester Dickson Baguma's career is a story of more than three decades of dedication to strengthening agricultural research systems in Uganda and the region. From his early days as a young scientist seeking to understand how farming systems could become more productive and sustainable, to his current role leading regional agricultural research collaboration, his journey has been defined by commitment scientific rigor, institutional development, and mentoring the next generation of researchers.

Dr. Baguma trained as an Agronomist and specialized in Knowledge Management at PhD level. This equiped him with the expertise to strengthen how research institutions generate, manage, and use knowledge for development.

Dr. Baguma joined Uganda's agricultural research system in 1988 and transitioned into NARO when it was established in 1992. His early research focused on conservation agriculture, and he contributed to the development of maize varieties originating from Kawanda 131, which later formed the foundation for widely adopted varieties such as Longe 1 to Longe 5 (popularly known as Nalongo).

Dr. Baguma's career gradually expanded into planning, monitoring and evaluation roles within NARO and he later became a key contributor to NARO's strategic planning processes and helped institutionalize results-based management approaches within the organization. He played a key role in establishment of the knowledge management unit of NARO.

His leadership journey later culminated in his appointment as Director of the Bulindi Zonal Agricultural Research and Development Institute (Bulindi ZARDI), where he guided research, outreach, and institutional development across western Uganda. He emphasized outreach services to strengthen linkages between scientists, extension services, and farming communities. He also served as staff representative on the NARO Governing Council.

Dr. Baguma is proud of his role in mentoring young scientists and nurturing leadership within the agricultural research system. He speaks most proudly about mentoring is Dr. Yona Baguma, the current Director General of NARO. Their professional relationship stretches back many years, having known each other since their school days, progressed through university together, and eventually worked side by side within NARO.

Dr. Baguma's influence extends beyond Uganda; he has worked extensively across Eastern and Central Africa in areas such as knowledge management and institutional capacity building. In recognition of this experience Dr. Baguma was appointed Interim Executive Director of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) in October 2024 before assuming the substantive role in July 2025.

Reflecting on his career, Dr. Baguma often emphasizes professionalism, accountability, integrity and service as the principles that must guide research leadership. For him, science is most meaningful when it improves the lives of farmers and communities.

Dr. Baguma's legacy stemmed from pioneering conservation agriculture experiments in farmers' fields to shaping research systems at national and regional levels.

Dr. Imelda Night Kashaija: A Life Devoted to Science, Service, and Impact

When Dr. Imelda N. Kashaija joined Uganda's agricultural research system in the mid-1980s.Trained as a plant nematologist, Dr. Kashaija was among the pioneering scientists who transitioned into the newly established NARO in 1992. Her early scientific work focused on banana parasitic nematodes at a time when banana the pest was poorly understood. As part of the founding team of the National Banana Research Programme, she worked tirelessly to generate new knowledge on the pests. This work laid an enduring foundation for banana pests management in Uganda and the East Africa region.

From the outset, her work bridged research and real-world application by translating findings into users' manuals and farmer-friendly materials, an approach that would later define her leadership philosophy. Dr. Kashaija's served as a founding Centre Manager and later Director of Research at Kachwekano Zonal Agricultural Research and Development Institute (KaZARDI), transformed the institute into a respected hub for agricultural innovation in the southwestern highlands. Her success at KaZARDI prepared her for national-level leadership and in 2012, Dr. Kashaija was appointed Deputy Director General in charge of Agricultural Technology Promotion (DDG-ATP), a role that placed her at the heart of ensuring that research outputs reach the people that need it.

As the first DDG-ATP, Dr. Kashaija led the establishment of the Directorate of Agricultural Technology Promotion, setting up its staffing structures, operational systems, and guiding policy frameworks. Under her stewardship, NARO strengthened its approaches to adaptive trials, demonstration gardens, farmer field schools, and exhibitions. She is most proud for championing intellectual property management and technology commercialization as legitimate and necessary pathways for disseminating public research outputs.

In 2013, while serving as Acting Director General, she was called upon to explain, to the President of Uganda, the growing challenge of acaricide resistance. Drawing on her scientific training, she proposed evidence-based solutions including acaricide rotation and the development of an anti-tick vaccine. She believes that the conversation helped shape government's decision to investment in research for development of the anti-tick vaccine. Her science-driven advocacy also contributed to national acceptance of Quality Declared Seed (QDS) systems, strengthened seed potato supply chains, and research in new high-value crops for Uganda's highland regions such as apples.

As a woman rising through a male-dominated system, she faced gender challenges that she handled with professionalism, consistency, and results; quietly redefining what leadership looked like for the women who followed.

Her legacy lives on in her research and technology transfer contributions, empowered scientists especially the women, informed policies, and in farming communities whose livelihoods improved because of her research and decisions.

Prof. Wilberforce Tushemereirwe: Science at the Frontline of Uganda's Banana Revolution

For more than three decades, Prof. Wilberforce Tushemereirwe (Prof. Tush) stood at the frontline of one of Uganda's most critical agricultural battles of protecting the banana, a crop that underpins food security, culture, and livelihoods for millions of households.

Trained as a Plant Pathologist, Prof. Tush joined Uganda's agricultural research system in the early 1980s. When NARO came into being in 1992, he was working on banana diseases. In the early 1990s, Prof. Tush was the first scientist in Uganda to identify Black Sigatoka disease, and his findings placed Uganda on the global plant pathology map.

In mid-1990s, his team established the Uganda's Banana Breeding Programme to develop host- plant resistance supported by international partnerships and funding from the Rockefeller Foundation.

Prof. Tush's most defining scientific contribution emerged when his team developed an Integrated Pest Management (IPM) package Banana Bacterial Wilt (BBW) in the early 2000s. Supported by targeted government funding, the solution led to near-complete control of the disease across Uganda, and was benchmarked by various East African countries; a rare instance of African-led science solving an African agricultural crisis at scale.

Prof. Tush recognised the limits of conventional breeding and cultural practices, and in early 2000s he championed biotechnology and genetic engineering as complementary tools. Under his leadership, Kawanda became home to a world-class biotechnology facility, inaugurated by the President in 2003. This achievement earned Uganda global recognition for demonstrating use of cutting-edge science in a developing country, by local scientists, to address local needs.

After 15 years as Leader of the National Banana Research Programme, Prof. Tush became Director of Research, National Agricultural Research Laboratories (NARL) and he served for nearly a decade. As Director, he strengthened scientific standards, prioritised comprehensive planning, expanded infrastructure, and invested heavily in human capital development.

Reflecting on unfinished ambitions, Prof. Tush speaks candidly about the failure to release a genetically modified provitamin A rich banana after more than two decades of research. For him, the lesson was clear: scientific innovation must be accompanied by strategic communication and public engagements from the very beginning.

Prof. Tush's legacy also lies in mentoring more than 20 PhDs and dozens of MSc. scientists. Many of these mentees hold leadership positions within national research system and beyond.

His legacy lives on in healthier banana plantations, regional banana diseases control strategies, and a generation of scientists equipped to tackle tomorrow's challenges, grounded in evidence, guided by integrity, and driven by purpose.

Dr. Anton Bua: Forty years of science, service, and stewardship

After forty years of service in Uganda's agricultural research system, Dr. Bua Anton steps into retirement not simply as a star scientist, but as a builder of institutions, a pillar of crops research, and a mentor of generations.

When he joined the research service in 1983, the system was fragmented and under-resourced. What the system lacked in resources, Dr. Bua supplied in conviction. He noted that in those days, it was not allowances that sustained scientists, but devotion and passion for service.

Dr. Bua was assigned a daunting task of revitalizing research on sunflower and soybean without supervision, technicians nor viable planting germplasm. Over time, through persistence, careful breeding and agronomic work, he led a team to release Sunfola, a variety that moved sunflower from ornamental gardens into commercial fields. They released Namso 1 and Namso 2 varieties that boosted the role of soybean both as food and feed in the Ugandan market; Sesame 1 and Sesame 2. Which shifted simsim from domestic consumption to an export crop.

But it was cassava that defined his most profound contributions. When Cassava Mosaic Disease devastated more than 500 local varieties, threatening household food and income security across Uganda, his team developed a solution. In 1993, they released NASE 1, NASE 2, and NASE 3, the first cassava varieties released since 1952. These virus-resistant varieties restored productivity. To see those varieties widely adopted across the country remains one of the most satisfying moments of his career.

Dr. Bua's influence extended beyond the field and into the architecture of the nation's research system. He participated in the restructuring process of NARO using the Act of Parliament in 1992. Later, when proposals emerged to privatize the institution, he stood firm on the taskforce that redefined and protected the public research mandate. This contributed to the development of the 2005 NAR Act that continues to guide agricultural research in Uganda today.

His leadership also shaped regional and international collaboration. Under his stewardship, cassava research grew into a Regional Centre of Excellence. Uganda became not just a beneficiary of research networks, but a leader within them.

Perhaps his most enduring legacy lies in people. Over four decades, he mentored and trained scientists and technicians who today serve leadership roles in research systems and academia.

His scientific disappointment was failure to breed for durable resistance to cassava brown streak disease. External funding shifts disrupted carefully laid plans, therefore, he advocates for stronger government support and local capacity development.

His message to the NARO is clear: let passion and ethics lead your work; preserve institutional memory by continued engagement of experienced scientists; guard the institution against corruption and division; and align research with national transformation.

His legacy lives in fields of cassava, sunflower, soybean and simsim across Uganda and beyond; in laboratories strengthened; in policies shaped; and in the many scientists he mentored who now carry the torch forward.

Ms. Elizabeth Nahidu: The Quiet Backbone of the Office of the Director General

For more than two decades, Ms. Elizabeth Nahidu (commonly known as Betty) served at the very heart of the NARO, not in laboratories or boardrooms, but in the office of the Director General. An office where decisions were shaped, crises managed, and the Institution's rhythm sustained. Her story is not one of public recognition or scientific breakthroughs, but of steadfast service, trust, and institutional continuity; the kind of contribution without which leadership cannot function.

Betty joined NARO at a time when the Institution was still finding its footing, evolving through reforms, leadership transitions, and with expanding national expectations. From the beginning, her role demanded more than administrative skill. It required discretion, emotional intelligence and unwavering professionalism.

As Secretary to the Director General, she became the first point of contact for Ministers, Scientists, Partners, and staff from across the system. Every day, she managed confidential correspondence, coordinated high-level meetings, handled sensitive information, and ensured that the Office of the Director General functioned seamlessly, often under intense pressure.

Betty served under five Directors Generals, each with distinct leadership styles and priorities. Through all these transitions, one constant remained - the trust placed in her office and in her person. She upheld the values of discretion, loyalty, respect, and service, earning the confidence of every Director General she worked with.

Her desk became a living archive of institutional memory. In moments of transition, her presence offered stability. New leaders relied on her deep knowledge of systems, protocols, and relationships. Senior staff depended on her clarity and calm. Junior staff saw in her an example of professionalism grounded in humility.

Betty understood procedures not just as written rules, but as live practices. She knew when to speak, when to listen, and when to act. She built strong working relationships across departments, often serving as a quiet bridge between leadership and staff.

When asked what she is most proud of, Betty points not to individual achievements, but to consistency: showing up every day, doing the work well, and supporting the institution through change.

Her loyalty to NARO was sustained by a sense of purpose and belonging. She understood that strong institutions are built not only by visionary leaders and brilliant scientists, but also by dedicated administrative professionals who ensure that systems function, records are kept, and people are supported.

To young administrative staff joining NARO, Betty's message is simple but powerful: *Be professional. Be discreet. Be dependable. Remember that trust is earned daily.*

Betty leaves behind a legacy of service defined not by visibility, but by impact, trust, and commitment.

Robinah Gaffabusa: A Lifetime of practical science and farmers' transformation

For more than three decades, Robinah Naggayi Gaffabusa quietly made her contribution to agricultural research; not from the spotlight of scientific publications, but from the practical fieldwork that makes research possible. As a Technician, she stood at the intersection of science and farmers, translating experimental knowledge into skills that farmers could apply to improve their livelihoods.

Robinah joined the agricultural research system in 2002 as a Technician at Mukono Zonal Agricultural Research and Development Institute (MuZARDI), bringing with her specialized skills in fruit propagation. She joined when the institute was evolving from a District Farm Institute, originally focused on farmer training, into a research institute. Her dedication during those formative years helped strengthen the foundation upon which later research and outreach activities were built.

Overtime, Robinah's work extended beyond fruit propagation to include vegetable production research, germplasm collection and conservation, and the promotion of indigenous vegetables. She also contributed significantly to the promotion of urban agriculture and youth mentorship.

What gave her the greatest satisfaction, however, was witnessing farmers transform their lives through the skills she helped impart. Many of the fruit nurseries and vegetables seed multipliers trace their roots back to her training sessions.

Her career also exposed her to the deeper social realities faced by many communities. One particularly memorable experience involved participating in surveys within refugee settlements in northern and southwestern Uganda. The experience left a profound impression on her, reinforcing her desire to play an important role in restoring dignity and hope to the vulnerable communities.

Over the years, Robinah continued to adapt to the institutional changes and grow professionally resulting in her promotion to Senior Technician. For her, being a technician meant being flexible and deeply committed to understand both the science and the practical realities of farming systems.

After 32 years of service, Robinah retired with a deep sense of fulfilment. She takes pride in the many farmers she trained, the fruit trees and vegetables germplasm she helped conserve, and the practical innovations especially for seed multiplication and urban agriculture. Even after retirement, she remains active having using her networks to prepare for life beyond formal employment.

Robinah's legacy reminds us that behind every scientific breakthrough lies the dedication of technicians whose hands, skills, and commitment bring research to life in farmers' fields.

Scientific Publications 2024/2025

One way that NARO shares its knowledge with the world is through its vast library of publications. This enables spillover benefits and maximizes the return on research investments. In FY 2024/25, NARO researchers published over 100 publications including articles in peer reviewed journals. NARO also publishes reports, field guides and manuals.

List of Licensed Seed Companies

NARO has so far licensed 26 seed companied to boost dissemination and adoption of NARO crops varieties including: 30 maize; 11 rice; 5 sorghum; 5 finger millet; 3 wheat; 1 pearl millet; 17 bean; 10 groundnut; 5 cowpea; 3 sesame; 2 green gram; 2 pigeon pea; and 2 sunflower varieties.

Acronyms

AbiZARDI	Abi Zonal Agricultural Research Development Institute
AEATREC	Agricultural Engineering and Appropriate Technologies Research Center
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ARDC	Agricultural Research and Development Centre
BugiZARDI	Buginyanya Zonal Agricultural Research Development Institute
BuZARDI	Bulindi Zonal Agricultural Research Development Institute
CABI	Centre for Agriculture and Biosciences International
DANIDA	Danish International Development Agency
EAAPP	Eastern Africa Agricultural Productivity Project
IACUC	Institutional Animal Care and Use Committee
IBC	Institutional Biosafety Committee
ICPAU	Institute of Certified Public Accountants of Uganda
JICA	Japan International Cooperation Agency
KaZARDI	Kachwekano Zonal Agricultural Research Development Institute
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
MbaZARDI	Mbarara Zonal Agricultural Research Development Institute
MoFPED	Ministry of Finance, Planning and Economic Development
MTEF	Mid-Term Expenditure Framework
MuZARDI	Mukono Zonal Agricultural Researvch Development Institute
NAADS	National Agricultural Advisory Services
NaCORI	National Coffee Research Institute
NaCRRI	National Crops Resources Research Institute
NaFIRRI	National Fisheries Resources Research Institute
NaFORRI	National Forestry Resources Research Institute
NAGRC&DB	National Animal Genetic Resources and Data Bank
NaLIRRI	National Livestock Resources Research Institute
NARI	National Agricultural Research Institute
NARL	National Agricultural Research Laboratories
NARO	National Agricultural Research organization
NAR Act	National Agricultural Research Act, 2005
NaSARRI	National Semi Arid Resources Research Institute
NBC	National Biosafety Committee
NDP	National Development Plan
NGOs	Non-Governmental Organisations
NTR	Non-tax Revenue
PARI	Public Agricultural Research Institute
PMEA	Planning, Monitoring, Evaluation and Accountability
RUFORUM	Regional Universities Forum for Capacity Building in Agriculture
UBOS	Uganda Bureau of Statistics
UJAS	Uganda Journal of Agricultural Sciences
UNBS	Uganda National Bureau of Standards
UNCST	Uganda National Council for Science and Technology
ZARDI	Zonal Agricultural Research Development Institute

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