



# ANNUAL REPORT **2024**



*Promoting Excellence in Agricultural Research for Sustainable Development*



The Papua New Guinea National Agricultural Research Institute (NARI) was established by an Act of the Parliament in July 1996, as a public funded, statutory research organisation to conduct and foster applied and adaptive research into:

- I. any branch of biological, physical and natural sciences related to agriculture;
- II. cultural and socio-economic aspects of the agricultural sector, especially of the smallholder agriculture; and
- III. matters relating to rural development and of relevance to Papua New Guinea.

In its Vision for PNG, NARI sees *Prosperous PNG Agricultural Communities* through its Mission of promoting innovative agricultural development in PNG through scientific research, knowledge creation and information exchange. This is to be accomplished through the Institute's Purpose (Strategic Objective) of enhanced productivity, efficiency, stability and sustainability of the smallholder agriculture sector in the country so as to contribute to the improved welfare of farming and rural communities who depend wholly or partly on agriculture for their livelihoods.

See *Annex 8: The Institute* for more information on the Institute.

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# 2024 Annual Report

National Agricultural Research Institute  
Lae, Papua New Guinea  
Corporate Document 2 / 2025

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## Foreword

Papua New Guinea is richly endowed with both renewable and non-renewable natural resources. In spite of this attractive resource scenario, PNG still ranks poorly on social indicators, showing last in the Pacific on the Human Development Index (HDI). Overcoming these requires people and communities to be empowered to participate in economic growth and national development. Development of PNG's agriculture sector is key to addressing the key challenges of access to healthy and nutritious diets, resilience to environmental and economic pressures, and participation in economic opportunities.

The National Agricultural Research Institute (NARI), as a government funded statutory institution, operates within the strategic framework set by the PNG Government. The *NARI Strategy and Results Framework (SRF) 2022-2031* and supporting *NARI Strategic Implementation Plan, 2022-2026*, provide the road-map for the Institute's contribution to improving PNG's welfare, especially of smallholder farmers and rural communities. Our strategy aligns and contributes directly to the achievement of the GoPNG Development Goals laid out in the *MTDP IV, 2023-2027*, in particular to promote economic activity and reduce poverty, to improve food and nutrition security, to promote sustainable resource management, and respond to climate change challenges. These also cascade from the UN Sustainable Development Goals (SDGs) the PNG Vision 2050 and PNG's DSP 2030, which share a common 2030 target date with our framework.

The *National Agricultural Sector Plan 2024–2033* was launched in 2024 and provides the guidance to NARI and other sector agencies on agricultural research for development. NARI has embraced the clear direction to support the envisaged shift towards market-driven commercial agriculture. While the *NARI SRF 2022-2031* was developed before the NASP was completed, the SRF and SIP are well aligned with the medium-term sector strategies outlined in the NASP. NARI will contribute to the achievement of NASP objectives and strategies with innovations arising from research interventions addressing the needs, constraints and opportunities of farming communities and other stakeholders in the wider Agricultural Research for Development (AR4D) system. The contribution is delivered through the *NASP Agricultural Priority Area 6 Comprehensive Agricultural Research and Development*.

The *NARI SRF 2022-2031* priority areas clearly articulate the research strategies, which with the supporting technical services and institutional structure provides a firm foundation for the research and partnerships needed to deliver on PNG's National development goals. We must extend our focus on women and young people, focus to provide economic opportunities and improved diets and nutrition, particularly among mothers and young children, and intensify our work on climate-smart agriculture. These are all given new emphasis in our research agenda, along with identifying novel opportunities, strengthened value chain support, and continuing research efforts to improve the productivity of new and traditional staple food crops, livestock and aquaculture, and the sustainability of our natural resources and environment.

Successful delivery of the Strategy and Results Framework not only requires clear plans, but also adequate resourcing in finance and a revision of the Institute's organisational management structure, taking into account the lesson's learnt from previous and current performance of the structure and what is required to take NARI into the future. The SIP (2022-2026) provides the basis for building, guiding the resourcing of the Institute, planning and implementation of projects, and providing a road-map to achieving impacts in the lives of rural communities over the next five (5) years

Effective agricultural research for development is key to PNG's development aspirations, and the 85% of the population who are rural based and depend on productive agriculture to escape the poverty trap of the rudimentary subsistence agriculture systems. While the Strategy and Results Framework and Strategic Implementation Plan provide a clear platform and pathway for the future, NARI cannot do it alone. We call on our partners and stakeholders to work with us to share in achieving our common aspirations in fulfilling our national development plans and objectives.



## **Message From The Minister For Agriculture**

Despite the significant development and contribution of the mineral sector since Independence, agriculture remains the main source of livelihood for over 85% of our population.

The National Agricultural Research Institute (NARI) was formed to conduct applied, adaptive and development oriented agricultural research with a view to enhance the productivity, efficiency and sustainability of smallholder agriculture in PNG; and to provide authoritative technical, analytical and diagnostic services and up-to-date information to drive agricultural development in PNG. Our agriculture sector is expanding fast with farmers looking to move to commercial scale production.

The NARI agriculture research for development innovation supports the government aspirations. The Institute Council, Management, and Staff have worked consistently to maintain a solid Institute, ensuring to adapt and align with the objectives of the Government Medium Term Development Plan, and my Department's National Agriculture Sector Plan, strengthening the focus on commercial agriculture. We must continue to support the development of strong research and technical capacity to build and ensure sustained contribution of the agriculture sector to the National economy.

I now have the greatest pleasure in presenting this report to the National Parliament, the farming community at large, the general public, development agencies, scientists and professionals, donor agencies, and international organisations. It is my fervent hope that the spirit of innovation and enterprise for improved agriculture will continue to grow in PNG.

**Honourable John Boito, MP**  
**National Parliament Minister for Agriculture**



## Message from the Chairman



Greetings to you all from the NARI Council. It gives us great pleasure to share NARI's progress during 2024 with you.

The Council acknowledges the NARI Management team for their initiatives laying the groundwork for a renewed NARI aligned with the Government drive to a wealthier and healthier Papua New Guinea, delivering on the MTDP 4, NASP, and Sustainable Development Goals.

We are concerned that while the importance of agriculture is well known, the Government support through funding for agricultural research, in relative terms, has been in decline over the past 20 years. The excellent returns on research investment have been well documented for countries similar to PNG. We very much appreciate the emphasis on agriculture and response and support given by the Prime Minister, Minister for Agriculture, and Government agencies who have taken time to recognise the role and value of research and the resources needed to deliver its contribution to development objectives. We continue our call on the Government to continue to review this situation and substantially increase research funding.

With the support of the Minister, the Council has initiated a review of the NARI Act to ensure that the Act aligns with the current agricultural development goals and aspirations.

We also recognise and thank the Governor for Morobe Province, Hon Luther Wenge, for the ongoing support of the Morobe Provincial Government. The commitment, during our Agricultural Innovation Show, to support agricultural research with funding and the construction of an Information Centre is timely and will contribute greatly to commercialising and scaling of research technologies.

The NARI Council expresses its appreciation to all our partners and to NARI staff for their contributions and commitment which underpins the organisation's expanding achievements. NARI will continue to build in 2025 on its modest progress made in 2024 to continue to strengthen our ongoing transformation as an improved results-oriented learning organisation. We look forward to your continued support in 2025.

**Mr Nimo Walter Kama**  
**Chairman, NARI Council**

## **From the desk of the Director General**



Investment in research is critical to the development of agriculture, and its contribution to the economy and well-being of the people of Papua New Guinea.

NARI has taken steps to address the National Strategic Goals, DSP 2030, and Sustainable Development Goals through the alignment of the Institute Strategy and Results Framework 2022-2031 with the Government Medium Term Development Plan IV 2024-2027 and the National Agricultural Sector Plan, 2026-2033, Vision 2050. Derived from this basis, the key research outcomes revolved around the three priority areas covering policy, commercialisation,

resilience to shocks, and nutrition.

We have established a new relationship for research and capacity building with the Peoples Republic of China, through the Jiangsu Academy of Agricultural Sciences, and look forward to exciting developments in 2025. We further strengthened our relationship with CABI through the International PlantwisePlus program building the capacity for crop protection and increased productivity across the food and commodity sectors. We appreciate the continued support from our development partners, particularly from the Australian Government through the Centre for International Agricultural Research, and look forward to new initiatives. We are also appreciative of the collaboration and assistance provided through International Food Policy Research Institute, Taiwan ICDF, the International Atomic Energy Association and Bioversity International.

We have taken the lead in several new initiatives in 2024 to build collaboration and effectiveness of the National Agricultural Research System in the sector, development of a national seed policy framework, extension of our digital information system, and revitalisation of the PNG Journal of Agriculture, Forests and Fisheries and the Harvest magazine supporting our agricultural extension system.

The urgent intensive research required for growth in agro sector commercialisation requires an adjustment of the funding models supported by a strong capacity development program. The cadet scheme which contributed to NARI success in developing highly skilled, competent scientists, economists, social and development professionals provides a model to build on. The minimal funding and resource requirement to properly operationalise NARI is provided in the NARI Strategic Implementation Plan 2022-2026.

Administratively, we have made good progress to ensure NARI is effective in delivery and is responsive to the reporting requirements and changing needs. Our 2023 accounts are under audit at the time of writing and we expect the 2024 audit to closely follow. We continued the organisational restructuring exercise based on the resource needs identified in the NARI Strategic Implementation Plan 2022-2026, to support the NARI Strategy and Results Framework 2022-2031 and sector alignment with the MTDP 4 and NASP.

I look forward with confidence to a progressive 2025.

**Dr Nelson Simbiken**  
**Director General**



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## Acronyms and Abbreviations

ACIAR	Australian Centre for International Agricultural Research
AIP	Annual Implementation Plan
AR4D	Agricultural Research For Development
BCS	Bogia Coconut Syndrome
CABI	Center for Agriculture and Biosciences International
CCR	Climate Change Resilience
CSA	Climate Smart Agriculture
CIP	International Potato Centre
CPL	City Pharmacy Limited
DAL	Department of Agriculture and Livestock
DSP	Development Strategic Plan
ENB	East New Britain
EU	European Union
EUCCR	European Union funded action for climate change resilience
FAW	Fall Army Worm
FFL	Frangipani Fresh Foods
FPDA	Fresh Produce Development Agency
CNC	Galip Nut Company
GRFA	Genetic Resources For Agriculture
HARC	High Altitude Regional Centre
HRC	Highlands Regional Centre
IAEA	International Atomic Energy Agency
ICDF	Taiwan International Cooperation and Development Fund (TTM Taiwan)
ICIPE	International Centre of Insect Physiology and Ecology
IPM	Integrated Pest Management
IRC	Islands Regional Centre
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
KIT	Kernel in Testa (Galip)
LAES	Lowlands Agricultural Experiment Station
LLG	Local Level Government
MRC	Momase Regional Centre
NAIC	National Agricultural Insect Collection
NARI	National Agricultural Research Institute
NAQIA	National Agricultural Quarantine Inspection Authority
NGO	Non-Government Organisation
NIP	Nut in Pulp
NIS	Nut in Shell
NISIT	National Institute of Standards & Industrial Technology
PGR	Plant Genetic Resources
PIP	Public Investment Program
PMNEC	Department of Prime Minister and National Executive Council
PPP	Public Private Partnership
PT	Pathogen Tested
RA	Result Area
R4D	Research for Development
SIP	Strategic Implementation Plan
SP	Sweetpotato
SRC	Southern Regional Centre
SRF	Strategy and Results Framework
SSS	Storage, Seed, Sprouting
TADEP	Transformative Agriculture & Enterprise Development Program
TOT	Training of Trainers

## Executive Summary

There has been good achievement of targeted outputs planned for 2024. Many of the currently implemented projects continue to be collaborative, involving international donors as well as government and non-government organisations. FAO through associated Plant Genetic resources projects, ACIAR as a donor and Australian institutions as partner organisations, and IAEA through inputs on laboratory support for food safety and plant breeding continue to dominate the current project portfolio. The groundwork has been established for collaboration with the International Rice Research Institute and the Jiangsu Academy of Agricultural Sciences in 2025.

NARI's research funding has not seen any real increases over the past 20 years to 2024, with an actual decline in relative terms. Research is a critical need in fulfilling the Government development plans to revitalise and take agriculture forward.

We have identified, imported, and begun assessment on a range of small machines to support the move to increasing mechanisation for commercialisation. For longer term sustainability, we are assessing a way forward with partners including TVET, Districts, and farmer groups. Taiwan ICDF are also supportive of the research and have committed to further support in 2025.

A major outcome for climate change resilience has been the ACIAR supported collaboration between NARI, Australian National University, and the PNG National Weather Service, in development of seasonal climate advisories to assist farmers with weather related risk and decisions. This is key to a climate smart approach to commercial farming of vegetables and arable crops.

The success of the Black Soldier Fly Larvae as a protein component of livestock and fish feed is now being extended for the equally beneficial outcomes with farm and urban organic waste management and organic fertiliser byproducts to the primary BSFL production.

The Galip nut value chain work has moved into its final stages with a Public Private Partnership arrangement established with a local startup, Frangipani Fresh Foods. Frangipani Fresh Foods and two other entrepreneurs have significantly progressed in 2024 to take the Galip marketing aspects forward. Following on from promising international response, NARI attention in 2024 was given to Galip Weevil management, alternative product development, and HACCP quality accreditation to take advantage of the export opportunities.

Research on Genetic Resources is a key area for NARI and PNG, mandated under the NARI Act, to ensure that agro-biodiversity through collections of valuable genetic plant and animal resources are not lost. As the national Focal point for the International Treaty on Plant Genetic Resources for Food and Agriculture, NARI is working with stakeholders to both protect PNG genetic resources and take advantage of international benefit sharing agreements. One supported project targeted on farm conservation and utilisation of sweetpotato for climate vulnerable farmers, successfully demonstrating how farmers can diversify and select more suitable varieties within their local environment.

Recruitment has been challenging, frustrating delivery on some of our aspirations. NARI has found it especially challenging to fill the Principal and Senior Scientist positions with experienced staff able to mentor and guide less experienced teams. These needs are highlighted in the NARI Strategic Implementation Plan 2022-2026. To address this need and supplement immediate recruitment, NARI has proposed a longer term investment, to build from the ground up, through establishment of a multidisciplinary cadet program to support effective research and development across the agriculture sector. This vision for developing this sustainable capacity builds on NARI's previous success in delivering a similar cadet program. Many of the leaders in the sector today have benefited either directly or indirectly from the early NARI cadet program.

## NARI 2024 achievement highlights

- Inaugural Agriculture Minister’s Seminar Series on Commercialisation of the agriculture sector was hosted at Bubia concurrently with the 2024 Agricultural Innovation Show.
- Privatisation of Galip Nut technology development with support for HACCP certification to facilitate export to Europe – going forward to strengthen the value chain, explore clonal propagation options, and identify the extent and location of Galip resource to focus development.
- Extension of BSFL research with collaborative proposal with ACIAR, ICIPE, UNITECH to initiate research into urban organic waste management and organic fertiliser byproducts to the primary BSFL production as a protein component of livestock feed. Paralleling this upcoming larger scale commercial research with development and promotion of a scalable farmer based approach supporting local feed and poultry, pigs and fish production.
- Digitisation of information resources: e-library, insect collection, plant disease database, soils database. Ongoing in 2025 with extension to data collection for agricultural production.
- Preparation for publication in 2025 of the research publication, *PNG Journal of Agriculture Forests and Fisheries* and the associated agriculture development publication, *Harvest*.
- Procurement of a range of small machines and trickle irrigation technology for assessment and development of scalable mechanised farming models for commercial productivity. Initiated contact for development of proposal for integration with TVET and opportunities under the ADB project.
- Maintained and strengthened plant genetic resource collections, digitisation of records and opportunities for benefit sharing. Meeting this week to strengthen the sector collaboration and way forward for management and benefit sharing from PGRFA.
- Privatisation of taro export dependent on the disease resistance of NARI developed varieties. Supported supply of taro planting material. Current stock of 7500 suckers. This to be extended in 2025 with mechanisation and irrigation models.
- Continued supply of foundation tissue culture material for the potato and sweetpotato commercial developments. Developed a new apical cutting technique for propagation of seed potato material. The cost savings to seed potato production will be assessed as this is released for scaling in 2025.
- Piloted distribution seasonal farm advisories via SMS and social media in cooperation with National Weather Service. The advisories provide an interpretation for farmers of NWS supplied seasonal weather forecasts as a tool for crop risk assessment. This is being assessed in 2025 for a cost effective way forward.
- With support from ACIAR and CABI, NARI progressed development of PNG capacity for plant diseases and disorders diagnosis through plant health clinics.

## Introduction

The *NARI Annual Report 2024* provides a review and assessment of the achievements of the Institute at different levels of operation against planned milestones, outputs and outcomes, as outlined in the *Annual Implementation Plan 2024* (AIP 2024). The AIP 2024 is the third annual plan to be based on the second *NARI Strategy and Results Framework 2022-2031* (SRF) and its subsidiary *NARI Strategic Implementation Plan 2022-2026* (SIP) which guides implementation for the first five year period of the SRF, from 2022 to 2026.

The Institute links well with the GoPNG priorities arising from the targeted development impacts of reduction of poverty, assurance of food and nutritional security and health and sustainable resources management as guided by the countries long-and medium-term development strategies. The three derived priorities of the Institute for the next 10 years for which the Institute will contribute to are:

**Priority 1:** Economic resilience and development by enhancing agricultural markets, value chains and trade.

**Priority 2:** Enhanced resilience of rural communities and systems in light of climate, economic and demographic changes and associated threats to livelihoods and the environment.

**Priority 3:** Enhanced consumption of healthy and sustainable diets by rural and urban households.

The Result Areas being targeted within the priority areas:

- |                                  |                             |
|----------------------------------|-----------------------------|
| 1. Fore sighting and Advocacy    | 5. Bio-security             |
| 2. Value Chain Support / Scaling | 6 Genetic Resources         |
| 3. Household resilience          | 7. Safe and nutritious Food |
| 4. Agro-ecosystem resilience     |                             |

For each of these areas there are key cross-cutting results to ensure appropriate delivery of research outputs and ensure a significant return on research investment:

- Gender, Youth and Social Inclusion (GESI)
- Communication for Change

All staff are required to develop and follow a personal annual implementation plan aligned with the overall NARI Strategic Implementation Plan. Overall, staff have become familiar with the new SIP. All staff personal implementation plans are monitored at the Centre level. The AIP 2024 was monitored through quarterly reports, and end of year review of the overall AIP 2024. It is the responsibility of centre management and support staff to manage resources and create an enabling environment for research to flourish. This is being addressed in the shorter term through recruitment and reporting adjustments, supported by the organisational restructure over the longer term. The assessment of the Institute needs for effective implementation is laid out in the *NARI Strategic Implementation Plan 2022-2026*.

Section 1 of this report covers the achievements for each of the priority areas with further explanations of implementation progress. The second section includes an assessment of the overall institutional progress and achievements.

The full table of achievements against the AIP 2024 for each Result Area and Institutional Management is provided in tables starting at: Priority 1 – Outputs in 2024 against Result Area Priorities in Result Areas 1 and 2

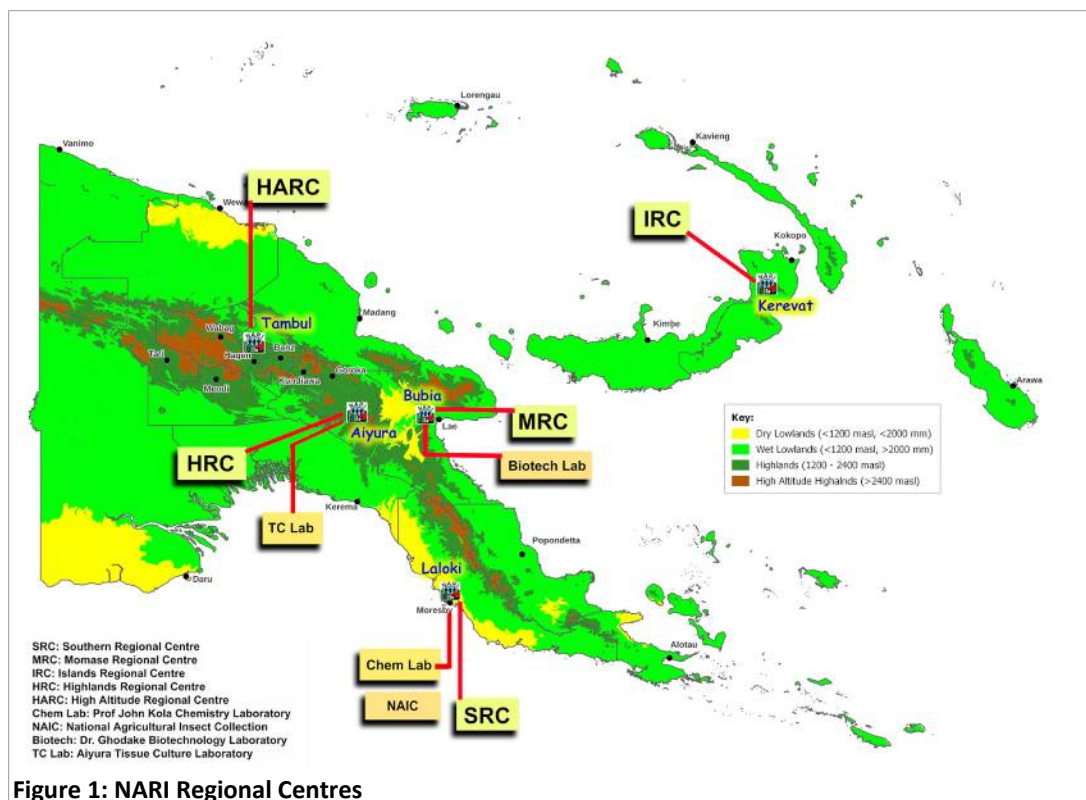


Figure 1: NARI Regional Centres

## NARI's Contribution to Economic Development

The food and industrial crop and livestock sector has an enormous potential to contribute to the PNG economy through commercial production and opportunities for downstream processing and subsidiary rural industry and employment. The value of investment in agricultural research is well recognised, not only research in improving the productivity of our agricultural producers, but to invest in research supporting the development of the midstream and downstream components of the sector. Agriculture can provide employment, not only on the farm, in the value chain, including in processing, and in support industries fabricating small machines, tools, packaging materials, and other farm inputs.

NARI is a key agency to drive the necessary innovation in technology and its enabling production and marketing environment. Over the 27 years since its establishment, NARI has contributed significantly towards the development of economic opportunities in the agriculture sector. Some highlights:

- Through its highland centres, NARI's research has developed effective strategies for the management of the Potato Late Blight epidemic that nearly wiped out the commercial potato industry. The research delivered integrated management packages using protectant fungicides and four new resistant



varieties that have enabled the industry to recover and grow, now contributing well over 20 Million Kina to the local economy.

- Similarly, sweetpotato yields had seriously declined with a build up of Pest and Diseases. NARI's introduction of the pathogen tested (PT) innovation has doubled the productivity of commercial sweetpotato varieties. This PT technology has been taken on by FPDA, commercial growers and is now also being scaled through Provincial Didiman Centres. Current estimated production of sweetpotato is around 4.6 Million tons with around 50,000 tons sold in markets from the Highlands alone translating into an approximate value of PGK 100 Million (average market price of K2/kg). Wider adoption of this technology will further improve productivity and economic returns to growers and value chain actors and enable value addition and downstream processing of sweetpotato in the food and livestock feed industries.
- The NARI managed Aiyura Tissue Culture Laboratory has led the PT research and continues to be the sole supplier of "clean" foundation planting material essential to both the commercial potato and sweetpotato industries. Research is ongoing with both new varieties and in propagation techniques to improve efficiency and reduce cost of seed material production.
- The NARI Chemistry Laboratory (*Professor John Kola Chemistry Laboratory*) is a modern laboratory, accredited through NISIT, and provides analytical services to the agricultural sector in soil, foliar, and water analysis. The laboratory is now moving to provide analytical capability for food safety and for contaminants that threaten our export commodities.
- Active research on key agricultural pests of economic importance e.g. Fall Army Worm, Diamond Back Moth, Sweetpotato weevil, Banana Wilt Phytoplasma. The sweetpotato weevil pheromone trap has proved an effective management tool for commercial production. While answers are not yet available for the new Banana wilt problem, NARI has developed the protocols for management through clean planting material.
- NARI's lowland centres released 8 improved Taro varieties resistant to the serious Taro Leaf Blight disease. The improved hybrids have a yield potential 100-200% higher than traditional varieties. Increased productivity results in significant increased returns to growers and other value chain actors and opens the door for further competitive export opportunities.
- NARI's rice research program has released 4 varieties for the lowland and 2 varieties from cooler highland environments. The rice variety NR 1 was grown by Rigo Rice, one of the few larger scale rice producers in the country, due to its superior performance and pest resistance in the PNG environment.
- NARI has developed productive livestock feeds using local feed sources, and mini feed mill technology as a low cost technology to support small poultry and pig producers. The feed diet technology has also been adopted by a larger commercial livestock feed producer. Current research is progressing well on developing a low cost protein source for feed using the Black Soldier Fly larvae.

This innovation also has application to the problem of urban organic waste disposal.

- NARI is the only institution in the country that invests and develops agricultural technologies and strategies for rural communities to gain greater resilience to the impacts of Global Climate Change. NARI is a lead partner in a current collaboration to linking seasonal climate forecasting to farm advisories. Technologies and strategies are aimed at maintaining agricultural food production during climate stress, to ensure that the country has a productive and healthy working force necessary to maintain and increase the national economy.
- NARI is mandated to manage the country's Genetic Resources for Food and Agriculture. NARI is the only institution maintaining seed stock of important agricultural (staple crops and vegetables) and horticultural (fruits and nuts) crops to supply to growers. Quality seed is an essential input for any commercial farming operation regardless of scale.

## Achievement of 2024 Implementation Plan

NARI currently has 31 on-going research activities/projects covering climate change, soils and fertiliser yield responses, crop protection, plant and livestock genetic resources, biotechnology, nutrition, and information development. Alongside the recurrent budget, this work has been made possible through financial support from the PNG Government's Public Investment Program (PIP), Australian Centre for International Agriculture Research (ACIAR), International Atomic Energy Agency (IAEA), and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). The key work areas for this reporting period are summarised as follows.

### Plant Genetic Resources

The management of genetic resources for agriculture is a mandated activity for NARI. NARI maintains collections at its regional centres (*Table 9: Number of accessions of different crops held in ex-situ collections at NARI Centres*). NARI had two projects in this area, through the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).



Figure 2: Irrigated taro at NARI Laloki

The Biodiversity for Opportunities, Livelihoods and Development (BOLD) Initiative, which promotes the conservation and use of crop diversity, supported NARI targeting on-farm conservation and utilisation of sweetpotato for climate vulnerable farmers. Nutritious sweetpotato varieties having orange, yellow, and purple flesh colours, with climate resilient

traits such as early maturity and drought tolerance were identified on-farm and are

now being adopted into the farming communities. Farmers were also introduced to poly cross techniques for as a tool develop diversity supporting climate resilience.

The ITPGRFA Benefit Sharing Fund supported the Institute's capacity to manage collections, which will also allow PNG to benefit from international access to its Plant Genetic Resources for Food and Agriculture (PGRFA). This involved establishment of a GRIN Global Community Edition (GGCE) database. Initially this database is restricted to in-country access. A trial upload was successful for 840 accessions of the PNG highlands and lowlands sweet potato collections.

More of the currently characterised germplasm is ready to be adopted into GRIN Global and GENESYS databases with GLIS document object identifiers (DOI) assigned. Under the project, in addition to sweetpotato, passport validation and characterisation was completed for cassava (10), yam (114) and aibika (13). 21 bananas and 7 winged-bean cultivars are in progress. Complementing the morphological datasets, proximate analysis was done for 10 selections of cassava, yam and banana, based on flesh colour, cultivar complexes (yam) and genomics differences (banana). The current PGR collections have been broadened with an additional 49-winged bean cultivars, 82 dasheen taro (*C. esculenta*), 1 eddoe taro (*C. antiquorum*), 1 elephant foot yam (*A. peanifolius*), and 23 yam cultivars (*D. alata*, *D. nummularia*, *D. esculenta*, and *D. bulbifera*).

The ongoing Galip nut development work has been another example of how research into an indigenous nut can lead to a commercial product with export potential.

The NARI/ACIAR collaborative research on Galip will finish in mid 2025. It has been a long but successful road coming to maturity with several PNG entrepreneurs now committed to taking the industry forward. While the industry now has a good



Figure 3: Cracking galip nuts



Figure 4: Galip product promotional displays by processors



foundation, NARI will continue providing research support on key identified gaps in value chain operations, clonal propagation, and galip weevil management.

Marita and Breadfruit are other under-utilised traditional crops with have scope for commercialisation. Breadfruit in particular is being targeted to also play a larger role in mitigating the impacts of climate change, especially in coastal and atoll island communities.



Figure 5: Breadfruit project launch

Using the shared NARI/CIC Tissue Culture Laboratory at the Highlands Research Centre in Aiyura in Eastern Highlands, NARI has continued to supply potato plantlets as the foundation material for the National Seed Potato Scheme. The laboratory plays an essential role in cleaning viruses from selected sweet potato varieties to provide foundation material for further multiplication by FPDA under the Pathogen Tested (PT) program. This work is the foundation for commercialisation of sweetpotato. Further research is currently ongoing at the Aiyura centre into alternative rapid multiplication techniques using apical cuttings to speed up and lower the cost for seed potato production. The first phase of this work has been completed, ready to move on to assessment for technology scaling.

## Mechanisation



Figure 6: Mechanised sweetpotato digger

The development of scalable mechanised farming models for productivity is a key input in the transition to commercial agricultural production for small farmers. For 2024, we focused on sourcing a number of small machines, and trickle irrigation technology, with impact potential in rice, root crops and downstream processing for livestock feed.

In this we have moved beyond the old style of focus for rice on land preparation and mills e.g. we have introduced a semi-automatic 6 row transplanter which can allow 3 people to plant a hectare in hours instead of 8 days. This releases labour for other tasks and ensures more uniform stands of rice for efficient management. We also introduced an inter-row weeder and simple

adapted brush cutters as a lower cost innovation for harvest. Three simple tools with potential to revolutionise small scale rice production.

Our challenge in 2025 is on taking this forward beyond machine testing and documentation of farming models to collaborative models of mechanisation sustainability.

## Innovation in Livestock Research

While we focus on agriculture, there is a critical need to address the poor human nutrition indicators for PNG, particularly protein deficiency in young children. NARI contribution to addressing this in 2024 involved a continuing project to develop sustainable livestock and aquaculture farming systems. In a move from reliance on commercial day-old chickens, community hatcheries using sustainable solar incubators will supply adapted poultry stock directly to the participating families while a commercial hatchery supplies them with quality breeding stock. The success and sustainability is being built on a strong foundation of research including building of family cohesion through the successful Family Farm Teams approach.

A key activity building from this has been incorporation of technology using Black Soldier Fly Larvae (BSFL) as a feed protein. The BSFL technology is an innovation with potential to be a catalyst for the adoption of mini feed mills for downstream feed processing.

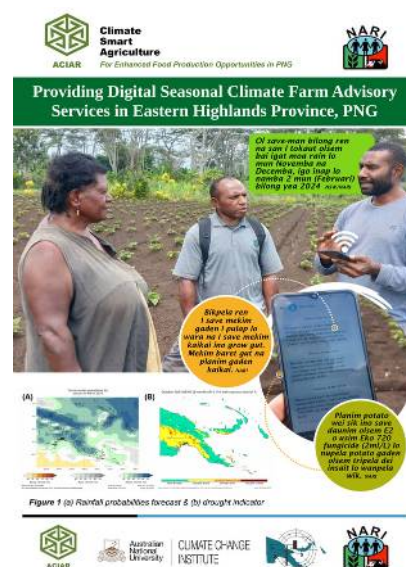
The use of the BSFL is not limited to providing a cheap source of protein, but also in waste management and organic fertiliser. Under some scenarios, particularly in urban areas, the role of BSFL in organic waste reduction producing high value organic manure, will outweigh its value as a feed. The technology across each of the outputs is scalable from backyard to industrial scale.



Figure 7: Black Soldier Fly Larvae

## Climate Change Preparedness and Mitigation

Climate change is an ongoing concern with early concerns in 2024 of a possible El Nino event. NARI is collaborating with the National Weather Service (NWS) and other PNG and Australian partners to develop an improved farm advisory and climate warning system based on seasonal climate forecasts. The NWS climate forecasts are currently available through the NARI web site. The pilot SMS service introduced in late 2023 was extended in 2024 in Eastern Highlands Province. The recipient feedback to date has been positive. NARI continued assistance to provinces to build their support for climate change resilience through training and



assisting to build provincial capacity to provide planting material and livestock in the event of such adverse events. NARI is currently assisting Eastern Highlands, Jiwaka, and Simbu Provinces to establish Provincial Didiman Centres as information, planting material, and breeding stock hubs to help in building resilience to climate change. Work has concentrated in the highland provinces with current focus following up on training workshops with supply of foundation planting material and establishment of poultry hatcheries for supply of adapted village chicken breeds. It is important for Districts to work with their provincial agriculture advisers to build this preparedness into their programs and budgets.

### **Digitisation of Information**

Information is a driver of innovation and agricultural development. While NARI has always been known for its strong information resources, the accessibility of this information for farmers and investors, and the underlying technical reports is being brought online through a publicly accessible web information database housed in the cloud. There is still a lot of work to be done but the foundation is already in place and NARI is actively digitising information resources with a further 480 full text records added in 2024. We are looking to accelerate this with additional short term staff in 2025.

NARI has been collaborating with both the Pacific Plant Health Clinic program (UOG / UQ / ACIAR) and the Centre for Agriculture and Bio sciences International (CABI) and other stakeholders in improving plant health diagnostics in PNG. The PlantwisePlus Program has progressed well in 2024, building to our capacity to face the challenges of plant health and other invasive species threats particularly under a changing climate, empowering all stakeholders in PNG including farmers to recognise and address biological threats. The data generated from these programs is being consolidated by

NARI and will provide a key research outcome on the presence of plant health problems and actions required.



**Figure 8: Staff cleaning specimens at NAIC**

The National Agricultural Insect Collection (NAIC) is a key service activity for insect pest identification. The collection holds 12800 insect specimens, but not all have been classified. Adding specimens to the NAIC database continues to be the main task.

Development of the online NAIC database has commenced with 3885 records added. The addition of photographs is delayed by as much time was taken in cleaning specimens damaged by poor storage. We have taken action to protect the collection from further deterioration as we should note though that the virtual database collection is primarily for ease of searching, it cannot replace the need for a physical collection.

The commitment by Governor for Morobe Province to partner with NARI through establishment of an Information Centre building at Bubia will give impetus to data collection and management, and provide a base to serve farmers and sector professionals, supporting information as a driver of innovation and development.



## Priority 1 – Outputs in 2024 against Result Area Priorities in Result Areas 1 and 2

Result Area/Targeted Output in SIP	Outputs from projects/studies to be delivered in 2024	Achievement
<b>Result Area 1 – Fore-sighting and Advocacy</b>		
Relevant databases on research investment, Agriculture Science and Technology Indicators (ASTI) and other information developed and maintained	ASTI Database established and awareness raised with stakeholders on regular data collection	Background information and methodology finalised. Database development and stakeholder survey deferred to 2025
<b>Result Area 2 – Value Chain Support – Value chain innovations for priority crops and livestock</b>		
Information and technology package on small scale commercial production of root, tuber and banana crops	Recommendations on soil management in SP systems in PNG Highlands released	Project completed 2024 – Recommendations included in final project report. To be extracted as separate publications.
	Extension Booklet on options of farm by-products as nutrient source in SP systems	
	Information on economic benefit of the use of locally available fertilisers in vegetables, corn and sweetpotato available	Study L10025 completed. Report to be submitted.
	Information on attainable yield for sweetpotato and banana varieties in demand in market places;	Study proposals approved for banana to be implemented at SRC. Deferred due staff availability
	Information on best-practice spacing for NARI Taro varieties	Study MRC/40337 – A study proposal has been approved and is being implemented; however lead researcher has left NARI. Study implementation at SRC for 2025.
	Targeted research interventions supporting commercial taro and rice production planned and resourced	Introduction of rice transplanter giving positive results. Agronomic taro interventions to be combined with mechanisation and irrigation assessment.
Gaps in availability of guidelines, protocols and systems for production of certified planting material of taro, sweetpotato, potato and banana addressed;	Protocols for Potato Rapid propagation technique available to stakeholders	Study HRC/A10227 completed, Technical report available
	Protocols for tissue culture propagation for 3 diploid banana types developed	Study B40325 -The work is progressing but slow; principal researcher has left the Institute;

	Quality taro planting material SOP	SOP document delayed
	Rapid taro propagation methods assessed for efficiency and cost	
Specific innovations in target value chains made available to actors in the value chains as part of scaling process	PT varieties produced and supplied according to demand;	NARI TC lab Aiyura (Technical Services)
	Quality Potato plantlets supplied as per agreement	
Result Area 2 – Value Chain Support – Galip value chain		
Commercial viability of business models for galip nut processing improved;	Financial analysis of operating cost at the factory and primary processing to factory gate;	IRC/K1006 – Most project activities completed - compilation and delivery of outputs deferred to 2025 with official project ending in June;
	Cost of production of nuts and various by-products	
	Options for use of by-products assessed	
Appropriate business models for micro-enterprises developed and capacity of operators increased;	financial analysis for female smallholders selling galip or from micro-enterprises	
	Training modules and learning materials appropriate for micro-enterprises and female smallholders for galip production and processing	
	Key factors that enable micro enterprises and female entrepreneurs to effectively participate in canarium value adding and processing	
Improved production technologies developed (harvesting practices, on-farm processing;	Information and protocol for effective and affordable off-station drying methods and protocols;	
	Harvesting system at different scales of operation;	
	Information on reproductive biology of trees and implications for tree improvement; development of a cropping calendar	
	Information on tree variability	
Information on management options and strategies for the Galip weevil	Information on Galip Weevil life cycle stages and protocols for in-vitro rearing of weevil;	
	Information on natural enemies of GW;	
	Information on population structure and vertical distribution maps of GW in infested trees;	
	Information on origin and dispersal of GW;	
	Information on alternative hosts of the GW;	
Suitable mechanisation options available for different scales of operation;	Information on efficiency, suitability of depulping methods and equipment for on-station and off-station processing;	
Advocacy and Awareness on Galip pro-	Media articles on areas of production, processing and marketing	

duction	in print and social media	
<b>Result Area 2 – Value Chain Support – Pork Value Chain</b>		
Effective research collaboration and networks between NARI and NAQIA on animal health & diseases.	Participation and contribution to African Swine Fever Task force	Completed
Capacity of selected smallholder farmers on improved production practices and animal Health & welfare management and production increased.	Information available on the impact of ASF in local household of Tambul District and disease areas	HARC/T20330 – delayed, funding withdrawn
	Maps documenting spatial distribution of ASF in the Mt. Giluwe LLG of Tambul based on epidemiological information	
Value chain mapping and key determinants influencing output across the value chain documented;	Improved understanding of status of the pork value chain and gaps in research (Literature review)	Not started – staff capacity
Demand & key requirements in production, processing and marketing to support niche markets for pork meat determined;	Information on the most cost-efficient feeding regimes for weaner and for grower-finisher pigs using different commercial feeds and blended diets based on local feeds available	Study completed, technical report delayed

## Priority 2 – Outputs in 2024 against Result Area Priorities in Result Areas 3 – 6

Result Area/Targeted Output in SIP	Outputs from projects/studies to be delivered in 2024	Achievement
<b>Result Area 3 – Household resilience – Climate Smart Solutions</b>		
Vulnerability and needs assessment information and maps	Needs of higher risk provinces in relation to preparedness to cope with climate induced stresses established;	Limited achievement – dedicated staff engaged for 2025
Diversified climate resilient portfolios of crop varieties and species as well as live-stock strategies and technologies adapted to climate risks available to stakeholders;	Information on promising NERICA rice varieties;	SRC/L10024 – Completed, Technical report available
	Information on use of BSFL as low cost protein source to supplement diets in village chicken	MRC/U10014 – preliminary work completed
	Improved wheat varieties identified for farmer assessment	HARC/T20333 – completed
	Land management Information Guides	HRC/A10228 – Field study ongoing
Relevant farm practices and strategies from production to marketing (e.g. soil fertility and moisture management, storage, on-farm processing, use of seasonal farm advisory) to mitigate risks to household resilience developed and adapted;	Crop calendars documented for selected areas in the country	HRC/IRC/MRC/B40329 – completed and being piloted in EHP through web, social media and SMS.
	Key crop advisories for NWS seasonal climate forecasts	

Scaling approaches applied for wider awareness and adoption on use of climate smart innovations in target areas;	Capacity of extension agents in vulnerable districts in climate smart use of agriculture production technologies and practices built;	HRC/MRC, A10228,B40329 – Training workshops conducted and ongoing support through active social media.
<b>Result Area 3 – Household resilience – Disaster Response</b>		
Sufficient quality planting material and breeding stock available as foundation material for rehabilitation after disaster events;	Key agricultural rehabilitation crops identified and processes in place for deployment in disaster situations;	Completed
Weather data available from all NARI Centres to stakeholders	Weather data captured from the AWS at all Centres and captured in central database	Data base records – some issues with network connectivity
	National Climate forecast information sharing platform;	MRC, HQ/B40329 – Available through NARI web site
<b>Result Area 4 – Agro-ecosystem resilience</b>		
No outputs planned for 2024		
<b>Result Area 5 – Bio-security – Management of Bio-security Threats</b>		
Fall Army Worm Management Package and associated information available and capacity built for use by different stakeholders;	Information on FAW baseline sensitivity for pesticides used in control and efficacy under lab conditions;	HRC/A10225 – in progress
	Information on presence and identity of FAW natural enemies in selected areas in PNG	
Additional environmentally safe options available to vegetable producers for effective management of Diamond-back moth;	Information on Diamond Back moth baseline sensitivity for novel insecticides (BT and others) and information on efficacy of two best performing insecticides;	HRC/A10225 – not completed
Effective management strategies of Banana-associated Phytoplasma in affected areas in Morobe and Madang;	Information on spread of BWAP in the Markham Valley;	MRC/B40323 – Project activities completed, final report to be submitted
	Information on vectors involved with transmission of BWAP in the Markham Valley	
Relevant information on other pest and disease management issues	Management strategies for ascites in broiler chicken in the Highlands of PNG	HARC/T20331 – completed
<b>Result Area 5 – Bio-security – Bio-security Preparedness</b>		
Contribution to data bases developed for pest alert and incursion threats by NAQIA for stakeholder advise and planning.	Specimen in the NAIC maintained and 500 specimen digitised in an electronic database;	Focus in 2024 on cleaning mould infestation due to continuous power cuts – 6150,(50%) cleaned. 3373 records in on-line database.
	Access to CABI PlantWise on-line resources integrated in NARI online resources	Records not yet available from plant clinics. Scheduled for 2025
Pest & Disease diagnostic capacity in-	Plant Doctor training conducted for NARI and other NARS	Completed as scheduled

creased in supporting the sector;	staff and applied in pilot Plant Clinics	
<b>Result Area 6 – Genetic Resources – Genetic Resources Management</b>		
A pilot in-situ conservation approach to sweetpotato genetic resources is tested in four districts;	<i>In-situ</i> conservation training manual developed; <i>In-situ</i> conservation training conducted in 4 communities;	SRC/B40333 – completed
Sweetpotato cultivars characterised, phenotyped, evaluated, documented, pre-bred for traits of importance to adaptation and resilience;	Sweetpotato cultivars in national collections characterised and phenotyped;	MRC, SRC/B40333 – 840 characterised accessions uploaded to database with DOIs allocated. - Genesys/GLIS records
Information on GRFA is available to stakeholders in PNG and international community;	Sweetpotato PGR information captured in a local database and kept current capturing all PGR kept in ex-situ collections at NARI stations;	
	Information on sweetpotato accessions held in NARI <i>ex-situ</i> , incl new breeding lines, added to database and assigned DOIs from upload into Genesys/GLIS;	
	Fact sheets on poultry breeds kept at NARI	
	Information on morphological descriptors and characterisation data available for current taro, yam, cassava, aibika collections	
	GRIN-Global PGR information system installed and operating in NARI	MRC, SRC, HRC/B40336 – system established
New PGR collections established and current collections expanded	New accessions for taro, yam and winged bean collected from Madang, Simbu, WHP, Jiwaka	MRC, SRC, HRC/B40336 – completed
	Breadfruit collection expanded and characterisation data established	SRC, MRC, IRC/L10031 – in progress
	Kava genetic resources collected and chemically characterised	Deferred
Germplasm of root and tuber crops, fruits and nuts, rice, wheat, maize, OP vegetable seed, spices maintained for further research and development purposes with minimum losses;	All PGR collections in NARI are documented with basic passport data and other pre-breeding information as available;	Records in the database; fields labelled but maps yet to be finalised
	all PGR collections are numbered with respective accessions numbers in the field and field plans available;	
	Seeds of 550-600 SP accessions stored at Svalbard Vault;	A10232 – completed
Breeding stock of village chicken, cross-breeds, ducks, goats and pigs maintained at NARI centres;	Data base of livestock GR set up;	Database deferred, Characterisation of village chicken ecotypes in progress
	Chicken and duck breeds characterised;	

Management of international GRFA Agreements and conventions (ITPGRFA and CPGR FAO)	Annual report on status of PGR collections in PNG submitted to CPGR FAO against SDG indicators;	Compliance reports; meeting minutes; SMTA records
	SMTAs signed for supply of PGRFA to external collaborators;	
	PNG representation in regional and international PGRFA working groups and networks;	Participation as scheduled
	Dialogue established with CEPA, DAL and other stakeholders on management of international agreements and treaties through domestic policies and legislation;	Stakeholder meet scheduled for Q1 2025
	Stakeholder Consultations for Seed policy development facilitated and relevant information and contributions made to NDAL	Draft Seed policy in progress
<b>Result Area 6 – Genetic Resources – Genetic Resources Use and Access</b>		
Locally adapted sweetpotato varieties (early maturing, drought tolerant, purple and orange fleshed) bred with farmers' participation;	Farmer preferred SP landraces from the NARI SP collections	MRC, HRC, SRC/B40333 – completed
	Workshops conducted in 4 sites and shared learning on breeding of sweetpotato using poly cross;	
Seed systems enhanced to promote adapted sweetpotato varieties and other crops;	New sweetpotato varieties introduced to target communities;	MRC, HRC, SRC/B40333 – completed
	Increased knowledge on quality planting material of sweetpotato by target communities;	
Improved rice and corn varieties released;	64 introduced rice varieties assessed and most promising accessions identified for on-farm trials;	MRC/B402328 – phase 1 completed
Standard operating procedures operating in all NARI centres for production of foundation crop planting materials and breeding stock;	Standard operating procedures for PGR collection maintenance and seed production	SOP document in progress
Facilities, equipment and infrastructure in place for production and post harvest processing and safe storage of seed and planting material at NARI centres	Multipurpose shed incl seed processing set up at MRC	Contractor delays
	Facilities at NARI MRC and SRC upgraded with irrigation facilities (all centres), screen houses (HRC, HARC, IRC)	In progress
	Seed handling system at HARC, HRC, MRC SRC IRC	Deferred, waiting on completion of construction
Established nurseries and bud-wood trees for new introductions and domesticated fruit and nut crops with commercial potential.	Priority fruit and nut trees for supply to stakeholders identified and sources of planting material supply identified	Deferred to 2025



	Nursery infrastructure established or improved	Deferred to 2025
Facilities, equipment and infrastructure in place for improved supply of poultry breeding stock at NARI Centres;	2 breeding sheds and hatchery set up at MRC	MRC/U10015 – completed
	Equipment for Centre hatcheries SRC, IRC, MRC, HARC hatchery capacity – incubators, power backup	

### Priority 3 – Outputs in 2024 against Result Area Priorities in Result Area 7

Result Area/Targeted Output in SIP	Outputs from projects/studies to be delivered in 2023	Achievement
<b>Result Area 7 – Nutritious Food and Health – Improved Diets</b>		
Improved capacity of households to practice sustainable village poultry farming and other appropriate livestock systems in target communities and districts;	RDO and poultry production unit operators in target sites skilled to operate rural hatcheries	MRC/U10015 – completed
	RDOs in target sites skilled in delivery of poultry production training;	
	Rural hatchery units upgraded and operational in target districts	
Enhanced active involvement in households and community on equitable use and consumption of livestock and fish products from village poultry or other livestock/aquaculture systems;	Family Teams in 2 target sites in Momase formed and supported with building social and economic development skills and awareness on balanced diets	MRC/U10015 – activity cancelled
	On-farm participatory research interventions in place enhancing technology transfer and adoption of improved livestock management practices in 2x target sites	MRC/U10015 – training workshop and stock supplied
<b>Result Area 7 – Nutritious Food and Health – Advocacy on safe and nutritious food</b>		
Information materials produced and disseminated on nutritional properties of crop and livestock products	Information materials developed	MRC/ U10015 – incomplete

### Outputs in 2024 in Cross-cutting Areas

Result Area/Targeted Output in SIP	Outputs from projects/studies to be delivered in 2024	Achievements
<b>2.4.1 Scaling of outcomes and impacts of R4D innovations</b>		
Inclusive and equitable partnership models and improved institutional arrangements for scaling of research outputs and providing sustainable support to target value		

chains, vulnerable communities and other target beneficiaries;		
Operational provincial didiman centres with selected provinces for climate change adaptation support		A10230 – operating with active social media network
Documented models for mechanisation of agricultural SMEs from research and partnerships	Suitable small scale farm machinery identified and sourced	Phase 1 machinery sourced
	Machine operators trained in use of rice equipment	In progress
Technical feasibility and commercial viability of research outputs determined;	Commercial viability of business models for galip nut processing improved;	IRC/K1006 in progress, to be delivered with final project report
	Key scaling factors for taro and rice commercialisation identified and actioned on	Actions taken on planting material availability and procurement of mechanisation options for testing
Systems and processes in place for up-scaling of supply of planting material and breeding stock;	Provincial administration and relevant stakeholders are engaged to manage and promote sustainable farming of village poultry, fish and goats at households in selected communities;	MRC/U10015 – Training workshop conducted at MRC, and site demonstrations established at 2 sites
	Provincial administration and relevant stakeholders are engaged to support resilient farming in selected higher risk provinces	HRC, HARC/A10230, A10228 – Stock, planting material, training, and active social media supporting provincial actions
Innovative learning approaches and activities in knowledge transfer and information access to reach rural communities in ADDs developed and applied;	Mobile app for information dissemination developed and launched;	Sample App developed – launch deferred
	TOT modules incl suit of learning materials fully developed for 5 modules	Training manuals developed
Events organised enabling exchange and sharing of insights into lessons learnt from R4D interventions among stakeholders and policy makers;	Annual Innovation Show 2024	AIS 2024 conducted Participation in shows for Morobe, Port Moresby, Goroka, IRC/World Food Day
	Participation in regional shows and exhibitions (Goroka Show, Morobe Show, World Food Day etc.)	
Stakeholders supported with efficient and affordable diagnostic and analytical services;	Increase numbers of sample submission and analysis compared to previous year (2023)	In progress
	Capability of the lab increased with testing capacity for EtO and Vanillin established	Proposal with EU-STREIT in progress
	Tissue Culture potato delivery targets met	Targets met as scheduled
	Digital database of agriculturally important insects in the NAIC established and physical records digitised as per work plan targets	Online database in place
<b>2.4.2 Gender, Youth and Social Inclusion</b>		

Information access takes into account education and literacy (basic and technical literacy such as use of ICT) / client friendly design	Examples of learning materials for farmer level learning are suitable for learning by groups with low literacy	Sample app with synchronised voice developed, suitable for agricultural based literacy work.
<b>2.4.3 Communication for Change</b>		
GIS databases and applications	Updated ADD GIS	ADD maps updated
	Revitalised PNGRIS2 delivers to users.	HQ, HRC/B40215
Scientific, technical and general information accessible from on-line and other media platforms;	Increased number of records available through Online platform to the information database	488 new full text records added
	Ongoing updating and increased access of stakeholders to records in the National Agricultural Information System;	Site awareness promoted
	Increased networking and contributions from NARS partners to the Information Database	Digital records from across the sector being added
Internal Information system with on-line databases on research management, Finance, HT and Assets management	HT leave management system database operating;	HR leave database framework completed
	Functions in the Research management database expanded to online reporting system;	Research management data available online
	Assets Management database operating;	System operating online

## Outputs in Result Areas addressing Institutional Efficiency and Effectiveness

Result Area/Targeted Output in SIP	Milestones in addressing critical areas in Institutional Management and Development	Achievement
<b>3.1 Results-based Management</b>		
Annual reporting	Annual report 2023	Annual report for 2023 submitted Q1 2024
Annual Corporate Implementation Plan	Annual Corporate Implementation Plan 2025 endorsed by Council in the last meeting;	AIP for 2025 endorsed by Council
Institute M&E system – Stage I Basic capacity for M&E at project level	Capacity building module for basic project M&E for NARI staff developed	Draft module available
<b>3.2 Resourcing the Institute</b>		
<b>3.2.1 Advocacy and Visibility</b>		
Avenues for increased level of advocacy and dialogue at policy level created	Advocacy, partners and policy related networking strategy;	
	Public Relation Officer established	Position advertised, recruitment delayed
NARI achievements presented in diverse media and its profile raised	Media articles (Radio, TV, Newspaper,);	As scheduled

	Video clips; Social media posts; Press releases reporting on NARI key activities	As scheduled
	NARI Overview Video revised	Preliminary update as powerpoint
3.2.2 Diversifying Funding Sources		
Annual cash flow plans for internal revenue activities completed and implemented	Annual revenue targets met as per Business plan	Deferred for uptake by NEL
Chemistry laboratory Business plan developed	Business Plan developed that shows increasing level of cost coverage / decreasing operational subsidy by NARI recurrent	Deferred for uptake by NEL
NARI centre management structure and systems adjusted for improved delivery on assigned functions including revenue generation	Restructuring plan submitted to Council	Plan submitted and approved
Active engagement with GoPNG and donors result in annual award of diverse research for development grants and funding support	new proposals submitted to donors	Engagement with donors
	engagement with ACIAR and DFAT for new project(s)	
3.2.3 Investing in Human Talents		
Human Talent Management and Development Strategy (HTMDS) developed	Restructuring plan approved by SCMC and requirements incorporated in 2025 Budget submission	relevant council submissions;
	Review and revisions to position designations, career path progression completed and submitted to Council for endorsement;	submissions to DPM and SCMC
	Training plan established and implemented for NARI staff in all categories;	Draft training plan submitted to HR committee
Performance based Appraisal system operating	Staff Annual Work plans submitted through rank and file by set deadlines;	Annual work plan and PDR system implemented
	Annual PDR review time table implemented	
On-line HT Management system operating	Leave management system operating	Database in place, base records being updated by HR
Cadetship Program operating	Cadetship Program fully scoped with resource requirements;	Cadetship proposal submitted
3.2.4 Management of financial and material resources		
Finance management system in NARI improved with online access to reporting and project management information	New Accounting Software operational across NARI Centres;	Consultant engaged to manage transition for commencement with 2025

Medium-term assets and facility management and development plan developed and annual targets met	Online fixed assets management register	Operating online
	NARI land use mapping and zoning plan developed	In progress, GIS map in place for centres
	Field research area mapped, demarcated and land use history database developed in all Regional Centres	In progress for finalisation in 2025
	Infrastructure Development Strategy and Implementation Plan for NARI Centres developed and implemented	In progress
NARI land resources secured with title and ownership ascertained	6 portions of land at HRC to get titles and secure	Land title document, Council minutes
Key Infrastructure improvements	3 new Staff houses completed in MRC and SRC and substantial R&M at IRC completed	completed
	Multipurpose buildings at MRC completed	80% complete – lab section to be completed
	Laboratory infrastructure at SRC upgraded	In progress, scheduled complete Q1 2025
	other key Research Infrastructure activities as per PIP 2024 plan completed;	70% complete – budget shortfall for 20%
<b>3.3 Governance, Policies, Processes</b>		
Revised Organisational Structure at corporate level and regional centres in place	Restructuring plan implemented	Proposed restructure submitted to DPM
HT Management policies updated or developed	All current policies updated	Not implemented
	Occupational Health and Safety Policy developed	
Financial Management and procurement policies and processes updated	Financial Management standard updated and submitted for endorsement by Council	Deferred until new software transition completed
IT management policy developed	Policy developed and submitted to Council for endorsement	In progress for internal review

## Institution Management and Services

### Finance management, sources and trends

Agricultural research spending continues to decline. The actual value of recurrent funding has not increased over the past 20 years, with inadequate funding to improve or even maintain facilities, equipment (scientific, tractors, implements) etc. There is insufficient funding to increase staff strength in relevant disciplines with necessary competencies in research to deliver along the impact pathway. This needs to change to allow PNG to reap the benefits from research investment.

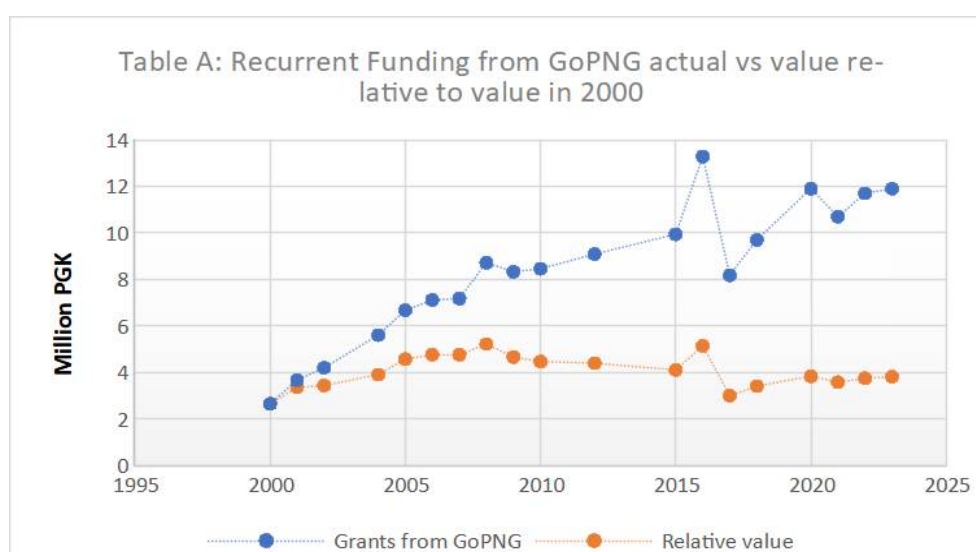


Figure 9: Funding in relative value decline

The GoPNG **Recurrent Budget** allocated to NARI for 2024 decreased in real terms despite an increase from the K11.9m allocation in 2023 to K14.46m in 2024. The 2024 recurrent budget allocation was still far short of the budget estimate of K17.5m requested.

The changes in funding allocations by source for 2022 to 2024 are illustrated below.

Table 1: Sources of Funds (millions)

Funding Source	2022	2023	2024
Grants from GoPNG – Recurrent	11.66	11.9	<b>14.46</b>
Grants from GoPNG – PIP	1	7.5	<b>8.5</b>
Collaborative projects	0.53	1.2	<b>0.66</b>
Cost recovery from sales & services	5.28	2.85	<b>3.88</b>



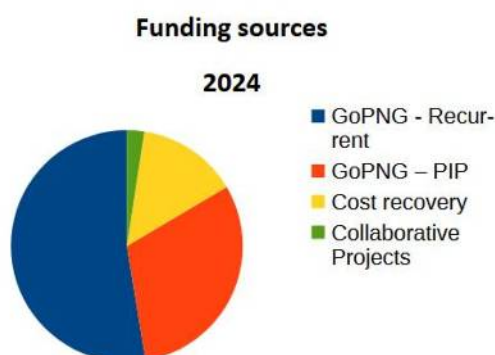


Figure 10: Funding sources 2024

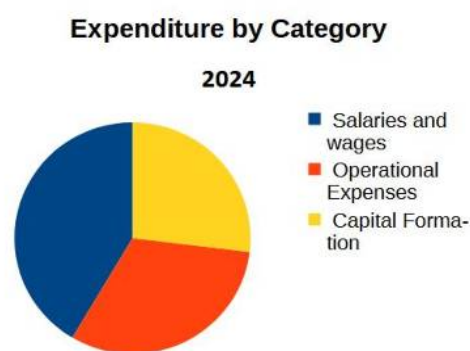


Figure 11: Expense categories 2024

The Institute's detailed funding and expenditure statement for the year ending December 2024 is given in Annex 4: Income and Expenditure 2024. While salaries and wages continue to take around sixty percent (60%) of the total GoPNG grant, this remains far short of the amount required to recruit the staff needed, and unfortunately limits delivery of impacts from research. NARI maintained its staff level in 2024, but while K16.32m was requested for a minimal staffing requirement, the K11.4m allocation only allowed limited recruitment of replacement staff. There is an immediate need to recruit at least 33 senior technical and research staff who can deliver on immediate priorities, and also lead and mentor new graduate recruits.

Table 2: Expenditure: 2022-2024 (K million)

Expenditure Category	2022	2023	2024
Salaries and wages	10.27	11.31	<b>11.40</b>
Operational Expenses	6.69	8.40	<b>8.68</b>
Capital Formation	1.04	2.65	<b>7.40</b>

#### ***Challenges for operational expenditure***

- There is a shortfall of K3.0m required for utilities and routine maintenance
- NARI is regionally spread with substantial infrastructure over six locations.
- Power expenses under funded given current cost of electricity and generator fuel for constant blackouts and risk of loss of research materials.
- ICT is an essential tool for NARI as a knowledge institution and essential for effective communication within the organisation and external stakeholders; ICT cost alone is in excess of PGK 400,000;

- Maintenance needs are high with more than 300 residential and operational buildings with current book value of K32m. Many of these buildings require significant maintenance due to age, dating per-NARI establishment in 1996.
- 200 staff residences overdue for maintenance. As a starter, K0.5m was budgeted for scheduled routine maintenance of 20 houses. A further K0.75m for operations buildings. K1.25m for centre water supplies as they are in locations not serviced by Water PNG.
- End of Life replacements – Office Equipment, Furniture, & Fittings, tractors, farm equipment, vehicles; e.g. of 30 operational vehicles, 12 vehicles more than 10 years old have reached their economic life. 8 vehicles scheduled for replacement in 2024.

The Institute continues to manage its expenditure under strict financial management procedures and protocols. 2024 saw the introduction of improved software supporting expenditure and fixed asset management. All financial transactions in NARI are subject to annual audit by the Auditor General's Office. The Institute has always maintained a good audit record since its establishment in 1997. The 2023 audit is near complete at time of writing, with the 2024 accounts ready for audit following the receipt of the 2023 audit report.



**Figure 12: JAAS team visit MRC**

## **Appendix**

## Annex 1: Alignment with MTDP IV Planning Framework

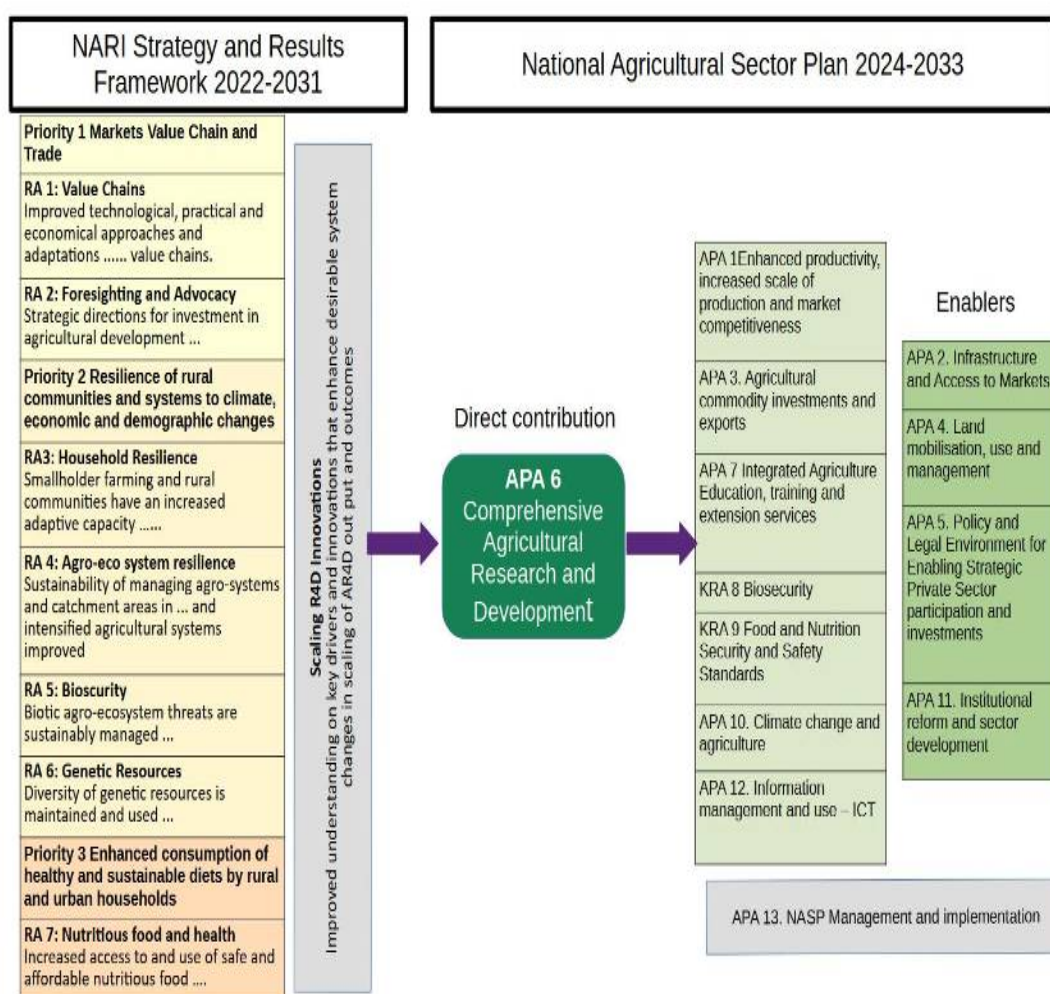
The following summary alignment of NARI priorities with the MTDP IV framework

DIP Reference	MTDP IV Investment Programs	Sector Aligned Investment Programs/Projects	Implementing Agency	Location	MTDP IV Funding Estimates (K'mill)				Total Cost(K'mill)	Funding Sources
					2024	2025	2026	2027		
1.1,1.5, 1.11, 9.3	National Agriculture Development Program	1. Scaling for agricultural SME production and commercial value-added products	NARI/DAL/Commodity boards	National	14.7	10.0	8.2	7.2	40.1	GoPNG
	Fresh Produce Development Program									
	Agriculture Research									
1.1	Rice Development Program	2. Value chain innovations supporting the scaling of rice production in the country	NARI/DAL	HRC, IRC, SRC, MRC		2	2	2	6	GoPNG
1.1, 1.11	National Livestock Development Program	3. Stakeholder access to and supply with quality improved small livestock breeds (village chicken, ducks, goats, Honey bees) and breeding stock improved	NARI/DAL/LDC	HARC, IRC, MRC, SRC		4	4	4	12	GoPNG
1.1, 1.11	Spice Development Program	4. Increased access to improved varieties and planting material and production methods of priority spices supporting value chain development	NARI/DAL/Spice Board	IRC, MRC, SRC		1.5	0.5	0.5	2.5	GoPNG
9.2	Environment & Bio-science Research Support Program	5. Exploration, conservation and use of diversity of PNG Genetic resources for Food and Agriculture	NARI/Prov. Govt/CEPA	National		2.5	1	1	4.5	GoPNG
9.3 and 9.6	Agriculture and Food Security Research Support Program	6. Equipping and positioning NARI to better deliver research results for PNG economic and development outcomes	NARI	National	2	2				PIP
		7. Building Agriculture research	NARI and	National	10	8	6	6	30	GoPNG

		capacity through National the Cadetship program	NARS							
9.5	Socio Economic Policy Research Support Program	8. Increased capacity for delivering policy recommendations on agricultural investment strategies and economic feasibility of fresh, processed and non-food agricultural production at different scales	NARI			2	2	2	6	GoPNG/Donors
9.6	Food Security	9. Smallholder farming and rural communities have an increased adaptive capacity to cope with climate change	NARI and partners	National		2	2	2	6	GoPNG
		10. Sustainable poultry, aquaculture and goat farming for economic and nutritional well-being of rural communities throughout PNG	NARI and selected Districts	Madang and Morobe	2	2	2	2	8	PIP

## Annex 2: Alignment with the National Agricultural Sector Plan 2024-2033

The National Agricultural Sector Plan 2024 – 2033 was launched in 2024 and since provides the guidance to NARI and other sector agencies on agricultural research for development. NARI has embraced the clear direction to support the envisaged shift towards market-driven commercial agriculture. While the NARI SRF 2022-2031 was developed before the NASP was completed, the SRF and SIP are well aligned with the medium-term sector strategies outlined in the NASP as illustrated in Figure 13: Contribution of the NARI Strategy and Results Framework.



**Figure 13: Contribution of the NARI Strategy and Results Framework**

NARI will contribute to the achievement of NASP objectives and strategies with innovations arising from research interventions addressing the needs, constraints and opportunities of farming communities and other stakeholders in the wider AR4D system. The contribution will be captured and coordinated through the NASP Agricultural Priority Area 6 Comprehensive Agricultural Research and Development.

The alignment is clearly shown in the following illustration of the *Contribution to the long-term vision, mission and objectives of the National Agricultural Sector Plan*.



## Contribution to the long-term vision, mission and objectives of the National Agricultural Sector Plan

NARI SRF 2022-2031	NASP 2024-2033
<p>NARI Vision</p> <p><i>Prosperous PNG Agricultural Communities</i></p>	<p>NASP Vision</p> <p><i>Empowered healthy and prosperous agricultural communities in a food secure Papua New Guinea</i></p>
<p>NARI Mission</p> <p><i>Promoting innovative agricultural development in PNG through scientific research, knowledge creation and information sharing</i></p>	<p>NASP Mission</p> <p><i>Transform PNG's Agriculture through Productive Partnerships, Innovation and Sustainable Entrepreneurial Farming Systems and Value Chains</i></p>
<p>NARI Strategic Objective</p> <p><i>Enhanced productivity, efficiency, stability and sustainability of the smallholder agriculture sector</i></p>	<p>NASP Goal</p> <p><i>To stimulate growth in the agriculture sector</i></p>
<p>Targeted Development outcomes</p> <p><i>Increased incomes and employment in rural areas arising from increased economic activities and business development</i></p> <p><i>Enhanced stability and resilience of livelihood systems of rural households and communities</i></p> <p><i>Production, productivity and efficiency of crop and livestock products increased and producers better linked to profitable markets at scale</i></p> <p><i>Rural and urban households consuming healthy balanced and nutritious diets</i></p> <p><i>Improved standards in Food and Feed safety in agricultural production and food/feed use are applied</i></p> <p><i>Enhanced and equitable benefits from agree-ecosystem goods and services</i></p> <p><i>Agricultural production systems are sustainably managed under changing climates and macroeconomic drivers</i></p>	<p>Targeted Development outcomes</p> <p><i>To improve food security, nutrition and health</i></p> <p><i>To increase income earning opportunities for population dependent on agriculture</i></p> <p><i>To reduce imports of food, rice and grains, meat and poultry and increase exports</i></p> <p><i>To improve agriculture sector performance through effective coordination between all agencies at all levels</i></p> <p><i>To create employment opportunities for all, including youth and women in PNG</i></p> <p><i>To improve the quality of population in rural villages and transform into economically vibrant communities</i></p>

## Annex 3: Research Activity

**Table 3: Continuing Projects and studies**

No	Project Code No.	Name of Project/Study	Project Leader and team	Funding body
1	A10224	Agro-morphological Characterisation of PNG Highlands Sweetpotato Germplasm for Establishment of Core Collection and their Conservation	Boney Wera	NARI Research fund
2	A10225	Responding to emerging pest and disease threats to horticulture in the Pacific islands – HORT/2016/185	Robert Geno	ACIAR 2016/185
3	A10226	Sustaining soil fertility in support of intensification of sweetpotato cropping systems Phase II – ACIAR SMCN 2012/105	William Sirabis/ Tai Kui	ACIAR SLAM/2017/041
4	A10230	PNG Preparedness to Cope with Climate Change induced Stresses (Drought (frosts), Excess Moisture and Salinity)	Johannes/ Stanley	PIP R&D
5	A10232	Regeneration, Conservation and Safety Duplication of Papua New Guinea Sweetpotato Germplasm Collection through Botanical Seeds at the Svalbard Global Seed Vault	Boney Wera	BOLD/Crop Trust
6	A10237	Growth response of pathogen-tested sweetpotato cultivars to Nitrogen application methods in highlands agro-ecological zones of Papua New Guinea	William Sirabis/Floyd Simo	APSF
7	B40328	On-station evaluation and selection of suitable 64 new rice varieties in PNG	Charlie Suruban	NARI Research fund
8	B40323	Investigation into Banana Wilt Associated Phytoplasma in the Markham valley	Gou Rauka	NARI/PIP funds
9	B40325	Banana (Musa sp) and Sweet potato in-vitro mutagenesis in Papua New Guinea	Joel Pilon	IAEA/NARI Research Fund
10	B40329	Climate Smart Agriculture opportunities for enhanced food production in PNG	Ruth Baiga	ACIAR ASEM/2017/026
11	B40336	Upgrading National Gene banks in the Global System	Jeffrey Waki	Bioversity International

No	Project Code No.	Name of Project/Study	Project Leader and team	Funding body
12	B40337	Determination of optimum plant spacing of taro cultivars	Charlie Suruban	Funded from R4D funds
13	HQ40214	Equipping and positioning NARI to better deliver research results for PNG economic and development outcomes	Thomas Omot	PIP Infrastructure
14	HQ40215	Better soil and land information for improving PNG's agricultural production and integrated land use planning - building a revitalised PNGRIS2	Mark Tinah	ACIAR
15	K10006	Enhancing private sector- led development of the canarium industry in PNG (Phase II)	Godfrey Hannel	ACIAR FST/2017/038
16	K10007	Behavioural response of galip weevil to host-plant volatiles	Jacob Yombai	Funded under ACIAR Galip Project
17	K10008	Characterising productivity of village chicken eco-types under free-range semi-intensive and intensive management systems in Kerevat, Papua New Guinea	Fred Besari	Funded under R4D funds
18	K10009	Testing bio-conversion efficiency of Black Soldier Fly ( <i>Hermetia illucens</i> ) Larvae on Galip ( <i>Canarium indicum</i> ) pulp and cocoa ( <i>Theobroma cacao</i> L.) Pod Husk under Tropical Lowland Islands Region	Fred Besari & Jacob Yombai	PIP R&D Livestock Component
19	L10025	Assessing the effectiveness of Grow Hariap Foliar Fertiliser (GHFF) in managing crop productivity relative to conventional fertiliser practices.	Philmah Seta-Waken	NARI Research fund
20	L10031	Raising the profile of breadfruit production in coastal and island food systems in PNG	Philmah Waken	Funded under FAO benefit sharing fund
21	L10032	Yield data evaluation of common kalapua bananas grown in the Central Province	Dickson Benny	Funded under PIP R&D Technologies)
22	L10033	Yield and agronomic data evaluation of taro, sweetpotato, cassava and corn grown and distributed at NARI the Southern Regional Centre, Central Province	Dickson Benny	Funded under PIP R&D
23	L10034	Evaluation of less-labour intensive yam propagation techniques with improved	Philmah Waken	Funded under PIP R&D

No	Project Code No.	Name of Project/Study	Project Leader and team	Funding body
		agronomic practices for high yield production		
24	L10035	Amaranth diversity evaluation of agronomic traits (Phenotyping) in Laloki conditions	Philmah Waken & Joseph Siwer	To be funded from PIP R&D
25	T20330	Investigating the epidemiology and economic impact of the African Swine Fever (ASF) in Tambul, WHP	Stanley Amben	NARI Research fund
26	T20331	Strategies to alleviate ascites in broiler chicken production in the high-altitude areas of Papua New Guinea (PNG).	J. Ahizo	NARI Research fund
27	T20332	Assessing the baseline productivity of native chickens from different ecotypes adapted to highlands conditions	Jeremiah Ahizo	Funded under R4D funds
28	T20333	Assessing the growth, yield performance and other traits of the promising Wheat cultivars on-station at Tambul and Aiyura research centres	Stanley Amben	Funded under PIP R&D
29	U10013	Optimum switch over time from starter to finisher for two broilers genotypes fed different commercial feeds	Elly Solomon	NARI Research fund
30	U10014	Rearing Black Soldier Fly Larvae (BSFL; <i>Hermetia illucens</i> ) as an alternative source of high protein from regenerating organic farm wastes into feed for fish and chickens (Project U10008: Phase 2)	A. Roberts	PIP R&D Livestock
31	U10015	Sustainable poultry, aquaculture and goat farming for economic and nutritional well being of rural communities in Morobe and Madang Provinces	Michael Dom/Janet Pandi	PIP R&D Livestock

## Annex 4: Income and Expenditure 2024

**Table 4: Income and Expenditure 2024 (Interim)<sup>1</sup>**

Description	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total 2024
<b>Income</b>					
GoPNG – Recurrent	2,457,104	4,441,013	1,399,992	6,165,458	14,463,567
GoPNG – PIP	0	3,500,000	5,000,000	0	8,500,000
Sales of Produce and Services	189,242	290,154	165,280	283,025	927,701
Assets Disposal	344,294	424,135	415,055	332,237	1,515,721
Donor Project – HR and Admin Contributions	0	25,380	395,512	242,907	663,799
Acquittal Reconciliations	345,110	614,652	345,680	126,173	1,431,615
<b>Total Funds Available</b>	<b>3,335,749</b>	<b>9,295,334</b>	<b>7,721,520</b>	<b>7,149,800</b>	<b>27,502,403</b>
<b>Expenditure</b>					
Salaries & Allowances	2,912,411	2,974,371	2,371,946	3,138,385	11,397,113
Travel Expenses	150,949	184,366	362,024	184,077	881,416
Office Materials & Supplies	49,976	74,335	38,116	42,219	204,646
Operational Materials/Supplies and Other Expense	518,035	1,773,198	941,326	993,617	4,226,177
Transport & Fuel	64,713	82,548	65,352	54,328	266,941
Administrative Consultancy Fee	2,000	0	0	66,600	68,600
Council	49,326	85,683	154,498	81,070	370,578
Legal	0	97,663	20,000	0	117,663
Security	94,069	56,952	84,570	109,386	344,977
Training costs	17,970	3,900	13,280	4,242	39,393
Medical Insurance	24,177	292,946	2,165	0	319,288
Electricity and Water	183,922	138,052	195,057	181,289	698,320
Information and Communications Technology	80,119	6,409	93,231	93,520	273,278
Membership Fee	26,314	28,876	3,630	25,051	83,871
Routine Maintenance	170,377	158,585	218,041	138,718	685,721
R&M Substantive	0	0	9,587	84,786	94,373
Furniture & Office Equipment	381,373	164,699	234,278	271,040	1,051,390
Purchase of Vehicles	224,059	574,886	0	0	798,945
Plant, Equipment & Machinery	396,931	790,597	97,924	234,302	1,519,754
Construction of Building, Fencing etc	1,626,902	905,356	661,856	835,935	4,030,049
<b>Total Expenditure</b>	<b>6,973,622</b>	<b>8,393,422</b>	<b>5,566,881</b>	<b>6,538,564</b>	<b>27,472,489</b>
<b>Net Surplus (Deficit)</b>	<b>(3,637,873)</b>	<b>901,912</b>	<b>2,154,640</b>	<b>611,235</b>	<b>29,914</b>

<sup>1</sup>The audited 2024 financial report was not available at time of printing the Annual Report 2024.

## Annex 5: Human Talent Status

**Table 5: Staff roles at 31st December 2024**

Distribution of Contract Staff as Per Various Categories													
Staff/ Category	Grade	Non-PNG Citiize	PNG Citiizen	Sub Total	HQ	HRC Aiyura	HRC Tambul	SRC Laloki	SRC Kilakila	MRC Bubia	IRC Keravat	Total	%
Executive	Ex 4	0	2	2	2	0	0	0	0	0	0	2	0.93%
Director/ Manager	10 – 12	2	3	5	5	0	0	0	0	0	0	5	4.63%
Research Coordinator	5 – 9	0	6	6	0	1	1	1	1	1	1	6	5.55%
Research staff	4 – 8	0	66	66	3	14	6	7	7	20	9	66	55.56%
Management Support Staff	2 – 7	0	30	30	22	1	1	2	1	1	2	29	33.33%
Cadets	0	0	0	0	0	0	0	0	0	0	0	0	0%
<b>Total Staff</b>		<b>2</b>	<b>107</b>	<b>109</b>	<b>32</b>	<b>16</b>	<b>8</b>	<b>10</b>	<b>9</b>	<b>22</b>	<b>12</b>	<b>109</b>	<b>100%</b>
Male				<b>66</b>								<b>66</b>	<b>60%</b>
Female				<b>43</b>								<b>43</b>	<b>40%</b>

**Table 6: Staff categories at 31st December 2024**

LOCATION	CONTRACT	ANCILLARY	TOTAL
Head Office	33	21	54
Aiyura	16	39	55
Tambul	7	28	35
Laloki	10	40	50
Bubia	21	57	78
Kerevat	12	57	69
Kilakila	10	11	21
<b>TOTAL</b>	<b>109</b>	<b>253</b>	<b>362</b>



**Table 7: Staff Movement**

Staff Movement	Quarter: 1	Quarter: 2	Quarter: 3	Quarter: 4	Total
Staff Exiting	1	2	1	3	7
New Hires	2	1	2	1	6
Transfers	0	0	0	0	0

**Table 8: Staff Training & Development in 2024**

Name	Work Location	Training	Institute	Completion Status
1. Wilfred Wau	HRC	Masters in Agriculture Science	University of South Queensland. Australia	Thesis
2. Mr. Raywin Ovah	MRC	Master of Agricultural Economics	University of Western Australia	Ongoing
3. Tai Kui	HRC	Masters in Agriculture Science	Niigata University in Japan	Ongoing
4. Mr. Godfrey Hanneth	IRC	Masters in Agriculture Science	PNG University of Technology	Ongoing
5. Mr Alex Galus	IRC	Masters in Agriculture Science	Niigata University in Japan	Ongoing
6. Clementine Sesega	SRC	Masters In Agriculture Science	University of Western Australia	Ongoing

## Annex 6: Plant Genetic Resources

**Table 9: Number of accessions of different crops held in ex-situ collections at NARI Centres**

Crop	HRC Aiyura		MRC Bubia	IRC Keravat	SRC Laloki	HARC Tambul
	Ex-situ	In-vitro	Location			
Sweetpotato ( <i>Ipomea setosa</i> )	839	17	149	52	39	
Aibika ( <i>Abelmoschus manihot</i> )			15	12	43	
Cassava ( <i>Manihot esculenta</i> )			7	9	125	
Yam ( <i>Dioscera esculenta</i> )			1		55	
Yam ( <i>D. alata</i> )			16		42	
Yam ( <i>D. nummularia</i> )			7		10	
Yam ( <i>D. bulbifera</i> )					5	
Yam (wild species)					2	
Taro ( <i>Colocasia esculenta</i> )			216	12	69	
Banana ( <i>Musa spp.</i> )			53	30	244	
Winged Bean ( <i>Psophocarpus tetragonolobus</i> )					7	
Breadfruit ( <i>Artocarpus altilis</i> )					18	
Amaranthus ( <i>Amaranthus spp.</i> )					20	

Night shade ( <i>Solanum nigrum</i> )					3	
Chinese Taro ( <i>Xanthosomans sagittifolium</i> )			8	3		
Other Aroids					6	
Potato ( <i>Solanum tuberosum</i> )		22				6
Durian ( <i>D. zibethinus</i> )				13		
Rambutan ( <i>Nephelium lappaceum</i> )	13			13		
Mango ( <i>Mangifera indica</i> )	15			15		
Carambola ( <i>Averrhoa carambola</i> )	5			5		
Ton ( <i>Pometia pinnata</i> )	7			7		
Kava ( <i>Piper methysticum</i> )	3			3		
Galip ( <i>Canarium indicum</i> )	5			5		
Other fruit/nuts/spices	19			19	10	

**Short-term plant Genetic Resources Collections for evaluation and selections at NARI Regional Centres**

Crop	MRC Bubia	HARC Tambul
Rice ( <i>Oryza sativa</i> )	63	
Tomato ( <i>Solanum lycopersium</i> )	11	
Cucumber ( <i>Cucumis sativus</i> )	12	
Pumpkin ( <i>Curcubita.moschata</i> )	9	
Eggplant ( <i>Solanum melongena</i> )	10	
Soybean ( <i>Glycine max</i> )	10	
Yard long bean ( <i>Vigna unguiculata</i> <i>subsp. sesquipedalis</i> )	11	
Lablab ( <i>Lablab purpureus</i> )	4	
Cowpea ( <i>Vigna unguiculata</i> )	5	
Wheat ( <i>Triticum aestivum</i> )		26

## Annex 7: Publications

### Journal Publications

- Anne C. Johnson, Birte Komolong, Lastus Kuniata, Guang Yang & Geoff M. Gurr, 2024 Detection and identification of Bogia coconut syndrome phytoplasma from seed-associated tissues and seedlings of coconut (*Cocos nucifera*) and betel nut (*Areca catechu*) Scientific Reports | (2024) 14:11542 | <https://doi.org/10.1038/s41598-024-61916-4>
- Hosseini Bai, S., Wallace, H.M, Hannet, D., Komolong, B., Grant, E., and Hannet, G. *Canarium indicum*. 2024. People and Plants, Food and Agriculture Organisation, United Nations. <https://www.peopleandplants.org/canarium-nut>
- Jacob Yombai, Gerry Cassis, Jakub Stoklosa, Chris Reid, Godfrey Hannet, Birte Komolong, 2024, Plant provenance and habitat may contribute to galip weevil damage (*Ectatorhinus magicus*) to galip nut tree (*Canarium indicum*) in Papua New Guinea, NZ Journal of Crop and Horticultural Science
- Mereia Fong-Lomavatu, Kaliova Ravuiwasa, Lilly Sar, Robert Geno, Alois Ndrewou, Lawrence Atu, Ricardo Matapaza, Michael J. Furlong, Grahame Jackson & Caroline Smith (13 Nov 2023): Plant health clinics in the Pacific region and the role of regional universities, New Zealand Journal of Crop and Horticultural Science, DOI: 10.1080/01140671.2023.2278789
- Wallace, H.M, Bai, S.H., Grant, E., Hodges, B., Kill, E., Randall, B., Komolong, B., Waaii, C., Hannet, D., Hannet, G., Kapi Ling, S., Johns, C., Simos, T., Nevenimo, T., Jones, K., Ashford, G., 'From raw nuts to commercial products: Enhancing private sector-led development of the Canarium industry in PNG' in Raising Trees and Livelihoods. 2024 (in press). Australian Centre for International Agricultural Research, Canberra.
- Zhang, H., Woruba, S.B., Feng, B., Johnson, A.C., Komolong, B., Kuniata, L., Yang, G., Gurr, G.M., 2024. Detection and identification of Bogia coconut syndrome phytoplasma from seed-associated tissues and seedlings of coconut (*Cocos nucifera*) and betel nut (*Areca catechu*). Scientific Reports 14, 11542. <https://doi.org/10.1038/s41598-024-61916-4>

### Prepared for submission

- Hannet, G., Wallace, H.M., Kavala, L., Minnah, S., Grant, E., Hosseini Bai, S., Farrar, M.B. & Elliott, B., 2024, Fruit development and fruit fall in *Canarium indicum* (Burseraceae). PLoS One
- Tonissen, K., Wallace, H.M., Hannet, D., Trapani, J.D., Komolong, B., Farrar, M.B., Elliott, B., Hosseini Bai, S., 2024, Assessing antioxidants from *Canarium* nuts: their bioavailability from roasted nuts and their stability during aging of canarium oil. Journal of Agricultural & Food Chemistry

### In-house Technical Publications

- Jonah Anton, Stanley Amben, Terry Tokam, and Birte Komolong, 2024, Evaluating the growth parameter and the grain yield of 34 Wheat cultivars on-station at Tambul in the high-altitude highlands of Papua New Guinea
- Tai Kui & Mauro Okrupa, 2024, Construction, Installation, and Management of a Biosand Filter for Safe and Quality Drinking Water, NARI Training Manual
- Tonavu Yaubi & Johannes Pakatul & Mauro Okrupa, 2024, Upland Rice Production and Processing for Household Consumption, NARI Training Manual.

## Conference papers

Arthur Roberts and Michael Dom 2024. Integrating fish-duck ponds improved the growth performance of tilapia and carp, marginal gain by value added egg production and economic efficiency, 7th PNG Conference on Science and Technology, PNG University of Technology, Lae, 1-4 July, 2024

Arthur Roberts, Peter Lambert, Elly Solomon and Michael Dom 2024. Improved growth of juvenile tilapia fed farm-made diets of either protein concentrate or Black Soldier Fly larval meal in fertilised water, 7th PNG Conference on Science and Technology, PNG University of Technology, Lae, 1-4 July, 2024

Fred Besari and Godfrey Hannet 2024. Assessing the Growth Performance of Broiler Chicken on Commercial Feeds in East New Britain Province of Papua New Guinea, 7th PNG Conference on Science and Technology, PNG University of Technology, Lae, 1-4 July, 2024

Jacob Yombai, Gerry Cassis, Jakub Stoklosa, Chris Reid, Birte Komolong, 2024. Galip nut (*Canarium indicum*) varieties and habitat may contribute to galip weevil (*Ectatorhinus magicus*) infestation in Papua New Guinea, 7th PNG Conference on Science and Technology, PNG University of Technology, Lae, 1-4 July, 2024

Mauro Okrupa and Sibjan Chaulagain, 2024. Production and dissemination of digital seasonal farm advisory (SFA) service to farmers in the Eastern Highlands Province of PNG: a case study under the ACIAR funded Climate Smart Agriculture Projects, 7th PNG Conference on Science and Technology, PNG University of Technology, Lae, 1-4 July, 2024

Ruth Baiga, Rajashekhar Rao, Michael Dom, 2024. Nitrogen Mineralization in an Acid Soil Following Biochar and Urea Co-application and its Effect on the Growth of Chinese cabbager, 7th PNG Conference on Science and Technology, PNG University of Technology, Lae, 1-4 July, 2024

Simo, F., Sirabis, W., 2024, Effects of mineral fertiliser on sweet potato agronomic yields in commercial cropping systems using pathogen-tested planting material in Asaro, Eastern Highlands Provincer, 7th PNG Conference on Science and Technology, PNG University of Technology, Lae, 1-4 July, 2024

Winnie Maso and Tonavu Yaubi, 2024, Utilising Potato Apical Cuttings for the Rapid Multiplication of Quality Planting Materials, 7th PNG Conference on Science and Technology, PNG University of Technology, Lae, 1-4 July, 2024

Yapo Jeffrey, William Sirabis, Johannes Pakatul, Gunnar Kirchof, 2024, Coffee Pulp and chicken manure can enhance soil nutrients and increase pathogen tested sweetpotato storgaeroot yields in Papua new Guinea, 7th PNG Conference on Science and Technology, PNG University of Technology, Lae, 1-4 July, 2024

## Reports

Jacob Yombai, Fidelis Hela, 2024, The galip weevil (*Ectatorhinus magicus*) ecology, biology and rearing techniques NARI Technical Report

Maso, W., 2024, Aiyura Tissue Culture Standard Operating Procedures, NARI Technical Manual

National Agricultural Research Institute, 2024, Annual Implementation Plan 2024, Corporate Plan 1/2024, National Agricultural Research Institute, Lae, Papua New Guinea.

National Agricultural Research Institute, 2024, Alignment Of NARI Strategic Implementation Plan To MTDP IV (2023-2027), Corporate Plan 2/2024, National Agricultural Research Institute, Lae, Papua New Guinea.

National Agricultural Research Institute, 2024, NARI Annual Report 2023, Corporate Document 3/2024, National Agricultural Research Institute, Lae, Papua New Guinea



## Annex 8: The Institute

The **National Agricultural Research Institute (NARI)** was established by an *Act of the National Parliament of Papua New Guinea (PNG)* in July 1996 as a public funded, statutory research organisation to conduct and foster applied and adaptive research into:

- IV. any branch of biological, physical and natural sciences related to agriculture;
- V. cultural and socio-economic aspects of the agricultural sector, especially of the smallholder agriculture; and
- VI. matters relating to rural development and of relevance to Papua New Guinea.

Under the NARI ACT (1996), the Institute was given responsibility for the following functions:

- to generate and adapt agricultural technologies and resource management practices appropriate to the needs, circumstances and goals of smallholders.
- to promote and facilitate applied and adaptive research in food crops, livestock, alternative cash crops, and resource management.
- to promote the use of appropriate technologies and provide essential technical services to improve the productivity, income, nutritional status and food security, resource base and quality of life of rural households and communities.
- to develop and promote ways of improving the output, quality, harvesting, post-harvesting, handling and processing and marketing of food crops, livestock produce and alternative crops.
- to maintain and conserve the diversity of genetic resources for food and agriculture, act as custodian for these resources, and promote the effective utilisation of these resources in the country; and to update and maintain the national inventory on soil resources.
- to develop, promote and maintain sustainable practices in agriculture.
- to provide agricultural information services, extension service support and other such assistance packages to the agricultural sector.
- to provide liaison and access to international agencies that promote agricultural development
- to formulate national agricultural research policies, define sectoral research priorities and allocate funds and advise the Minister and the National Executive Council on these matters.

## Governance

The Institute Council reports to the Minister for Agriculture.



**NARI Council Members**

### Composition of the Council, 2022-2025

Name	Constituency Represented
Mr Nimo Walter Kama Chairman	Smallholder Farmers
Mr Pius Piskaut Deputy Chairman	University of Papua New Guinea
Dr Patrick Michael	PNG University of Technology
Mrs Maria Linibi	Smallholder Women Farmers
Mr Humphrey Saese	Smallholder Farmers
Mr Ronnie Ilam	Growers' Association
Mr Francis Daik	Department of Agriculture
Mr Sioni Ioa	Department of Treasury - Secretary's Nominee
Dr Nelson Simbiken	NARI Management – Director General

The National Agricultural Research Institute Act, 1996, sets forward the roles and responsibilities of the NARI Council in providing governance for the organisation. This ensures the separation of governance from the management. It is the Council's role to approve strategic directions and structures for control and accountability. The Council

safeguards and supports the implementation of the mission of the organisation, integrates organisational interests and stakeholder interests, and serves as a link to NARI's constituencies. The Director General manages the affairs of the organisation to deliver the objectives and targets according to NARI's strategic directions as determined by the Council, and in compliance with the NARI Act and Council approved policies and procedures.

The Council is the final authority of NARI. The Institute was reporting to the Minister for Higher Education, Research, Science and Technology until recently through National Gazette No# G690 of 31st August 2022 on Determination of Titles and Responsibilities of Ministers, NARI is now reporting to the Minister for Agriculture. The membership is made up of nominated representatives from the agricultural sector, Higher Education, and Ex-Officio representatives of key Government Departments.

The non-Ex-Officio Council members were appointed in April 2022. The Council convened on three occasions in 2024.

NARI is guided by five core values:

### **Our Core Values**

The five Core values provide the foundation for an organisational culture in NARI that is focused on leading in agricultural research for development and delivering innovative solutions to its stakeholders in agricultural and rural development.

**Leadership** is a key value for the future of the Institute. NARI needs leaders who are visionary, apply systemic thinking and serve as inspiring role models at different levels of the operation. Leaders should wish to serve, help others to see beyond the obvious and look forward to the new possibilities of shaping the future. This leadership aspiration extends to the aim for NARI to be a leading agricultural research organisation in PNG and the Pacific.

**Innovativeness** is a leading principle for the Institute as a leader in Agricultural Research for Development (AR4D). This encompasses catalysing, facilitating and incentivising creativity in all facets of organisational behaviour to ensure responsiveness to the changing external environment and encouragement of innovation as an on-going process in agricultural development.

**Integrity** at all levels of the organisation is the basic moral fabric that guides our behaviour and conduct. We uphold high transparency and accountability standards and believe in consistency between words and deeds, trust, unity and honesty within the organisation, with our valued partners and engagement with rural communities and other stakeholders.

**Communication** is a foundational value for NARI to reach all stakeholders. Communication needs to be clear, intentional, and effective and incorporate feedback as essential part in on-going organisational learning.

**Organisational Excellence and Relevance** is applied at all levels of the Institute. With a strong client focus, we plan and strive to be systematic and efficient and promote scientific rigour in research for development at high standards.

## Our Strategy

In its Vision for PNG, NARI sees *Prosperous PNG Agricultural Communities* through its Mission of promoting innovative agricultural development in PNG through scientific research, knowledge creation and information exchange. This is to be accomplished through the Institute's Purpose (Strategic Objective) of *enhanced productivity, efficiency, stability and sustainability of the smallholder agriculture sector in the country so as to contribute to the improved welfare of farming and rural communities who depend wholly or partly on agriculture for their livelihoods*.

Our strategy aligns and contributes directly to the achievement of the GoPNG Development Goals, which also cascade from the UN Sustainable Development Goals (SDGs), the PNG Vision 2050, and PNG's DSP 2030, PNG Medium-Term Implementation Plan (MTDP3) 2018-2022, and the Agriculture Medium Term Development Plan (AMTDP), 2020-2022. The medium-term strategies and priorities are documented in the NARI Strategy and Results Framework 2022-2031 and NARI Strategic Implementation Plan (SIP) 2022-2026, and have guided the NARI research directions for 2022.

To deliver on its research mandate, NARI has its head office situated in Bubia, Lae, Morobe Province with regional centres established according to agro-ecological areas covering the dry lowlands, wet lowlands, highlands and high altitude highlands (Fig. 10). See Annex 8: The Institute for more details on the NARI regional centres.

## NARI Regional Centres

NARI Head Office is located outside Lae, at Bubia in the Morobe Province. There are five regional centres and tree technical facilities. The regional centres are distributed throughout the country to enable adaptive research specific to the respective agro-ecological zone where they are located. While the centres primarily serve the region where they are located with research, information, and genetic resources, the location allows the centre to conduct research which can then be applied to similar agro-ecological zones anywhere in PNG. All centres have recently been equipped with automatic weather stations which are networked with the NARI website, and will supplement the national climate data collated by the National Weather Service.

### Highlands Regional Centre

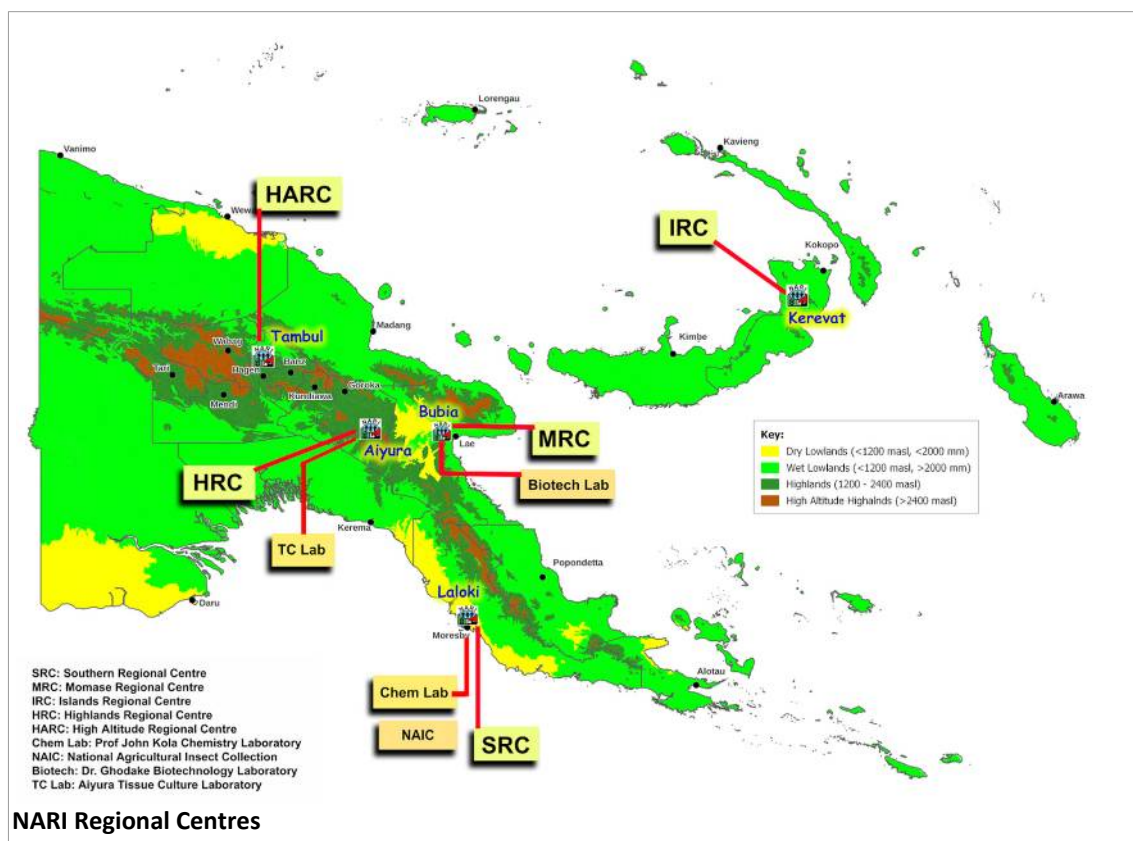
The Highlands Regional Centre (HRC) is in the Aiyura valley, close to the township of Kainantu, Eastern Highlands province. HRC Aiyura is situated at an altitude of 1664 metres above sea level (masl). The centre supplies the demand for foundation planting material for improved crop varieties and other planting materials for both commercial production and building of resilience to climate change and other natural disasters. HRC is the centre for several research studies in soil management and pest management, particularly in relation to the sweetpotato value chain.

### High Altitude Regional Centre

Tambul in the Western Highlands province at 2200masl focuses on locations in the higher altitude range, from 1,800 to 2,850 masl.

The centre maintains planting material to supply foundation stock for adapted village chickens and high altitude adapted crop varieties for both commercial production and

building of resilience to climate change and other natural disasters. Key focus crops have been potato, sweetpotato, wheat, and pyrethrum.



### Islands Regional Centre

The agro ecological zone for the Islands Regional Centre (IRC) is the wet lowland and islands including atolls. Formerly known as Lowland Agriculture Experimental Station (LAES), the IRC is based at Keravat in the Gazelle Peninsula of the East New Britain Province. It services the agricultural research needs of the five island provinces of East New Britain, West New Britain, New Ireland, Manus and the Autonomous Region of Bougainville.

Galip research and development piloting value chains of quality Galip primary and secondary product (kernel, oil), has been a key focus for the Islands Regional Centre. Apart from Galip, maintenance of germplasm collections of food and cash crops of the region and implementation of the EUCCR and CSA projects have been key activities.

### Momase Regional Centre

The Momase Regional Centre (MRC) research and development activities are coordinated from Bubia, Lae, Morobe province. Research and development initiatives at MRC is focused on both livestock and food crop improvement; germplasm maintenance; pest and disease management; post harvest and food technology; lowlands food crop screening, evaluation and multiplication; integrated farming systems, and marketing systems.

The main focus of livestock research for development is on the delivery of appropriate technologies to make smallholder livestock production more effective and sustainable, especially on developing low cost feeding options through enhanced utilisation of local

feed resources for priority small livestock such as pigs, chickens, ducks, goats, sheep and rabbits.

MRC also hosts a biotechnology research laboratory. The current focus has been on disease diagnosis using molecular tools, development of tissue culture protocols for the response to BWAP, and development of protocols for preparation of materials for invitro mutagenesis.

### **Southern Regional Centre**

The Southern Regional Centre (SRC) is located at Laloki in the Central Province, about 30 km outside the capital, Port Moresby. Research and development activities of the Centre are focused on dry-lowland areas of the country. The Southern Region includes the Western Province through to Gulf and Central to Milne Bay and Oro Provinces.

Most of the current research and development activities are related to building climate change resilience under a European Union funded action, and multiplication of quality foundation seed with assistance from the Taiwan Technical Mission (Taiwan ICDF). The Centre also conducts conservation, characterisation, evaluation, maintenance and documentation of the national plant genetic resources (PGR) ex-situ collections of banana, yam, cassava and aibika.

### **National Agricultural Insect Collection**

The National Agricultural Insect Collection (NAIC) located at Kilakila, Port Moresby. NAIC provides an insect identification service and holds more than 200,000 insect specimens.

### **Prof John Kola Chemistry Laboratory**

The John Kola Chemistry Laboratory located at Kilakila, Port Moresby. It is an ISO/IEC 17025 registered laboratory and offers a wide range of services including chemical (trace and heavy metals), physio-chemical parameters (ions and anions) and bacteriological testing.

### **Aiyura Tissue Culture Laboratory**

The tissue culture laboratory in HRC Aiyura is a shared facility with the Coffee Industry Corporation (CIC). NARI manages the facility and has been able to consistently provide pathogen free potato plantlets to the Fresh Produce Development Agency (FPDA) as foundation material for the national seed potato scheme. Supply of foundation planting material of potato late blight (PLB) resistant potato varieties continues as a key contribution to the commercial potato industry, reducing the need for chemical fungicides. The laboratory also provides pathogen free (PT) sweetpotato cuttings of commercial varieties.







**NARI Logo** - The letters NARI are the initials of the National Agricultural Research Institute. The PEOPLE symbolise those included in the mandate of NARI such as farmers, researchers, extension agents, partners, NGOs etc., backed with **BLUE** to encompass the sky and the macro environment. The LEAF symbolises crops, backed with **GREEN** to depict the crop environment. The PIG and CHICKEN heads symbolise livestock. The **RED** background portrays the toil and sweat of the people.

***Our international development partners play a key role in enabling the National Agricultural Research Institute to achieve its development objectives. The Institute gratefully acknowledges the generous support of our international partners.***



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ON PLANT GENETIC RESOURCES  
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## **Contact NARI**

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*Promoting excellence in agricultural research for sustainable development*