Bureau of Plant Industry
Research & Development Agenda
2025-2030

REPLANTING THE SEEDS OF PROGRESS:
AN INDUSTRY-LED AND
GENDER-RESPONSIVE TRANSFORMATION
OF THE PHILIPPINE PLANT INDUSTRY

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FOREWORD

Middle-income countries play a vital role as agricultural innovators by investing in public R&D, which yields better prospects for agricultural products (Gaffney et al., 2019). Changes in agricultural research and development (R&D) will undoubtedly impact future global patterns of poverty, hunger, and other results.

In the 1970s, Philippine agriculture outperformed that of other Asian nations; however, in the 1980s, it had one of the slowest growth rates in agricultural gross domestic product, food per capita, agricultural exports, and agricultural gross value added. Thus, at present and in the coming years, agricultural R&D will have a crucial impact on agricultural production and productivity, food costs, and poverty.

This publication describes the mandate, roles, and functions of the Bureau of Plant Industry's (BPI's) Research and Development Agenda. BPI traces its beginnings to the Philippine government's laws penned in 1930. Since then, BPI has served as one of the Philippine government's arms which puts food security as the top priority intervention.

Today, the quest for food security continues, and based on the laws of the land, the corresponding body that answers this call from the past to present is the Department of Agriculture-Bureau of Plant Industry.

The contents of this agenda were derived through a series of discussions, and consultations, which began in 2022. This document is divided into five Chapters:

Chapter 1 - Introduction: This chapter details the history and policy defining the role of BPI since its foundation and how it has evolved through changes in the national and global context. In general, the introduction chapter lays out the rationale and scope of this R&D agenda.

Chapter 2 - Fitting in with Changes in Time: R&D Strategy and Objectives: This chapter delves into the strategic framework for research and development. It outlines the key strategies that will guide the R&D efforts, ensuring they align with the overarching goals of the agenda.

Chapter 3 - Replanting the Seeds of Progress: The Seven Flagship Programs: This chapter focuses on the implementation phase, detailing the seven flagship programs designed to drive an industry-led, demand driven

, and gender-responsive agriculture economy. It highlights how these programs will be executed to achieve the desired outcomes and foster sustainable development.

Chapter 4 - A Glimpse of the Past Harvests: This chapter provides the reader with a bird's eye survey of the bureau's past achievements. Here, the role of the five R&D Centers in developing new varieties and germplasm conservation are emphasized. Other overlapping, but equally important roles such as, but not limited to include: packaging sustainable farmer- and environment-friendly crop production technologies (e.g., genetic/germplasm conservation of high value crops, organic farming; vertical farming; urban and peri-urban community-based vegetable gardening).

Chapter 5 – Birth, Reason for Being, & Organizational Structure: The BPI's primary purpose is to promote the development of the plant industry in the Philippines. This includes ensuring the availability of high-quality seeds and planting materials, protecting plant health, and enhancing agricultural productivity. The laws, policies, and mandates that enable BPI offices to operate are detailed in this chapter.

To sum up, this agenda is a comprehensive and collaborative effort that aims to make significant progress, which when viewed together, all chapters form a coherent roadmap that will direct our efforts in replanting the seeds of progress and promoting sustainable development for the future.

This publication is the product of many dedicated staff who spent many hours piecing together the Bureau's R&D experience and achievements over the years. We express our heartfelt thanks to them.

Let us continue to work steadfastly for a fruitful R&D and agriculture industry. God bless us all!

HERMINIGILDA A. GABERTAN, PhD
Assistant Director for Research, Development, and Production Support Services

SECRETARY'S MESSAGE

The Bureau of Plant Industry has evolved significantly over the years. Adapting to the ever-changing national and global agricultural landscapes, addressing the needs of farmers, consumers, and stakeholders. Initially focusing on plant quarantine and disease control, we have continuously progressed with our goals for food security, sustainable agriculture, and economic growth.

I am inspired by the collaborative efforts given to complete this research and development agenda which represents an exciting venture and transformative opportunity for our institution to innovate and lead in the agricultural industry.

Climate change and food insecurity are among the global challenges through which we can see the importance of innovation. We aim to be resilient amid these adversities, ready to prove our adaptability through innovation. The production of quality seeds and climate-smart technologies is but the start of a generations-long agenda to continually overcome obstacles that come before us.

I congratulate the minds behind this publication. Through its completion, we will move a step forward in meeting our goal of sustainable development. In line with the *Masaganang Bagong Pilipinas* Plan, the documentation underlining the seven flagship programs is our contribution to the future of Philippine Agriculture, our way of imparting our knowledge to industry leaders, agribusinesses, and agricultural sectors, thus promoting convergence and harmonizing each agency projects. Through this, we can promote good agricultural practices, drive innovation, and ensure that every Filipino benefits from the advances we make.

I am privileged to recognize this work, through which the future of Sustainable Agriculture can be established.

Mabuhay!

FRANCISCO P. TIU LAUREL JR.
Secretary, Department of Agriculture

DIRECTOR'S MESSAGE

Research and Development is essential to agriculture, serving as the foundation for innovation and progress in the sector. Numerous studies highlight the critical role of R&D in driving growth across various economic sectors. It is our mandate to generate knowledge that will empower local farmers, giving them access to the latest innovations. Agriculture is not only the backbone of our food systems, but it is also a key driver of economic stability and rural development. In today's rapidly evolving world, where climate change, population growth, and resource scarcity pose significant challenges, R&D provides industry-led and demand-driven agriculture solutions necessary to secure the future of food production.

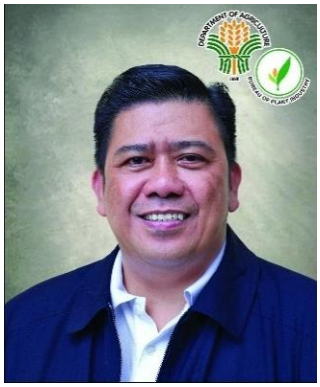
The Bureau of Plant Industry, founded in 1930, has long been at the forefront of our nation's pursuit of food security in the face of climate change. Since its establishment, BPI has played a vital role in ensuring that Filipinos have access to safe, sufficient, and nutritious food. Over the decades, the Bureau has evolved, meeting both national and global challenges while staying true to its mandate. Today, as we face the complex realities of climate change, population growth, and shifting agricultural landscapes, BPI remains steadfast in its mission to support the agricultural sector.

While we are committed to generating new knowledge, we must also embrace the need for a clear and harmonized approach to R&D. This is crucial to avoid duplication, optimize resource use, and focus on priority areas, to our collective impact. This Research and Development Review is especially significant as it marks the official launch of our R&D Agenda for the next five years. This agenda will serve as our strategic roadmap, guiding us as we push the boundaries of innovation, address emerging challenges, and align our objectives with the broader goals of food security and sustainability. I would like to take this opportunity to express my deep appreciation to all those who contributed to bringing this agenda to life. Special thanks to AD Gilda for leading its creation, and to all the stakeholders and experts who generously shared their knowledge and insights.

To all our researchers, may this inspire you to continue pushing the frontiers of knowledge and innovating with purpose and dedication, knowing that your work is essential to shaping a more resilient and sustainable future for agriculture.

GERALD GLENN F. PANGANIBAN, PhD
Director

ASSISTANT DIRECTOR'S MESSAGE



To the team responsible for publishing this Research & Development Agenda (BPI-RDA), my congratulations go out to you. The campaign for food security in our nation depends on this program, which aims to perform research to boost farming productivity. The Office of the Assistant Director for Regulatory Services (AD-RS) expresses gratitude to all those who have contributed to the completion of this guide.

The standards and applicability of the research topics and flagship initiatives listed on the agenda have impressed me. It summed up the BPI's mission and matched the difficulties with food security. The agenda emphasize the BPI's consistent efforts and collaboration in producing significant outcomes that positively impact our country's efforts to attain food sustainability and income stability.

Among other areas of research, the BPI's Office of the AD-RS contributes to food safety, plant quarantine, seed quality control, the seed industry, and biotechnology.

I ardently and firmly endorse the BPI-RDA, as we persistently pioneer the advancement of the Philippine plant industry through every possible means. I am optimistic that establishing these agenda items will provide clarity and fortify our commitment to collaborating with other agencies and groups in the future to achieve the desired outcomes.

Above all, I want to thank you for continuing to stand by us as we stay committed to our country's farmers and stakeholders. To achieve this objective, let us unite in our shared vision of a world-class, resilient, and collaborative public sector. We are moving toward a future marked by increased food security!

Again, congratulations, and God bless us all!

RUEL C. GESMUNDO
Assistant Director for Regulatory Services
Concurrent Chief, National Seed Quality Control Services

R AND D CHAIRPERSON'S MESSAGE

The Philippine economy and research and development (R&D) are integral to the well-being and progress of the Filipino people. While each serves distinct roles, they are fundamentally interconnected—greater economic investment in R&D leads to substantial economic gains. A study by the Philippine Institute for Development Studies underscores the critical role of R&D and technology in driving the country's economic growth through enhanced productivity (Coronaton, 2003).

We are acutely aware of the gaps in R&D, their impact on the economy, and the urgent need to address these challenges to mitigate crises and improve our overall performance. It is with great honor that I lead the Bureau of Plant Industry (BPI)-Research and Development Technical Core Team (RDTCT) in the preparation of this publication. The dedication and hard work of the men and women in the R&D sector have been instrumental in fully realizing and institutionalizing our processes. The strategic efforts of each BPI Center have been vital in shaping this well-rounded document.

A nation's economic growth hinges on how effectively it deploys its resources—capital, land, labor, and human skills—to enhance productivity and increase the output of goods and services. Central to this are technology, research, and development which are key drivers of productivity.

Over the past five years, we have prioritized research programs and projects aligned with the Harmonized National Research and Development Agenda (HNRDA) 2017–2022. This document reflects the harmonization of our efforts and their alignment with the current administration's campaign for a food-secure nation.

Agriculture remains a focal point of the HNRDA, and we recognize both the opportunities and challenges it presents. Together, let us continue to empower each other for a brighter future. My deepest gratitude to everyone who contributed to this endeavor.

JOEL L. ADORADA, PhD
Chair, BPI Research and Development Technical Core Team

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INTRODUCTION

GOALS AND DIRECTIVES OF THE BUREAU OF PLANT INDUSTRY

The Bureau of Plant Industry (BPI) is a world-class, resilient, and collaborative public sector organization dedicated to leading the transformation and development of the Philippine plant industry by 2030.

Figure 1. President Ferdinand R. Marcos Jr. during the BPI-KOPIA turnover ceremony with Lucban, Quezon, Siniloan, Laguna and Zaragosa, Nueva Ecija LGU, Farmers, and other stakeholders.

Through fruitful collaboration with private industries and stakeholders, the agency ensures the availability of high-quality seeds and advanced farming technologies, maintains the safety and integrity of plant food, and supports the export industry through proactive biosecurity. The Bureau is committed to valuing and satisfying the needs of its stakeholders in research and development, production support, and regulatory services and as such observe compliance to applicable regulations set by the government and international bodies. The publication of this Research and

Development Agenda is part of the agency's dedication for institutional development and continual improvement of its overall operations.

Rationale and Purpose of the Manual

The overarching purpose of this manual is to direct the DA-BPI (the executing agency) and other collaborating agencies towards the goal of providing the Filipino people with sustainable and easily accessible nutritious food, while adhering to the bureau's mandates.

This manual serves three other specific purposes:

a) as Guide to the Bureau's workforce in undertaking strategic planning, streamlining operations and creating uniformity of technology generation processes, implementation, and extension of information and products of R&D;

b) as a Blueprint of DA-BPI's 5-year R&D agenda, encompassing everything from the bureau's *raison d'être* to the seven flagship programs it will address in the upcoming years; and

c) as a general overview of the roles and functions of the R&D team members (e.g., from headquarters, 5 R&D centers, and cooperating partners at the national, regional, and local levels)

Scope and Limitations

This document does not serve to prescribe but rather serves to guide researchers on the historical, global, and national context of the organization and equip them institutional knowledge on what programs are deemed effective for addressing challenges in the period when this was written.

Chapter 2
FITTING WITH CHANGES IN TIME

STRATEGIC MAP & OBJECTIVES

In fitting in with changes in time, the BPI adapts its research and development **(R&D)** agenda and target outcomes to the current social, technological, economic, environmental and political system of the country.

This section visualizes the overall rationale and directions of the BPI (Figure 2. REPLANT)**.** The **REPLANT** framework gives teeth to the Bureau's **Vision**, **Mission**, **Goal, and Strategies**. The framework guides both internal and external stakeholders on a roadmap in achieving the goals, objectives and actions of the Bureau by 2030.

Vision

By 2030, the BPI is a world-class, resilient, and collaborative public sector organization continuously innovating to lead the development of the Philippine plant industry by 2030.

Mission

To achieve the Bureau's vision within its legal mandate, the Bureau's mission revolves around fulfilling three key priorities:

- Ensuring the availability of high-quality seeds and advanced farming technologies,
- Maintaining the safety and integrity of plant food, and
- Supporting the export industry through proactive biosecurity.

Goal

The main goal of the BPI is to take the collaborative leadership in developing the Philippine plant Industry into a strong food-producing and economically viable industry based on scientific research-informed technology and a technology-driven foundation for dynamic and productive agriculture.

Overall, the Bureau hopes to achieve plant industry transformation through technology-driven and sustainable agriculture. Putting handles on this broad goal, the BPI bundles this into four subgoals.

Subgoals. To put handles on this seemingly gigantic goal, the Bureau parcels this into four subgoals, namely:

- Subgoal 1 – Excellence in Research for Development
- Subgoal 2 – Demand-driven Production Support and Outreach
- Subgoal 3 – Simplified Regulations
- Subgoal 4 – Ethical Governance and Resource Management

Strategies

From the above four broad strokes, the strategies enumerated below enable the BPI to implement specific and doable actions to achieve each of the 4 subgoals.

Figure 2. Identification of Cacao-Banana disease specimen from BPI Davao NCRDPSC.

Subgoal 1 – Excellence in Research for Development

- Strategy 1.1. Develop relevant and appropriate technologies for selected vegetables and fruits adopted to Luzon, Visayas,
  and Mindanao geographical settings
- Strategy 1.2. Develop innovative and quality vegetable and fruit products
- Strategy 1.3. Strengthen regulatory, laboratory, and pest management (Figure 2: Banana-Cacao disease identification (BPI-Davao Center)
- Strategy 1.4. Engage with different stakeholders

Subgoal 2- Demand-driven Production Support and Outreach

- Strategy 2.1. Develop knowledge and technology management plans
- Strategy 2.2. Collaborate with international institutions, government agencies and private sector
- Strategy 2.3. Provide relevant training and other technical support

Subgoal 3 – Simplified Regulations

- Strategy 3.1. Ensure compliance to food safety and phytosanitary requirements to agricultural crops
- Strategy 3.2. Ensure compliance to seed quality standards
- Strategy 3.3. Ensure ease of doing business by adhering to good regulatory principles

Subgoal 4 – Ethical Governance and Resource Management

- Strategy 4.1. Manage financial resources judiciously
- Strategy 4.2. Strengthen monitoring and evaluation
- Strategy 4.3. Provide infrastructure and support facilities and services
- Strategy 4.4. Enhance human resource and capability
- Strategy 4.5. Achieve highest stakeholders' satisfaction
- Strategy 4.6. Digitize processes and information management

OUTCOMES

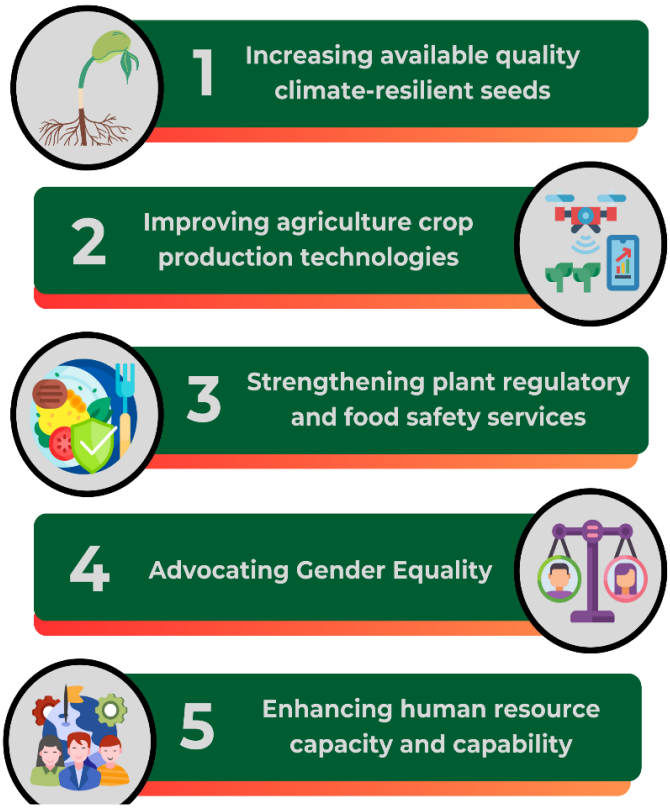


Figure 3. Research and Development Outcomes.

In general, the outcomes of the different strategies revolve around addressing the needs of farmers, consumers, and other plant industry stakeholders. Specifically, the five outcomes of the proposed studies under the agenda are as follows.

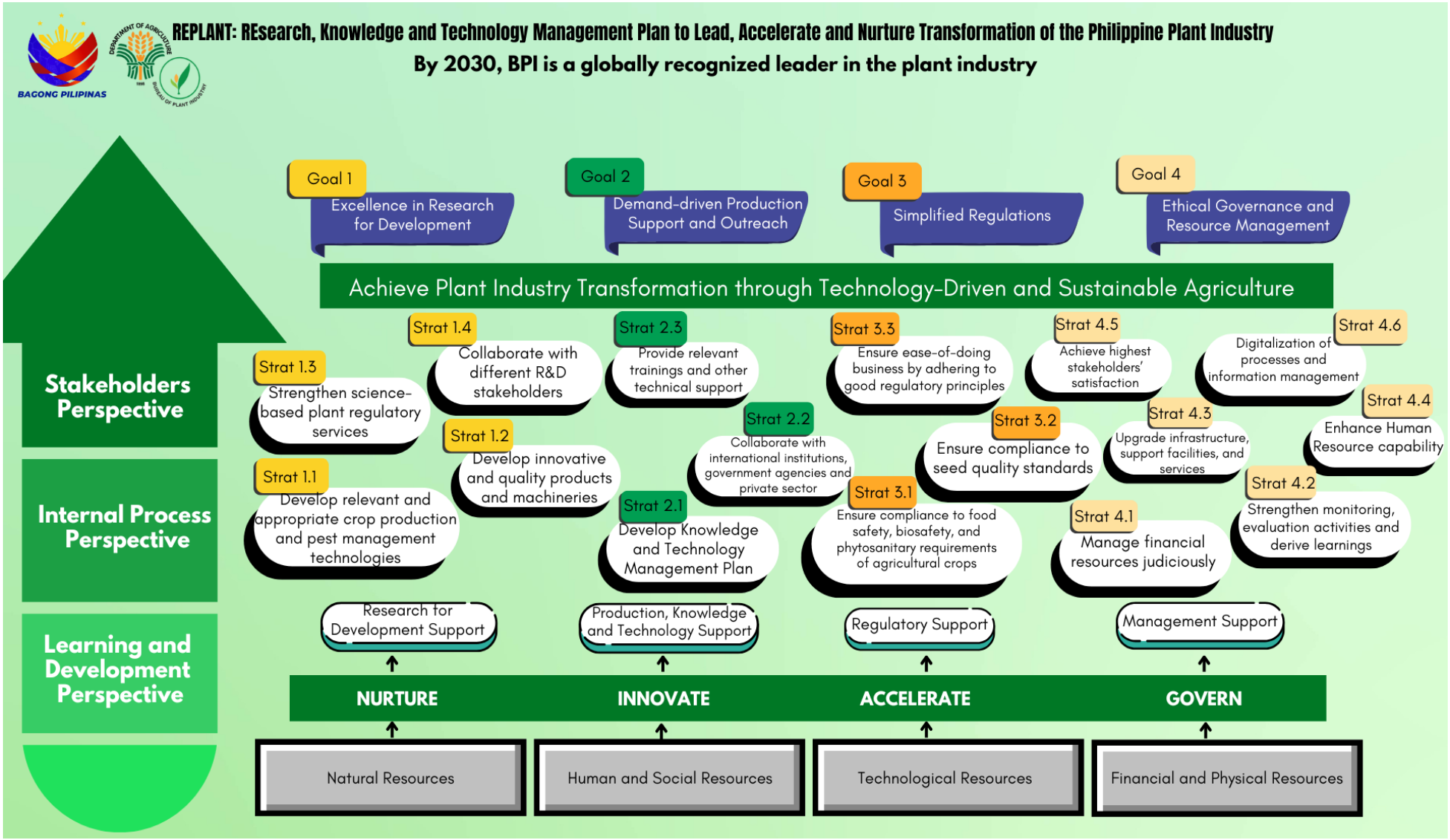


Figure 4. BPI strategic framework. Research and Development Plan to Lead, Accelerate and Nurture Transformation of the Philippine Plant Industry (REPLANT).

Figure 5. Harvesting of mungbeans (top) and soybeans (bottom) at the La Granja National Crop Research, Development, and Production Support Center, with a total harvest of 3 tons for mungbeans and 1 ton for soybeans in 2024.

Chapter 3

THE SEVEN FLAGSHIP PROGRAMS

This Chapter showcases the seven flagship programs that embody the four strategies outlined in the BPI's R&D Agenda. Delivering the seven flagship programs is the BPI's primary focus as a government entity. These flagship programs properly situate R&D activities in the context of industry and consumer needs. The Bureau, with its mandate to deliver a responsive R&D agenda, sets seven priorities over the next 6 years.

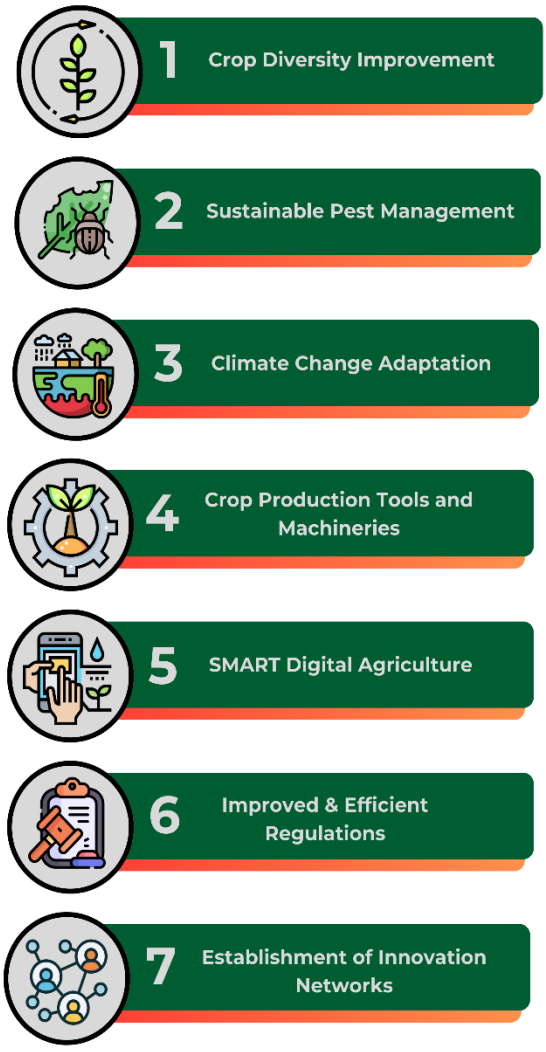


Figure 6. Seven flagship programs.

More legally important is that these major initiatives are based on Republic Act No. 8435, Series of 1997, generally known as the Agriculture and Fisheries Modernization Act (AFMA). ***The 7 Flagship Programs***

The BPI advocates 7 flagship programs (Figure 4) highlighting the organization's comprehensive work in promoting productivity enhancement and sustainable development in the Philippines.

Several bases were considered in crafting the flagship programs in the next 6 years:

- its political/legal mandate;
- the Philippine Development Plan 2023-2028;
- the trends in global agriculture and the need;
- to transition to demand-driven agriculture, and;
- the Food and Income Sustainability cum Climate Changes concerns.

These four bases provide context for the seven flagship programs' framework embodied in the R&D agenda, which makes this manual relevant to the needs of industries and consumers.

Four Major Concepts Incorporated within the 7 Flagship Programs

Foremost, four major concepts (Figure 6) are also incorporated within the 7 flagships in the R&D Agenda: **Climate Change Adaptation (CCA)**, **SUSTAINABLE** AND **SMART and Digital Agriculture (SSDA), Demand-Driven/Market-Oriented (DD/MOP) Production,** and **Stakeholder (Gender) Inclusivity**.

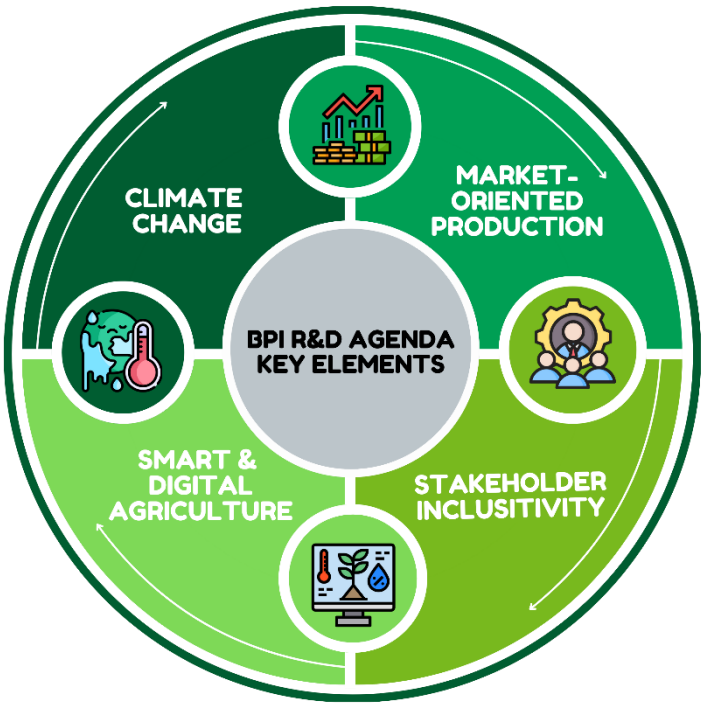


Figure 7. Four major concepts incorporated within the seven flagship programs.

CLIMATE CHANGE

Climate change adaptation (CCA). By 2050, the world will need to boost food production by more than 50% to feed nearly 10 billion people (ADB, 2023). But climate change's effects on agriculture destabilize food supply lines, increase production costs, and lead to rising food prices, which disproportionately affect the most vulnerable. The best way to lessen these effects and make sure that future generations have a stable, safe food system to avoid poverty and hunger is to use farming methods that are resilient and long-lasting.

Figure 8. View of mungbean field in BPI Los Baños NCRDPSC (climate-resilient crop).

Increasing agricultural output without adding more farmland is what we need right now. At the top of the Bureau's list of goals is funding research and development of crop varieties that can survive in harsh climates and environmentally friendly farming methods.

The R&D path for the Bureau to chart is to invest in developing crops that can withstand extreme weather conditions and implement practices that enhance soil health and water efficiency. The resulting impact would be twofold - farmers can achieve higher yields on existing farmland, while simultaneously protecting natural ecosystems for future generations.

Figure 9. Smart greenhouse in Los Banos, funded by KOPIA.

SUSTAINABLE SMART AND DIGITAL AGRICULTURE (SSDA)

The Bureau of Plant Industry (BPI) in the Philippines is actively pursuing the advancement of digital agriculture through various initiatives, including:

- Research facilities and smart greenhouses to enhance research centers in chosen locations are being established (Figure 9).
- Digital transformation - BPI is utilizing technology to improve data collection, monitoring, and reporting processes.
- Enhancing skills and capabilities training programs for farmers and stakeholders to assist them in adapting to new agricultural technologies and practices.
- Raising public awareness - communicating with and to the public via the face-to-face dialogues and the social media innovative agricultural technologies and information drive on plant health and biosecurity measures.
- Engaging key communities through multistakeholder participation in conceptualizing and rolling out agri-based sustainable innovations.

STAKEHOLDER (GENDER) INCLUSIVITY

Figure 10. Discussion with stakeholders (local government, NGO, PO representatives) for the peri-urban outscaling program.

Stakeholder participation. The Bureau has incorporated multi-stakeholder (gender) inclusivity into its planning of R&D efforts in the past. Specifically, this manual emerged from the collaboration of various multi-stakeholder groups actively involved in the BPI's operations.

More recently, the BPI has collaborated with various stakeholders to create innovative solutions that prioritize sustainability and inclusivity. The BPI partnered with the DA-BAR and IRRI to introduce the D4AgPH platform, designed to assist farmers, local agriculture officers, and key decision-makers in utilizing data to enhance the nation's digital agriculture community.

Gender inclusion. The BPI has implemented measures to enhance gender responsiveness (Figure 11) in its research and development efforts, including:

- Initiatives and programs that are responsive to gender. The BPI has arranged seminars aimed at identifying gender issues and recommending practices that are responsive to gender considerations.

Figure 11. Basic Gender and Development awareness seminar. BPI, Manila.

- Programs focused on Gender and Development (GAD)
  The Bureau has also implemented programs focused on gender and development that foster gender equality and inclusivity. To date, it is progressively working on the Philippine Seed System and Seed Industry that incorporate a gender perspective culture.

MARKET-ORIENTED PRODUCTION

Demand-driven, industry-led R&D bridges the perceived disconnect between researchers and its intended beneficiaries, and more importantly makes prominent the translation of R and D investment into tangible research outcomes that directly benefit the industry and its various players and indirectly, the economy.

Figure 12. Kadiwa ng Pangulo center at BPI.

The Bureau supports the Kadiwa ng Pangulo center (Figure 12), this aims to bring the produce of the farmers direct to the consumers.

INNOVATION NETWORKS

Figure 13. Hi-Las marketing corporation mangoes for export.

Industry-led agricultural research is a collaborative approach wherein private sector entities, such as agribusinesses, biotech firms, and food manufacturers, are integrated into the R and D system of the Bureau, primarily sharing information on current market demand as well as capital and other resources to enable research and development activities that effectively meet industry needs. This approach is primarily driven by market demand and the potential to commercialize innovative solutions.

This approach is characterized by several key factors, one of which is collaboration between industry, government, and academia, through public-private partnerships, can accelerate innovation and facilitate the transfer of technology and create jobs to stimulate economic growth.

To make sense of the huge coverage of our mandated roles, functions/services, and outcomes, we present here the bureau's R&D agenda conceptual framework being hitched into one major goal, that is, *R&D excellence* (Figure 14) that would guide us as well our stakeholders and beneficiaries.

Figure 14. R&D agenda conceptual framework.

The conceptual map (Figure 15) illustrates how we can replant the seeds of progress in the most practical manner, in sync with the BPI's mandates, goals, and strategies.

Figure 15.. Programs to implement the strategies under Subgoal 1 – Excellence in Research for Development.

There are 7 flagship programs of BPI that provide the main pathways that the bureau will spend all its efforts and funds in the next 5 to 6 years of its being. The research outcomes of these 7 flagship programs are discussed in detail in **Annex C.** These 7 flagship programs are as follows**:**

1 CROP DIVERSITY AND IMPROVEMENT PROGRAM

This program delves into the critical role of crop diversity and plant breeding in ensuring food security, promoting sustainable agriculture, and bolstering resilience to changing climate conditions. This section is subdivided into four research areas namely:

1. Plant genetic resources
2. Climate-resilient varieties
3. Development of high-yielding varieties
4. Seed storage technologies

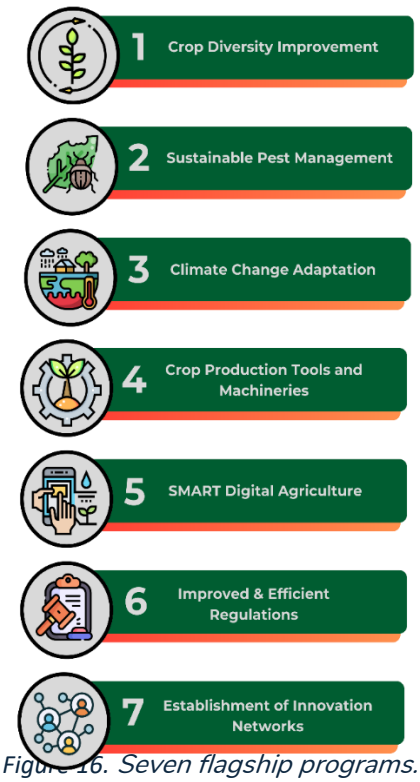


Figure 16. Seven flagship programs.

PLANT GENETIC RESOURCES

Agriculture and food production rely on genetic resources that have been domesticated and subsequently developed in different nations and areas.

For food security, access to plant genetic resources must be maintained, and the benefits derived from their use must be shared fairly (Ferranti, 2016).

The conservation of plant genetic resources for food and agriculture that Bureau of Plant Industry (BPI) holds are distributed in its five national Centers and BPI Central Office in Manila. Genetic materials conserved ex situ specifically in seed and field gene banks constitute the crop germplasm of the Bureau.

The bureau's strength lies in maintaining a substantial portion of the accessions in the field gene banks. Active collections in the field gene banks are mangoes in BPI Guimaras; tropical fruits including banana and durian in BPI Davao; citrus, white potato, and strawberry in BPI Baguio. Orthodox seeds of lowland vegetables, field

Figure 17. Ex situ field genebank for banana (left), durian (middle) and mango (right) from BPI Davao and Guimaras NCRDPSC.

legumes and indigenous vegetables are raised in BPI La Granja and Los Baños R&D Centers.

Strengthened PGR management activities (acquisition, characterization, conservation, regeneration, multiplication, documentation, and utilization) have always been in the pipeline. Therefore, it is crucial to incorporate these components into the R&D agenda. The establishment of the BPI-Plant Genetic Resources Center and Laboratory (BPI-PGRCL) can facilitate competitive conservation and management. Capacity building for curators and researchers in conservation is necessary to efficiently handle collections for long-, medium-, and short-term seed storage. Acquisition, characterization, regeneration, conservation, and utilization of high-value crops is essential to having a sustainable gene bank.

The BPI will also consider in vitro conservation as a backup to asexually propagated collections. Launching and accelerating the development and management of a consolidated national database, including the SCUs and RFOs, on top of the BPI national Centers is imperative. The establishment of a plant genetic resources network is a parallel pursuit. Individuals, communities, and organizations should conserve and share PGR for crop breeding a more holistic approach, as crop breeding aims to develop new varieties with higher yield, pest resistance, more secondary metabolite production, and longer shelf life.

CLIMATE-RESILIENT VARIETIES

The backbone of crop improvement at the BPI starts with identifying NSIC varieties that can thrive in saline, upland, drought-prone, and flood-prone environments. These conditions are prevalent in different regions of the Philippines, making it crucial to develop crops that can withstand these challenges. Researchers may also access

germplasm through research institutions in the Philippines or through international collaborators such as the World Vegetable Center (WorldVeg) and other major institutions (see Annex G).

HIGH-YIELDING VARIETIES

The Bureau conducts research on the development of high-yielding varieties to ensure access of farmers to quality seeds and planting materials. Promising lines that consistently show better growth and yield performance across different locations in the country will be registered under the NSIC. After the NSIC registration, BPI researchers introduce these varieties for utilization into farmers' fields or demonstration sites, or through partners.

SEED STORAGE TECHNOLOGIES

Proper seed storage is crucial for ensuring food security by maintaining a stable supply of high-quality seeds, which supports consistent crop production and mitigates food shortages. Advanced storage technologies enhance climate resilience by preserving seed viability even under adverse conditions.

Figure 18. La Granja NCRDPSC seed storage.

This is vital to our country's food security, as we are frequently visited by extreme weather events like typhoons. Effective seed storage also maintains genetic diversity, which is essential for breeding new crop varieties that can withstand pests, diseases, and climate changes. Economically, high-quality seeds lead to better yields and higher incomes for farmers, boosting rural economic development.

Sustainable agriculture benefits from storage technologies that reduce the need for chemical treatments, promoting eco-friendly practices. Additionally, community-based seed banks and participatory plant breeding programs empower local farmers, enhancing community resilience and self-sufficiency. Investing in seed storage

technologies is a strategic move to ensure the Philippines' agricultural sector remains robust and capable of meeting future challenges.

Figure 19 illustrates the outputs, outcomes, and impact of the flagship program.

Figure 19. Flagship program no. 1: crop diversity and improvement.

2 SUSTAINABLE PEST MANAGEMENT PROGRAM

Sustainable Pest Management is the Bureau of Plant Industry's program to address concerns about pests and diseases for effective, safe, and environment-friendly production technologies to increase farm productivity, food sufficiency, and security.

In collaboration with DA Regional Field Offices (RFOs), through the Regional Crop Protection Centers (RCPCs) in collaboration with academic institutions, funding agencies, and private collaborators, BPI provides support in terms of the following:

- Biological control agent provision
- Technical assistance on IPM application
- Proper use of effective synthetic pesticides
- Infestation validation

- Plant health databases
- Pest surveillance, forecasting, and early warning systems and information materials are published, such as but not limited to:

    a. Digital pest monitoring
    b. Mobile applications for rice, corn, and onion, and adaptive research for Corn Fall Armyworm (FAW)
    c. Forecasting model for cassava pests and diseases.
    d. Integrated Pest Management (IPM) handbooks for corn, and handbooks on BPI's available biological control agents (BCAs).

Priority actions of the government under Flagship Program No. 2 include the following:

PEST FORECASTING AND ADVISORY

Pest forecasting is the meticulous monitoring and prediction of pest outbreaks based on the empirical and historical data taken from the Regional Crop Protection Centers nationwide. This activity will include crop pests monitoring, surveillance, and an early warning system to determine the actual status of pests and diseases in the field to be able to identify, validate, and give possible management recommendations for specific pests.
Pest advisory, on the other hand, creates awareness of relevant information to farmers, researchers, technicians, agriculturists, and other stakeholders about the pests that are possible to occur in the upcoming months.

Also, recommended actions will be based on the Integrated Pest Management (IPM)–PAMS (Prevention, Monitoring, Avoidance, and Suppression) Approach to ensure the balance of the crop ecosystem.

PLANT HEALTH AND PEST STATUS

Pest metadata for pests and diseases affecting crops from all regions is being consolidated and validated by BPI-CPMD. The validated data is analyzed for the issuance of pest status reports and serves as the basis for the issuance of pest management advisories in case of alarming situations (Figure 20). Efficient and timely submission of pest data enables the detection of alarming pest situations and the detection of invasive pests which may cause an outbreak or epidemic.

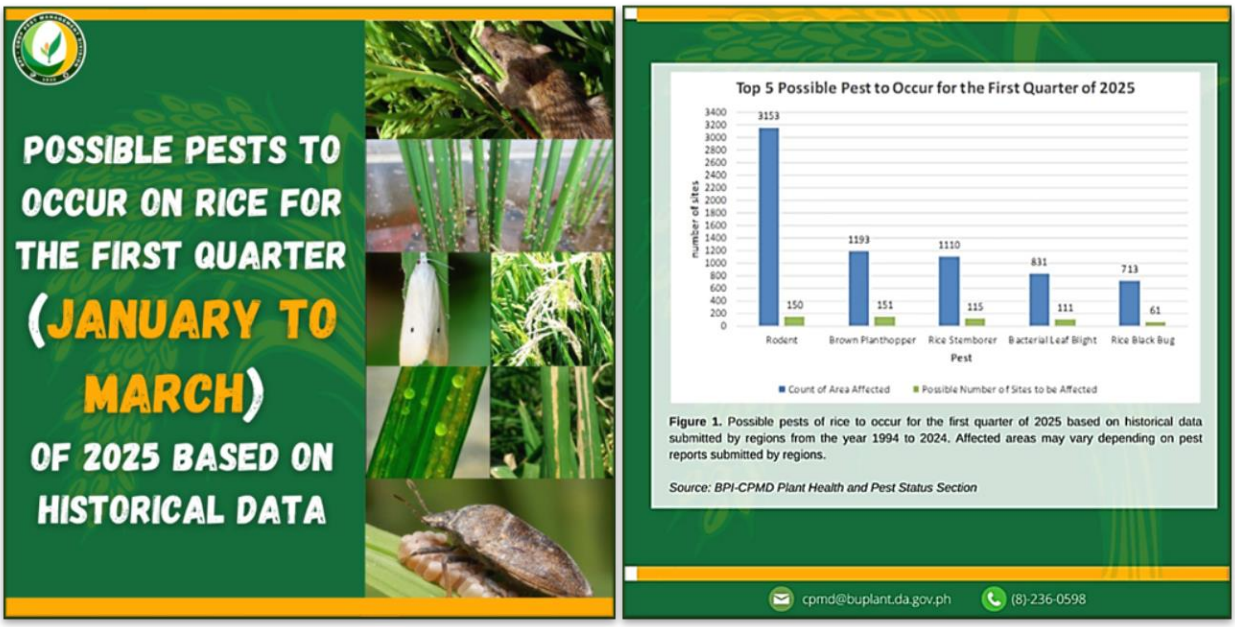


Figure 20. Crop Pest Management Division pest advisory for first quarter of 2025.

BIOLOGICAL CONTROL AGENTS (BCAs)

At present, BPI-CPMD performs 4 roles in the use and research of BCAs, and they are as follows:

Figure 11. Eucanthecona attacking fall army worm (left) and sample of produced Trichoderma harzianum (right).

- Oversees Production, Maintenance, Distribution, Screening, and Assessment of the Effectiveness of Bio-Control Agents.
- Provides Direction in the Establishment of Sustainable Bio-Control Agent Production Systems in Communities
- Conducts Assessments of Regional Crop Protection Centers (RCPCs) and the Network of Bio-Control Laboratories, and
- Undertakes Field Verification of Integrated Pest Management (IPM) Activities.

INTEGRATED PEST MANAGEMENT

Integrated Pest Management (IPM) has been an integral concept in crop protection for the past 60 years. During this time, IPM has aimed to encourage sustainable agricultural practices, significantly reduce the use of synthetic pesticides, and address various socio-economic, environmental, and health issues. However, global pesticide usage has largely persisted, negatively impacting farmer incomes, biodiversity preservation, and the human right to food.

The concept of **Sustainable Pest Management (SPM)** reimagines the IPM approach by giving importance to social aspects to drive and sustain economic and ecological soundness, thereby producing a healthy and viable economy. SPM is anchored on three sustainable pillars, namely Human Health + Social Equity, Environmental Protection, and Economic Vitality (SPM Work Group and Urban Subgroup, 2023).

With the clear alignment to One Health Approach, and the holistic coverage towards sustainable agriculture, BPI aims to adopt SPM on its action in the forefront of crop pest management in the country, bridging the gap and deficiencies from IPM implementation, thus delivering sustainable outcomes.

Figure 22 illustrates the outputs, outcomes, and impact of the Flagship Program No 2.

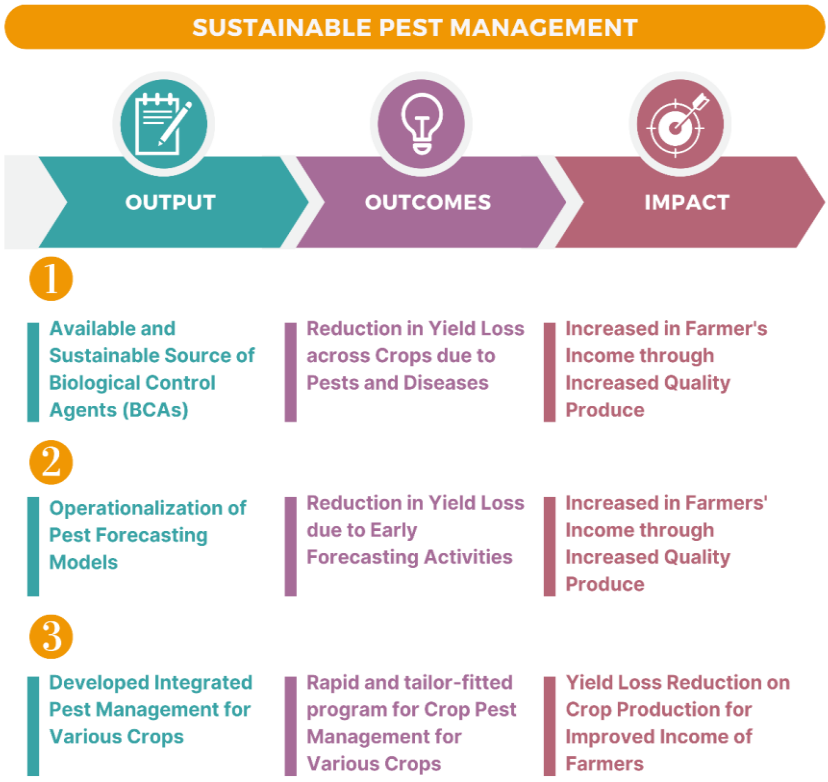


Figure 22. Sustainable pest management program.

3 CLIMATE CHANGE ADAPTATION PROGRAM

Previous research found that climate change could cost the Philippine economy around US$ 520 million a year by 2050 (Figure 23). Decline in domestic production of agricultural commodities due to climate change is expected to result in increased imports, particularly for products like coffee, rice, vegetables, and pork which may lead to import dependence.

Simultaneously, the damage to agricultural productivity would likely reduce the Philippines' ability to export key agricultural products such as sub-tropical fruits and coconut oil.

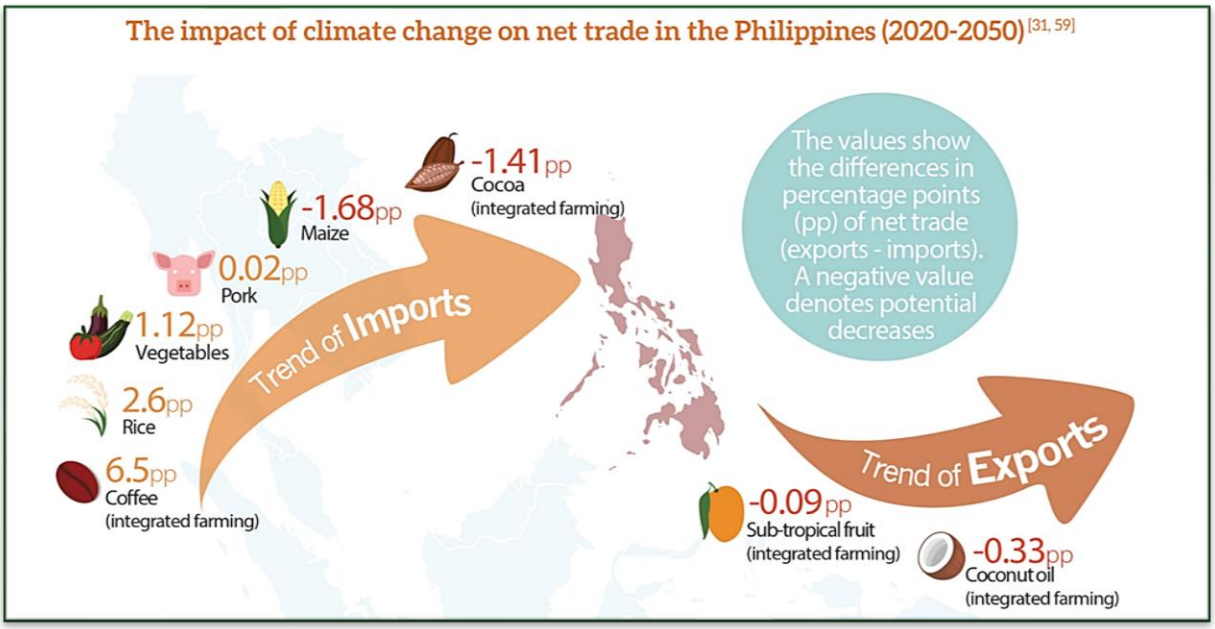


Figure 23. Impact of climate change on net trade in the Philippines (2020-2050).

Local and regional adaptation strategies include developing crop varieties that are resistant to pests and diseases and resilient to unfavorable environments (drought/flood-prone areas). Climate change adaptation research and proven good agriculture practices on soil management, protective cultivation, and ecologically sound and climate-smart agriculture aim to increase

Figure 24. KOPIA greenhouses, seedling nursery and postharvest facility at the pilot village in Barangay Kulapi, Lucban, Quezon.

productivity and income while addressing climate change and food security issues.

At present, there are two climate change adaptation programs that the BPI is focusing on. These are organic agriculture, urban and peri-urban agriculture, and protective cultivation.

ORGANIC AGRICULTURE

This type of farming takes advantage of establishing farmers' knowledge base so that they will be able to handle changes in climate. In this way, agroecosystems are fortified with diversified crop production.

Figure 25. Net tunnel cultivation (left) and organic field (right) in BPI-Los Baños NCRDPSC.

The Bureau, under the virtue of Republic Act 10068, otherwise known as "Organic Act of 2010", had its role expanded to work with Philippine Center for Postharvest and Mechanization (PhilMech) to focus its assistance on the development of organic farming systems. The BPI's five National Crop Research Development and Production Support Centers maintain certified organic farms that produce the organic seeds of cereals, field legumes, lowland vegetables and semi-temperate crops that are being distributed to organic farmers in the country. BPI also assisted in the capacity building of farmers to be qualified for certification. The farms engage in the production of certified organic seeds and planting materials which are compliant with the requirements set by DA-Bureau of Agriculture and Fisheries' Standards.

URBAN AND PERI-URBAN AGRICULTURE

The Bureau promotes urban and peri-urban agriculture to decrease, if not mitigate, malnutrition and address food security. One banner program of the Department of Agriculture, the National Urban and Peri-Urban Agriculture Program (NUPAP), is closely tied with the Bureau and shares the same vision to make food abundant and accessible to urban and peri-urban areas. The program mobilizes the community to

work closely together as a team to put up with community gardens to contribute to sustainable food production.

The Bureau of Plant Industry's implementation of the National Urban and Peri-Urban Agriculture Program offers several benefits to communities. By promoting local food production, the program helps ensure a steady supply of fresh, nutritious food, reducing dependency on external sources. By reducing the distance food travels from farm to table, the program lowers fuel consumption and logistics costs, making food more affordable.

Urban crop production also fosters collaboration among local government units, civil

Figure 26. Outscaling project on urban and peri-urban – Baguio R&D Center (left), distribution of organic vegetable seeds and seedlings to Itogon, Benguet farmers (middle), BCAs (right), (Trichoderma harzianum, Metarhizium anisopliae, and vermicompost.

society organizations, and private sector partners. The program's training and education activities empower individuals with knowledge and skills in urban agriculture. These benefits collectively enhance the quality of life in urban and peri-urban areas, making communities more self-sufficient and resilient.

PROTECTIVE AGRICULTURE

Protective cultivation may be as simple as using indigenous materials to cover and protect the crops and/or constructing sturdy greenhouses. Protective cultivation prevents pest infestation, makes production of off-season crops possible, protects crops from harsh weather, and assures sustained water supply through the integration of automated irrigation and fertigation.

The Agricultural Engineering Division of the Bureau is devoted to designing simple set-ups for protective cultivation, as well as continuously innovating manual and automated greenhouses.

Figure 27 illustrates the outputs, outcomes, and impact of the flagship program no. 3.

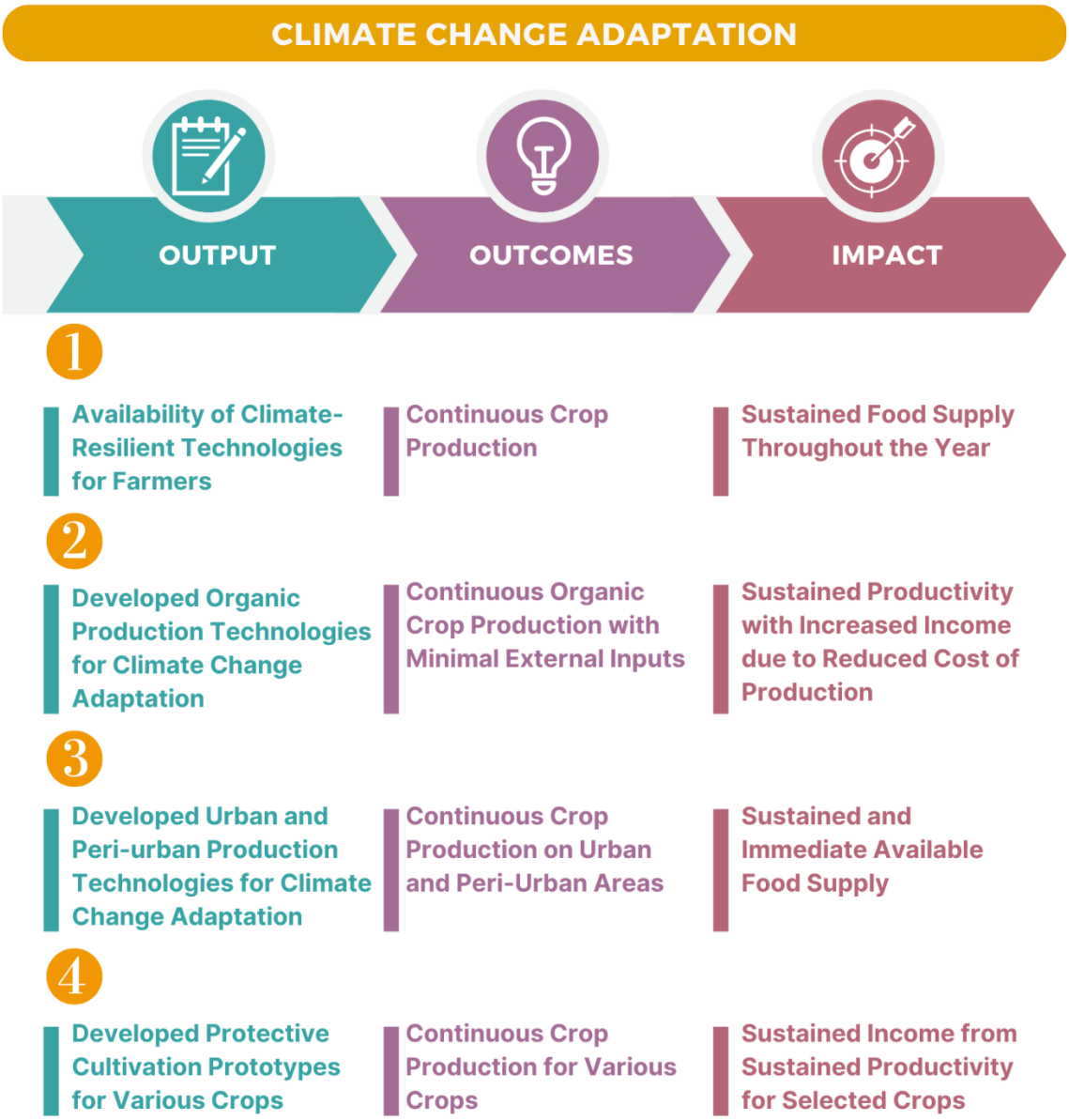


Figure 27. Climate change adaptation program.

4 CROP PRODUCTION TOOLS AND MACHINERIES PROGRAM

The BPI continuously conducts R&D on specialized tools for specific commodities, such as safety gear for mango baggers and mango seed-slicing tools. These tools aim to mitigate seed weevil infestations, aid crop protection programs by reducing costs, producing safe vegetables, and minimizing environmental contamination.

On mechanization, the BPI is working on improving storage technologies. Between 2018 and 2022, the BPI-AED developed nine machine tools; the researchers designed machines that enhance various production processes.

Figure 28. BPI rice straw chopper (left), BPI mushroom substrate bag filler (middle) and BPI mushroom substrate mixer (right).

Specifically, the Bureau's Mushroom Mechanization program introduced two innovative technologies: the Mushroom Substrate Material Mixer and the Mushroom Substrate Bag Filler. These tools significantly streamlined and simplified the processes involved in mushroom cultivation, making them more efficient and less labor-intensive.

SPECIALIZED FARM IMPLEMENTS DESIGN AND FABRICATION

There is a need to focus on designing and fabricating farm implements that are appropriate for specific commodities such as mango, durian, avocado, and banana to enhance production capabilities for high-value crops.

INTEGRATION OF SOIL AND WATER MANAGEMENT

Effective soil and water management is crucial for sustainable agriculture. The high demand for freshwater in agriculture, combined with limited availability due to drought, indicates the need for conservation and innovation of technologies to ensure continuous production. To address these challenges, the Bureau is engaged in several key initiatives such as irrigation systems, soil tillage, and hydroponics to support the plant industry.

Figure 29 illustrates the outputs, outcomes, and impact of the flagship program #4.

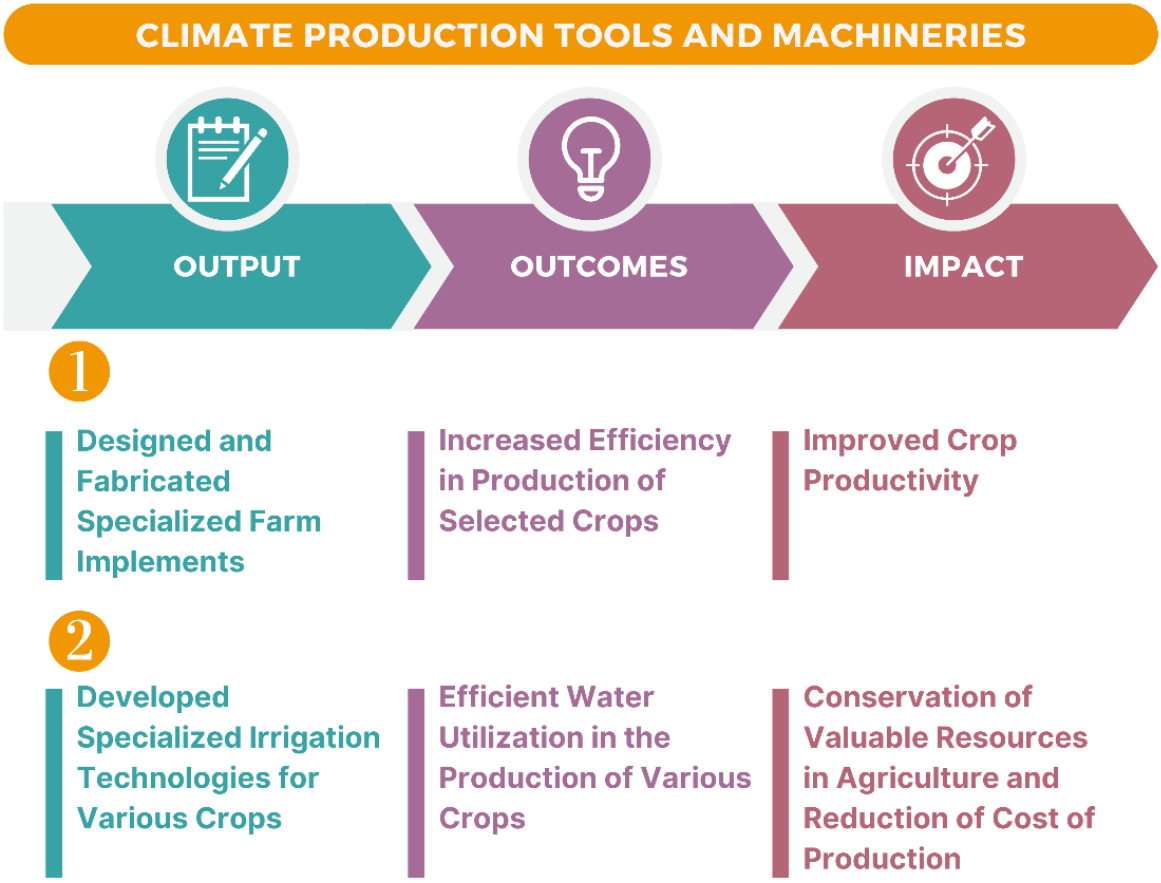


Figure 29. Crop production tools and machineries.

5 SMART AND DIGITAL AGRICULTURE (SDA)

Generally, smart and digital agriculture is the integration of modern technology into farming practices to increase efficiency, productivity, and sustainability. Here's a list of the key components currently studied in the Bureau:

CLIMATE-SMART INDOOR CULTIVATION

The BPI Headquarters provides ideal growing conditions for off-season and site-specific crops. The 130-m^2 area accommodates 4,560 pieces of leafy vegetables per planting by using digitally centralized indoor hydroponics technology.

The project aims to showcase modern digital technology in an urban setting to produce high-quality and pesticide-free vegetables up to four times more than those produced through conventional farming.

Moreover, one of the key aspects of DA-BPI Indoor Controlled Environment Agriculture is the automation and precise timing of nutrient recirculation. The automatic artificial lighting system, which allows the user to specify the ideal time range for the photosynthetic activity of the plants, is another important feature.

Through this, desired time can be set on the control panel display. To maintain appropriate humidity levels inside the system, an automated humidification system is also employed. Similarly, an automated dosing system provides the ideal nutrient levels needed for optimum plant growth. Several units of this system will be established in partnership with public and private institutions.

PRECISION AGRICULTURE

The BPI - Smart Greenhouse at the Headquarters and in the R&D Centers showcases an example of precision agriculture. By introducing various sensors into the greenhouse, farmers can streamline numerous tasks, such as watering, lighting, and other functions that have also been automated such as shading, ventilation, humidification, and dosing of fertilizer and other inputs.

Generally, BPI Indoor Cultivation System and Smart Greenhouse are designed to cater to efficient indoor production of high-value and off-season crops through the provision of controlled environments favorable for plant growth. These technologies eliminate all risks and other unfavorable aspects of growing plants outside, making food production more effective and sustainable.

Figure 30. Secretary of DA visits the smart greenhouse project at the DA-BPI in Baguio.

Figure 31 illustrates the outputs, outcomes, and impact of the flagship program #5.

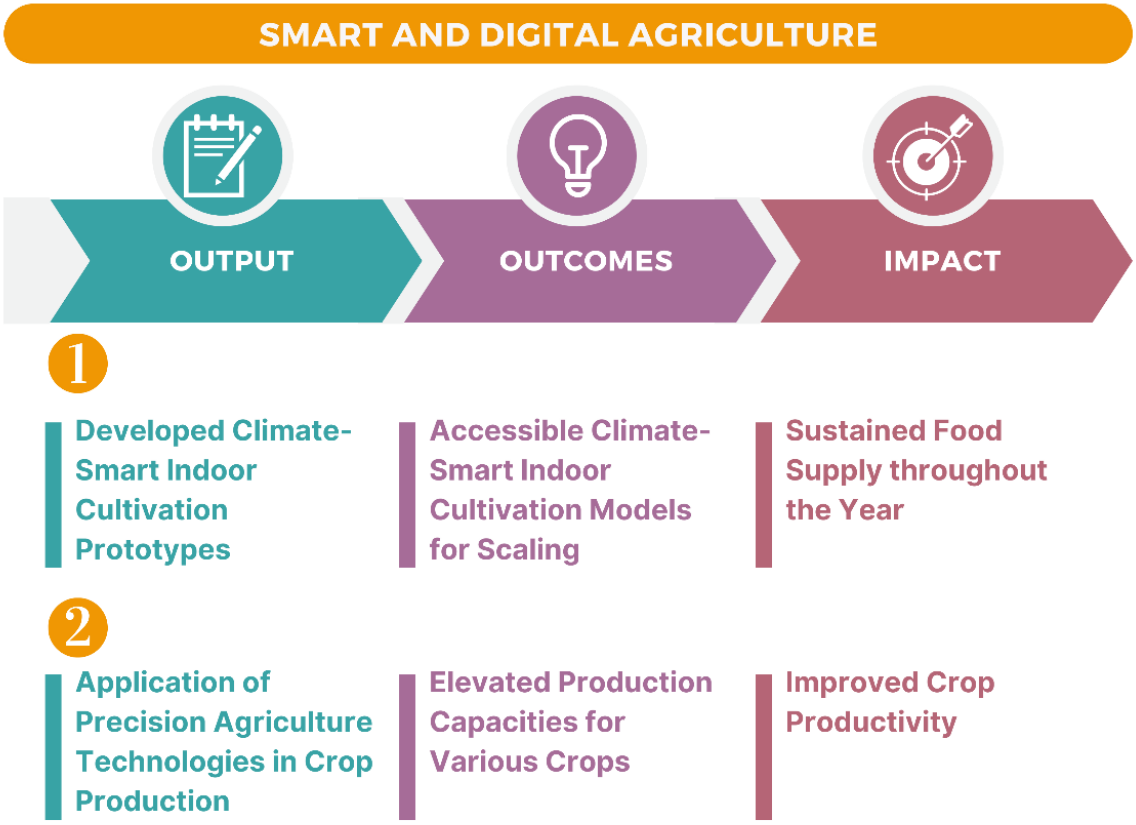


Figure 31. Smart and digital agriculture.

6 IMPROVED AND EFFICIENT REGULATORY SERVICES PROGRAM

This research program seeks to bolster the capabilities of BPI's regulatory services by conducting rigorous research and expanding the bureau's knowledge base in regulatory sciences. This will enable BPI to effectively support the development, evaluation, and implementation of regulations governing agricultural products, processes, and practices.

Regulatory science is paramount to the plant industry, ensuring the safety and quality of the food supply, safeguarding plant health, and promoting sustainable agricultural practices. It encompasses a broad spectrum of scientific disciplines, including entomology, plant pathology, nematology, chemistry, toxicology, microbiology, nuclear science, and environmental science.

Figure 32. Durian safety and quality testing.

This program is fully aligned with the Philippine Good Regulatory Principles (PGRP), a framework established by the Anti-Red Tape Authority (ARTA) to streamline and improve regulatory processes in the Philippines. These principles are in harmony with Republic Act No. 11032, also known as the 'Ease of Doing Business Act of 2018,' which aims to reduce bureaucratic red tape and facilitate business operations.

The PGRP states that regulators must have a strong foundation of legal and empirical evidence before implementing new regulations. This means carefully considering the existing laws and regulations, as well as conducting thorough research to identify any issues or problems that may require intervention. As such, regulators should only intervene in instances when evidence supports that the regulations will address the issue or lead to benefits.

In essence, regulatory science is essential for maintaining the integrity of the food and agriculture sectors, promoting public health, and supporting economic growth. By applying scientific principles to regulate the food supply and agricultural processes, regulatory science contributes to a safe, efficient, and sustainable food system.

ASSESSMENT OF FOOD SAFETY COMPLIANCE

To accurately evaluate food safety compliance and pinpoint where BPI's intervention is necessary, researchers need to collect extensive data from multiple sources.
This includes government agencies, research institutions, food industry associations, academic publications, and international organizations. Data on compliance rates, common violations, geographical distribution, and pesticide residue levels should be collected to provide a holistic understanding of the current situation.

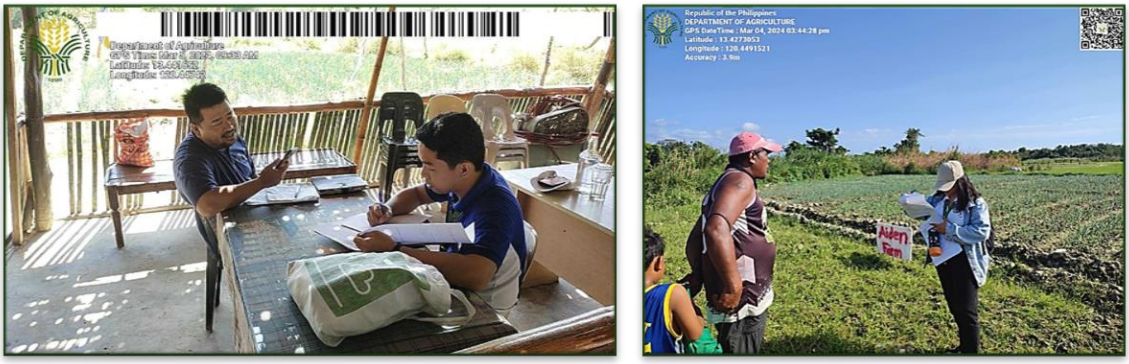


Figure 33. Stakeholders' data gathering during Good Agricultural Practices (GAP) inspection.

Based on the findings of the data analysis, researchers should develop targeted recommendations for BPI's intervention. These recommendations may include focusing on areas with high rates of non-compliance, providing training and technical assistance to food businesses, strengthening regulations, and conducting public awareness campaigns. By implementing these recommendations, BPI can effectively address food safety issues and improve the overall quality of the food supply in the Philippines.

ENHANCED METHODOLOGY IN PEST RISK ANALYSIS

Pest Risk Analysis (PRA) is a critical process used to evaluate the potential risks posed by pests and determine appropriate phytosanitary measures to prevent their introduction and spread. As defined by ISPM No. 5, PRA involves the systematic evaluation of biological, scientific, and economic evidence to ascertain whether an organism qualifies as a pest, if it requires regulation, and to establish the necessary level of control (ISPM, 2007). Through PRA, countries can effectively implement strategies to prevent new pests from threatening agricultural systems and biodiversity (Figure 34).

The International Plant Protection Convention (IPPC) provides a globally recognized framework for conducting PRAs. However, emerging challenges, such as climate change, necessitate enhanced and adaptable methodologies to maintain effective pest management.

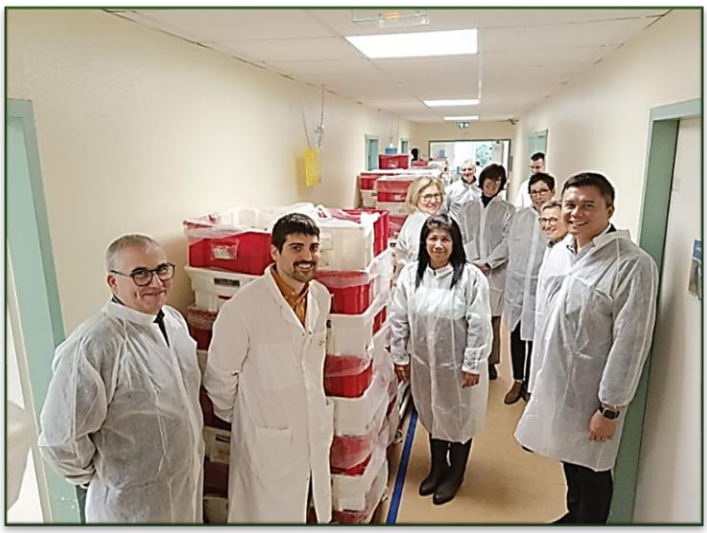


Figure 34. Phytosanitary audit of the French potato sector.

For example, shifts in temperature, precipitation, and ecosystems can influence pest behavior, leading to new outbreaks in previously unaffected areas. As such, modern PRAs must integrate dynamic factors like climate modeling to predict the potential distribution and impact of invasive species under various climate scenarios.

To enhance its Pest Risk Assessment (PRA) techniques, the Bureau of Plant Industry (BPI) is concentrating efforts to establish robust frameworks and methodologies. BPI aims to strengthen and standardize the PRA process by developing comprehensive frameworks that integrate innovative scientific tools, economic analyses, and risk evaluation models. This approach will ensure that all PRAs are thorough and responsive to contemporary challenges, including environmental and trade-related factors.

ADVANCED DIAGNOSES OF PESTS & DISEASES

Advanced diagnosis plays a crucial role in plant quarantine services by implementing strategies to rapidly detect pests and diseases in the plants and plant products being moved across Philippine borders. Improving the accuracy and cost-effectiveness of pest and disease diagnosis will enable quarantine officers to identify and intercept harmful organisms before they establish themselves in a new environment.

To enhance NPQSD's regulatory capabilities, several key issues and topics should be addressed. This includes the development of more robust surveillance and monitoring protocols for detecting pests and diseases in both imported and exported plant products. By leveraging remote sensing, automated detection systems, and molecular diagnostics, NPQSD can significantly improve the accuracy of pest and disease identification.

Further, accurate diagnostic information can help plant quarantine authorities make informed decisions about regulatory measures, such as quarantines, and entry-restrictions.

DEVELOPMENT AND IMPROVEMENT OF TECHNIQUES FOR SEED QUALITY CONTROL, DUS AND GMO DETECTION

BPI-NSQCS is committed to improving and ensuring the quality of seeds and planting materials. As part of its commitment, research on procedures to improve and develop seed testing activities and its standards for seed and plant material certification. This includes validation of methods, and improvement of existing procedures by aligning to international standards.

One such research is the breaking of dormancy of certain crops like garlic. It is commonly propagated through the use of cloves; however, these have a certain period of dormancy after harvesting, thus cannot be immediately used. Through the development of methods to break the dormancy of garlic, garlic planting materials can immediately be tested for its germination percentage. This enables the determination of the quality of garlic planting materials for use and distribution to the farmers.

Also, the improvement of seed health testing through the incorporation of virus indexing for seed and plant material certification will allow better implementation of the agency's mandate to serve the beneficiaries. This, in turn, will help in preventing the movement, introduction, and establishment of economically important viral diseases.

The globalization of the seed trade necessitates standardized methods for GMO detection to ensure compliance with international regulations and trade agreements. Accurate GMO identification is crucial for protecting the environment by preventing the unintended spread of transgenic traits. Moreover, continuous advancements in seed quality control and GMO detection techniques foster innovation in the development of new crop varieties with improved yield, nutritional value, and resistance to pests and diseases (Figure 35).

Figure 35. GMO detection activities of the Biotechnology office.

These techniques collectively contribute to sustainable agriculture, guaranteeing that seeds meet stringent quality standards and are safe for both the environment and human health (Zhou, 2024). To keep pace with the evolving landscape of the seed industry, it is imperative to embrace current innovation trends. Updating information system management for seed industry database management is essential to ensure accurate and efficient data storage and retrieval.

Integrating artificial intelligence technology can revolutionize seed industry database management by digitalizing and automating tasks such as DUS evaluation, thereby improving efficiency and reducing human error. Additionally, an improved database management system can streamline various operations within the seed industry, enhancing overall productivity and competitiveness.

Figure 36 illustrates the outputs, outcomes, and impact of the flagship program #6.

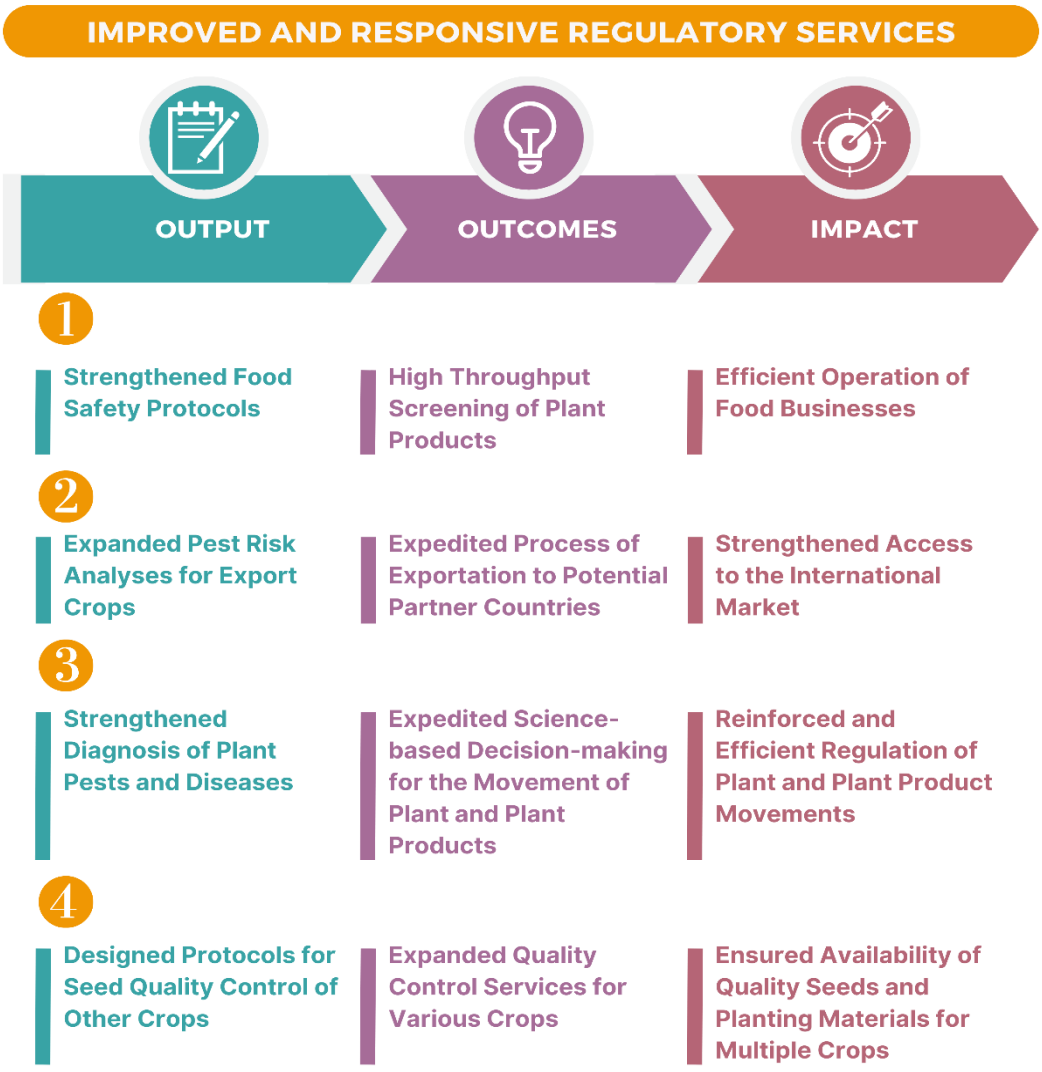


Figure 36. Improved and responsive regulatory services.

7 ESTABLISHMENT OF INNOVATION NETWORKS PROGRAM

The National Agriculture and Fisheries Modernization and Industrialization Plan (NAFMIP) 2021-2030 defines an innovation network as “a diverse group of agents who voluntarily contribute knowledge and other resources (money, equipment, and land, for example) to jointly develop or improve a social or economic process or product. It is characterized by a nonhierarchical structure with no legal personality and often with fuzzy objectives”.

The National Innovation Agenda and Strategy Document (NIASD) 2023-2032 outlines the Philippines' vision and long-term goals for innovation. This envisions fostering a culture of innovation that drives sustainable economic growth and improves the quality of life for all Filipinos. A major strategy of the NIASD is the fostering of collaboration between the government, private sector, academia, and civil society to drive innovation to leverage resources and expertise from various stakeholders (NEDA, 2023).

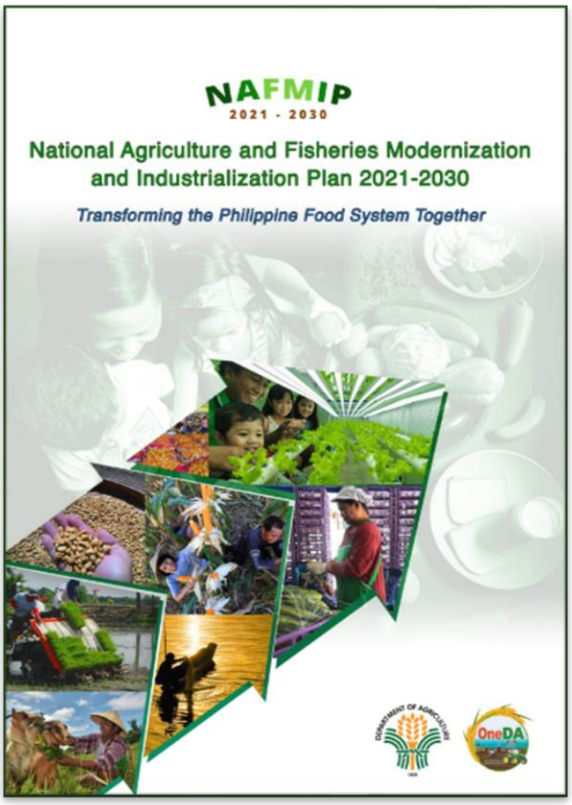


Figure 37. NAFMIP 2021 – 2030.

Photo : NAFMIP 2021 – 2030 source : https://www.da.gov.ph/infographics/nafmip-2021-2030/

Network membership can include farmers and farmer organizations. This uncertainty would force partners to use flexible approaches to explore potential solutions instead of getting into contracting and structured partnerships. This flexibility does not fit easily into the usual requirements of publicly funded projects, especially because it is difficult at first to define clear objectives and the steps that will deliver the innovation (DA, 2022).

The Bureau capitalizes on its being a member of the following collaborative local and international partnerships/networks *(See Annex for full listing, Chapter 3B- National and International Establishment of Innovation Networks).*

International Partnerships

1. APSA (Asia and Pacific Seed Alliance) Regional Plant Variety Protection and Biodiversity Consultation.
2. ASEAN Genetically Modified Food Testing Network
3. ASEAN-World Vegetable Center Regional Network for Vegetable Research and Development (AARNET).

Figure 38. BPI's local and international linkages, partnerships, and collaborations : World Vegetable Center (top-left), Bukid Amara ((top-right), Australian Center for International Agriculture Research (middle-left), Korea Partnership for Innovation of Agriculture Philippines Center (KOPIA) (bottom-left and right).

Figure 39 illustrates the outputs, outcomes, and impact of the flagship program No. 7

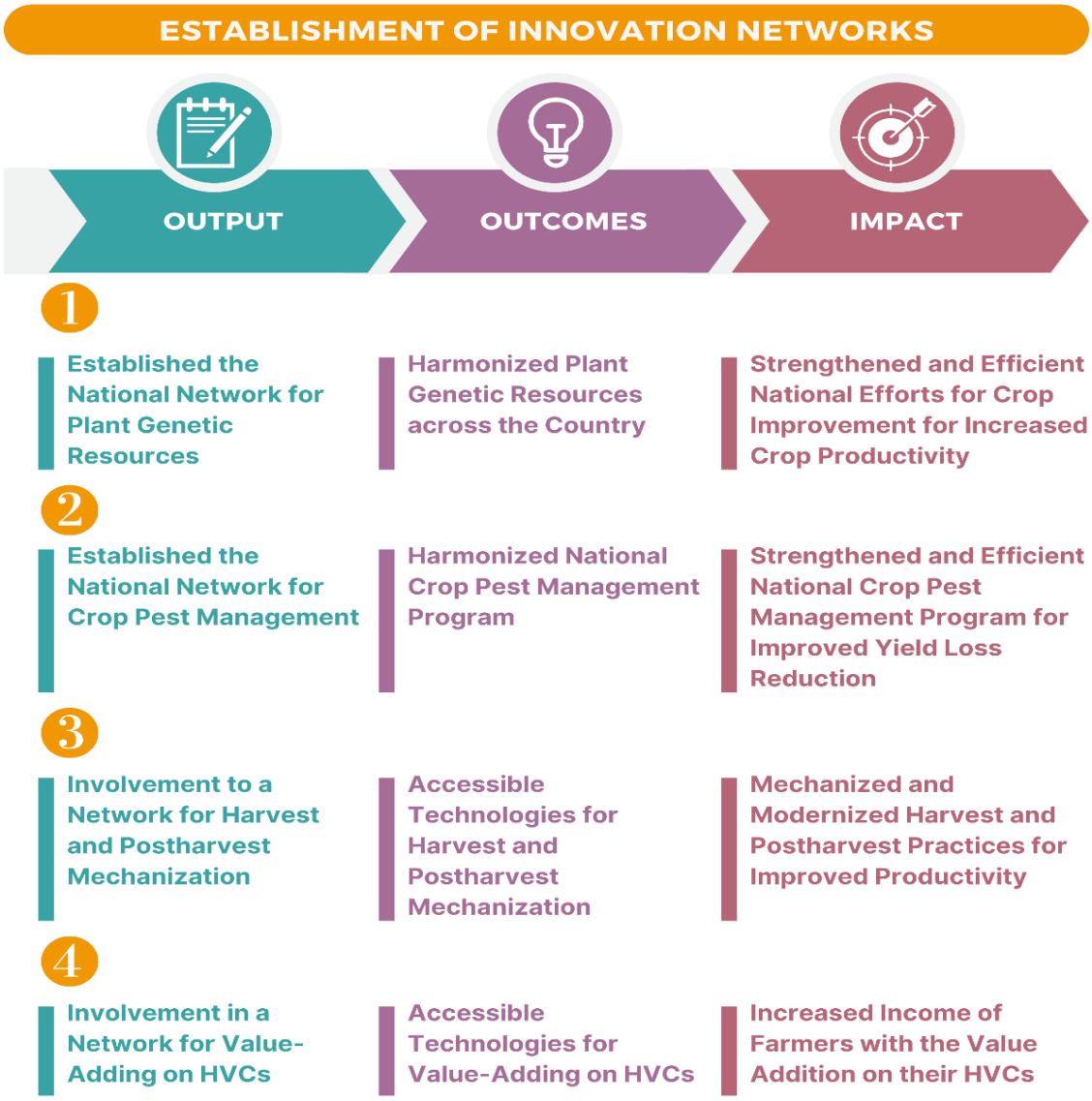


Figure 39. Establishment of innovation networks.

Chapter 4

A GLIMPSE OF THE PAST HARVESTS

The Bureau, since the mid-nineties up to 2023, has been aggressively occupied with developing quality seed and planting materials. These have been also extended to and adopted by farmer-cooperatives, local government units, and the like.

The five R&D Centers located in the five regions of the country are directly engaged in developing and registering new varieties under NSIC. Annex E – Table 1 shows the number and progression of developed and duly registered varieties by the National Seed Industry Council - varieties developed by Bureau of Plant Industry.

Figure 40. Established gardens under the outscaling of selected vegetable seed production in support to National Urban and Peri-Urban Agriculture Program (NUPAP) project.

NEW VARIETIES

To date, there are **113 crop varieties** developed by BPI and registered by NSIC, in which every center has its contribution. Baguio Center having 32 varieties, Davao and Guimaras Centers with 4 each, La Granja Center with 17, and Los Baños Center with 58 varieties.

Based on the data from the five R&D Centers of the Bureau of Plant Industry, significant trends and shifts in breeding activities are observed from 1994 to 2023.

From 1994 to 2002, Baguio focused on breeding citrus fruits and vegetable crops suitable to the region's climate. Davao specialized in breeding high-value tropical fruits and produced two varieties of durian.

Meanwhile, La Granja worked on staple crops, field legumes and fruits such as corn, soybean, sweet potato, and santol. Los Baños focused on field legumes and vegetable crops such as tomato, pole sitao, bush sitao, and cowpea.

From 2003 to 2011, Baguio continued with its citrus breeding work, producing four ponkan varieties, two citrus pummelo, two citrus gayunan, and expanded into coffee, breeding 12 varieties. This period also saw Los Baños breeding five varieties of mungbean and two of tomato, maintaining its focus on legumes and vegetables.

From 2012 to 2023, Baguio introduced one calamansi and one macadamia variety, while Davao remained consistent with its focus on durian with two new varieties added to the list. Guimaras specialized in region 6's key commodity, mango and cashew varieties.

La Granja continued with its staple crop breeding, producing four corn, five soybean, two sweet Potato, four Santol, two Peanut and three mungbean varieties. Los Baños increased its breeding activities and introduced mungbean, tomato, and pole sitao varieties.

The continuous focus on field legumes across different periods underscores the importance of these crops for food security. Additionally, the introduction of new fruit varieties, despite their longer breeding periods, highlights the center's efforts to meet market demands and adapt to changing dietary trends.

Plant Genetic Resources

The BPI values the importance of having ready access to genetic materials and farming; thus, it gives prime importance to continuous germplasm development. Through the assembly of different genetic materials, farmers will have climate-resilient and improved crop genetic resources that can be used for food or seeds, either for home or commercial purposes (Figure 41).

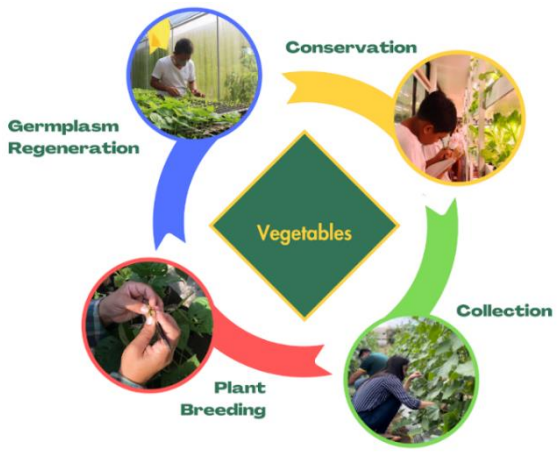


Figure 41. Plant genetic resources cycle for vegetables.

To sustain the availability of quality seeds and planting materials, the BPI headquarters and its five National Research Development and Production

Support Centers continuously collect, conserve, breed, and regenerate germplasm of vegetables, legumes, fruits, and indigenous crops.

National Crop Improvement Network

The National Crop Improvement Network for the Philippines (NCIP) is envisioned to be a network composed of organizations that are focused on enhancing the development, productivity, and sustainability of major crops in the Philippines. This network aims to foster synergistic and meaningful collaborations with various research institutions, government agencies, universities, and private sector stakeholders to innovate and respond to the needs of Filipino farmers and consumers. Here are some key aspects of the NCIP's objectives and functions. The NCIP's primary goals include:

- **Improving Crops:** Developing high-yielding, pest-resistant, and climate-resilient crop varieties through advanced breeding techniques and biotechnology.
- **Research and Development:** Addressing key challenges in Philippine agriculture, such as climate change adaptation, food security, and crop diversity.
- **Technology Adoption and Knowledge Sharing:** Facilitating the adoption of new technologies, sharing knowledge, and providing access to crop improvement facilities.

The Network is highly encouraged to develop the Key Crop Priorities namely:

- Legumes and pulses
- Banana, pineapple, and other tropical fruits
- Lowland Vegetables (Garlic, Onion, Ginger)
- White and Yellow Corn
- Purple yam

Through the integration of scientific research, innovative practices, and community engagement, the network aims to boost productivity and improve crop varieties in the Philippines.

CLIMATE SMART AGRICULTURE NETWORK

Climate-smart agriculture (CSA) is a strategic approach aimed at transforming agri-food systems to be more sustainable and resilient to climate change. CSA focuses on three primary objectives: sustainably increasing agricultural productivity and incomes, adapting and building resilience to climate change, and reducing and/or removing greenhouse gas emissions where possible (FAO, 2022). The specific practices of CSA are context-specific, depending on local socio-economic, environmental, and climate change factors.

As such, one of the objectives of forming the network is to define the context of CSA in crop production in the Philippines, particularly for high value crops, field legumes, highland and lowland vegetables and fruit trees.

Roles of various stakeholders are being recognized as vital in crafting substantial CSA measures and programs. Among the identified institutions with important parts on primary objectives are the following.

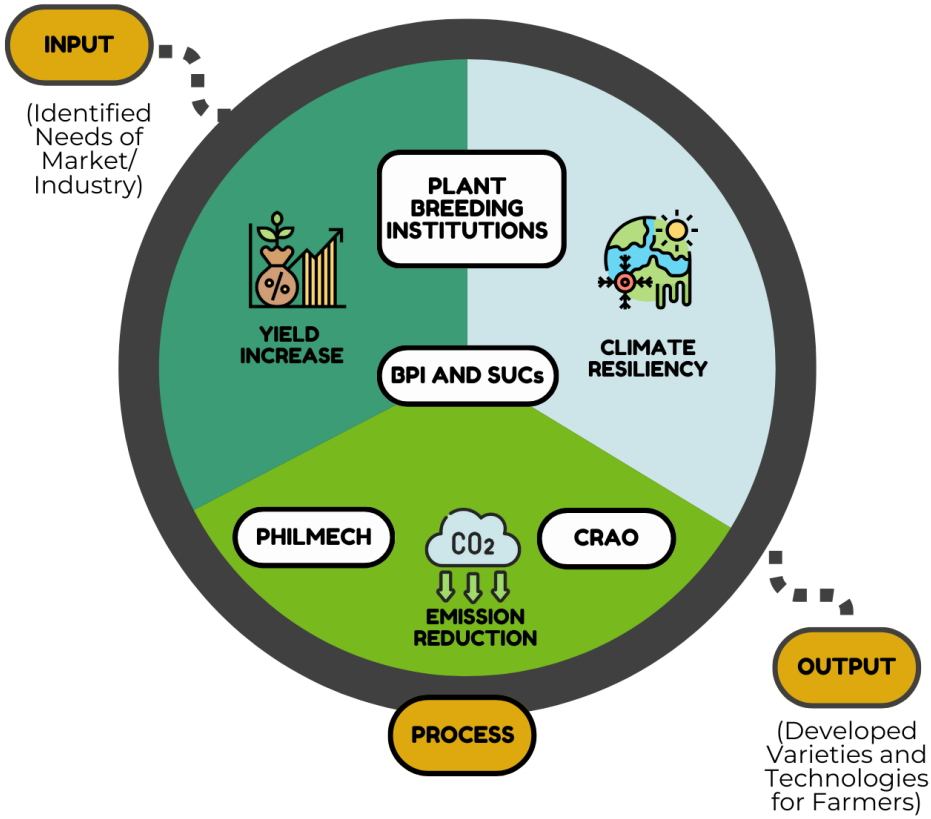


Figure 42. Climate smart agriculture network.

Convergence of efforts such key agencies and research institutions to develop innovative production systems is paramount for our farmers to adapt to the challenges of climate change.

CHAPTER 5
BIRTH, REASON FOR BEING AND ORGANIZATIONAL STRUCTURE

Birth
The Bureau of Agriculture was renamed the Bureau of Plant Industry on January 1, 1930, by virtue of the Republic Act of 3639. This Act specifically transferred tasks related to plant research and crop production to BPI (Annex F).

Reason for Being
The BPI, as a public sector organization, envisions a resilient, innovative, and sustainable plant industry contributing to the Philippines' food and economic security. Since 1930, the bureau's functions and tasks, from being dedicated only to plant research and crop production, have evolved through a series of laws, and executive and administrative orders.

The policies below outline how the Bureau, since 1930, has enlarged its territory from plant research and crop production to 6 more territories through the Republic Act No. 4007 known as the "Reorganization law of 1932". BPI then was re-organized to consist of **5 divisions**:

- Administrative
- Plant Investigation
- Agricultural Extension
- Plant Sanitation and
- Plant Propagation

Over the years, the agency has added new functions to cope with the changing of times. Today, there are six divisions as follows:

- Agricultural Engineering
- Plant Product Safety Services
- National Plant Quarantine Services
- Crop Pest Management
- Crop Research and Production Support, and
- National Seed Quality Control Services.

Two special regulatory offices have also been established:

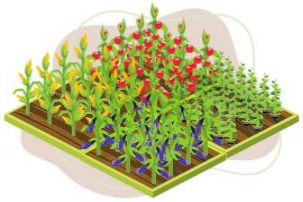
- National Seed Industry Council/ Plant Variety Protection Office
- Biotechnology Office

Figure 43. Bureau of Plant Industry historical timeline.

1977

Presidential Decree No. 1050

"Renaming of Crop Development Services"



Field Trial Services

1960

"Commercialization of Pineapple"

"Importation for large-scale planting in Mindanao

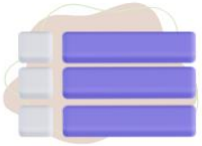
Improved Pineapple Strains

1986

Executive Order No. 116

"From Line Bureau to Staff Bureau"

Staff Bureau



Streamlined Programs

Plant Quarantine Policies

Strengthened Pest Management

1992

Republic Act No. 7038

"Creation of the National Seed Industry Council"

National Seed Industry Council Building

2013

Executive Order No. 366 of 2013

"Reorganization Plan of the Government Sector"

Plant Product Safety Services Division

2013

Executive Order No. 366 of 2013

"Reorganization Plan of the Government Sector"

Crop Research Production & Support Division

2013

Five BPI Centers Were Renamed

"National Crop Research, Development and Production Support Center"

Baguio

Davao

Guimaras

La Granja

Los Baños

Figure 43a. Bureau of Plant Industry historical timeline (continued)

2019

Republic Act 11203

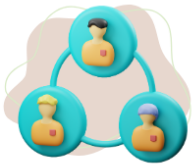
"Transfer of Food Safety functions to BPI"

"An Act Liberalizing the Importation, Exportation and Trading of Rice"

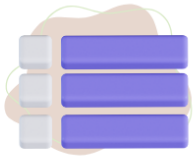
2017

ISO/IEC 17025:2005 Certification

Regional Pesticide Analytical Laboratories



Baguio



Cebu

Cagayan De Oro

Davao

Plowing through the Food Crop Research Field

Plowing through the food crop research field, the Bureau reaches out to farmers and cooperatives from Luzon, Visayas and Mindanao with the help of the 5 National Research Development and Production Support Centers. These 5 centers provide R&D products such as quality seeds, planting materials and package of technologies. There are five Centers currently functioning as direct links to farmers: namely:

- The **Baguio National Crop Research Development and Production Support Center (BNCRDPSC**) originally began as the Trinidad Garden in 1904. It promoted scientific agriculture services to farmers of semi-temperate crops. Over the years, it underwent various name changes and relocations before settling in Guisad Valley, Baguio City. Today, the Center provides research, production, and technology services on white potato, highland vegetables, banana, strawberry, citrus, and others. The Center's mission is to enhance agricultural growth in the region. Sual Foundation Grove, a station of BNCRDPSC dedicated for assorted fruit crops such as citrus, mango, pummelo, durian, and papaya are currently being maintained in Sual, Pangasinan. They serve as a source of scions or budwoods for scion groves. Another station, Buguias Seed Farm, located at Barangay Calagan in Buguias, Benguet, has a total operational area of 10 hectares containing eight (8) units of plastic houses for potato seed production.

Figure 44. Baguio National Crop Research Development and Production Support Center (BNCRDPSC).

- The **Davao National Crop Research, Development and Production Support Center (DNCRDPSC)** was established in 1947 as the Davao Experiment Station. Initially, it focused on abaca research but later expanded to various fruit trees and plantation crops. The center receives support from both Japan and the Philippines. The Center plays a significant role in agricultural development in Mindanao. Among the R&D priority commodities of DNCRDPSC are banana, durian, citrus, lanzones, papaya, mangosteen, rambutan, cacao, and other special fruit crops of economic potential. They engage in plant genetic resources conservation and development, selection, breeding, gene-mapping, development of cultural management practices, crop protection management strategies, and new pomological technologies.

Figure 45. Davao National Crop Research, Development and Production Support Center (DNCRDPSC).

- The **Guimaras National Crop Research, Development, and Production Support Center (GNCRDPSC)** is one of two agricultural centers of the BPI in the Visayas. GNCRDPSC is formerly known as the National Mango Research and Development Center (NMRDC), a specialized crop center under the Bureau. Established in 1969, NMRDC drives mango research and development to improve industry management and enhance mango exports. The center conducts research on various aspects of mango production and post-harvest handling, maintains a germplasm collection, and provides information and support to the mango industry.

Figure 46. Guimaras National Crop Research, Development, and Production Support Center (GNCRDPSC).

- The **La Granja National Crop Research, Development and Production Support Center (LGNCRDPSC)** – has served as a model farm since 1902 and continues to serve as an agricultural research center under the BPI. The Center develops new varieties of field legumes and through various research and technical assistance, contributes to agricultural development in the Visayas. Among the notable accomplishments of LGNCRDPSC were the following National Seed Industry Council (NSIC)-approved crop varieties, namely: three (3) yellow, flint, and open-pollinated corn, 3 soybeans, and 1 sweet potato. Additionally, LGNCRDPSC has two (2) Bangkok santol trees known for their superior quality. They serve as parent trees and scion source for propagation of certified planting materials.

Figure 47. La Granja National Crop Research, Development and Production Support Center (LGNCRDPSC)

- The **Los Baños National Crop Research, Development, and Production Support Center (LBNCRDPSC)** was established in 1931 as the Los Baños Economic Garden. It was later renamed and reorganized several times, becoming its current name in 1988. The center is a research and development institution that focuses on the development of lowland vegetables under the Bureau of Plant Industry. Among these crops, LBNCRDPSC is inclined in researching and developing varieties of tomato, eggplant, pole sitao, squash, mungbean, and vegetable soybean. They gear towards production of breeder and foundation seeds of NSIC approved varieties, high quality fruit trees, ornamental and medicinal plants, and other economically important crops. They also engage in technology transfer activities for promotion of production technologies such as use of vermicompost for organic production and potting media preparation for ornamental crops.

Figure 48. Los Baños National Crop Research, Development, and Production Support Center (LBNCRDPSC)

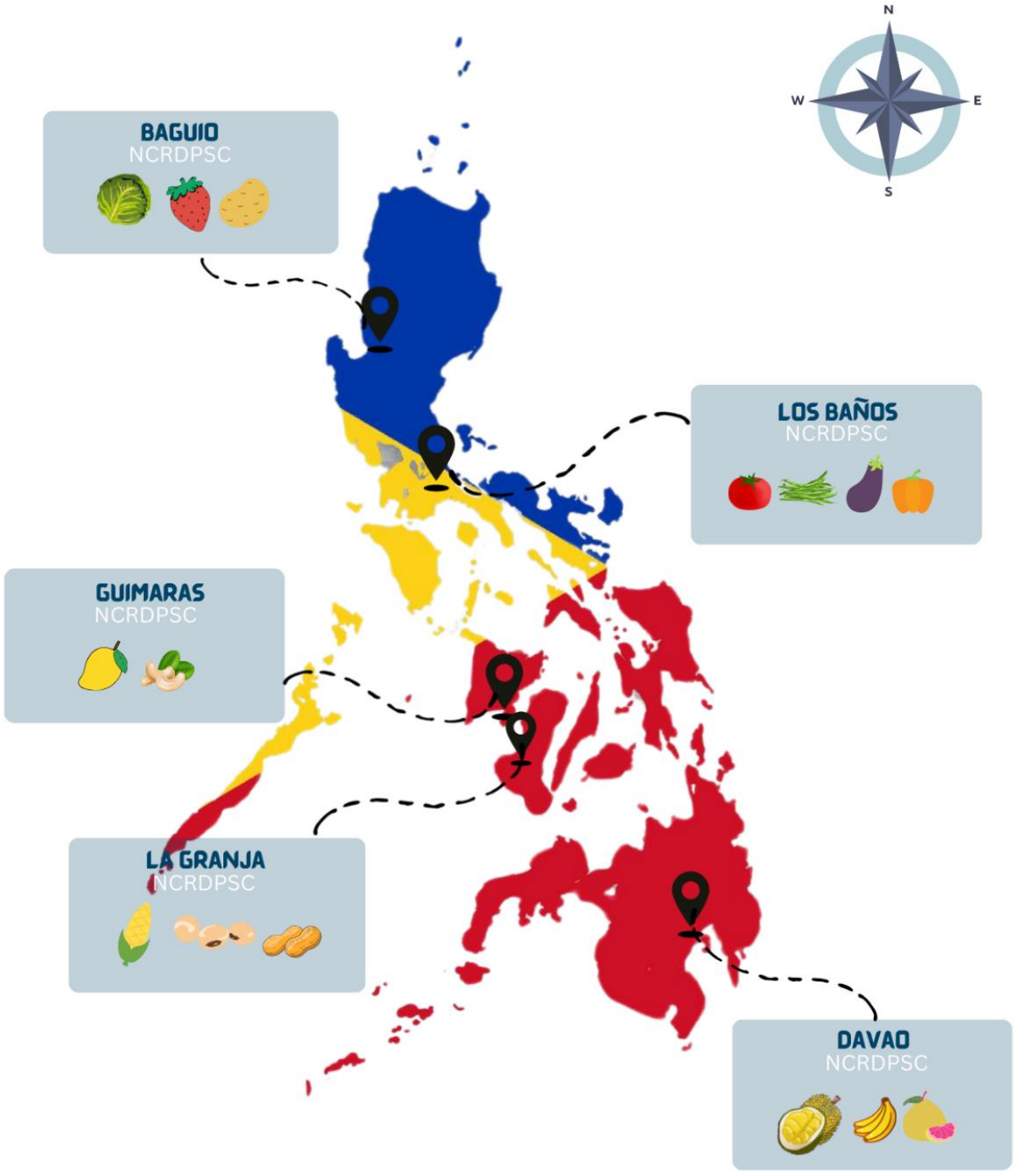


Figure 49. Location of BPI centers.

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ANNEXES

Annex A. BPI at the National and Global Context

National Context

Since the founding of the Bureau in 1930, the research, development and resources needed for production support of economically important crops such as **rice**, **sugarcane**, **coconut**, **tobacco**, **rubber** and **abaca** have been delegated to 10 specially created agencies in the Department of Agriculture (See Annex D for list of DA Agencies that were born out of these developments).

Global Context

The agricultural research investment ratios of Southeast Asian countries' fall short of the one percent recommended by global and regional bodies like the United Nations. Thailand and Malaysia have the highest intensity ratios in the region, while the Philippines' AgGDP spending in 2017 was 0.41, falling within the middle range.

The ASEAN region needs to significantly increase its agricultural research investment to effectively address future production challenges and ensure productivity growth. (Suphannachart, citing from ASTI 2016).

DA Institutions Supporting the Plant Industry

Out of the 10 institutions of DA providing direct and indirect support to the plant industry **(Annex A**. List of DA R&D Institutions supporting Plant-based Commodities**)**, seven focus on plant commodities; namely:

- The Bureau of Plant Industry (BPI),
- The Philippine Coconut Authority (PCA),
- The Philippine Fiber Industry Development Authority (PhilFIDA),
- The Philippine Rice Research Institute (PhilRice),
- The National Tobacco Authority (NTA),
- The Sugar Regulatory Administration (SRA), and
- The Philippine Rubber Research Institute (PRRI).

These institutions play vital roles in their respective sectors, focusing on research, development, and implementation of technologies and practices that enhance productivity, ensure quality, and support economic growth.
Overall, DA also takes a commodity-based approach in research and development among its banner programs (See Annex E) and regional offices (Annex F).

For BPI, the main task is to explore and develop other crops with socio-economic potential, such as field legumes, vegetables, tropical fruits, ornamentals, and

medicinal plants. Additionally, the BPI's expanded regulatory mandate empowers it to enhance the overall consumption safety system for the high-quality seeds and planting materials it distributes to farmers.

State Universities and Colleges Collaborating with the Plant Industry

The BPI works hand-in-hand with state universities and colleges (SUCs), thus, deepening the reach and substance of the agricultural innovations. **(Annex Chapter1B: List of SUCs)**. The research thrusts and priorities generally of SUCs are patterned after the national, regional, and provincial agenda and road maps of the government, research personnel, deans, faculty researchers, students, and external stakeholders (Lansigan, 2016).

To date, the bureau actively works with five consortia for smoother regional planning, evaluation, and sharing of resources among RDE agencies across various agencies the region and they are as follows:

- **Southern Tagalog Agriculture, Aquatic, and Resources Research Development and Extension Consortium (STAARRDEC)**. The consortium is hosted by Cavite State University with the BPI Central Office and BPI Los Baños as its members with 9 other SUCs in the region.

- **Cordillera Consortium for Agriculture, Aquatic, and Resources Research and Development** (CorCAARRD). Benguet State University hosts the consortium and BPI Baguio is one of its members, together with 11 SUCS in the region.

- **Visayas Consortium for Agriculture, Aquatic, and Resources Program (ViCAARP)**. This consortium is hosted by the Visayas State University and serves as the agriculture and natural resources research and development arm in in Eastern Visayas. BPI is one of its members, together with 11 SUCs in the region.

Annex B. List of Research and Development Institutions focusing and supporting Plant-based Commodities of the Department of Agriculture

YEAR FOUNDED	AGENCY AND MANDATE
1930	**Bureau of Plant Industry (BPI)** Ensures the availability of high-quality seeds and planting materials; conducts research and development/technology generation; manages crop pests and diseases; sustainably conserves and utilizes plant genetic resources for food and agriculture; oversees plant quarantine; certifies seeds and plant materials; registers and protects plant varieties; ensures food safety; and implements rules and regulations for genetically modified plants and plant products. (BPI, 2022)
1951	**Bureau of Soils and Water Management (BSWM)** Formulates measures and guidelines for the effective utilization of soil and water resources as vital agricultural resources to attain food security and safety, environmental stability through soil and water resources-based adaptation and mitigation measures that address multi-environmental concerns on land degradation, climate change, and agricultural biodiversity conservation. (BSWM, 2020)
1972	**National Food Authority (NFA)** Promotes the integrated growth and development of the grains industry in the Philippines. Its research and development agenda focuses on enhancing productivity, ensuring food security, and stabilizing market prices.
1973	**Philippine Coconut Authority (PCA)** Promotes the rapid integrated development and growth of the coconut and other palm oil industry in all its aspects and to ensure that the coconut farmers become direct participants in, and beneficiaries of such development and growth. (PCA, 2020)
1980	**Philippine Center for Postharvest Development and Mechanization (PhilMech)** Generates, extends and commercializes appropriate and problem-oriented agriculture and fishery postharvest and mechanization technologies, practices and systems (PhilMech, 2022)
1981	**Philippine Fiber Industry Development Authority (PhilFIDA)** Promotes the growth and development of the natural fiber industry through research and development; production support; extension support, education and training services; fiber utilization and technology; and standards implementation and trade regulation. (PhilFIDA, 2021)

1985	**Philippine Rice Research Institute (PhilRice)** Helps develop high-yielding and cost-reducing technologies so farmers can produce enough rice for all Filipinos. (PhilRice, 2023)
1987	**National Tobacco Authority (NTA)** Improves the economic and living conditions and raises the quality of life of the tobacco farmers including those who depend on the industry for their livelihood; and promotes the balanced and integrated growth and development of the tobacco industry to help make agriculture a solid base for industrialization.
1987	**Sugar Regulatory Administration (SRA)** Exercises supervision over the growth and development of the sugar industry through greater and significant participation of the private sector and the improvement of the working conditions of the sugar workers. (SRA, 2021)
1998	**Bureau of Agriculture and Fisheries Standards (BAFS)** Develops and promotes standards to ensure food safety, quality, workers' health and welfare, environmental management, and global competitiveness of Philippine agriculture and fishery products. (BAFS, 2024)
2010	**Philippine Rubber Research Institute (PRRI)** Created through Republic Act 10089 or the PRRI Act of 2010, strengthens the research and development on rubber and other aspects of the industry, to increase rubber production and improve the quality of life of people in the rural communities that depend on this industry. (PRRI, 2020)
	DA-Regional Field Offices The Department of Agriculture's Regional Field Offices (RFOs) in the Philippines play a crucial role in coordinating and implementing agricultural research and development initiatives across their respective regions. They manage a grant system through the Bureau of Agricultural Research to fund projects that focus on technology adoption and market-oriented innovations in agriculture. Additionally, RFOs provide extensive support services, including extension services and training, aimed at disseminating agricultural knowledge and enhancing productivity within local communities.

Annex C. Research Outcomes of the Flagship Programs

PROGRAM	OUTPUT	OUTCOMES	IMPACT
Crop Diversity and Improvement	Available germplasm collection	Accessible Materials for Plant Breeding	Strengthened Crop Biodiversity
	NSIC Registered Varieties	Increase in Farmers Productivity and Income	Improved well-being of farmers
	Developed climate-resilient varieties	Accessible varieties adaptive to adverse climatic conditions	Sustained production amidst adverse climatic conditions
	Developed seed storage technologies	Accessible technologies for seed storage	Readily available seeds for sustained crop production
Sustainable Pest Management	Available and sustainable source of Biological Control Agents (BCAs)	Reduction in Yield Loss across Crops due to Pests and Diseases	Increased in Farmer's income through increased quality produce
	Operationalization of Pest Forecasting Models	Reduction in Yield Loss due to early forecasting activities	Increased in Farmers' income through increased quality produce
	Developed integrated pest management for various crops	Rapid and tailor-fitted program for crop pest management for various crops	Yield loss reduction on crop production for improved income of farmers
Climate Change Adaptation	Availability of Climate-Resilient Technologies for Farmers	Continuous crop production	Sustained food supply throughout the year
	Developed organic production technologies for climate change adaptation	Continuous organic crop production with minimal external inputs	Sustained productivity with increased income due to reduced cost of production
	Developed urban and peri-urban production technologies for climate change adaptation	Continuous crop production in urban and peri-urban areas	Sustained and immediate available food supply

PROGRAM	OUTPUT	OUTCOMES	IMPACT
	Developed protective cultivation prototypes for various crops	Continuous crop production for various crops	Sustained income from sustained productivity for selected crops
Climate Production Tools and Machineries	Designed and fabricated specialized farm implements	Increased efficiency in production of selected crops	Improved crop productivity
	Developed specialized irrigation technologies for various crops	Efficient water utilization in the production of various crops	Conservation of valuable resources in agriculture and reduction of cost of production
Smart and Digital Agriculture	Developed climate-smart indoor cultivation prototypes	Accessible climate-smart indoor cultivation models for scaling	Sustained food supply throughout the year
	Application of precision agriculture technologies in crop production	Elevated production capacities for various crops	Improved crop productivity
Improved and Responsive Regulatory Services	Strengthened Food Safety Protocols	High throughput screening of plant products	Efficient operation of food businesses
	Expanded pest risk analyses for export crops	Expedited process of exportation to potential partner countries	Strengthened access to the international market
	Strengthened diagnosis of plant pests and diseases	Expedited science-based decision-making for the movement of plant and plant products	Reinforced and efficient regulation of plant and plant product movements
	Designed protocols for seed quality control of other crops	Expanded quality control services for various crops	Ensured availability of quality seeds and planting materials for multiple crops
Establishment of Innovation Networks	Established the national network for plant genetic resources	Harmonized plant genetic resources across the country	Strengthened and efficient national efforts for crop improvement for increased crop productivity

PROGRAM	OUTPUT	OUTCOMES	IMPACT
	Established the national network for crop pest management	Harmonized national crop pest management program	Strengthened and efficient national crop pest management program for improved yield loss reduction
	Involvement to a network for harvest and postharvest mechanization	Accessible technologies for harvest and postharvest mechanization	Mechanized and modernized harvest and postharvest practices for improved productivity
	Involvement in a network for value-adding on HVCs	Accessible technologies for value-adding on HVCs	Increased income of farmers with the value addition on their HVCs

Annex D. Flagship Program No. 7 - Establishment of Innovation Networks (National and International)

National Networks

- *NATIONAL PLANT GENETIC RESOURCES NETWORK (NPGRN)*

The National Plant Genetic Resources Network (NPGRN) is envisioned to be a unified body to fully represent the various initiatives of different institutions involved in the conservation utilization of plant genetic resources for food and agriculture.

This program aims to position BPI at the forefront of PGR Conservation in the Philippines to fulfill its commitment as a representative to the UN Commission on Genetic Resources and to fulfill its obligation as a party to the ITPGRFA.

The network shall be headed by the BPI- ITPRGFA Technical Working Group to spearhead and initiate activities to centralize the PGR databases in the country across various crops.

The overall goal of the network is to establish uniform and validated protocols in PGR activities to set the direction on conservation priorities and to also reflect their members' position in the meetings of the ITPGRFA. The network also encourages the pooling of material, financial, and human resources to fulfill its shared goals, as well as exchanging innovation on plant material conservation.

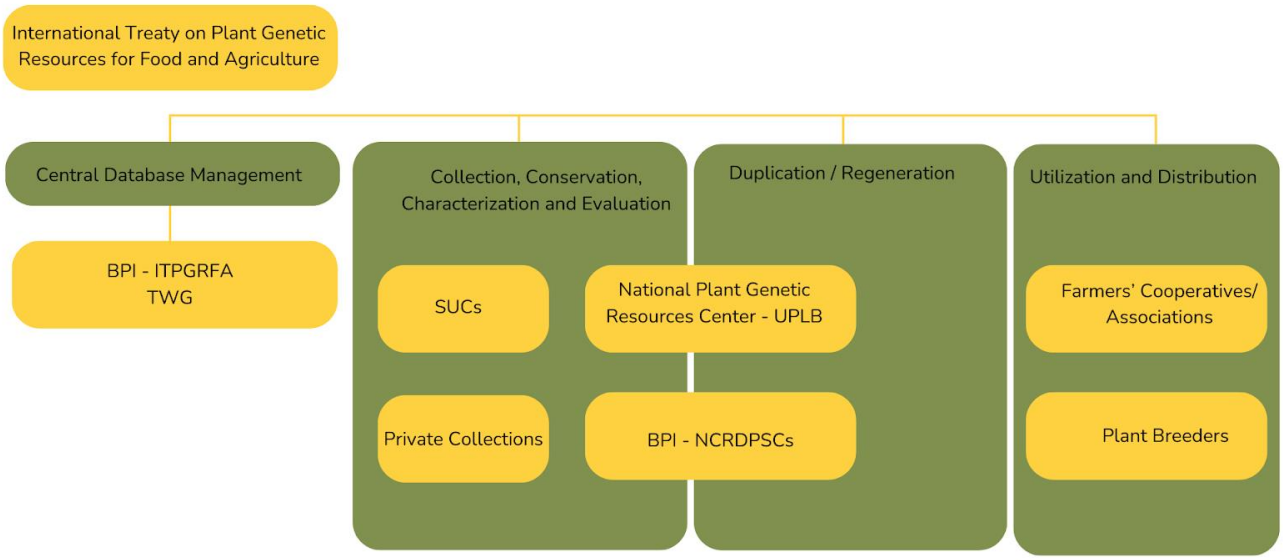

Figure 50. National Plant Genetic Resources Network (NPGRN).

- ***INNOVATION NETWORK FOR AGRICULTURAL MECHANIZATION***

The **Innovation Network for Agricultural Mechanization** is envisioned to be a collaborative network that promotes the development and adoption of innovative mechanization technologies in agriculture, particularly for high-value crops through partnerships among its member institutions.

This network aims to enhance the agricultural productivity of farmers by leveraging cutting-edge technologies and fostering partnerships among various stakeholders in the private and public sector including researchers, farmers, industry players, and policymakers.

The network shall be headed by the BPI Agricultural Engineering Division who shall spearhead and initiate activities to establish networks for the mechanization of harvest, post-harvest, and value-adding activities for identified priority crops such as field legumes, tomato, mango, and durian.

The overall goal of the network is to set the prioritization of resources to the mechanization of production systems for identified priority crops. The network also encourages the pooling of material, financial, and human resources to fulfill its shared goals, as well as exchanging innovations on agricultural mechanization among local and global partners. The members shall be composed of other agencies focusing on postharvest mechanization, the UPLB- Postharvest Horticulture Training and Research Center. One of the major principles to guide the network shall be the consultations with the Farmers' Cooperatives / Associations to effectively address their needs.

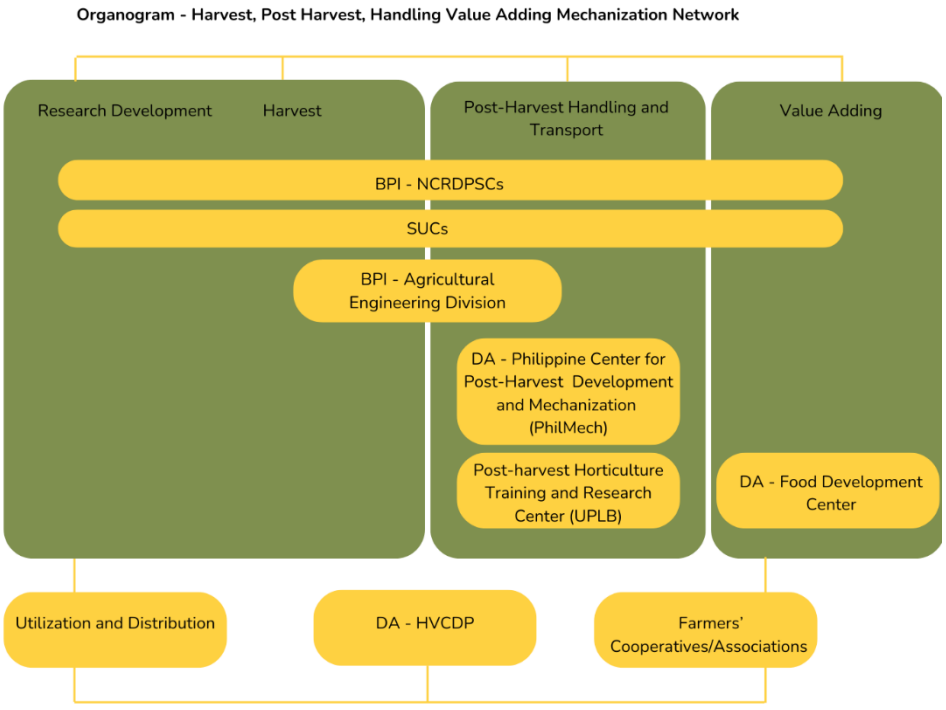

Figure 51. Proposed organogram on harvest, post-harvest, handling value adding mechanization network.

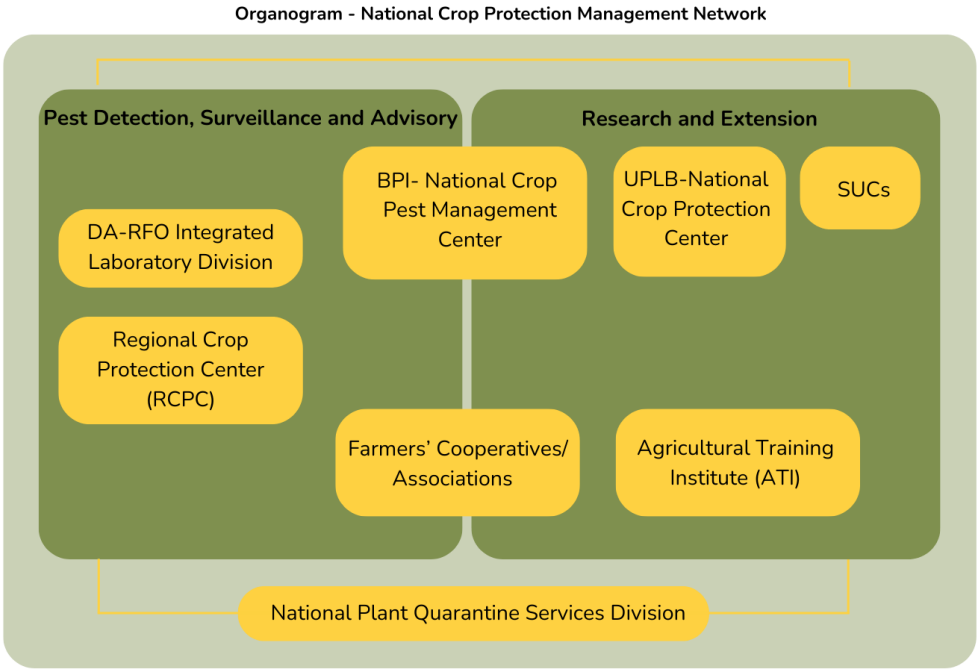

Figure 52. Proposed organogram on national crop pest management network.

- ***NATIONAL CROP PEST MANAGEMENT NETWORK***

This program aims to rapidly and effectively address the management of emerging pests across the country through the coordinated efforts of all actors in the Crop Pest Management Sector. Farmers can benefit significantly from this coordinated effort in several ways:

1. *Strengthened Plant Quarantine Services:* BPI, through the NPQSD prevents the introduction and further spread of plant pests by complying with the phytosanitary conditions of trading partners. Alignment with these conditions may be satisfied through the use of advanced technologies for quarantine pest detection and disease diagnosis, and streamlined methods for pest risk analysis, ensuring efficient border control and plant health.
2. *Enhanced Pest Management:* With the National Crop Pest Management Center (NCPMC) and other agencies working together, farmers receive timely and effective pest management strategies. This reduces crop losses and increases yields, ensuring better productivity and profitability.
3. *Access to Resources and Training*: BPI in coordination with the Agricultural Training Institute and other extension services provide farmers with the latest knowledge and skills in pest management. This includes training on integrated pest management (IPM) techniques, which are more sustainable and environmentally friendly.
4. *Support and Collaboration:* Farmers' Associations and Cooperatives, supported by the Department of Agriculture's clustering directive, enable

farmers to work together, share resources, and access services more efficiently. This collective approach strengthens their bargaining power and ensures that they receive the necessary support to manage pests effectively.

Overall, this coordinated effort ensures that farmers are better equipped to handle pest challenges, leading to improved crop health and increased agricultural productivity.

The concept of collaborative crop pest management has been effectively executed in the Pest and Disease Risk Identification and Management (PRIME) project, a four-year collaboration between the Bureau of Plant Industry (BPI), International Rice Research Institute (IRRI), and the Philippine Rice Research Institute (PhilRice). This project aims to understand the risk factors for pest outbreaks and develop appropriate management strategies to reduce crop losses. This was funded by the Department of Agriculture (DA) through the National Rice Program (DA-NRP) and the Bureau of Agricultural Research (DA-BAR), PRIME and on enhancing pest management practices.

As part of the project, a national pest surveillance system was established. DA-Regional Field Offices, in collaboration with local government units, regularly monitor the occurrence of major pests in over 2,000 rice fields across the country. Additionally, the project studies five pests that cause significant crop losses: blast (leaf and neck blast), bacterial leaf blight (BLB), rice tungro disease/green leafhopper (GLH), brown planthopper (BPH), and rats.

With this, the program aims to replicate the success of PRIME in other key commodities and high-value crops.

International Partnerships and Engagements

- Asia and Pacific Plant Protection Commission (APPPC)
- Australian Centre for International Research (ACIAR)
- Commission on Phytosanitary Measures (CPM) of the International Plant Protection Convention (IPPC)
- Expert Working Group-ASEAN-GAP
- Experts Working Group in Harmonization of Phytosanitary Measures in ASEAN (EWG-PS)
- Food and Agriculture Organization (FAO)
- German Agency for International Cooperation (GIZ)
- International Fruits Network (ITFNet)
- International Institute for Rural Reconstruction (IIRR)
- International Seed Testing Association (ISTA)

- International Treaty on Plant Genetic Resource for Food and Agriculture (ITPGRFA)
- Korea Seed Variety Services (KSVS)
- Rural Development Administration - Asian Food and Agriculture Cooperation Initiative (RDA-AFACI)
- Rural Development Administration - Korea Partnership for Innovation in Agriculture (RDA-KOPIA)
- The New Zealand Institute for Plant and Food Research Limited
- World Vegetable Center (WorldVeg)

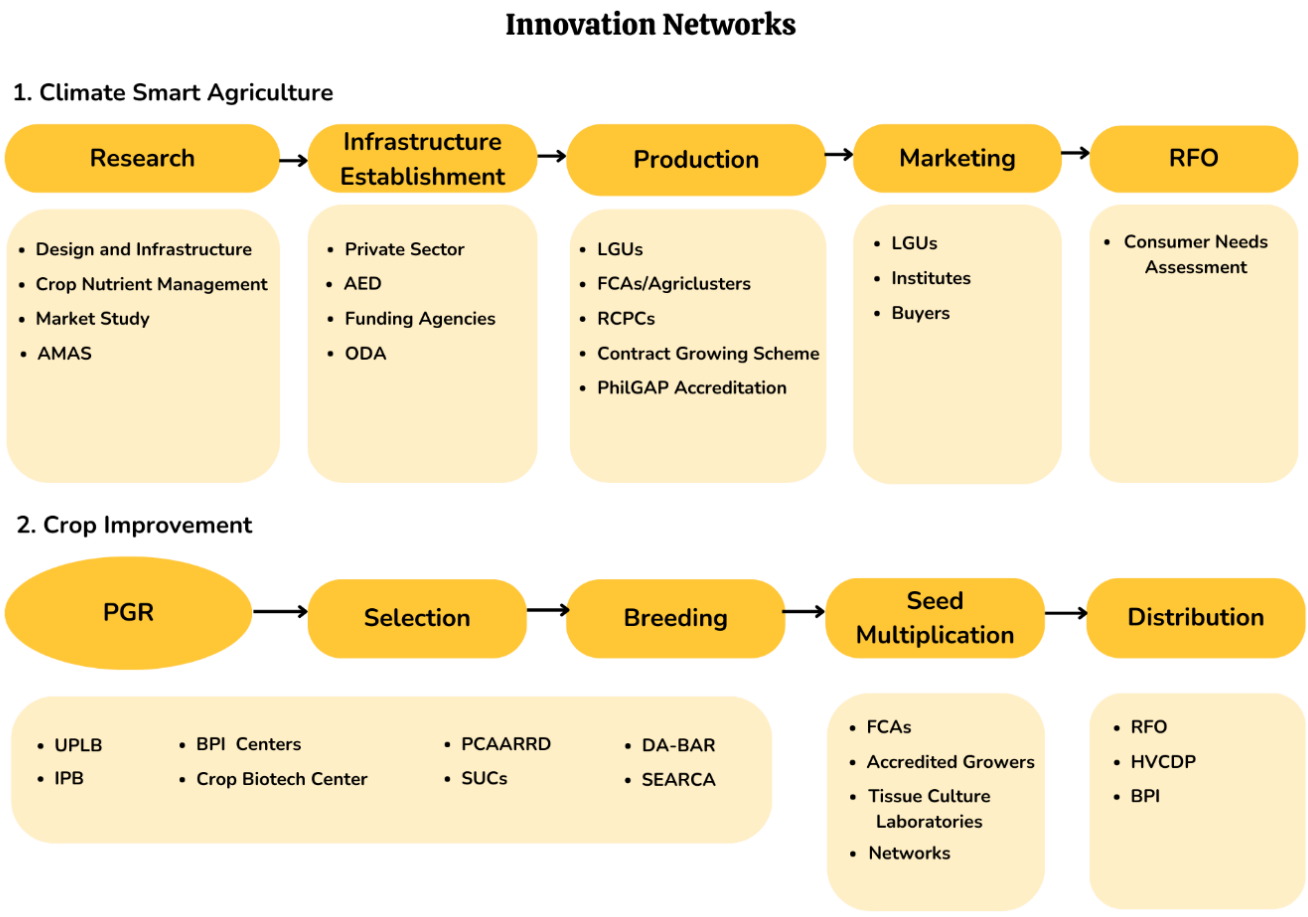

Figure 53. Innovation networks.

Annex E. NSIC Varieties and other Commodities developed by the Bureau of Plant Industry.

R&D Centers/Year	1994-2002	2003-2011	2012-2023	Total	List of Commodities
BAGUIO	6	-	-	6	White Potato
	2	4	-	6	Ponkan
	1	2	-	3	Citrus-Pummelo
	1	2	-	3	Citrus-Gayunan
	-	12	-	12	Coffee
	-	-	1	1	Calamansi
	-	-	1	1	Macadamia
	Subtotal: 32				
DAVAO	2	-	-	2	Durian
	Subtotal: 2				
GUIMARAS	-	-	1	1	Pico Mango
	-	-	1	1	Cashew
	-	-	2	2	Carabao Mango
	Subtotal: 4				
LA GRANJA	3	-	-	3	Corn
	3	2	-	5	Soybean
	1	-	-	1	Sweet Potato
	2	-	-	2	Santol
	-	-	2	2	Peanut
	-	2	-	2	Mungbean
	Subtotal: 17				
	10	-	-	10	Peanut
	13	5	4	22	Mungbean
	12	-	-	12	Soybean

LOS BAÑOS	2	2	1	5	Tomato
	2	-	6	8	Pole Sitao
	2	-	-	2	Bush Sitao
	2	-	-	2	Cowpea
	Subtotal: 58				
Grand Total: 113					

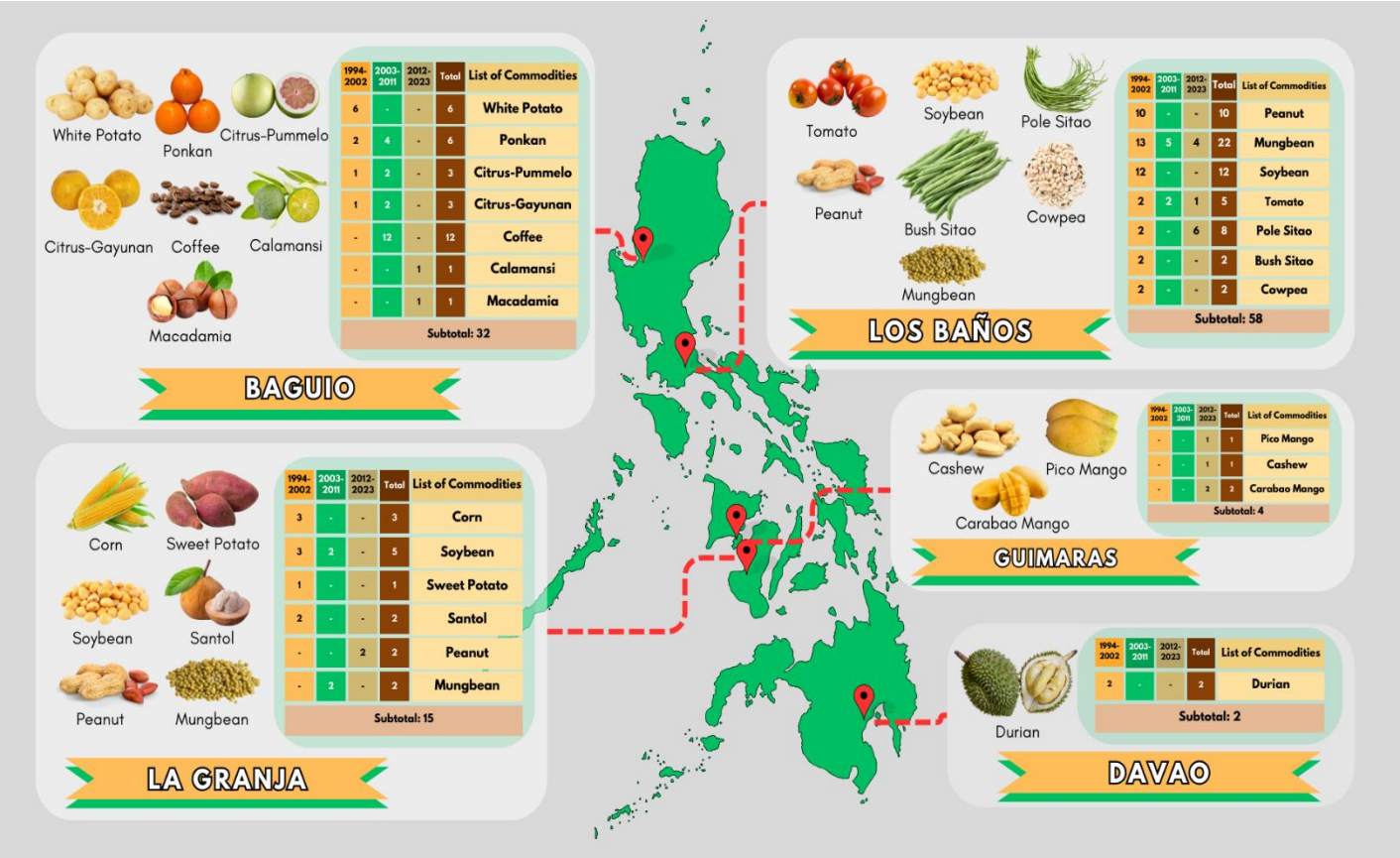

Figure 54. NSIC Varieties developed by the Bureau of Plant Industry

Annex F. History of the Bureau of Plant Industry

On August 1, 1936, the **Plant Utilization Division** was created. Providing basis to this was the General Memorandum Order No. 186 issued by the Secretary of Agriculture and Commerce. The memorandum called for the merging of the Home Economics Division of the Bureau of Science and that of the Agricultural Chemistry Section of BPI.

On January 6, 1957, the **Research Division** was formed based on the Reorganization Plan No. 30-A as implemented by Executive Order No. 216. The Plant Pest and Disease Control Division was also renamed to **Pest and Disease Control Division**.

The Production Division was also created to handle the planning and programming of seed production and propagation, along with the Laboratory Services Division, which is responsible for providing common laboratory services and undertaking research on the utilization of plant products.

A new division, Crop Development Services was later renamed as Field Trial Services by Presidential Decree No. 1050 dated January 1, 1977. The Pesticide Analytical Laboratory was created as one of the sections under the Crop Protection Division through a Special Order from the Office of the Minister of Agriculture in 1978.

In 1957, the Bureau of Plant Industry (BPI) officially recognized the significance of agricultural engineering research and development by creating the Farm Operations Division. This division was later renamed the **Agricultural Engineering Division** in 1972.

Over the years, the BPI has undergone several organizational changes to meet evolving needs. As a result, the mandate of the Agricultural Engineering Division has also shifted. Currently, as of 2013 (following the Rationalization Program), the division's primary responsibility is to conduct agricultural engineering research and provide services that support the BPI's core mission: ensuring the availability of high-quality seeds and planting materials.

By virtue of Presidential Decree No. 1433, known as the “Plant Quarantine Decree of 1978”, as amended by Executive Order No. 366 Series of 2003, **BPI-National Plant Quarantine Services Division was strengthened (NPQSD)** by adequate updated laws, regulations, resources and facilities to monitor and control the movement of plant pests and diseases.

Executive Order No. 116, signed by then President Corazon C. Aquino in 1986 placed BPI under the Production Group and made BPI one of the Staff Bureaus from its former function as a Line Bureau.

For its sector, BPI shall be responsible for the recommendation of plans, programs, policies, rules, and regulations to the Minister of Agriculture and provide technical assistance in its implementation.

The **National Seed Industry Council (NSIC**) was created with BPI Director as the Executive Director through Republic Act No. 7038, also known as the Seed Industry Development Act of 1992. The Council Secretariat was likewise established to provide administrative and other support services to the Council, which is placed under the supervision of the Executive Director. Further, the Seed Quality Control Section under the Crop Production Division was constituted as the **National Seed Quality Control Services (NSQCS)**. The NSQCS shall have control and supervision over existing field inspection and control services and seed testing laboratories established throughout the country.

The Bureau of Plant Industry (BPI) plays a crucial role in the biotechnology landscape of the Philippines. By virtue of DA Administrative Order No. 8, Series of 2002, the BPI, through it**s Biotechnology Office,** is responsible for the implementation and enforcement of biosafety regulations. The BPI ensures that all the use of genetically modified plants and plant products in agriculture adhere to national and international safety standards, thereby protecting both the environment and public health.

Executive Order No. 366 of 2013, otherwise known as the "Reorganization Plan of the Government Sector" created two divisions namely: **Crop Research and Production Support Division (CRPSD) and Plant Product Safety Services Division (PPSSD**). The CRPSD is mandated to develop crop farming technologies that aims to increase farmer's productivity, conserve and utilize plant genetic resources and ensure availability of quality seeds and plant materials. It merged the former Crop Research and Crop Production Support Division. On the other hand, PPSSD is created to ensure plant product safety for fresh and minimally processed agricultural produce through formulation of food safety protocols and monitoring for compliance with food safety schemes as supported by its laboratory activities.

The **BPI-Crop Pest Management Division (CPMD)'s origins** can be traced back to the Plant Sanitation Division, founded in 1932. Over time, the division has evolved in response to changing agricultural demands and government policies, undergoing name changes and reorganizations. Department Order No. 9 Series of 2020 further bolstered the BPI-CPMD's services and functions by streamlining and strengthening its crop pest management activities. As the leading agency in implementing this order, the BPI-CPMD is committed to providing efficient, environmentally friendly, and cost-effective pest control measures. These efforts align with the government's goal of ensuring food security and resilience through intensified food production programs.

Annex G. Engagements of BPI

OPERATING UNITS	ENGAGEMENTS	GOAL OF ENGAGEMENTS
Biotechnology Office	ASEAN Genetically Modified Food Testing Network	It is one of the Working Groups under the SOM-AMAF that provides mechanisms to facilitate the exchange of updates on GMO regulatory systems, GM crops under research, GM testing capabilities, facilitate capacity building efforts, and discuss ASEAN common approach in current issues on modern biotechnology.
Los Baños National Crop Research Development and Production Support Center	APSA (Asia and Pacific Seed Alliance) Regional Plant Variety Protection and Biodiversity Consultation	Strengthen collaborations and networking with other Asia Pacific countries and Seed Sectors
	ASEAN-AVRDC Regional Network for Vegetable Research and Development (AARNET)	Enhance cooperation and partnership within the ASEAN Member States (AMS) in contributing to Regional Vegetable Research and Development
National Plant Quarantine Services Division	Experts Working Group in Harmonization of Phytosanitary Measures in ASEAN (EWG-PS)	To implement activities related to promoting food, agriculture and forestry cooperation in ASEAN, Working Groups/Expert Working Groups and Task Force have been established to support Senior Officials of ASEAN Ministers on Agriculture and Forestry (SOM-AMAF) and ASEAN Ministers on Agriculture and Forestry (AMAF). The ASEAN Sectoral Working Group on Crops (ASWGC) provides a mechanism to develop ASEAN Standards on Crops regarding Good Agricultural Practices (GAP), pesticides, pest risk analysis, Biological Control Agents and other related issues. One of the working groups under the ASWGC is the EWG PS which focuses on phytosanitary concerns among ASEAN countries. Major discussion areas are the following: 1. Progress in the implementation of policy framework related to ASEAN cooperation in Phytosanitary Measures 2. Progress in the Plan of Action on ASEAN cooperation on phytosanitary measures a. Harmonize phytosanitary requirements for crops b. Enhance National and ASEAN expertise in

OPERATING UNITS	ENGAGEMENTS	GOAL OF ENGAGEMENTS
		Pest Risk Analysis and emergency incursion response and management (risk-based biosecurity) c. Enhance ASEAN regional diagnostic capacity and capability d. Identify phytosanitary treatments e. MB alternatives on prioritized crops for harmonized treatment f. Harmonization of national standards with IPPC standards ISPMs
	Commission on Phytosanitary Measures (CPM) of the International Plant Protection Convention (IPPC)	The International Plant Protection Convention (IPPC) is the intergovernmental treaty that aims to protect the world's plants, agricultural products and natural resources from plant pests. Ratified by 185 contracting parties, the IPPC develops, adopts and promotes the application of International Phytosanitary Measures (ISPMs) as the main tool to safeguard global food security, facilitate safe trade and protect the environment. The IPPC is governed by the Commission on Phytosanitary Measures (CPM) which normally meets every year in March or April at FAO headquarters to promote cooperation of contracting parties and relevant stakeholders to help implement the objectives of the IPPC. In particular, the Commission: • reviews the state of plant protection around the world • identifies action to control the spread of pests into new areas • develops and adopts international standards • establishes rules and procedures for resolving disputes • adopts guidelines for the recognition of regional plant protection organizations; and • cooperates with international organizations on matters covered by the Convention. Commission meetings are attended by IPPC contracting parties and by observers from organizations such as the Regional Plant Protection Organizations, the Convention on

OPERATING UNITS	ENGAGEMENTS	GOAL OF ENGAGEMENTS
		Biological Diversity, the Standards and Trade Development Facility, the World Customs Organization, and the World Trade Organization, among others. CPM normally also hosts a scientific session for discussion of important issues. Past sessions have covered topics such as pest movements through food aid shipments and the potential impact of climate change on the spread of invasive alien species.
	Asia and Pacific Plant Protection Commission (APPPC)	The Asia-Pacific Plant Protection Commission (APPPC) convened for the first time in 1956. The Commission administers the Regional Plant Protection Agreement for Asia and the Pacific. It reviews the plant protection situation at the national level in member countries, and also at the regional level. Coordinating and promoting development of regional plant protection systems, assisting member countries to develop effective plant protection regimes, setting standards for phytosanitary measures, and facilitating information sharing are among its key objectives. A total of 25 countries are members and the APPPC meets at least once every two years.
	Asia and Pacific Plant Protection Commission (APPPC) Regional Workshop on Review of Draft International Standards for Phytosanitary Measures (ISPMs)	The development and implementation of international standards on phytosanitary measures (ISPMs) by member countries are part of the core context of IPPC for helping countries implement the WTO SPS agreement. According to the rules and procedure for the development of new ISPMs, draft ISPMs should be reviewed by member countries and regional plant protection organizations to reflect their comments as well as for consolidation before final adoption. APC has organized the regional workshop since 2000, and it has become a persistent standing agenda of APPPC annual work plan adopted by the biennium session. This workshop is usually held in the Rep. of Korea, with the support from the Department of Plant Quarantine Agency (APQA), Republic of

OPERATING UNITS	ENGAGEMENTS	GOAL OF ENGAGEMENTS
		Korea, with the support from the Department of Plant Quarantine, Animal and Plant Quarantine Agency (APQA), Republic of Korea. Not only does the workshop review and discuss the draft ISPMs and other subjects of IPPC and APPPC but also illustrates the latest development of the regional standard of phytosanitary measures (RSPMs).
	Training Program on Plant Quarantine for Developing Countries including ASEAN	Hosted by APQA Korea, this training program contributes to enhancing the national phytosanitary capacity of ASEAN developing countries including ASEAN member countries, improve their understanding of Korea's plant quarantine system and further develop friendly relationships between Korea and participating countries.
National Seed Quality Control Services Division	International Seed Testing Association (ISTA)	Participate in Interlaboratory Seed Testing and to ensure that the laboratory follows international standards for seed testing
	Korea Seed Variety Services (KSVS)	The Korea Seed & Variety Service (KSVS) supplies high-quality certified seeds for the stable production of food crops, and has become a leading seed management & service organization working for the future of agriculture by promoting support projects to develop the seed industry, operating a plant variety protection system to protect the rights of new plant breeders, training specialists in the seed industry, managing the distribution of seeds and seedlings, and providing research on seed testing and services. KSVS has been organizing Asia Seed Industry Development Training every year aiming to improve agricultural productivity of participating countries. KSVS invites officials of seed-related affairs in Asian countries for information sharing on the latest technology and seed inspection technology for seed production and quality certification and information on seed policy and market.

OPERATING UNITS	ENGAGEMENTS	GOAL OF ENGAGEMENTS
Plant Product Safety Services Division	Expert Working Group-ASEAN-GAP Member	Harmonization of PhilGAP to ASEAN-GAP

ANNEX H. Participation of BPI to ASEAN Meetings

OPERATING UNITS	MEETINGS	GOAL OF MEETINGS	OUTPUT OF THE MEETINGS
Agricultural Engineering Division	Annual Meeting on the ASEAN Genetically Modified Food Testing Network	To discuss concerns/issues on GM testing, capacity building, updates on biotech regulations of each member country, efforts on the harmonization of risk assessment, efforts on proficiency testing and initiatives and training opportunities	Enhanced capability on GM testing of regulators, attendance to meetings and training on GM detection, participation in the proficiency testing program arranged by Malaysia, awareness on the status of GM regulations in ASEAN member states, networking opportunities, and creation of a database for available reference materials for GMO detection.
Los Baños National Crop Research Development and Production Support Center	APSA (Asia and Pacific Seed Alliance) Regional Plant Variety Protection and Biodiversity Consultation	Presentation, consultation and discussion of updates on Plant Variety Protection (PVP) and Access and Benefit Sharing (ABS)	Update on the status of PVP and ABS in other Asia and Pacific countries Support efforts on the alignment of proposed policies and protocols for PVP and ABS with ASEAN
	Steering Committee Meeting of the ASEAN (Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam) - AVRDC Regional Network for Vegetable Research and Development (AARNET)	Presentation and updates on the Status and Priorities of the Vegetable Research and Development in each ASEAN Member States (AMS) Discussions on the progress of AARNET proposals	Reports on updates of the Status and Priorities of the Vegetable Research and Development in each ASEAN Member States (AMS) Enhance cooperation and partnership within AMS Strengthens exchange of information and Techno Transfer on

OPERATING UNITS	MEETINGS	GOAL OF MEETINGS	OUTPUT OF THE MEETINGS
			Vegetable Research and Development
National Plant Quarantine Services Division	ASEAN CONTACT POINTS (ASCP)	Strengthens coordination arrangements on SPS in the region, enhances SPS cooperation and exchange of information in the region, promotes harmonization of SPS-related measures in the region and, monitors SPS initiatives under AMAF	
	ASEAN Committee on Sanitary and Phytosanitary Measures (AC-SPS)	The AC-SPS is established to ensure effective implementation of the provisions contained in Chapter 8 (Sanitary and Phytosanitary Measures) of the ATIGA	
	WTO SPS Committee meetings	The SPS Committee is the forum where WTO members discuss issues related to the implementation of the SPS Agreement and potential trade concerns. Article 12.1 of the SPS Agreement establishes a Committee on Sanitary and Phytosanitary Measures to provide a regular forum for consultations. It is mandated to "carry out the functions necessary" to implement the SPS Agreement and further its objectives. The Committee usually meets three times per year (March; June/July; and October/November), sometimes preceded by workshops or thematic sessions, and reaches its decisions by consensus.	
Plant Product Safety	Annual Meeting on the development of harmonization and	To harmonize the standards pertaining GAP	Through the ASEC of ASEAN GAP, projects were participated to

OPERATING UNITS	MEETINGS	GOAL OF MEETINGS	OUTPUT OF THE MEETINGS
Services Division	other concerns of implementation through projects, etc.		continuously implement the Food Value Chain with ASEAN Member countries on Good Agricultural Practices.
	On-Line meetings yearly and F2F with PPSSD and BAFS		
	ASEAN-JICA Food Value Chain (AJFVC) project attended - June 19-21, 2024 Jakarta, Indonesia		
	ASIA-GAP Certification of Kalasag MPC thru ASEAN-MAFF GAP Project. -On Going - 2023-2024		

Annex I. Banner Programs of the Department of Agriculture for Plant-Based Commodities

YEAR FOUNDED/LAUNCHED	PROGRAM AND MANDATE
2014	**Adaptation and Mitigation Initiative in Agriculture (AMIA)** Aims to address both adaptation (adjusting agricultural practices to changing climatic conditions) and mitigation (reducing greenhouse gas emissions from agriculture). It includes projects related to sustainable farming practices, agroforestry, and carbon sequestration.
2019	**High-Value Crops Development Program (HVCDP)** Specifically targets the development of high-value crops such as fruits, vegetables, and nuts. It includes support for research and development, promotion of market linkages, and adoption of best agricultural practices to enhance productivity and profitability.
2019	**National Corn Program (NCP)** Focuses on corn production. It includes activities such as promoting hybrid corn varieties, providing support for corn farmers, and enhancing post-harvest facilities to improve corn yield and quality.
2019	**National Rice Program (NRP)** This program aims to enhance the productivity and sustainability of rice farming in the Philippines. It includes initiatives for improved seed varieties, better farm management practices, and technological advancements to increase yield and resilience to climate change.
2022	**Urban and Peri-urban Agriculture Program** This initiative focuses on promoting agricultural activities within urban and peri-urban areas. It encourages urban farming, rooftop gardening, and community gardening to improve food security, reduce food miles, and promote sustainable urban development.