Corporation: Philippine Rice Research Institute

I. CORPORATE PROFILE

A. Corporate Objectives (as mandated by its charter)

PhilRice is a chartered government corporate entity created through Executive Order (EO) No. 1061 on November 5, 1985 (amended by EO 60 on November 7, 1986). According to Section 2 of its charter, the purpose of PhilRice is to develop a national rice research program so as to sustain and further improve the gains already made in rice production, improve the income and economic condition of small rice farmers, expand employment opportunities in the rural areas, and ultimately promote the general welfare of the people through self-sufficiency in rice production. Its functions as outlined in Section 3 of the charter include, among other duties, the following:

1. Serve as the coordinating center of a national network of rice research stations located in the different agro-ecological regions of the country;
2. Plan and carry out research and development activities, specifically in the areas of varietal improvement, planting and fertilizer management, integrated pest management, farm mechanization and post-harvest engineering, farming systems, training and technology transfer, and social science and policy research;
3. Verify, package, and transfer economically viable technologies, giving emphasis on the social engineering aspects necessary for group endeavor;
4. Provide the data base or policy formulation that will stimulate and sustain rice production, marketing, and consumption;
5. Organize and develop strong training programs for rice scientists, research managers, and extension workers; and
6. Publish and disseminate research findings and recommendations

B. Corporate Priorities for Year 2023-2028

Guided by its new vision, "*Advanced science and technology for prosperous rice-farming communities toward sufficient and affordable rice for all*," under its new Strategic Plan for 2023-2028, PhilRice and its partners will propose and execute strategies on how to create significant impacts on the lives of all rice stakeholders.

With its mission "*to improve the productivity, profitability, and well-being of rice-farming communities toward a resilient and sustainable rice industry and nutrition-secure Filipinos through climate-smart, socially inclusive, demand-driven, and partnership-based rice research for development and extension*," PhilRice will work with partners to deliver outcomes that will inch us closer to the attainment of (1) prosperous and empowered rice-farming communities, (2) nutrition-secured Filipinos, and (3) resilient and sustainable rice industry by the end of 2028.

C. Major Programs and Projects, 2023-2028

To achieve our goals and targets, we will implement three flagship R4DE programs, namely: Rice Seeds Systems (RSS); Scaling Modern and Adaptive Rice Technologies for Prosperous Farming Communities (SMART Farm); and Rice Business Innovations System 2.0 (RiceBIS 2.0). We will also carry out special programs, such as the Rice Competitiveness Enhancement Fund (RCEF) Seed and Extension Programs and the Malusog Rice Program.

While projects under the flagship and special programs are designed to have an immediate effect on the outcomes, we will continue creating new knowledge and technologies that will become new sources of growth in the future. This will be done through our discipline-anchored projects. We will continue adapting these to location-specific environments through our development efforts as well as our branch stations' R4DE initiatives.

C.1. National Rice R4DE Programs

Program 1. Rice Seeds Systems (RSS) caters to all the necessities relating to farmers' timely access to quality seeds. This program targets improving and sustaining vigorous seed supply chains by developing innovative approaches toward seed security – from seed availability, access, and utilization to provide farmers with their preferred seeds that are high-quality in sufficient quantities in a timely manner.

Program 2. Scaling Modern and Adaptive Rice Technologies for Prosperous Farming Communities (SMART Farm) zeroes in on smart and modern processes, technologies, and management of the rice plant. This new program concentrates on innovating rice farming systems to help farmers boost their yield and income through the development of cutting-edge climate-resilient technologies in the whole value chain. These will address yield gaps, location-specific constraints, and data-use efficiency to maximize the quantity and quality of rice and, thus, ensure the availability and accessibility of nutritious, balanced, and safe rice and rice-based diets to all Filipinos at all times.

Program goal is to scale out modern, mechanized, precise, and best-fit mature production technologies for transplanted and direct-seeded rice through a leveled-up integrated crop management such as the digitized PalayCheck System. These ICMs will be deployed using the farm cluster approach.

Program 3. Rice Business Innovations System 2.0 (RiceBIS 2.0) will help farmers connect their rice and rice-based products to the market. This continuing program encompasses improving the production to marketing of farmers' groups and is geared at developing rice and rice-based enterprises to address farmers' needs in a resilient and sustainable manner, ensuring available and affordable rice. Overall, this program aims to revitalize rice-based

farming communities through agro-enterprise model development with improved value chain efficiency.

C.2. Special Programs

C.2.1 Rice Competitiveness Enhancement Fund – Seed and Extension Programs (RCEF)

Enabled by Republic Act 11203, more popularly known as the Rice Tariffication Law, PhilRice will continue to lead the implementation of the RCEF Seed Program. With an annual allocation of Php 3.0 billion from 2019 to 2024, it is focused on the development, propagation, and promotion of inbred rice seeds and the organization of rice farmers into seed grower cooperatives and associations engaged in seed production and trade.

The Institute will also continue to co-implement the RCEF Rice Extension Services Program, shoulder-to-shoulder with the Agricultural Training Institute (ATI), Philippine Center for Postharvest Development and Mechanization (PHilMech), and Technical Education and Skills Development Authority (TESDA). With a Php 100.0 million annual budget, it aims to help teach farmers, farm intermediaries, and extension workers skills in rice production, modern rice farming techniques, seed production, farm mechanization, and knowledge / technology transfer.

C.2.2 Malusog Rice Program (Golden Rice)

Through this Program, we aim to bring the beta carotene-enriched rice variety to those who need it the most through an interplay of supply, demand, and advocacy. All efforts will work toward preparing the community and individuals to accept and adopt Malusog Rice, which will be rolled out through program-based and market-based approaches. We will endeavor to make Golden Rice contribute 10% to the country's total rice production to meet the rice requirements of all vitamin A-deficient households, and thus help achieve our goal of nutrition-secured Filipinos.

C.3. Discipline-Anchored and Upstream Rice R4DE Projects

In support of the operationalization of the Rice R4DE programs, PhilRice continues to carry out basic and upstream research activities through the following disciplines:
Agronomy, Soils, and Plant Physiology leads efforts to evaluate, refine, and facilitate the delivery of improved soil, nutrient, and water management practices to enhance soil quality and profitability, and plant resource-use efficiency.

Crop Protection seeks to generate, develop, and promote pest management strategies that are environment-friendly, economical, sustainable, and compatible with each other to address

farmers' needs. It also assists breeders in screening potential varieties for insect and disease resistance.

Genetic Resources does germplasm collection, conservation, management, dissemination, and utilization. It ensures the availability of fully characterized germplasm to rice plant breeders and researchers. Through its Seed Technology Unit, it performs basic studies on seed biology and physiology, health and pathology, purity and quality control, production, preservation and storage, coating / treatment and mechanical seeding. It also ensures that high-quality seeds are available to farmers / stakeholders, and helps make rice farming a profitable business by developing cost-effective and environment-friendly rice seed technologies.

Plant Breeding and Biotechnology focuses on enhancing genetic variability of potential rice varieties / elite lines; developing breeding materials with yield-enhancing, stabilizing, and value-adding traits for use as parents in hybridization programs and direct utilization as varieties; characterizing important germplasm and making available nucleus seeds for commercial cultivation. It seeks to ensure stable and sustainable rice production by developing high-yielding, pest and abiotic stress-resistant, and good grain quality rice varieties suitable to major rice-growing ecosystems.

Rice Chemistry and Food Science concentrates on increasing the profitability of rice farming systems by determining grain quality characteristics of rice, developing and promoting technologies on other uses of rice and its by-products to benefit consumers/ farmers and food manufacturers.

Rice Engineering and Mechanization develops machines and tools to increase the national level of farm mechanization and modernize rice production and postharvest operations to increase farm efficiency and productivity.

Socioeconomics conducts research and policy studies to help develop an efficient, competitive, and sustainable rice industry, nurtured by sound policy environments. It supports PhilRice's function of providing timely information to the industry.

Technology Management and Services promotes / disseminates high-impact location-specific rice technologies through area-based technology promotion and training and education to help lift up the productivity and income of rice farmers. Likewise, it enhances the capacities of extension workers and other change agents through retooling or rice S&T updates.

Development Communication promotes rice science for sustainable development through strategic use of communication media. It aims to manage (i.e., capture, organize, package, and improve access to) rice science and technology information and knowledge to rice stakeholders, particularly in identified areas of development interventions; and to examine,

explore, and promote knowledge-sharing and learning processes and pathways among stakeholders.

Information Systems and Data Management interactively and collaboratively caters to the data information needs of rice stakeholders. Integrating information systems with rice R4DE will help to systematically plan, schedule, share, and document key activities that support the development of rice production technologies, farm equipment, technology transfer, and the production of high-quality rice varieties.

The PhilRice-based Crop Biotechnology Center implements a rationalized, effective, and efficient agricultural biotechnology R&D program for the Department of Agriculture with the end view of generating improved agricultural technologies, productivity, profitability, and enhanced commercial potential, value, and activities for agricultural crops.

C.4. Area-based Rice R4DE Projects

Cutting across R4DE programs are station-based projects that address location-specific problems in areas of operations of PhilRice Batac, Isabela, Los Baños, Bicol, Negros, Agusan, and Midsayap branch stations.

PhilRice Batac improves rice-based cropping systems in semi-arid areas and other environments in Northwestern Luzon (Region 1). It develops technologies and management options for rice and rice-based crops in rainfed and drought-prone environments, such as water harvesting, conservation, management, and storage techniques, and mechanized rice-based farm production and postproduction operations.

PhilRice Isabela, the Institute's hybrid rice center, develops, packages, and promotes hybrid rice and its related technologies to boost rice production in Northeastern Luzon (Region 2 and Cordillera).

PhilRice Los Baños develops and radiates location-specific rice and rice-based technologies in the CALABARZON and MIMAROPA regions. Its partnership with the International Rice Research Institute (IRRI) and UP Los Baños also attends to basic research studies in plant breeding, crop protection, agronomy and soils, and rice chemistry and food science for the generation of new products. The branch also oversees the operations of the ***PhilRice Mindoro*** satellite station to serve farmers, seed growers, and other stakeholders from the entire Mindoro Island and neighboring provinces.

PhilRice Bicol develops and promotes strategies and technologies for the Bicol and Eastern Visayas Regions, focusing on climate change adaptation and resilience. It is also being developed as a rice R4DE center for disaster risk reduction and mitigation. It helps increase rice productivity in the flood-, submergence-, and drought-prone ecosystems and raises

income through rice intensification and crop diversification. It also shepherds the ***PhilRice Samar*** satellite station that promotes rice R4DE to spur rural transformation and development, and attain inclusive growth and stable rice productivity in the entire Samar Island.

PhilRice Negros is being transformed as the lead in organic rice-based integrated farming system, which fine-tunes and radiates fossil fuel-free technology packages for Visayan farmers. It also conducts and promotes rice R4DE on science and appropriate production technology, primarily for rainfed and direct-seeded rice stakeholders in the area.

PhilRice Agusan develops, improves, and promotes location-specific technologies suitable to the unique agro-climatic and socio-economic conditions in Northeastern Mindanao. It also addresses challenges such as nutrient-deficient and problem soils and low solar radiation in the area because of frequent rainfall. The station is being strengthened as the Institute's nutrient management center. It also oversees the ***PhilRice CMU*** field station, which caters to the needs of seed growers and farmers in Central Mindanao and nearby areas, producing both hybrid and inbred seeds.

PhilRice Midsayap develops and promotes location-specific rice and rice-based technologies for Regions 9, 12, and BARMM, with a focus on ecological engineering and integrated pest management practices because of the prevalence of rice pests within the region. It also supervises the ***PhilRice Zamboanga*** satellite station.

C.5. New Initiatives (*Proposed*)

C.5.1. Strengthening DA-PhilRice's Capacity on Inbred Seed Production and Management

The DA-PhilRice is mandated (RA 7308, IRR Chapter V, Sec. 2) to develop rice varieties suitable for Philippine condition and propagate them into breeder (BS), foundation (FS), and registered seeds (RS). These are the higher seed classes that are crucial in making inbred rice seeds, specifically certified seeds (CS), available to farmers. As stipulated in Republic Act 11203, DA-PhilRice serves as implementer of the Rice Competitiveness Enhancement Fund-Seed Program Component. This Seed Component intends to improve the yield in 77 rice-producing provinces through adoption of inbred rice seeds by providing CS to farmers. To meet the FS and RS requirements of the country in time for planting, the DA-PhilRice needs to be capacitated to have faster and improved operations which can be brought about by personnel complementation, relevant farm, production, and postproduction machines and equipment, and construction of machinery sheds, and post production and storage facilities. Land development which includes consolidation of small parcels of lands and rehabilitation of irrigation facilities are also needed to provide a favorable production environment. Capacitating the DA-PhilRice in producing higher seed classes of inbred rice varieties taking its whole operations vital is imperative.

Generally, this project aims to strengthen DA-PhilRice's capacity to produce high-quality higher seed classes demanded by seed growers and farmers in support of the RCEF-Seed Program Component and the Masagana/National Rice Program. Specifically, it aims to:

1. Capacitate the DA-PhilRice to produce the right volume of higher seed classes with high quality;
2. Enhance timely accessibility and availability of higher seed classes through the provision of farm, production, and post-production machines and equipment, and irrigation facility; and
3. Minimize deterioration of higher seed classes while storage through provision of machinery sheds, processing structures, and warehouses.

C.5.2. Malusog Rice Program: Enhancing Supply, Demand, and Policy Environment for the Smooth Deployment of Beta Carotene-Enriched Rice in Target Provinces with High Incidence of Vitamin A Deficiency in the Philippines

Malusog (Golden) Rice is a new type of rice with a significant amount of beta carotene in its grains, which when regularly consumed as a staple can provide at least 30% of the estimated average requirement for vitamin A. One cup of cooked Malusog Rice can provide up to 30-50% of the estimated average requirement of vitamin A of under-five children and pregnant or lactating mothers. This beta carotene, similar to what is found in orange-colored fruits and vegetables, is converted to vitamin A as needed by the body. It is an agricultural innovation specifically developed to help address a malnutrition problem in the Philippines and to uplift the lives of farmers and consumers. The Philippines is the first country in the world to approve this genetically engineered rice with nutritional benefits.

The Malusog Rice Program, as one of the banner R&D Programs of PhilRice, aims to contribute to food and nutrition security of the country by providing access to nutritious food (i.e., Malusog Rice) to meet the required dietary needs for a healthy life of households at high risk of Vitamin A deficiency. It specifically seeks to increase vitamin A intake and improve vitamin A levels of the target populations by (1) ensuring availability and accessibility of quality Malusog Rice seeds and milled rice (Supply); (2) increasing knowledge, promote acceptability, and encourage desirable behaviors for uptake (Demand); and (3) creating a science-based supportive policy and enabling environment and governing structures for the smooth deployment of Malusog Rice in target areas (Governance).

C.5.3. National Rice Research for Development Management Information System

Executive Order 1061 establishes the DA-PhilRice charter, aiming to boost rice production in the Philippines through the National Rice Research for Development (R4D) Program. This initiative involves collaboration among various stakeholders, including government agencies, academic institutions, NGOs, and farmer groups. The Strategic Plan 2017-2022 led to

significant progress, and a new plan for 2023-2028 focuses on leveraging technology to enhance productivity, affordability, and nutritional value of rice. To support this, a National Rice R4D Management Information System (NR4DMIS) will collect and analyze data for informed decision-making. The *Ugnay Palay*: National Rice R4DE Conference serves as an annual platform for stakeholders to share knowledge and address challenges in the rice industry.

The general objective is to disseminate comprehensive and easily accessible information regarding the National Rice R4D programs and projects to all stakeholders through the seamless integration of the Institute's various information systems. The specific objectives include (1) integration of information systems into a unified, interoperable, and cohesive network aligned with DA-PhilRice's strategic plan; (2) compilation and promotion of key project outputs across information channels and knowledge-sharing platforms, ensuring wide-reaching visibility; and (3) efficient evaluation for program improvement.

C.5.4. Enhancing Rice Production through Climate-resilient, High-yielding, and Nutritious Varieties at the DA-Rice/Crop Biotechnology Center

Achieving rice sufficiency is still one of the urgent goals in Philippine agriculture. In 2021, the total annual palay production volume reached an all-time high of 19.96 million metric tons, 3.4% higher than a year earlier. This was attributed to government interventions in terms of subsidy and promotion of modern rice production technologies. To sustain the increase in production amidst the challenges and constraints to rice productivity, the increase in production efficiency can be the most feasible and comprehensive approach to addressing the challenge (Kumar and Ladha, 2011). Over the years, the employment of superior rice varieties with high yield, high nutritional value, and climate change resilience has been considered the most economical and effective solution (Rosegrant, 2003; Huang et al., 2012). Climate change introduces two obstacles to rice production: increased and unpredictable patterns of pest and disease occurrences and unpredictable rain patterns that make rice more vulnerable to flooding, drought, soil moisture fluctuations, and hotter temperatures, especially during the flowering stage. Human nutrition is completely dependent on plant systems, directly or indirectly. Food with higher nutritional value is always desired for human health. Rice is the prime staple food in over thirty developing countries, providing at least 20% of dietary protein, 3% of dietary fat, and other essential nutrients. Efforts have been taken to improve rice's nutritional quality as this is the primary food source with a low amount of micronutrients.

Furthermore, with the rising cost of fertilizers and the associated environmental concerns associated with excessive and improper use of fertilizers, the use of more nutrient-efficient crops is likely to play a pivotal role in increasing or maintaining crop yields in the future, especially in the light of current developments in the field of bio-economy which requires the

ecologically sustainable production of food and biomass (Fageria et al. 2008; Spiertz and Ewert 2009).

Crop improvement targeting different traits is always considered a race against time to address food security. Therefore, the use of agricultural biotechnology can help improve the quality of life by developing new strains of plants that give higher yields with fewer inputs, can be grown in a wider range of environments, give better rotations to conserve natural resources, provide more nutritious harvested products that keep much longer in storage and transport, and continue low-cost food supplies to consumers in a faster pace and more efficient ways.

With refinement of the roles of the DA-Rice/Crop Biotechnology Center R and D Facilities and with the ever-increasing demand for new biotechnology products that enhance agricultural productivity, profitability, and climate change resiliency, a new state-of-the-art Rice Biotechnology Center was established at PhilRice, Maligaya, Science City of Muñoz. To further sustain the operation of the new facility, construction of additional infrastructure is necessary to provide housing for visiting scientists, Microbiology Laboratory, Greenhouses in implementing collaborative projects with the center.

C.5.5. Modernizing and Improvement of Greenhouse for Speed-flowering of Photoperiod Traditional Rice Varieties

Traditional rice varieties maintained and cultivated by farmers are likely sources of germplasm for breeding new rice varieties (Rabara et al., 2014). These traditional varieties possess traits potentially adaptable to a wide range of abiotic and biotic stresses, but some of them are photosensitive, making the production of new germplasm time-consuming and laborious. Additionally, emerging climate change impacts, including the depletion of the water table and shrinking water supplies (L. Muralikrishnan et al., 2021), are problems that hinder the proper breeding process.

Another variable that contributes to the cycle of creating new germplasm is the influence of the length of day and night on the initiation of flowering. This phenomenon is called photoperiodic induction or photoinduction. Plants may require one or more inductive cycles for flowering. An appropriate photoperiod in a 24-hour cycle constitutes one inductive cycle (Eagri.org, 2014). By using screenhouses, the natural dark period can be extended (to create a shorter day), shortened, or interrupted by providing light (to create a longer day) to manage photoperiodic plant responses such as flowering. This technique can help schedule plants to flower for specific dates and also reduce production time.

Upgrading the facility to a high-throughput breeding platform will enhance the efficiency and precision of speed-flowering for these important germplasms, while also ensuring the safeguarding of these genetic stocks and associated information in the DA-PhilRice genebank

for future use. The resulting high-quality phenotypic characterization will enable breeders to dissect the genetics of quantitative traits, with particular attention to yield and stress tolerance (Araus and Cairns, 2014), and identify potentially useful germplasm for incorporation into breeding programs. These improvements are necessary to capitalize on and complement developments in molecular breeding, as well as to assess overall phenomics, thereby increasing food production and alleviating hunger in the future.

D. Linkages of Corporate Priorities / Programs / Projects with the National/ Sectoral Plan, the Medium-Term Philippine Development Plan, and National Pronouncements

The government hopes that all Filipinos will have a comfortable and secure life. That is why it is our goal to protect the purchasing power of families through food security – the first among the eight-point economic agenda of President Ferdinand R. Marcos Jr. under the Philippine Development Plan 2023-2028.

DA-PhilRice has been helping farmers grow rice since 1985. But our goal is beyond just feeding rice farmers; rather, it is to improve their income and well-being and help the consumers access affordable and healthy rice. These goals are anchored to several international and local frameworks to ensure our relevance and contribution to improving the lives of everyone.

Planning for our priorities set out in the DA-PhilRice Strategic Plan 2023-2028 was likewise guided by the following Sustainable Development Goals (SDGs): 1) No poverty; 2) Zero hunger; 5) Gender equality; 10) Reduced inequalities; 12) Responsible consumption and production; and 13) Climate Action. The SDGs, along with the gender and development mainstreaming efforts of the government, were carefully considered to examine conditions for disadvantaged groups at the nexus of gender inequality, poverty, and social justice.

We also ensure that our strategic plan would contribute toward the attainment of the goals of the National Agriculture and Fisheries Modernization and Industrialization Plan (NAFMIP) 2021-2030, the policy- and strategy-oriented directional plan that targets to guide agriculture and fisheries sector-wide growth. Specifically, NAFMIP will serve as our collective compass guiding us along three North Stars: (1) raising profitability and total incomes (doubling incomes of farmers); (2) promoting consumer health and nutrition via a balanced Filipino diet; and (3) ensuring sustainable rice farming.