ROADMAP FOR IMPACT:

The PhilRice Strategic Plan

2017-2022

DEPARTMENT OF AGRICULTURE
1898
PHILRICE

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Foreword

At PhilRice, we start and end the day with thoughts on how else can we push the Philippine rice industry forward.

As a plant breeder, I have spent more than a decade of my professional life developing rice varieties that can tolerate pests to help farmers get decent yields. I know the patience, perseverance, and the intellect required to produce a single grain. It is never easy; and it is not always successful.

The requisites of good science are as odd as the scientists. Yet, the belief is that only those who think beyond the usual can address the rather unusual course of things. That's the kind of thinking that we bring in through this Strategic Plan. This is a document that cements and communicates our shared dream of a "Rice-Secure Philippines"!

This Plan presents our rice S&T commitments in 2017-2022. We have clear targets that can be validated and audited anytime during the course of our execution. Our targets are, by all means, aligned with the Masaganang Ani program of the Department of Agriculture.

Second, this Plan that we have crafted, together with our key stakeholders, is one with the rest of the country in combating hunger and malnutrition. We make a strong general reference to the UN 2030 Sustainable Development Goals. Third, we show in this Plan how we are addressing known threats to food production in the future.

Aside from our research for development (R4D) commitments, we also show how we plan to transform our workforce and the whole Institute so we can best cultivate an advanced culture of science. This will help us give technically sound recommendations for the Filipino rice farmers in the future.

Read on. Our aim is for you to own this Plan, and see where you can significantly contribute.

Sailila E. Abdula
Acting Executive Director

Preface

The Duterte Administration is committed in its resolve to making this country rice-secure. It is a tall order that we must heed at the Department of Agriculture. Among my first moves as DA Secretary was to release my 10-point agenda in pushing the agriculture sector forward. Rice is given primary attention owing to its cultural, economic, and political importance to us Filipinos.

This Strategic Plan of the Philippine Rice Research Institute for 2017 to 2022 lays down cogent strategies on how we can increase the competitiveness of our rice sector. It is a product of rigorous stakeholder consultations participated in by some of the best minds in rice research for development in our country. This Plan is attuned to the realities of our time. It thoroughly considers pressing concerns such as climate change, malnutrition, and trade liberalization.

For 2017-2022, PhilRice has laid down concrete targets that it commits itself to achieving guided by its vision of a “Rice-Secure Philippines”. This Plan orchestrates all known voices in rice R4D such as those from plant breeders, agronomists, rice machine experts, crop protection specialists, social scientists, and resource-poor farmers.

While the Plan appears structured, it is by all means open to adjustments that might be necessary during the course of execution. It primarily values partnership, collaboration, and feedback with and from our intended clients.

We should never stop dreaming BIG especially for our resource-poor farmers. This Plan helps us realize just that. We offer to you what our own rice research institution can do amid all the challenges in rice production.

Emmanuel F. Piñol
Secretary, Department of Agriculture, and
Chair, PhilRice Board of Trustees

Executive Summary

The Duterte administration envisions the availability and affordability of food for all Filipinos, thus the DA has adopted a policy of achieving food sufficiency, especially for basic and staple food commodities like rice. To implement such a policy, it will pursue the Masaganang Ani program that desires to increase rice yield to 10 tons/ha in irrigated areas; lower production cost to P8/kg; and reduce postharvest losses. It calls for improved rice farming technologies, the use of hybrid seeds, and effective soil rehabilitation and nutrient management.

PhilRice will help pursue the Program by providing science-based approaches on how to produce enough rice for all Filipinos. In consultation with our major partners and key stakeholders, we have mapped out this Strategic Plan for 2017-2022. Guided by our new vision, "Rice-Secure Philippines", we and our partners will propose and execute strategies on how to create significant impacts on the lives of all our rice stakeholders. This Plan has three salient features:

- We shift our operations from business-as-usual to business-unusual.
- We move from a production orientation to the development of the whole rice industry focused on four Cs (cultivation, commerce, consumption, and competitiveness).
- We re-focus on achieving strategic outcomes through impact-oriented and partnership-driven research for development (R4D).

By 2022, our aspired impact is for the country to have a competitive rice economy, with PhilRice and its partners generating and sharing cutting-edge agricultural innovations vigorously guided by science-based and supportive policies; resilient rice-farming communities benefiting from increased income in a sustainable environment; improved rice trade through efficient post production, better product quality and reliable supply, and distribution system; and responsible consumers having access to safe, nutritious, and affordable rice and rice-based products.

To help realize the foregoing, we will showcase that average rice yields can be increased by 1.0 t/ha (irrigated) and a minimum of 0.5 t/ha (rainfed) in our target sites. We will target provinces with yields of < 4t/ha in irrigated and <2.98 t/ha in rainfed areas; with more than 50,000 ha harvested area; and poverty incidence of > 25.23%. We will also help reduce postharvest losses from 16% to 10%. Likewise, we will help reduce the cost of rice production from the national estimate of PhP 12/kg to PhP 7/kg so our rice producers (especially smallholder farmers) will be competitive in an integrated ASEAN market.

Along with this, we will pursue seven strategic outcomes: (1) increased productivity, cost-effectiveness, and profitability of rice farming in a sustainable manner; (2) improved rice trade through efficient postproduction, better product quality, and reliable supply and distribution system; (3) enhanced value, availability, and utilization of rice, diversified rice-based farming products, and by-products for better quality, safety, health, nutrition, and income; (4) science-based and supportive rice policy environment; (5) advanced rice science and technology as continuing sources of growth; (6) enhanced partnerships and knowledge management for rice research for development (R4D); and (7) strengthened institutional capability of PhilRice.

ROADMAP FOR IMPACT

The PhilRice Strategic Plan, 2017-2022

ILLUSTRATOR: ANDREI B. LANUZA

Chapter One

Introduction

The world's food security is being seriously challenged by a ballooning population, rising standards of living, climate change, and water scarcity. These challenges are even more pronounced in the Philippines, requiring urgent collective action.

World population in 2050 is set to reach 9.6B (UN, 2013). Food production must keep pace with the high global population rate. The Philippine Statistics Authority (PSA) projects more than 120M Filipinos in 2025. Annual average population growth rate from 2015 to 2020 is 1.59% (PSA, 2015).

Experts agree that rising standards of living will soon have significant impacts on agriculture (IPCC, 2015). The quest for a better living environment and the growing demand for bio-energy will "likely shift agriculture into a new era of development" (Zhao and Hung, 2011). They note that the "role of agriculture within social development and a national economy will gradually extend from ensuring food security to also preserving positive environmental externalities, traditional knowledge, and cultural heritage." This has happened in the Philippines in recent years through rapid urbanization that resulted in the conversion of many agricultural areas into other uses. In 2010, 45.3% of our population were already in urban areas.

Climate change now poses the biggest threat to our food production systems. It confronts the rest of the world, and will hit agriculture and other weather-dependent sectors (Field et al., 2014; Lasco et al., 2015). In 1994-2013, the Philippines was the 5th most affected country worldwide (Kreft et al., 2015).

The Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA) projects that extreme weather events will occur toward 2020 through 2050. Dry areas will be drier while wet areas will be wetter due to severe droughts and floods. These changes in climate were never seen in the past 140 years. The document "Climate change in the Philippines" contains projections for all provinces in 2020 and 2050. Wetter climate means lower solar radiation and consequently low photosynthetic activity for the rice plant. Above-normal increases in temperature raise the photorespiration of the rice plant, diminishing its ability to produce grains. Both scenarios result in lower rice yields (Centeno and Wasmann, 2010).

Germane to climate change and rising standards of living, is the major challenge of water scarcity. The International Water Management Institute (IWMI) notes that changing standards of living worldwide will push up water demand at the expense of the poor. Irrigation reliability, by 2025, is projected to decline to 76% with corresponding 1.2% yield decreases worldwide (Rosegrant et al., 2002). These projections are based on business-as-usual scenarios, which many scholars find to have over/underestimated water demand (Amarasinghe and Smakhtin, 2014). Rational water management practices along with changes in cropping patterns are needed.

Given the scenarios above, the challenge is how to produce more food with less water. Zhao and Huang (2011) underscored that the challenge to produce more food in challenging environments will be the major focus of agricultural research for development. Increases in production will also ultimately depend on increases in unit yield as land area for agriculture will decline.

Aside from the foregoing, the Philippines also moves to a new trade scenario with the ASEAN Economic Integration. In July 2017, quantitative restrictions on rice will be lifted. This will bring in cheap imported rice, which may be good for consumers but not for producers (farmers). Hence, there is an urgent need to improve the competitiveness of Filipino farmers (Bordey et al., 2015) by improving their productivity and reducing costs at pre-integration level.

These challenges impose negative repercussions on our smallholder farmers who are among our

poorest (NSCB, 2014). This Strategic Plan is for all rice stakeholders, especially the 2 million Filipino rice farmers. It lays down what we and our partners intend to do, given our changing rice landscape. From production-intensive targeting, we shift to industry development. Hence, the seven outcomes that we envision to achieve with our partners cover cultivation (farmers), commerce (processors), consumption (consumers), and competitiveness. We will pay attention to all industry players so we can respond to the pressing needs.

This plan is also anchored on global targets set forth in the UN's Transforming Our World: The 2030 Sustainable Development Agenda (Assembly, 2015). This agenda takes off from the Millennium Development Goals. Specifically, this Plan responds to Goal 1 (Eradicate poverty in all its forms everywhere) and Goal 2 (End hunger, achieve food security and improved nutrition, and promote sustainable agriculture).

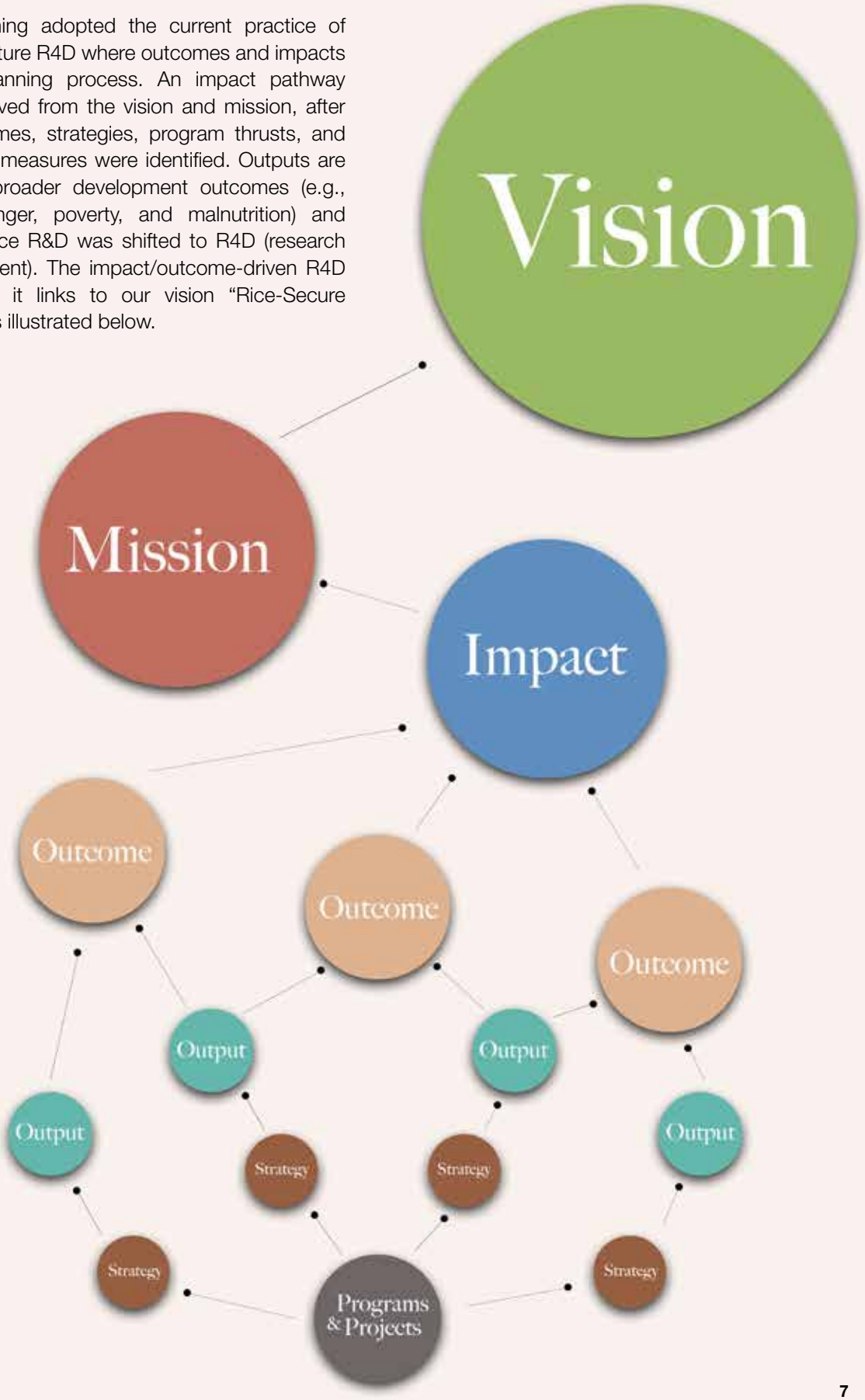
Pursuant to the policy pillars of the DA, the heart of this Plan is to increase productivity and income of rice farmers. This is well-communicated in its impact statement and in its specific targets. For instance, agripreneurship is highlighted in our development initiatives. This Plan has concrete and time-bound targets on how to enhance the adaptive capacity of farmers to climate change that can lead to ensuring sustainable food production systems. Moreover, this Plan commits to intensify PhilRice efforts, in collaboration with its R4D partners, to step up initiatives relating to technology development and agricultural extension services.

Planning process and framework

Commissioned by the PhilRice Board of Trustees (BOT), an external program and management review (EPMR) of the Institute was carried out in the first half of 2015. Among the conclusions of the review is the need to craft this Plan.

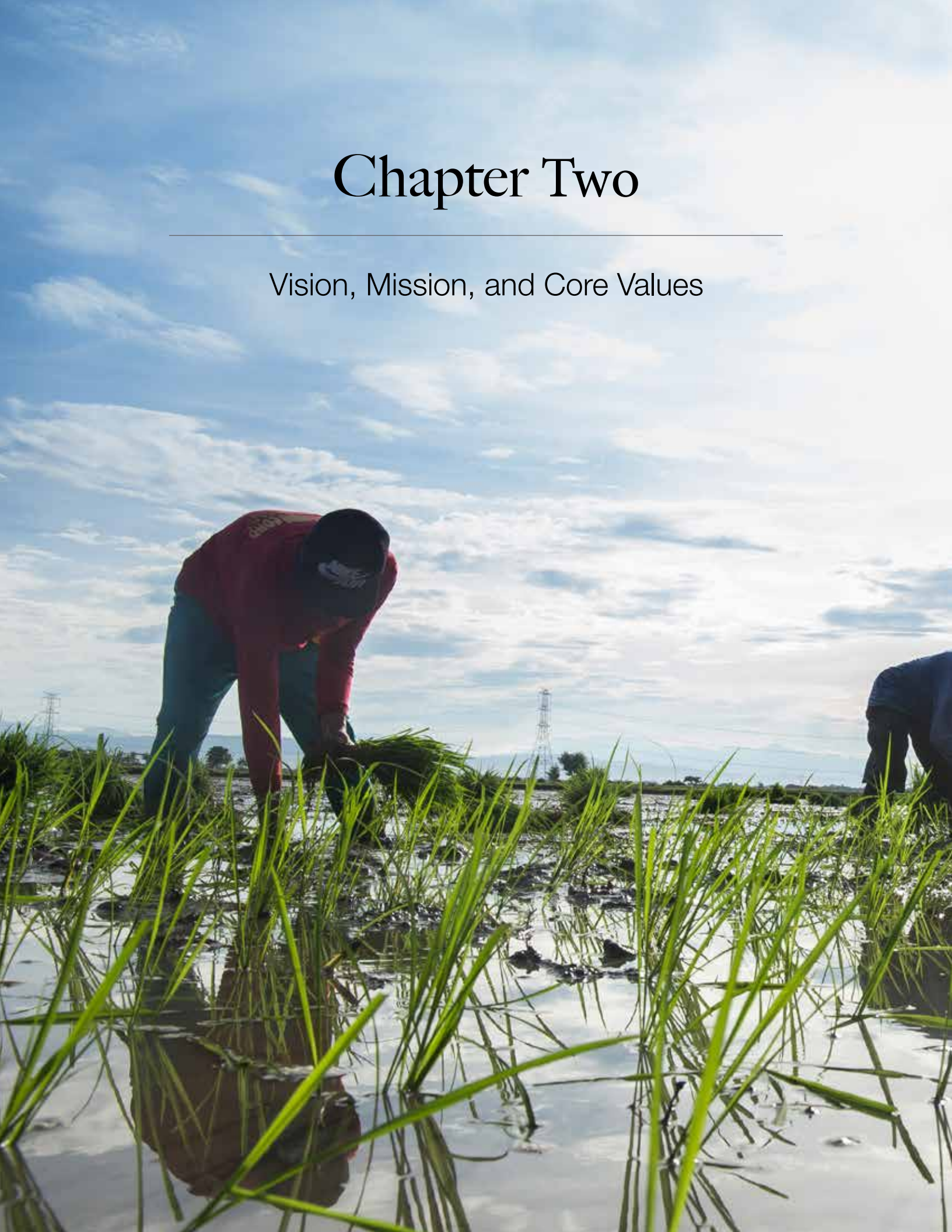
This Plan benefits from the inputs of major stakeholders in the rice industry, which were solicited during a series of consultations conducted. The December 2015 consultation in Manila was participated in by some 100 representatives of PhilRice partners from the academe and private and nongovernmental organizations, including the PhilRice EPMR team. It mapped out our Vision, Mission, and Impact and Outcome statements. Targets for each outcome were also drafted. All technical staff members of PhilRice participated in the second consultation that set detailed targets. A series of experts consultations followed. The Strategic Plan Writing Team was formed to draft the document to be validated with partners and key stakeholders before its finalization and submission to the BOT for approval in October 2016.

Our planning adopted the current practice of global agriculture R4D where outcomes and impacts drive the planning process. An impact pathway was first derived from the vision and mission, after which outcomes, strategies, program thrusts, and performance measures were identified. Outputs are linked with broader development outcomes (e.g., reducing hunger, poverty, and malnutrition) and impacts, hence R&D was shifted to R4D (research for development). The impact/outcome-driven R4D paradigm as it links to our vision "Rice-Secure Philippines" is illustrated below.



Chapter Two

Vision, Mission, and Core Values



Vision

Rice-Secure Philippines

As the lead agency for rice R4D, PhilRice and its partners envision a “Rice-Secure Philippines”. Rice security, in our parlance, means availability, affordability, and accessibility to high-quality and nutritious rice at all times. This vision therefore encompasses broad areas relating to rice cultivation, commerce, consumption, and competitiveness. It is founded on the DA’s vision of a “food-secure society where farmers enjoy decent and rising standards of living”.

We further believe that the most sustainable pathway to realizing rice security is domestically producing sufficient rice at a competitive cost. This way, rice will be affordable even to the millions of poor Filipinos. Cheap but quality rice will enable us to buy other necessary food items. We agree that poverty is the root cause of food insecurity, thus the need to increase people's income. National food security and self-sufficiency must be achieved by improving the income and livelihoods of our people within the framework of equitable and sustainable development. We acknowledge the pivotal role of smallholder farmers and their communities, and all other sectors involved in rice cultivation, commerce, and consumption in attaining national food security. We have to establish effective systems for farmers and their communities to be prepared at all times and be resilient to the effects of natural calamities triggered by climate change.

Producing rice at a competitive cost will enable our farmers to profit and compete with imported rice. Without profit, farmers will not be motivated to produce more. This leads to lower domestic supply that necessitates rice imports. Small farm income coupled with uncertainty brought about by changing climate can doom farmers to deeper poverty. Rice security among our producers should first be realized before we could even dream of a rice-secure Philippines.

We emphasize the need for climate-smart and ecosystem-friendly agriculture practices. It is the only path we know that can lead to sustainable rice farming.

Mission

"To improve the competitiveness of the Filipino rice farmer and the Philippine rice industry and transform it to be more profitable, resilient, and sustainable through responsive, balanced, environmentally sound and partnership-based research, development, and extension."

In this mission statement, PhilRice and partners highlight competitiveness as the primary guidepost for this Strategic Plan. Competitiveness rests on the ability of farmers and processors to produce paddy/rice at the same or superior quality but at a lower cost than its local or international competitors (Bordey, 2015). We believe that we can only do this if we will develop, adapt, and share technologies that will make our rice production systems climate-resilient and sustainable. Our production practices must be ecosystem-sensitive. Additionally, we underscore partnership as central to our success. These challenging times necessitate collaboration with other institutions.

We will therefore pursue a balanced R4D approach along three strategic areas: (1) information that advances knowledge; (2) technologies that can be used by farmers and can be commercialized; and (3) policy recommendations that effectively address problems and opportunities in the rice industry.

Core Values and Attributes (R-I-C-E)

Relevance and Responsiveness (R)

Relevance is the institutional capability of PhilRice and partners to address contemporary challenges in the task environment; responsiveness is our ability to plan and execute quick action in pursuing the needs of our stakeholders within our R4D mandate. We have to engage our partners and stakeholders by listening intently and promptly acting on their needs. We must offer them only the best products and services. This will help us build a strong identity as a reliable and highly trusted public institution.

Integrity and Innovativeness (I)

These values are grounded on ethical principles at work at PhilRice, enabling the staff to establish trust among themselves, with partners and stakeholders. Honesty and trust are central to our integrity as an R4D institution. Scientific integrity dictates that we respect intellectual property, and that we uphold honesty in reporting our research results and delivering our services. We will not use PhilRice resources for personal gain.

Innovativeness is the ability of introducing new and sound ideas and methods in addressing challenges in an organization. It must drive us as a knowledge-generating institution. We can do this by being reflective, thinking business-unusual, and asking the most important and urgent scientific questions of our time. Innovativeness always comes with a high sense of scientific and service integrity.

Collaborative and Collective Spirit (C)

Our mode of work is based on partnerships and teamwork. Hence, the spirit of collaboration and collectivism will pervade our R4D efforts with partners here and abroad. We will attract more partners into our existing network of more than 300 institutions, local and international. We will ensure that the men and women of PhilRice work as a team in pushing for our rice R4D agenda for our stakeholders.

Excellence and Equity (E)

Scientific excellence accommodates no compromises in producing the best-quality outputs and services for our stakeholders. Equity is our commitment to social justice. We will endeavor, through rice R4D, support services, and policy research, to elevate the standards of living of our indigent farmers. Through our commitment to producing cost-reducing, yield-enhancing, and climate-smart rice production technologies, we will see more and happier rice-farming communities.

Integrated Management System (IMS) Policy Statement

“PhilRice adheres to a system of quality management, environmental protection, and occupational health and safety in research and development to advance rice science and ensure quality technologies and services.”

PhilRice is ISO-certified in quality (ISO 9001) and environmental management systems (ISO 14001), and Occupational Safety and Health Assessment Series (OSHAS 18001). The certification attests to PhilRice’s commitment to international standards pertaining to the abovementioned management systems, which serve as the guiding principle in the delivery of its products and services.

Chapter Three

Impacts and Outcomes

PhilRice's Impact by 2022

The country attaining a competitive rice economy, with PhilRice and partners generating and sharing cutting-edge agricultural innovations vigorously guided by science-based and supportive policies; resilient rice-farming communities benefiting from increased income in a sustainable environment; improved rice trade through efficient post production, better product quality and reliable supply, and distribution system; and responsible consumers having access to safe, nutritious, and affordable rice and rice-based products.

Outcomes

1. Increased productivity, cost-effectiveness, and profitability of rice farming in a sustainable manner
2. Improved rice trade through efficient postproduction, better product quality, and reliable supply and distribution system
3. Enhanced value, availability, and utilization of rice, diversified rice-based farming products, and by-products for better quality, safety, health, nutrition, and income
4. Science-based and supportive rice policy environment
5. Advanced rice science and technology as continuing sources of growth
6. Enhanced partnerships and knowledge management for rice research for development (R4D)
7. Strengthened institutional capability of PhilRice

OUTCOME ONE

Increased productivity, cost-effectiveness, and profitability of rice farming in a sustainable manner

Food production experts agree that the way to feed the ballooning world population is to increase crop productivity as land devoted to agriculture will ultimately shrink. This applies to rice production in the Philippines. Along with increased productivity, we must make rice production cost-effective and profitable, all done in a sustainable manner under a climate change regime. These elements do not always go easily together, but given increasing challenges, we will do them.

How will we do these? We will effectively conduct research to increase yields, optimize production costs, reduce field, postharvest, and milling losses; and effectively share and demonstrate research results and technologies.

We will further increase the attainable yields of our rice varieties with improved resistance to biotic and abiotic stresses. Bruinsma (2009) noted that 80% of the growth in crop production will come from higher yields and increased cropping intensity; 20% from land expansion. We know that productivity results from the yielding ability of rice varieties using the best crop production and management technologies.

We will align our R4D efforts to narrow the gap between experimental and on-farm yields. Laborte et al. (2012) noted that if left unaddressed, yield gap will have significant negative repercussions on food availability in the future. Issues relating to adaptability of farmers to technologies or vice-versa should not be taken lightly.

Developing location-specific rice production technologies will start with breeding high-yielding varieties (HYV) that can withstand abiotic (drought, salinity, heat, waterlogging) and biotic (pests) stresses. This will go with resource-efficient and climate-smart crop management strategies. Breeders' access to genetic resources and quality information on rice germplasm will hasten the development of new HYVs. To support continuous varietal improvement, acquiring, preserving, characterizing, evaluating, documenting, and distributing genetic resources to the end-users are vital.

We likewise know that cost-effectiveness of rice farming is the key factor that brings about competitiveness among our farmers. We will then develop technologies that will address labor intensity, investment costs, and accessibility of inputs or efficiency of input use.

Together with our partners, we will step up our mechanization efforts on developing machines for land preparation, crop establishment, and overall crop care. Investment on machines is expected to make rice-farming operations more cost-effective as has been observed in Vietnam (Bordey et al., 2015). In the Philippines, 61 person-days (PD)/ha/season, on average, are needed during the wet season and 64 PD during the dry season. Transplanted rice needs 65-73 PD/ha/season; 38-46 PD for direct-seeded. These figures are way higher than China's [20, 35], Thailand's [10, 11], and Vietnam's [22, 22] (Mataia et al., 2015; Manalili et al., 2015; Beltran et al., 2015).

With climate change, we will intensify R4D work on water scarcity. We already have piloted innovative water-harvesting systems as sources of supplemental irrigation. They will be adapted further and promoted to enhance and sustain productivity in water-scarce rice areas. The systems being developed are expected to not only collect torrential rainwater but also minimize flooding and soil erosion during rainy season, and provide water during drought. These will make the farms climate-resilient, thereby ensuring sustainability.

We will also further develop pest management diagnostic tools and decision support systems, as well as user- and environment-friendly fertilizer and soil management and information support systems to reduce cost of production. We know that these decision support tools are anticipatory mechanisms that will help farmers come up with informed decisions.

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
1.1 Genetic resources conserved and their profile made available to increase utilization for direct use and in support of breeding new rice varieties	(1) Germplasm is accessible to end-users (breeders, and other researchers)	2,444 available for use out of existing 5,205 accessions (47%)	8%	15%	15%	15%			By 2020, 5,205 accessions available
	(2) Profile of 3,063 Philippine TRVs conserved germplasm completed for direct use and in support of breeding:								Of the 5,205 accessions, 3,063 are prioritized for profiling/ characterization
	• 58 agro-morphological traits	2,813 accessions have data, but only 16% fully characterized (58 traits covering 439 entries)	9%	25%	25%	25%			
	• Biotic stress (pest and disease) – GLH, BPH, tungro, blast	12% with biotic stress evaluation data	13%	25%	25%	25%			seed increase to be completed in 2017
	• Abiotic stress tolerance – drought, salinity, zinc-deficient soil	4% with abiotic stress evaluation data	21%	25%	25%	25%			seed increase to be completed in 2017
	• Grain quality – amylose content (AC), gelatinization temperature (GT)	30% with grain quality data	20%	25%	25%				seed increase to be completed in 2017
	• Phytochemicals (as applicable)	No baseline	25%	25%	50%				Refers to anthocyanin, phenolic content, antioxidant, etc.
	• DNA Fingerprinting	8% with DNA profile	20%	22%	50%				
	(3) Reacquisition of seeds of 690 accessions		20%	30%	25%	25%			Recollect 665 Philippine TRVs based from passport data (donor name and province source); Request IRRI for the 25 improved varieties.
	(4) Number of provinces explored for germplasm collection	32 of 81 provinces are not yet fully explored	8	8	8	8			Collection is a routine activity in genebank work

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
1.2 Yield-enhancing, risk- and cost-reducing technologies developed	(1) Number of high-yielding inbred rice varieties developed with acceptable grain quality, resistance to major pests in the NCT sites:								Consider in varietal development traits suitable for mechanization, eg. harvesting
	Irrigated • DS: 8t/ha average; 10t/ha attainable yield • WS: 5.5t/ha average; 8t/ha attainable yield	Irrigated lowland (69 varieties from 1991-2015) with average yield (t/ha): DS/WS = 5.3 ±0.6 DS = 5.5 ±0.0.5 WS = 5.1±0.7 Attainable or max. yield DS = 8.3 ±1.6 WS = 7.6 ±1.6		1		1		1	Varieties tested in 20 NCT sites for 2 wet and 2 dry seasons (WS/DS)
	Rainfed (drought-prone) • 4t/ha average; 6t/ha attainable yield (WS only)	27 varieties from 1992-2001) with ave. yield = 3.3 ±0.4; and attainable yield = 5.5±0.7 t/ha		1		1		1	Varieties tested in 4 NCT sites for 2 WS + on-farm trial
	Stress-prone environments								
	• Varieties with multi stress tolerance	Released varieties with single stress tolerance: <u>(a) saline areas:</u> 28 varieties from 1991-2015 with ave. yield (t/ha): DS/WS = 2.8 ±0.5 DS = 3.0 ±0.9 WS = 3.0±0.5 Attainable yield DS = 4.0 ±1.4 WS = 4 ±1.0 t/ha <u>(b) submergence</u> Submarino 1: Non-stress yield = 3.5 t/ha; With stress = 2.5 t/ha (c) none yet for high temperature					1	1	NCT protocol needs to be prepared by RTWG for NSIC approval. Varieties with tolerance to at least two stresses (submergence, stagnant flooding, saline, high temperature, and drought).

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
	(2) Number of hybrid rice varieties developed with acceptable grain quality, resistance to major pests in NCT sites • DS: 9t/ha average; 12t/ha attainable yield • WS: 7.5t/ha average; 10t/ha attainable yield	72 varieties from 1994-2015) with ave. yield (DS/WS) of 6.2 ±0.5t/ha; and attainable yield of 10.1 ±1.0 t/ha			1		1	1	Varieties tested in 20 NCT sites for 2 wet and 2 dry seasons (WS/DS)
	(3) Number of machines/systems developed that can reduce labor, inputs, and other production costs for:								1-means a commercial model released to accredited manufacturer
	Land preparation								
	• Gear-transmission power tiller with pivot mechanism that will be used as prime mover of walking-type transplanter and seeder	Existing design not available locally; activities on-going		1					
	• GPS-based laser leveler with locally manufactured control box that can cover at least 30 ha at a time (for flat terrain); with bucket and hydraulic system)	Existing IRRI-designed leveler not available locally particularly its control box		1st proto-type		1			Localized means using locally available materials
	• Riding-type boat tiller that can operate on shallow and laboy (waist-deep mud) conditions	Two existing machines, one can operate in shallow, and the other in waist-deep mud conditions; currently under design stage of machine that can operate in both conditions, and riding-type	1st proto-type		1				
	Crop establishment								
	• Localized walking-type transplanter 40% cheaper than commercial unit, can reduce labor requirement from 20-25 man-days to 2 man-days/ha, and reduce transplanting cost by 7%	Existing imported walk-behind transplanter; conceptualization stage of power transmission and transplanter attachment	Fabrica-tion and testing	1st pro-totype	1				This will include different options on seedling preparation such as use of trays or by dapog method
	• Localized riding-type transplanter 30% cheaper than commercial unit, can reduce labor requirement from 20-25 man-days to 1 man-day/ha, and reduce transplanting cost by 7%	Existing imported riding transplanter; 1st prototype completed and tested; 60% completed commercial prototype	Pilot testing	1					

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
	• Walking-type seeder for dry and wet seeding that can reduce labor requirement from 3 man-days to 1 man-day per ha, and reduce seeding rate from 200 kg to 40 kg seeds per ha	Existing machine: drumseeder, manually drawn	1st prototype (dry seeding)	1	1st prototype (wet seeding)	1			
	• Localized riding-type mechanical seeder that can reduce labor requirement from 1 man-day to 0.33 man-day per ha, and reduce seeding rate from 20-60 kg to 15-40 kg seeds per ha	Existing machine not locally available; localized Korean seeder, 1 prototype fabricated	1st prototype	Testing, modification	1				
	Crop care • Multi-function farm equipment for land preparation with attachments for drilling shallow tube wells (STW), trenches, dikes, and water ponds for small farm size; can reduce labor requirement and cost by 50% (drilling STW, dikes, and small farm reservoir)	Existing handtractor for land prep; machines are designed for single function		1st prototype (main body)	1st prototype (with attachments)	1			
	• Chemical-free weed control equipment that can reduce labor requirement by 30% (vs manual weeding)	Existing mechanical weeders with low capacity; manual sprayers for herbicide application	1st prototype	1					(0 herbicide application)
	(4) Number of crop management practices/systems (eg. water and nutrient) developed/ improved that can increase yields by: • 7% to 10% in irrigated areas • 5% to 7% in rainfed areas	PalayCheck systems for: Irrigated - 7% (2005-2009 in Castaneda 2014); Rainfed – 5% in pilot site (Pangasinan, WS drought-prone)	1	1					Improvement/ enhancement in the succeeding years. Sustaining the gains made shall be included in the strategy)

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
	(5) Number of water-harvesting and management technologies/ systems that will increase water-use efficiency:								
	• Water resources information support system	No system available	50%	75%	1				With updates in the succeeding years
	• Water-harvesting system adapted in Luzon, Visayas, and Mindanao particularly in rainfed areas	2 existing sites in Luzon (Camarines Sur and Abra)	1	2	2				
	• Improved AWD technique with biochar that can improve water-holding capacity in light soils, thereby lengthen irrigation interval from 7-14 days to 9-16 days	AWD without biochar	1						
	• Solar- and wind-powered energy generation system 25% cheaper than commercial unit (includes green energy-based water- harvesting and distribution systems)	Existing design: Reymill CPU at P200k per unit (windmill only); Existing prototype of solar- and wind-powered pump developed at PhilRice Batac; solar- and ethanol-powered water pump solar- and wind-powered water pump	1		1st proto-type	2			
	(6) Renewable energy system/ models developed								
	• bioethanol production system for operating farm machines (i.e. water pump, grasscutter)	Pilot-testing of distillers and fuel injectors for hydrous bioethanol	1						Local (village) distilling units produce crude bioethanol; multiplex fuel system developed abroad

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
	(7) Number of decision-support/ diagnostic tools/ options developed for pest management:								
	• Sustainable management approaches developed for:								Sustainable (practical, economical, environmental, ecological and biological)
	- current and emerging pests	Management options have been developed for major pests and diseases but need to be further evaluated whether improvements have to be done to consider the changing pest dynamics, climate, and environment	Population dynamics studies	1 each for grain & rice bugs	1 for PH		1 for RBB & stem-borer		
	- major diseases		Epidemiology studies	1 for RB, ShB, & RTV		1 for BB, ShR & brown spot			RBB- rice black bug PH –planthopper RB – rice blast ShB – sheath blight BB – bacterial blight RTV – rice tungro virus ShR – sheath rot GAS – golden apple snail
	- Weeds and other pests		Invasiveness studies	1 for weedy rice 1 for paddy eel	1 for rodent	1 for herbicide-resistant weeds 1 for GAS		1 for invasive weeds	
	• Sustain durability of resistance against bacterial blight				1 for BB				
	(8) Number of accurate, user- and environment-friendly fertilizer and soil management recommendations, and soil information support system developed:								
	• MOET App v2.0 (5% Deviation; 95% accuracy)	V1.0 with 92% accuracy and -/+ 16% deviation; V2.0 (50% completed, pilot-testing ongoing)	1						Improvement/ enhancement in the succeeding years
	• Digital LCC for topdressing (90% accuracy)	Existing manual Leaf Color Chart (LCC); algorithm (research) being established		1					Improvement/ enhancement in the succeeding years
	• Soil identification and characterization protocol improved	Existing protocol needs refinement		1					

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
1.3 Technologies/ Systems packaged for specific growing conditions	Customized PalayCheck for different provinces with: • Yield level of less than 4t/ha in irrigated areas (with harvested area >50,000 ha) • Yield level of less than 2.8t/ha in rainfed areas (with harvested area >50,000 ha) • Yield level of less than 4t/ha in irrigated areas (with harvested area 10,000 to 50,000 ha) • Yield level of less than 2.8t/ha in rainfed areas (with harvested area 10,000 to 50,000 ha) • Yield level of more than 4t/ha in irrigated areas • Yield level of more than 2.8t/ha in rainfed areas	PhilRice stations produced the following location-specific technology (LST) packages: PhilRice Batac (10); Isabela (29); CES (7); Los Baños (36); Negros (29); Midsayap (49); and Agusan (10). These packages were developed through the implementation of the Location-Specific Technology Development (LSTD) Program from 2009-2011. These will be utilized if still applicable, or will be modified to suit the target sites.	14 7	22 19	20 20	11 21			Technologies for climate/biotic stresses (such as typhoon, drought, flood, high temperature) are considered

OUTCOME TWO

Improved rice trade through efficient postproduction, better product quality, and reliable supply and distribution system

If we are to achieve our R4D goals for the Philippine rice industry, we cannot gloss over concerns relating to postproduction, product quality, and supply and distribution.

Among the highlights of this outcome are to significantly improve our harvest and postharvest facilities, and come up with better-quality rice. This is pursuant to RA 10601 (Agriculture and Fisheries Mechanization Law of 2013), which aims to increase the use of farm machines so our producers are at par with their counterparts in Southeast Asia. In their studies in Camarines Sur, Iloilo, Leyte, and Oriental Mindoro, Amongo and Larona (2015) note that only harvest and postharvest facilities are widely adopted in rice production, specifically handtractors (91.05%) and threshers (86.38%).

The R4D emphasis on improving harvest and postharvest facilities is due to the postproduction losses in rice. Reconciling data from PhilRice and the Philippine Center for Postharvest Development and Mechanization (PHilMech), postharvest losses account for 16% of all total losses. This could be alleviated by more efficient postharvest facilities, hence we target to reduce such losses to 10%. We will improve harvesting, piling, hauling, and threshing (from 4% to 2%); drying (from 5.86% to 2%); and milling (from 5.52% to 4%) [All figures from PHilMech].

We also aim to achieve high standards for milling recovery, now partly done through rice breeding. Only one of 19 varieties commercialized in 2015 had a milling recovery lower than 65% (64.7%), with the highest at 73.3%. The standard in the National Cooperative Tests (NCT) is 65-70% milling recovery for a variety to be classified as Grade 1 or Premium-Quality Rice.

High milling recovery, which is a function of milling machines, remains an important target. The present use of single-pass machines for milling that results in low-quality grains is prevalent. Globally, the standard is to use multipass machines for improved milling recovery, which PhilRice can adopt and push. In our target sites, we can develop machines and strategies that help improve milling recovery.


PREHUMBIKES

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
2.1 Technologies and information developed/ generated	(1) A localized rice-combine machine developed cheaper than commercial brands, can increase field capacity from 1 ha to 2 ha per day; reduce fuel requirement by 15% (using 30hp engine); and meet max. allowable 3.5% grain loss (PNS and PAES standard)	Ongoing testing and modification; existing machine is PhilRice mini combine harvester	Working prototype		1				
	(2) Combined conduction and far-infrared radiation dryer for rapid drying technology that can reduce labor requirement from 15 man-days to 3 man-days for every 10 tons, and drying time from 1 hr to 10 minutes (vs conventional method)	Flash dryer developed by IRRI with throughput capacity of 0.75 – 1.0 t/hr. Ongoing design development.		Working prototype		1			Manual drying (conventional method)
	(3) Continuous-flow microwave system dryer for brown rice that can prolong shelf-life from 3 to 8 months, reduce drying time from 1 hour (conventional drying) to 15 minutes, and increase processing volume from 10 to 40 bags at a time	Existing method of drying is conventional (manual drying)	1st prototype		1				
	(4) Information packaged into a brochure on clustering/ grouping of rice varieties made available and distributed to millers/traders	Data available for released varieties but no brochure prepared	1						Updated as needed
	(5) KeyChecks on harvest and postharvest management revalidated	Existing recommended practices per component, but need to be integrated into one system	1						Includes evaluation of harvesting time at 80-85% mature grains, and pre-milling and milling practices to achieve at least 65% milling recovery
	(6) Integrated, mechanized, and climate-responsive postharvest handling and drying system for typhoon-affected palay; can reduce processing time by 20% (from field-handling to drying); and reduce labor requirement in handling grains from fresh (high MC) to dry condition by 30%	Existing practice of manual loading/ unloading of grains (50kg bags) in trucks and flatbed dryer	1st prototype	1					
	(7) Low-cost typhoon-resistant pre-fabricated multi-purpose farm structure 50% cheaper than putting up a concrete structure	1st prototype under field-testing	Improved prototype	1					

OUTCOME THREE

Enhanced value, availability, and utilization of rice, diversified rice-based farming products, and by-products for better quality, safety, health, nutrition, and income.

PSA (2015) says the country can reduce the "proportion of the population below the national subsistence (food) threshold" as set forth in the Millennium Development Goals (MDG). From 17.6% in 1991 when the MDG started, it diminished to only 10.4% in 2012. But in 2015, the International Food Policy Research Institute (IFPRI) reported that we have a Global Hunger Index (GHI) of 20.1, which is higher than the regional average, a serious level of hunger.

The 2013 National Nutrition Survey (NNS) of the Food and Nutrition Research Institute (FNRI) shows that many Filipino children remain malnourished. Underweight, stunting, and wasting among 5 to 10-year-old children remain significant at 29.1%, 29.9%, and 9.1%, respectively. Also, one of every 10 adults is Chronic Energy-Deficient (CED), with higher incidence in women. The most serious micronutrient setback is iron-deficiency anemia, which affects 39.4% of infants, 25.2% of pregnant women, 21.2% of ≥ 60-year-old elderly, and 16.6% of lactating women. The same survey says 3 out of 10 adults are overweight and obese, also a manifestation of malnutrition.

A major goal of the UN 2030 Sustainable Development Agenda is to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture. This underscores the importance of access to sufficient, safe, and nutritious food, and is also the focus of the Nutritional Guidelines for Filipinos (FNRI, 2012).

This outcome then aims to help reduce hunger and malnutrition, and enhance income through value-adding and increasing accessibility and utilization of rice, diversified rice-based farming products, and by-products. As rice is still the most commonly consumed food item of all Filipinos (FNRI, 2013), rice with value-added traits will be developed and made accessible. These include pigmented rice with high amounts of antioxidants, and micronutrient-dense rice with iron or pro-vitamin A. Products from rice and diversified rice-based farming commodities with better quality and nutritional content will also be developed. Research on value-added technologies will be pursued to improve quality in terms of shelf-life, nutrition, safety, and market value. Furthermore, PhilRice and partners will conduct intensive work on technologies and systems for diversified rice-based farming not only to optimize resources but also to address issues relating to nutrition and income.

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
3.1 Rice varieties with value-added traits	(1) Number of traditional rices that are aromatic, pigmented, (antioxidant-rich) and glutinous made accessible to target market	Some available TRVs: Dinorado, Azucena, Ominio, Galo, Ballatinaw, Pinilisa, Chor-chor-os, etc.	5	5	5	5	5	5	TRV – traditional rice varieties
	(2) Number of modern varieties made accessible to target market (as seeds): • Aromatic • Glutinous • Japonica-type • Micronutrient-dense: high-Zn	These are existing modern varieties that are aromatic, glutinous, and japonica-type	 5 5 4		 1 1 1 1			 1 1 1 1	
	(3) Number of varieties developed and released:	The following varieties developed and released:							With acceptable yield level, grain quality, and agronomic traits;
	• Aromatic	NSIC Rc128, 148, 218SR, 342SR, 344SR (Mabango 1-5) with ave. yield of 4.9 ±0.6; attainable yield = 7.2 ±1.0		1					new varieties with yield level of 5 tons per ha and stable aroma
	• Micronutrient-dense: high-Zn and -Fe	NSIC Rc172 (MS13) with Zn and Fe contents of 19.4 and 3.6 mg/kg		1					
	• Micronutrient-dense: Pro-Vit. A	PSB Rc82 with GR2E event (Golden Rice) under confined field trial						1	
	• Pigmented rice	Elite line for PVP application		1					currently no NCT
	• Tropical japonica-type	NSIC Rc170 (MS11); 220SR, 242SR, 304SR (Japonica 1-3) with ave. yield of 3.5 ±0.3; attainable yield = 6.3 ±1.3 t/ha		1					
	• Glutinous	NSIC Rc13, 15, 17, 19, 21 (Malagkit 1-5) with ave. yield = 4.7±0.5; attainable yield = 7.0 ±1.1 t/ha		1					
	(4) Number of varieties suitable for: • organic rice production with at least 5 t/ha yield • low inputs, low cost production • high mechanization potential	Trials on-going			3			3	

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
3.2 Products from rice and diversified rice-based farming commodities with improved quality, nutritional value, and income	(1) Number of existing nutrient-enriched rice-based products and by-products consumed and accessible to target clients	Available rice-based food products ready for promotion such as rice-corn grit, nutri-rice milk	1	1	1	1	1	1	target clients are school children in provinces with high incidence of malnutrition (product produced by PhilRice and PCC)
	(2) Number of high-quality, nutritious, and income-generating products from rice and its environment developed:	Some products already developed such as:							In strong partnership with local producers
	• Beverages	instant rice water ("am"), rice wine, rice vinegar, non-fermented rice milk, rice bran protein concentrates, nutri-rice milk, instant GABA rice milk on-going development: black rice bran juice, monascus-rich coffee			1		1		
	• Snacks	Rice bihon, spaghetti, chiffon and molded puffed rice cakes, brownies with saluyot and squash powder, waffles, pancakes, cookies bar, shangrice, puto, puto pao, nougat, espasol, rice flat noodle with malunggay leaves, from rice wine lees flour (polvoron, butterscotch, and brownies) on-going development: rice-adlai energy bar, monascus cookies			1		1		

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
	• Meals	canned rice and rice meal, porridge casserole-type dishes on-going development: GABA rice instant and porridge nanocarbs			1		1		
	• Antioxidant-rich supplements	rice bran oil on-going development: red mold rice supplement, nano-anthocyanin capsule, nano-encapsulated rice bran oil, antioxidant capsule, rice bran antibacterial products			1		1		
	• Other products (eg. BGA as feed and biofertilizer, algae-based feed ingredient for aquaculture)	malunggay-supplemented rice crackers, dried chili pepper leaves, powdered/crushed chili pepper leaves, squash powder, rice wine lees flour, chili pepper-enriched salt bread		1		1		1	BGA - blue green algae
		on going development: Optimization of pond and on-farm culture of an edible, nitrogen-fixing BGA; other BGA that can be used as feed ingredient for aquaculture		1	1				
3.3 Value-added technologies to improve quality	(1) No. of machines developed as attachment to the existing rice hull carbonizer								Machines/ processes to be designed will be free from any contamination such as rust, pesticides, residues, etc.
	• multi-purpose dryer for rice-based crops and fish produced in diversified farming	Existing designs are electricity-dependent; prototype for performance-testing in 2016	1						
	• distilling apparatus for water purification and oil extraction from rice-based crops	Existing design is electricity-dependent and laboratory-type Proof of concept available	Working proto-type	1					
	• pasteurizer for mushroom production	Existing design uses wood as fuel, low capacity and efficiency	Proto-type for durability-testing	1					Model that can be easily set up by farmer

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
	(2) Household-type brown rice mill with 0.5 to 2-kg (manual and electric-powered)	Existing design is for village level			1				
	(3) No. of processes (ex. packaging, shelf-life, hermetic storage, germination) developed		1		1			1	This will include processes for risk-mitigating strategies
3.4 Technologies and systems for diversified rice-based farming	(1) Number of technologies for crop management in rice-based farming (biopesticides, bio fertilizers)	The effectiveness of several organisms for use as bio-inoculants or biocontrol agents is being verified; some are already advanced to product formulation, further analysis/ testing is needed; some organisms are being evaluated for use as bio-indicators of soil health or for bioremediation	1		1		1		1 bio-inoculant every other year from 2018-2022 (1 BCA against rice black bug, 1 for rice bug, 1 for rodents, 1 bio-indicator of soil health)
	(2) Number of technologies to optimize utilization of rice by-products (straw, hull, bran) and other biomass				1			1	
	(3) Number of clean, green, practical and smart (GPS) practices developed and established in diversified agri-biosystems	BPI-initiated GAP for rice-based farming systems started	1						In collaboration with other agencies; Improvement/ enhancement in the succeeding years
	(4) Number of business enterprise-driven agri-biosystems for different rice environments that will optimize resources and increase profitability	Nucleus estate strategy models in each station initiated in 2013	8						Enhancement/ improvement in the succeeding years

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
	(5) Number of technologies/ systems developed to increase cropping intensity and diversity								
	• Localized multi-crop till planter for rice, corn, and mungbean (4-wheel tractor-mounted) that can reduce seeding rate from 80-120 kg per ha to 20-60 kg per ha	Localized Indian seeder; performance evaluation ongoing; started fabrication of prototype and testing of metering plate for corn Existing design is electricity-powered, centrifugal pump; proof of concept available	1st prototype (rice)	1st prototype (corn & mungbean)	1				
	• Multi-crop seeder (handtractor-mounted) that can reduce labor requirement from 2 man-days to 1 man-day per ha, and increase field capacity from 1 to 1.5 ha/day	Field testing of the seeder is on-going	1						
	• Carbonizer-based water-pumping system for irrigating rice-based crops that can reduce cost in fuel per m^3 of pumped water vs centrifugal pumps		Experimental prototype	Working prototype	1				
	• Long-range sprinkler with 0.25 ha coverage for rice-based farming that can increase water-use efficiency by 40% (vs hose or furrow irrigation using centrifugal pumps), and reduce labor requirement in irrigation by 40%	Existing units are designed for upland crops; hose or furrow irrigation using centrifugal pumps	Conceptualization, fabrication	1st prototype	Testing, modification	1			

OUTCOME FOUR

Science-based and supportive rice policy environment.

To triumph in a globally competitive environment and adapt to changing climate, the Philippine rice industry needs a science-based and supportive policy environment both at the national and local levels. To ensure this, we will vigorously conduct policy research and elevate our advocacies to influence legislative agenda that will improve efficiency of the rice value chain – from the input sector to production, processing, marketing, and the consuming public.

PhilRice and partners will focus on policies that will improve farmers' access to high-quality seeds of high-yielding and climate-resilient rice varieties, with tolerance to biotic and abiotic stresses and have better nutritional and eating qualities.

Also, we will help promote the mechanization of rice farming while creating safety nets for displaced farmers. We will zero in on reducing labor cost. Launio et al. (2015) note that labor cost accounts for 35-40% of total rice production cost. This must be addressed to improve our competitiveness. Bordey et al. (2015) found that, on average, an irrigated farmer in Nueva Ecija spends about PhP 3.76 on hired labor to produce a kilogram of paddy, while Can Tho, Vietnam spends only PhP0.46/kg as their investment on farm mechanization is high.

We will likewise generate information that will lead to policies geared at narrowing the yield gaps across rice-producing provinces. We will intensify our efforts on location-specific recommendations, departing from the one-size-fits-all approaches in the past. We will then pay close attention to the uniqueness of the physical environment, technical and socio-economic preparedness of farmers, and the local rice economy of our target sites. We will support policies on credit and insurance that will enable farmers to adopt improved rice production technologies. Access to credit has been a perennial issue among rice farmers in the Philippines (Arida, 2009).

Finally, PhilRice and partners will actively develop, advocate, and recommend policies that will promote consumption of safe and nutritious rice for better health of all Filipinos.

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
4.1 Systems and policies	(1) Value chain-input subsystem								
	a. *Seed distribution system*								
	a.1. PhilRice protocol on seed production reviewed/ updated and strictly followed to ensure certification of seeds as breeder, foundation, and registered seeds	Current protocol reviewed	1	1	1	1	1	1	
	a.1.1. passing rate for BS	60%	75%	85%	87%	89%	92%	95%	
	a.1.2. passing rate for FS	80%	88%	90%	92%	94%	96%	98%	
	a.1.3. passing rate for RS	85%	90%	92%	94%	96%	98%	100%	
	a.2 Seed quality monitoring system enhanced and other policies developed in PhilRice	Existing RA 7308 or Seed Industry Act of 1992		1					With improvements every year as needed
	a.3 Marketing schemes/ innovations developed for seed growers	"PalayTindahan" (on-line) was established but not sustained		1					With innovations every year as needed
	a.4. Mobile seed center (Lakbay-Binhi) pilot-tested	Concept-testing started in 2015		1					By 2017 with appropriate vehicles; in areas without accredited seed growers
	a.4.1. Identification of areas without accredited seed growers		1						
	a.4.2. Matching of varieties with the needs of target province		1						
	a.4.3. Aquisition and retrofitting of vehicles			4	4	4	4		
	a.4.4. Deployment of Lakbay-Binhi per branch station with vehicle (% of provinces covered by station)				30%	50%	75%	100%	
	b. Labor and mechanization								
	b.1 Protocol on mechanized inbred seed production	Study started in 2016	1						
	b.2 Policy paper on reconfiguration of rice paddies	No existing policy				1			
	b.3 Impact assessment/policy analysis on rice mechanization component of DA Program (machine distribution)	No baseline study conducted by PhilRice			1				
	b.4 Policy paper on the adoption/ utilization of machines for postharvest production (drying, milling)	Baseline study conducted by UNESCAP		1					
	b.5 Policy paper on the socioeconomic costs and benefits of rice combine harvester	Study on rice combine harvester started in 2016		1					
	c. Credit & Insurance								
	c.1. Policy research on credit and insurance	Study conducted by PhilRice on crop insurance only		1					
	d. Standards on processing systems and product quality								
	d1. Proposed grain quality standards and clustering		1						

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
4.2 Policy briefs/ papers	(1) Policy paper on recommended interventions or programs needed for provinces with less than 4t/ha, and for more than 4t/ha yields	Study conducted 2015 to 2016		1					With updates as needed
	(2) Policy paper to rationalize fertilization to increase rice productivity	Benchmarking study conducted (international comparison); Rice-based farm household survey (inter-provincial comparison)	1						With updates as needed
	(3) Policy paper on potential of rice corn grit mixtures in the market			1					
	(4) Policy paper on small-scale irrigation systems	Study on Impact Assessment of SSIS conducted in 2013-2015		1					
	(5) Policy paper on Rice Value Chain	Study conducted in 2015-2016	1		1				
	(6) Policy paper on the structure, conduct, and performance of the rice seed industry	Study conducted in 2014		1					
	(7) Policy papers on enhancing farmers' awareness and adoption of PhilRice technologies a. Varieties b. Other technologies			1	1				
	(8) Policy paper on demand, supply, and price forecasting			1					With updates as needed
4.3 Policy ordinances	No. of policy ordinances on rice consumption, farm waste management, and others a. Strengthened policy ordinance on non-drying of palay on roads b. Prohibition of rice straw burning	Existing ordinances on half-cup rice & brown rice consumption adopted in 31 municipalities/cities	1		1				
4.4 Campaigns/ Advocacies	Be Riceponsible campaign (rice mix, brown rice, and other staples)			1	1	1	1	1	
4.5 Inclusion of rice technology adoption and yield gap reduction in provincial agricultural development programs	Number of provinces that adopts rice technology and yield gap reduction strategies		8		8				
4.6 Maintained/ updated databases	Database containing rice-related statistics available for policymakers, researchers, etc.	Rice-based socio-economic information system	1						With updates every year
	Price and production database		1						With updates every year

OUTCOME FIVE

Advanced rice science and technology as continuing sources of growth

As stressed in the earlier sections of this Plan, agriculture and the rice industry face serious challenges, foremost of which are globalization of rice trade, declining yields, decreasing land area for rice cultivation, deteriorating rice environments, and effects of climate change. Physical area for rice cultivation is limited, hence there must be new sources of growth to sustain food security.

While rice yields have increased significantly since the green-revolution days, our farmers remain poor chiefly because of the low level of mechanization and the increased use of chemical inputs to boost yields. The high cost of inputs has eroded farmers' incomes. We must optimize production through better and more efficient crop management and postharvest operations to allow farmers' profits to climb.

Given these threats and opportunities, we will explore the benefits of advanced rice science and technology – both local and foreign – as continuing sources of growth in production. The application of space and information technologies, bioinformatics, automation, robotics, alternative energy, and biotechnology will help to better manage the rice crop, increase input-use efficiency, reduce production costs, and limit our carbon footprints.

To boost the resilience of farming communities, PhilRice recognizes the renewed capacity of local government units and will partner with local universities, R&D organizations, farmers' cooperatives, and non-government organizations to enable farming communities to intensify production, protect the rice environment, increase income opportunities, and make them food-secure with access to safe and nutritious crops.

Our research questions to better serve the rice industry and its major stakeholders are limitless. The innovations named above are not in any way exhaustive. As an R4D institution, we keep an open mind to what we can do and what might come our way. We will hold on to our seeker attitude so no stone will be left unturned in our quest to give our best to the Filipino rice farmers.

INNOVATIONS

Dynamic, satellite-based rice map of the entire country showing various rice ecosystems and effects of climate change, drought and flooding, urbanization, and environmental damage

Use of robotics, controlled environments such as food factories, drip irrigation technology, aquaponics, and wireless sensor networks for crop management

Use of other remote-sensing tools like unmanned aerial vehicles (UAVs) for mapping, surveillance, monitoring, and warning systems

Use of smart phones as platform for various apps development for farm management, crop combination, yield and profit prediction, and market integration

Rice Intel – a Geographic Information System-based integration of all rice databases, overlayed with socio-demographics data , economic, infrastructure, agro-industry information for greater knowledge-sharing and dissemination

Use of biotechnology and nanotechnology for food production, fuel, fertilizer, waste management, and value-added products

Decision support systems, diagnostic tools, precision agriculture, and farm automation

Application of new techniques in sociology, anthropology, ethnography, human geography, development, extension, and communication in technology promotion, and knowledge-sharing

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
5.1 ICT-based land resources management (model/system/ process)	(1) Provincial soil characteristics and management maps developed (web- and GIS-based)	Existing provincial soil characteristics guide books (15 hard copies, of which 11 e-copies are uploaded via PhilRice website)	10	20	20	11	10	10	• include specific soil problem mgt. • precision farming • crop suit-ability • varieties (and other interven-tions) with tolerance to problem soils • using local languages • targets to be reviewed/ sites should be within the priority provinces in the RiceBIS
5.2 Advanced water resources management (model/ system/ process)	(1) Second-generation irrigation systems that are 50% cheaper and with higher water-use efficiency than existing irrigation systems developed/demonstrated	Existing AWD technology		1		1			
	• Field water-monitoring and control systems model developed (precision agriculture)	Existing prototype: field water-monitoring system at PhilRice CES for testing		1					On-farm
	(2) Water quality-monitoring and mapping system	None for irrigation systems; existing for heavy metals accumulation (mine tailings at San Roque Dam Agno River Irrigation System)	2	3	3	3	4	4	Major irrigation systems, to identify targets based on existing NIS

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
5.3 Rice and rice-based agricultural information systems (model/ application/ solution)	(1) Regional seed information system models developed/ deployed (sources of seeds, locations)	Model for Region 3 (proof of concept) available at Google Maps		5	6	6			
	(2) Regions covered by PRISM Deployment (actual rice area planted, cropping calendar, pest monitoring, yield estimates, damage estimates)	PRISM rice maps for entire Philippines available at PhilRice website	17	17	17	17	17	17	When PRISM is institutionalized to PhilRice
	(3) New early-warning systems for decision support development	Population dynamics studies and diagnostic tool (e.g. LAMP) available		1					
	(4) Rice intel	Information available but not consolidated	data-base struc-ture	25%	25%	50%			
5.4 Rice and rice-based farm automation (process/model/ system)	(1) Working precision-agriculture models developed	Rice Crop Manager for nutrient and pest management	1	1	1				
	• Robotic models developed for crop management (e.g. for bird dispersal)	Ongoing review of literature		1					
	• Unmanned aerial vehicle (UAV)-aided nutrient management model (NDVI-based) and pest monitoring	2 UAV units available		1					Normalized Difference Vegetation Index (NDVI)
	• ICT-based production mgt. system (e.g. application software)	Existing prototype (Production Management App)	1						
	(2) Automated rice hull gasifier for electricity and irrigation	Existing rice hull gasifier but not automated				1			with sensor for gas intake
5.5 New methods developed for rice and rice-based quality and chemistry	Protocol for new method standardized :								
	• Rapid amylose-testing for field application	Alkali-based method optimized and published in a refereed journal; rapid field test kit still under development		1					AC – amylose content
	• Rapid GT-testing for field application	Rapid AC and GT field testing based on old method was developed at PhilRice LB and published			1				GT – gelatinization temperature
	• Nondestructive NIR-based physico-chemical determination	Model development and calibration for GT, AC, and CP are on-going						1	CP – crude protein

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
5.6 Advanced Biotechnology Solutions	(1) Number of gene editing-based pyramided traits generated for RTSV and herbicide resistance, red pericarp, low-lignin, and submergence tolerance	Already being used by IRRI; PhilRice to target different varieties/traits; under conceptualization stage				1 line with at least 2 pyra-mided traits		1 line with at least 2 pyra-mided traits	In support of breeding new varieties. If resulting variety is classified as GMO, commercial release will be after 6 years (developed line to undergo Biosafety-testing for 6 seasons)
	(2) Number of novel genes/ QTL discovery for important traits (drought, submergence, herbicide-resistant, soil problems [such as P and Zn def, Fe toxicity], stay green, long stigma, root plasticity, pest and diseases, high temperature, yield-related genes)	Existing study protocol for "Gene-Mining of Yield-Related Genes in Philippine Rice Landraces"		1	1	1		1	1 gene/QTL for: yield-related traits by 2018; insect by 2019 and 2022; disease by 2020
	(3) Number of genotypes sequenced using Next-Generation sequencer	5 whole genome sequence based on existing CBC and GRD study		1	1	1	2	2	

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
	(4) Genetically engineered microbes for enhanced rice production and industrial uses • lignin-degrading fermenting bacteria for bioethanol production from rice biomass	Previous studies by University of Florida USA (Wang et al. 2013) on bacteria that can ferment lignocellulosic sugars but these have not been designed to degrade lignin	Micro-organisms identified	Genes identified				1	
	• genes and by-products from microorganisms with pesticidal and plant growth-promoting activities	With existing technology but not for crop yield, pesticidal and plant growth		1 gene cloned	1 gene cloned	2 genes characterized	1 genetically engineered bioinoculant or by-product	1 genetically engineered biopesticide or by-product	
	• Recombinant protein-based antisera for diagnosis of tungro viruses	PhilRice does not produce its own antisera but needs these to support its breeding objective for virus resistance. The traditional method of antisera production requires virus purification, a laborious and complicated process. The modern alternative method can be much more practical.		2 virus coat protein genes cloned	2 purified recombinant proteins (RP)	2 RP-based antisera	1 RP-based antiserum optimized for detection of RTSV	1 RP-based antiserum optimized for detection of RTBV	

OUTCOME SIX

Enhanced partnerships and knowledge management for rice research for development (R4D)

This Plan stresses that PhilRice cannot do it alone. We have a long history of vibrant partnerships with local, national, and international knowledge and development institutions (e.g., SUCs, private and civil society organizations, international agri-research institutions, and LGUs). These partnerships will be continued and enhanced through innovative projects that provide credit and institutional benefits to all participants.

Partnerships are crucial at a time when donors seem to put rice R4D at the back burner. In Asia-Pacific, agricultural R&D funding decreased in 1976-2000 owing to the belief that the problem on inadequate food supply has already been solved (Wesley and Faminow, 2014). Annual budget for PhilRice had been fluctuating until it stabilized to about PhP 200M in the mid-2000s. The DA-Rice Program's budget for rice R&D has also been declining since 2001 with some increases past 2003 (Bordey, 2010).

We will strengthen and increase our network of partner-institutions and further intensify our initiatives in all areas of rice science. Likewise, we will institutionalize getting and acting on feedback from our stakeholders. Like the famous Japanese Kaizen principle, we will continually improve on this aspect to ensure that we are responsive to their needs.

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
6.1 National and island-wide/ regional consultation workshops conducted with partners and stakeholders	Number of national and island-wide consultation workshops conducted spearheaded by branch stations to define thrusts and programs, and possible collaboration with partners in the region	PhilRice hosts a national rice R&D conference held annually participated in by partners and collaborators	4			4			
6.2 Collaborative rice R&D projects and capability-building thrusts developed and implemented with partners	(1) Number of new/renewed agreements (MOU, MOA) executed with DA, LGUs, and other institutions and donors with well-defined mandates/ functions of PhilRice and partners	Existing 50 MOUs/MOAs with partners	50	50	50	50	50	50	
	(2) Number of new/renewed R&D projects implemented with funding from international organizations	Existing 11 R&D projects implemented	2			2			
	(3) Number of new and continuing projects implemented with national and local agencies with funding from PhilRice, partners, or both		50	50	50	50	50	50	
6.3 Presence of PhilRice in the R&D communities	Number of new areas (provinces, and municipalities) reached by public relations, corporate affairs, and communication and promotional activities of PhilRice	Social media platform (Facebook): 7908 number of likes Broadcast initiatives: 100 media exposures; national coverage with millions of audience reached Public Relations value (measured on a per square cm of a broadsheet): 9,471,000	9						One per station in 2017, and radiates to different provinces/ municipalities every year
	Number of Corporate social responsibility initiatives conducted	Medical mission, feeding programs, tree planting, gift giving	5	5	5	5	5	5	
6.4 Partnership/ dialogues with regulatory institutions	(1) Number of dialogues with NEDA, RDCs, COA, BPI and other regulatory offices for policy clarification and formulation	Nothing institutionalized so far	1	1	1	1	1	1	
	(2) Regular meetings with DA-BAR, DA-Rice Program, PCAARRD, and other government institutions providing funds for rice R4D-related projects to enhance integration of rice R4D programs	Nothing institutionalized so far	1	1	1	1	1	1	

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
6.5 Workshops conducted with BPI, seed growers and other stakeholders on rice seed distribution	Workshop conducted annually to develop/improve policies/guidelines related to seed certification and distribution	Rice summit conducted starting 2016	1	1	1	1	1	1	
6.6 Feedback gathered from partners	Feedback mechanism developed/ enhanced	There are scattered feedback mechanisms being implemented by concerned process-owners (visitors' feedback by VCSO, from users of publications by DevComm, PhilRice Text Center, adoption studies, etc), but these are not linked and integrated and are not comprehensively consolidated and analyzed into one institutional customer feedback results where appropriate corrective and preventive actions are clearly defined.	1						Will be further enhanced or new mechanism developed as needed
	Feedback gathered from clients/ partners for all products/services provided			✓	✓	✓	✓	✓	
6.7 Context-specific and innovative knowledge management system	Number of new/enhanced platforms for knowledge-sharing and learning (ICT- or non-ICT based)	Farmers' Information and Technology Services (FITS), K-AgriNet, Text Center, Pinoy Rice Knowledge Bank	1						To be modified/ updated as needed

OUTCOME SEVEN

Strengthened institutional capability of PhilRice

Human and physical resources will enable PhilRice to achieve the outputs, outcomes, and impacts set forth in this Plan. A well-capacitated human resource base begins with its highest officials, the Board of Trustees, and the people on the ground. The Board, which provides policy, management and operational oversight to PhilRice, needs a balanced and active membership to guarantee sound governance. A balanced membership will result from careful selection of representatives from key rice industry players and stakeholders. And, most importantly, an active Board has to convene as often as possible as recommended by the PhilRice External Program and Management Review (EPMR) in 2015.

The government's Rationalization Plan of 2013 cut the PhilRice workforce by almost 50% -- from 422 to 286 plantilla positions. In 2014, 83.5% (1,106) of the 1,324 total personnel were service contractors. Our seven branch stations only have 71 regular staff members (9/station, on average). To improve our rice industry, we need to develop and use science-based technologies, strategies, and policies. The Plan has decapitated PhilRice's institutional capacity to perform its mandate, thus we need to restore and strengthen it to produce these strategic outputs.

Many of the approved positions are unattractive to MS and PhD degree holders. This is happening while the tasks at hand and beyond remain immense with the surge of natural, economic, and societal challenges. The organization needs to expand rather than downsize because of these challenges. It needs a stronger structure supported by a bigger workforce deployed in all its areas of operations. This workforce must be provided with modern tools to fulfill their tasks like ICT-aided operational systems. The Institute needs to be fully abreast and compliant with reforms and innovations in the bureaucracy such as the *Procurement Law*, the *E-commerce Act,* and the *Philippine Quality Award Act*. It has to maintain its commitment to international management standards as reflected in its IMS Policy Statement. This requires that administrative and financial support systems and processes are fully integrated, fast, and efficient, and






that its accounting and auditing systems are those prescribed for a dynamic research institution.

With wider areas of coverage, the branch stations are now ripe to have some form of rein over their administrative and fiscal resources. They can take the lead in crafting the rice R4D plans for their respective regions in coordination with their regional partners. Land development in the stations should also be boosted along with the provision of needed facilities, vehicles, and equipment. The collective efforts of all the staff members must be rewarded with training, postdoctoral, and sabbatical opportunities, aligned with the competency plan of PhilRice. The competency-based human resource management that is taking shape will dictate the mechanisms of recruitment, selection and placement; learning and development; performance management; and rewards and recognition. PhilRice must have more scientists and CESOs within its ranks not only to serve as hallmarks of excellence but also as proofs of productive and efficient people committed to the delivery of services to clients and their contributions to science. Corollary to this, the staff must enjoy the benefits assured by an enticing reward and incentive system like the *Magna Carta* privileges due to employees of a productive research organization.

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
7.1 Improved PhilRice governance									
(1) Reconstituted PhilRice BOT	Appointment of fresh BOT members to represent different sectors and ex-officio members in accordance with the PhilRice charter and GOCC Governance Act of 2011	Current BOT members are on a hold-over capacity	1		1		1		
(2) Manual of BOT operations	Manual developed and circulated to all BOT members Orientation conducted for new members.	The Board of CGIAR follows a manual for its operations. A similar manual for the PhilRice BOT will be useful and will be the first.	1 1		1		1		The manual stipulates improved TOR of officials as approved by the BOT with emphasis on stronger national and regional management. It will be updated/ reviewed as needed
(3) Regular BOT meetings	At least 1 meeting per quarter	For 2014, there were three meetings; none for 2015-2016	4	4	4	4	4	4	
7.2 Strengthened organizational structure and staffing									
(1) New and expanded organizational structure and staffing pattern	Proposed organizational structure approved by the BOT and DBM with the following features: (1) New divisions and offices included in the organizational structure (2) Plantilla items particularly critical positions, increased and balanced according to area and scope of operations	2013 Rationalization Plan virtually cut the workforce in half and failed to include existing internally created divisions and offices. Very limited plantilla positions especially in the branches. To provide needed workforce, outsourcing is adopted. Engagement of contractors stands at a 3 contractors :1 regular personnel ratio.	Approved by BOT	Approved by DBM					

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
7.3. Strengthened support systems and processes									
(1) Improved financial and administrative operational systems and processes	(1) More unified and efficient administrative and financial support systems, and processes developed and implemented	Existing but needs streamlining of administrative and financial support systems and processes	1						Improvement/ enhancement as needed
	(2) Complete ICT-aided operational systems integrated and unified	Two systems, FMIS and PSIS, are being linked and further enhanced. Other systems like HRIS are under development	50%	100%					for traceability, efficiency, databasing and report preparation
	(3) Deployment of (1) one ICT personnel per branch station	No permanent ICT personnel in all branch stations		7					
	(4) Decentralized authority and fiscal autonomy of branch stations • At least 30% of income from seeds retained by branch stations, subject to an approved work and financial plan	All income is remitted to the Central Station	1						
7.4 Enhanced capacity-building of PhilRice CES and branch stations									
(1) Regional rice R4D plans	Programs/projects based on regional rice R4D plans developed by the branch stations with the local partners, and approved by the BOT for implementation	This will be a new exercise.	7						
(2) Station development plans for the branch stations	Site development plan developed for each branch station, approved by the BOT, and implemented	Concrete site development plans for stations need updating. Developments in the stations are sporadic and limited by budget constraints.	8		8				Eight plans will be developed in 2017, to be fully implemented by 2019

OUTPUTS	PERFORMANCE MEASURES							REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
(3) Facilities , vehicles and equipment	(1) Improved/new infrastructure and facilities established in CES and branch stations		8	8	8	8	8	8	
	(2) Number of running vehicles provided for CES and branch stations	CES only has 20 serviceable vehicles that include general dispatch, waste management, emergency, operations and service for officials; 39 vehicles in branch stations	10 5	10 5	10 5	10 5	10 5	10 5	Additional units to be provided if scope of activities is also expanded
	(3) Equipment and materials needed for the implementation of projects made available	Equipment procurement is mostly income-sourced and externally funded.	✓	✓	✓	✓	✓	✓	
(4) Staff development	(1) Number of new and upgraded scientists conferred	No conferment and upgrading for 2015; currently 4 conferred scientists		2		2		3	
	(2) Number of staff sent to degree training	21 scholars graduated in 2014-2015; 11 were sent to school for the same period.	5	5	5	5	5	5	New implementation guidelines by 2017
	(3) Number of staff sent to non-degree training programs	For 2014, attendance in trainings was 103% (attendance vs. no of trainings) availed of by only 50% of plantilla staff. Attendance increased to 157% in 2015.		100%	100%	100%	100%	100%	Will be based on competency-based training to be implemented by 2017 = interventions will start 2018, approach is individual
	(4) Number of staff sent to post-doctoral and sabbatical leaves	2014-2015: 1 postdoc; One sabbatical leave availed of so far.	2	3	3	2	2	3	
	(5) Human resource competency plan developed and implemented	First ever competency plan under development	✓	✓	✓	✓	✓	✓	Start middle of 2017

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
(5) Incentive and reward system	(1) Incentive and reward system for PhilRice personnel enhanced and implemented	Revised guidelines were implemented 2013	✓	✓	✓	✓	✓	✓	
	(2) PhilRice covered by Magna Carta Law *	2015 renewal of Magna Carta accreditation is 52% of R&D staff; 24 new applicants	✓	✓	✓	✓	✓	✓	

** Under the RA 10149 (GOCC Governance Act of 2011), PhilRice is a research institution not under the GCG; Under EO 596, PhilRice is a government instrumentality with corporate powers under the jurisdiction of the OGCC. However, it is still expected to remit 50% of its income to the National Treasury and is governed by accounting and auditing rules of the National Government. If classified as strictly a research institution under the DOST, it may adopt the Magna Carta rules for all its employees; use its own income; and adopt accounting and auditing rules for a research agency.*

Chapter Four

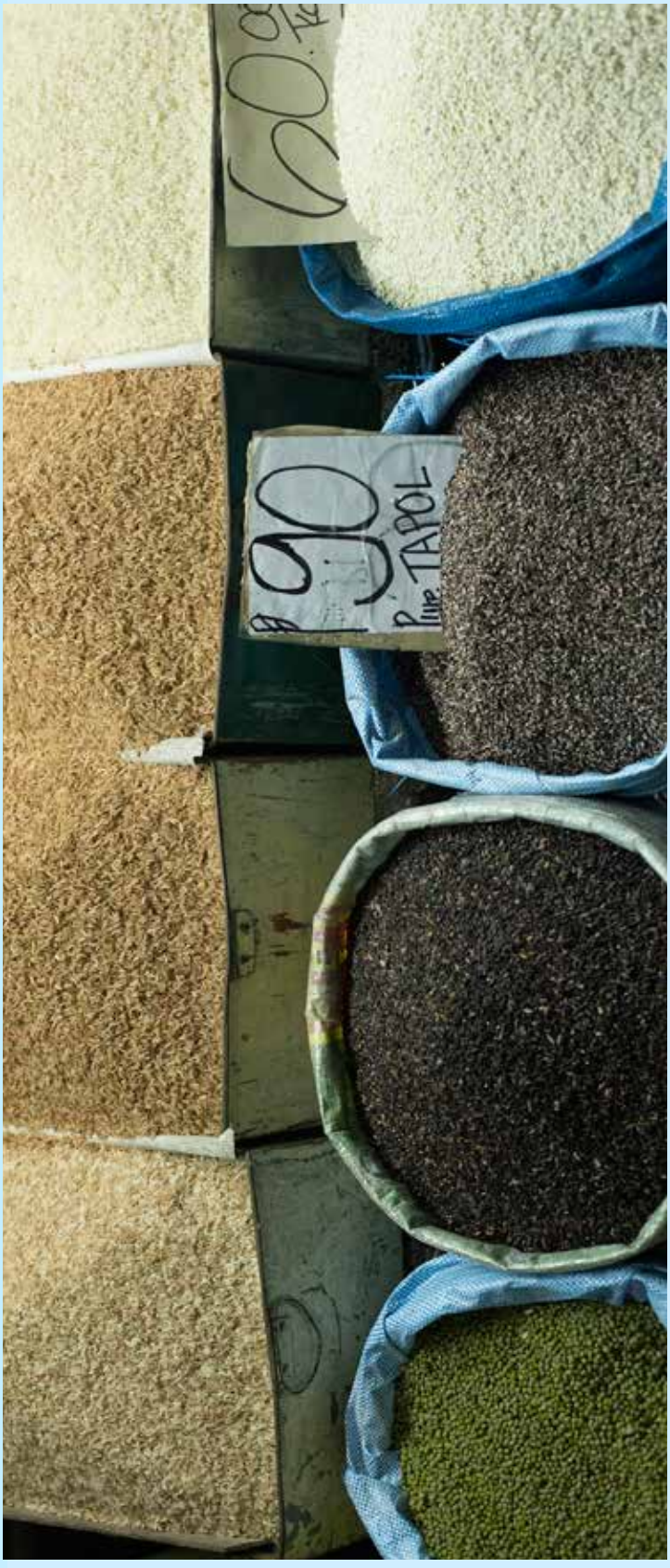
Achieving our Goals

PhilRice's reason for being is the development of technologies that will help rice farmers live decently. While we have had modest successes, the path ahead is more complicated, and the tasks are more challenging. On a national scale, our palay production has declined from its peak of 18.96 million tons in 2014 to 17.63 M tons in 2016 due to El Niño and more extreme typhoons. While our population grows, the threat of international competition to local producers also hovers as the country is bound to honor its commitment to world trade agreements and replace its quantitative restrictions on rice trade with tariffs. Many of our rice farmers are not prepared to compete due to their high cost of production. At the household level, 30-40% of rice-farming families have income below the poverty threshold and are indebted. While they produce rice to feed the nation, many of them are also food-insecure. Our tall order is to translate our scientific outputs into solutions that will help ease these problems.

For 30 years now, PhilRice has developed 44 inbred and 7 hybrid rice varieties, production and postharvest machines, rice-based food products, harnessed biological agents for pest and nutrient management, diagnostic/decision tools, integrated rice management practices (*PalayCheck*), and rice-based farming systems (Palayamanan). To promote these among farmers, we have utilized various deployment and promotion strategies such as establishment of technology demonstration areas; training of trainers, rice specialists, and farmer-leader technicians; conduct of on-farm research (Palayamanan and location-specific technology development); development and dissemination of information, education, and communication materials; radio and television broadcasts; development and deployment of ICT support tools (PhilRice Text Center and PinoyRice website); and more recently, the knowledge-sharing and learning (KSL) activities as well as social mobilization initiatives such as the Rural Transformation Movement, Infomediary, and Be Riceponsible campaigns.

Despite all these efforts, the adoption of technologies remains wanting and much more needs to be done to achieve our desired outcomes.

Our development modalities had been production-driven, leaving farmers on their own to market their outputs. However, due to their lack of business orientation, market information, entrepreneurial skills, and support network, farmers became reluctant participants in the market and value-adding processes. They passively interacted with market actors such as suppliers of their inputs, farm service providers, and buyers of their products. They were price takers for the inputs and services they bought and outputs they sold. As a result, many rice farmers have looked at farming as a lowly work instead of a business that needed to be done profitably.



Besides improving farm production, market-based assistance is equally important. We must help them acquire skills and resources to market their products and capture greater value for their crops, and increase their income in the process. In the end, development interventions will result in a stabilized well-being of the farming households.

Development Models & Strategies

In support of our shift from production-driven to market-oriented approach, we will adopt the concept of agroenterprise as our new development modality. The Catholic Relief Services¸ defines agroenterprise as "group marketing business of organized farmers, where they actively work with market chain actors, having relationships with buyers of their products, and business development services that support the movement of their products in the market chain at a profit".

We will follow the modified eight steps for agroenterprise development (Figure 1): 1) partnership-building, site selection, and cluster formation; 2) supply assessment and market-scanning; 3) cluster commitment-setting and strengthening of organization; 4) agroenterprise-planning and mobilization; 5) cluster capacity enhancement; 6) product supply-organizing and processing; 7) test marketing; and 8) sustaining the enterprises.

PhilRice will strengthen its partnerships with DA Central and Regional Field Offices, attached agencies, provincial and municipal local government units, State Universities and Colleges, other related government agencies (e.g., DAR, DOST, DTI), non-government organizations, and the private sector. With the help of our partners, we will spearhead and facilitate the establishment of rice business innovation systems (RiceBIS) communities, which will be the focus of rice-based agroenterprises that will be developed. Strategically located all over the country, the RiceBIS will be PhilRice's development outlets as we continue to deliver our R4D outputs to our target clients.

Figure 1. Agroenterprise development framework (modified from CRS 2014)

Figure 2. The initial eight RiceBIS in 2017 nationwide.

RiceBIS Community

Rice Business Innovation System (RiceBIS) is a community of practices geared at developing rice and rice-based enterprises within a province to address farmers' needs - from production, to processing, to marketing - in a resilient and sustainable manner, ensuring available and affordable rice. Within its core are clusters of farmers who commit to participate in group-marketing. Each cluster is composed of 10-15 farmers.

The clusters will then be linked to allied service providers, processors, market intermediaries, institutional buyers, and eventually to consumers. To enhance the capacity of farmer-partners to engage in rice-related enterprises, PhilRice with its partners will showcase mature technologies, increase access to seeds and other inputs, training, experts' consultations, and market information support. For the RiceBIS community to thrive, it will need an enabling environment, which encompasses technology providers, financing institutions, technical and logistical support, and favorable policies. It will be considered as full-fledged when a critical number of farmers' clusters have ventured into multiple rice and rice-based enterprises that are sustainable and resilient.

In 2017, we will initiate the establishment of eight RiceBIS communities in the provinces where PhilRice stations are located (Figure 2). These provinces have at least 50,000 ha rice areas each, hence the potential to contribute significantly to national rice security. We will initially target irrigated areas with strong LGU support, then expand in rainfed areas. We will also favorably engage farmers cultivating an area not bigger than three hectares.

To bring about the RiceBIS community, we will engage 100 farmers in rice production training as entry point. They will be motivated to join clusters that will develop agroenterprises. As they commit to market their rice products together, they will also be trained on entrepreneurship and their organizations will be formalized and strengthened. PhilRice and its partners will also link them to business service providers and buyers of products. They will be guided until they are able to deliver products to buyers.

Starting 2017, each PhilRice station will establish at least two clusters to constitute the community. As we gain more experience in this modality and as more farmers appreciate the benefits brought by the agroenterprise approach, we will expand by establishing more clusters of farmers. The target number of clusters per community is summarized in Table 1. By 2020, a new set of hubs with respective clusters will be established in other major rice-producing provinces within the coverage area of each PhilRice station.

Table 1. Target number of hubs and clusters of farmers.

Station	Provinces	Hubs		No. of New Clusters					
		Phase 1	Phase 2	Phase 1			Phase 2		
		2017	2020	2017	2018	2019	2020	2021	2022
CES	Nueva Ecija, Pangasinan	1	1	2	3	5	3	5	2
Batac	Ilocos Norte, Abra	1	1	2	3	3	3	3	2
Isabela	Isabela, Kalinga	1	1	2	2	4	2	4	2
Negros	Negros Occidental, Iloilo	1	1	2	2	3	2	3	2
Bicol	Albay, Camarines Sur	1	1	2	2	3	2	3	2
Los Baños	Laguna, Occidental Mindoro	1	1	2	3	3	3	3	2
Agusan	Agusan del Sur, Bukidnon	1	1	2	3	5	3	5	2
Midsayap	North Cotabato, Maguindanao	1	1	2	3	4	3	4	2
Total per year		**8**	**8**	**16**	**21**	**30**	**21**	**30**	**16**
TOTAL		**16**		**134**					

The overall goal is to spur the agro-entrepreneurial potential of the community with rice and rice-based enterprises as springboard for social and economic transformation. At the end of our engagement, we expect to help increase farm income by 25% in our target sites. We will also work to improve their productive capacity to achieve a minimum 1.0t/ha yield increase and to lower their production costs to P8.00 per kilogram by 2019, to P7.00 by 2022.

Also, this strategy has a built-in feedback mechanism. Through scoping studies, we will then be able to give voice to rice industry stakeholders as regards the rice R4D agenda. The major stakeholders can then input ideas on the technologies they need to improve their rice farming and quality of life. Participatory monitoring and evaluation will also be in place. Transdisciplinary encounters among staff members of PhilRice and its partners will be fostered. The community will benefit from not just one project but many need-based interventions of the Institute.

The specific target outputs are summarized in Table 2.

Table 2. Specific outputs of the RiceBIS development.

OUTPUTS	PERFORMANCE MEASURES								REMARKS
	Indicators	Baseline	2017	2018	2019	2020	2021	2022	
16 RiceBIS community with 134 clusters of farmers engaged in various rice-based agroenterprises	50-hectare technology demonstration area		8 sites in 1 season	8 sites in 2 sea-sons	8 sites in 2 sea-sons	8 sites in 2 sea-sons	8 sites in 2 sea-sons	8 sites in 1 season	
	100 farmers per hub trained on rice production		800			800			
	75% of trained farmers committed to participate in agro-enterprises are further trained on organization-building, values formation, and agro-enterprise development			600			600		
	Field day to showcase technologies		8 sites	8 sites	8 sites	8 sites	8 sites	8 sites	
	Knowledge-sharing and learning activities		4 per year	4 per year	4 per year	4 per year	4 per year	4 per year	
	Market linkages established		1 per site	1 per site	1 per site	1 per site	1 per site	1 per site	
	Package of technology developed per cluster that can increase yield by 1t/ha, reduce production cost to P7-8/kg, and is utilized in the production module		1 per cluster	1 per cluster	1 per cluster	1 per cluster	1 per cluster	1 per cluster	
	Training curriculum with modules on rice production, processing and marketing updated		1						
	Training curriculum with module on agro-enterprise development updated	CRS module available but needs fitting to rice enter-prise	1						
	Training curriculum with modules on values formation, organization-building and management, and leadership/personal development validated		1						
	Agroenterprise plans developed		1 per site	1 per site	1 per site	1 per site	1 per site	1 per site	
	Communication plan developed and implemented with program briefer, IEC materials, and mindsettting campaigns		1	1	1	1	1	1	1 plan will be established by 2017 but execution will be refined until 2022
	Baseline and monitoring surveys conducted to generate information/data related to socioeconomic conditions of farmers and impact of PhilRice		1	1	1	1	1	1	1 project will be initiated in 2017 to establish baseline and will be sustained until 2022 to monitor the progress of impact

Impact Pathway

The key features of this initiative such as being partnerships-heavy, community-centric, and participatory can lead to lasting impacts in the future. We will develop communities and train champions who will play pivotal roles in upscaling the principles of this initiative.

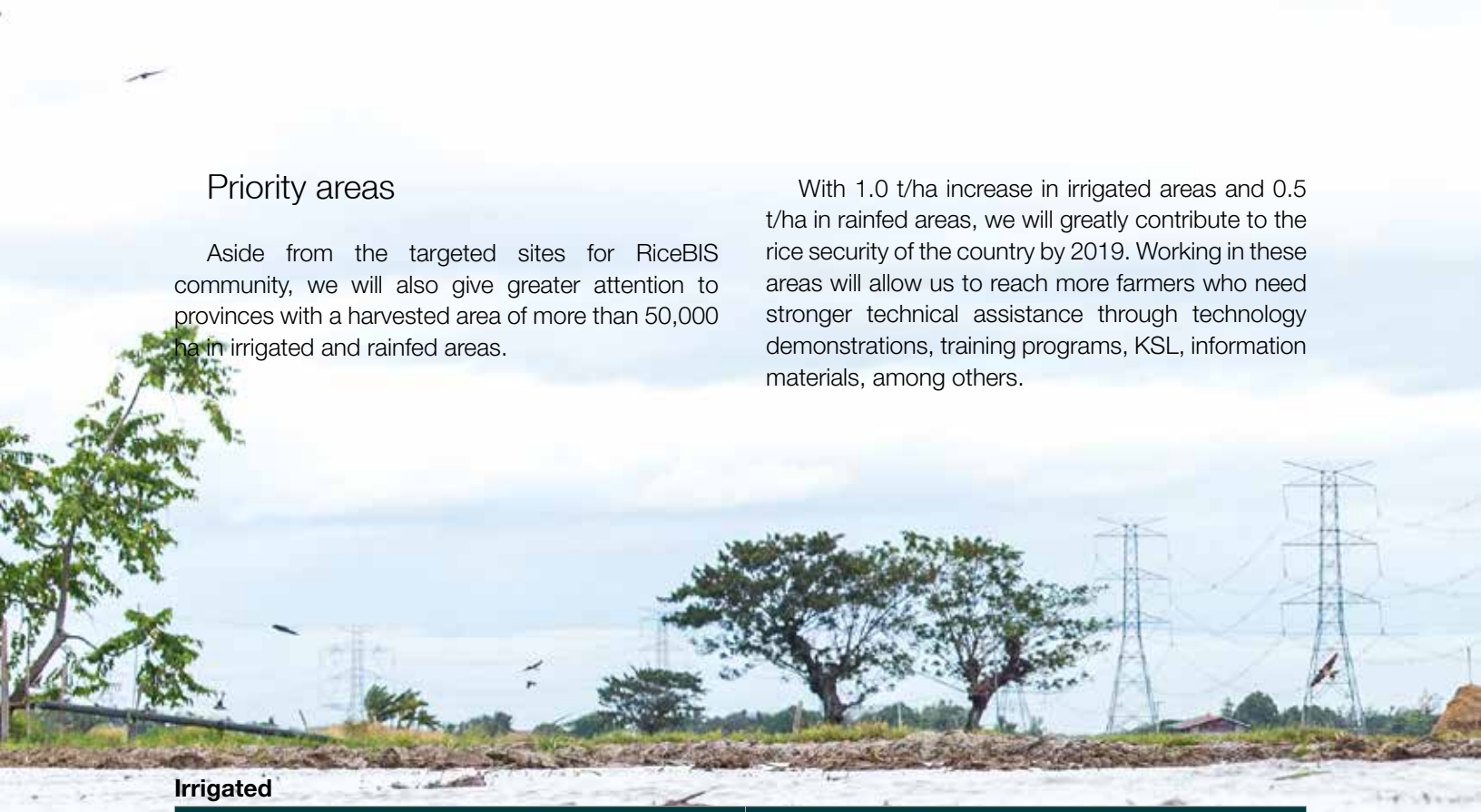
As we see fit, we will recommend for the upscaling and outscaling of this development modality in other provinces. We believe that our interventions will create the most impact in these priority provinces. We will also assist other provinces that may need us. If economic and social development is realized, other communities will soon benefit and champions will emanate from them. Our technologies will then have a life of their own, thereby creating more vibrant rice-farming communities.

This strategy involving RiceBIS makes it easy to measure impact. Operating in specific communities allows us to document changes brought about by our interventions. In the past, we could not point any community where we made an impact. We then operated in any community where certain projects fitted, not mindful of the overall impact an integrated approach could have made. Through this initiative, we are hopeful that we can show concrete examples that PhilRice-generated technologies and its development services can create meaningful impact on rice-farming communities toward a rice-secure Philippines.

Priority areas

Aside from the targeted sites for RiceBIS community, we will also give greater attention to provinces with a harvested area of more than 50,000 ha in irrigated and rainfed areas.

With 1.0 t/ha increase in irrigated areas and 0.5 t/ha in rainfed areas, we will greatly contribute to the rice security of the country by 2019. Working in these areas will allow us to reach more farmers who need stronger technical assistance through technology demonstrations, training programs, KSL, information materials, among others.



Irrigated

Provinces with Harvested Area of More than 50,000 ha		Provinces with Harvested Area of 10,000 to 50,000 ha	
Yield < 4 t/ha	**Yield > 4 t/ha**	**Yield < 4 t/ha**	**Yield > 4 t/ha**
1. Oriental Mindoro	1. Ilocos Norte	1. Abra	1. Apayao
2. Palawan	2. Pangasinan	2. Ifugao	2. Kalinga
3. Albay	3. Cagayan	3. Aurora	3. Ilocos Sur
4. Camarines Sur	4. Isabela	4. Batangas	4. La Union
5. Antique	5. Nueva Vizcaya	5. Cavite	5. Quirino
6. Capiz	6. Bulacan	6. Quezon	6. Bataan
7. Iloilo	7. Nueva Ecija	7. Romblon	7. Zambales
8. Bohol	8. Pampanga	8. Camarines Norte	8. Laguna
9. Western Samar	9. Tarlac	9. Catanduanes	9. Biliran
10. South Cotabato	10. Occidental Mindoro	10. Masbate	10. Southern Leyte
11. Sultan Kudarat	11. Negros Occidental	11. Sorsogon	11. Zamboanga Sibugay
12. Agusan del Sur	12. Leyte	12. Aklan	12. Lanao del Norte
13. Lanao del Sur	13. Zamboanga Sur	13. Guimaras	13. Misamis Occidental
14. Maguindanao	14. Bukidnon	14. Negros Oriental	14. Davao del Sur
	15. North Cotabato	15. Eastern Samar	15. Davao Oriental
		16. Northern Samar	16. Compostela Valley
		17. Zamboanga Norte	
		18. Davao del Norte	
		19. Sarangani	
		20. Agusan del Norte	
		21. Surigao del Norte	
		22. Surigao del Sur	

Note: Provinces in red font have poverty index higher than 25.23 (national poverty index)

Rainfed

Provinces with Harvested Area of More than 50,000 ha		Provinces with Harvested Area of 10,000 to 50,000 ha	
Yield < 2.8 t/ha	Yield > 2.8 t/ha	Yield < 2.8 t/ha	Yield > 2.8 t/ha
1. Cagayan	1. Ilocos Norte	1. Apayao	1. Abra
2. Isabela	2. Pangasinan	2. Ifugao	2. Ilocos Sur
3. Nueva Vizcaya	3. Bulacan	3. Kalinga	3. La Union
4. Bohol	4. Nueva Ecija	4. Quirino	4. Aurora
5. Western Samar	5. Pampanga	5. Batangas	5. Bataan
6. Lanao del Sur	6. Tarlac	6. Cavite	6. Zambales
7. Maguindanao	7. Occidental Mindoro	7. Quezon	7. Laguna
	8. Oriental Mindoro	8. Romblon	8. Camarines Norte
	9. Palawan	9. Catanduanes	9. Masbate
	10. Albay	10. Aklan	10. Sorsogon
	11. Camarines Sur	11. Guimaras	11. Southern Leyte
	12. Antique	12. Negros Oriental	12. Zamboanga Sibugay
	13. Capiz	13. Biliran	13. Lanao del Norte
	14. Iloilo	14. Eastern Samar	14. Misamis Occidental
	15. Negros Occidental	15. Northern Samar	15. Davao del Norte
	16. Leyte	16. Zamboanga Norte	16. Davao Oriental
	17. Zamboanga del Sur	17. Davao del Sur	17. Compostela Valley
	18. Bukidnon	18. Sarangani	18. Agusan del Norte
	19. North Cotabato	19. Surigao del Norte	19. Surigao del Sur
	20. South Cotabato		
	21. Sultan Kudarat		
	22. Agusan del Sur		

Note: Provinces in red font have poverty index higher than 25.23 (national poverty index)


MICROMATIC

Chapter Five

Organization and Management System

To carry out this Plan, we will reconfigure our organization and management (O&M) system by improving our structure to include relevant units to further strengthen support, coordination, and harmony. We will reconstitute and reconfigure the PhilRice Board of Trustees. The administrative and financial support systems and procedures must be reviewed and streamlined especially on human resource, procurement, and financial management. A topnotch management consultant will be hired.

We will adopt a transdisciplinary approach to research management through a matrix O&M system for R4D initiatives, to be more comprehensive and to enhance PhilRice's excellence and relevance. The matrix management system breaks rigid disciplinary silos within divisions and increases cooperation and communication across and within them (see table below). It enables the Institute to respond and effectively address transdisciplinary concerns in rice R4D. It synergizes staff capabilities, optimizes scarce resources, and enables PhilRice to add value to its services.

Organization and management matrix for R4D programs.

Programs	Discipline-based researches					
	A	B	C	D	E	F
1						
2						
3						
4						

A series of workshops will be conducted to develop programs and projects that will be implemented by PhilRice and its partners to achieve the outcomes and outputs. These programs and projects will focus on:

(1) increasing yields;

(2) optimizing production costs;

(3) reducing field, postharvest, and milling losses;

(4) enhancing value, availability, and utilization of rice, diversified rice-based farming products, and by-products

(5) effectively sharing and demonstrating R4D results and technologies with stakeholders.

These important research interventions will be prioritized to develop a well-balanced and adequately funded research program mix. As part of its oversight mandate, the expected research outputs and impacts will be regularly monitored and evaluated by the PhilRice Board to assess performance.

Personnel complement

A well-thought-through personnel complement will be central to PhilRice's new rationalization plan and organizational structure that will be proposed to the Department of Budget and Management. We will propose plantilla positions that will help us to respond to the challenges besetting the Philippine rice industry. The branch stations will be provided with positions in plant breeding, agronomy and soils, crop protection, engineering and mechanization, socio-economics, and technology promotion to fully carry out their regional functions.

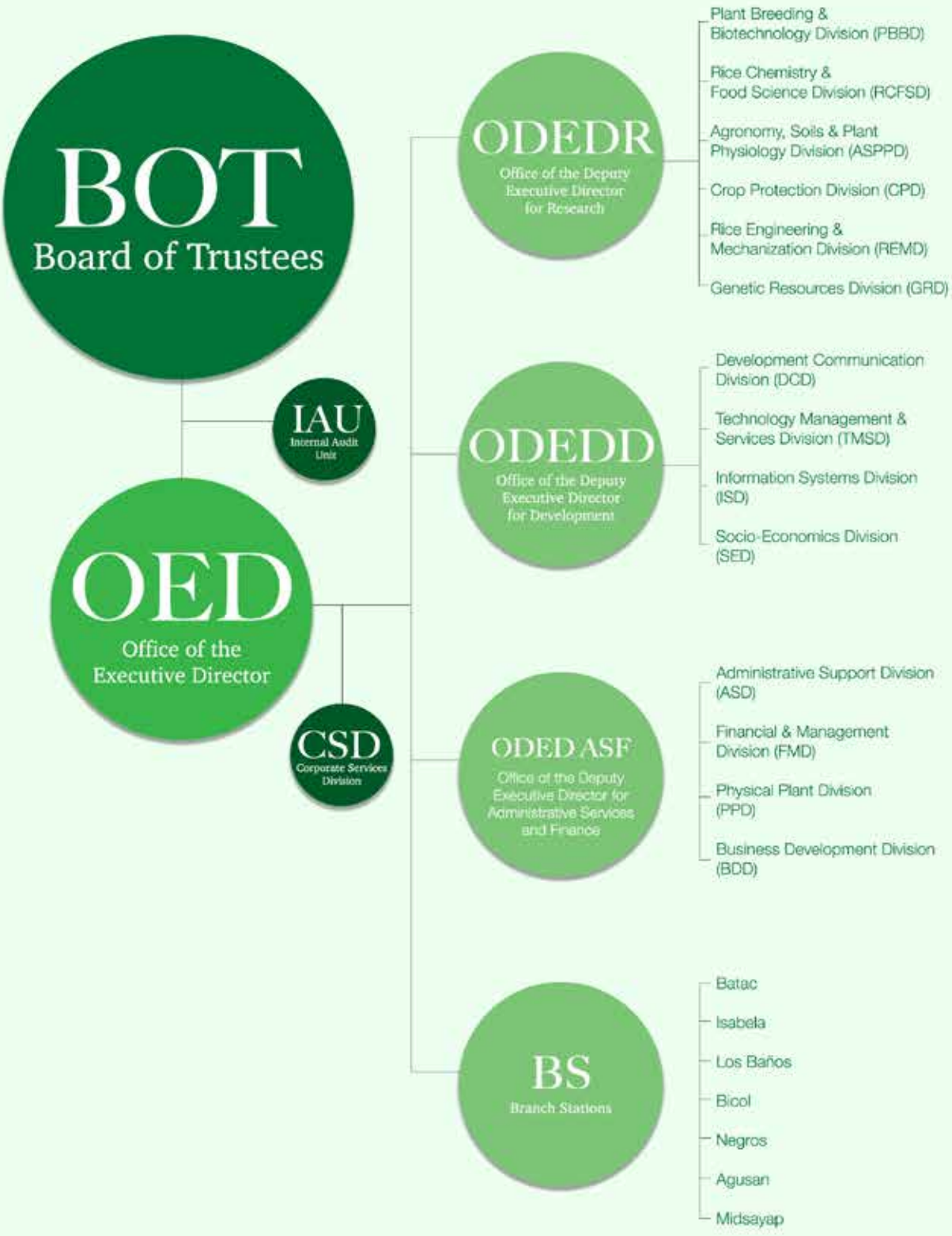
Budget

We need enough resources to put this Plan into action, such as state-of-the-art facilities, vehicles, and high-caliber people. The PhilRice corporate operating budget for 2016 amounts to P581M (P518 subsidy and P63M projected income). We need an 18% annual average increase for six years to help us create significant positive impacts on our rice farmers and other rice stakeholders.

Projected corporate operating budget (COB) by source of fund (in thousand pesos)

Particulars	2016		2017		2018		2019		2020		2021		2022	
	Subsidy	Projected Corporate Income	Subsidy	Projected Corporate Income	Subsidy	Projected Corporate Income	Subsidy	Projected Corporate Income	Subsidy	Projected Corporate Income	Subsidy	Projected Corporate Income	Subsidy	Projected Corporate Income
Personal Services	**185,900**		**206,296**		**227,292**		**351,859**		**351,859**		**351,859**		**351,859**	
Maintenance and Other Operating Expenses	**332,100**	**1,200**	**319,904**	**30,000**	**587,650**	**2,000**	**668,365**	**2,000**	**760,444**	**2,500**	**865,517**	**2,500**	**985,452**	**2,500**
General Administration	160,500	1,200	143,340	10,000	148,650	2,000	163,515	2,000	179,867	2,500	197,853	2,500	217,638	2,500
Research for Development	171,600		176,564	20,000	439,000		504,850		580,578		667,664		767,814	
Capital Outlay	**-**	**62,157**	**84,800**	**10,000**	**138,000**	**58,000**	**103,770**	**78,000**	**100,000**	**77,000**	**110,000**	**76,000**	**80,000**	**77,000**
Office equipment		8,773	10,000	10,000		6,000		7,000		7,000		7,000		7,000
Farm machinery & equipment		20,104	32,500		30,000	12,000		14,000		25,000		14,000		20,000
Laboratory equipment			19,300		38,000		20,000		20,000		20,000		10,000	
Motor vehicles		3,000				20,000		20,000		20,000		20,000		20,000
Infrastructure		30,280	23,000		70,000	20,000	83,770	37,000	80,000	25,000	90,000	35,000	70,000	30,000
TOTAL	**518,000**	**63,357**	**611,000**	**40,000**	**952,942**	**60,000**	**1,123,994**	**80,000**	**1,212,303**	**79,500**	**1,327,376**	**78,500**	**1,417,311**	**79,500**
TOTAL COB	**581,357**		**651,000**		**1,012,942**		**1,203,994**		**1,291,803**		**1,405,876**		**1,496,811**	

Existing Organizational Structure
Philippine Rice Research Institute



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