RICE VALUE CHAIN ANALYSIS IN THE PHILIPPINES

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The Philippine Rice Research Institute (PhilRice) is a chartered government corporate entity under the Department of Agriculture. It was created through Executive order 1061 on November 5, 1985 (as amended) to help develop high-yielding, cost reducing, and environment-friendly technologies so farmers can produce enough rice for all Filipinos.

It accomplishes this mission through research, development, and extension work in its central and several branch stations, coordinating with a network that includes 59 agencies strategically located nationwide.

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ACRONYMS

ACPC	-	Agricultural Credit Policy Council
ACSP	-	Agricultural Credit Support Project
ADB	-	Asian Development Bank
AEWs	-	agricultural extension workers
AFE	-	agriculture and fisheries extension
AFMA	-	Agriculture and Fisheries Modernization Act
AgRiDOC	-	agricultural development officers of the community
AIP	-	Agricultural Insurance Program
AMCFP	-	Agro-Industry Modernization Credit and Financing Program
AMCFP-CBAP	-	Agro-Industry Modernization Credit and Financing Program-Cooperative Banks Agricultural Lending Program
AMP	-	Agricultural Microfinance Program
APCP	-	Agrarian Production Credit Program
ARBs	-	agrarian reform beneficiaries
ARCCESS	-	Agrarian Reform Community Connectivity and Economic Support Services
ARCs	-	agrarian reform communities
ASEAN	-	Association of Southeast Asian Nations
ATI	-	Agricultural Training Institute
BAEx	-	Bureau of Agricultural Extension
BAR	-	Bureau of Agricultural Research
BINTIKU	-	Binhi-an Timog Kutabato
BPI	-	Bureau of Plant Industry
BSWM	-	Bureau of Soils and Water Management
CAFED	-	Central Agriculture and Fishery Engineering Division
CARL	-	Comprehensive Agrarian Reform Law
CAP-PBD	-	Credit Assistance Program for Program Beneficiaries Development
CBAP	-	Cooperative Banks Agri-Lending Program
CDIF	-	Cooperative Development Incentive Fund
CIS	-	communal irrigation systems
CMGP	-	Conditional Matching Grant to Provinces
DA	-	Department of Agriculture
DAMSEPCO	-	Davao Multi-purpose Seed Producers Cooperative
DA-NRP	-	Department of Agriculture-National Rice Program
DAR	-	Department of Agrarian Reform
DAR ARB AIP	-	DAR-Agrarian Reform Beneficiaries Agricultural Insurance Program
DA-RFOs	-	Department of Agriculture regional field offices
DA-SSP	-	Department of Agriculture -Sikat Saka Program

DASUSEPCO	-	Davao Sur Seeds Producers Cooperative
DENR	-	Department of Environment and Natural Resources
DILG	-	Department of Interior and Local Government
DOF	-	Department of Finance
DOSEPCO	-	Davao Oriental Seeds Producers Cooperative
DPWH	-	Department of Public Works and Highways
FAO	-	Food and Agriculture Organization of the United Nations
FAOSTAT	-	Food and Agriculture Organization of the United Nations Statistical Databases
FDI	-	foreign direct investment
FMRDP	-	Farm-to-Market Road Development Program
FMRs	-	farm-to-market roads
FOBB	-	farmers' option to buy back
FOs	-	farmers' organizations
FPA	-	Fertilizer and Pesticide Authority
FSSP	-	Food Staples Sufficiency Program
GDP	-	gross domestic product
GOCC	-	government-owned and -controlled corporation
GSR	-	green super rice
HYTA	-	high yield technology adoption
IA	-	irrigators' association
IDRC	-	International Development Research Centre
IFAD	-	International Fund for Agricultural Development
IPaD	-	Improving Technology Promotion and Delivery through Capability Enhancement of Next-Gen Rice Extension Professionals and Other Intermediaries
IRRI	-	International Rice Research Institute
KOICA	-	Korean International Cooperation Agency
LBP	-	Land Bank of the Philippines
LCC	-	leaf color chart
LFTs	-	local farmer technicians
LGUs	-	local government units
LTO	-	Land Transportation Office
MAO	-	municipal agriculture officer
MARINA	-	Maritime Industry Authority
MARO	-	municipal agrarian reform officers
MAV	-	minimum access volume
MFIs	-	Microfinance Institutions
MKD	-	Mekong River Delta
MOET	-	minus-one element
MPDP	-	multi-purpose drying pavement
MR	-	Milling Recovery
NCR	-	National Capital Region
NFA	-	National Food Authority

NGO	-	non-governmental organizations
NGSR	-	national grain standards for rice
NIA	-	National Irrigation Administration
NIS	-	national irrigation systems
NSIC	-	National Seed Industry Council
NSQCS	-	National Seed Quality Control Services
OFE	-	operator, family, and exchange
PARO	-	provincial agrarian reform officers
PATC	-	Philippine Agricultural Training Council
PCAARRD	-	Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development
PCC	-	Philippine Carabao Center
PCFC	-	People's Credit and Finance Corporation
PCIC	-	Philippine Crop Insurance Corporation
PGSP	-	Philippine Grain Standardization Program
PhilMech	-	Philippine Center for Postharvest Development and Mechanization
PIS	-	Private Irrigation Systems
PNP	-	Philippine National Police
PPA	-	Philippine Ports Authority
PhilRice	-	Philippine Rice Research Institute
PSA	-	Philippine Statistics Authority
PTC-RD	-	Philippine Training Center for Rural Development
QR	-	quantitative restriction
RBFHS	-	Rice-based Farm Household Survey
RCBs	-	rural and cooperative banks
RCM	-	rice crop management
RIRM	-	rice industry road map
RMR	-	regular milled rice
RPCs	-	rice processing centers
RSBSA	-	Registry System for the Basic Sectors in Agriculture
SAFDZ	-	strategic agriculture and fisheries development zone
SMEs	-	small and medium enterprise
SRR	-	Strategic Rice Reserve
SUCs	-	state universities and colleges
TBs	-	thrift banks
UPLB	-	University of the Philippines Los Baños
UpTech	-	upland technology development
VC	-	value chain
VCA	-	value chain analysis
WARA	-	weather adverse rice areas
WMR	-	well-milled rice
WFP	-	World Food Program

ABBREVIATIONS

hr	-	hour
d	-	day
md	-	manday
ha	-	hectare
kg	-	kilogram
km	-	kilometer
t	-	ton
M	-	million
B	-	billion
sq.m.	-	square meter
PhP	-	Philippine peso
US$	-	United States dollar
mo	-	month
yr	-	year
ai	-	active ingredient
MC	-	moisture content

FOREWORD

PhilRice is delighted to present to you this book accruing from the research project: "Value Chain Analysis of the Rice Industry in the Philippines." The project was funded by the DA - Bureau of Agricultural Research, and implemented by the Socioeconomics Division of the Institute.

This book analyzes the local rice value chain (RVC) and pinpoints the potential areas for improvement to make them more responsive to high domestic prices and supply constraints. It provides an overview of the rice industry, a methodical and comprehensive assessment of the nature and structural transformation of the rice marketing channels, and the profitability of the RVC focusing on the value addition and distribution of profit shares of each chain actor. It also documents and sheds light on the facilitative and supportive roles of the government, the private sector, and development institutions in enhancing the performance of the RVC and its actors.

This material can be an essential reference for evaluating and tackling specific segments of the RVC that unnecessarily add to inefficiency, exacerbating in high domestic rice prices. Most importantly, it recommends specific strategies and interventions to energize the rice industry as a whole and to upgrade specific value chain segments in particular, which can fuel competitiveness and bring about inclusive economic growth.

We congratulate the Value Chain Analysis research team for devoting considerable time, efforts, and ideas in coming up with this book. We hope that, through this book, we can engender ideas on how to integrate small farmers into the RVC, and link them with markets to capture the value addition and uplift their financial position in the value chain total profits, as well as boost rice value chain efficiency, which is a crucial key for the welfare of the rice sector.

For a Rice-Secure Philippines.

SAULLA E. ABDULA
Acting Executive Director,
PhilRice

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EXECUTIVE SUMMARY

Rice is one of the most important crops of the Philippines, making the country seventh among the top rice-producing countries in the world. In 2014, it supplied around 3% of global paddy rice production. In the same year, the Philippines achieved its highest paddy production: 18.97 M t produced from 4.74 M ha. Average yield was 4 t/ha. From 2005 to 2014, production has continuously increased by 2.99%/yr, except in 2009 and 2010 when the country experienced strong typhoons and prolonged droughts, respectively, resulting in a decrease in area harvested and yield. Although the country has shown significant growth in paddy output, paddy production still lags behind total rice requirements. Hence, it has traditionally imported rice from Vietnam and Thailand. Domestic rice prices are also relatively higher in the Philippines than in its neighboring countries in Southeast Asia. This stems from high production and marketing costs and supply constraints, which negatively affected the competitiveness of the rice value chain. This book presents findings from a detailed analysis of the rice value chain in the country. It becomes an essential guidebook for assessing and tackling all specific segments of the rice value chain that unreasonably contribute to inefficiencies and higher rice prices.

The country's rice value chain starts with the provision of inputs to produce paddy and ends with the consumption of the final product, milled rice. It includes all the economic activities performed between the different segments related to input provision, production, aggregation, processing, marketing, and consumption. These segments are performed by eight key chain actors: input providers; farmers; aggregators; rice processors (custom millers, miller-traders); wholesalers, wholesaler-retailers; retailers (traditional and modern); and consumers (institutional buyers and households). They add value to the rice product as it moves through the entire chain. The other actors are the enablers consisting mostly of government agencies from national, regional, LGUs, SUCs, and from international and non-government organizations. They carry out several activities in support of the rice value chain.

Not all paddy produce is sold; majority (70%) is marketed and absorbed in the domestic market, where paddy and milled rice pass through several marketing channels before they reach consumers. There were 112 marketing channels identified in the Philippine domestic rice market, dominated by the traditional multilayered supply chain (farmers - paddy traders - millers - wholesalers - retailers - consumers) with many competing chain actors in each channel from farmers to consumers and, oftentimes, with the engagement of brokers in both paddy aggregation and rice distribution, thus increasing marketing cost. As in other Asian countries, several transformations were observed in the structure of the value chain with fewer actors, less interactions, and integration and diversification of functions that eliminate other chain actors that do not carry out value-adding activities. Many actors were interrelated, as shown by their strong vertical relationships; many have already diversified and their functions were interconnected to various segments of the value chain — e.g., rice traders buy paddy directly from farmers and sell

it as milled rice in wholesale and retail markets. Majority of the miller-traders were also wholesalers and wholesaler-retailers, with some modern miller-traders selling directly to big wholesalers and modern retailers (supermarkets) in urban cities and supplying well-packed and quality rice. Shorter market channels also evolved; an example is the shorter and compressed farmer supply chain, which directly distributes to institutional buyers and households. This chain, however, is insignificant in terms of volume handled in the domestic rice market.

Results of the cost analysis of paddy production revealed that average cost of production during wet season and dry season was PhP 12.48/kg and PhP 11.63/kg, respectively. Of this, labor cost had the biggest share of 50-51%, attributed to the practices of transplanting, manual harvesting, and use of axial threshers in threshing and small tractors in land preparation. The imputed value of harvesters' and threshers' share, which is paid on a crop share basis, also contributed to high labor cost. Similarly, the relatively low rice yield per hectare is one major reason for the high production cost. In addition to cost of production, high marketing cost was incurred in other segments of the chain: paddy trading, rice milling and distribution owing to high milling, transportation, drying, handling, and administrative costs.

The high milling cost was due to the use of manual labor and the high cost of electricity in operating the mill. Moreover, another contributing factor was the underutilization of rice mills, which is caused by the pricy and insufficient paddy supply as well as low capacity of some mills. The high cost of fuel and oil and the poor road infrastructure translated into high transportation cost. The poor road network prevented paddy traders from hauling more tons of grains. Trucks in the country generally have lower capacity, only about 15 t, on average. On the other hand, handling cost was high because loading and unloading of grains was manually done, unlike in Thailand, which is mechanized and where conveyor belts are used in handling grains. Payment for commission agents also increased handling cost. In addition, drying cost was high because of high cost of fuel and labor. The popularity of solar drying among paddy traders likewise negatively affects the quality of milled rice especially during rainy season. Administrative cost was a big expense, owing to the considerable amount spent on government fees, materials, and labor used in business operations.

Nevertheless, the cost and net return analysis showed profit from several segments in the rice value chain. Overall, total chain profit of a typical or traditional market channel from producing fresh paddy to rice retailing was PhP 9.43/kg. An analysis of the relative financial position of the value chain actors revealed that farmers who produce paddy received the highest profit share of 58%. Miller-traders obtained a profit share of 20%; retailers had an 11% profit share, while paddy traders and wholesalers got the lower profit share of 5% and 6%, respectively. The market players' profits, however, were increased by volume, fast stock turnover, integration of functions, and investments in quality improvement. Farmers produced about 8 t/yr and traded a small quantity of marketable surplus; profit turnover was very slow, realized from a 4-month cropping period.

In general, the constraints identified in the rice value chain from input provision and production to paddy aggregation, rice processing, and marketing segments included tight local paddy supply and high domestic prices of paddy and milled rice, which were attributed to low yield and high production and marketing costs. Specifically, the constraints are as follows:

1. Mismatch of available high-quality variety seeds with farmers' preference
2. High prices of material inputs
3. Too many rice varieties that lead to misclassification
4. Inadequate water supply
5. Shortage and high cost of labor
6. Limited access to production machinery
7. Pest and disease incidence
8. Limited access to modern rice technologies and practices
9. Limited financing/credit to expand production
10. Climate change/unfavorable weather condition resulting in high production losses
11. Low access to crop insurance
12. Limited knowledge on paddy grades and standards set by NFA and BAFPS
13. Limited advocacy for paddy grading and standardization for new traders
14. Malpractices in selling-scaling or weighing, deductions, and quoting of lower prices than actual
15. Inadequate financing and lack of drying and storage facilities
16. Low farmgate price of paddy during peak harvests
17. Insufficient modern milling, mechanical drying, weighing and storage facilities, which result in low-quality milled rice and high marketing cost
18. Untimely rice importation that coincides with peak harvest
19. Rice smuggling: undocumented rice supply flooding the market on lean months
20. Limited procurement funds of small- and medium-scale traders and millers
21. Low paddy supply
22. Poor farm-to-market roads
23. Port congestion during peak season in some ports
24. High inter-island freight rate for rice
25. Limited entrepreneurial skills of farmers' organizations and cooperatives in rice milling and marketing

Within the next 5 years, the rice industry should concentrate on R&D to come out with yield-increasing, postharvest loss-reducing, and cost-minimizing technologies, new products, as well as measures that improve efficiency in the rice value chain to enhance competitiveness (e.g., investments in enabling infrastructure and in transport, storage, drying, and milling facilities). The following are the specific interventions that can be initiated and continuously pursued to improve the competitiveness of the rice industry:

1. Improve yield of high-quality varieties and reduce postharvest losses to increase and sustain the volume of quality rice supply.
2. Reduce cost of production by promoting labor-saving, cost reducing, and climate-smart technologies and practices to lower per-unit cost of paddy and consequently the price of milled rice.
3. Strengthen training and extension delivery services to accelerate the delivery of the latest production, postharvest, and processing technologies to farmers and other value chain actors.
4. Reduce marketing cost or margin through better logistics, support of mechanization of processing and marketing facilities, improvement of rice quality, and increased competition.
5. Provide economic incentives and ensure enabling environments such as appropriate price support, right timing of NFA paddy procurement in major rice-producing and remote surplus provinces, adequate budget allocation, greater access to low-cost credit, and expansion of affordable crop insurance to farmers and other value chain actors.
6. Enhance the share of farmers in the rice market by providing them with regular market information and assistance in linking with potential markets or by integrating them into the rice value chain.
7. Proper management of the supply and demand situation to stabilize paddy and rice prices.
8. Increase income opportunities of farmers and other value chain actors by embarking on product development of rice and rice by-products for agri-business opportunities.

Photo: PhilRice

CHAPTER 1

INTRODUCTION

Background of the Study

The free trade that will come along with the forthcoming ASEAN economic integration and the probable removal of quantitative restriction (QR) in rice in 2017 compel the Philippine rice industry to prepare for this significant development. This eventful scenario requires an understanding of dynamic factors that operate within the whole rice value chain. At present, there are limited national data on the structure and performance of domestic basic staple commodity value chain. To fill this gap, the Department of Agriculture-National Rice Program, through the Bureau of Agricultural Research, funded a detailed study on the rice value chain. Nestled under the Food Staples Sufficiency Program (FSSP) Research and Development, this research was conducted by the Philippine Rice Research Institute, with the end in view of using the results to craft the country's rice industry road map (RIRM). The RIRM aims to formulate strategies and identify key interventions that will make the rice industry and its stakeholders competitive, enabling them to cope with the more aggressive competition brought about by free trade.

Rice is one of the country's most important crops not only because it is the staple of the majority of the Philippine population but also because it provides a source of income to its large chain of stakeholders both on the demand and supply sides. It includes more than 3 M farmers and their families, thousands of traders, millers, retailers, and several individuals employed in the processing and marketing of its related products (Intal, 2005). Owing to its significant contribution to the country's economic development, the government has initiated several programs to increase the productivity and improve the competitiveness of the rice sector.

Within the 1997-2007 period, rice productivity growth in the country grew by 30%, from 2.93 to 3.80 t/ha. This was attributed to the adoption of high-quality seeds (hybrid and certified), increased irrigation investment, and use of improved location-specific technologies (Mataia et al., 2011). The annual increase for 2008-2016 was 1.23% (PSA, 2017). Yet, in spite of this remarkable yield growth, Philippine rice is not competitive as domestic prices are much higher than its neighboring countries in Southeast Asia both at the farmgate and retail levels (Bordey et al., 2016). In 2014 and 2015, domestic rice was about 50% more expensive than imported rice. Hence, the advent of ASEAN economic integration poses a considerable challenge to the rice industry, particularly to small farmers.

Notwithstanding the interventions given by the National Food Authority (NFA) to stabilize rice supply and prices, the rice market has been characterized by

"high" prices for consumers and "low" paddy prices for farmers. Price data from the Philippine Statistics Authority (PSA) corroborate previous observations on large price margins wherein the share of farmers to the retail price is insignificant. From 2000 to 2013, the average ratio of farm gate to retail price was only 0.49 compared with the share of wholesale to retail price at 0.92. Some analysts attribute this wide price spread to inefficiencies along the rice value chain, which was characterized by high production and marketing costs, thereby driving the domestic price of rice above that of the world market.

Moya et al. (2016) found that high production cost was primarily due to high farm labor and power cost, which constitutes around 50% of the total production cost. On the other hand, previous rice marketing studies showed that high marketing cost was largely due to the presence of too many market players performing a complex range of activities to bring the raw material through a chain to the point of sale of the final product, which negatively affected the profitability and competitiveness of rice. In addition, Dawe (2013) stated that high marketing costs reflect the inadequate and weak physical and institutional infrastructure in the rice marketing system.

In preparation for a liberalized and a more competitive rice market in the face of the ASEAN economic integration and the probable termination of QR in 2017, farmers and other market players need to overcome obstacles along the rice value chain. Value chain analysis (VCA) is a tool that identifies each segment of the value chain and looks where improvements can be made either from a production or marketing cost perspective to enhance competitiveness through delivering maximum value at the least possible total cost (Porter, 1985). An analysis of the rice value chain is critical to understand rice markets, relationships of market players, as well as constraints that limit production and competitiveness of smallholder farmers (IFAD, 2010). This information can be used to identify key points of intervention and recommend specific upgrading strategies to enhance efficiency or competitiveness of the rice industry, particularly specific segments in the value chain to increase benefits of market players, as well as improve the market position and income of farmers. Moreover, according to FAO (2013), it can guide policy interventions toward efficient allocation of resources and support programs for the benefit of the most vulnerable groups within the chain.

Objectives

Overall, the study aimed to analyze the rice value chain in the top 20 major rice-producing provinces in the country and to identify constraints and recommend specific strategies and interventions for the improvement of the rice industry in general and the upgrading of specific segments in the rice value chain in particular. Specifically, it intended to

1. present an overview of the rice industry at the global and national levels;
2. analyze the nature and structure of the rice industry with emphasis on the

geographic flow of paddy and milled rice, description of players by segment in the value chain, rice value chain maps, inter-firm relationships, and economic analysis;

3. identify and analyze markets and opportunities in the rice value chain with a focus on global and domestic markets;
4. determine the appropriateness, accessibility, and sufficiency of existing support services in the rice value chain;
5. examine the business-enabling environment that affects the performance of specific segments in the rice value chain; and
6. identify and analyze the constraints and opportunities in each segment of the value chain, and thereby provide specific strategies and interventions to improve the rice industry in general and the specific segments in the chain in particular, especially the market position of small rice farmers.

Photo: PhilRice

CHAPTER 2

APPROACH AND METHODOLOGY

The Value Chain (VC) Framework

Figure 1 shows the VC framework used in the study. It encompasses the different segments or core functions related to input provision, production, aggregation, processing, marketing, and consumption, which are carried out by an entire network of chain actors who are involved in conducting business by adding value to a particular product as it moves through the entire chain. The firm sector in which the industry operates is characterized in terms of four elements—end markets, support services, interfirm relationships, and business-enabling environment—which influence the value chain actors. These elements can either facilitate or hinder industry performance in terms of growth and competitiveness.

The end markets into which a final product is sold provide the market opportunities and set the parameters for the industry's growth. It highlights information on market size, current and emerging market trends and growth, and price structure of the final products and raw materials, as well as the linkages of major markets and suppliers in the value chains at different locations.

Support services include financial (e.g., formal and informal credit, crop insurance), and non-financial services (e.g., RDE, market information, infrastructure, and other services). These play a supporting role to enhance the operation of the different segments in the value chain and the chain as a whole.

Interfirm relationship is the critical element of the core VC, which refers to the nature and quality of relationships or coordination between different chain actors in the value chain. Strong coordination between chain actors through horizontal (e.g., farmer to farmer or miller to miller) or among actors through vertical integration (farmer to paddy trader or miller to rice trader) is essential to maintain or sustain competitive advantage.

The business-enabling environment, which can be global, national, or local, includes laws, policies, duties, international trade agreements, business-licensing procedures, public infrastructure, and enacted regulations that facilitate or hinder the development and competitiveness of the value chain.

Selection of Study Areas

The study covered the top 20 rice-producing provinces strategically distributed in the three major islands in the Philippines. Luzon Island was represented

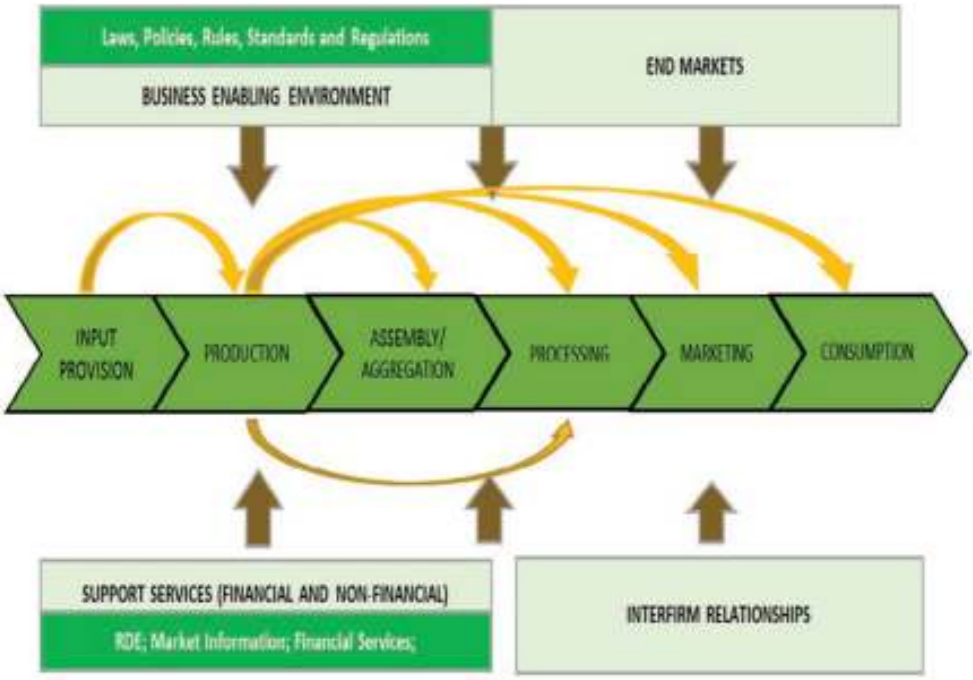


Figure1. The value chain (VC) framework
Source: Lantican (2015) with some modifications

by 10 provinces in regions I, II, III, MIMAROPA, and Bicol: Pangasinan, Cagayan, Isabela, Nueva Ecija, Tarlac, Bulacan, Pampanga, Occidental Mindoro, Oriental Mindoro, and Camarines Sur. The Visayas Island included four provinces: Iloilo, Negros Occidental, Bohol, and Leyte, which represent regions VI, VII, and VIII. On the other hand, six provinces from regions IX, X, XI, XII, and CARAGA represented Mindanao Island. These provinces were Zamboanga del Sur, Bukidnon, Davao del Sur, Sultan Kudarat, North Cotabato, and Agusan del Sur (Figure 2).

The specific provinces were selected based on volume of paddy production and its strategic importance to rice trade. Table 1 shows average paddy production and contribution to total domestic production of these provinces. Each province was ranked on the basis of its percentage share to total paddy output using 5-year average paddy production data from 2010 to 2014. These provinces are considered the most favorable rice-growing areas in the Philippines, producing an average of 9.8-12.23 M t annually for the 2010-2014 period. Together, these account for an average of around 65% of total paddy produced per year; Nueva Ecija, Isabela, and Pangasinan represent a 23% share of total paddy output in the country. These provinces consistently remain the top three large rice producers because of their large rice area and production volume.

Additionally, the study included wholesale rice markets in Metro Manila, Cebu, Cagayan de Oro City, and Davao City, representing the major demand trading centers of milled rice in the country. The major ports are also located in the Metro cities where major transhipments of inbound and outbound milled rice are carried

out for both domestic and import trading. Based on PSA data, Metro Manila had the biggest volume transhipment of milled rice in 2014 and 2015 with an average of 134,350 t annually.

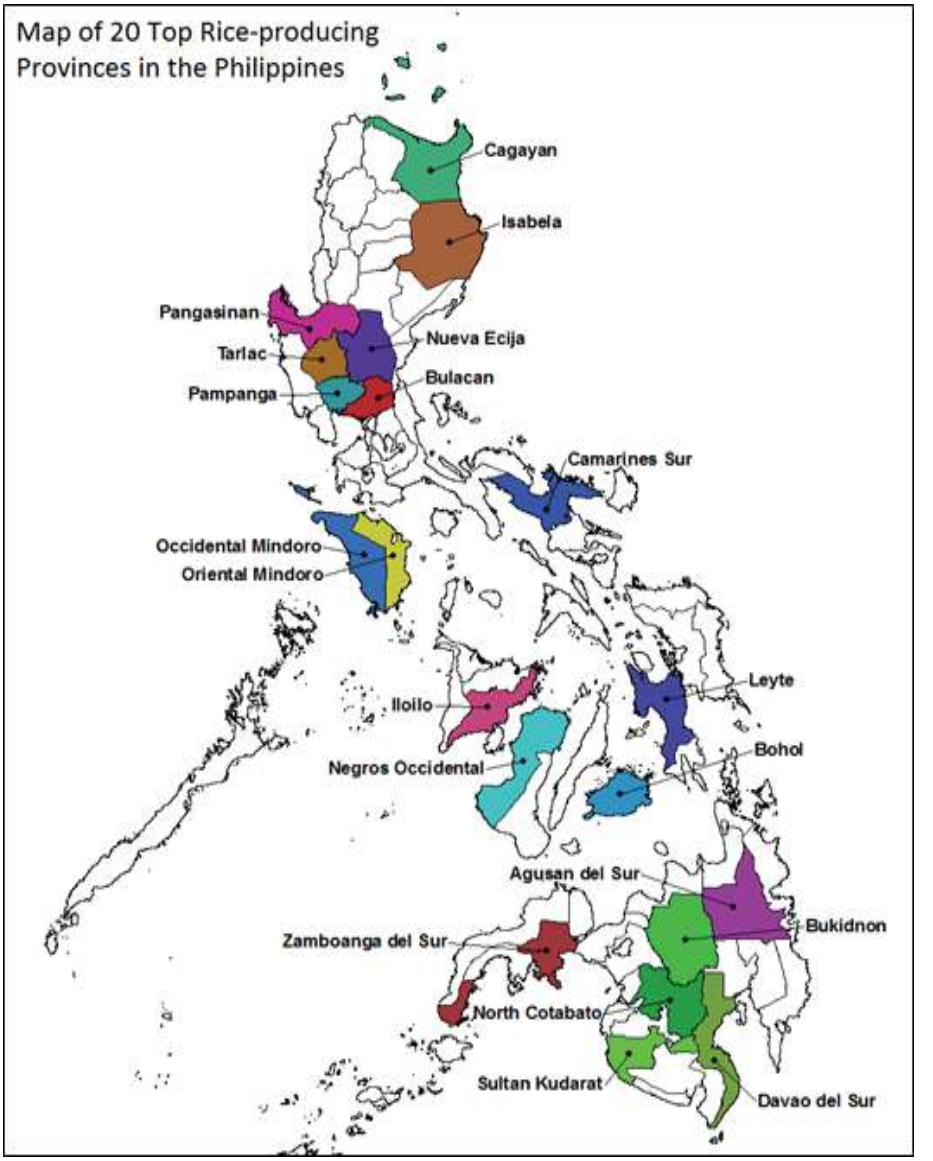


Figure 2. Administrative map of the Philippines showing the top 20 major rice-producing provinces included in the study

Table 1. Top 20 rice-producing provinces in the Philippines, 2010-2014

Province	Average paddy production (t)	Share to total production (%)	Province	Average paddy production (t)	Share to total production (%)
1. Nueva Ecija	1,730,275	10	11. Sultan Kudarat	434,367	2
2. Isabela	1,248,010	7	12. Pampanga	413,671	2
3. Pangasinan	1,078,780	6	13. Bukidnon	400,118	2
4. Iloilo	888,163	5	14. Oriental Mindoro	393,527	2
5. Cagayan	867,013	5	15. Agusan del Sur	382,906	2
6. Tarlac	591,094	3	16. Bulacan	363,448	2
7. Camarines Sur	583,009	3	17. Occidental Mindoro	338,826	2
8. North Cotabato	516,585	3	18. Zamboanga del Sur	328,684	2
9. Leyte	508,669	3	19. Davao del Sur	328,087	2
10. Negros Occidental	478,033	3	20. Bohol	324,820	2

Source: PSA, 2015

Data and Methods

Types and sources of data

The study used both secondary and primary data. Secondary data consisted of desk review of existing reports, documents, publications, and databases obtained from relevant websites. Databases included estimated data from 2010 to 2014, which consisted of a) basic facts of rice situation such as paddy area harvested, yield, and production in the world and in the top 10 rice-producing countries; and monthly world prices of milled rice, by type, from FAOSTAT; b) national, regional, and provincial rice area, production, and yield, monthly farm gate, wholesale and retail rice prices, and rice supply and utilization data from the PSA; c) licensed pesticide and fertilizer distributors at the national and provincial levels from the Fertilizer and Pesticide Authority (FPA); d) national and provincial licensed grain businessmen and their functions from the NFA; and e) farm machine distributed per province by the DA-CAFED.

Other data and related information were also requested from concerned agencies: a) inbound and outbound domestic and imported rice, by major port, from the Philippine Ports Authority (PPA) port management offices; b) geographic flow of volume of milled rice by region, port of origin, and port of destination;

and c) 2014-2015 costs and returns of rice production; and d) support initiatives and programs provided to the rice sector from the national and local government agencies.

Primary data were collected through a variety of data collection methods that are designed to complement each other: (1) field survey, (2) key informant interviews, (3) field observations and photo documentation, and (4) stakeholders' workshop.

Survey methods and data gathered

During the field surveys, the actors in the rice value chain were personally interviewed. Four sets of detailed structured questionnaires were developed for the field surveys. One set was for farmers and the other three were for the other chain actors (paddy traders/assemblers, millers, and wholesalers/retailers). Each set of questionnaires was pre-tested before the actual field survey. After pre-testing, the questionnaires were modified and finalized for final printing and reproduction. Project team leaders personally administered the questionnaires, except in the instance that hired contractual data collectors interviewed sample farmers under close supervision of the project team.

Data on production harvest and marketing practices for the 2014 wet season and 2015 dry season were gathered in the 2015 survey period. For farmer respondents, these primary data were collected: a) socio-demographic characteristics of farmers, b) farm characteristics, c) membership in farmers' organization, d) gross production and disposition, e) sources of and access to material inputs, f) crop management practices, g) material inputs and cost, h) labor use and cost, i) other production expenses, j) marketing practices and cost, k) farm gate prices by quality of output, l) geographic destinations and types of buyers, m) support services received from government and non-government agencies, and n) production and marketing problems and needs.

The following marketing data were obtained from market intermediaries: a) basic information on their functions or line of business and years of operation; b) paddy procurement and disposal, including sources, outlets, geographical origins, and destinations; c) quality requirements of paddy procured; d) volume of paddy procured and sold; e) buying and selling prices of paddy, by quality; f) transport cost, by distance, for paddy and milled rice bought and sold; g) drying cost and custom drying fee, by type; h) rice mill type, capacity, milling ratio, and milling operation; i) milling cost and custom milling fee; j) users, volume, and price of by-products; k) volume of rice bought and sold, including place of suppliers, outlets, and place of destinations; l) price of milled rice, by quality; m) government and other fees; n) administrative cost; o) support services received; p) current and emerging problems and constraints by market players, per segment; and q) suggested interventions and support needs.

Sampling procedure

A quota sample of 30 farmers, five paddy traders/assemblers, five rice millers, five rice wholesalers, and five rice wholesaler-retailers and retailers was set per province for the field survey. However, in most cases, this was not strictly followed because some paddy traders and rice millers performed integrated functions such as paddy assembling, milling, rice wholesaling, and retailing. A total of 600 farmers and 409 market intermediaries were interviewed in 20 provinces and four major cities. The sample distribution of chain actors is summarized in Table 2.

A multi-stage sampling design was used in the selection of sample respondents. For each sample province, the top six rice-producing municipalities were selected (identified using data obtained from the Office of the Provincial Agriculturist) and for each municipality, the top rice-producing barangay was chosen and five sample farmers with marketed surplus of paddy were surveyed. The five sample farmers in each barangay were chosen using simple random sampling. On the other hand, the tracing approach was employed in the selection of market intermediaries. From the sample farmers, the market intermediaries involved in the rice value chain were traced up to the retail level. Afterward, market intermediaries were selected. For major rice trading centers, a minimum of five wholesalers were chosen.

In addition, key informant interviews of financial and non-financial support service providers and photo documentations in the survey areas were carried out to complement the field survey data. Key officials and experts from LBP, ACPC, PCIC, PhilRice, PHilMech, PCC, DA-RFOs, DAR, NIA, ATI, LGUs, research centers, NFA, SUCs, and other institutional and support service providers took part in the process. The interview used a set of guide questions on the type of support given to rice farmers and the policies and program initiatives that affect the rice industry and farmers. There was photo documentation of activities performed by a chain actor in specific segments in the value chain to reflect actual and current situation of the rice industry. The uses of rice and its by-products were also documented.

Stakeholders' consultation workshops in three major islands of the country were also conducted for the presentation and discussion of results of the study. The aim is to validate salient findings and get an approval on the identified key interventions needed to upgrade segments in the value chain. Eighty-five stakeholders in Luzon, 95 in the Visayas, and 65 in Mindanao participated in the consultation workshops, which were conducted in Nueva Ecija, Iloilo City, and Davao City, respectively.

Methods of data analysis

Data analysis used several techniques: trend, descriptive, structural, and economic analyses.

Table 2. Sample distribution, by chain actor and island/province, Philippines, 2014-2015

Island/province	Farmer	Paddy trader		Rice processor			Paddy-rice trader		Rice Trader		
		Cooperative paddy trader	Private paddy trader	Cooperative miller-trader	Custom miller	Miller-trader	Paddy-rice trader wholesaler	Paddy-rice trader wholesaler-retailer	Wholesaler	Wholesaler-retailer	Retailer
						(Number)					
Luzon											
Pangasinan	30		4			7		1		3	2
Isabela	30		5	1		5		2		5	1
Cagayan	30		9		1	2				2	
Nueva Ecija	30		5			5			1	3	2
Bulacan	30		4			5	1				5
Pampanga	30	1	4			1				2	5
Tarlac	30		7			7		1		1	2
Occidental Mindoro	30	1	5	1		5		2		5	1
Oriental Mindoro	30	1	4			5				5	1
Albay	30		1			2					1
Camarines Sur	30		5			5			1	4	1
Visayas											
Iloilo	30		2	2		7	2	2	3	7	5
Negros Occidental	30				5		5		6	4	5
Bohol	30		3	1		4				2	1
Leyte	30		5		1	5	3	5	3	7	
Mindanao											
Zamboanga del Sur	30		2		1	4	3		3	6	4
Bukidnon	30				1	3	4		5	2	2
Davao del Sur	30	1	1			5		4		4	4
North Cotabato	30		5			5	1	1		2	4
Sultan Kudarat	30		3	1	2	4	1	1	1	3	5
Agusan del Sur	30		5			4	1		1		5
Metro cities (trading centers)											
Metro Manila									5	1	1
Cebu									1	4	3
Cagayan de Oro City									3	1	1
Davao City									3	4	5
Total	600	4	79	6	11	90	21	19	36	**77**	**66**

Trend analysis used graphs, tabulated data, and growth rates to illustrate patterns or relationships using 10-year period data on global, national, regional, and provincial paddy production; rice area harvested; yield; and farmgate, wholesale, and retail rice prices.

Descriptive analysis employed tabulated statistics such as sums, means, averages, and frequencies to describe in physical terms the profile and relationships of chain actors in the value chain at the national level and by major island group, region, and province. Their lines of business or functions, practices and facilities used at various segments, and the problems, constraints, and opportunities they encounter were also described.

Structural analysis used graphs to show product flow and sequence of operations and activities by the chain actors, from provision of inputs, production, aggregation, processing, to distribution of the product to end users. It also illustrates the relationships among actors in the value chain.

The *economic analysis* of costs and returns looked at the profitability of producing and marketing of rice and the distribution process. It assessed the value added created by the overall value chain, and the value added and margins for each actor in a specific segment of the chain. The distribution of profits in the chain determined the relative financial position of the different players—that is, who gained most in the rice value chain's total profit.

Specifically, a farm budget structure was constructed for the production of paddy rice using actual and imputed prices. The cost structure was disaggregated by seasons across regions and provinces. Relevant costs included seed, fertilizer, pesticide, irrigation, machine rental, fuel and oil, transportation, labor (land preparation, crop establishment, crop care and maintenance, harvesting and threshing, and postharvest), rental value of land, and interest cost of capital. All costs were expressed on a per-hectare basis. The equivalent cost per kilogram was also computed. Gross revenue was calculated by multiplying rice yield (after threshing) with the price of paddy. Net returns above production cost per hectare were computed using this equation:

$$\pi = (y \times p) - \left(\sum x \right) \qquad \left(j \in \{seed, fertilizer, pesticide, labor, irrigation, land, others\} \right) \quad (1)$$

where π is net returns, y is rice yield, p is price of paddy, and x's are the cost items. Using the farm budget structure, the costs of rice production and profitability of rice farming were compared across seasons and locations.

The study also estimated the costs and returns per kilogram (kg) of paddy and milled rice at different stages of the marketing system based on data and information gathered from sample respondents for each of the different types of players. Relevant costs included the cost of good and marketing costs. Net returns are calculated by getting the difference between gross returns and total costs of each player.

Moreover, the economic analysis used these conversion factors: 1) conversion from fresh to dry weight paddy at 14% moisture content and 2) conversion of paddy to milled rice equivalent using a milling ratio of 65%.

In the analysis, the equivalent price of dry paddy was computed by adjusting the wet paddy to a moisture content of 14%, the typical moisture content when paddy is milled. This adjustment to farmgate price does not include the costs of drying but is just a physical adjustment factor to standardize moisture content. The equivalent price of dry paddy (p_d) is computed by multiplying the water adjustment factor and the farmgate price. Mathematically, it is described as:

$$p_d = p_f \frac{(1-0.14)}{(1-MC)} \tag{2}$$

where p_f is the farmgate price of wet paddy; MC is the moisture content of wet paddy as sold by the farmer, as a fraction of one.

The milled rice equivalent of dry paddy was also estimated. The formula used is described as:`

$$p_r = p_f \frac{(1-0.14)}{(1-MC)} \times \frac{1}{MR} \tag{3}$$

where p_f is defined as the price of 1 kg of dry paddy in milled rice equivalent; p_f is the farmgate price of wet paddy; MC is the moisture content of wet paddy; and MR is milling recovery, i.e., the yield of milled rice as a fraction of one. The adjusted p_f is then divided by MR to generate p_r .

Data limitation

Production harvest data for the 2014 wet season and 2015 dry season were gathered in the study. Output prices were relatively different between seasons. Prices at the farmgate, wholesale, and retail levels in 2014 were considered not normal relative to price trends as these were reasonably higher than those of previous seasons and 2015. The restriction of rice imports in 2012 and 2013 by the DA had escalated the price of milled rice, which then transmitted into a high farmgate price. Hence, relatively high prices were observed from the survey data.

Furthermore, the validity of data and information used is subject to the responses of farmers, market intermediaries, and other chain actors, which are based only on recall. Likewise, the study utilized voluminous secondary data from multiple sources, which vary considerably due to different times for which data are available.

Photo: PhilRice

CHAPTER 3

OVERVIEW OF THE RICE INDUSTRY

A. Product Description and Forms

Rice, *Oryza sativa,* is generally considered a semi-aquatic annual plant. It can grow up to 3.3-5.9 feet, depending on climate and variety. Traditionally, rice grows in a wide range of environments, but, in the Philippines, rice is mostly harvested from irrigated and rainfed lowland environments (GRiSP, 2013). In 2014, the total rice area harvested was 4.74 M ha; of these, 3.25 M ha are irrigated and 1.49 M ha are rainfed. About 97%, equivalent to 4.60 M ha, was planted to modern or high-yielding rice varieties. The rest (3%) was planted to some traditional or specialty rice varieties that are commonly grown in the upland rice area (PSA, 2015).

Rice goes through a series of production processes from seed selection, land preparation, crop establishment, nutrient management, pest management, water management, to harvesting. Depending on the variety, a rice crop usually reaches maturity at around 105-150 days after crop establishment. Harvested rice grain or 'paddy rice' consists of edible and non-edible parts, which were produced from harvesting to processing of milled rice (Figure 3). During harvesting, 0.41 to 3.96 kg of rice straw were generated from every kilogram of paddy rice. Milled or white rice and several rice by-products were produced during milling; the percentage of rice by-products depends on milling rate and variety. According to Esa et al. (2013), the ideal composition is 20% rice hull or husk, 8-12% bran, and 68-72% milled rice or white rice. Total milled rice consists of whole grains (or head rice) and brokens. A report from www.feedipedia.org states that by-products from rice consist of 20% hull, 10% bran, 4% brokens, and 50-66% milled or polished rice.

Annually, millions of milled rice and by-products are produced in the Philippines. In 2014, PSA reported 18.97 M t of paddy produced, which is equivalent to 12.3 M t of milled rice at 65% milling recovery, 3.79 M t of hull, and 1.90 M t of bran and broken rice.

Product forms

The following are the product forms of rice:

Rice straw or stubble is a by-product obtained after harvesting paddy. Each kilogram of milled rice produced results in roughly 0.7–1.4 kg of rice straw, depending on variety, cutting height of stubbles, and moisture content during harvest. Rice straw is separated from the grains after the plants are threshed either manually (using stationary threshers) or, more recently, by using combine harvesters.	
Rice hull, also called rice husk, is the coating on a grain of rice. It is formed from hard materials, including silica and lignin. It is generated during the first stage of rice milling, when paddy rice is husked. This layer is removed from all rice types before the grain can be consumed.	
Rice bran is a by-product obtained from the outer layer of brown rice grain during milling. It is usually tan-colored, but it may be reddish or black, depending on the pigmentation in the bran layers. Rice bran is a mixture of substances, which include protein, fat, ash, and crude fiber. In modern rice mills, different kinds of bran are produced: coarse bran (from the first whitening step); fine bran (from second whitening step); and polish (from the polishing step). It contains 10-23% bran oil (IRRI, 2017).	
White rice (milled rice) is also known as white rice. It is obtained after removing the bran and germ from brown rice (Hui, 2007). White milled rice can also be classified into well-milled, regular milled, and ordinary milled.	

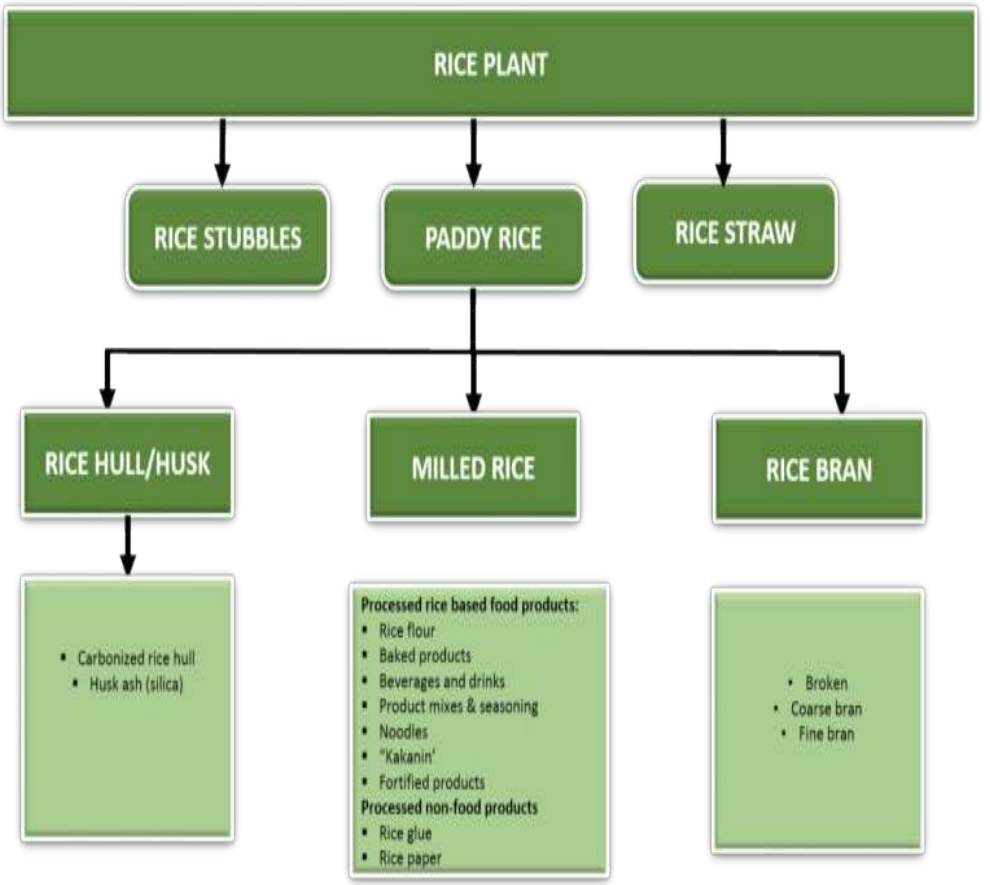


Figure 3. Rice product forms and uses in the Philippines, 2014-2015

Uses of rice and rice by-products

As depicted in Figure 3, rice, more than a staple food to millions of Filipinos, is consumed primarily as table rice for meals and snacks. It is likewise utilized as processed food product made from various forms of rice—rough, brown, milled, broken, flour, and starch (Juliano and Hicks, 1996). Numerous products with added value have been developed from rice: puffed and crispy rice, breakfast cereals, rice biscuits, and snacks. Redondo et al. (2013) gave an inventory of value added products from rice in the Philippines, specifying that milled rice is also ground and made into rice coffee, rice tea, and package mixes such as adobo mix, rice mate, and used as ingredients for baby food and cereal drinks, as well as components of wine and rice milk. It was also reported that 88% of value added products in processed snacks/food are locally produced, 12% are imported (e.g., pet food). Table 3 presents some of the processed, rice-based food and drink products in the Philippines. Majority of these products already have established markets, except for rice wine and rice milk where supply is still limited.

Table 3. Sample processed rice-based food and drink products in the Philippines

Rice cakes and snacks	Rice package mixes	Rice food products	Rice drink products
			

Source: Redondo et al. (2014)

On the other hand, by-products such as rice straw, rice hull, and rice bran are becoming important sources of raw material for industry, generating new income opportunities for some of the players in the rice sector. Based on the survey of rice millers in the sample 20 provinces, rice hull and rice bran were used by industry (63%) and households (34%).

Overall, 95% reported that rice bran was used as ingredient for animal feeds (in particular, livestock and poultry) by feed mills and backyard growers. Typically, rice bran is 15-30% of poultry feed and 12-30% of hog feed. On the other hand, 77% of the sample millers reported that, rice hull, in its loose form, was used for producing alternative energy, such as for combustion and gasification. Combustion generates heat energy for mechanical drying, while gasification produces electricity that is used to power rice mills. In Isabela, Nueva Ecija, Iloilo, and other parts of the country, power plants are constructed to generate energy to power big rice mills in the areas. Similarly, most millers in the survey provinces used recirculating dryers to dry paddy and rice hull is one of the major sources of energy for this purpose.

Moreover, 11% of the sample millers reported that rice hull is used in cement manufacture. Rice hull ash is the by-product after combustion and its high silica content makes it a good additive to make cement. Likewise, 9% had stated that rice hull is used as soil additive in major crop plantations and in backyard and commercial gardening, while 3% mentioned that buyers used it to make concrete blocks or tiles. Across major islands, similar observations on the uses of these by-products from rice were made (Table 4). Also, rice straw is reported to be a good by-product inasmuch as it is used as fuel for cooking, roofing material, livestock feed, fertilizer, and a medium for growing mushrooms.

FAO also lists other uses of rice hull: as bedding, incubation material, and seedbed medium. Sometimes, they are incorporated into livestock feeds, fiberboard, ceramics, cement, filters, charcoals, and briquettes and are used to produce cooking gas (GRiSP, 2013).

Table 4. Major uses of rice by-products, by major island group, in the Philippines, 2015

Major island	Rice bran (n=107)	Rice hull/husk (n=107)			
	Feeds	Fuel	Silica/ cement	Tiles	Soil additive
			(%)		
Luzon	93	76	13	4	7
Visayas	100	81	6	0	14
Mindanao	91	86	7	0	7
Philippines	95	77	11	3	9

Source: Rice value chain survey of rice millers, Philippines, 2015

In addition to a variety of processed rice-based food and drink products, there are also numerous non-food products derived from rice and rice by-products. As reported in www.ricepedia.org, rice and rice bran contain many compounds that promote shiny hair and good skin. Rice bran in particular is rich in vitamins E and A, and it contains the nutrient oryzanol, which is an anti-oxidant. Table 5 shows some non-edible products from rice and rice-by products developed in some countries i.e., cosmetic, pharmaceutical, and rice bran oil products. In the Philippines, Oryspa health and beauty products made from rice bran and rice bran oil are becoming popular. However, the processing of rice bran oil and other non-edible foods for commercialization is not yet extensively advanced in the country because of the high price of raw material.

Table 5. Some non-edible products from rice and rice by-products, by country

Country	Product form	Uses	Source
Japan	Milled rice		http://en.riceforce.com/products/body/moisture-shampoo/
	Rice bran	   Skin care items; sunscreen, soap	https://www.tatcha.com http://www.darksideofbeauty.com
Thailand	Milled rice	 Rice grain soap bar with rice bran oil, charcoal and rice scrub 100 g  Rice extract lip balm with rice bran oil, shea butter and aloe vera extract 10 g  Rice extract moisturizing cream with organic evening primrose oil, rice bran oil, shea butter, and regenistem rice extract 80 g	http://www.thann.info/
Korea	Milled rice, brown rice	 NEOGEN rice peel  SKINFOOD brown rice oil cleansing tissue	http://eng.theskinfood.com/
	Rice bran	 SKINFOOD Rice brightening cleansing tissue  Rice mask wash off  SKINFOOD Rice brightening scrub foam  Rice concealer pen	

Korea							http://eng.theskinfood.com/
		Wash off mask, concealer, brightening cleansing tissue and scrub made from rice water, rice extract, rice bran water for cosmetic purposes					
India	Rice bran	 Vimal rice bran oil		 Heloi rice bran oil			http://www.svroil.com/ http://www.vimaloil.com http://www.internationalagrooil.com
USA	Milled rice	Rice powder	 Rice facial cleanser	 Rice facial scrub		 Fresh rice dry oil	https://www.palladiobeauty.com http://www.mattyskincare.com/ http://www.sephora.co
	Rice bran	 Rice bran moisturizer		 Whipped rice bran lotion			https://www.olivu426.com
Italy	Milled rice, purple rice & black rice	 Nourishing face scrub with whole-grain rice	 Olos delizia di riso nourishing no-oxidant face cream		 Olos delizia di riso rice essence 3 in 1: make-up remover, cleanser and toner		http://www.olos.eu
Greece	Milled rice	 rovitamin B5 & rice bran mascara		 Korres rice proteins and Linden shampoo			http://www.korres.com
Philippines	Rice bran	 Rice bran soap	 Red rice bran hair spa refresh	 Hand sanitizer with Aloe & rice bran moisturizer	 Rice bran calming oil	 Wasabi rice bran body butter	http://www.oryspa.com

B. Production Trends

Global production

Rice is grown worldwide. In 2014, paddy production was 741 M t. Asia dominates in paddy production, supplying 90% of global output, equivalent to 667 M t. Only 10% of global paddy output is cultivated outside of Asia, with America contributing 5.1%; Africa, 4.2%; and the Caribbean and Europe, 0.7% (Figure 4).

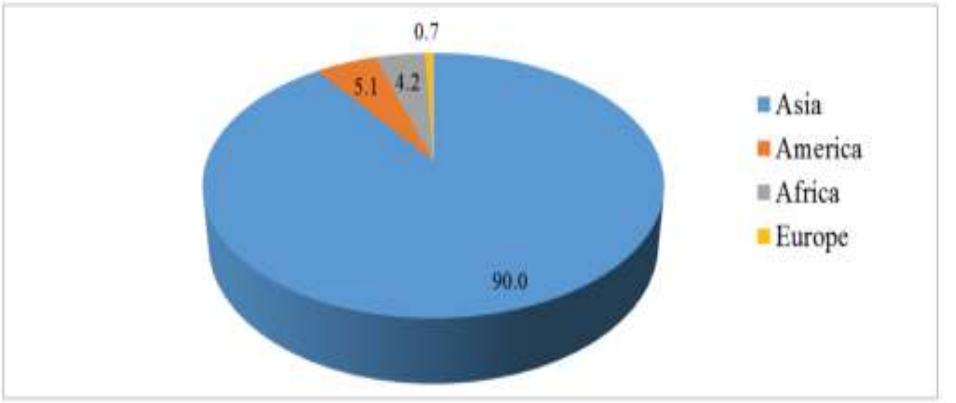


Figure 4. Percent share to world paddy production, by continent, 2014

Figure 5 shows the world's top 10 rice-producing countries based on paddy production. Together, they represent 83% of paddy output globally. China is the leading world rice producer, with India placing second. China and India alone account for around 50% of global paddy output. The other Asian top rice producers are Indonesia, Bangladesh, Vietnam, Thailand, and the Philippines. The other non-Asian countries in the top 10 are Brazil and the United States, which jointly account for around 3% of global paddy production.

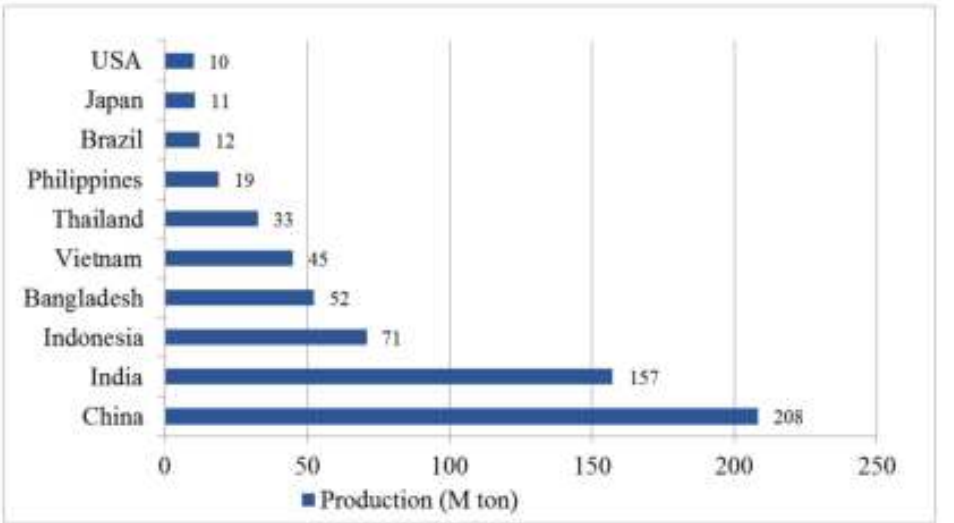


Figure 5. World's top 10 rice-producing countries, 2014 Source: FAO, 2015

Global paddy production increased from 634 M t to 741 M t from 2005 to 2014. Annual growth rate was only 1.68%, with area accounting for 0.60% and yield for around 1.10%. Within the same period, paddy production showed an increasing trend in all top 10 rice-producing countries, except for the non-Asian countries. The fastest growth in paddy production has occurred in Bangladesh, Indonesia, the Philippines, and Vietnam, which grew by 3.12%, 3.08%, 2.99%, and 2.55% per annum, respectively. Much of the growth came largely from yield improvement than from expansion in harvested area. In contrast, the top rice non-Asian producers experienced a decrease in paddy production growth, attributed to a decrease in cultivated rice area (Table 6).

There has been a gradual expansion in global area harvested in the 2005-2014 period. Area increased merely from 155 M ha to 163 M ha, an average annual growth of 0.53%. Expansion of areas came mainly from an increase in cropping intensity in the Philippines and Bangladesh because of intensified investments in irrigation. Rice area in the Philippines rose from 4.07 M ha to 4.74 M ha, whereas that in Bangladesh was from 10.5 M ha to 11.8 M ha. Vietnam, Thailand, and China likewise exhibited a growth in area, but in slight amount. On the other hand, India and the non-Asian rice-producing countries experienced a reduction in area (Table 6).

In the same period (2005-2014), world productivity progressively increased, from 4.09 to 4.54 t/ha, an annual growth rate of 1.1%. Of the top 10 rice producers, only Brazil marked a significant yield growth at 5.44% per year.

Table 6. Annual growth performance of the world's top 10 rice-producing countries, 2005-2014

Country	Average production growth (%/yr)	Average growth in area (%/yr)	Average yield growth (%/yr)	Share of area to production growth (%)	Share of yield to production growth (%)
China	1.44	0.60	0.79	42	55
India	1.42	-0.06	1.49	-4	105
Indonesia	3.08	1.66	1.23	54	40
Bangladesh	3.12	1.24	1.69	40	54
Vietnam	2.55	0.67	1.77	26	69
Thailand	0.77	0.60	0.16	78	21
Philippines	2.99	1.65	1.15	55	38
Brazil	-0.77	-4.03	5.44	523	-706
Japan	-0.70	-0.76	0.07	109	-10
USA	-0.08	-1.32	1.43	1650	-1788
Other countries	1.70	1.05	1.09	62	64
Asia	**1.62**	**0.48**	**1.09**	39	67
World	**1.68**	**0.53**	**1.10**	32	65

Source of basic data: FAO, 2015

The rest had less than 2% annually. Thailand's yield did not change considerably, exhibiting a growth rate of 0.16% per annum (Table 6).

Across the top 10 rice-producing countries, China recorded the highest paddy production (208 M t), harvested from around 31 M ha in 2014. Despite the fact that its area was only second to that of India, China has achieved the highest yield (6.75 t/ha) and has been a consistent high yielder among the top 10 rice producers in Asia. Mataia et al. (2016) attributed the steadily high yield in China to the country's continuous investment in R&D, particularly in hybrid rice technology and mechanization, which put China at the top.

India, the second largest rice producer, produced 157 M t of paddy. It has the world's largest harvested area, representing a share of around 27%. India has the second lowest yield (3.62 t/ha) because most (52%) of its rice area is rainfed. However, the country is one of the leading exporters of basmati and non-basmati rice. Based on USDA statistics, it exported 11.5 M t in 2013, but these went down to 9 M t in 2015; relatively due to the 0.06% per annum decline in rice area growth (Table 6).

Indonesia and Bangladesh placed third and fourth, with paddy production of 71 M t and 52 M t in 2014, respectively. Indonesia has around 14 M ha of harvested area with yield averaging 5.13 t/ha. Paddy production grew by 3.08% annually from 2005 to 2014, largely due to a yield improvement of 1.23% and area expansion at 1.66% per year.

Vietnam and Thailand, the world's top rice exporters, are in fifth and sixth place, respectively. Vietnam is second in the list of the world's leading rice exporters, with a total harvested area of 7.8 M ha (around 4.8% of global figure) in 2014 (Mataia et al., 2017). Paddy production was estimated at around 45 M t, of which 6.6 M t of milled rice were exported to Indonesia, the Philippines, Iraq, Cuba, and the African countries (ADB, 2012). In the last 10 years, paddy production has continuously increased by a significant 2.55%/year, mostly due to increases in yield that grew annually by 1.77%.

Thailand, the sixth rice producer in the world, manages to keep its status as the leading rice exporter. The country has a harvested rice area of 10.8 M ha with an average yield of 3.01 t/ha in 2014. Total paddy production was 32.6 M t, increasing per year at a rate of 0.77%. Of this, 0.60% came from gain in area harvested and 0.16% came from yield growth. Thailand's average yield was also the lowest among the top 10 rice producers, and this is attributed to the kind of variety planted, which is high quality Jasmine rice with the characteristic low yield. Although yield figures were low, Thailand is consistently the top rice exporter as its total rice production is much higher than its domestic rice requirement.

The Philippines placed seventh among the top rice-producing countries in the world. It achieved the highest paddy production in 2014, 18.97 M t, produced

from 4.74 M ha. Average yield was 4 t/ha. From 2005 to 2014, production has continuously increased by 2.99%/yr, except in 2009 and 2010 when the country experienced strong typhoons and prolonged drought, respectively, resulting in a decrease in area harvested and yield. Although the country has shown significant growth in paddy output, paddy production still lags behind total rice requirements hence it resorted to rice importation (see Chapter 5, Figure 27).

Domestic production

Over an 11-year period (2005-2015), the Philippines showed remarkable growth in domestic production. While a decline was noted in some years, total production increased from 14.60 M to 18.15 M t. Annual production growth performance was 2.2%, with considerable increases in 2012, 2011, 2007, and 2006 (8%, 6%, 6%, and 5%, respectively). Typhoons and droughts caused a plunge in production in 2009 and 2010; a huge decrease was seen in 2015, 0.72 M t (-4.3%) from the 2014 baseline, mainly due to the effects of El Niño. On the other hand, area harvested did not expand considerably, which grew only by 1.31% annually from 4.07 to 4.66 M ha. In the same vein, improvement in farm yield was not significant at 0.76%, a small increase from 3.59 to 3.90 t/ha only (Table 7).

Figure 6 shows the 16 regions in the country with their corresponding average paddy production, area, and yield from 2005 to 2015. The major rice producers are Central Luzon with a share of 18.18% to total production, followed by Cagayan Valley (13.72%), Western Visayas (11.34%), Ilocos Region (9.79%), SOCCSKSARGEN (7.5%), and Bicol (6.8%). Likewise, these regions have the largest rice area harvested. Central Luzon (4.58 t/ha) and Ilocos Region (4.14 t/ha) were the only two top rice-producing regions that posted the highest average farm yields, which are above the national yield.

Luzon Island

Luzon is the largest rice-producing island in the Philippines, producing 10.71 M t in 2015, which came from 2.55 M ha. Average yield was 4.21 t/ha. The island is represented by seven regions (CAR, Ilocos, Cagayan Valley, Central Luzon, CALABARZON, MIMAROPA, and Bicol), but paddy production is concentrated only in five (Ilocos, Cagayan Valley, Central Luzon, MIMAROPA, and Bicol). For the 2005-2015 period, paddy production in Luzon increased from 8.29 to 10.71 M t, an average growth rate of 2.65% per year, of which expansion in area (1.67%) contributed greatly than did yield improvement (0.79%). There was significant production growth in all regions, except in CAR and CALABARZON, and this deviation was attributed to a drop in farm yield (Table 7).

Central Luzon (Region III) has the largest plains in the country, with total area of 0.70 M ha in 2015, and total paddy output was 3.30 M t. The region accounted for 15% and 18% of total domestic rice area and paddy production, respectively, thereby making it the top rice- producing region in the country. Average yield was recorded at 4.72 t/ha, the highest among the 16 regions. From 2005 to 2015, paddy

production grew by 29.8%, up from 2.55 M to 3.30 M t. Annually, it rose by 2.7%, which came largely from growth in area (2.05%) rather than from yield (0.54%) (Table 7). The region is also home to Nueva Ecija, the number one rice-producing province in the country and in Central Luzon, which contributed nearly 9% to total domestic paddy production and 48% that of the region. The other major rice-producing provinces are Tarlac, Pampanga, and Bulacan.

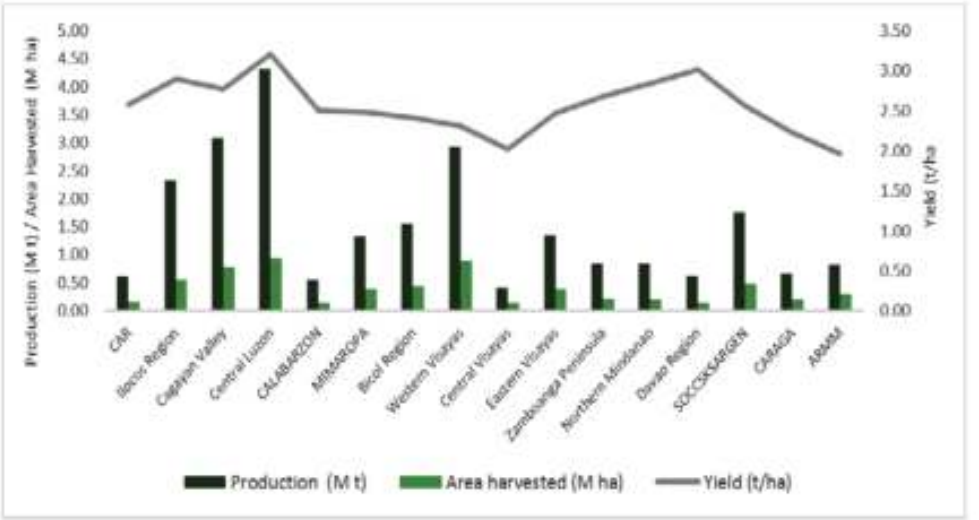


Figure 6. Average paddy production, area and yield, by region, Philippines, 2005-2015 (Source: PSA, 2015)

Cagayan Valley (Region II) placed second to Central Luzon in paddy production and third in area harvested in 2015. The region contributed 13.72% to total paddy output and 12.54% to total rice area. In terms of farm yield, it ranked sixth among the 16 regions. From 2005 to 2015, paddy production increased considerably, by almost 35%, a yearly growth of 3.15%. Area expansion (2.11%/yr) contributed much to the growth in paddy production; yield, however, grew only by 0.84% (Table 7). Isabela is the biggest rice-producing province in the region, and the number two rice-producing province in the country, representing a share of around 7% to domestic total paddy output and 50% to the regional output. This is followed by Cagayan, which placed fifth in the country's largest rice-producing provinces, accounting for 5% of total paddy output.

Ilocos Region (Region I) represented 9.79% of domestic paddy production and 8.87% of the area in 2015, claiming fourth place among the 16 regions. Table 7 shows that, between 2005 and 2015, paddy output improved from 1.38 to 1.78 M t (a yearly growth of 2.59%), attributed to expansion in area (1.27%) because of increased cropping intensity as well as to growth in yield (1.16%). The region is also one of the top yielders, which placed fifth among the 16 regions. It is also home to Pangasinan, the number three rice-producing province in the country, representing a share of 6% of total paddy output.

Table 7. Production, area, and yield growth performance, by major island group and region, 2005-2015

Major island/ region	2005-2015				
	Production		Area harvested		Yield
	Share to total in 2015 (%)	Average growth rate (%/yr)	Share to total in 2015 (%)	Average growth rate (%/yr)	Average growth rate (%/yr)
Philippines	**100.00**	**2.21**	**100.00**	**1.31**	**0.79**
Luzon	**59.02**	**2.65**	**54.70**	**1.67**	**0.83**
CAR	2.21	1.19	2.39	1.11	0.08
Ilocos Region *(Region I)*	9.79	2.59	8.87	1.27	1.16
Cagayan Valley *(Region II)*	13.72	3.15	12.54	2.11	0.84
Central Luzon *(Region III)*	18.18	2.71	15.03	2.05	0.54
CALABARZON *(Region IV-A)*	2.16	0.01	2.43	0.23	-0.21
MIMAROPA *(Region IV-B)*	5.96	3.43	6.09	2.08	1.10
Bicol Region *(Region V)*	6.97	2.62	7.35	1.13	1.32
Visayas	**18.45**	**1.79**	**21.33**	**0.95**	**0.76**
Western Visayas *(Region VI)*	11.33	1.29	13.37	0.54	0.71
Central Visayas *(RegionVII)*	1.85	5.54	2.20	2.29	2.60
Eastern Visayas *(Region VIII)*	5.27	1.92	5.76	1.51	0.36
Mindanao	**22.53**	**1.49**	**23.97**	**0.86**	**0.57**
Zamboanga Peninsula *(Region IX)*	3.65	1.6	3.51	0.29	1.27
Northern Mindanao *(Region X)*	4.00	5.27	3.52	2.83	1.86
Davao Region (Region XI)	2.43	-0.55	2.13	-0.77	0.24
SOCCSKSARGEN *(Region XII)*	7.12	1.68	7.3	0.85	0.76
CARAGA *(Region XIII)*	2.65	2.25	3.33	2.99	-0.56
ARMM	2.69	-0.95	4.17	-0.25	-0.72

Source: PSA, 2015

MIMAROPA (Region IV-B) is also one of the major rice-producing regions in Luzon. Paddy production in 2015 accounted for 5.96% of total production. Notably, the region showed significant improvement in paddy production over the period of 2005-2015, growing at 3.43%/yr, attributed largely from growth in area and yield, by 2.1% and 1.1% per year, respectively (Table 7). Oriental Mindoro and Occidental Mindoro are the two top rice-producing provinces in the region. Together, they accounted for 69% of the region's total paddy production. Likewise, during the same period, production grew faster in these provinces. Occidental Mindoro experienced a remarkable annual growth of 5.46%, whereas Mindoro Oriental had 3.21%; this trend was caused by a rapid increase in area, improving by 4% and 3%, respectively.

Bicol (Region V), composed of six provinces, placed sixth among the 16 regions. In 2015, it contributed nearly 7% to domestic paddy production. The

last 10 years saw a notable growth in paddy production, escalating by 2.62% per annum. This can be credited to investment in irrigation system and technology interventions, which augmented area and yield by 1.13% and 1.32% per annum, respectively (Table 7). Camarines Sur is the top rice-producing province in the region.

CAR contributed only 2.2% to total paddy production (it is 14th of the 16 regions). From 2005 to 2015, production rose by only 1.19% annually. Although area expansion was 1.1%, yield grew only by a mere 0.08%. On the other hand, CALABARZON did not exhibit any promising growth in paddy output, resulting in a yield regression (-0.21%); there was also marginal improvement in area (0.23%) per year (Table 7).

Visayas Island

The Visayas Island supplies 3.35 M t of the country's total paddy production, produced from 0.99 M ha of rice area. Average yield was 3.37 t/ha, which was the lowest among the major islands and which was below national yield average (3.90 t/ha) in 2015, mainly because a big portion of the area is rainfed. Over the last 11 years (2005-2015), production in the island grew from 2.80 to 3.35 M t, an average annual growth rate of 1.79%. On the other hand, area and yield did not show significant improvement, expanding by only 0.95% and 0.76%, annually, respectively. Among the three regions, remarkable production growth was noticed in Central Visayas (Region VII), which surged by 5.54% per annum, the biggest jump among the 16 regions. Growth came largely from improvement in both area and yield by 2.29% and 2.6%, respectively (Table 7). Bohol contributed largely to this growth; paddy production in the province increased by a significant 8.24% per year, from 0.13 M t in 2005 to 0.25 M t in 2015.

Western Visayas (Region VI) paddy production in 2015 accounted for 11.33% of total domestic paddy production, which placed it third among the 16 regions, after Central Luzon and Cagayan Valley. The region has the second largest rice area, 0.62 M ha. However, its yield was one of the lowest (3.31 t/ha), which is below the national average of 3.90 t/ha. The region supplies most of the paddy produced in the island, which comes largely from Iloilo. It is the fourth largest producing province in the country, contributing 5% to the country's total output and 50% to the total Visayan production. As shown in Table 7, production improved only by 1.29% annually, resulting from insignificant improvement in area (0.54%/year) and yield (0.71%/year) from 2005 to 2015.

Eastern Visayas (Region VIII) is the second largest rice producer in the region. It accounted for 5.27% of total paddy production. In the 2005-2015 period, paddy production increased annually by 1.92%. Expansion in area (1.51%/year) contributed much more than did yield, 0.36%/year (Table 7). Among the six provinces in the region, Leyte contributed more than half to Eastern Visayas' total production.

Mindanao Island

Mindanao is represented by six regions. In 2015, it posted 4.09 M t of paddy production and 1.12 M ha of rice area, which placed it second to Luzon. Average yield was 3.66 t/ha. Within the same study period, production in Mindanao grew from 3.51 to 4.09 M t (average growth rate of 1.49% per year). Similarly, growth in area posted 0.86% and yield, 0.57% per annum. Zamboanga Peninsula, northern Mindanao, and Davao are the top yielding regions with farm yields of 4.04, 4.43, and 4.45 t/ha, respectively.

SOCCSKSARGEN (Region XII) is the biggest rice-producing region, accounting for 7.12% of total domestic paddy production (it ranks seventh among the 16 regions). The region contributed 32% to total production in Mindanao. However, over the 2005-2015 period, the region exhibited an annual production growth performance that is lower than the national average (Table 7). North Cotabato provided one-third (37%) to total production in the region and 12% in the island. It is the ninth biggest rice-producing province in the country. The other major rice-producing provinces in the region are Sultan Kudarat and South Cotabato.

Zamboanga Peninsula (Region IX) accounted for less than 4% of total paddy production in 2015. From 2005 to 2015, it only improved by 1.6% per annum with area having a modest share of 0.29% and yield, 1.27% (Table 7). Zamboanga del Sur (contributing 50% of regional paddy production) and Zamboanga Sibugay (contributing 25%) are the two largest rice-producing provinces in the region. Significant growth was noted in Northern Mindanao (5.27%/year), but production declined in ARMM and the Davao region brought about by a reduction in area and yield (Table 7).

Photo: PhilRice

CHAPTER 4

THE NATURE AND STRUCTURE OF THE RICE INDUSTRY

This chapter discusses geographic flows and marketing channels of paddy and milled rice, characteristics and functions of value chain actors, as well as their interlinkages. It also presents costs and returns by market players, and their relative financial position in the rice value chain's total profit scheme.

A. Geographic Flows

Geographic flows trace the movement of paddy and milled rice from the source of production to the final destination of ultimate consumption. The geographical movement of these products explains the importance of supply areas relative to demand centers. In addition, the magnitude of interisland and interregional transfer of paddy and milled rice shows the relationships between production-consumption characteristics of the different regions and provinces.

Overall, paddy flowed mostly within the production area, whereas milled rice moved across market places (within, from, and to other provinces) in the country. This can be explained by the demand and supply situations across areas as well as the trading practices of market players. Usually, milled rice is transmitted from production surplus areas to major deficit trading centers and populated provinces.

Luzon

Paddy production is concentrated in Luzon and is characterized by large rice surpluses. Hence, outflow of milled rice from the island to the outer regions and provinces is very common (Figure 7). Surpluses from this island are supplied to the major rice-deficit provinces and cities in the Visayas and Mindanao. The marketing survey results show that Luzon has traded 14% of its milled rice to Visayas and Mindanao in the 2014 wet season and 2015 dry season.

In Ilocos region, more than half (57%) of the farmers' total marketable surplus paddy in Pangasinan flowed within the province and was processed by local millers, while 43% outflowed to millers in Nueva Ecija. This group procured paddy at a high price. On the other hand, majority (73%) of the locally processed rice outflowed to wholesalers outside the region such as Benguet, Pampanga, and Nueva Ecija and to wholesale centers in Metro Manila. The rest (27%) went to local wholesalers and retailers, which then catered to consumers. The province also received an inflow of paddy and milled rice from Central Luzon and Cagayan Valley, respectively.

Millers in Cagayan Valley procured and processed the majority (71%) of paddy produced in Cagayan and Isabela, the two largest rice-producing provinces in the region. Notably, the region has the second largest volume of paddy production in the country; however, it also has the most number of licensed millers in 2015. Thus, a strong competition on paddy supply exists. Outflow of paddy was evident: around 29% of the paddy produced was sold to millers in Ilocos Norte and Nueva Ecija, particularly in San Jose City where most millers are located, and a negligible volume (0.07%) was shipped to Davao City. Due to the region's huge rice surplus, rice moved largely outside the region to several identified urban wholesale outlets in Luzon, Visayas, and Mindanao. Of the total local milled rice, 63% was distributed within Luzon, to wholesalers in Ifugao, La Union, Pangasinan, Metro Manila, and to provinces in CALABARZON, while 18% went to Cebu and Cagayan de Oro City, two major rice-deficit trading centers in the country. Only 19% was consumed locally. However, the region, particularly Cagayan, also received rice from MIMAROPA as reported by one of the big rice millers in the province. Mostly the native Dinorado variety flowed into the region.

Bulacan, Nueva Ecija, Pampanga, and Tarlac produced the biggest volume of paddy in Central Luzon wherein majority (80%) was absorbed and processed by local millers, suggesting a high demand for paddy. This can be attributed to the high concentration of millers, in particular in Nueva Ecija and Bulacan, which resulted in greater competition. Moreover, these provinces are nearer the demand area (Metro Manila). A small percentage (5%) of paddy was also traded to paddy traders in Pangasinan and 13% went to hired agents (paddy aggregators) outside the region. Of the locally processed rice, a substantial volume (65%) was supplied to provinces outside the region. Central Luzon filled up largely the rice requirement of urban centers in Metro Manila, Laguna, Cavite, Batangas, Quezon, and outer Luzon such as Cebu and Davao City. Millers, particularly those in Nueva Ecija, have established contacts with big wholesalers in these places. In Metro Manila, the major wholesale outlets are wholesalers in Binondo, Dagupan, and other wholesale outlets in Quezon City, Pasig, Marikina, and Sta. Mesa. About one-third (35%) of the processed rice was marketed and consumed locally. There were also some rice inflows from other regions despite the fact that Central Luzon is a surplus area because of trading practices and the preference of traditional retailers for premium quality rice as consumer demand for specific grain qualities of milled rice increased.

Most (73%) of the paddy from Occidental Mindoro and Oriental Mindoro, the two largest rice-producing provinces in MIMAROPA, flowed within paddy traders and millers, farmer cooperatives, and the NFA in the province. In contrast, outflow to millers in Bulacan, Laguna, and Quezon was estimated to be 27%. Millers in Bulacan also demand premium rice variety, knowing that MIMAROPA grows aromatic rice or the native Dinorado variety, which is unique in the region. Of the processed rice, 61% outflowed to all provinces in CALABARZON as well as to Metro Manila, Bulacan, and Albay. Interisland shipping is most apparent in the region, owing to the existence of many shipping and port facilities, which enables the movement of paddy and milled rice to nearby islands within and outside Luzon. Twenty percent of the milled rice was exported to big wholesalers in Palawan,

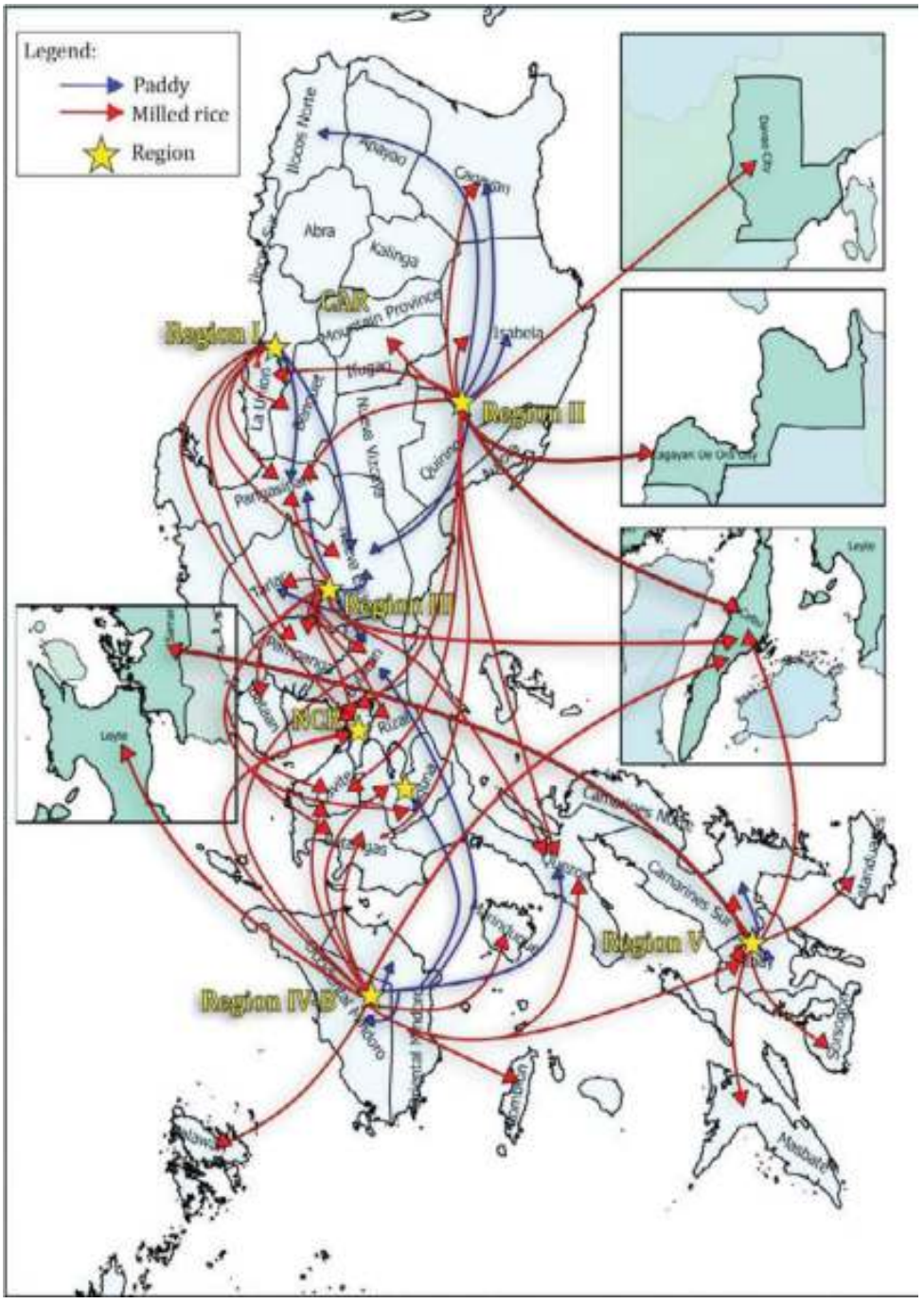


Figure 7. Geographic flows of paddy and milled rice in Luzon, Philippines, 2015

Leyte, Cebu, Antique, and Iloilo. An insignificant amount (19%) was sold to consumers through wholesalers and retailers within the region. The MIMAROPA region supplied mostly the deficit provinces in CALABARZON and the Visayas.

In Bicol region, most of the paddy produced in Albay and Camarines Sur was procured, processed, distributed, and consumed within the provinces in the region, although there was also an outflow of milled rice to other provinces within the region such as Masbate, Catanduanes, and Sorsogon, as well as outside of the region (Samar and Cebu). The region also absorbed milled rice from millers in MIMAROPA as it is less sufficient in rice.

Visayas

Five provinces representing the four regions in the Visayas were included in the study. Despite the region's topography, the flow of rice was not restricted within the island. Interregional and interisland movement of rice is commonly practiced by rice distributors. Big wholesalers in Cebu, Leyte, Cagayan de Oro City, and Zamboanga City are largely the common rice outlets of rice traders in the island (Figure 8).

Iloilo and Negros Occidental, representing Western Visayas, are the two major rice surplus provinces in the region. Local millers gathered and processed most of the paddy production within the provinces, although some of the paddy and milled rice from Negros Occidental flowed into Negros Oriental. However, majority of the processed rice (65%) was supplied and consumed within the region, while 14% was sold wholesale to Cebu, Bohol, Leyte, and Samar and 21% was marketed and moved to deficit trading areas of Cagayan de Oro City and Zamboanga City in Mindanao. There was also rice inflows in the region, particularly in Negros Occidental, mostly from millers in MIMAROPA, Isabela, and Cagayan. Rice traders in the region also received rice from major deficit trading areas such as Manila and Cebu. These inflows are probably imported rice that entered in the ports of Cebu and Manila.

In Central Visayas, Bohol's paddy was generally procured and milled by local millers in the province. Most (80%) of the locally processed rice flowed within the province's local markets and nearby deficit provinces such as Cebu and Siquijor with only 20% outflowing to traders in Leyte. A large volume of milled rice from surplus production areas of Iloilo, Isabela, MIMAROPA, Leyte, Zamboanga del Sur, Cotabato City, as well as from Manila and Davao City also flooded into the region. Cebu in particular received most of the rice inflows from different regions and provinces because of its big rice demand. Most of the rice brands available in the area were Ganador (Nueva Ecija) and Lion Ivory (Isabela) which were transported to wholesalers in Manila and then shipped to Cebu. Likewise, inflows of imported rice within and from other discharging ports were prevalent in Cebu; the province has a discharging port just like the ports of Batangas and Mindanao, where goods from other provinces and countries were being unloaded. NFA, rice wholesalers,

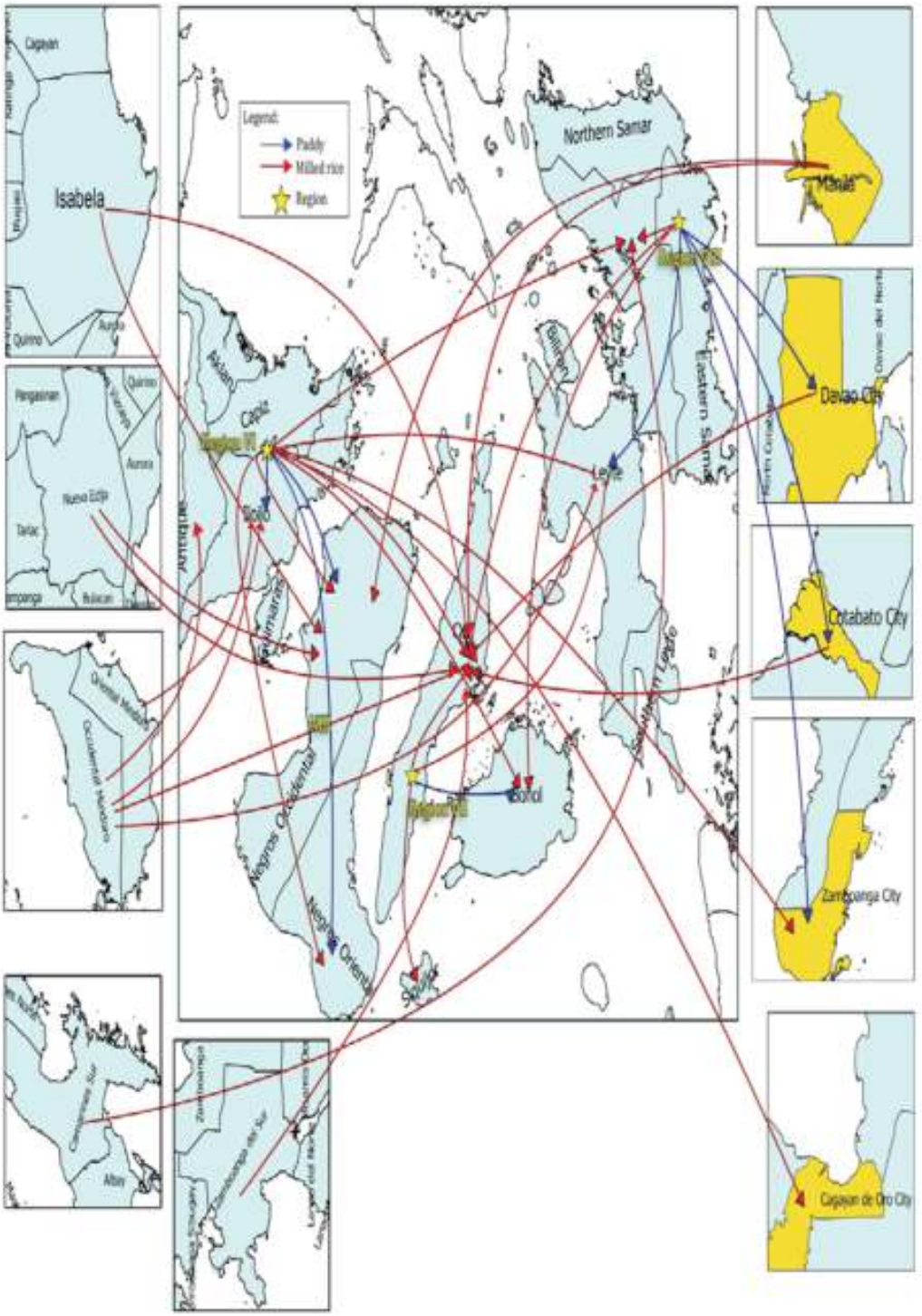


Figure 8. Geographic flows of paddy and milled rice in the Visayas, Philippines, 2015

and the private sector imported milled rice from Vietnam and Thailand. Outflows of milled rice from the province to other provinces were commonly observed.

Paddy produced in Leyte, a major rice surplus province in Eastern Visayas, mostly flowed within the province and only a portion was traded outside the region, particularly in Mindanao. Some traders and millers reported that paddy traders from Davao del Sur, North Cotabato, and Surigao del Norte passed through Leyte, particularly during peak harvest months, procuring paddy directly from farmers, which results in increased competition and higher paddy price that benefit farmers. Of the locally processed rice, a large amount (86%) was distributed and consumed mainly within Leyte, and a small percentage was sold wholesale to Samar. Only 14% flowed outside the region, especially to Cebu. Traders in the province also received rice inflows from Oriental Mindoro, Camarines Sur, Bohol, and Iloilo.

Mindanao

Six provinces and two cities represent the five regions in Mindanao covered in the study. Regional and interregional flows of paddy and milled rice are an ordinary feature in the island. There is an excellent transportation network, which enables the efficient movement of paddy and milled rice. It can also be observed that even surplus and deficit regions and provinces experience rice outflows as well as rice inflows from other areas (Figure 9).

In Zamboanga Peninsula, 83% of paddy in Zamboanga del Sur generally flowed within the province, aggregated and processed by local paddy traders and millers, respectively. Only a small percentage (17%) outflowed to millers and traders in Misamis Occidental. Of the locally milled rice, 31% was bought by wholesalers from outer regions—19% was shipped to Cagayan de Oro City, Cotabato City, and Lanao Del Sur and 12% was sent to Cebu City. However, still a large proportion (36%) was distributed by wholesalers and retailers to end users within and outside the province. The region, especially Zamboanga City, also received rice from provinces in the Visayas Island such as Iloilo and Leyte. It can be noted that rice from Cebu flowed into the region despite the province being a major rice deficit area and importer. Some market analysts surmise that this is probably smuggled rice from exporting countries such as Vietnam and Thailand.

Total paddy production in Bukidnon in Northern Mindanao flowed mainly within the province, with local millers and traders procuring and processing it. Millers in the province also bought paddy from North Cotabato as paddy supply is limited and that province is near Bukidnon. Processed rice flowed within the province, and some were traded to wholesalers in Cagayan de Oro City. Northern Mindanao, however, also imported majority of its rice supply from outside the region. Hence, rice from surplus provinces in Luzon, Visayas, and Mindanao flooded into the region.

In Davao region, almost all of the paddy produced in Davao del Sur was procured and milled by millers and rice traders within the province, with a petty

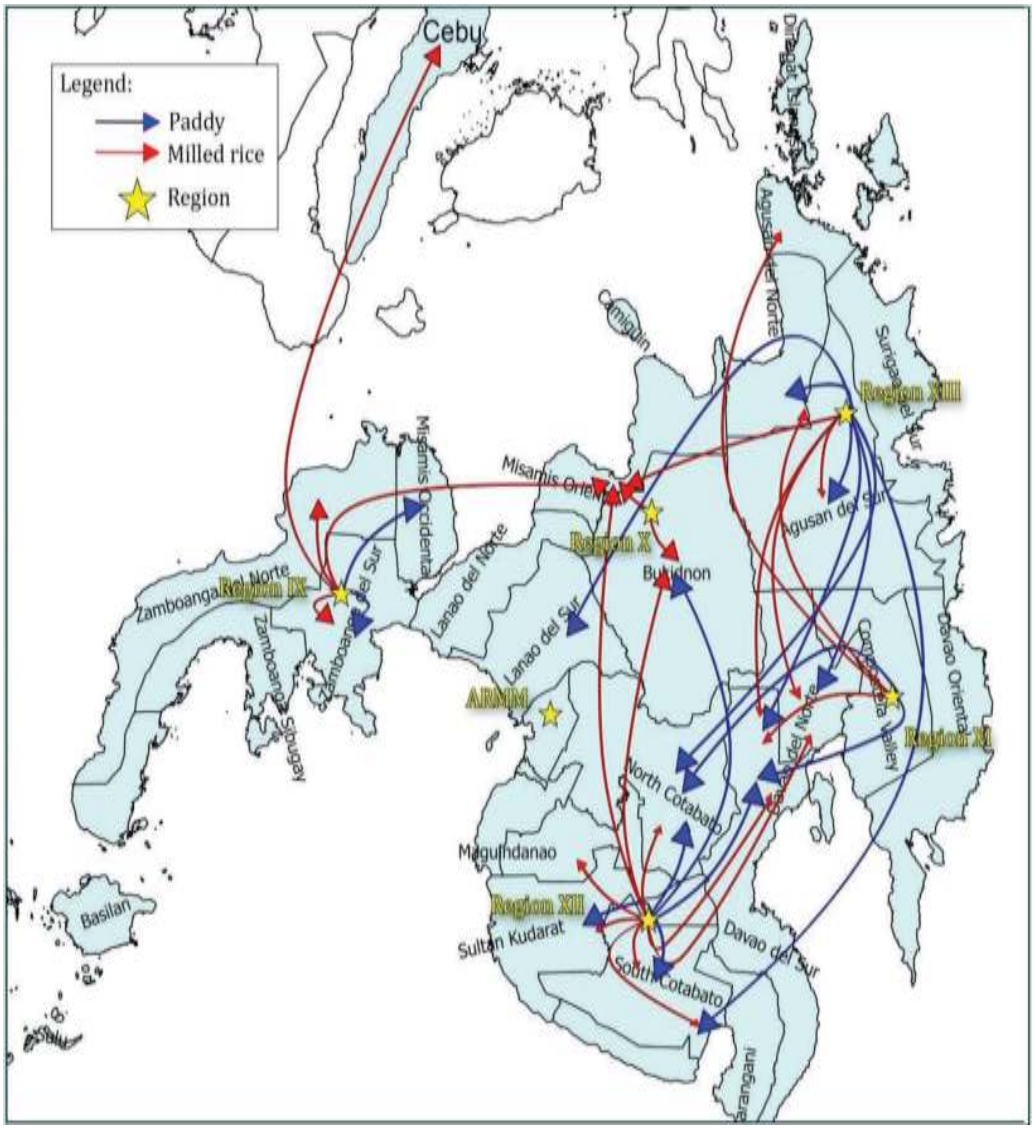


Figure 9. Geographic flows of paddy and milled rice in Mindanao, Philippines, 2015

amount (5%) being traded to rice millers in North Cotabato. Milled rice was largely traded and consumed within the province; some was exported to wholesalers outside the region, in particular, to Surigao del Norte and Agusan del Sur. In addition, the region, especially Davao City, being a highly deficit urban city, had rice inflows from nearby regions and Luzon Island. Wholesalers in Metro Manila (Binondo) and millers in Nueva Ecija were the common rice suppliers of wholesalers in Davao City.

Around 38% of North Cotabato's paddy production (SOCCSKSARGEN) was procured by millers in Sultan Kudarat and Bukidon. Majority (62%) was

nonetheless traded and milled within the province, of which 44% of the total processed rice was marketed and consumed locally. More than half (56%) was outflowed to rice traders in Sultan Kudarat and outside the region, particularly Cagayan de Oro City, Davao del Norte, Davao del Sur, Maguindanao, Misamis Oriental, and Sultan Kudarat. However, paddy from provinces in the outer regions such as Agusan del Sur, Davao Sur, and Bukidnon also entered the area, implying that demand for paddy is high because several rice millers compete for supply.

The lack of inflow of paddy and milled rice in CARAGA was notable. In fact, 50% of Agusan del Sur's paddy production was exported to Davao del Norte, Davao City, Lanao del Sur, North Cotabato, and South Cotabato. Only half of the paddy produced in the province was purchased and processed by local millers. Likewise, locally processed rice flowed into and was consumed within Agusan del Sur, with around one-third (37%) being sold wholesale to traders in Cagayan de Oro City, Davao City, and Davao del Norte.

B. Description of Key Players

Rice value chain map

Rice needs to go through several processes before it reaches the end user. Figure 10 shows the rice value chain map in the country that illustrates the product flows and dynamics of interlinkages within key players in the rice value chain from input provision to final sale. It involves eight major actors: input providers, farmers, aggregators, millers/processors, wholesalers, wholesaler-retailers, retailers (traditional and modern), and consumers (households and institutional buyers). It also presents the tasks or activities of the value chain actors as well as the functions of specific segments. Moreover, some elements of the rice value chain such as support service providers and enablers are presented.

Value chain actors

Input providers

The input providers consist of private individuals and companies, commercial establishments, government agencies, and non-government organizations. They provide the material inputs used in rice production such as seeds, fertilizers, pesticides, fuel, and oil. They also supply farm equipment, tools and implements, irrigation water, credit, machine custom services, and extension services. Also, paddy traders and miller-traders sometimes engage in input provision particularly to their *suki* farmers.

Seed suppliers. Seed (inbred and hybrid) is a vital input in rice production. Farmers access seeds through formal and informal seed distribution systems. The formal seed system covers seed production and supply mechanisms that are ruled by defined methodologies and controlled (stages of) multiplication and are backed by national legislation and international standardization of methodologies (DA, 2011).

This includes the production and distribution of high-quality inbred and hybrid seeds. Breeding institutions such as PhilRice, UPLB, and BPI produce foundation seeds for reproduction to registered seeds for Seednet members. Accordingly, accredited seed growers buy registered seeds to produce certified seeds, which are then distributed to farmers for commercial production.

The most common suppliers of high-quality inbred seeds are individual seed growers, farmer organizations, farmer cooperatives, and seed companies. As of 2015, there were 1,728 accredited individual seed growers in the Philippines with a total accredited seed production area of 13,653 ha, 65% of which are in Luzon, 12% in the Visayas and 23% in Mindanao. The largest number of seed growers was located in Central Luzon, Cagayan Valley and Ilocos Region, which are the major rice hubs in the country (Table 8). Nueva Ecija and Isabela host the highest number of seed growers, as these provinces have large rice areas and huge seed requirements (Mataia et al., 2017). Seed producers sell either directly to farmers or through seed distribution outlets such as seed centers and agricultural input stores. Generally, seed centers are situated in major rice production areas; most are located in Muňoz, Nueva Ecija, which is near PhilRice. Mainly, inbred certified seeds are sold at the approved government price of PhP 1,350 per 40-kg bag with tag.

For hybrid rice seeds, the suppliers are mostly multinational seed companies such as SL Agritech Corporation, Bayer Crop Science, Pioneer, Syngenta, Bioseed, Allied Longpin Hybrid, and Seed Works. These companies are involved in the breeding, production, and marketing of hybrid rice seeds. They also import from other countries and sell hybrid rice seeds to farmers through their accredited distribution outlets nationwide. In addition, local cooperatives such as DOSEPCO, S2R, BINTIKU, DAMSEPCO, and DASUSEPCO are also involved in the production and distribution of public hybrid rice seed in their respective areas. In contrast to inbred seed, the price of hybrid rice seed is quite high (six to seven times higher than certified seed), but the seeding rate is lower (18-20 kg/ha). For public hybrid seed, the price is limited to PhP 212/kg, while PhP 275/kg for private hybrid; it is packed in 5- and 18-kg bags.

Local government units (LGUs) also distribute high-quality seeds. Some provide varying degrees of subsidy to local farmers. Community seed banks, managed by DA and LGUs, also serve as source of quality seeds in their respective localities. However, many farmers still access seeds through the informal seed distribution system. This system covers methods of local seed selection, production, and distribution—the farmers themselves produce, distribute, and access seeds directly from their own harvests or through exchange with other farmers (DA, 2011). This informal seed system is akin to 'local' or farmers' seed system, particularly that involving small-scale farmers.

Input dealers. Fair competition exists in the factor input market. A large number of fertilizer and pesticide suppliers are available in the local production

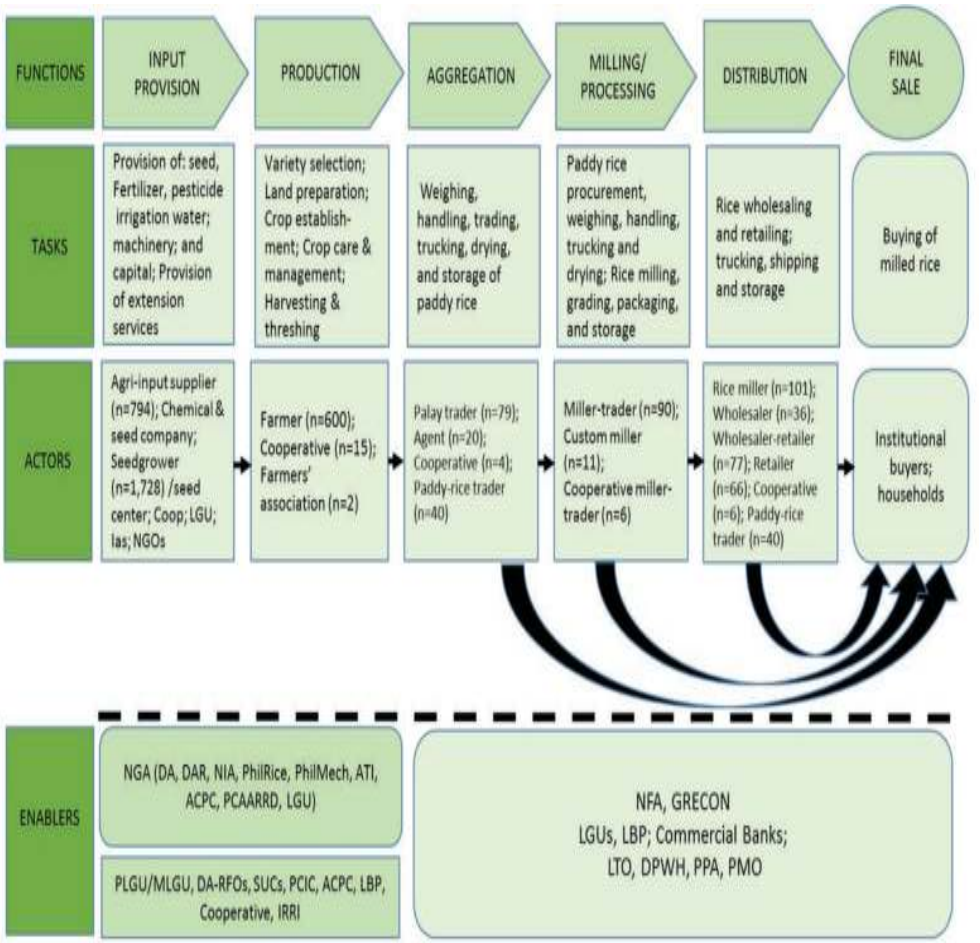


Figure 10. Value chain map of rice in the Philippines, 2014-2015

areas and are accessible to farmers. These are mostly agricultural input stores or licensed dealers that sell a variety of agricultural products (including fertilizers and pesticides) directly to farmers. Most fertilizers and pesticides are imported into the country by wholesale area distributors and then supplied to small-scale retailers for direct selling to smallholder farmers and a few commercial producers. There were 475 fertilizer handlers registered with the Fertilizer and Pesticide Authority (FPA) in 2014. Handlers are located in major cities, but the majority are concentrated in Metro Manila, Cebu, and Davao City. They usually come from the business sector. The handlers' major functions are distribution and importation, but they also perform other activities such as manufacturing, processing, exporting, bulk handling, indenting, and repacking. There were 181 distributors, 15 area distributors, and 117 importers of fertilizers nationwide and 82-84% of these are found in Luzon Island (Table 9).

In general, input dealers also supply pesticides directly to farmers. Multinational chemical companies are the major players in the R&D, marketing, and distribution of pesticides. In most provinces, farmers have direct access to pesticide suppliers; area distributors sell to agricultural input dealers through

Table 8. Number of individual inbred rice seed growers, by major island and region, Philippines, 2015

Major island/region	Accredited individual seed growers (no.)	Accredited area (ha)
Philippines	**1,728**	**13,653**
Luzon	**1,127**	**8,238**
CAR	46	464
Ilocos region	190	564
Cagayan Valley	191	1,221
Central Luzon	383	3,852
CALABARZON	58	248
MIMAROPA	137	1,159
Bicol	122	729
Visayas	**206**	**1,228**
Western Visayas	109	793
Central Visayas	38	162
Eastern Visayas	59	273
Mindanao	**395**	**4,187**
Zamboanga Peninsula	23	233
Northern Mindanao	21	699
Davao region	151	1,433
SOCCSKSARGEN	123	1,252
CARAGA	66	469
ARMM	11	102

Source: BPI, 2015

their agents, and dealers sell to farmer organizations (FOs), farmer cooperatives, and individual farmers. In 2014, FPA reported 319 registered pesticide handlers nationwide, with the majority performing several functions (i.e., distributors, importers, and indentors). Most pesticide handlers are in Luzon and their business locations are in Manila (Table 10).

In addition, private chemical and seed companies support the rice value chain by providing related extension support services such as establishment of demonstration plots, disseminating information, and delivering farm advisory services for their R&D products.

Labor and machine providers. The agricultural labor force in the Philippines in 2015 was about 11,294 (PSA, 2016). Cagayan Valley (8%) and Bicol (8%)

Table 9. Number of registered fertilizer handlers, by region, Philippines, 2014

Major island / region	Area distributor	Bulk handler	Distributor	Exporter	Formulator	Importer	Indentor	Manufacturer	Processor	Repacker
Philippines	**15**	**7**	**181**	**15**	**5**	**117**	**22**	**72**	**4**	**37**
Luzon	**11**	**4**	**149**	**14**	**4**	**98**	**22**	**58**	**2**	**34**
CAR			2			2				1
Ilocos Region	1		8		2	4		7		2
Cagayan Valley			6			2	1	2		
Central Luzon			19	2		5		15		1
CALABARZON & MIMAROPA	4	1	19	4		10	2	10		3
NCR	5	3	91	8	2	73	19	22	2	25
Bicol Region	1		4			2		2		2
Visayas	**1**	**3**	**23**	**1**	**0**	**13**	**0**	**11**	**2**	**3**
Western Visayas	1	2	9			6		6		3
Central Visayas		1	13	1		7		4	2	
Eastern Visayas			1					1		
Mindanao	**3**	**0**	**9**	**0**	**1**	**6**	**0**	**3**	**0**	**0**
Northern Mindanao			1					1		
Davao Region	3		7		1	6		1		
Central Mindanao			1					1		

Source: FPA, 2016

regions have the largest number of agricultural workers employed in agriculture in Luzon Island; Western Visayas (10%) and Central Visayas (7%) have the most of these workers in the Visayas Islands; and so do the SOCCSKSARGEN (7%) and ARMM (8%) regions in Mindanao Island. This total labor force, however, is not solely working in the rice sector. Typically, farmers, landless or farm laborers, and animal and machine operators provide majority of the labor requirements in rice production, from land preparation to postharvest activities. Dawe (2006) estimates that landless laborers constitute 13% of the rural labor force, doing the bulk of the work in rice cultivation.

Established individual farmers, FOs, and cooperatives provide customized services such as provision of farm machinery for major operations in rice production. Furthermore, the government has established farm service providers to serve as model enterprises for labor and machinery pooling.

Fuel and oil companies. Fuel and oil are vital inputs in rice production as they are used for mechanized farm operations such as land preparation, harvesting and threshing, and irrigation. Gas and oil companies are the major players in this sector as they supply the input. Farmers get their fuel requirements directly from these companies, which are strategically located in most of the town centers.

Table 10. Number of pesticide handlers, by region, Philippines, 2014

Major island /region	Area distributor	Distri-butor	End-user	Expor-ter	Formu-lator	Importer	Importer End-user	Indentor	Manufac-turer	National distributor	Repacker	Supplier's local repre-sentative	Supplier's local subsidiary
Philippines	**20**	**87**	**4**	**8**	**9**	**86**	**5**	**44**	**2**	**39**	**7**	**7**	**1**
Luzon	**7**	**17**	**2**	**1**	**7**	**17**	**2**	**6**	**1**	**25**	**5**	**1**	**0**
NCR	7	65		7	1	65	1	37	1	7	2	6	
CAR		1				1				2			
Ilocos Region	1		1				1			2			
Cagayan Valley		1				1		1		7			
Central Luzon	1	5			2	5		1		6	1		
CALABARZON & MIMAROPA	4	9	1	1	5	9	1	4	1	8	4	1	
Bicol Region	1	1				1							
Visayas	**1**	**3**	**0**	**0**	**1**	**2**	**1**	**1**	**0**	**4**	**0**	**0**	**1**
Western Visayas							1			4			
Cenral Visayas	1	3			1	2		1					1
Mindanao	**5**	**2**	**2**	**0**	**0**	**2**	**1**	**0**	**0**	**3**	**0**	**0**	**0**
Northern Mindanao							1						
Davao Region	5	2	2			2				2			
Central Mindanao										1			

Source: FPA, 2016

Farmers

Farmers are the main producers and suppliers of paddy and are next to input providers in the rice value chain. An estimated 2.4 M farmers are engaged in rice production in the Philippines with the majority (53%) concentrated in Luzon and the rest in the Visayas and Mindanao. The top four rice-producing regions (Ilocos Region, Cagayan Valley, Central Luzon, and Western Visayas) have the most number of farmers, which corresponds to the largest rice areas cultivated (Table 11). The top five with the most numbers of farmers among the provinces, were Pangasinan, Iloilo, Nueva Ecija, Isabela, and Cagayan, which are the top five rice-producing provinces (PSA, 2001).

Table 11. Number of farmers, by major island and region, Philippines, 2001

Major island/region	Farmers (no.)
Philippines	**2,439,759**
Luzon	**1,301,624**
Cordillera	93,102
Ilocos Region	279,985
Cagayan Valley	203,734
Central Luzon	284,077
CALABARZON	116,359
MIMAROPA	132,642
Bicol Region	191,725
Visayas	**555,700**
Western Visayas	299,502
Central Visayas	105,237
Eastern Visayas	150,961
Mindanao	**582,435**
Zamboanga Peninsula	99,147
Northern Mindanao	52,593
Davao region	115,705
Central Mindanao	118,428
ARMM	114,059
CARAGA	82,503

Source: PSA, 2001

Agents/brokers

The agents' main function in the rice value chain is to facilitate transaction between suppliers and buyers of paddy or milled rice, for which they receive commission doing trading services such as negotiating and bargaining. In general, agents have vast knowledge and experience, reputation, and several connections with paddy traders, millers, and rice traders. There are two types of agents/brokers: 1) those engaged only in paddy aggregation and 2) those engaged in milled rice distribution. These actors, not licensed by the NFA, are common in major rice-producing areas and rice-trading centers.

Paddy traders

Paddy traders engage solely in trading. Their main function is to collect paddy for sale to large miller-traders who do not have the time to perform small procurement from scattered small farmers. Their marketing activities involve buying and selling of paddy with some actors performing drying, hauling, and storage functions. Normally, they are located in rural markets or towns. Paddy traders consist of individual paddy traders and farmers' cooperatives. Few farmers' cooperatives carry out paddy trading primarily for their members; these they sell to the NFA, receiving an incentive of PhP 0.70 per kg in addition to the paddy support price. They also sell to miller-traders, especially if the price is higher than the NFA support price.

Individual paddy traders may be big or small. Majority of the big paddy traders have NFA license, a business office in the town center, big warehouses, and fleets of trucks. Because they have big operating capital, they can procure large volumes of paddy during peak harvest season, which they then store and sell in large quantity to miller-traders when the price is relatively high. They buy paddy from farmers and from small paddy traders who at times employ agents.

On the other hand, small paddy traders are mostly village or local consolidators. Consisting the majority (85%), they operate only during harvest time and keep a small buying station along the road in towns or farming villages. They buy in varying quantities directly from farmers in the locality and across municipalities and provinces, sometimes through hired agents. They also purchase in small volume from farm laborers and small farm households. Majority of them dispose of their procured paddy immediately, either in freshly threshed or dried form, depending on the millers' moisture content (MC) requirements. Small paddy traders have limited storage capacities due to their limited capital, and they sell the procured paddy instantly to roll over their capital.

Traders (paddy and milled rice)

Paddy cum rice traders are synonymous to miller-traders. However, these actors do not have rice mills and only utilize the services of custom milling providers for rice processing. Their main function in the value chain is rice distribution.

They carry out rice wholesaling and retailing activities. However, being aware of value addition in transforming procured paddy into milled rice and selling it to wholesalers and retailers, these actors procure, aggregate, dry and store paddy, and have it milled through custom milling services, then sell it in milled rice form. The majority also keep rice retail outlets in the public market to cater to walk-in household consumers and small retailers.

Millers/processors

There were 8,249 rice millers licensed by NFA in 2015, 60% of which are heavily concentrated in Luzon, with the highest numbers located in major rice-producing regions such as Cagayan Valley (26%), Ilocos Region (22%), Bicol Region (15%), Central Luzon (14%), and MIMAROPA (Table 12). Across provinces in Central Luzon, Bulacan accommodates 125 and 15 rice mills in Intercity and Golden City, respectively, whereas Nueva Ecija hosts 139 rice mills. This suggests the high concentration of rice processors in the region. NCR, CAR, and ARMM, which are largely the net importing regions, have the least number of millers (Mataia et al., 2017). The processors' main function in the value chain is to process paddy into milled rice but they are also into rice distribution. There are three types of processors: (1) custom millers, (2) cooperative miller-traders, and (3) miller-traders.

Custom millers are service providers who accept milling fees either in cash or in kind (by-products) for processing paddy into milled rice. Some also provide drying and storage services (storage is usually included in the milling fee). Usually, they cater to paddy cum rice traders, miller-traders, and big farmers. At the barangay level, there are custom millers with small cono mills or *kiskisan* that provide custom milling services to farm households, usually in smaller quantity, for home consumption. In addition, there are also mobile millers who usually travel across barangays in the rural areas, providing custom milling services. Around 1,208 units of single-pass *kiskisan* and 539 travelling rice mills are licensed under NFA in 2013.

Cooperative miller-traders consist of a group of farmers or individuals who are into rice marketing. These cooperative miller-traders procure paddy mostly from their members but they may also buy from non-members. They have the paddy processed in their own mills, then sell it to wholesaler-retailers, retailers, and institutional buyers. Likewise, they keep rice outlets in the town center for rice distribution. Usually, they operate only within several municipalities in the province because of limited procurement fund. They also offer postharvest facilities, especially mechanical dryers, to their coop members at a reasonable fee.

Few cooperative miller-traders are beneficiaries of the program that gave farmers rice processing centers (RPCs) to manage. The Korea International Cooperation Agency (KOICA) established RPCs equipped with state-of-the-art

postharvest facilities, serving as a one-stop service center for milling, drying, and storing to members and non-members of the cooperative. Five such RPCs in the Philippines are located in Pangasinan, Aurora, Iloilo, Bohol, and Davao del Sur. Apart from the RPCs granted by KOICA, Agri Pinoy RPCs were also awarded to FOs and cooperatives through funding and supervision of the DA regional field offices (DA-RFOs). As reported by Mataia et al., (2017), 170 units have already been distributed by DA-PHilMech from 2011 to 2016 across the regions. Western Visayas received the most number, accounting for 24 units, followed by SOCCSKSARGEN (19 units), Central Luzon (18 units), and Bicol (17 units).

Rice miller-traders are those whose functions are vertically integrated. They perform majority of the functions in the rice value chain from paddy procurement, milling, to rice distribution. A few are also into paddy production. Apart from these multiple functions, most miller-traders also provide drying, storing, and custom milling services to fellow millers, rice traders, farmers' associations, and large-scale farmers, mostly in bigger quantity.

Rice wholesalers

Wholesalers perform wholesale distribution in the rice value chain. They deal in larger volumes and often store rice. In 2015, there were 4,052 licensed wholesalers in the country, with almost two-thirds (63%) found in Luzon (majority were in Ilocos, Cagayan Valley, and Central Luzon regions) (Table 12). These rice traders cater to the needs of larger markets. Majority of the wholesalers operated on a larger scale in urban areas such as Metro Manila and major cities such as Cebu, Iloilo, Cagayan de Oro, General Santos, and Davao. Wholesalers are mostly Chinese businessmen, but some big miller-traders are also wholesalers. These actors have established vast networks and have long experience in rice trading, equipped with a vast knowledge of rice supply, rice quality, and market prices. Intercity and Golden City in Bocaue, Bulacan, are also known as central area for wholesalers and wholesaler-retailers in Manila and most provinces in CALABARZON. Wholesalers and wholesaler-retailers go to Bocaue to procure rice, specifying the rice brand and the qualities they prefer. Other big wholesalers have also acquired rice import licenses from NFA, which enable them to import rice outside the country and then sell it in local wholesale markets.

Wholesaler-retailers

Wholesaler-retailers are also involved in rice distribution in the value chain. Their major function is wholesaling and retailing, wherein around 31% use the services of brokers in rice procurement. Their main rice outlets are traditional retailers and supermarkets. Some also provide packaging services for rice distributed to supermarkets and hypermarkets for a fee (5-, 10-, 25-, and 50-kg bags). Majority of them either rent or own rice stalls along the highway in the town center.

Retailers

Rice retailing is very competitive because of the presence of many retailers in the market. NFA recorded 61,463 licensed rice retailers in 2015, almost half (49%) were concentrated in Luzon. The rest were in Mindanao (26%) and Visayas (25%). Bicol and Western Visayas regions have the most number of small retailers, representing 10% each of the total (Table 12).

The retailers' main function in the rice value chain is rice distribution to end users or consumers. Their role is to get rice supplies and display them in their market stalls or supermarkets for consumers. Two classes of retailers perform retailing activities for end users: traditional and modern. Traditional retailers sell rice in rented stalls in the municipal or public market or in sari-sari stores. In general, they are not only engaged in rice retailing but also trade other products to augment income. Usually, the volume of operation is small, selling 10-30 sacks of rice a week.

On the other hand, modern retailers include big groceries, convenience stores, supermarkets, and hypermarkets. They regularly purchase rice from established corporations or through contacts of miller-traders, wholesalers, and wholesaler-retailers to ensure quantity and quality of rice. Few modern retailers own mills but they also source out from other wholesalers for special-quality rice. Modern retailers offer convenience and quality; rice is sold in a variety of packaging forms (in kilograms and bags) as well as loose rice and grades to meet the needs and preferences of consumers belonging to different socioeconomic classes. Their volume of operation ranges from 1 to 10 t/mo, and they prefer checks and 15-30-day consignment as modes of payment. Currently, supermarkets/hypermarkets also allow rice traders to sell in the premises of their trading areas, for which they charge certain fees.

National Food Authority

In addition to market intermediaries, NFA is also involved in paddy procurement and rice distribution in the domestic rice market as part of its rice food and price stabilization policies. The NFA is the marketing agency of the government, whose goal is to ensure food security as well as provide affordable rice to consumers and remunerative profits to farmers.

Consumers

Consumers are the final users of milled rice and can either be households or institutional buyers. Institutional buyers consist of government and non-government agencies, private corporations, fast food chains, restaurants, hotels, cafeterias, and school canteens.

Enablers

Enablers are generally government, non-government organizations, and international organizations (Figure 10). Government includes national and regional agencies and local government units as well as state universities and colleges. They perform several activities in support of the rice industry. Both government and private companies help the rice value chain by providing financial and non-financial support services, transferring farming technologies, and promoting suitable farm

Table 12. Licensed grain businessmen. by major island and region, Philippines, 2015

Major island/region	Millers	Wholesalers	Retailers
		(number)	
Philippines	**8,249**	**4,052**	**61,463**
Luzon	**4,933**	**6,041**	**25,807**
CAR	170	66	1,654
Ilocos	1,318	4,052	4,102
Cagayan Valley	1,120	868	2,826
Central Luzon	713	690	4,548
CALABARZON	237	70	3,258
MIMAROPA	629	166	3,520
Bicol	746	129	5,899
Visayas	**1,616**	**526**	**15,427**
Western Visayas	664	244	4,557
Central Visayas	501	65	6,259
Eastern Visayas	451	217	4,611
Mindanao	**1,736**	**1,077**	**19,730**
Zamboanga Peninsula	365	169	1,832
Northern Mindanao	344	296	3,244
Davao Region	273	109	2,764
SOCCSKSARGEN	237	201	1,203
NCR	13	101	4,253
ARMM	29	42	1,610
CARAGA	475	159	4,824

Source: NFA, 2016

input application among farmers. The government especially plays a vital role at the farm level, undertaking R&D for varietal improvement, quality seed improvement and propagation, and promoting organic fertilizer and good agricultural practices.

C. Marketing Channels

A marketing channel is a distribution path consisting of market intermediaries involved in the movement of paddy and milled rice from the farm to the end users. These intermediaries interact with each other for paddy aggregation and processing and distribution of milled rice in the domestic market.

This section discusses marketing channels focusing mainly on the marketable surplus sold in 2014 and 2015 by sample farmers in the 20 provinces covered in the study and the portion of the paddy paid to laborers that were sold and that entered the local market. Marketable surplus of farmers was estimated at around 70% (69% in 2014 wet season and 71% in 2015 dry season). This refers to the amount available for sale by farmers that is distributed through different channels in the domestic market, excluding the amount kept for home consumption (which is usually passed to custom milling, then back to farm household consumption).

As depicted in Figure 11, rice marketing channels in the Philippines are quite complex as there are various paths that paddy and milled rice pass through before they reach consumers. For paddy, several marketing channels are available to farmers. A large percentage of marketed paddy went to paddy traders (61%) and millers (30%) on account of the high buying farmgate price. Very few sold to cooperatives (2%) and hired agents/brokers (6%). An insignificant quantity (2%) was sold to NFA and consumers. On the other hand, milled rice flows and is exchanged at multi-levels of market intermediaries before it ends up with consumers. From millers, rice passes through wholesalers, then to wholesaler-retailers and retailers, oftentimes with the engagement of brokers.

In general, there were 112 marketing channels identified in the domestic rice market. Primarily dominated by typical marketing channels with many actors from farmers to consumers, the chain is traditionally long. Noted, however, were several transformations observed in the structure of the domestic rice market with fewer actors, less interactions, and integration of functions, thus eliminating other chain actors that do not carry out value-adding activities.

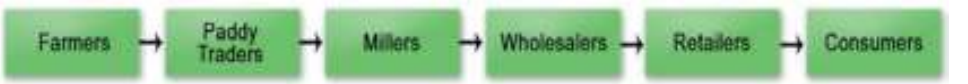
It was observed though, that many actors have already diversified and that their functions are interconnected to various segments of the value chain—e.g., rice traders buy paddy directly from farmers and sell it as milled rice in wholesale and retail markets. Majority of the miller-traders are also wholesalers and wholesaler-retailers, and there are modern miller-traders that sell rice directly to big wholesalers in urban cities such as Manila (Binondo) and Cebu City. These established big wholesalers are also supplying well-packed and labeled quality rice to supermarkets, mini-marts, and convenience stores, which implies that traditional rice retailing is now shifting toward better differentiated quality rice, great

packaging, and branding. There are also a few farmer and farmer cooperative supply chains, which are shorter, compressed, and that directly distribute to institutional buyers or households. In addition, there is the government supply chain, which is relatively shorter, represented by NFA.

Overall, the following are the top five most common channels from the survey areas, which managed the biggest percentage volume (63%) of paddy and milled rice traded in the domestic market. Accordingly, each channel accounted for approximately 27%, 15%, 8%, 7%, and 6% of the total volume flowing in the domestic rice market.

Traditional or typical channels

These channels involve greater interactions with key actors throughout the chain. Paddy and rice changed possession five to seven times from the farm to the end user, excluding the engagement of brokers both in paddy aggregation and milled rice distribution, thus making the "chain customarily long due to many actors." Generally, in this channel, the first major handler of paddy from farmers was the paddy traders, followed by miller-traders.



Miller-traders are the main outlet of paddy collected by paddy traders, thus these two actors play a major role in price formation at the farmgate level. This observation corresponds to the findings of Yorobe et al. (2005) that point to buyers usually controlling paddy price during procurement. From miller-traders, agents deal with wholesalers in the major urban markets, who assemble the processed rice and further distribute it to wholesaler-retailers; rice is then absorbed by retailers. Households are the main buyers of rice retailed in the local market. This traditional channel handled only around 8% of the total volume of paddy and milled rice traded in the domestic market. Thus, the impression that traditionally long routes dominate rice marketing channels in the Philippines is no longer valid.

A transformation in the traditionally long channels was also observed in the receding role of village paddy traders in some areas. Farmers sell directly to rice millers (or rice miller-traders), thus shortening the number of levels that paddy and milled rice pass through before it ends up with end users. This channel managed 7% of the total paddy and milled rice flowing in the domestic market. Around 30% of the farmers' marketable surplus sold in the domestic market went directly to the miller-traders (Figure 11). This can be partly explained by the credit and output market linkages between farmers and miller-traders, wherein miller-traders establish paddy output arrangements by advancing credit to farmers (cash or in kind) to secure a steady supply during harvest. The survey data showed that almost 66% of the millers or miller-traders extended credit to farmers.

Non-typical channels

Informal or non-typical channels are also becoming popular in the domestic rice market. These channels procure paddy directly from farmers, process it through custom milling services, and then sell it directly either to rice traders or consumers. The general picture that emerges in the survey area is the increase in number of the paddy cum rice trader supply chains, which accounted for the biggest percentage (27%) of the total volume of paddy and milled rice managed in the domestic market.

In this channel, from farmers, paddy flows immediately to paddy cum rice traders, then passes to custom millers for custom milling services; processed rice is subsequently sold to wholesaler-retailers and retailers before it reaches the final users. The prevalence of this channel suggests that traditional channels are now changing and moving to a transition stage, with the rise of rice traders who procure paddy directly from farmers, obtain the services of custom millers, and carry out direct sales to either wholesaler-retailers or retailers and consumers. As can be observed, there was a decline in the function of village paddy traders and millers and in the growth of custom milling service providers across the survey areas.

Another non-typical channel, which is increasing in popularity, is from farmers, paddy flows directly to paddy cum rice traders, and then moves to the custom miller; the processed rice is then sold to consumers. This market channel manages the second biggest volume of paddy and milled rice in the domestic market, accounting for 15.4% of the total traded.

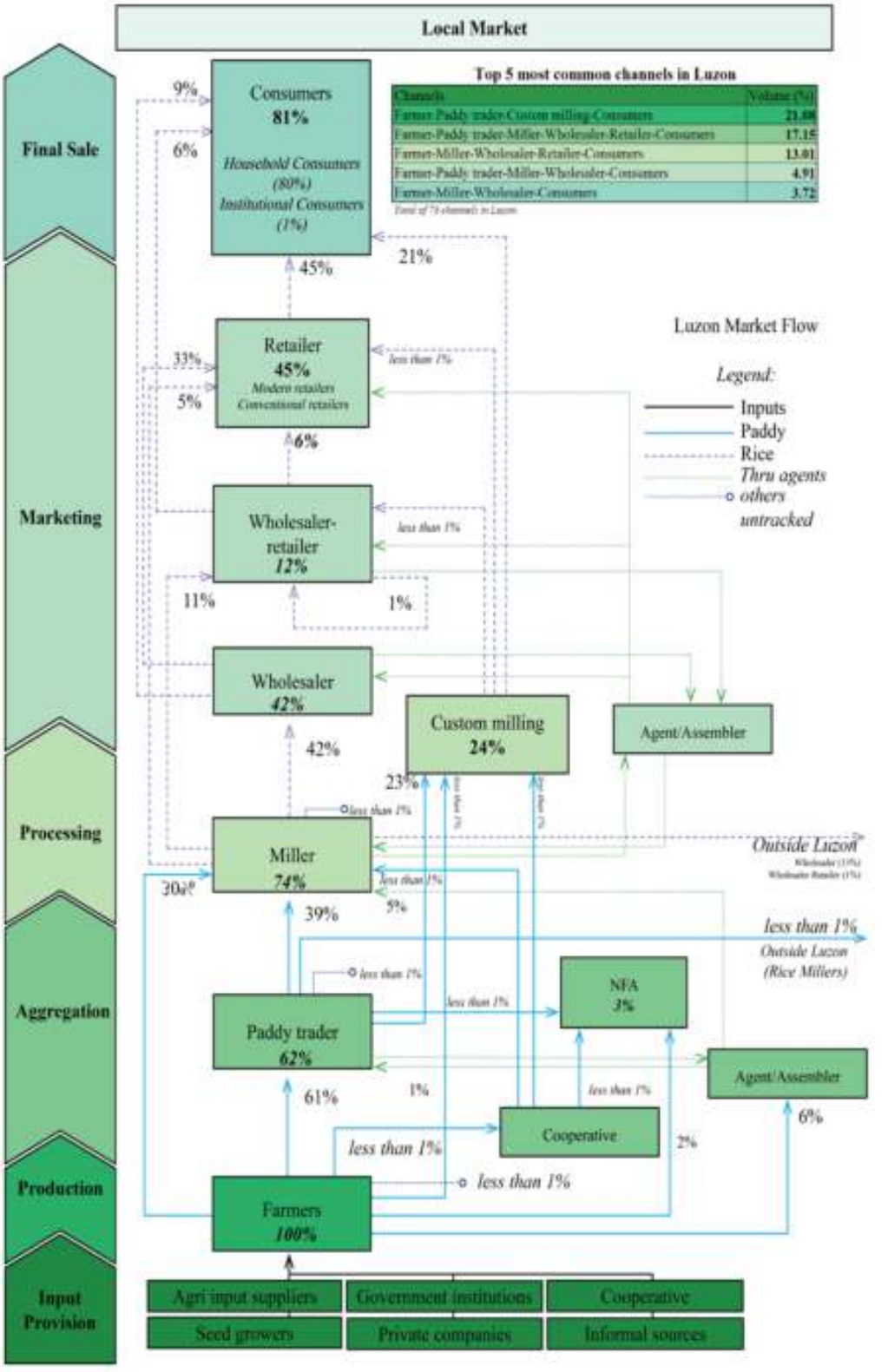


Figure 11. Paddy and rice marketing channels in the Philippines, 2015

Modern channels

Due to technological advancement, changes in market conditions, and increase in urbanization, modern rice supply chains also emerged. These modern channels are more integrated and more developed, thereby reducing the number of market intermediaries. Modern channels have large networks and capital and are capable of entering into consignment arrangements (10–15-day payment) with trading parties. Among these are the big rice miller-traders who own modern marketing facilities. Big miller-traders in Isabela, Nueva Ecija, Tuguegarao City, Iloilo City, and Davao mostly own modern rice mills. These actors are known to be more receptive to technological changes, enabling them to supply well-labelled and nicely packaged rice to reputable big wholesalers in the urban cities, and to supermarkets and large institutional buyers with which they have established linkages. Additionally, they trade rice to wholesalers and retailers in local markets, with some selling in their own retail outlets. There are 188 modern rice mills registered across Philippines in 2013 (NFA, 2015).

These modern channels carry out vertically integrated functions from input provision to paddy aggregation, milling, and rice distribution. Such vertical integration allows these chain actors to perform most of the functions in the chain to lower cost and standardize quality in order to improve their financial position in the total chain profit.

Government channel

The National Food Authority (NFA) is the sole government agency involved in the rice marketing system. The NFA supply chain is shorter than traditional channels inasmuch as there are fewer intermediaries involved. Paddy from farmers or farmer cooperatives is sold right away to NFA. It is then processed in its own mills and the processed rice is distributed to its own retail market outlets and accredited grain retailers nationwide. NFA intervenes in the rice distribution by subsidizing the retail price of milled rice, particularly for low-income consumers. Likewise, NFA procures paddy from farmers at a support price of PhP 17/kg at 14% MC plus an incentive of PhP 0.15/kg for drying and PhP 0.15/kg for trucking services, and an additional special cooperative development incentive fee (PhP 0.30/kg). However, NFA plays only a minor role in paddy procurement and rice distribution. The survey data showed that only 2% of the marketable surplus paddy of farmers is sold to NFA because of the agency's stringent requirements as well as low support paddy price. Oftentimes, paddy price offers from private traders are higher than what NFA gives so farmers prefer to sell their produce to private traders and millers.

Farmer and cooperative market channels

Farmer-cooperative and individual-farmer supply chains exist in the areas surveyed, but the number is insignificant. These supply chains are very short as farmer cooperatives or individual farmers market their product (milled rice)

directly to consumers. In these channels, farmers' cooperatives and individual farmers make incremental profit for carrying out additional value-adding activities compared to just marketing their output in paddy form. Cooperative supply chains are shorter and use fewer intermediaries. Usually, cooperatives consolidate the paddy produced by farmer-members, mill it in their own mill, then distribute it to their retail outlets, retailers, and institutional buyers.

On the other hand, very few farmers have their harvested paddy processed in rice mills that provide custom milling service and sell this milled rice to local consumers in their rented stalls at public markets. They also procure a small volume of paddy from co-farmers to ensure a stable supply. Also, there are a few exceptional farmer supply chains involving a small number of large farmers that produce paddy with premium quality; this they dry, store, subject to custom milling, and market to institutional buyers that continuously demand timely delivery in the required quantity and quality.

The inclusion of farmer cooperatives or individual farmers in the rice value chain guarantees them of higher profit. However, farmer or farmer-cooperative supply chains require not only technical, entrepreneurial, and financial management skills but also knowledge of trading relationships to ensure that buyers' requirements are met. Thus, only an insignificant number of farmers or farmers' cooperatives perform multiple value-adding activities in the chain in spite of the big profit margin.

Marketing channels in Luzon

Seventy-eight paddy and rice marketing channels were identified in the 10 provinces covered in Luzon. Surprisingly, a disintermediation of the rice value chain in the island was also notable, wherein the role of traditional village paddy traders and brokers was decreasing, and shorter supply chains with fewer actors were evolving. Figure 12 illustrates the top six most common channels as illustrated below:

The first major channel in Luzon starts with paddy coming from farmers then going to paddy traders whose millers (or miller-traders) are the main outlet. From millers, milled rice passes through long-distance wholesaler-retailers outside of Luzon. The second major channel is a little modification from the typical channel, wherein paddy passes from farmers to paddy cum rice traders through custom milling service providers to being directly marketed as milled rice to consumers such as local households and institutional buyers. This explains the better integration of functions of paddy cum rice traders, which, apart from simply carrying out rice trading, also procure paddy from farmers and have it processed to increase their profit margin. This channel manages about 21% of the total paddy and milled rice distributed in Luzon Island. The third major channel is traditionally long, involving six players before the final product reaches the consumers. It accounts for 17% of the total volume traded. However, the fourth major channel consisting of five players has a share of 13% of the total volume marketed in Luzon. It is almost similar to the third common channel, but without the village paddy traders, thus making the chain relatively shorter.

On the other hand, the fifth popular channel controls around 5% of the total volume marketed in the island. In this channel, the roles of wholesaler-retailers and retailers were eliminated. From millers, milled rice moves through wholesalers, this is then marketed to consumers. While the sixth major channel handles around 4% of the volume marketed, it is almost identical with the fifth major channel but with the removal of the village paddy traders. In this channel, farmers sell paddy directly to village millers, which also serve as wholesaler-retailers who undertake

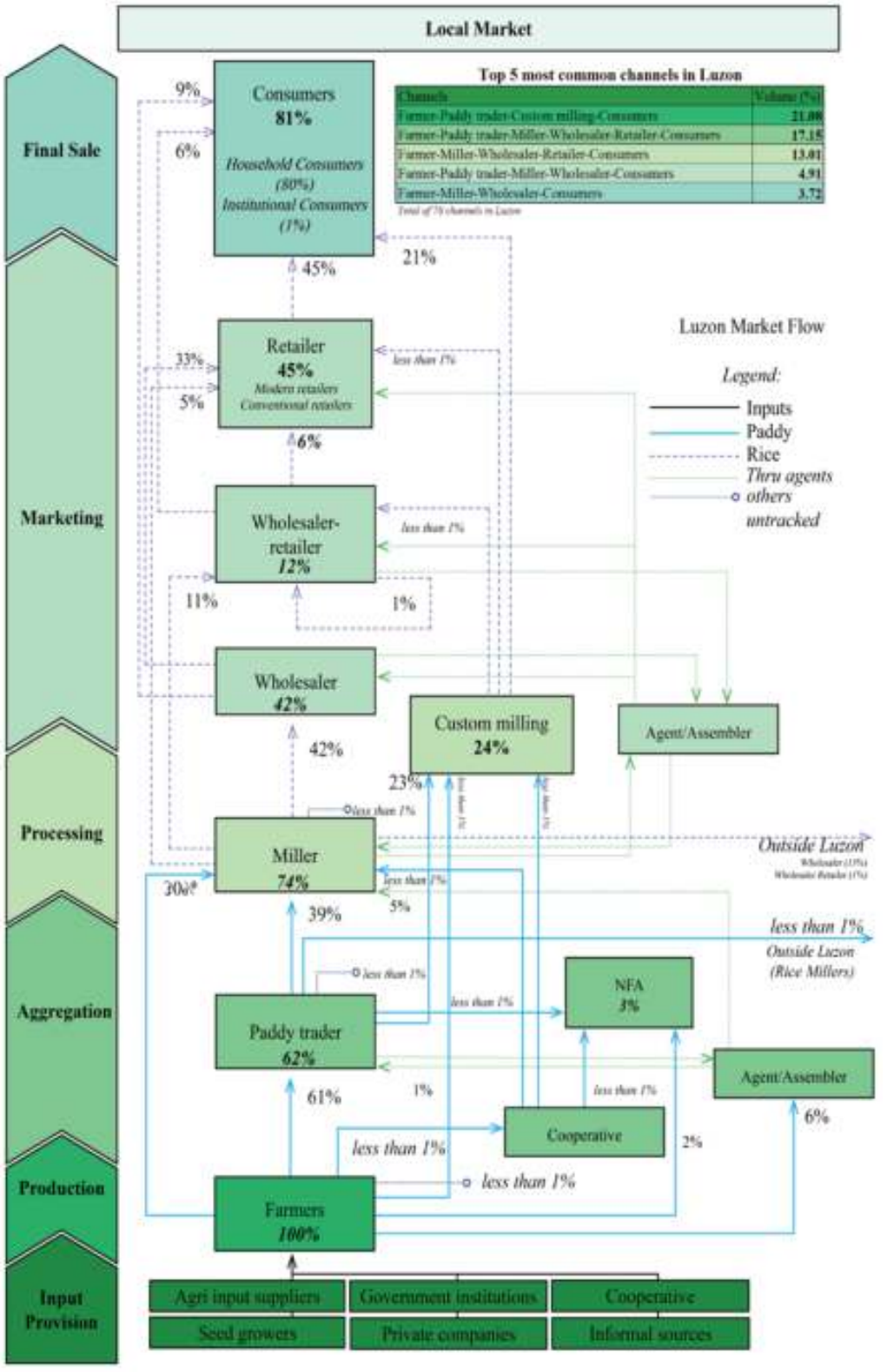


Figure 12. Paddy and rice marketing channels in Luzon, Philippines, 2015

direct selling to consumers. Millers or miller-traders in this channel are the majority, small in scale and barangay-based.

As reported by Mataia et al., (2017), the transformation from the use of traditionally long channels of many players to the rise of custom milling service providers is being observed across regions, especially in Ilocos region that is, there is a growing a reputation of paddy cum rice traders. This channel accounts for around 6% of the total volume of paddy and milled rice marketed in the region. Typical marketing channels still dominate: from farmers, paddy passes to paddy traders to millers outside the region. Similarly, from farmers, paddy passes to village paddy traders then to millers to wholesalers and wholesaler-retailers outside of the region.

In contrast, most notable in Cagayan Valley, is the fact that more than half (55%) of the paddy marketed is handled by big miller-traders, in which majority of the processed rice moves to long-distance wholesalers outside of the region. Processed rice is delivered through urban big wholesalers and wholesaler-retailers in Metro Manila, Visayas, and Mindanao. Likewise, miller-traders carry out wholesaling and retailing activities; they also sell packed and labeled rice to supermarkets and in their respective rice outlets. These miller-traders own sophisticated and modern milling facilities. In addition, as in Ilocos region, the paddy cum rice trader channel is also becoming important in Cagayan Valley. This channel manages about 15% of the total volume of the paddy and milled rice marketed. NFA handles only around 0.7%.

In Central Luzon, more than half (56%) of the paddy and rice volume is managed under the traditional marketing structure. Similar to Cagayan Valley, from farmers, paddy passes to village paddy traders to miller-traders to wholesalers, wholesaler-retailers, and retailers outside of the region. The region is a hub to several modern big miller-traders, the majority of which distribute rice to large wholesalers in Metro Manila, Cebu, Iloilo, Cagayan De Oro City, and Davao City. They also cater to large institutional buyers such as food chain companies, private corporations, and modern retailers, supplying well-differentiated quality, packed, and branded rice. Additionally, the expansion of paddy cum rice trader supply chains with relatively shorter routes is being seen in the region, which manages about one-third of the total volume of paddy and rice marketed. The increasing number of paddy cum rice traders in Central Luzon translates into the declining role of millers and the rise of custom milling service providers.

Some large miller-traders in the region are also importers, supplying rice to co-miller-traders and wholesalers. Intercity and Golden City in Bocaue, Bulacan, serve as center area for wholesalers and wholesaler-retailers in Manila and most provinces in CALABARZON. Many of the miller-traders in these areas are also licensed importers.

In MIMAROPA, typical marketing channels are more evident (farmers -> paddy traders -> millers -> wholesalers -> wholesaler-retailers -> consumers).

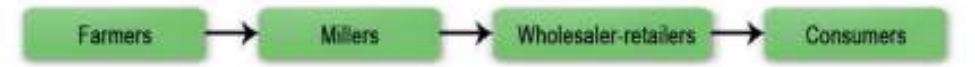
However, majority of the milled rice goes to wholesalers and wholesaler-retailers outside of the region. The shorter supply chains are also increasing, particularly with the emergence of paddy cum rice trader supply chains with diversified functions. Surprisingly, the NFA supply chain manages 6% of the paddy and milled rice marketed in the region, which means that NFA participation in the regional rice market is higher relative to the other regions.

Traditional marketing channels are very common in the Bicol region, that is, many market intermediaries get involved before the final product reaches the consumers. However, the diminishing role of village paddy traders was also observed. Farmers sell directly to millers, thus making this chain relatively shorter (farmers -> millers -> retailers -> consumers). This chain handles around 19% of the total volume marketed in the region. In this channel, village-based miller-traders procure paddy from farmers, mill it in their own small mills, then market the milled rice to local retailers for distribution to consumers in the area.

Marketing channels in Visayas

In the Visayas Island, 88 types of marketing channels were seen, typically long with many routes. The presence of agents was also common in both paddy aggregation and rice distribution, thus making the chains longer. Traditional rice value chains in the islands are notably transforming, with the increasing vertically integrated role of paddy cum rice traders. These actors in search of added value perform additional functions in the value chain. In this channel, typical pathways still exist, although the function of miller-traders has been eliminated and this group was replaced by custom milling service providers. This channel manages the biggest volume marketed, accounting for around 13% of the total (Figure 13).

The declining function of traditional village paddy traders was also noted, along with the rise of farmers selling directly to millers as well as millers performing direct sales to wholesaler-retailers, which accounts for around 10% of the total volume traded. The shortest channel involving farmers, paddy cum rice traders who paid for custom milling and consumers makes up 9% of the total paddy and milled rice marketed in the Visayas (Figure 13).



Among the regions in the island, the rice value chains in western Visayas have transformed into a less dominant traditional structure, with the evolution of vertically integrated functions of paddy cum rice traders and the rise of custom milling service providers. This channel handles the biggest volume of paddy and milled rice marketed, totalling around 40%. Likewise, shorter chains were noticed

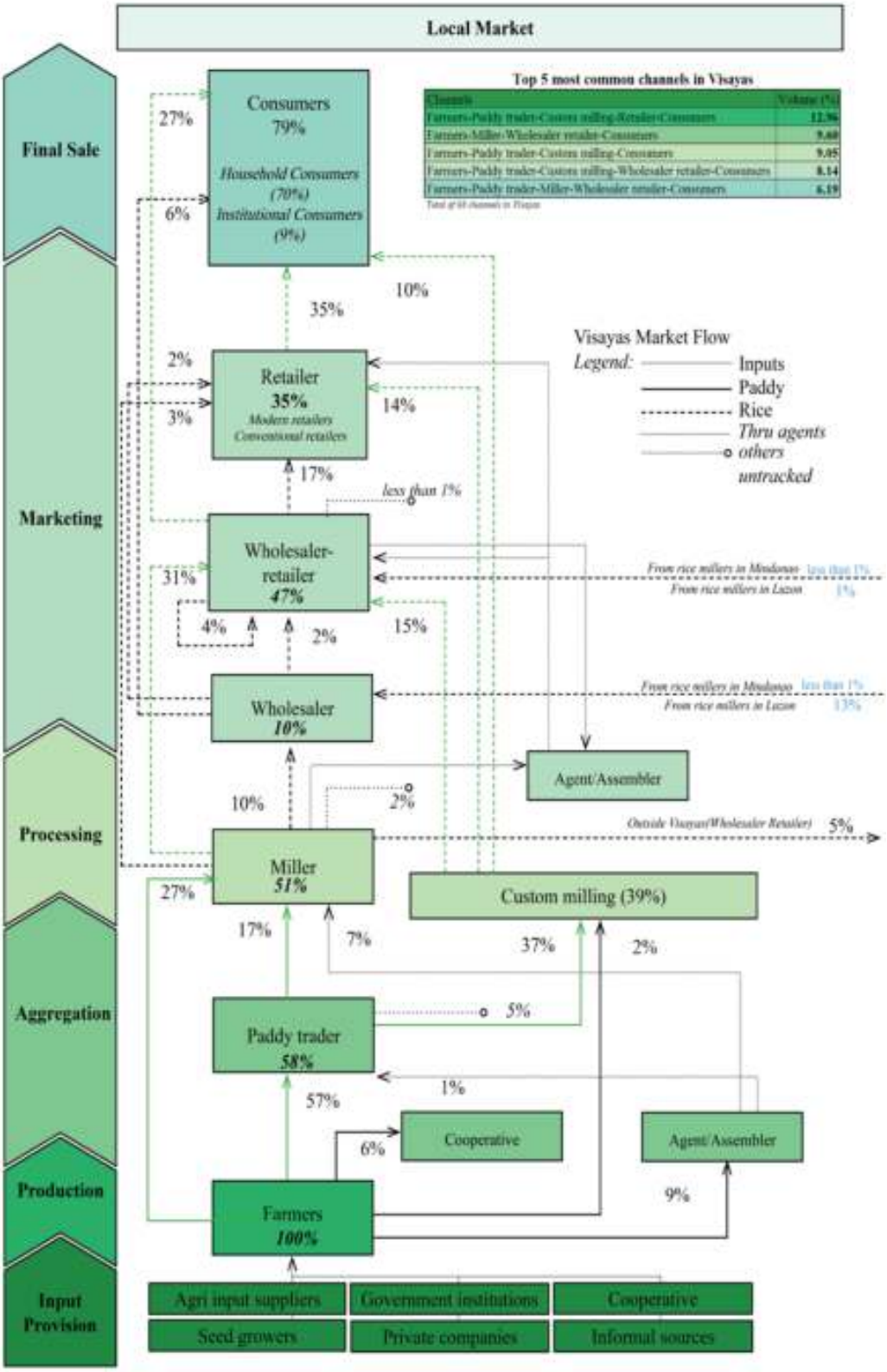


Figure 13. Marketing channels of paddy and milled rice in the Visayas, Philippines, 2015

(farmers –> millers –> retailers –> consumers) with the changing marketing practices of chain actors—that is, with the elimination of the function of paddy traders and other intermediaries. The traditionally operated channels (farmers –> paddy traders –> millers –> wholesaler-retailers and retailers) are still popular, though milled rice from miller-traders passes to wholesaler-retailers and retailers outside of the region. Thirty-three rice marketing channels exist in Western Visayas.

There are only 11 marketing channels of paddy and milled rice identified in central Visayas, which are largely controlled by traditional structures and chain actors, with little disintermediation due to the presence of a few modern rice millers. The typically long chains of many actors handle majority of the volume of paddy and milled rice traded in the region, while the emerging modern channels (Farmers –> Millers –> Wholesaler-retailers –> consumers) manage around 15%. Normally, processed rice from the modern mills moves to supermarkets, which are also owned by modern big miller-traders in Bohol.

Thirty-four marketing channels were found in eastern Visayas. The typically dominant structures of many actors are still most evident in the region, which manage the biggest volume of paddy and milled rice marketed. The most common traditional channel is farmers –> paddy traders –> millers –> long-distance wholesalers outside the region and from the millers, milled rice goes to wholesalers in Cebu City. Traditionally operated market structures are declining with the changes in marketing practices of chain actors. These transform into more dense supply chains with the participation of farmers in the rice value chains (farmers → (custom milling) –> consumers), as well as the growing vertically incorporated functions of paddy cum rice traders (farmers –> paddy cum rice traders → (custom milling) –> consumers), and farmers directly selling to millers (farmers –> millers –> retailers –> consumers), thereby removing the role of other actors in the chain.

Marketing channels in Mindanao

Currently, 68 types of marketing channels prevail in Mindanao Island. Majority of these are typical channels, with traditional structures, actors, and brokers participating in the rice value chain. A few transformations to a transitional stage were observed though. One is the diminishing role of village paddy traders as some farmers sell directly to millers and the upsurge of rice traders carrying out additional functions within the chain, which results in the growth of custom milling service providers. Farmer supply chains were also developing, but they control only a small percentage of the total marketed paddy and milled rice in Mindanao because of their insignificant number (Figure 14).

Marketing channels in Zamboanga Peninsula are still dominated by customary pathways that involve many traditional actors. However, from the millers, a big percentage of the processed rice moves to long-distance wholesalers and wholesaler-retailers outside the region. As in other parts of the Philippines, some typical channels in the region are changing with the shift in marketing

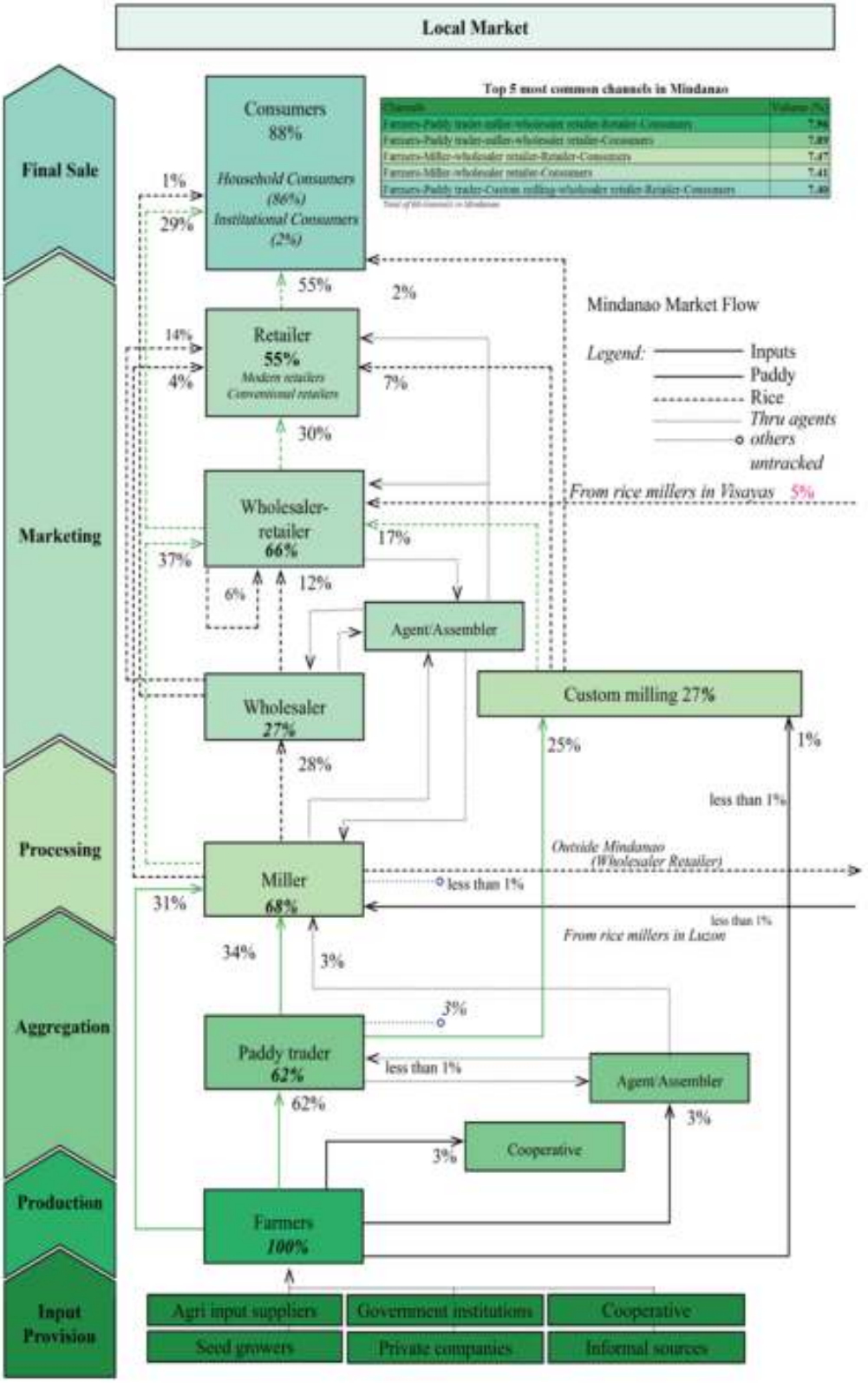


Figure 14. Marketing channels of paddy and milled rice in Mindanao, Philippines, 2015

practices of some intermediaries, thus reducing the number of actors participating in the chain. The most common of these is the vertical integration of functions of paddy cum rice traders, which handle around 15% of the total volume traded in the region, as well as the increase in number of farmers selling directly to millers, hence effectively removing the role of paddy traders.

In Northern Mindanao, there are 22 marketing channels identified with a notable growth of custom milling service providers and the emergence of shorter supply chains. Remarkably, rice marketing channels in the region are switching from a traditional to an intermediate stage, with a declining role of village paddy traders in paddy aggregation and the increase in number of farmers and paddy cum rice traders supplying rice directly to consumers. The top five most common channels in the region have already deviated from traditional market structures.

Similarly, the picture in Davao region reflects the diminishing role of traditional village paddy traders supplying paddy to millers. The top most common channel in the region is from farmers, paddy goes to paddy cum rice traders (custom milling) then milled rice passes to wholesaler–retailers, retailers and consumers, which has the largest volume of paddy and milled rice distributed throughout the regional market, accounting for 20%. The second major channel is farmers supplying paddy directly to millers (farmers –> millers –> wholesaler-retailers –> retailers –> consumers), which controls 19% of the total marketed paddy and rice in the regional rice market. The third major channel handles 13% of the volume marketed and it is almost similar to the first, except for the absence of the role of retailers in the chain. The other top five channels are virtually the same but relatively shorter (farmers –> millers –> retailers –> consumers, and (farmers –> millers –> wholesaler-retailers –> consumers). These channels control 15% and 13% of the total volume, respectively

In SOCCSKSARGEN region, 29 marketing channels were noted. The most common channel (farmers –> paddy traders –> millers –> wholesalers and wholesaler-retailers) is still characterized by traditionally long paths. However, most of the processed rice flows out to long-distance wholesalers and wholesaler-retailers in other regions. This channel handles more than half of the total volume of paddy and rice marketed. Nevertheless, it is also worth noting that the rice value chains in the region are shifting from traditional to transitional—i.e., paddy cum rice traders' functions are vertically integrated from paddy procurement to supplying rice through wholesaler-retailers and retailers, which control about 24% of the total amount traded in the regional market. Likewise, the growing number of farmers supplying directly to miller-traders is very apparent in the region, with handled volume accounting for nearly 17%.

As in the other regions in Mindanao, the customary rice value chains in CARAGA region are transforming to an intermediate phase, although the majority is still operated by typical supply chains.

D. Characteristics of Chain Actors and Functions in the Rice Value Chain

This section characterizes the key chain actors who do specific functions in various segments of the rice value chain. It discusses specific value-adding activities as the product moves along the chain and the marketing facilities available (e.g., for drying, milling, transport, storage, etc.). A value chain map (Figure 10) shows these major functions—from input provision and production, paddy aggregation, milled rice processing, and marketing or distribution to final sale to end users (consumption of final product).

Characteristics of key chain actors

Farmers

Farmers are the key actors in the production of paddy in the rice value chain. Table 13 shows that, on average, farmer respondents from the 20 sample provinces are in their 50s (53 years old), with half of their lives (25 years) spent on rice farming; 84% are married, belong to a five-member household, and have had 9 years of schooling or have almost completed secondary education. Seventy-five percent are full-time rice farmers, with 71% being members of a farmers' organization (46% of them are affiliates of irrigators' associations and 7% have joined farmers' associations). Membership in cooperatives is only 8%, with the highest percentage seen in Occidental Mindoro (27%). Majority of Mindanao farmers are members of farm organizations.

Across sample provinces, farmers in Bulacan and Davao del Sur have the highest mean age, 60 and 50 years old, respectively. This means that sample farmers are aging, and this can be partly explained by the succession problem in these provinces—i.e., most of their children opt to engage in non-farming professions. In contrast, farmers in Occidental Mindoro have the lowest mean age (47 years old), lower than the national mean age. Farmers in Leyte and Davao del Sur have longer farming experience (30 years) than their counterparts. In terms of education, many farmers in Iloilo and Negros Occidental have reached college (12 and 11 years, respectively) on average. It can also be observed that not all farmers are full time in rice farming and only in Bukidnon (97%), Mindoro Occidental (93%), and Mindoro Oriental (93%) do most farmers work full time on rice.

Market intermediaries

Market intermediaries in the rice value chain are those who perform physical marketing functions to earn profit. These include paddy traders, millers or processors, and rice traders. Rice traders consist of paddy cum rice traders, wholesalers/importers, wholesaler-retailers, and retailers.

On the average, wholesalers had the longest years in the business, engaging in wholesaling of milled rice for 23 years, whereas retailers were less experienced, spending 11 years in rice retail. Many are members in business-allied associations,

Table 13. Socio-economic characteristics of sample farmers, by province, Philippines, 2015

Item	n	Mean age (yr)	Sex (M%:F%)	Mean house-hold size (no.)	Married farmers (%)	Mean stay in school (yr)	Average farming experience (yr)	Full time in rice farming (%)	Membership in farmers' organization (%)	Type of farmers' organization (%)		
										Farmers' association (FA)	Irrigator's association (IA)	Coopera-tives
Philippines	*600*	53	81:19	5	84	9	25	75	71	7	46	8
Luzon												
Pangasinan	*30*	51	97:30	5	80	9	22	83	43	7	27	7
Cagayan	*30*	55	85:15	5	89	8	24	87	48	0	36	3
Isabela	*30*	53	87:13	4	82	9	27	68	85	0	83	2
Bulacan	*30*	60	73:27	4	80	8	25	80	40	3	23	3
Nueva Ecija	*30*	52	87:13	4	80	9	24	53	43	10	23	10
Pampanga	*30*	52	97:30	5	87	9	25	67	57	17	17	7
Tarlac	*30*	51	83:17	4	93	10	21	67	57	10	33	13
Occidental Mindoro	*30*	47	77:23	4	80	8	25	93	63	0	33	27
Oriental Mindoro	*30*	55	77:23	5	93	10	24	93	63	23	30	3
Camarines Sur	*30*	57	83:17	5	100	8	25	83	57	0	37	10
Visayas												
Iloilo	*30*	56	80:20	5	77	12	20	83	80	20	20	17
Negros Occidental	*30*	53	70:30	5	80	11	22	77	67	3	43	17
Bohol	*30*	50	73:27	5	90	10	26	53	90	0	60	3
Leyte	*30*	56	90:10	5	80	7	30	87	63	0	53	7
Mindanao												
Zamboanga del Sur	*30*	53	60:40	5	80	10	24	83	97	53	13	17
Bukidnon	*30*	51	70:30	5	77	10	25	97	97	0	83	3
Davao del Sur	*30*	59	80:20	4	67	9	30	83	100	0	67	3
North Cotabato	*30*	50	93:70	5	77	10	23	50	83	7	70	3
Sultan Kudarat	*30*	54	87:13	4	90	10	30	50	100	7	70	10
Agusan del Sur	*30*	51	83:17	5	97	8	26	60	90	0	60	17

Source: Rice value chain survey of farmers, 2015

Table 14. Business profile of market intermediaries, Philippines, 2015

Item	Processors/ millers	Paddy traders	Paddy-rice traders	Whole-salers	Wholesaler-retailers	Retailers
n	*n=107*	n=83	*n=57*	*n=36*	*n=77*	*n=66*
Average years in business	19	14	14	23	18	11
Membership in farm & business-related associations (%)	43	26	19	71	50	33
Type of association (%)						
Rice millers	50		33			
Miller-traders	18		33			
Rice wholesalers				80	15	
Grain traders/ GRECON	18		33		22	15
Rice retailers				20	63	65
FORMICA	11					
Rice processing center	4					
Paddy traders		26				
Farmers' association/ Irrigators' association		28	33			5
Cooperatives		21	33			15
Chamber of commerce & industry		7				
Pays NFA licensing fee (%)	74	71	69	100	100	100
Plans of business expansion (%)	45	52	56	33	18	35
Percentage of business expansion plan	74	95	90	100	53	89
Needs additional services to expand business (%)	92	95	56	20	36	49
Upgrading needs (%)						
Financial services	41	42	62	100	80	86
Postharvest facilities	39	34	24			10
Business permit/tax incentives	2					
Less government intervention	9					
Regulate rice importation	2	2				
Price support	2	4	5		10	
Security	2				10	
Technical assistance (training)	2	6				5
Others	4					

Source: Rice value chain survey of market players, 2015

but, surprisingly, some intermediaries are also members of farm-related organizations. Majority (71%) of the wholesalers have affiliations with business associations—80% are members of the Rice Wholesalers' Association. This was followed by retailers (50%) and millers (43%) where most are members of the Rice Retailers' Association and GRECON and Millers Association, respectively. This suggests that these market intermediaries are more horizontally integrated and have strong relationships. In contrast, paddy traders and paddy cum rice traders have the smallest percentage of membership in any business associations (23% and 19%, respectively), meaning that their connections are relatively weak. This observation can be explained by the seasonality of paddy trading; most of them operate only during harvest season. Also notable is the fact that some of them are members of farm-related associations such as cooperatives and farmers/irrigators' associations, which indicates that aside from the paddy and rice trading business, they are also engaged in rice production (Table 14).

Generally, market intermediaries get a license from NFA to meet the government requirement. This agency licenses and registers all grain businessmen for the purpose of acquiring industry information and ensuring rational distribution of the grain business for optimum utility and profitability (NFA, no date). All wholesalers, wholesaler-retailers, and retailers reported paying their licenses annually. Conversely, about one-third of the processors and paddy traders admitted not paying at all. This is especially true for the village custom millers and village paddy traders. The intermediaries also revealed plans to expand their business operation and majority asked for financial assistance, postharvest, and market facilities to upgrade their operation in order to increase efficiency and enhance competitiveness.

Functions in the Rice Value Chain

Input provision and production

Generally, rice farmers (92%) get their material inputs, particularly fertilizer and pesticides, from agricultural input stores or input dealers within the municipality. Rice seeds though were acquired from different sources, with only 34% obtained from input dealers. The high price of material inputs was one of the major constraints to farmers' easy access to inputs.

Rice farm area

Generally, sample farmers cultivated an average of 2.4 ha, majority of which is irrigated lowland. Farmers practiced two croppings a year. This average rice area is bigger than the national average of 1.41 ha, as sample selection was made in this study (farmers with marketable surplus were chosen). Based on 2011-2012 RBFHS, rice farming in the Philippines is generally small scale: more than half (54%) of the farmers cultivate an area less than 1 ha; 27% plant in 1-2 ha; 10%, 2-3 ha; and only 9% operate in fields above 3 ha. Across provinces, farmers in Oriental Mindoro have the largest mean rice area cultivated (4.39 ha), followed

by Bukidnon (4.12 ha), and Sultan Kudarat (3.82 ha). On the other hand, farmers in Bulacan have the smallest average rice area (1.50 ha). Overall, about two-thirds (69%) of the rice farms are fully owned. Rice area in Bukidnon and Agusan del Sur are majority owned as reported by 90% of the farmer respondents whereas than half in Leyte (40%) are fully owned (see Table 20).

Seed and variety selection

Variety. There are 164 unique rice varieties reported in the 20 provinces surveyed, suggesting a great diversity of varieties planted by farmers. This also explains the continuous breeding and release of new rice varieties of breeding institutions. However, farmers have reported various varieties that are not approved and released by the National Seed Industry Council (NSIC) because, oftentimes, they fail to identify the exact names of the varieties they grow. Table 15 shows the characteristics of the top 10 varieties commonly planted by farmers in the 2014 WS and the 2015 DS. NSIC Rc222 was the most planted variety, followed by NSIC Rc216, SL-8H, and NSIC Rc160.

NSIC Rc222 and SL-8H were high-yielding, medium-duration varieties with moderate resistance to brown planthoppers, green leafhoppers, and stem borers, whereas NSIC Rc216 and NSIC Rc160 were known for their premium eating quality characteristics (long grain, softer and whiter rice), high milling recovery, and moderate resistance to major pests. The latter two also command a higher price in the market because of their good grain attributes. Many farmers planted as well the early-maturing variety PSBRc10, especially during DS when water supply is limited. Some farmers cultivated the late-maturing PSB Rc18, which is resistant to disease and is tolerant of other weather stresses. Aromatic varieties NSIC Rc238 and NSIC Rc226 were also popular for their high yield and eating quality. These observations indicate that farmers adopt varieties that are high-yielding, have good grain quality, are resistant to pests and diseases, and are early-maturing and accessible. These correspond to the results of the rice-based farm household survey that listed the farmers' top reasons for choosing a variety.

The survey data also reveal that farmers' choice of varieties differed across provinces. NSIC Rc222, NSIC Rc216, and NSIC Rc160 topped the list of widely planted varieties in majority of the sample provinces. NSIC Rc222 was the most popular in Cagayan, Isabela, Pangasinan, Nueva Ecija, Tarlac, Camarines Sur, Bohol, and Leyte. PSB Rc216 was most favored in Bulacan, Pampanga, Iloilo, and Leyte, whereas NSIC Rc160 was common in Sultan Kudarat, Agusan del Sur, North Cotabato, and in most provinces surveyed.

Aromatic rice such as NSIC Rc218 was also becoming popular in some provinces. NSIC Rc218 commands a premium price comparable with that of NSIC Rc160, owing to its aroma and excellent eating quality characteristics. This implies that farmers' choice of varieties is shifting— they consider not only high yield but also high market potential or demand. NSIC Rc218 was the most adopted variety in Oriental Mindoro because it is similar to the native Dinorado variety, which is

Table 15. Characteristics of top 10 varieties planted by farmers, Philippines, 2014-2015

Rice variety	% of users	% amylose	% milling recovery	% head rice	% chalky grains	Ave. yield (t/ha)	Maturity (d after sowing)	Reaction to diseases and insect pests					
								Blast	BLB	Tungro	BPH	GLH	Stem-borer
NSIC Rc222	18.7	24	68	47	31.6	6.1	114	I	I	S (I)	MR	MR	MR
NSIC Rc216	7.8	20	69	52	9.5	6.0	112	S	I	S (S)	MR	MR	-
SL-8H	6.1	-	-	-	-	-	-	-	-	-	-	-	-
NSIC Rc160	5.2	16	71	43	4.9	5.6	107	I	I	S (S)	MS	I	-
PSB Rc10	4.8	24	63	39	1.9	4.1	106	I	I	S (S)	MR	MR	R
PSB Rc18	3.3	22	66	42	3.4	5.1	123	I	I	I	I	I	MS
NSIC Rc224	2.7	19	65	44	17.0	5.8	111	I	S	S (S)	MR	MR	-
PSB Rc82	2.5	22	70	45	5.0	5.4	110	R	I	S	I	MS	I
NSIC Rc226	2.2	19	68	39	23.3	6.2	112	S	S	S (S)	MR	MR	-
NSIC Rc238	2.2	21	70	54	13.8	6.4	110	0	0	0	0	0	0

Sources: Rice value chain survey of farmers, 2015; and PhilRice, 2015.
S = susceptible; R = resistant; MS = moderately susceptible; MR = moderately resistant; I = intermediate; BLB = bacterial leaf blast; BPH = brown planthopper; GLH = green leafhopper.

widely known in the province. PSB Rc10 was the most planted in Davao del Sur; it was NSIC Rc238 in Bukidnon, and PSB Rc82 in Occidental Mindoro. The adoption of hybrid varieties such as SL-8H, Bigante Plus, and PHB varieties (73,77, and 79) was also observed across provinces. Farmers were also moving toward growing hybrid rice with consistently high yield.

Seed class. Inbred seeds are categorized into five classes: breeder, foundation, registered, certified, and good seeds. In this study, farmers were asked only if they used certified, good, and farmer seeds, as well as hybrid seeds. Certified seeds (CS) were produced from the registered seed by accredited seed producers, and distributed to farmers for commercial production. CS carries a blue tag from the National Seed Quality Certification Services (NSQCS). Good seeds maybe produced by farmers from the CS or from candidate varieties whose characteristics already meet the standards of NSIC. They were produced from varieties not yet approved by the NSIC and meeting the prescribed standards by the certifying agency. Farmers' seeds were repeatedly planted either by the farmer or other farmers or they did not undergo seed selection and management practices. Hybrid seeds were the product of crossing male and female "parent" varieties. (for example, Mestizo 1, Bigante, SL-8H, etc.).

Most of the sample farmers acquired seeds through the formal seed system. Only a few (14%) used informal seed sources (own-saved seed and exchanged seed from co-farmers). Overall, more than half of the sample farmers used CS, 63% during WS and 55% during DS. Hybrid seed users accounted for 12% and 17% during WS and DS, respectively. These adoption rates are higher than the RBFH survey results in 2011-2012, implying that farmers' use of hybrid and CS has been steadily increasing over the years. This can be credited to the proven yield advantage of these quality seeds as this trait has influenced the farmers' decision to adopt a specific technology. On the other hand, only a few of the sample farmers used good seeds (16% in WS and 15% in DS) and farmers' seeds (11% in WS and 14% in DS) as presented in Table 16. Basically, the reasons for not using quality seeds were the high price, the possibility of seed mixture, and the poor germination rate of some CS.

Adoption rates, by seed class, also varied among the provinces. Majority of the farmers in the surveyed provinces in Luzon used CS during WS. High adoption rates of CS were observed in Nueva Ecija, Pampanga, and Tarlac (80-86%) Notably, none of the sample farmers in Nueva Ecija adopted good and farmers' seeds in the WS, thus enabling the province to get the highest yield. During 2015 DS, some farmers shifted to hybrid seed and CS adoption plunged. Hybrid adoption rates were high in Nueva Ecija (52%), followed by Mindoro Oriental (40%), Mindoro Occidental (30%), Bulacan (23%), and Cagayan (17%) (Table 16).

Table 16. Adoption rate (%), by seed class and by province, Philippines, 2014-2015

Province	2014 WS				2015 DS			
	Hybrid seed	Certified seed with tag	Good seed	Farmers' seed	Hybrid seed	Certified seed with tag	Good seed	Farmers' seed
Philippines	**10**	**63**	**16**	**11**	**18**	**55**	**15**	**12**
Luzon								
Pangasinan	3	70	10	17	7	73	10	10
Cagayan	17	70	13	0	17	70	13	0
Isabela	9	72	12	7	0	76	15	8
Bulacan	0	70	20	10	23	57	13	7
Nueva Ecija	20	80	0	0	52	38	10	0
Pampanga	7	80	10	3	14	72	7	7
Tarlac	0	86	7	7	10	79	7	3
Mindoro Occidental	10	50	37	3	30	50	13	7
Mindoro Oriental	20	63	10	7	40	40	10	10
Camarines Sur	7	60	7	27	7	47	23	23
Visayas								
Iloilo	13	50	33	3	13	40	40	7
Negros Occidental	3	57	33	7	7	43	33	17
Leyte	7	53	27	10	13	50	17	17
Bohol	30	30	7	33	53	14	10	23
Mindanao								
Zamboanga del Sur	10	80	0	10	7	80	0	13
Bukidnon	0	34	45	21	0	28	45	28
Davao del Sur	7	63	13	17	13	57	10	20
North Cotabato	0	73	4	23	0	73	3	23
Sultan Kudarat	0	62	14	24	3	60	13	23
Agusan del Sur	27	45	21	7	18	61	11	11

Source: Rice value chain survey of farmers, 2015

In the sample four provinces in the Visayas, adoption rate was also high for CS (50-57%), except for Bohol during WS. Adoption of hybrid seed ranged from 3% to 30%, with Bohol registering the highest adoption rate (30%) and Negros Occidental the lowest (3%). However, adoption rate of CS dropped during DS as some farmers moved to hybrid seed and others opted to use non-quality seeds such as own-saved seeds (Table 16).

In Mindanao, CS adoption was also high in both seasons in all sample provinces, except in Bukidnon where two-thirds of the farmers reported using good and farmers' seeds. Hybrid seed was also not adopted in Bukidnon and in North Cotabato, partly due to the location specificity of hybrid seeds (Table 16).

Land and seedbed preparation

In general, land preparation in the Philippines is mechanized, with majority (90%) of the sample farmers using tractors and 10% using man-animal power. Land preparation is done to provide favorable soil conditions for crop growth and development. It consists of several sub-activities before the rice crop is established. These involve cutting or spraying of grass on ditches and fields, rototilling, plowing, harrowing, leveling, side plowing, ditching, and cleaning and repair of dikes. In the irrigated areas, land preparation is carried out upon the release of irrigation water from the irrigation systems. In rainfed areas, farmers start preparing the land at the onset of the rainy season during WS, whereas this activity is performed immediately after the WS harvest during DS due to water constraints. Most often, seedbed preparation is also done during land preparation. The wetbed method is common while the dry seedbed method is practiced by some farmers with limited water supply.

The practices in land preparation included two passes of plowing, two passes of harrowing, leveling, and side plowing using two-wheel tractors. Few farmers used carabaos for leveling and side plowing. Leveling was done to ensure uniform water distribution and less water requirements. Quite a few farmers (17% in WS and 11% in DS), particularly those in Luzon, used four-wheel tractors for the first plowing (rototilling); two-wheel tractors were then used for the other activities. Two-wheel tractors are commonly used in Luzon and the Visayas, while floating tillers ('bao-bao') are popular in the Mindanao provinces. Around 35% of the sample farmers used their owned tractor in land preparation while 65% engaged in custom hiring with terms of payment varying, depending on the province.

Overall, 9-10 mandays (md) were devoted to land preparation on the average, a considerably higher number compared with our neighboring rice-producing countries (Vietnam 2.4 md/ha, Thailand 1.8 md/ha) due to the widespread use of small tractors in contrast to the use of four-wheel tractors in Vietnam and Thailand. Land preparation was largely done by hired labor (78%) and operator, family, and exchange (OFE) labor (22%). Hired labor consists of farm workers who are hired on a daily basis and paid with wages or those on contract or crop share basis and paid in cash or in kind. High labor and power cost, unavailability of laborers and machinery during peak farm operations, and insufficient water supply are some of the constraints that farmers face in their land preparation operation.

Across the sample provinces, majority went to custom service providers for land preparation activities because less than half of the farmers surveyed (particularly those in Visayas and Mindanao) owned tractors. Nevertheless, in Luzon, many farmers owned tractors, with the biggest percentage seen in Cagayan

(67%), Occidental Mindoro (63%), Oriental Mindoro (53%), Camarines Sur (50%), Pampanga (47%), Isabela (45%), and Nueva Ecija (43%). Moreover, the share of hired labor to total source of labor was high and hardly differed by province, which was high in North Cotabato (96%) and Bulacan (93%) and low in Mindoro Occidental (43%). The higher rate of hired labor can be partly attributed to aging farmers (see Table 13), availability of large rural landless workers, and many labor-deficit farm households.

Crop establishment and seed use

Farmers practice two crop establishment methods: transplanting and direct seeding. Transplanting was more laborious, using 21 md/ha for activities such as pulling and hauling of seedlings, transplanting, and replanting. In contrast, only around 2 md/ha was spent on direct seeding. Crop establishment is one of the most laborious operations in rice production (30% of total labor use) and this is attributed to the practice of transplanting. As shown in Table 17, most farmers practiced manual transplanting in both seasons (69% WS and 66% DS), whereas 31-34% of the farmers performed direct seeding. Of these farmers, only 0.13% employed drum seeders in broadcasting the seeds. In majority of the sample provinces, transplanting was also followed in both seasons. However, all farmer-respondents in Cagayan, Bohol, Leyte, and Zamboanga del Sur practiced transplanting technique. In contrast, direct seeding method was popular in Camarines Sur.

Overall, average seed usage rate was lower in transplanting (61 kg/ha) than in direct seeding (110 kg/ha). These seed utilization rates were higher than the recommended rates of 40 kg/ha for transplanting and 80 kg/ha for direct seeding. Farmers applied high seeding rates for purposes of replanting missing hills and combating the incidence of golden apple snails (GAS). Likewise, many farmers believed that high seed usage translates into high yield. Among the surveyed provinces, seed usage rates were higher than the recommended rates, except in provinces such as Bohol, Zamboanga del Sur, and Cagayan. Farmers in these places rigorously used the recommended rates. The other farmers were aware of the standard protocol but they opted to deviate from it because of the prevalence of snails and birds in their specific areas. The provinces with the highest seed utilization rates were Negros Occidental and Bukidnon (2-2.5 bags/ha for transplanting and 4-5 bags for direct seeding) (Table 17).

Two-thirds of the sample farmers used one to two seedlings per hill for transplanting, as majority believed that this practice would reduce seed utilization rate and cost of seeds and result in good tillers with better crop growth. The rest (25%) just relied on the usual custom of planting with transplanters. Transplanting was mostly carried out by hired labor, while direct seeding was done by permanent hired and OFE labor.

Table 17. Adoption rate and seed use, by crop establishment and by province, Philippines, 2014-2015

Province	Adoption rate (%)				Seed use (kg/ha)			
	2014 WS		2015 DS		2014 WS		2015 DS	
	Trans-planting	Direct seeding	Trans-planting	Direct seeding	Trans-planting	Direct seeding	Trans planting	Direct seeding
Philippines	**69**	**31**	**66**	**34**	**63**	**114**	**59**	**105**
Luzon								
Pangasinan	86	14	83	17	71	130	73	108
Cagayan	100	0	100	0	44	-	44	50
Isabela	78	22	79	21	67	113	67	117
Bulacan	43	57	27	73	74	109	86	116
Nueva Ecija	90	10	83	17	70	107	70	96
Pampanga	53	47	50	50	72	129	80	119
Tarlac	87	13	90	10	84	88	84	107
Mindoro Occidental	93	7	83	17	78	95	75	97
Mindoro Oriental	57	43	50	50	78	117	79	112
Camarines Sur	10	90	10	90	87	93	47	97
Visayas								
Iloilo	43	57	40	60	80	125	77	125
Negros Occidental	40	60	37	63	93	173	104	163
Leyte	97	0	94	3	56	-	57	40
Bohol	100	0	100	0	40	-	40	-
Mindanao								
Zamboanga del Sur	100	0	100	0	42		42	
Bukidnon	31	69	28	72	88	163	92	158
Davao del Sur	80	20	77	23	48	109	47	96
North Cotabato	53	47	57	43	66	79	65	80
Sultan Kudarat	23	77	20	80	69	86	83	82
Agusan del Sur	62	38	66	34	53	71	56	68

Source: Rice value chain survey of farmers, 2015

Seedling care and management

Most farmers transplanted the seedlings at 21-25 days. However, other farmers favored 30-day-old seedling (30 days) since the younger seedlings are prone to snail infestations. To ensure healthy seedlings, farmers applied fertilizer and sprayed pesticide on the seedbed when necessary. More than half (54%) of the farmers did apply fertilizer and pesticide at least once.

Fertilizer use and nutrient management

Overall, farmers applied fertilizers across ecosystems using an average of 6.23 bags/ha during WS and 6.74 bags/ha during DS. The relatively bigger amount of fertilizer applied in the DS implies that farmers knew that yield response to fertilizer is high in DS due to high solar radiation. In addition, crop and fertilizer losses were less in DS due to favorable weather conditions. These fertilizer application rates were higher compared with what the RBFHS (2012) found (5.04 bags/ha in WS and 5.16 bags/ha in DS), which means that application rates of farmers have been increasing gradually through the years. However, these rates are still beyond the optimum level or below recommended rates. The high price of fertilizers prevented farmers from applying the required amounts of fertilizers.

Almost all farmers preferred inorganic fertilizers over organic ones. The most commonly used fertilizer grades were urea (45-0-0), complete (14-14-14), 21-0-0 (ammonium sulfate), and 16-20-0. Other fertilizers such as 0-0-60 and 17-0-17 were also applied in small quantity. Organic fertilizers (foliar, crop giant) were also used but in small amounts. Farmers did one to four applications, but majority (62%) applied fertilizers twice: the first application during early vegetative stage (10-15 days after direct seeding or transplanting), and the second, during maximum tillering (16-45 days). Only 11% of farmers applied during panicle initiation stage. About 20% of farmers applied only once. Majority used calendar-based fertilizer application or utilized lessons learned from training, while the others relied on their own experience and the appearance and color of the paddy crop.

Basal application (before planting or direct seeding) was not commonly practiced by farmers. Moreover, adoption of nutrient-management-related technologies and practices was still low, as revealed by the RBFHS in 2011-12—only 3-5% farmers adopted the minus one element technique (MOET) and 6-12% used the leaf color chart (LCC). Additionally, farmers who performed basal application of fertilizers comprised only 26-30%, while only 24-28% applied organic fertilizer. The low adoption of these technologies may be due to several factors: the technology is too complex for most farmers who want to keep things simple; the MOET and LCC are not available in agricultural input stores; and they are laborious and costly due to the large volume of organic fertilizer that had to be applied. Dissemination of these technologies and practices must be intensified to make them more accessible to farmers and thus enable them to improve their nutrient management practices. These technologies should be made available as

well in agricultural input stores and LGU offices. Many farmers are still not aware of these nutrient management technologies.

Among the provinces surveyed, fertilizer application was highest in Negros Occidental and lowest in Leyte. In spite of the high fertilizer rates in Negros Occidental, no big yield increase was seen since its yield level was lower than those in provinces that applied less fertilizer. It can also be noted that, in almost all provinces, fertilizer application rates were relatively higher in DS than in WS however, a significant difference was only observed in Bulacan and Nueva Ecija (Table 18). The basic reasons for the bigger amount of fertilizers applied were the higher yield response to fertilizer during DS (owing to higher solar energy) as well as less risk of crop loss in this season compared with WS where extreme weather stress occurs (Moya et al., 2015),

Table 18. Fertilizer application rates (bags/ha), by season and by province, Philippines, 2014-2015

Province	2014 Wet season	2015 Dry season
Philippines	**6.23**	**6.74 ****
Cagayan	4.77	5.54
Isabela	6.78	7.17
Pangasinan	4.46	5.30
Bulacan	5.47	6.70 *
Nueva Ecija	5.71	8.05 **
Pampanga	6.11	7.18
Tarlac	7.28	7.42
Occidental Mindoro	6.38	6.42
Oriental Mindoro	8.04	8.29
Camarines Sur	5.47	5.75
Iloilo	5.53	5.63
Negros Occidental	11.73	12.08
Bohol	6.77	6.77
Leyte	4.07	4.03
Zamboanga del Sur	4.87	4.47
Bukidnon	8.04	8.82
Davao del Sur	7.38	7.62
North Cotabato	5.04	5.46
Sultan Kudarat	4.57	4.72
Agusan del Sur	6.63	6.9

*, ** Significant at 10% and 5%, respectively;
Source: Rice value chain survey of farmers, 2015

Pest and weed management

Based on RBFHS data (2012), pests and diseases ranked second in the top five problems in rice farming. Oerke et al. (1994) state that yield losses attributed to pests account for 15-25%, hence farmers traditionally use chemical control methods to manage pests and diseases. Chemical control was popular because of its simplicity, versatility, effectiveness, and availability. Only a very few farmers resorted to non-chemical control. Majority of them used it whenever pest problems were observed. However, there were also those who sprayed even without pest problems as a preventive measure, especially with respect to herbicides that are applied before weed emergence.

In general, sample farmers used several forms of pesticides, either in liquid or powder form, in both seasons. About four to five types of pesticides were applied, which consist of herbicides, insecticides, fungicides, rodenticides, and molluscicides. The most commonly sprayed was insecticide as reported by 85-86% of farmers, followed by herbicide (70-73%), which was usually applied during pre-emergence in the main field. The least applied was fungicide (11-16%).

Table 19 presents the rate and amount of pesticides used (active ingredient [ai]), by type and season. Application rates were notably higher for herbicides (32 kg ai/li/ha in WS and 40 kg ai/li/ha in DS) because they are normally applied in the whole area. Herbicides also substitute for manual weeding because they are easy to use and are less expensive, considering that farm wage rates are rising. The high rates of herbicide application can also be associated to the practice of direct seeding by around one-third of the sample farmers. Insecticide application rates ranked second inasmuch as it is sprayed in the main field with and without insect occurrence. Rodenticide application rates were minimal since many farmers chose non-chemical application and rats were not a major problem in rice fields.

Table 19. Pesticide rate application, by season, Philippines, 2012

Pesticide	WS (kg ai/li/ha)	DS (kg ai/li/ha)
Insecticides	0.25	0.23
Herbicides	0.32	0.40
Fungicides	0.11	0.06
Molluscicides	0.16	0.02
Rodenticides	0.03	0.05

Source: Siddayao J. et al. (2016)

Application rates also differed by season, except for insecticides, where application rates were almost the same. Variations in application rates could be attributed as well to differing incidences of pests and varying pest management approaches of farmers. For herbicides, the high application rates during DS can be explained by constraints in water supply, especially in rainfed areas, whereas the high fungicides rates during WS can be associated with extreme water rainfall

that attracts fungal diseases such as blast and blight. High molluscicide application rates were noted in WS due to the high incidence of GAS. Siddayao J. et al. (2016) list the most commonly used AI: 2,4-D IBE (herbicide), cypermethrin (insecticide), copper hydroxide (fungicide), difenoconazole + propiconazole (fungicide), niclosamide ethanolamine salt (for GAS), and zinc phosphide (for rats).

Harvest management

On the average, labor use in harvesting and threshing was around 20 md/ha. It is one of the two most labor-intensive operations in rice production, contributing the largest share (31-32%) to total labor use. This is attributed to the common practice of manual harvesting and threshing using small axial threshers. However, this practice was progressively being replaced by the combine harvester as the latter is now being widely adopted nationwide. Custom hiring of combine harvester is becoming popular owing to the economic benefits that the machine offers (i.e., greater labor and cost efficiency). A study by Arida et al. (2016) reported that the use of a combine harvester requires only around 2-5 md to finish a hectare of paddy. It also ensures timeliness of harvesting, thus preventing significant grain losses by around 2.2% (Mataia et al., 2016) due to fast recovery of the threshed paddy grain within the day compared with the traditional practice of manual harvesting and use of axial thresher in threshing. Furthermore, it addressed the labor shortage problem during harvesting times. However, the use of combine harvesters reduced paddy price by an average of PhP1.00/kg because the paddy contains high moisture content and lots of impurities as reported by farmers, paddy traders, and miller-traders.

Paddy production, yield, and marketable surplus

The farmers' average gross harvest amounted to 11,202 kg or 224 sacks (at 50 kg/sack) per cropping. Mindoro Oriental recorded the highest, 26,367 kg (527 sacks), followed by Bukidnon, 18,162 kg (363 sacks). Bulacan registered the lowest average harvest with only 6,868 kg (137 sacks) as this province had the smallest area harvested. The higher production in Mindoro Oriental and Bukidnon could be attributed to the relatively larger rice area harvested (Table 20).

On a per-hectare basis, average yield was 5,069 kg (Table 20). Farmers in Luzon were the most productive, with yield levels above overall yield (except Camarines Sur). Farmers in Nueva Ecija boasted about their highest yield (6,002 kg/ha), which can be due to the presence of the Pantabangan and Casecnan dams and the province's proximity to PhilRice, ensuring easy access to irrigation water and the latest rice technologies. In contrast, farmers in the Visayas got low yields, with Bohol obtaining the lowest (3,495 kg/ha). In Mindanao, three of the provinces showed remarkable yield levels, while another three had yields below the overall average. Davao del Sur farms enjoyed the highest yield (5,784 kg/ha) and Bukidnon farms had the lowest yield of 4,586 kg/ha.

Not the entire paddy produced by the farmers was sold in the market. Farmers distributed their harvested paddy to landlords as rent, to harvesters and threshers as shares, to laborers and creditors as payment, and the rest, kept for home consumption, seeds and feeds, given away, or used as irrigation fee. The harvesters/threshers' share was 12%; followed by home consumption, 9%; payment to laborers, 5%; payment to landlord, 2%; and for seed keeping, 1%. About 2% was used to pay creditors and cover the irrigation fee and the rest, given away. What is left is the marketable surplus, which is the quantity available for sale. Marketable surplus comprised the largest share of the farmers' paddy distribution, at an average of 70% of the total harvest. This suggests the farmers' highly commercialized endeavors, with marketable surplus rates higher than that found by Mataia (2013), which was only around 50% on the average. Among the provinces surveyed, Mindoro Oriental had the largest percentage of marketable surplus (89%), while Pampanga had the smallest (56%). The relatively low marketable surplus in Pampanga can be partly explained by the relatively high harvesters/threshers' share and the large amount kept for home consumption (Table 20).

Upon harvest, farmers solicit multiple price bids from different market intermediaries and decide where they will sell their produce. About 71% of the farmers sold paddy in fresh form because they have limited access to postharvest facilities, and have immediate need for cash to pay their crop production loan. Majority of the freshly threshed paddy was picked up by buyers from sites near the farms that are accessible to four-wheel vehicles. On the average, 42% of the farmers did a canvass to seek better prices, usually talking to three buyers before making a decision. Quality, which is determined by percentage MC of paddy, and the prevailing price were the major factors considered by buyers in price determination. Farmers reported that the buyers (paddy traders, miller-traders) set the buying price of paddy, which means that buyers have control of the price at the farm level. Farmers also have better knowledge of the market, with more than half (57%) of them relying on paddy traders for information on prevailing paddy price. Only a small percentage depended on co-farmers, cooperatives, and NFA for price formation.

In most provinces, majority of the sample farmers preferred to sell to paddy traders and millers as they bought in fresh form, did the picking up in the field, and paid cash on delivery. Only in Leyte and Mindoro Occidental did most of the farmers sell paddy in dried form. The aim is to avail of the incentive of drying paddy, where farmgate price is higher than the price of the fresh form. In Mindoro, this can also be explained by the relatively bigger percentage of farmers selling to NFA, which prefers dried paddy. NFA participation in paddy procurement in the province was about 50-55% of total paddy production (Evelyn Paje-Sy, senior economist, NFA, Mindoro Occidental, pers. commun.).

Table 20. Paddy area, production, and disposition of sample farmers, by province, Philippines, 2015

Item	*n*	Average rice area operated (ha)	Rice farm owner-ship (%)	Average area har-vested (ha)	Ave. gross harvest (kg)	Mean yield (kg/ ha)	Production Disposition (%)									
							Land rent	Harves-ter's share	Thre-sher's share	Paid to permanent laborer + other laborers	Kept for seeds	Given away	Kept for home consum-ption	Paid to creditor	Irriga-tion fee	Marketa-ble surplus
Philippines	**600**	**2.4**	**69**	**2.21**	**11,202**	**5,069**	**2.35**	**7.15**	**4.62**	**4.64**	**0.91**	**0.65**	**8.78**	**0.64**	**0.20**	**69.91**
Luzon																
Pangasinan	30	1.64	57	1.62	9,518	5,436	3.35	7.01	3.94	1.00	0.52	0.30	9.19	1.35	0.06	73.28
Cagayan	30	2.15	69	1.95	10,334	5,221	2.41	8.54	7.11	3.39	0.08	1.34	9.36	0.73	0.38	66.65
Isabela	30	1.76	65	1.66	9,216	5,746	3.58	6.97	3.2	7.95	0.64	0.37	7.60	2.17	0.48	67.04
Bulacan	30	1.5	50	1.36	6,868	5,137	4.51	9.85	3.93	3.66	1.39	0.90	13.09	0.40	0.00	62.29
Nueva Ecija	30	1.83	77	1.89	11,197	6,002	0.99	8.97	3.08	5.44	0.07	1.00	8.25	1.18	0.00	71.02
Pampanga	30	2.7	60	2.32	11,394	5,123	3.21	10.79	6.7	5.34	0.50	1.40	14.32	0.84	0.03	56.88
Tarlac	30	1.76	83	1.73	8,850	5,160	1.68	7.02	4.65	5.09	0.29	0.70	9.84	0.07	0.00	70.66
Mindoro Occ.	30	2.94	87	2.66	14,105	5,386	0.5	7.32	0.22	7.64	1.20	0.58	8.60	1.64	0.76	71.53
Mindoro Or.	30	4.39	83	4.39	26,367	5,562	1.34	0.4	1.23	1.40	0.90	1.03	4.64	0.00	0.04	89.01
Camarines Sur	30	1.92	50	1.87	8,070	4,241	5.65	8.43	2.88	1.47	2.45	0.42	10.93	0.06	0.00	67.71
Visayas																
Iloilo	30	3.00	47	2.95	11,918	4,040	3.5	4.41	2.05	1.43	1.67	0.73	7.79	0.03	0.02	78.36
Negros Occidental	30	2.22	70	2.22	9,951	4,484	4.3	5.92	2.36	1.44	1.96	0.61	8.97	0.04	0.01	74.37
Bohol	30	2.25	50	2.00	6,976	3,495	4.57	6.42	2.47	1.45	2.06	0.57	9.36	0.05	0.01	73.04
Leyte	30	1.92	40	1.39	5,834	4,187	4.03	5.42	2.26	1.44	1.87	0.65	8.57	0.04	0.02	75.70
Mindanao																
Zamboanga Sur	30	2.46	73	2.46	12,256	4,982	4.22	5.76	2.33	1.44	1.93	0.62	8.84	0.04	0.01	74.81
Bukidnon	30	4.12	90	3.96	18,162	4,586	4.24	5.8	2.34	1.44	1.94	0.62	8.87	0.04	0.01	74.70
Davao Sur	30	2.21	83	1.89	10,933	5,784	4.2	5.73	2.32	1.44	1.93	0.63	8.82	0.04	0.01	74.87
North Cotabato	30	1.84	87	1.84	9,026	4,905	4.22	5.76	2.33	1.44	1.93	0.62	8.84	0.04	0.01	74.79
Sultan Kudarat	30	3.82	80	2.80	15,487	5,531	4.21	5.75	2.33	1.44	1.93	0.62	8.83	0.04	0.01	74.83
Agusan del Sur	30	2.53	90	1.99	10,834	5,444	4.17	5.67	2.31	1.44	1.92	0.63	8.77	0.04	0.02	75.04

Source: Rice value chain survey of farmers, 2015
Note: Numbers are average of two cropping seasons

Paddy aggregation

After paddy is harvested, it moves to the aggregation segment of the rice value chain. Aggregation refers to the collection and consolidation of paddy from farmers from different rice production areas with different harvest months. Most of the time, this function happens immediately after the paddy harvest. The market players involved in paddy aggregation are aggregators, consisting primarily of paddy traders (located within and outside the province) whose primary activity is paddy trading. In addition, other players are involved: independent rice traders (paddy cum rice traders), paddy agents hired by traders and miller-traders, farmer cooperatives that buy paddy from their members; and miller-traders who also procure directly from farmers and process paddy in their own mills. The NFA also aggregates paddy, which it buys from farmers and cooperatives. However, it does not sell paddy but mills it and distributes the milled rice in the local market.

Marketing practices of paddy aggregators

Many of the market intermediaries availed of services of agents to contact suppliers of paddy. More than half of the millers (57%), 40% of paddy traders, and 45% of paddy cum rice traders hired agents to look for sources of paddy. In aggregating paddy, agents oftentimes operate as independent or agents hired by traders or miller-traders to procure and aggregate farmers' produce. Normally, they get a commission fee ranging from PhP 0.10 to PhP 0.20 per kg of paddy aggregated or, in some cases, they get much higher, especially when they successfully haggle the price, which is lower than the buying price set by the paddy traders, paddy cum rice traders or miller-traders. There are also instances of having two agents ("double agents") involved in one business deal, and each gets the same commission; this happens usually between agents across provinces. Some miller-traders also provide a single motor vehicle for their own agents for greater mobilization to secure supply.

In general, paddy traders and paddy cum rice traders pick up the procured paddy from the farmers' field and they pay in cash. However, transportation cost is deducted from the buying price of paddy. In contrast, paddy traders deliver the consolidated paddy to miller-traders' rice mill area.

Farmgate prices during procurement are normally determined by paddy traders: the basis is the selling price to paddy cum rice traders or miller-traders (as reported by 85% of the paddy traders). This implies that miller-traders are the price setter, controlling the price at the farm gate level. The buying prices of paddy traders were also based on quality (MC and appearance) and the prevailing price. Paddy prices are low during peak harvest months and high during lean months. This seasonality of paddy prices is obviously associated with the seasonality of paddy production in the country. Peak harvest months for paddy during WS are September, October, and November and those during DS are February, March, and April. High-quality paddy and milled rice are commonly produced in DS, owing to favorable weather conditions. The WS harvest has low-quality paddy and milled

rice due to the rainy season. There were instances in the rainy season when buyers (millers and paddy traders) stopped buying fresh paddy (undried) from farmers because of limited drying facilities and oversupply, which forced farmers to sell their produce at a very low price.

Ensuring a steady supply of paddy is critical to paddy aggregators (miller-traders, paddy traders, and paddy cum rice traders) to sustain their business operations. For this purpose, they advance funds to farmers at an interest rate lower than that offered by private moneylenders in order to establish long-term trading relationships. Overall, 66% of miller-traders, 72% of paddy traders, and 65% of paddy cum rice traders provided credit to farmers (in cash and material inputs), charging an average interest rate of 3% per month for a 4-month loan. This is relatively lower than the interest rate charged by typical private moneylenders. This practice established a 'suki' relationship between farmers and buyers (millers, paddy traders). Other millers did not charge interest rate in exchange for a guaranteed supply during harvest. Credit-market tie-up or providing cash advance was one strategy used by miller-traders to be able to aggregate and procure in large volume, thus ensuring sufficient paddy supply and maintaining long-established trade relationships. Large miller-traders in particular own large fixed capital such as drying and milling facilities and fleet of trucks, which need to keep operating in order to maximize the rate of operation. Hence, they need to gather a big amount of paddy from different aggregators.

The following activities-transporting/trucking, handling, weighing, and storing-are carried out in paddy aggregation. In most cases, drying is also performed because of value adding, and millers and traders prefer to buy dried paddy as well.

Transportation

Yorobe et al. (2005) reported that transportation is an important component in the aggregation function in the rice value chain because it facilitates timely movement of the product and quick exchange of price information between markets. In the provinces surveyed, vehicles such as trucks were predominantly used in both paddy procurement and disposal. Overall, paddy aggregators owned a fleet of trucks, ranging from one to 15 units. In addition to these road transport units, paddy was also transported through Ro-Ro vessels for short-distance, interisland shipping (see geographical flow section). Transport services were also secured by some large traders and millers to expedite the movement of paddy. Outsourcing transport services enable them to avoid transportation hazards and unscrupulous charges such as "kotong" along the major highways that they traverse.

Paddy traders, in general, used an average of three (from 1 to 13) trucks in gathering paddy collected from various sources. Among the regions, paddy traders in Cagayan Valley used the most number of trucks, from 3 to 10 units, mainly because some of them are established traders with big capital (Figure 15). It was also noted that a sample paddy trader in Eastern Visayas, particularly in Bohol,

used 13 trucks to procure paddy. In the other regions, one to three small trucks were used. The most commonly used truck types were 'elf' (60%), followed by 'forward' (27%); a few (5%) used 10- wheelers (Table 21). These trucks have differing load capacities: elf (6-7 t), forward (12 t), and 10-wheelers (23-25 t).

Figure 15. Storage and drying facility of large and well-capitalized paddy traders

Miller-traders used an average of seven units of trucks, with load capacity ranging from 7 to 25 t. Forward, elf, 6-wheelers, and 10-wheelers were regularly utilized. Among regions, millers in Ilocos, Central Luzon, Bicol, Central Visayas, and Northern Mindanao did not use trucks in paddy procurement. This might be due to the fact that most big miller-traders from these regions procured directly from paddy traders and paddy is delivered to the rice mills. Rice mills owned by cooperatives employed a maximum of 15 units of trucks, particularly the large ones. In MIMAROPA, many large cooperatives (members include both farmers and non-farmers) are into the rice milling business (Table 22). Paddy rice traders used one to three trucks for paddy procurement operation. As with other market chain actors, they used small trucks for this purpose.

The type of truck used in transporting was dependent on the volume of paddy to be gathered. In small villages, elf and forward were more commonly utilized because of the road structure and network, which are usually small and narrow. Most often, paddy was picked up from farmers' fields to the nearest road, a practice that is advantageous to farmers. Majority (76%) of paddy traders, millers, and other buyers shouldered the transport cost in paddy procurement, which relieved farmers of such cost. The rest (24%) deducted transport cost from the buying price of paddy.

As to disposal of aggregated paddy, paddy traders commonly used large trucks with big load capacity such as 10-wheelers (25 t), forward (12 t), and trailers (32 t) to accommodate the large volume. This is to reduce cost and enhance cost efficiency. Delivery cost was shouldered by buyers, mostly millers, which are located along highways near the production areas. On the other hand, NFA provides an incentive of PhP0.20/kg for paddy delivered by an individual farmer or cooperative.

Paddy traders made an average of three trips a day for paddy procurement, and two trips for paddy disposal during peak harvest months in both seasons. The volume of paddy aggregated by paddy traders ranged from 45 to 12,754 t during 2014 WS, slightly higher than that in DS (44-10,776 t) since not all rice areas are planted during DS (23% of these areas are rainfed). The largest volume of paddy procured was by paddy traders in MIMAROPA, followed by those in Cagayan Valley and Central Luzon, whereas Davao region and Central Visayas had the smallest volume because of their small rice areas.

On the other hand, miller-traders made an average of three trips per day. In general, miller-traders had a bigger volume of paddy aggregated and procured, ranging from 105 to 90,650 t in 2014 WS and from 103 to 90,650 t in 2015 DS. Millers in Central Luzon procured the largest volume, while the smallest was reported in Northern Mindanao in both seasons, owing to the volume of paddy produced in these regions (Table 22).


Paddy collected


Transport to drying area


Drying area


Paddy disposal to rice mill

Handling

Handling includes the following activities: paddy loading and unloading, weighing, classification or grading, and other activities during paddy procurement and disposal. From the field, newly threshed paddy was transported to the rice mill. In many cases, it was brought first to the drying area before delivery to the rice mill using a truck. The loading of sacks of paddy from the field to the truck and the unloading of the same from the vehicle to the rice mill was manually done, for which payment was made per move. An additional loading operation was incurred when paddy was transported first to the drying area before delivery to the rice mill. The loading and unloading of sacks of paddy incurred extra labor cost, which is largely assumed by the paddy traders, cooperatives, or miller-traders. An average of three to four moves was incurred from procurement to disposal, which translated into high handling cost. In all the regions and provinces surveyed, loading and unloading of sacks of paddy were manually done and the rates were almost similar.

In addition to loading activity, weighing was likewise performed in paddy aggregation. Before transport, the sacks of fresh paddy were weighed using a small weighing scale or a truck scale. Typically, small weighing scales (50-100-kg capacity) are used in paddy procurement because their transport is manageable. However, relative to a truck scale, small weighing scales are prone to weight manipulation, hence, farmers repeatedly complain of inaccurate weights. Majority

Table 21. Transportation practices of and volume procured by paddy traders, selected regions, Philippines, 2014-2015

Items	Philippines	Ilocos Region	Cagayan Valley	Central Luzon	MIMAROPA	Bicol Region	Western Visayas	Central Visayas	Eastern Visayas	Zamboanga Peninsula	Davao Region	SOCCSK-SARGEN	CARAGA
n	72	3	13	19	10	6	1	3	1	2	2	7	5
Number of truck used for paddy procurement													
Minimum	1	2	3	1	1	2	1	1	13			3	2
Maximum	13	2	10	2	2	5	1	2	13			3	2
Average	3	2	7	2	1	3	1	2	13			3	2
Type of truck used for paddy procurement (%)													
Elf	60	100	56	61	67	55	100	67	33			83	56
Forward	27		28	28	17	27		33	33			17	44
Ten-wheeler	5		11	6	17								
Jeep	5		6			18			33				
Canter	1										100		
Cart	1			6									
Number of truck used for paddy disposal													
Minimum	1	5	3	1	1	2	1	2	1				1
Maximum	5	5	3	2	1	4	1	2	1				3
Average	2	5	3	2	1	3	1	2	1				2
Type of truck used for paddy disposal (%)													
Ten-wheeler	33	50	37	11	50	20			100			50	40
Forward	31	50	21	33		40		50				50	40
Elf	23		5	56	50	40	100	50					20
Trailer	13		37										
Average number of peak trips per day	3		3	3	2	4	1	2	4			3	4
Average number of lean trips per day	1		1		2	2		1				1	
Average number of peak trips per day	1		1	2		2		0	1			1	1
Average number of lean trips per day	2					2		1					
Average sack capacity (kg)	53	50	49	53	55	51	50	38	50	68	60	62	61
Volume of paddy procured (t)													
2014WS													
Minimum	45	45	278	95	101	457	563	58	1,502	121	339	120	659
Maximum	12,754	5,363	10,361	5,877	12,754	2,101	563	854	1,502	949	356	5,702	3,061
2015DS													
Minimum	44	58	424	95	65	548	523	44	1,602	93	339	110	259
Maximum	10,776	2,681	10,497	4,779	10,776	3,796	523	854	1,602	949	356	6,069	3,061

Source: Rice value chain survey of market players, 2015

Table 22. Transportation practices of and paddy procured by miller-traders, by region, Philippines, 2014-2015

Item	Philippines	Ilocos Region	Cagayan Valley	Central Luzon	MIMA-ROPA	Bicol Region	Western Visayas	Central Visayas	Eastern Visayas	Zamboanga Peninsula	Northern Mindanao	Davao Region	SOCCSK-SARGEN	Caraga
n	*107*	*7*	*9*	*18*	*11*	*7*	*14*	*5*	*6*	*5*	*4*	*5*	*12*	*4*
Number of truck used (paddy procurement)														
Minimum	2		4		2		9		10	4		4	4	12
Maximum	15		4		15		9		10	4		10	7	12
Average	7		4		8		9		10	4		7	6	12
Type of truck used for paddy procurement (%)														
Forward	39	50	38		27	50		40	50	50	50	29	56	50
Elf	33	50	38	67	27	33	50	20	50	33	17	14	33	50
Ten-wheeler	15			33	27		25	20			17	43	11	
Six-wheeler	5				9		25	20				14		
Canter	1									17				
Others	7		25		9	17					17			
Ave. number of trips per day (peak month)	3		3	3	4	3	1	3	3	3				2
Ave. number of trips per day (lean month)	1		1		2	1			1					
% that shouldered transport cost (paddy procurement)	76	71	100	44	91	71	67	100	50	100	100	80	100	75
Volume of paddy procured (t)														
2014WS														
Minimum	105	317	336	793	2,162	194	269	2,254	468	218	526	623	167	105
Maximum	90,650	11,973	4,161	90,650	40,265	16,313	10,115	11,116	3,825	1,837	944	1,369	12,921	13,235
Average	6,090	3,891	2,477	11,760	9,593	5,969	4,027	6,432	1,880	1,268	804	902	5,184	4,205
2015DS														
Minimum	103	168	268	461	440	246	445	1,822	465	205	147	477	144	103
Maximum	90,650	40,237	7,555	90,650	33,000	20,045	10,115	5,544	4,189	1,243	806	4,041	12,921	18,265
Average	6,269	7,875	3,003	12,055	7,621	6,901	3,613	3,291	2,224	943	493	1,609	5,255	5,175

Source: Rice value chain survey of market players, 2015

of village paddy traders and small miller-traders do not own truck scales. As presented in Table 23, only 22% of the miller-traders and 3% of the paddy traders in the surveyed provinces have their own truck scales. Millers in Davao region (100%) mostly owned truck scales, while a few paddy traders in Cagayan Valley (15%) and Eastern Visayas (11%) reported to have such scales.

Mechanical weighing scale

Truck scale

Moisture meter

Similarly, the classifier's role is critical in paddy aggregation to ensure quality assessment of paddy grains based on physical criteria (% MC, appearance, presence of foreign material and impurities). However, only 5% of the miller-traders and 3% of the paddy traders have their own moisture meter machine (Table 23), they were from Cagayan Valley, Central Luzon and MIMAROPA. Most often, MC of paddy was assessed based on ocular inspection or by pressing hard the grain or biting it. Farmers also reported that paddy price was often deducted as "reseko" based on MC level.

Table 23. Ownership of truck scale and moisture meter machine, by region, Philippines, 2015

Region	Ownership of truck scale		Ownership of moisture meter machine	
	Miller-traders (%)	Paddy traders (%)	Miller-traders (%)	Paddy traders (%)
n	*107*	*72*	*107*	*72*
Philippines	22	3	5	3
Ilocos Region	29	0		
Cagayan Valley	11	15	17	8
Central Luzon	28	0	30	
MIMAROPA	18	0		11
Bicol	29	0		
Western Visayas	0	0		
Central Visayas	40	0		
Eastern Visayas	17	11		
Zamboanga Peninsula	20	0		
Northern Mindanao	25	0		
Davao Region	100	0		
SOCCSKSARGEN	17	0		
CARAGA	0	0		

Source: Rice value chain survey of market players, 2015

Drying

Generally, paddy is normally harvested at MC ranging from 20 to 28%; it is reasonably higher in the WS than in the DS. In the Philippines, paddy is dried using either solar or mechanical drying. As reported by Rickman (n.d.), about 3-5% losses in grain quality and quantity were caused by sun drying, while 1-2% were due to mechanical drying. Similarly, Salvador et al. (2012) reported an average of 5.86% post-production losses attributed to drying.

Drying pavements, recirculating dryers, and flatbed dryers are the types of dryers most often used by paddy aggregators in large-scale drying. Solar or sun drying in pavements was commonly practiced in both seasons because it is cheap. Around 71% of paddy traders and 64% of miller-traders, 95% of paddy cum rice traders, and 83% of cooperatives used sun drying. Mechanical drying was utilized by a few (15%) paddy traders, by 43% of paddy cum rice traders, and by a majority of millers (62%) and cooperatives (100%). The rest (14% paddy traders; 31% paddy cum rice traders, 39% millers) were using a combination of solar and mechanical drying (Table 24).

Table 24. Drying practices by market players, Philippines, 2015

Drying practice	Paddy traders	Paddy cum rice traders	Cooperative miller-traders	Custom millers	Miller-traders
n	72	*39*	*6*	*11*	*90*
			%		
Solar drying	71	95	83	11	64
Mechanical drying	15	43	100	33	62
Both	14	31	83		39

Source: Rice value chain survey of market players, 2015

Sun or solar drying was commonly practiced by most paddy aggregators primarily because it is relatively cheaper than mechanical drying. The drying method is typically a labor-intensive activity so traders and miller-traders hire a group of workers to carry out the drying operations. Sun drying cost was contracted on a per sack basis per day. During DS, it takes only 1-2 days to get the desired 14% MC, while it takes around 2-3 days in WS, especially if the weather condition is not sunny. During sun drying, paddy was stirred using hand rakes or motorized rakes (for larger volumes). Sun drying, however, reduces milled rice aroma and head rice output, owing to improper or over drying, which is difficult to control. De Padua (2007) stated that improper use of drying results in fissured grains, which

generally leads to cracking of grains during milling, thereby significantly reducing head rice recovery and, consequently, market value.

Paddy traders, paddy cum rice traders, cooperative miller-traders, and miller-traders practiced the sun drying method extensively. Paddy traders took advantage of the public road or highway because only a few of them have their own drying pavements. Major arterial roads widened nationwide by DPWH were used as solar dryers by paddy traders. Drying paddy along highways has become a common sight in most rice production regions and provinces in the country. Among the regions, mostly paddy traders in Luzon maintained drying pavements with Cagayan Valley and Central Luzon having relatively bigger solar dryers. Similarly, they also owned mechanical dryers with an average of three units recirculating dryer.

In contrast, most millers have their own big drying pavements located near or within the rice mill area. The survey data show that, on average, the solar dryers of millers were estimated to be 3,500 m^2**,** with an average capacity of around 180 sacks (50 kg/bag). Big millers have bigger solar drying areas with maximum capacity of up to 1,200 sacks per load. Among the regions, the largest average solar drying pavement was reported by millers in SOCCSKSARGEN (5,250 sq.m.), while pavements in other regions ranged from 2,000 to 3,500 sq.m.

Mechanical drying was also widely used by millers, particularly during rainy season when sun drying is not effective; it is also done to supplement the sun drying method. Lantin (n.d.) pointed out that the use of mechanical drying eliminates problems related to sun drying because it increases efficiency due to timely drying, better control during the drying process, and smaller handling losses. However, more importantly, it maintains the quality and improves the milling recovery of the grain. Recirculating batch dryers were likewise common, as reported by 91% of the millers. The number of units owned ranged from 1 to 39 (average of seven units). Very few (9%) were using flatbed dryers. This recirculating batch type of dryer avoids the problem of moisture gradients by recirculating the grain during drying. It also has a shorter drying time, more uniform grain drying, and larger load capacity per hour. Most millers used oil-fueled batch dryers with heated rice hull furnaces as backup. More than half (67%) used diesel/gasoline and 33% used biomass. At present, the rising cost of diesel and gasoline encouraged millers to switch to biomass-fueled dryers to reduce drying cost.

Mataia et al., (2017) reported that, among regions, millers in SOCCSKSARGEN owned the largest number of recirculating dryers (1 to 39 units), while millers in most of the other regions kept from 1 to 21 units, except Zamboanga Peninsula and Northern Mindanao (fewer than 10 units owned). Also notable is the scenario in Isabela and Nueva Ecija where a few, large, modern miller-traders used outdoor grain dryer facilities capable of drying 900 t/day.

Paddy cum rice traders owned 1 to 16 units of mechanical dryer, of which 60% are flatbed and 40% are recirculating batch type. Cooperatives mostly used

mechanical dryers as many of them own one to five units. Usually, flatbed dryers are used by small farmers' cooperatives, as this facility was provided by DA. In contrast, large cooperatives preferred the large-capacity recirculating batch dryers (Mataia et al., 2017).


Recirculating batch dryer


Flatbed dryer


Sun /solar dryer


Sundrying along highway

Sorting of paddy varieties

It can be recalled that several rice varieties are planted by farmers every season, hence mixing of different varieties by paddy aggregators before disposal was unavoidable (reported by 11% of paddy traders). This is especially true when paddy collected is in small volume and comes from different varieties. Mixing is done usually for varieties with the same attributes—e.g., size, color, shape, degree of impurity and ripeness, and eating quality. Oftentimes, mixed varieties and those with low eating quality are termed 'ramble'. Sorting is done to meet the quality requirements of miller-traders. Typically, NSIC Rc218, NSIC Rc160, and NSIC Rc216 are separated as these have a price advantage of PhP 1.00-PhP 3.00/kg over that of 'ramble' varieties because of their premium eating quality characteristics.

In contrast, mixing varieties is commonly practiced by miller-traders owing to several factors: varieties are already mixed as they come from different suppliers and from different areas, it is laborious and tedious to segregate numerous varieties, and there is a need to achieve economies of scale. As with paddy traders, almost all miller-traders differentiated varieties with high market potential to maintain quality and meet the demand for high-quality rice by modern retailers and high-end consumers.

Processing

After paddy has been consolidated and dried, the next phase in the rice value chain is processing or milling. Rice milling is the process of transforming paddy grains into milled rice by removing the husk and bran to generate polished rice. As milling is the most crucial step in the postharvest operation, it has to be done cautiously in order to produce white rice adequately milled and free of impurities. According to Salvador et al. (2012), improper milling accounted for 5.52% of the total post-production losses. These losses are manifested in low milling recovery as well as low head rice yield. Head rice recovery is one of the most important criteria for measuring milled rice quality. High head rice yield means high-quality rice, with low brokens, usually less than 5% brokens (IRRI, n.d.). Similarly, De Padua (n.d.)

reported that poor milling recovery is attributed either to inherent poor technical performance of the milling machinery or lack of proficiency of the mill operator.

The main activities in rice processing are milling, classifying, packaging, storage, and distribution, which are performed by key actors such as custom millers, miller-traders, and cooperative miller-traders. Custom millers provide primarily custom milling service and engage in drying and storage activities, while miller-traders' tasks are vertically integrated from paddy procurement, trucking, drying, milling to rice wholesaling and retailing (as some also own retail shops in public markets or town centers). Large miller-traders likewise produce their own paddy for supply security and for the purpose of capturing most of the margins in the rice value chain.

The cooperative miller-traders carry out the same activities with miller-traders. The NFA is also involved in rice milling; here, the procured paddy is milled in its own mills. As of 2016, the agency had 42 rice mills nationwide, of which 29 are multi-pass types, 12 are single-pass, and one is a mobile or travelling rice mill. In some regions and provinces where NFA rice mills are inadequate, some portions of NFA-procured paddy are also custom-milled by accredited miller-traders. Custom milling cost ranged from PhP 65 to PhP80 per 50-kg bag output.

Milling

Generally, only 25% of the millers managed more than one mill, with the majority (75%) using only one mill in their operation. The commonly used rice mills were the single- and multi-pass types, usually made of rubber rollers. The mills differed in milling performance due to varying capacities and different degrees of milling ratio—i.e., a single pass has lower milling output compared with that of a multi-pass mill. The *single pass* is a one-step milling process where the husk and the bran are removed in one pass and white rice is produced directly from the paddy. About 16% of the sample millers used this type and they reported having low white rice recovery, accounting for an average of 57% with many brokens. The fine brokens are often mixed with the bran. Expectedly, it is also less efficient as capacity was only 1.25 t of rice output per hour on average. Single-pass mills are commonly used by small millers in the village, oftentimes used for custom milling in rural areas. On the other hand, *multi-pass* mills are largely (84%) used by large custom millers and miller-traders for commercial milling. In this process, multi-stage milling tasks are performed from pre-cleaning of paddy, removal of husk, polishing of brown rice, separation of broken grains, and bagging of milled rice. The multi-pass type is more superior than the single-pass; it has an average milling capacity of 4.25 t/hr and a milling recovery of 66% (Table 25).

Milling capacity also differed among multi-pass mills. As shown in Table 26, 18% of the millers surveyed have mills with capacities less than 2 t/hr, which means that mills in operation are already outmoded and therefore less efficient, which resulted in low milling ratio. Also, these mills were unable to produce rice that meets quality standards, thereby rendering them powerless in the highly

Table 25. Number and type of mills operated by millers/processors, by region, Philippines, 2015

Region	Millers surveyed (no.)	Rice mills operating (%)			Type of mill (%)		Average milling recovery (%)	
		1	2	3	Multi-pass	Single-pass	Single-pass	Multi-pass
Philippines	**107**	**75**	**20**	**5**	**84**	**16**	**57**	**66**
Ilocos Region	7	100			86	14		65
Cagayan Valley	9	78	11	11	75	25	57	65
Central Luzon	18	78	17	6	88	12	59	65
MIMAROPA	11	73	27		100			65
Bicol Region	7	100			57	43	58	68
Western Visayas	14	70	30		90	10	56	64
Central Visayas	5	33	67		75	25	58	65
Eastern Visayas	6	100			80	20	55	66
Zamboanga Peninsula	5	100			100		60	67
Northern Mindanao	4	67		33	75	25	60	67
Davao Region	5	60	20	20	100		58	66
SOCCSKSARGEN	12	50	42	8	90	10	58	64
CARAGA	4	50	50		75	25		66

Source: Rice value chain survey of market players, 2015

competitive rice market. Nonetheless, a large portion (64%) of the millers used mills with milling capacities ranging from 2 to 5 t/hr, and a few (19%) owned mills with capacities of 5-10 t/hr and above. Most cooperative rice miller-traders used mills with a capacity of 2.5 t/hr. Surprisingly, custom millers also operated large mills with capacities of 10-15 t/hr. The survey revealed that these are formerly miller-traders that stopped their milling and trading business due to competition and decided to just concentrate on providing custom milling services and other postharvest services to large paddy cum rice traders and other miller-traders.

Because of increasing competition due to the ASEAN economic integration and the increasing consumer demand for high-quality rice, few well-capitalized miller-traders have continuously upgraded and modernized their milling facilities to improve efficiency and to be able to compete with imported rice. These modernized rice mills are more efficient, with milling capacities of 15-22 t/hr. The regions with modern or upgraded mills are Cagayan Valley, Central Luzon, Western and Central Visayas, and Zamboanga Peninsula. Half of the miller-traders in Bicol owned modern mills with more than 15 t/hr capacity.

Table 26. Miller-traders' milling capacity of owned mills, by region, Philippines, 2015

Region	Milling capacity of owned mills (t/hr)				
	Less than 2	2 to 5	5 to 10	10 to 15	More than 15
	%				
Philippines	**18**	**64**	**13**	**4**	**2**
Ilocos Region	17	83			
Cagayan Valley		33	67		
Central Luzon	15	62	15	8	
MIMAROPA	20	80			
Bicol		50			50
Western Visayas	30	60	10		
Central Visayas		67	33		
Eastern Visayas		100			
Zamboanga Peninsula			50	50	
Northern Mindanao		100			
Davao Region		100			
SOCCSKSARGEN	33	67			
CARAGA	50	50			

Source: Rice value chain survey of market players, 2015

Single pass rice mill | Agri-Pinoy RPC 2 rice mill | Multi pass rice mill | Modern rice mill

Source: www.familychoice.com.ph; and https://www.google.com.ph/agri-pinoy+rice+processing

The survey data showed that most mills are underutilized, which means that they are operating below 100% capacity. The mills reportedly operated at an average of 94% a year, of which 71% were for their own milling and 23% for custom milling services. The underutilization of rice mills can be attributed to several factors: seasonality of paddy, rice importation that limits the demand for local rice, regular maintenance service of the mill, low paddy supply due to strong competition, low quality of paddy available, and shortage of labor. Cooperative rice mills are the most underutilized and are often idle; operation was only 42% per year, mainly due to limited procurement fund (Table 27).

Table 27. Milling operation by type of processor, Philippines, 2015

Item	All	Cooperative miller-traders	Custom millers	Miller-traders
n	*107*	*6*	*11*	*90*
Milling operation (operation / year @ 8 hrs/md)	94	42	97	96
Mean number of months per year	10	6	11	10
Mean number of days per week	6	6	4	6
Mean number of hours per day	12	10	14	12
Average volume of paddy milled (t/day)	60	47	67	60
Percentage of annual milling operation				
Own mill	71	32		80
Custom mill	23	10	97	16

Source: Rice value chain survey of market players, 2015

Packaging

Miller-traders followed the standard milled rice classification established by the NFA, which is based on the degree of milling. But, they classified their milled rice only in three classes: premium, well-milled, and regular-milled. In addition, they categorized milled rice on the basis of grain size (long, medium, and short). Standard weights and measures were also followed by miller-traders, that is, rice sold in sacks are generally packed in standard weights in kilogram units.

Overall, miller-traders and rice traders carry out packaging activities before buying or selling for ease of handling and to safeguard the grains. In general, a plastic sack is the most commonly used packaging material for paddy and rice. Paddy grains are put in sacks for transport from farmers' fields to the buying area (either paddy traders' buying station or millers' mill area). Similarly, rice is placed in plastic sacks by miller-traders using the standard measure of 50 and 25 kg for storage and distribution. Rice is also packed in smaller packages of 10-, 5-, and 2-kg units, depending on the agreement between miller-traders and buyers. Some miller-traders also used laminated sacks to prolong storage life and maintain the quality of rice.

More sophisticated packaging of rice is now used by miller-traders, particularly the modern ones (Figure 16). They used packaging and labeling to make rice more attractive to buyers. The package is properly labeled, giving the following information: milling classification, name of variety, weight in kilograms, name and address of millers, and brand name. Well-recognized brand names with strong consumer support such as 'Sinandomeng,' 'Dinorado,' etc. were common. Differently colored sacks (as per milling classification) were also used to distinguish rice quality attributes. Packaging and labeling meant additional cost to

Figure 16. Types of packaging for milled rice, Philippines, 2015

traders and millers in their functions, and this cost is dependent on the quality of the material. Based on survey data, the average price of an ordinary sack used for paddy was PhP 9.00/piece, whereas that for rice was PhP 12.00/piece with simple labels. Laminated and labeled sacks were more expensive, ranging from PhP 20 to PhP 30 a piece. On the average, sacks for paddy were used twice in contrast to sacks of rice where they are considered disposed of when sold.

Across regions, the price of paddy sacks was lower than that of rice sacks. However, the average price of the sack was observed to be higher in regions in Mindanao compared with that in regions in Luzon and Visayas. For rice, packaging material cost was reportedly large for millers in Cagayan Valley (PhP 19/piece) and small in SOCCSKSARGEN (PhP10/piece). The maximum price was also reported by miller-traders in Cagayan Valley (PhP 30/piece), followed by Western Visayas and SOCCSKSARGEN (PhP 22/piece) as they were using superior quality plastic or laminated sacks (Table 28). Some miller-traders in these regions said that they also supplied or displayed their products in supermarkets and hypermarkets, and this necessitated the use of better quality packaging materials to lengthen the shelf-life of rice. In contrast, packaging costs were low for wholesaler-retailers and retailers because they were using plastic bags ("sando" bags) of different sizes in their rice distribution activity.

Storage

Rice production is seasonal, producing only during the harvest months of the wet and dry seasons. Hence, rice millers and traders practice storage functions, owing to supply fluctuations, which bear an impact on price levels, particularly during lean periods of supply. Most paddy traders reportedly disposed of their aggregated paddy immediately to miller-traders due to limited procurement fund and storage facilities. However, a few large and well-capitalized paddy traders performed intertemporal trading—i.e., they buy when the price of paddy is low and sell when the price is high. In this case, they store paddy in the warehouse for an average of more than a month (39 days). Usually, they own one storage unit with an average area of 785 sq.m. and a capacity of 800 t. Warehouses are the common types of storage facilities used. Similarly, 62% of the paddy cum rice traders stored paddy for 2-3 months and maintained at least one warehouse unit with an area of 120-650 sq.m. and an average capacity of 170 t (Table 29). The biggest warehouse area was reported by paddy traders in Cagayan Valley (650 sq.m.) with a 650-t capacity. The smallest was seen in Zamboanga Peninsula.

Table 28. Price of sacks (PhP/pc), by market player and by region, Philippines, 2015

Region	Miller-traders						Paddy traders		
	Price of paddy sack			Price of rice sack			Price of paddy sack		
	Ave	Min	Max	Av	Min	Max	Ave	Min	Max
Philippines	**9**	**3**	**15**	**12**	**5**	**30**	**9**	**4**	**15**
Ilocos Region	8	6	12	12	9	16	6	6	6
Cagayan Valley	6	4	9	19	12	30	7	4	15
Central Luzon	7	3	11	13	8	20	8	4	12
MIMAROPA	11	8	13	12	8	17	11	7	12
Bicol	9	4	14	10	5	20	11	10	12
Western Visayas	9	7	11	16	10	22	5	5	5
Central Visayas	8	7	10	11	7	16	9	6	10
Eastern Visayas	7	6	8	13	8	20			
Zamboanga Peninsula	15	15	15	15	15	15	13	13	14
Northern Mindanao	7	6	8	13	10	15			
Davao Region	11	9	13	12	8	16	13	13	13
SOCCSKSARGEN	10	8	14	10	7	22	11	9	14
CARAGA	13	12	15	13	12	15	12	9	15

Source: Rice value chain survey of market players, 2015

In contrast, miller-traders have large storage facilities as they engage in more substantial storage activities to manage supply even in the lean season. In general, miller-traders own one warehouse unit located in the mill area with an average area of 3,752 sq.m. and a capacity of 2,612 t. On the average, paddy is kept in storage for 8 months at an ideal MC of 14%. Some miller-traders brought down the MC to 13% to avoid spoilage and maintain grain quality during long-term storage. A small percentage (6%) of large modern miller-traders have few units of grain silos for storing paddy, each having a capacity of 1,000 t. The grain silos are equipped with grain coolers and are used for bulk paddy handling to maintain freshness longer (Figure 17).

Figure 17. Type of storage facilities used by different market players, Philippines, 2015 (Source: owned picture; www.familychoice.com.ph)

Table 29. Storage practices and facilities used, by market players, Philippines, 2015

Items	Paddy traders	Paddy-rice traders	Millers	Whole-salers	Whole-saler-retailers	Retailers
n	72	*39*	*107*	*19*	*66*	*66*
Number of storage (%)						
1	76	86	71			
2	20	14	15			
3	4		9			
4			5			
Storage type (%)						
Warehouse	29	50	52			
Conventional	29	50	42			
Silo			6			
Stall	24					
House	18					
Area (sq.m.)						
Minimum	54	120	50			
Maximum	1200	648	17,000			
Average	785	456	3,752			
Average storage capacity (t)	608	163	2,612			
% Stored paddy	69	62	79			
Ave. number of bags stored	2,290	1,647	24,505			
Ave.duration of paddy in storage (no. of days)	39	56	114			
Number of rice storage owned (%)						
1		100	87	86	68	
2			7		27	
3			7		3	
4				14	3	
Storage type (%)						
Warehouse		29	70	75	6	10
Conventional		57	30	25	3	3
Stall		14			88	87
House					3	
Area (sq.m.)						
Minimum		300	50	250	10	40
Maximum		900	17,000	250	18	40
Average		616	4,010	250	14	40
Ave. storage capacity (t)		170	2,102	1,225	236	62
% Stored rice		38	65		64	52
Ave. number of bags stored		1,442	11,423	13,154	1,161	130
Ave. duration of rice in storage (no. of days)		77	44	47	22	27

Source: Rice value chain survey of market players, 2015

Milled rice is also stored by miller-traders, normally within the mill area, separate from paddy. As opposed to grain paddy, milled rice is stored for an average of 44 days, since it does easily get spoiled. Overall, miller-traders regularly process rice in amounts sufficient to satisfy the purchase orders of their regular customers. On average, 11,423 sacks of rice were kept by millers in storage for distribution. On the other hand, paddy cum rice traders kept around 100 - 1,875 bags of milled rice in storage. The volume of rice stored by miller-traders and by rice traders depends on the demand and capacity of their regular rice outlets (Table 29).

Stockpiled paddy in storage

Stockpiled rice in storage

Marketing/Distribution

The next segment in the rice value chain is the marketing or distribution function that involves miller-traders, paddy cum rice traders, and an established network of wholesalers, wholesaler-retailers, and retailers. The main activity is delivery of milled rice from the mills to the distribution channels to final users. Specifically, this function involves the following activities: rice trading (buying and selling), transportation/shipping, and storage.

Source of milled rice

The major source of milled rice in the marketing function is the miller-traders. Likewise, rice is sourced from paddy cum rice traders, importers, cooperatives, and the NFA. Miller-traders are the most favored rice suppliers because of good relations, reliability and flexibility, and offer of good quality. Majority of miller-traders sold their processed rice mainly to the domestic market, where 51% were sold directly to urban wholesalers, 34% to wholesaler-retailers, and 15% to retailers. Large modern miller-traders sold rice not only to urban wholesalers but also to big institutional buyers, private corporations, and modern retailers. Similarly, paddy cum rice traders disposed of their rice in the local markets whose main buyers are outlets run by wholesaler-retailers and retailers. Few retailers obtained rice supply from their own mills as some miller-traders also maintained retail stores for rice distribution.

Generally, rice traders searched for suppliers that offer quality and good price. They keep a list of preferred suppliers who can produce consistently the quantity and quality demanded by their buyers, particularly supermarket chains. Some look for rice suppliers across major rice-producing provinces such as

Isabela, Nueva Ecija, Bulacan, Mindoro Occidental, and Mindoro Oriental, and generally, rice is paid in cash upon delivery. These provinces are known hubs of large miller-traders that offer differentiated quality and branded milled rice suitable for consumers belonging to different socioeconomic classes.

Many of the rice traders availed of services of agents to contact suppliers of milled rice. As in paddy aggregation, some agents act as brokers between miller-traders and rice traders (wholesalers or wholesaler-retailers) in the rice distribution. They also get a commission for the rice distributed. Some agents personally distribute the rice to their contact wholesalers and wholesaler-retailers across locations with the miller-traders providing the vehicle.

Miller-traders and large wholesalers controlled the selling price of milled rice in the domestic market. These prices depend on quality, variety/brand name, and prevailing prices. NFA also intervenes directly and indirectly in the domestic rice market by selling rice to accredited and licensed retailers only at a mandatory wholesale price. It also sells to non-retailers and consumers at a mandatory retail price, which is at least 1.8 times its procurement price (NFA, n. d.).

Overall, milled rice is either picked up by buyers or delivered to buyers, depending on the location. Normally, transportation cost is already built in on the selling price of milled rice. Most wholesalers pay in cash in contrast to wholesaler-retailers and retailers who like to get credit and pay on consignment basis.

Quality requirements

Grain physical characteristics topped the quality requirements of market intermediaries. Long-grained varieties were most favored in large markets because consumers give importance to appearance (e.g., shape, length, and color). Aside from physical appearance, major concerns were grain eating quality, specific variety, and grain purity. Currently, varieties with premium eating quality are becoming more important as more middle- and high-income consumers shift toward grain quality rice. Quality was the top factor considered by buyers, followed by price.

Market facilities by rice traders

Wholesalers are well-established in the rice market in the Philippines. Many wholesalers have their own mills or they buy from mills through their broker/agent contacts employed under a commission scheme. Similarly, some are licensed importers; they distribute imported rice to co-miller-traders and rice traders. Usually, wholesalers maintained just a few trucks for rice procurement and disposal. Transportation cost was shouldered by a majority of them. For interisland provinces, the incurred shipping cost was borne by wholesalers, but the land transport cost from the mill to the pier was the burden of rice suppliers.

They also have an established network of warehouses, maintaining one to four units of storage (though only 14% have four units). Storage area was, on average, 250 sq.m. and capacity was 1,225 t (24,500 bags of 50 kg each) (Table

29). Wholesalers in Northern Mindanao reported the biggest storage capacity, followed by those in the Davao region. On the other hand, the smallest storage capacity was seen in Western Visayas. Overall, wholesalers stored an average of 13,154 bags, which they kept for around 7 weeks. Among the regions, wholesalers in Northern Mindanao have also the largest bags of milled rice in storage (it took around 4 weeks to completely dispose of these bags). It can be observed that big wholesalers in the Metro Manila, specifically the Binondo area, maintained only an average of 2,438 bags and reported a fast rice disposal with a turnover of 2 weeks, implying that intertemporal trading was not a common practice. They disposed of the procured rice immediately to their established networks of traders in Luzon, Visayas, and Mindanao (Mataia et al., 2017).

Rice disposal to urban wholesale markets

Wholesaler-retailers' main rice outlets are retailers (44%), household consumers (30%), institutional buyers (11%), co-wholesaler-retailers (10%), cooperatives (1%), and modern retailers (3%). Majority (88%) held at least one unit of truck for rice trading (either a forward, a closed van, or an elf). However, not all shouldered the transport cost in rice procurement and disposal because such cost is dependent on what had been agreed with buyers. Sometimes, it is already built-in in the landed price of rice. Only 27% reported paying the transport cost in rice procurement, while only 32% mentioned shouldering the same cost in rice disposal. Likewise, most of them (68%) maintained one storage unit, while 27% retained two. Wholesaler-retailers in MIMAROPA and Central Visayas owned 1-4 and 1-3 storage facilities, respectively. Only a few (6%) owned warehouses because owned or rented stalls are the common storage types used in general. Their average storage capacity was 236 t. On the average, these market players stored about 1,161 bags, with the biggest volume reported in Davao region (3,150 bags), Western Visayas (2,920 bags), and Central Visayas (2,425 bags). The smallest volume stored was declared in Ilocos region. Rice stocks lasted only from 2 to 4 weeks in all regions due to storage capacity (Mataia et al., 2017).

Retailers' major outlets are consumers while their major suppliers are miller-traders. Miller-traders offer sale on credit with delayed payment for 15-30 days to regular customers. These are efforts carried out by miller-traders to entice retailers. Not all retailers are capable of owning a truck. As shown by the survey data, only some retailers in MIMAROPA, Zamboanga Peninsula, SOCSKSARGEN, and CARAGA admitted owning one truck for use in rice retailing. The retail shops are perhaps those owned by miller-traders, which kept rice retail stores in the public market. Normally, transportation cost in procuring and marketing of rice is not a burden for retailers because, in general, suppliers deliver the rice to retail outlets.

Also, retailers own or rent market stalls where they stock rice (average of 130 bags), which they regularly replenish every week.

Modern retailers such as supermarkets and hypermarkets offer access to relatively high-income consumers in meeting their rice requirements. As in other countries, supermarkets and hypermarkets are also rapidly rising in the Philippines not only in the urban market centers but also in small market centers in small provincial towns, as more consumers are encouraged to purchase packaged rice from these outlets as part of their bi-weekly or monthly shopping. Food safety standardization and quality enhancement are features of modern retailing, requiring differentiated and increasingly branded products. For rice, in particular, grain quality appears to be one of the important features of the supermarket and hypermarket retail trade.

Most supermarkets and hypermarkets sell different brands of milled rice ranging from regular, organic, premium, and fancy or aromatic rice. The most common rice brands traded are Dinorado (shining, premium, harvester), Sinandomeng (sunflower), glutinous rice, Milagrosa (qualigrain, Jordan), Japonica and Thai jasmine rice. Other rice brands are healthy organic rice, brown rice, gold cup, C4, and Jordan red rice. Moreover, they are now adopting the wet market practices; aside from the rice traded pre-packed and brand-labeled, they also sell directly from sacks by the kilogram.

Consumption/final sale

Consumption or final sale is the last function in the rice value chain and a critical part because it is the key driver of value chain growth and development. It refers to the target market that offers the greatest benefits and risks for each actor in the value chain. For milled rice, there are lot of potential end markets, segmented to the following: rural and urban households of differing socio-economic class and institutional buyers, which include private corporations and government offices. These markets have varying preferences for milled rice characteristics.

E. Inter-firm Relationships

Effective inter-firm relationships are a vital component in creating and maintaining value chain competitiveness. Even when other conditions in the value chain are favorable, ineffective relationships can threaten the competitiveness of a value chain and its ability to generate economic growth, employment, and income. The transformation of inter-firm relationships aims to attain these development goals (USAID, 2017).

Interdependence exists between and among actors of a value chain from basic input suppliers to end-users. Weak inter-firm relationships can hamper value chain competitiveness by creating technical and cost inefficiencies, stifling investment, and restricting the essence of commercial relationships. There are two forms of inter-firm relationship: horizontal and vertical linkages. Horizontal

linkages occur between actors of the same category. Vertical linkages exist between two sequential actors in the supply chain (Figure 18). Horizontal and vertical linkages reduce costs, encourage upgrading, and increase responsiveness to changing markets.

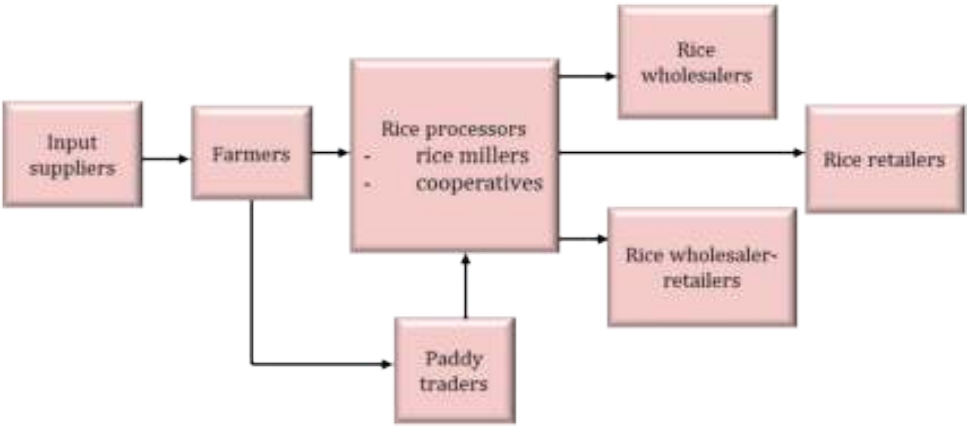


Figure 18. Vertical linkages of actors in the rice value chain

Horizontal linkages

Farm input suppliers. Farm inputs cover fertilizers, pesticides, fuel, and seeds. An almost non-existent linkage occurs between suppliers of fertilizers and pesticides. Rarely do farm input stores refer to other stores when the product is not available in their inventory. There is, however, some level of stabilization of prices in a locality.

Seed producers belong to two categories–seed growers of public inbred seeds and private companies that produce hybrid seeds. The latest available data show that there are 1,728 accredited seed growers in the country (see Table 8). These are monitored by the Department of Agriculture (DA) and directly supervised by local government units (LGUs) through their agriculture office. Local seed growers have some level of interaction during regular meetings held by the LGU. Private seed companies, however, always act as competitors and rarely establish any formal linkage since their main objective is to outdo the other in terms of producing superior hybrid seeds.

Farmers. Those residing in a locality have generally strong linkages in terms of sharing input and output price information, technologies, benefits or assistance available, and efforts to maintain communal farm resources. One avenue of establishing linkage between farmers is membership in an organization. Countrywide, 71% of rice farmers belonged to a farmer organization as shown in Table 5.6. Membership in an organization was highest in Mindanao (65%). Fewer farmers belonged to an organization in Luzon (44%) and the Visayas (45%).

Paddy traders. A linkage exists between paddy traders in various forms, particularly those who operate within a locality. One indication is the similarity

of paddy classification standards and buying price quotations in a particular area. This indicates that a set of standards is established among these actors by implicit agreement. Although usually operating under competition, some big traders absorb the procurement of others if the latter cannot deliver to buyers the minimum volume required or if delivery of the product entails very high transport cost. This trading relationship constituted 6% of the total volume procured by paddy traders in Mindanao and 4% in Luzon. It was non-existent, however, in the Visayas.

Information on buying price was likewise sought from other paddy traders by 7% in Mindanao and 5% in Luzon. Again, this relationship did not exist in the Visayas. Obtaining information from peers on the selling price of paddy happened only among 7% of paddy traders in Mindanao. In the survey, 26% of paddy traders belonged to various business-related organizations (Table 30). More paddy traders in Mindanao were members of an organization. Only those in Luzon (30%), however, were members of an organization of paddy traders.

Rice processors. They include rice millers, the NFA, and cooperatives. Formal linkages among rice processors appear to be strong as reflected by the membership of 43% in business-related organizations. Membership was higher in Luzon than in the other two island groups (Table 30). The organization allowed rice processors to agree on the buying price of paddy, share market information, and invoke fair competition among members.

Rice wholesalers. Those operating within the same geographic location consider each other as fair competition. This was evident by the absence of any organization for rice wholesalers in Luzon. In the other island groups, however, 67% in the Visayas and 75% in Mindanao belonged to business-related organizations. Through these organizations, wholesalers were able to share market information.

Rice retailers. These actors have strong linkages and are largely organized. In the survey, 33% of the rice retailers belonged to a business-related organization (Table 30). Membership was more prevalent in the Visayas and Mindanao. In Luzon, only a minimal proportion of rice retailers belonged to an organization.

Table 30. Membership of market players in business-related organizations, by major island, Philippines, 2015

Market player	Luzon	Visayas	Mindanao	Philippines
	%			
Paddy traders	23	20	40	26
Rice processors/millers	56	29	29	43
Rice wholesalers		67	75	71
Rice retailers	9	43	40	33

Source: Rice value chain survey of market players, 2015

Vertical linkages

Input suppliers and farmers. If the quality of inputs is perceived to be the same among input suppliers, the farmer tends to choose the one that offers the cheapest price and the most accessible. Hence, patronage is non-existent. However, if quality is not at par with expectations, in the next purchase, the farmer buys the input from other suppliers. The quality of fertilizers, pesticides, and fuel is generally consistent, owing to standards set by the manufacturing companies. Hence, if a farmer procures in cash, the choice of supplier is based on the price and on convenience. For seeds, however, quality can be variable. Although tagged inbred seeds have to pass through the National Seed Quality Control Services (NSQCS), there are times when farmer-buyers complain about seed quality that is inferior to standards.

A steady relationship is developed between these two actors of the rice value chain if the input supplier consistently meets the specifications, volume, and schedule required by the farmers. The farmers' organization serves as the proxy of the farmer in this relationship if it procures the farm input requirements of its farmer constituents. A similar scenario exists if the farmer or farmer organization obtains inputs under credit. The linkage is sustained while both parties are satisfied with the credit arrangements.

Farmers and paddy traders. The relationship between farmers and paddy traders is one of the strongest among the actors in the rice supply chain. In the survey, farmers supplied 94% of the total volume procured by paddy traders (Table 31). The trading relationship was more pronounced in the Visayas as paddy traders procured all their supply from farmers. Overall, the *suki* system was practiced by 38% of the farmers surveyed.

Table 31. Vertical relationship of market players and farmers, by major island, Philippines, 2015

Market player	Luzon	Visayas	Mindanao	Philippines
	%			
Proportion of players procuring rice from farmers (%)				
Paddy traders	95	100	89	94
Rice processors	53	39	60	53
Proportion of players extending credit to farmers (%)				
Paddy traders	65	80	75	68
Rice processors	64	38	81	66

Source: Rice value chain survey of market players, 2015

A solid interdependence exists between these two actors. Most farmers need financing for rice production and paddy traders want an assured source of the produce. Hence, the latter often provides credit to farmers to ensure payment in kind, which is equivalent to the loan principal and interest. In the survey, 68% of the paddy traders extended credit to farmers (Table 31). Credit was provided by more paddy traders in the Visayas. Yet, only 27% of the farmers nationwide claimed to have marketing tie-ups with paddy traders. Although the averages were almost the same in the three islands, at least 60% of farmers from Camarines Sur in Luzon and North Cotabato in Mindanao had marketing tie-ups with paddy traders.

For the entire Philippines, the amount of loan extended to one farmer ranged from PhP 5,000 to PhP 300,000 per season or PhP 36,880 on the average (Table 32). The loan was for 4.2 months with 3.2% monthly interest rate. Farmers in the Visayas borrowed more than those in Luzon and Mindanao, paid the highest interest rate, and had the longest loan duration. On the average, a paddy trader provided credit to 88 farmers. Paddy traders each catered to 116 farmers in Mindanao, 82 farmers in Luzon, and 43 farmers in the Visayas. Paddy traders set the loan terms, including the maximum amount a borrower can avail of, the interest rate, and the repayment arrangements.

Table 32. Loan extended to individual farmers by paddy traders, by major island, Philippines, 2015

Item	Luzon	Visayas	Mindanao	Philippines
Loan amount (PhP)				
Minimum	5,000	22,500	5,000	5,000
Maximum	300,000	155,000	75,000	300,000
Average	37,838	58,500	27,037	36,880
Monthly interest rate (%)	3.1	5.3	2.8	3.2
Loan period (mo)	4.0	6.3	3.9	4.2

Source: Rice value chain survey of market players, 2015

Paddy traders likewise serve as quality control agents as they set quality standards for the produce with corresponding price differentials. The price quotations are based on the buying prices set by rice millers. Agents are becoming very popular in paddy procurement. An agent serves as the intermediary between farmers and large paddy traders. The agent monitors farmers who want to sell their paddy. The transaction is settled after the agent brings paddy samples to the paddy traders' classifier and the farmer agrees to the price quotation. When sufficient volume is consolidated for one full truckload, the paddy trader picks up the produce. The agent is paid a fixed amount per volume. This arrangement reduces transaction cost as the paddy trader no longer deals with individual farmers.

Farmers and rice processors. The linkage between these two actors is weakening over time, especially with large rice millers. In the survey, only 53%

of rice processors procured directly from individual farmers. It appears, however, that more rice processors in Mindanao transacted directly with farmers. Only 39% of the rice processors procured paddy from farmers in the Visayas. Rice processors likewise extended credit to individual farmers. In the survey, 66% of the rice processors provided credit to farmers. The proportion of rice processors who extended credit to farmers, however, was higher than those who procured paddy directly from the latter (Table 33). The reason is that some cooperatives do not require marketing tie-ups with borrowing farmers.

Rice miller-traders dictate the price of paddy according to a classification system that they set up with corresponding price differentials. The classification varies between locations. For a transaction to be completed, farmers have to accept the quality assessment of rice millers. Interaction during trading is limited to details of the transaction. The amount of loan extended by rice processors to a farmer ranged from PhP 5,000 to PhP 490,000 per season or PhP 45,578 on average nationwide (Table 33). The loan was for 3.8 months with 3.5% interest rate per month. Farmers in Luzon borrowed more than did their Visayas and Mindanao counterparts. Loan duration was almost the same in the three islands. Interest rate was highest in Mindanao. No interest was charged to farmers in the Visayas. On the average, a rice processor extended credit to 94 farmers. Each rice processor served 116 farmers in Mindanao, 89 farmers in Luzon, and only 18 farmers in the Visayas. Rice processors set up loan arrangements similar to those established by paddy traders.

Table 33. Loan extended to individual farmers by rice processors, by major island, Philippines, 2015

Item	Luzon	Visayas	Mindanao	Philippines
Loan amount (PhP)				
Minimum	8,500	5,000	6,000	5,000
Maximum	490,000	25,000	175,000	490,000
Average	56,593	16,667	35,548	45,578
Monthly interest rate (%)	3.4		3.8	3.5
Loan period (mo)	3.7	3.5	3.8	3.8

Source: Rice value chain survey of market players, 2015

Paddy traders and rice processors. A strong vertical linkage exists between paddy traders and rice millers. In the survey, 92% of the volume of the paddy procured by paddy traders nationwide was marketed to rice millers. This relationship, however, was weaker in Mindanao. Some paddy traders in Luzon marketed a minimal portion of their procurement to NFA, an uncommon practice since farmers or farmer groups are the latter's usual clients. Rice processors, however, were less dependent on paddy traders for their supply as indicated by a mere 36% of the former's paddy procurement volume being provided by the latter nationwide (Table 34). This dependence was weakest in Mindanao with only 25% of the paddy coming from traders.

Nevertheless, the linkage between paddy traders and rice millers is sustained through a credit-marketing tie-up. The procurement capital of paddy traders is often financed by rice millers. Similar to the reasoning of paddy traders, rice millers ensure their paddy supply by financing the procurement capital of paddy traders. The amount and frequency of money transfer depend on the agreed volume of paddy to be delivered at a given period. Incentives are awarded to paddy traders who exceed the quota. Hence, paddy traders base their buying price on the quotations of rice millers, with proper adjustments to cover operating cost and mark-up. The grading system observed by paddy traders is likewise based on that set by rice milers. Paddy traders who fully finance their operation, however, tend to sell their procurement to rice millers who offer the highest price. Hence, some have established long-term relationships with rice millers who have specific quality requirements that they can deliver.

Table 34. Interlinkages between market players, by major island, Philippines, 2015

Item	Luzon	Visayas	Mindanao	Philippines
Market outlets of paddy traders (%)				
Millers	97	94	79	92
NFA	2	-	-	2
Others	1	6	21	6
Proportion of paddy procured by millers from paddy traders(%)	40	48	25	36
Market outlets of millers (%)				
Wholesalers	57	24	46	51
Wholesaler-retailers	26	52	46	34
Retailers	17	24	8	15
Preferred market outlets of millers (%)				
Wholesalers	63	20	50	53
Wholesaler-retailers	21	70	46	35
Retailers	16	10	4	11

Source: Rice value chain survey of market players, 2015

Rice millers and wholesalers. Rice millers usually have stable wholesaler clients who fill a significant share of the former's products. Some wholesalers perform dual functions in the rice value chain, i.e., act like a retailer. In the survey, both wholesalers and wholesaler-retailers were the major market outlets of rice processors. On the national level, 85% of the total volume traded by rice processors were marketed to wholesalers and wholesaler-retailers. Nonetheless, just above half of the rice volume was sold to wholesalers. The share of the two buyers, however varied between islands. While rice processors in Luzon disposed most of their outputs to wholesalers, the scenario in the Visayas was reversed (more output going to wholesaler-retailers), while those in Mindanao traded with the two types of buyers equally. In the Visayas, the share of the two buyers in terms of volume traded by rice processors was less compared with that in the two islands.

Although the proportion of actual market outlets of rice processors did not vary much with the latter's preferred clients, a different picture was reflected in the distribution, by island (Table 34). More rice millers in Luzon (63%) and Mindanao (50%) favored wholesalers, whereas majority of those in the Visayas (70%) preferred wholesaler-retailers.

The *suki* system was the most popular reason for choosing a buyer. While this system was carried out by 53% of rice processors at the national level, it was prevalent among 82% of those in the Visayas. The most conservative proportion was among rice millers in Luzon (41%) and Mindanao (56%).

On the other side of the linkage, the bulk of the rice supply of wholesalers (56%) and wholesaler-retailers (74%) nationwide was directly procured from rice processors (Figure 19). In Luzon, wholesalers traded solely with rice processors, while wholesaler-retailers, although having other sources, were largely dependent on rice processors for their supply.

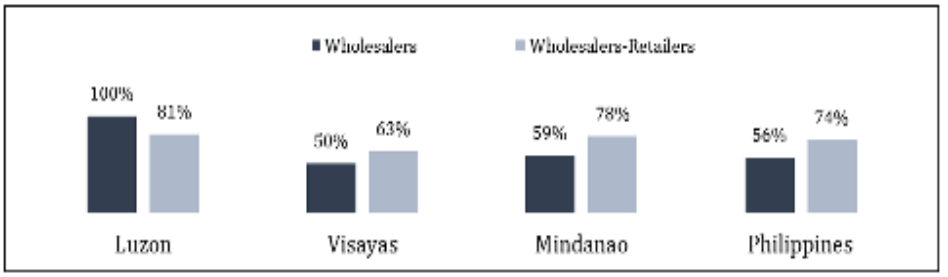


Figure 19. Proportion of procurement of wholesalers and wholesaler-retailers supplied by rice processors, by major island, Philippines, 2015

A different scenario existed in Visayas and Mindanao. Though the wholesalers and wholesaler-retailers still procured a greater portion of their rice supply directly from rice processors, trading was more intense with wholesaler-retailers. Other significant trading partners of wholesalers and wholesaler-retailers were big-time wholesalers. Almost 40% of the traded volume among wholesalers in Visayas and Mindanao was with other wholesalers. Wholesaler-retailers likewise

procured from cooperatives and farmers. Majority of the wholesalers (94%) and wholesaler-retailers (82%) had long-term relationships with their supply sources. Agents were very visible in the rice procurement of wholesalers and wholesaler-retailers. In the Visayas, 67% of the total procurement transactions of wholesalers were done through agents. This was likewise practiced in Mindanao, involving 29% of the traded volume. As to procurement of wholesaler-retailers, 31% of the traded volume was handled through agents. This setup was popular among Mindanao wholesaler-retailers, with 44% of total procurement.

Overall, 55% of the rice millers claimed that they set the wholesale selling price, while 37% said that this was set by wholesalers. The power of the rice millers in setting the price of wholesale rice was more evident in the Visayas (82%). The same trend existed in Mindanao but at a lower proportion, 67%. In Luzon, however, rice millers and wholesalers have equal power in setting the unit price of the product.

Rice processors and rice retailers. Some rice processors act as wholesalers and supply milled rice directly to rice retailers. In the survey, 15% of the output of rice processors was directly marketed to rice retailers nationwide. This practice was most prevalent in the Visayas as 24% of the output of rice processors was sold to by rice retailers. The situation can be attributed to the geographic features of the Visayas. It is composed of numerous but predominantly small- to medium-sized islands. This implies that most rice processors have easy access to rice retailers.

Rice millers set the selling price and retailers are merely price takers. Almost 60% of the retailers paid in cash while around 30% paid by consignment, which was more prevalent in Luzon and Mindanao. Retailers, however, seemed largely dependent on rice processors for their rice supply with 57% of paddy procured from the latter.

Wholesaler-retailers function as a wholesaler by selling to customers in bulk and as a retailer by supplying rice stocks to their own retail outlets. In the survey, 44% of the rice supply of wholesaler-retailers was sold to retailers, including their own stores.

Wholesalers and rice retailers. Wholesalers with a single function generally operate on a large scale. In the survey, 32% of the volume traded by wholesalers was with retailers. This scenario was more prevalent in Luzon, where half of the supply was sold to retailers; in Visayas and Mindanao, the figures were 23% and 37%, respectively. The share of retailers in terms of volume traded by wholesalers was the smallest as wholesalers sold mainly to wholesaler-retailers.

Wholesalers in the Visayas preferred retailers as customers. Those in Luzon and Mindanao, however, claimed that they do not favor a particular customer. The influence of the wholesalers was very evident in the Visayas because they solely have the power to set the selling price. In Luzon, all wholesalers claimed that their selling price is dependent on prevailing market prices. In Mindanao, most of the

wholesalers surveyed said that they set the selling price of rice, while the rest said that they based it on prevailing prices.

F. Economic Analysis

Cost and returns analysis of paddy rice production

Yield, paddy price, and gross returns

Table 35 shows the estimated costs and returns of paddy rice production per hectare during the 2014 WS and 2015 dry DS in the country using PSA data. The national dry yield average (at 14% MC) was 4.01 t/ha in the WS and 4.04 t/ha in the DS. At an average price of PhP 20/kg and PhP 17/kg, these would give gross returns

Table 35. Costs and returns of paddy production, by season, Philippines, 2015

Item	2014 Wet season	2015 Dry season
Returns		
Yield (at 14% MC, kg/ha)	4,008	4,036
Price (PhP/kg)	20.02	17.42
Gross Returns (PhP/ha)	80,240	70,307
Costs (PhP/ha)		
Seed	2,531	2,190
Fertilizer	4,770	4,584
Chemicals	1,298	1,248
Hired labor	19,705	18,172
Operator, family, & exchange labor (OFE)	5,036	5,711
Animal, machine, fuel & oil	2,019	2,337
Irrigation/drainage	548	751
Food	1,011	979
Transportation	180	166
Tax	193	185
Land rent	8,486	6,542
Interest cost	1,580	1,555
Other inputs	2,657	2,508
Total Costs (PhP/ha)	50,014	46,928
Total Costs (PhP/kg)	12.48	11.63
Net Profit (PhP/ha)	30,226	23,379
Net Profit (PhP/kg)	7.54	5.79
Net Profit-Cost Ratio	0.60	0.50

Source: PSA, 2016

of PhP 80,240/ha and PhP 70,307/ha in DS and WS, respectively. Gross returns in rice production varied considerably across regions. Among regions in Luzon, Central Luzon, Ilocos, and Cagayan Valley recorded higher gross returns than the national level in both seasons (Table 36). On average, gross returns were about PhP 110,000–112,000/ha in Central Luzon; PhP 83,000–94,000/ha in Ilocos; and PhP 73,000–91,000/ha in Cagayan Valley in the same cropping period. The higher gross returns in these regions are attributed to higher yields and higher prices. Bicol

Region, CALABARZON, and MIMAROPA had gross returns lower than national average—they ranged from PhP 66,000 to PhP 75,000/ha in WS and from PhP 53,000 to PhP 63,000/ha in DS (Table 36). All regions in the Visayas consistently had lower gross returns compared with national average in both cropping periods (Table 37). Gross returns in these regions were less than PhP 70,000/ha in WS and less than PhP 60,000/ha in DS. This is mainly because farm yields in these regions (3-3.5 t/ha) were still below that of the national average (4 t/ha). Except for CARAGA and ARMM with gross returns of less than PhP 60, 000/ha, all regions in Mindanao had comparable or slightly higher gross returns than the national average in both seasons (Table 38). Gross returns in Northern Mindanao and the Davao region were more than PhP 80,000/ha in both seasons. Zamboanga Peninsula and SOCCSKSARGEN had gross returns of PhP 76,000–79,000/ha in WS and PhP 68,000–70,000/ha in DS.

Cost of rice production

In the same cropping period, the average cost of production was about PhP 50,014/ha in WS and PhP 46,928/ha in DS, translating into an average per kilogram paddy rice production cost of PhP 12.48 and PhP 11.63, respectively (Table 35). As in gross returns, cost of production varied across regions. Among regions, Central Luzon, Ilocos, and Cagayan Valley recorded the highest production cost, which ranged from PhP 60,000 to PhP 62,000/ha in WS and from PhP 49,000 to PhP 64,000/ha in DS (these are above the national average) (Table 36). The high cost of production in these regions is attributed to the higher cost of labor, fertilizer, and land rent. The production costs in Bicol Region, CALABARZON, and MIMAROPA were comparable with the national average range of PhP 39,000–50,000/ha in WS and PhP 35,000–49,000/ha in DS in the same cropping period. All regions in the Visayas generally had production costs lower than the national average in all seasons (Table 37). Except for Central Visayas, farmers in Western and Eastern Visayas had lower fertilizer costs because most of them had lower fertilizer application rates. ARMM posted the lowest cost of production, about PhP 29,000/ha in both seasons, because of relatively lower fertilizer cost and land rent. Cost of production in other regions in Mindanao ranged from PhP 42,000 to PhP 58,000/ha in WS and PhP 39,000 to PhP 49,000/ha in DS (Table 38).

Considering the productivity and farming practices in each region across seasons, the cost per unit tells a different story. In 2014 WS, Bicol Region (PhP 10.06/kg), Western Visayas (PhP 11.39/kg), Eastern Visayas (PhP 10.99/kg), Northern Mindanao (PhP 9.99/kg), ARMM (PhP 10.39/kg), SOCCSKSARGEN (PhP 11.06/kg), and Zamboanga Peninsula (PhP 11.52/kg) had an average cost per unit less than the national average (PhP 12.48/kg). The rest had an average cost per unit of more than PhP 12/kg, with Ilocos and Cagayan Valley posting the highest, more than PhP 14/kg. In 2015 DS, Bicol (PhP 9.44/kg), Central Luzon (PhP 10.22/kg), Cagayan Valley (PhP 11.14/kg), Eastern Visayas (PhP 9.42/kg), and Zamboanga Peninsula (PhP 11.50/kg) had the lowest cost per unit, less than the nation's PhP 11.63/kg. Ilocos (PhP 14.02/kg) and Central Visayas (PhP 16.3/kg) topped the list of regions with the high cost per unit of more than PhP 12/kg.

Table 36. Costs and returns of paddy production, by season, Luzon regions, Philippines, 2015

Item	Ilocos			Cagayan Valley			Central Luzon			CALABARZON			MIMAROPA			Bicol Region		
	2014 WS	2015 DS	Cost share (%)	2014 WS	2015 DS	Cost share (%)	2014 WS	2015 DS	Cost share (%)	2014 WS	2015 DS	Cost share (%)	2014 WS	2015 DS	Cost share (%)	2014 WS	2015 DS	Cost share (%)
Gross Returns (PhP/ha)	94388	82846		90640	72586		111823	108936		65940	56431		75952	63063		72185	56965	
Yield (at 14% MC, kg/ha)	4,308	4,557		4,341	4,426		4,911	5,813		3,530	3,636		3,901	3,756		3,883	3,699	
Price (PhP/kg)	21.91	18.18		20.88	16.4		22.77	18.74		18.68	15.52		19.47	16.79		18.59	15.4	
Costs (Php/ha)																		
Seed	2,447	2,404	4	2,257	2,156	4	3,287	2,872	5	2,236	1,800	4	2,941	2,251	6	2,059	1,628	5
Fertilizer	6,709	8,064	12	6,178	5,907	11	5,297	6,000	9	4,048	4,321	9	5,448	5,200	12	3,201	3,313	9
Chemicals	838	1,038	2	1,135	1,405	2	1,109	1,284	2	1,352	1,525	3	1,952	1,746	4	774	644	2
Hired Labor	22,793	19,061	34	24,399	20,121	40	28,313	28,200	47	22,182	22,677	47	21,851	16,263	41	14,975	12,782	37
Operator, family, & exchange labor	4,176	6,286	8	4,595	4,192	8	3,161	3,705	6	4,694	3,933	9	2,755	3,780	7	5,468	4,846	14
Animal, machine, fuel & oil	1737	2632	3	2141	1630	3	2254	2835	4	726	1138	2	2509	2263	5	2284	2127	6
Irrigation/drainage	415	1383	1	1020	876	2	707	1155	2	805	795	2	399	759	1	325	306	1
Food	1,679	1,444	3	1,003	937	2	1,078	960	2	301	371	1	760	735	2	810	761	2
Transportation	290	225	0	162	217	0	186	240	0	94	61	0	201	101	0	129	137	0
Tax	0	0	0	161	134	0	347	321	1	114	253	0	161	253	0	113	137	0
Land rent	14,212	12,042	21	12,846	7,889	18	8,807	6,258	13	6,107	6,472	13	5,782	3,273	10	5,979	5,086	15
Interest cost	1,655	1,659	3	2,574	2,580	5	2,400	2,286	4	1,650	1,821	4	2,637	2,598	6	1,376	1,313	4
Other inputs	3,885	7,537	9	3,359	1,261	4	3,268	3,294	5	2,424	3,666	6	3,218	2,741	6	1,551	1,826	5
Total Costs(PhP/ha)	60,836	63,775	100	61,830	49,305	100	60,214	59,410	100	46,733	48,833	100	50,614	41,963	100	39,044	34,906	100
Total Cost (PhP/kg)	14.12	13.99		14.24	11.14		12.26	10.22		13.24	13.43		12.97	11.17		10.06	9.44	
Net Profit (PhP/ha)	33,552	19,071		28,810	23,281		51,609	49,526		19,207	7,598		25,338	21,100		33,141	22,059	
Net Profit (PhP/kg)	7.79	4.19		6.64	5.26		10.51	8.52		5.44	2.09		6.50	5.62		8.53	5.96	
Net Profit-Cost Ratio	0.55	0.30		0.47	0.47		0.86	0.83		0.41	0.16		0.50	0.50		0.85	0.63	

Source of basic data: PSA, 2015

Table 37. Costs and returns of paddy production, by season, Visayas regions, Philippines, 2015

Item	Western Visayas			Central Visayas			Eastern Visayas		
	2014 WS	2015 DS	Cost share (%)	2014 WS	2015 DS	Cost share (%)	2014 WS	2015 DS	Cost share (%)
Gross Returns (PhP/ha)	**64,140**	**50,353**		**66,617**	**53,640**		**60,273**	**57,669**	
Yield (at 14% MC, kg/ha)	3,467	2,919		3,466	2,944		3,482	3,525	
Price (PhP/kg)	18.5	17.25		19.22	18.22		17.31	16.36	
Costs (PhP/ha)									
Seed	3,415	3,011	8	2,060	2,141	5	1,293	1,372	4
Fertilizer	3,806	3,574	10	7,630	8,813	18	2,249	1,762	6
Chemicals	1,380	1,164	3	585	442	1	448	493	1
Hired labor	16,513	14,112	40	15,515	14,731	33	17,765	15,401	46
Operator, family, & exchange labor	2,978	3,150	8	4,840	5,788	11	5,573	5,566	16
Animal, machine, fuel & oil	2,551	2,973	7	1,642	1,124	3	971	793	2
Irrigation/drainage	216	441	1	473	648	1	133	96	0
Food	1,061	945	3	16	10	0	1,245	1,440	4
Transportation	151	132	0	159	148	0	89	68	0
Tax	198	223	1	145	119	0	109	35	0
Land rent	4,147	4,181	11	6,660	6,915	15	5,165	3,763	12
Interest cost	1161	1080	3	1504	1682	3	1800	915	4
Other inputs	1,910	1,818	5	3,744	5,206	10	1,412	1,519	4
Total Costs(PhP/ha)	39,487	36,804	100	44,973	47,767	100	38,252	33,223	100
Total Costs (PhP/kg)	11.39	12.61		12.98	16.23		10.99	9.42	
Net Profit (PhP/ha)	24,653	13,549		21,644	5,873		22,021	24,446	
Net Profit (PhP/kg)	7.11	4.64		6.24	1.99		6.32	6.94	
Net Profit-Cost Ratio	0.62	0.37		0.48	0.12		0.58	0.74	

Source of basic data: PSA, 2015

Table 38. Costs and returns of paddy production, by season, Mindanao regions, Philippines, 2015

Item	Zamboanga Peninsula			Northern Mindanao			Davao Region			SOCCSKSARGEN			Caraga			ARMM		
	2014 WS	2015 DS	Cost share (%)	2014 WS	2015 DS	Cost share (%)	2014 WS	2015 DS	Cost share (%)	2014 WS	2015 DS	Cost share (%)	2014 WS	2015 DS	Cost share (%)	2014 WS	2015 DS	Cost share (%)
Gross Returns (PhP/ha)	78,954	70,812		87,430	82,247		88,382	81,881		76,299	67,656		60,776	53,729		49,987	36,882	
Yield (at 14% MC, kg/ha)	4,074	3,878		4,509	4,233		4,457	4,374		4,001	3,687		3,149	3,183		2,813	2,238	
Price (PhP/kg)	19.38	18.26		19.39	19.43		19.83	18.72		19.07	18.35		19.3	16.88		17.77	16.48	
Costs (PhP/ha)																		
Seed	2,033	1,599	4	1,961	2,065	4	2,302	2,310	4	2,620	2,439	6	2,383	1,796	5	1,990	1,975	7
Fertilizer	4,793	4,036	10	5,548	5,614	11	5,279	5,345	9	3,682	3,471	8	2,877	2,653	7	1,481	1,843	6
Chemicals	2,074	1,790	4	1,458	2,002	3	2,029	1,985	3	2,063	1,766	4	1,858	1,294	4	662	1,013	3
Hired labor	15,453	16,737	35	18,268	19,752	39	18,764	21,985	35	17,410	15,363	37	15,903	15,766	39	10,826	8,690	33
Operator, family, & exchange labor	2,795	2,210	5	3,965	4,943	9	2,744	3,736	6	3,684	4,174	9	3,902	4,367	10	7,538	9,467	29
Animal, machine, fuel & oil	1,971	1,430	4	1,048	3,229	4	1,046	2,741	3	1,028	1,683	3	2,077	2,955	6	623	1,086	3
Irrigation/drainage	528	488	1	857	1630	2	1298	1411	2	712	1109	2	767	460	2	525	176	1
Food	705	663	1	963	925	2	1,413	1,384	2	805	743	2	1,227	1,403	3	376	208	1
Transportation	193	174	0	140	357	0	157	228	0	96	175	0	177	96	0	256	201	1
Tax	202	180	0	174	141	0	112	259	0	134	189	0	137	98	0	163	180	1
Land rent	11,244	10,017	23	7,291	7,890	15	18,230	14,618	28	9,554	10,751	23	6,205	4,062	13	3,100	2,346	9
Interest cost	1,638	1,878	4	1,857	2,042	4	1,969	1,677	3	1,083	1,017	2	1,913	2,106	5	619	766	2
Other inputs	3,311	3,377	7	1,507	3,435	5	2,171	1,766	3	1,397	2,077	4	2,643	1,996	6	1,061	1,520	4
Total Costs(PhP/ha)	46,940	44,579	100	45,037	54,025	100	57,514	59,445	100	44,268	44,957	100	42,069	39,052	100	29,220	29,471	100
Total Costs (PhP/kg)	11.52	11.50		9.99	12.76		12.90	13.59		11.06	12.19		13.36	12.27		10.39	13.17	
Net Profit (PhP/ha)	32,014	26,233		42,393	28,222		30,868	22,436		32,031	22,699		18,707	14,677		20,767	7,411	
Net Profit (PhP/kg)	7.86	6.76		9.40	6.67		6.93	5.13		8.01	6.16		5.94	4.61		7.38	3.31	
Net Profit-Cost Ratio	0.68	0.59		0.94	0.52		0.54	0.38		0.72	0.50		0.44	0.38		0.71	0.25	

Source of basic data: PSA, 2015

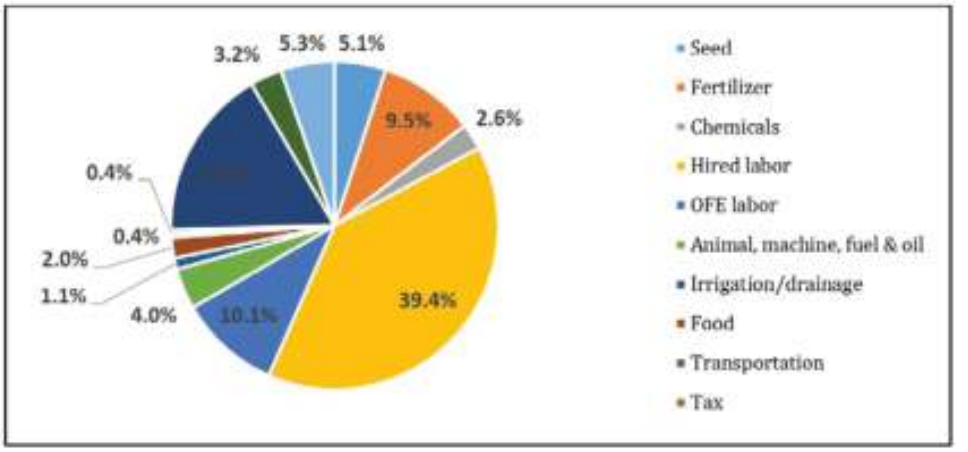


Figure 20. Cost shares in total cost of paddy production, Philippines, 2014 WS

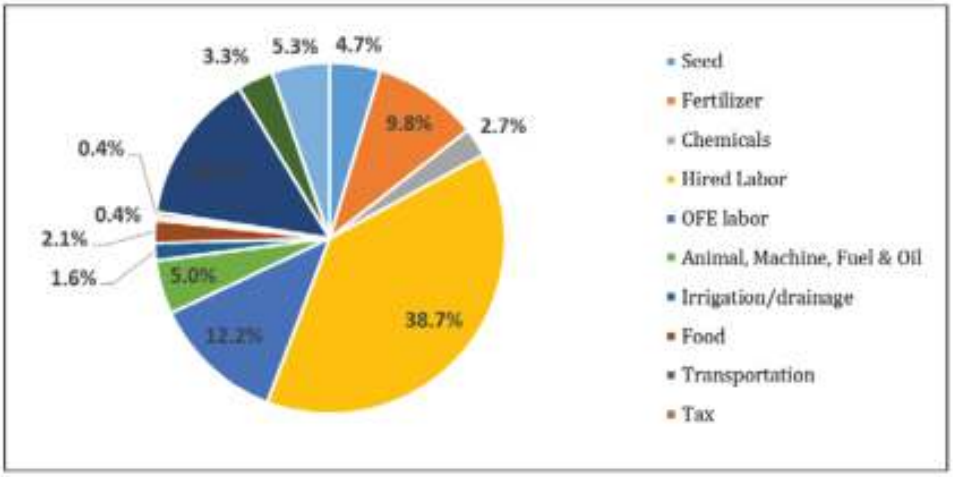


Figure 21. Cost shares in total cost of paddy production, Philippines, 2015 DS

On average, for all seasons, decomposing the cost shares of farm production at the national level resulted in labor cost constituting the biggest share of 50–51%: 39% from hired labor and 10-12% from the imputed value of operator, family, and exchange (OFE) labor (Figures 20 and 21). The bulk of the labor cost is the imputed value of the harvesters' and threshers' share (imputed using the average procurement price of paddy rice), which is paid at the end of the harvest period. Given the relatively high average yield in the area, the non-cash cost of harvesters' and threshers' share alone, when valued, comprised 20% of total production cost. It can be seen that, with this labor arrangement, the higher the procurement price, the higher the imputed labor cost. Land rent contributed 14–18% of total production cost. The high land rent could be attributed to increasing scarcity of productive rice land in the country. Given the high price and the amount of fertilizer use by farmers, it is not surprising that fertilizer cost had a significant share (around 10%) in total production cost in both seasons. In fact, considering only paid-out costs, fertilizer cost was more than the land rent. Farmers also spent considerable amounts on

animal, machine rental, and fuel with 4–5% share. Seed cost also had a 5% share, owing to the farmers' high seeding rate practice *(see Section D on Functions*). The remaining proportions of costs were spent on other inputs (5%), chemicals (3%), interest on capital (3%), food (2%), irrigation/drainage (1–1.6%), transportation (0.4%), and land tax (0.4%).

These cost shares were also observed in all regions. On average, cost shares generally exhibited the same trend in all regions. However, some cost items appeared to be more substantial in some areas. In Luzon, labor cost, land rent, and fertilizer cost captured the biggest share in total cost of production in all regions (Table 36). The Visayan region also demonstrated the same trend in cost sharing, although seed cost appeared to be an important item in Western Visayas, with more than 8% share in total production cost (Table 37). The high cost of seed in this region is mainly due to the farmers' practice of direct seeding, which requires higher seeding rate. Similar to their Luzon and Visayan counterparts, farmers in Mindanao regions spent more on labor, land rent, and fertilizers (Table 38). However, given the relatively high pesticide application of farmers in these regions, it is not surprising that this cost had a significant share, more than 3% of total cost of production.

Returns to rice production

Considering all costs (cash, non-cash, and imputed), average net returns in the country were PhP 30,226/ha in WS and PhP 23,379/ha in DS (Table 35). This translates into a net profit per kilogram paddy of PhP 7.54 in WS and PhP 5.79 in DS; profit cost ratio was 0.5–0.6. However, returning the value of imputed costs (i.e., the farmer owns the land and capital used in rice farming, and he did not pay for OFE labor), income from rice production increased to PhP 41,698/ha in WS and PhP 34,070/ha in DS. On average, a typical farmer can obtain an annual rice production income of more than PhP 75,000/ha. The positive net returns strongly suggest that farmers profit from rice farming. More importantly, income from rice production, including returns to own land, capital, and labor, will be able to cover (though barely) the basic needs of a farm household with five members.

Similar to gross returns and cost of production, net returns in rice farming varied largely across regions and seasons (Tables 36-38). In 2014 WS, Central Luzon received the highest net returns (more than PhP 51,000/ha); followed by Ilocos, Bicol, Northern Mindanao, Zamboanga Peninsula, SOCCSKSARGEN, and Davao region (PhP 35,000 /ha); Cagayan Valley, MIMAROPA, Western Visayas, and Eastern Visayas had less than PhP 30,000/ha; the lowest values were recorded in CALABARZON, CARAGA, and ARMM with only less than PhP 20,000/ha. Because of lower paddy prices in 2015 DS, net returns in all regions were less than those obtained in 2014 WS. Central Luzon consistently had the highest net returns of PhP 49,526/ha for this season. Lowest net returns were observed in CALABARZON, Central Visayas, and ARMM with just less than PhP 8,000/ha. The rest of the regions had net returns that ranged from PhP 14,000 to PhP 28,000/ha.

Table 39. Summary of yield, costs and net returns of the top 20 major rice-producing provinces, Philippines, 2014 wet season

Province	Yield (kg/ha)	Price (PhP/kg)	Gross returns (PhP/ha)	Total costs (PhP/ha)	Net returns (PhP/ha)
Pangasinan	4,205	22.21	93,393	48,244	45,149
Isabela	4,514	20.75	93,666	50,313	43,353
Cagayan	4,049	21.57	87,337	70,785	16,552
Nueva Ecija	5,389	23.85	128,528	55,458	73,070
Bulacan	4,496	23.48	105,566	64,393	41,173
Pampanga	4,643	21.54	100,010	48,421	51,589
Tarlac	4,706	19.15	90,120	55,795	34,325
Occidental Mindoro	3,988	19.63	78,284	57,664	20,620
Oriental Mindoro	4,130	20.74	85,656	56,856	28,800
Camarines Sur	4,088	18.63	76,159	33,107	43,052
Iloilo	3,342	18.57	62,061	39,088	22,973
Negros Occidental	3,925	18.52	72,691	42,274	30,417
Bohol	3,617	20.55	74,329	40,735	33,594
Leyte	3,699	17.68	65,398	38,079	27,319
Zamboanga del Sur	4,446	20.22	89,898	48,372	41,526
Bukidnon	4,685	19.09	9,437	48,245	41,192
Davao del Sur	5,127	20.77	106,488	65,343	41,145
North Cotabato	4,127	19.27	79,527	47,798	31,729
Sultan Kudarat	3,934	18.41	72,425	43,910	28,515
Agusan del Sur	3,047	18.85	57,436	42,525	14,911

Source: PSA (2015)

Tables 39 and 40 summarize the yield, cost of production, and net returns of the top 20 major rice-producing provinces covered in this study. Nueva Ecija was the highest yielder with an estimated dry yield (14% MC) of 5.39 t/ha in 2014 WS and 7.10 t/ha in 2015 DS. Relative to Nueva Ecija, all provinces covered in Luzon had lower yields at 3.9–4.5 t/ha in WS and 3.8–4.8 t/ha in DS. Provinces in the Visayas had relatively lower yields than Nueva Ecija. Iloilo, Negros Occidental, Bohol, and Leyte—3.3–3.9 t/ha in WS and 2.9–4.2 t/ha in DS. Among provinces in Mindanao, Davao del Sur attained the highest yield of about 5.0 t/ha across seasons. All other provinces in Mindanao had yielded 3.1–5.1 t/ha in WS and 3.3–5.0 t/ha in DS. Due to higher yield and price levels, Nueva Ecija posted the highest gross revenue: from PhP 128,000 to PhP 138,000/ha per cropping season. It is followed by Davao del Sur, Pampanga, and Bulacan with more than PhP 90,000/ha. Gross returns of the remaining provinces ranged from PhP 50,000 to PhP 93,000/ha, with Iloilo and Agusan del Sur recording the lowest values. These returns can still be improved through yield advancement.

Table 40. Summary of yield, costs and net returns of the top 20 major rice-producing provinces, Philippines, 2015 dry season

Province	Yield (kg/ha)	Price (PhP/kg)	Gross returns (PhP/ha)	Total costs (PhP/ha)	Net returns (PhP/ha)
Pangasinan	4,544	18.21	82,746	56,888	25,858
Isabela	4,532	16.70	75,684	48,933	26,751
Cagayan	4,341	15.87	68,892	57,586	11,306
Nueva Ecija	7,103	19.39	137,727	75,748	61,979
Bulacan	4,663	18.70	87,198	46,946	40,252
Pampanga	4,854	18.27	88,683	48,521	40,162
Tarlac	4,773	18.87	90,067	55,154	34,912
Occidental Mindoro	4,664	17.94	83,672	54,564	29,108
Oriental Mindoro	3,876	15.67	60,737	50,216	10,521
Camarines Sur	3,838	15.41	59,144	31,267	27,877
Iloilo	2,957	17.28	51,097	33,654	17,443
Negros Occidental	3,572	17.35	61,974	39,898	22,076
Bohol	2,912	18.29	53,260	46,024	7,236
Leyte	4,185	16.23	67,923	38,356	29,567
Zamboanga del Sur	4,388	18.7	82,056	47,316	34,740
Bukidnon	4,208	19.39	81,593	54,830	26,763
Davao del Sur	4,970	19.48	96,816	70,402	26,414
North Cotabato	3,759	18.23	68,527	50,696	17,831
Sultan Kudarat	3,638	18.11	65,884	41,547	24,337
Agusan del Sur	3,291	16.58	54,565	42,074	12,491

Source: PSA (2015)

On average, cost of production varied substantially across provinces and seasons (Tables 39 and 40). It ranged from PhP 31,000 to PhP 76, 000/ha. High-yielding provinces such as Nueva Ecija, Isabela, Bulacan, Tarlac, Pampanga, Davao del Sur, and Bukidnon incurred the highest cost of production. These provinces generally spent more on rice production mainly due to higher labor cost, fertilizer application, and land rent. Despite the high cost of production, high-yielding provinces still posted higher net returns. Nueva Ecija attained overwhelming net returns ranging from PhP 61,979 to PhP 73,070/ha. Bulacan, Tarlac, and Pampanga had net returns of more than PhP 34,000/ha. Isabela, Davao del Sur, and Bukidnon had varying net returns, from PhP 26,000 to PhP 40,000/ha. The huge difference in net returns observed in these provinces is primarily attributed to higher farmgate price recorded in 2014 WS compared with that in 2015 DS. Net returns in other provinces ranged from just PhP 7,000 to PhP 30,000/ha per cropping season. The positive net returns imply that farmers profit from rice farming. However, this income will not be enough to meet the basic needs of a five-member farm household.

Overall, costs of rice production in the country are still high. Consequently, net returns of producers are low. Intensifying yield and reducing the cost of production are key ways to improve competitiveness and increase profit in rice farming. These can be achieved through the use of hybrid varieties, high-quality seeds, improved agronomic techniques, as well as reducing labor use through direct seeding or use of combine-harvesters.

Cost and return analysis of paddy rice trading

Table 41 shows the average cost and return profile of paddy rice trading in selected regions in the country. Regional details on cost and returns of paddy rice trading across seasons are presented in the final report of Mataia et al., (2017). Estimates of costs and returns on a per kilogram basis were calculated on the basis of data obtained from a survey of paddy rice traders from the top 20 major rice-producing provinces in the country during 2014 WS and 2015 DS cropping (see Chapter on Methodology). As discussed earlier, paddy traders performed different marketing functions: (1) buying and selling of fresh or dry paddy rice, (2) procurement of fresh rice and selling it as dry paddy rice, and (3) procurement of either fresh or dry paddy rice and selling it as milled rice *(see Section D on Functions)*. In this study, the analysis was merely confined to function 2 because most traders procure fresh paddy rice directly from farmers and sell it as dry paddy to rice millers. In this marketing line, paddy traders commonly shoulder the cost of transportation or pick-up cost from farmers, as well as drying and shrinkage losses.

Cost of good

Cost of good refers to the procurement price of fresh paddy transformed into dry paddy price equivalent. Dry paddy price equivalent is defined as the price of fresh paddy adjusted to 14% MC, the typical MC when dry paddy is milled. It usually reflects the cost of shrinkage losses due to drying of fresh paddy. At the farm level, procurement price of fresh paddy varied substantially across locations and seasons. The survey showed farmers reporting different farmgate prices. Paddy traders also reported different procurement prices of fresh paddy. Variations in prices could be attributed to different levels of MC, grain quality, variety, and competition among players in the market. The WS harvests commonly have higher MC than DS harvests, and they therefore receive lower prices. Grains with better quality commonly have a one-peso price advantage than poor-quality ones. Some varieties of paddy rice, such as NSIC Rc160 and NSIC Rc218, received premium prices in the market, about one to three-pesos price difference relative to other common rice varieties. Competition among market players could also influence paddy prices. In some cases with limited supply but with many players, price tends to be higher or vice versa. With these price variations, the procurement price of fresh paddy rice used in these estimates was the average of the farmer's selling price and the paddy trader's procurement price.

Since paddy traders sold their product as dry paddy to rice millers, their procured fresh paddy was dried up to 14% MC. As mentioned earlier, the initial MC

Table 41. Costs and returns of paddy trading, by major island and selected regions, Philippines, 2015

ITEM	Philippines	Luzon	Visayas	Mindanao	Ilocos Region	Cagayan Valley	Central Luzon	MIMA-ROPA	Bicol Region	Western Visayas	Central Visayas	Eastern Visayas	Zamboanga Peninsula	Northern Mindanao	Davao Region	SOCCSK-SARGEN	Caraga
Gross Returns (PhP/kg)																	
Selling price of dry paddy	19.37	19.03	18.26	20.36	18.43	19.72	20.70	18.67	17.65	19.29	18.03	17.46	20.28	21.51	20.92	19.88	19.23
Costs (PhP/kg)																	
Procurement price of fresh paddy	16.31	15.71	15.42	17.44	15.97	16.02	16.88	15.07	14.63	16.45	15.54	14.28	17.79	18.58	18.38	15.99	16.46
Dry equivalent procurement price of paddy	17.99	17.54	17.01	19.04	17.61	17.79	18.72	16.98	16.59	18.04	17.05	15.94	19.04	20.18	19.67	18.21	18.10
Marketing costs																	
Drying	0.16	0.15	0.11	0.19	0.06	0.13	0.20	0.18	0.16	0.11	0.11	0.10	0.19	0.19	0.19	0.19	0.19
Storage	0.03	0.05	0.02	0.01	0.07	0.00	0.05	0.14	0.00	0.02	0.00	0.03	0.00	0.01	0.00	0.00	0.02
Packaging	0.10	0.10	0.17	0.05	0.11	0.08	0.12	0.11	0.06	0.17	0.23	0.10	0.00	0.05	0.00	0.13	0.08
Transportation	0.27	0.37	0.19	0.22	0.12	0.42	0.57	0.48	0.26	0.19	0.11	0.27	0.00	0.22	0.00	0.49	0.39
Handling	0.15	0.17	0.19	0.12	0.07	0.28	0.24	0.14	0.11	0.19	0.19	0.20	0.00	0.12	0.03	0.27	0.16
Administrative	0.11	0.06	0.19	0.11	0.06	0.06	0.06	0.10	0.01	0.19	0.05	0.33	0.33	0.11	0.01	0.09	0.02
Cost of working capital	0.06	0.09	0.05	0.05	0.04	0.12	0.10	0.09	0.08	0.05	0.03	0.06	0.01	0.05	0.07	0.11	0.01
Total	0.88	0.97	0.91	0.76	0.54	1.09	1.34	1.24	0.67	0.91	0.72	1.09	0.54	0.76	0.31	1.29	0.89
Total Costs (PhP/kg)	18.87	18.51	17.91	19.80	18.14	18.89	20.06	18.21	17.25	18.94	17.77	17.03	19.58	20.94	19.98	19.50	18.99
Net Profit (PhP/kg)	0.50	0.52	0.34	0.57	0.28	0.83	0.64	0.45	0.40	0.34	0.26	0.43	0.70	0.57	0.95	0.38	0.24
Net Profit-Cost Ratio	0.03	0.03	0.02	0.03	0.02	0.04	0.03	0.02	0.02	0.02	0.01	0.03	0.04	0.03	0.05	0.02	0.01

Source: Paddy traders survey, 2014-2015

Table 42. Average moisture content of fresh paddy rice and milling recovery, by major island and region, Philippines, 2015

National/Region	Moisture content (%)*		Milling recovery (%)**
	WS	DS	
Ilocos Region	21.33	23.25	64.57
Cagayan Valley	22.28	22.61	64.51
Central Luzon	22.27	22.67	64.76
MIMAROPA	23.72	23.69	64.77
Bicol Region	23.87	24.52	61.14
Western Visayas	22.44	21.25	65.07
Central Visayas	19.00	19.00	62.88
Eastern Visayas	22.99	22.85	64.30
Zamboanga Peninsula	19.90	19.50	63.00
Northern Mindanao	20.84	20.84	65.33
Davao Region	20.13	19.00	62.60
SOCCSKSARGEN	24.23	24.59	62.64
CARAGA	21.79	21.32	61.13
Luzon	**22.62**	**23.01**	**63.95**
Visayas	**22.46**	**21.81**	**64.08**
Mindanao	**22.03**	**21.84**	**62.94**
Philippines	**22.41**	**22.42**	**63.88**

Source: *Paddy traders survey, 2015; ** Rice millers survey, 2015

of fresh paddy was used in converting the procurement price of fresh paddy into its dry paddy price equivalent. Table 42 presents the regional summary of average MC levels used in the analysis. Generally, dry paddy price equivalent during WS should appear to be similar to that during DS. However, farmers get a lower price for their produce because paddy traders adjust their procurement price mainly to account for the higher shrinkage, the relatively lower quality of paddy rice during WS, and the higher drying losses and cost. Paddy traders also reported that they commonly adjust their paddy procurement price based on the procurement price set by miller-traders. Basically, if the procurement price of miller-traders' decreases, paddy traders also adjust by lowering their buying price, while maintaining their normal net profit. Moreover, if paddy is of low quality or if it has very high MC (as is the case during WS), the additional drying cost is reflected in the lower procurement price. In these estimates, however, procurement price during 2014 WS was relatively higher than that during 2015 DS, particularly in Luzon areas. This is mainly because of the abnormal buying and selling prices existing in the preceding season (*see Chapter on Methodology*).

In Luzon areas, dry paddy price equivalent during WS and DS, on average, differed by about PhP 2.00/kg. Central Luzon recorded the highest average procurement price of dry paddy per kilogram at PhP 19.61 in WS and PhP 17.84 in DS; followed by Cagayan Valley (PhP 18.84 and PhP 16.75) and Ilocos region (PhP 18.96 and PhP 16.26). The relatively higher prices in these regions are attributed to better quality of paddy, lower MC, and more competitive markets. The lowest

procurement prices were observed in MIMAROPA (PhP 18.09 and PhP 15.87/kg) and Bicol (PhP 17.82 and PhP 15.35/kg). Areas in the Visayas had relatively lower procurement prices than areas in Luzon and Mindanao. Dry paddy equivalent procurement prices were about PhP 18.00/kg in Western Visayas and PhP 17.00/kg in Central Visayas; it was almost PhP 16.00/kg in Eastern Visayas. In Mindanao regions, average procurement price was about PhP 19.00/kg. Procurement prices in Northern Mindanao, Zamboanga Peninsula, and Davao region ranged from PhP 19.00 to 20.00/kg. Meanwhile, about PhP 18.00/kg was recorded in SOCCSKSARGEN and CARAGA (Table 41).

Marketing costs

Besides the cost of good, paddy traders also incurred marketing cost. This covers transporting, drying, storing, packaging, handling, and other costs such as government fees and interest on working capital, including valued processing losses. However, there were cases when paddy traders did not incur any marketing cost, thereby indicating zero values. Marketing costs of paddy traders in each region were almost similar in WS and DS but varied considerably across regions. At the national level, average marketing cost was PhP 0.83/kg. In Luzon areas, marketing costs of more than PhP 1.00/kg were recorded in Central Luzon (PhP 1.34/kg), MIMAROPA (PhP 1.24/kg), and Cagayan Valley (PhP/ 1.09). Bicol and Ilocos region incurred lower marketing costs of less than PhP 0.70/kg. In the Visayas, the highest marketing cost (PhP 1.09/kg) was observed in Eastern Visayas, followed by Western Visayas (PhP 0.82/kg) Central Visayas had the lowest (PhP 0.72/kg). In Mindanao, SOCCSKSARGEN, CARAGA, and Northern Mindanao had higher marketing costs—PhP 1.29/kg, PhP 0.89/kg, and PhP 0.72/kg, respectively. Lower marketing costs were recorded in Davao region (PhP 0.31/kg) and Zamboanga Peninsula (PhP 0.54/kg), owing to merely the buy-and-sell functions of paddy traders in these regions.

Decomposing the cost shares of total marketing cost at the national level, transportation cost captured the biggest chunk, at 31% (Figure 22). On average, paddy traders spent PhP 0.27/kg for transportation (Table 41). This cost varied across regions and ranged from PhP 0.11 to PhP 0.57/kg, with Central Luzon recording the highest value. Cagayan Valley, MIMAROPA, and SOCCSKSARGEN also spent considerable amounts in transportation, PhP 0.50/kg. Transportation cost is high in the country, particularly in some areas, because of poor road infrastructure that prevents paddy traders from hauling more tons of grains per liter of fuel (Dawe et al., 2008). Trucks in the country generally have lower capacity, only about 15 t, on average. Larger trucks, on the other hand, are impractical to use because road quality is considerably poor. Roads in some areas of the country have more potholes, tend to pass through urban areas instead of passing the outskirts, and have fewer lanes, causing longer travel time. All of these factors make it difficult to drive large trucks, thereby resulting in higher transport cost.

Drying and handling costs are the other important portions of marketing cost, with shares of 18% each. On average, the cost of drying was PhP 0.16/kg.

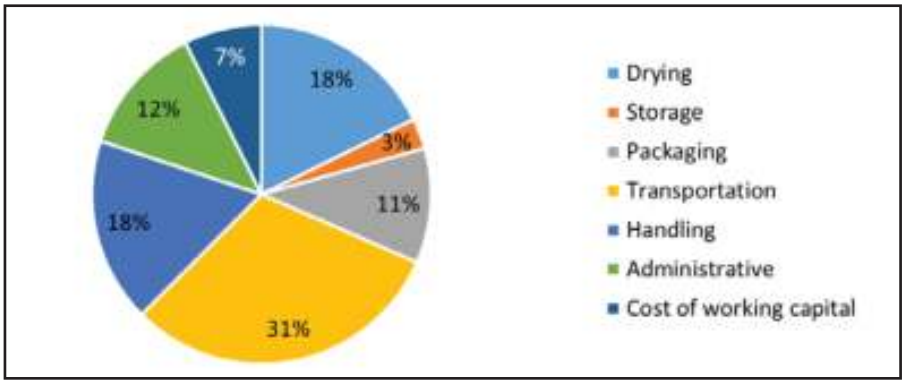


Figure 22. Cost shares in total marketing cost of paddy traders, Philippines, 2015

This cost is attributed to solar drying, a more popular method adopted by most paddy traders *(see Section D on Functions)*. In this method, they use public pavements or cemented roads to dry their paddy. Solar drying is generally cheaper than mechanical drying because of zero fuel cost. However, solar drying negatively affects the quality of milled rice. Low head rice recovery or higher percentage of broken rice is one such negative effect. Beltran et al. (2016) reported that average head rice recovery in the country was only 43%, which is below the standard of premium milled rice of 48% and above. Drying cost varied across locations with Central Luzon and all regions in Mindanao posting the highest cost of PhP 0.20/kg. Handling cost, on average, was PhP 0.15/kg at the national level. This cost varied across locations and ranged from PhP 0.07 to PhP0.28/kg. Handling cost is high because of the substantial amount spent on manual loading and unloading of grains. This cost ranged from PhP 1.50 to Ph P2.00/bag per move. In other countries such as Thailand and Vietnam, this process has been mechanized (Dawe et al., 2008). Traders in these countries are now using conveyor belts and they pay for the use of mechanized loaders instead of manual labor. This cuts the cost of hired labor in handling the marketing of grains. The additional payment for commission agents (PhP 5.00–10.00/bag) is also part of handling cost. Some paddy traders hire commission agents to ensure a steady supply of paddy.

Given the various government fees and other costs required to run the business, it is not surprising that administrative cost had a significant share, 13%. On average, administrative cost was PhP 0.11/kg. Paddy traders also spent a lot on packaging (11% cost share). Due to the high price of paddy sacks (Table 28), paddy traders spent about PhP 0.10/kg for packaging. Previous studies reported that traders in Thailand no longer use sacks in transporting paddy from the farm to the market (Manalili et al., 2016). Harvested paddy from the grain tank of the combine harvester is directly loaded to a truck through a swinging unloading conveyor. This process causes substantial reduction in packaging cost.

The remaining proportions of marketing costs covered cost of working capital (7%) and storage (3%). The cost of working capital is calculated by multiplying the price of dry paddy by the banks' investment loan interest rate and by the average length of storage period. The price of dry paddy was used in the

computation since paddy is stored longer than milled rice. Paddy traders spent a substantial amount on capital cost largely due to the expensive cost of dry paddy and the longer period of storage. On average, paddy traders spent PhP 0.06/kg for the cost of working capital (Table 41). Paddy traders incurred cost for storing paddy for a longer period to ensure supply during lean months. This requires them to rent storage space longer, which consequently translates into a sizeable amount of storage cost, averaging PhP 0.03/kg.

Total cost and profit in paddy trading

Adding marketing cost to the cost of good, at the national level, the average total cost incurred by a paddy trader was PhP 18.87/kg. At the average selling price of PhP 19.37/kg, a paddy rice trader got a net margin of PhP 0.50/kg of paddy rice procured (Table 41). Net margins of paddy traders varied considerably across regions but not across seasons, owing to the quality and MC of paddy and degree of competition among players in the market. Paddy traders said that sometimes they earn good profit but sometimes they also incur losses, depending on the market situation. On average, paddy traders in the Visayas had the lowest net margin of PhP 0.34/kg of paddy rice procured. This is probably because of the lower quality and higher shrinkage of procured paddy rice. The higher net returns observed in other regions could be attributed to the buying and selling system existing in the area. In addition, net margins depend on the strategies employed by paddy traders in the market.

Paddy traders, as mentioned earlier, perform different functions in the market. Consequently, their profit also varies, depending on the functions that they do. Paddy traders who buy and sell fresh or dry paddy rice can earn as much as PhP 0.20–0.40/kg. Moreover, paddy traders who expand their functions into milled rice trading can earn as much as PhP 2.00–5.00/kg, capturing the profits of other market players such as millers, wholesalers, and retailers. Expanding the line of business operation, however, requires huge investment. This is the reason most of the paddy traders do not venture into this kind of business operation.

Cost and return analysis of rice milling

Table 43 shows the estimated costs and returns of rice milling on a per kilogram basis of milled rice across regions using the same set of survey data. Similar to paddy traders, rice millers also perform different functions including but not limited to (1) procurement of fresh paddy and selling it as milled rice, (2) procurement of dry paddy and selling it as milled rice, (3) procurement of both fresh and dry paddy and selling them as milled rice, (4) buying and selling of milled rice, and (5) custom milling (see Chapter 5 on Functions). In this study, the analysis only focused on function 2. In this case, rice millers have no drying cost because procurement was confined only to dry paddy rice. As mentioned earlier, paddy traders bear the cost of drying and shrinkage losses.

Cost of good

The cost of good in rice milling refers to the procurement price of dry paddy at 14% MC. Procurement prices varied substantially across locations and seasons. The survey revealed that farmers and paddy traders reported different selling prices of their dry paddy. Rice millers also provided different procurement prices of dry paddy. With these price variations, the selling prices of dry paddy reported by the paddy traders were used as the procurement price of dry paddy by the rice millers (Table 43). This is valid since most of the rice millers directly procured their supply of dry paddy from paddy traders.

The procurement price of dry paddy was converted into its milled rice cost equivalent. The concept of rice cost equivalent per kilogram of dry paddy rice is important in the estimation of prices and marketing margins for rice millers. Generally, millers determine milling recovery (MR) in terms of how much paddy rice is required in order to produce a 50-kg bag of milled rice, which is the weight of one sack when dealing with rice wholesaling and retailing. The MR varied, depending on the type and capacity of milling machine used. In this analysis, the commonly reported MR of the rice millers during the survey was used (Table 42). To estimate the milled rice cost equivalent of procurement cost, the per unit dry paddy rice price was divided by the factor of average MR, which is 63.88% at the national level.

Since the procurement price of paddy rice and MR varied across regions, its milled rice cost equivalent also varied. On average, the price of dry paddy, in terms of milled rice equivalent, at the national level was PhP 30.46/kg (Table 43). Given the higher prices of paddy and MR in Central Luzon and Cagayan Valley, the rice cost equivalent of their dry paddy was more than PhP 30.00/kg, higher than in Ilocos region, Bicol, and MIMAROPA prices by about PhP 1.00/kg. The Visayan regions had relatively lower average rice cost equivalent of dry paddy (PhP 29.00/kg) than in Luzon and Mindanao regions, owing to the lower dry paddy prices reported by paddy traders (Table 43). Western Visayas posted the highest price at PhP 30.00/kg. Regions in Mindanao generally incurred the highest rice cost equivalent of dry paddy of about PhP 32.00/kg. This is mainly due to the aforementioned high dry paddy prices in these regions.

Marketing costs

The marketing costs of rice millers covered milling, storage, transportation, handling, packaging, and other costs such as government fees and cost of working capital, including valued processing losses. Similar to marketing costs of paddy traders, those of rice millers varied considerably across regions but not across seasons. On average, marketing cost at the national level was PhP 3.57/kg (Table 43). In Luzon regions, it ranged from PhP 3.00 to PhP 3.50/kg. These costs were lower than those in the Visayas (PhP 3.00–3.75/kg) and Mindanao (PhP 3.00–4.75/kg). The cost variations could be attributed to the different amounts spent on each cost item.

Table 43. Costs and returns of rice milling, by major island and selected regions, Philippines, 2015

ITEM	Philippines	Luzon	Visayas	Mindanao	Ilocos Region	Cagayan Valley	Central Luzon	MIMA-ROPA	Bicol	Western Visayas	Central Visayas	Eastern Visayas	Zamboanga Peninsula	Northern Mindanao	Davao Region	SOCCSK-SARGEN	Caraga
Gross Returns (PhP/kg)																	
Selling price of milled rice	35.86	34.31	34.47	38.45	32.36	35.48	36.17	34.26	33.27	34.63	36.45	31.91	39.05	38.24	40.06	37.86	37.03
Selling price of paddy by-products	0.46	0.42	0.61	0.40	0.05	0.00	0.13	0.76	1.18	1.14	0.00	0.70	0.00	0.00	1.36	0.60	0.02
Total returns	36.32	34.73	35.08	38.84	32.41	35.48	36.29	35.02	34.45	35.77	36.45	32.61	39.05	38.24	41.42	38.46	37.05
Costs (PhP/kg)																	
Procurement price of dry paddy	19.37	19.03	18.26	20.36	18.43	19.72	20.70	18.67	17.65	19.29	18.03	17.46	20.28	21.51	20.92	19.88	19.23
Rice equivalent procurement price of dry paddy	30.46	29.75	28.78	32.34	28.54	30.57	31.97	28.82	28.87	29.64	28.68	27.15	32.19	32.92	33.42	31.73	31.45
Marketing costs																	
Drying		0.52	0.58		0.25	0.48	0.52	0.84	0.52	0.71		0.21	0.72	0.69	0.62	0.64	0.82
Milling	1.18	1.15	0.98	1.36	1.10	1.06	0.99	0.98	1.61	0.84	1.31	0.60	1.50	1.42	1.30	0.82	1.75
Packaging	0.32	0.39	0.25	0.22	0.35	0.56	0.38	0.39	0.28	0.27	0.42	0.38	0.11	0.31	0.33	0.24	0.11
Storage	0.04	0.06	0.07	0.00	0.30	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transportation	0.62	0.66	0.58	0.66	0.44	0.62	0.73	0.77	0.74	0.39	0.61	0.51	0.84	0.46	0.68	0.63	0.69
Handling	0.28	0.21	0.38	0.32	0.18	0.39	0.22	0.15	0.13	0.29	0.09	0.55	0.29	0.50	0.38	0.21	0.23
Administrative	0.74	0.29	1.22	1.16	0.32	0.13	0.36	0.29	0.37	1.10	0.04	1.16	1.39	1.02	1.82	0.71	0.86
Cost of working capital	0.40	0.34	0.49	0.36	0.25	0.31	0.34	0.46	0.31	0.24	0.98	0.54	0.71	0.38	0.22	0.37	0.11
Total	3.57	3.10	3.97	4.08	2.95	3.06	3.01	3.05	3.44	3.34	3.45	3.74	4.85	4.09	4.73	2.98	3.76
Total Costs (PhP/kg)	34.03	32.86	32.75	36.43	31.49	33.63	34.98	31.87	32.31	32.98	32.12	30.89	37.04	37.01	38.16	34.71	35.22
Net Profit (PhP/kg)	2.29	1.88	2.33	2.42	0.92	1.85	1.31	3.15	2.14	2.79	4.32	1.72	2.02	1.23	3.27	3.75	1.83
Net Profit-Cost Ratio	0.07	0.06	0.07	0.07	0.03	0.06	0.04	0.10	0.07	0.08	0.13	0.06	0.05	0.03	0.09	0.11	0.05

Source: Rice millers survey, 2014-2015

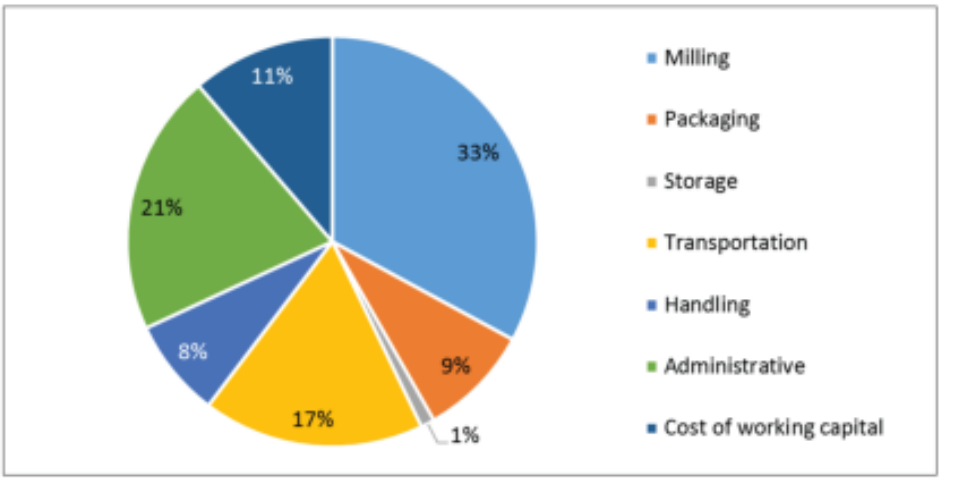


Figure 23. Cost shares in total marketing costs of rice millers, Philippines, 2015

Decomposing the cost shares of total marketing cost at the national level, milling cost captured the biggest chunk of 33% (Figure 23). Milling cost includes labor and energy used. On average, rice millers spent PhP 1.18/kg for milling. The high cost of milling in the country is largely attributed to many factors. First, most mills do not operate at full capacity, running only for about 8 hr a day during ordinary seasons and 16 hr during peak periods. The underutilization of rice mills appears to be caused by the low volume of paddy supply in the country. Second, the relatively expensive cost of paddy in the country prevents millers from acquiring a larger volume of paddy as they need more working capital to finance such purchases. In fact, some rice miller- respondents said that they opted to concentrate in custom milling services for lack of enough cash capital to buy paddy. Lastly, most rice mills in the country have low capacities *(see Section D on Functions)*. Given these factors, milling cost varied across regions, with the amount ranging from PhP 1 to PhP 1.75/kg. Among the regions, CARAGA, Bicol, Zamboanga Peninsula, and Northern Mindanao reported the highest cost (Table 43). This is probably due to the lower milling capacity of rice mills in these regions compared with those in other regions such as Central Luzon and Cagayan Valley.

Administrative cost has a 21% share, owing to a considerable amount spent on government fees, materials, and labor used in business operations. On average, administrative cost at the national level was PhP 0.74/kg. This cost varied across locations (values ranged from PhP 0.04 to PhP1.82/kg) (Table 43). Transportation cost, with a 17% share, is another important cost to rice millers. They spent more on transportation than did paddy traders because they handle both the pick-up cost from paddy traders and delivery cost of milled rice to wholesalers. On average, rice millers spent PhP 0.62/kg for transportation. Expenses on transportation across regions ranged from PhP 0.44 to PhP 0.77/kg. Transportation cost was high for the same reasons previously discussed.

Given the expensive cost of dry paddy and the longer period of storage, the cost of working capital captured a significant share, 11%. On average, the cost

of working capital of rice millers was PhP 0.40/kg (Table 43). This amount was significantly higher than the cost spent by paddy traders (PhP 0.06/kg) since most rice millers store larger volume of dry paddy for a longer period. The remaining proportions of marketing cost were spent on packaging (9%), handling (8%), and storage (1%). Like the paddy traders, rice millers also pay commission agents to ensure the supply of paddy and secure outlets for milled rice disposal.

Total cost and profit in rice milling

Adding the total marketing cost to the cost of good, the average total cost incurred by rice millers at the national level was about PhP 34.00/kg of milled rice (Table 43). With selling prices of milled rice averaging PhP 35.90/kg, this gives them net returns of PhP 1.90/kg. There are cases, however, that gross margin was zero, which means that the total cost incurred by the rice miller is equal to the selling price of milled rice. In this case, net returns to rice milling comes only from returns to by-products.

Considering the returns to by-products at PhP 0.46/kg, on average, the total net returns of rice millers amounted to about PhP 2.40/kg of milled rice. Net returns varied considerably across regions but not across cropping seasons (Mataia et al., 2017). In Luzon, net returns per kilogram of milled rice sold ranged from PhP 0.20 to PhP 0.76 in WS and from PhP 1.37 to PhP 4.43 in DS. In Visayas, net returns ranged from PhP 0.26 to PhP 3.39/kg in WS and from PhP 1.54 to PhP 5.26/kg in DS. Mindanao regions recorded the highest net returns in WS at PhP 1.61–3.64/kg, but the lowest was also seen in DS at PhP 0.84–2.66/kg.

In this analysis, net returns of rice milling considered only those from milling of paddy rice procured and sold in the market. In reality, most rice millers are also engaged in activities such as custom milling, paddy rice trading, and rice wholesaling and retailing. When rice millers perform these marketing lines, they shell out more capital to cover the additional trading costs, but they are able to capture the net margins from paddy rice trading and milled rice wholesaling or retailing, which otherwise would have gone to the other individual players.

Cost and return analysis of rice wholesaling

The estimation of costs and returns of rice wholesaling is a straightforward subtraction of total cost from the selling price of milled rice. Table 44 shows the costs and returns of rice wholesaling in selected regions. In this analysis, the cost of good (i.e., the wholesaler's procurement costs of milled rice) used was the selling price of milled rice reported by the millers themselves (Table 43).

The major cost items incurred by wholesalers, aside from their procurement cost, are labor, stall rental, and transportation cost. Transportation cost covers the amount spent in delivering milled rice to retailers. Across regions, total marketing cost of rice wholesalers, including depreciation, maintenance, and other costs, ranged from PhP 0.47 to PhP 3.20/kg. Among Luzon areas, the National Capital

Region (NCR) incurred the lowest cost at PhP 0.47/kg; followed by Ilocos region at PhP 0.63/kg; the highest cost of more than PhP 1.00/kg was observed in MIMAROPA (PhP 2.38/kg), Central Luzon (PhP 1.42/kg), Bicol region (PhP 1.41/kg), and Cagayan Valley (PhP 1.09/kg). All regions in the Visayas incurred a total PhP 1.00/kg with Negros Island and Central Visayas reporting the highest, more than PhP 1.20/kg. In Mindanao, Zamboanga Peninsula had the highest cost at PhP 3.20/kg, while Davao region had the lowest at PhP 0.90/kg. Both Northern Mindanao and SOCCSKSARGEN had a total cost of more than PhP 1.60/kg.

After decomposing the cost shares of marketing cost at the national level, administrative cost was seen to constitute the biggest share (48%) (Figure 24). Transportation contributed 27% of total marketing cost. It is followed by cost of working capital with 15% share. Rice wholesalers also spent a substantial amount on handling, 7% share. The remaining were on storage (1%) and other costs required in the operation such as packaging (2%).

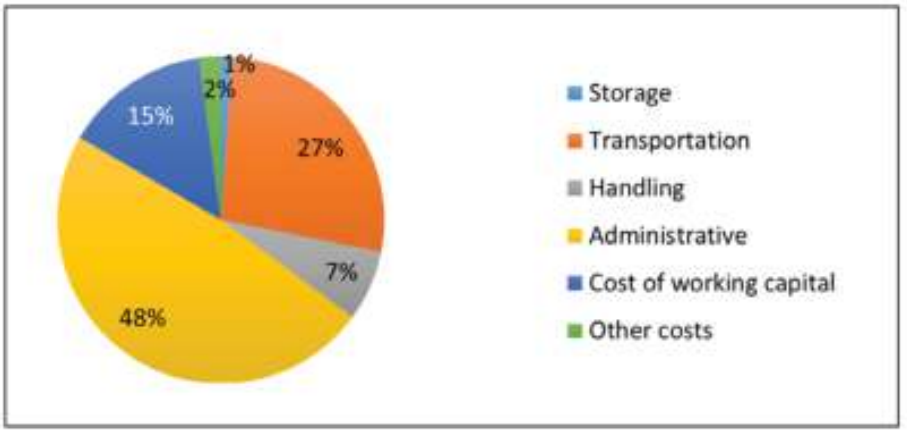


Figure 24. Cost shares in total marketing cost of rice wholesaling, Philippines, 2015

Considering procurement and marketing costs of rice wholesalers, at the selling price of milled rice to retailers ranging from PhP 35.00 to PhP 47/kg, they get a markup of PhP 0.10 – PhP 1.15/kg, depending on the quality of milled rice sold. This is assuming that they do not store rice as most of them have asserted. The net returns of rice wholesalers also varied across regions (Table 44). In Luzon, MIMAROPA, and Cagayan Valley recorded the lowest markup of less than PhP 0.25/kg, while Ilocos region had the highest at about PhP 1.43/kg. Other regions in Luzon had the markup range of PhP 0.50–PhP 0.75/kg. In the Visayas, the markup of rice wholesalers in all regions ranged from PhP 0.60 to PhP 1.15/kg. Rice wholesalers in Mindanao generally recorded a lower markup, less than PhP 0.60/kg. As with rice millers, most rice wholesalers also engaged in retailing activities. In doing this, they shell out more capital to cover additional trading costs, but they are able to capture the net margins from rice retailing.

NCR and the Negros Island region are included in the analysis because they are major rice trading areas.

Table 44. Costs and returns of rice wholesaling, by major island and selected regions, Philippines, 2015

ITEM	Philippines	Luzon	Visayas	Mindanao	Ilocos Region	Cagayan Valley	Central Luzon	MIMA-ROPA	Bicol Region	NCR	Western Visayas	Central Visayas	Eastern Visayas	Negros Island Region	Zamboanga Peninsula	Northern Mindanao	Davao Region	SOCCSK-SARGEN
Gross Returns (PhP/kg)																		
Selling price of milled rice	38.51	38.05	36.68	41.03	34.42	36.79	38.23	36.73	35.14	47.00	36.75	38.25	33.54	38.18	42.82	40.21	41.37	39.71
Costs (PhP/kg)																		
Procurement price of milled rice	36.52	36.22	34.70	38.80	32.36	35.48	36.17	34.26	33.27	45.80	34.63	36.45	31.91	35.80	39.05	38.24	40.06	37.86
Marketing costs																		
Packaging																		
Storage	0.02	0.00	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.16	0.00	0.00	0.00
Transportation	0.38	0.25	0.22	0.73	0.00	0.00	0.08	1.36	0.06	0.00	0.36	0.31	0.00	0.20	1.29	0.78	0.13	0.72
Handling	0.10	0.07	0.06	0.18	0.00	0.00	0.00	0.17	0.00	0.25	0.11	0.06	0.00	0.06	0.35	0.00	0.29	0.08
Administrative	0.68	0.73	0.55	0.73	0.56	0.97	1.05	0.63	1.07	0.09	0.44	0.54	0.68	0.52	1.15	0.72	0.38	0.66
Cost of working capital	0.20	0.12	0.32	0.21	0.05	0.12	0.13	0.10	0.18	0.14	0.23	0.23	0.36	0.45	0.24	0.16	0.25	0.21
Other costs	0.03	0.07	0.00	0.00	0.02	0.00	0.17	0.12	0.09	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Total	1.40	1.23	1.16	1.89	0.63	1.09	1.42	2.38	1.41	0.47	1.14	1.21	1.05	1.24	3.19	1.66	1.04	1.67
Total Costs (PhP/kg)	37.92	37.46	35.86	40.70	32.99	36.58	37.59	36.64	34.67	46.27	35.78	37.65	32.96	37.04	42.24	39.90	41.10	39.53
Net Profit (PhP/kg)	0.58	0.59	0.83	0.33	1.43	0.21	0.64	0.09	0.46	0.73	0.97	0.60	0.58	1.15	0.58	0.30	0.27	0.18
Net Profit-Cost Ratio	0.02	0.02	0.02	0.01	0.04	0.01	0.02	0.00	0.01	0.02	0.03	0.02	0.02	0.03	0.01	0.01	0.01	0.00

Source: Rice wholesalers survey, 2014-2015

Cost and return analysis of rice retailing

Table 45 shows the cost and returns of rice retailing in selected regions in the country. Similar to rice wholesaling, the estimation of costs and returns of rice retailing is straightforward. In this analysis, procurement prices of milled rice used are the selling prices of wholesalers. The costs incurred by retailers, aside from the procurement costs, are labor costs, stall rental, cost of working capital, and other expenses incurred in business operation. On average, total marketing cost at the national level was PhP 1.17/kg (Table 45). Cost varied across regions, with the amount spent ranging from PhP 0.66 to PhP 2.35/kg. Since consumers directly buy milled rice from retail stores, retailers do not incur any delivery cost. Administrative cost captured the biggest share (58%) of total marketing cost (Figure 25), followed by cost of working capital (17%). Packaging and handling costs contributed about 11% and 10% of total marketing cost, respectively. Rice retailers spent the rest on storage (1%) and other costs (3%).

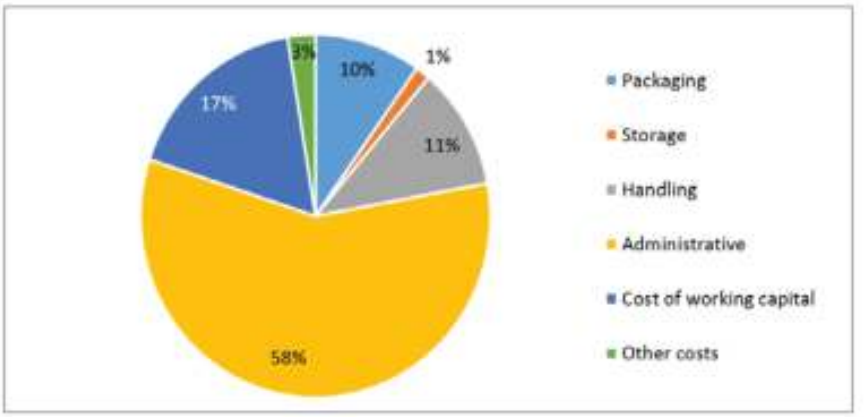


Figure 25. Cost shares in total marketing costs of rice retailing, Philippines, 2015

Total cost per kilogram of milled rice at the national level, considering that average buying price or retailer price is PhP 38.51 and that marketing cost is PhP 1.17, amounted to PhP 39.68 (Table 45). Thus, at an average retail price of P40.63/kg, the net return of retailers is PhP 1.08/kg of milled rice sold. Similar to what was seen among other market players, net returns of rice retailers varied across locations. Among regions in Luzon, Bicol region had the highest return at PhP 2.65/kg, whereas NCR had the lowest at PhP 1.33/kg, probably due to the existence of many retailers in the latter. In the Visayas, the highest and lowest returns were recorded in Negros Island region and Central Visayas, PhP 1.21/kg and PhP 1.83/kg, respectively. In Mindanao, Davao region had the highest return (PhP 1.57/kg), while SOCCSKSARGEN had the lowest (less than PhP 0.50/kg). The difference in net returns in rice retailing could be attributed to the level of competition. If there are more retailers in the area, then the retailing market is more competitive. In a competitive market, players cannot charge higher than the prevailing price; consequently, they cannot get any more markup.

Table 45. Costs and returns of rice retailing, by major island and selected regions, Philippines, 2015

ITEM	Philippines	Luzon	Visayas	Mindanao	Ilocos Region	Cagayan Valley	Central Luzon	MIMA-ROPA	Bicol Region	NCR	Western Visayas	Central Visayas	Eastern Visayas	Negros Island Region	Zamboanga Peninsula	Northern Mindanao	Davao Region	SOCCSK-SARGEN
Gross Returns (PhP/kg)																		
Selling price of milled rice	40.75	40.45	39.48	43.69	37.36	39.49	41.81	39.55	39.13	48.80	40.08	40.97	37.96	40.43	46.46	42.67	43.89	41.22
Costs (PhP/kg)																		
Procurement price of milled rice	38.51	38.05	36.68	41.03	34.42	36.79	38.23	36.73	35.14	47.00	36.75	38.25	33.54	38.18	42.82	40.21	41.37	39.71
Marketing costs																		
Packaging	0.11	0.13	0.08	0.13	0.02	0.14	0.37	0.24	0.00	0.00	0.02	0.00	0.29	0.00	0.03	0.23	0.04	0.23
Storage	0.02	0.00	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.16	0.00	0.00	0.00
Transportation	0.38	0.25	0.22	0.73	0.00	0.00	0.08	1.36	0.06	0.00	0.36	0.31	0.00	0.20	1.29	0.78	0.13	0.72
Handling	0.13	0.07	0.06	0.28	0.00	0.00	0.00	0.17	0.00	0.25	0.11	0.06	0.00	0.06	0.76	0.00	0.29	0.08
Administrative	0.68	0.73	0.55	0.73	0.56	0.97	1.05	0.63	1.07	0.09	0.44	0.54	0.68	0.52	1.15	0.72	0.38	0.66
Cost of working capital	0.20	0.12	0.32	0.21	0.05	0.12	0.13	0.10	0.18	0.14	0.23	0.23	0.36	0.45	0.24	0.16	0.25	0.21
Other costs	0.03	0.07	0.00	0.00	0.02	0.00	0.17	0.12	0.09	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Total	1.17	1.11	1.02	1.40	0.66	1.23	1.71	1.25	1.35	0.47	0.81	0.89	1.34	1.04	2.35	1.11	0.95	1.18
Total Costs (PhP/kg)	39.68	39.16	37.70	42.42	35.07	38.02	39.94	37.98	36.48	47.47	37.56	39.14	34.87	39.22	45.17	41.32	42.32	40.89
Net Profit (PhP/kg)	1.08	1.28	1.78	1.26	2.28	1.47	1.87	1.57	2.65	1.33	2.52	1.83	3.09	1.21	1.29	1.35	1.57	0.33
Net Profit-Cost Ratio	0.03	0.03	0.05	0.03	0.07	0.04	0.05	0.04	0.07	0.03	0.07	0.05	0.09	0.03	0.03	0.03	0.04	0.01

Source: Rice retailers survey, 2014-2015

Overall, it can be observed that, at the rice marketing level, there is no significant difference between the WS and DS production. Between seasons, after rice milling, millers generally classify and grade rice on the basis of grain quality (i.e., physical and cooking and eating qualities).

Relative financial position of value chain players

Various marketing channels exist in the country *(see Section D on Marketing Channels)*. In this analysis, the most common marketing channel (Figure 26), which includes collection agents such as paddy rice traders and wholesalers as middlemen, was used as base scenario. The average relative financial position of the market players was presented using two scenarios. The first one used fresh paddy as the initial product (scenario A) and the second one used dry paddy (scenario B). In both scenarios, the final product is milled rice.

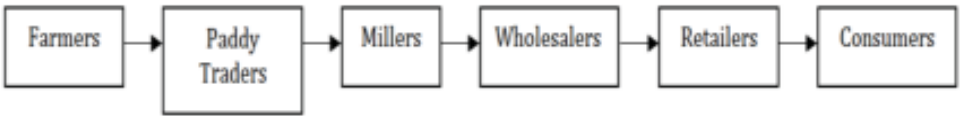


Figure 26. Common marketing channels for rice, Philippines, 2015

Total costs, selling prices, profits, and margins were estimated per trading level in order to decompose the value added, profit, and unit margin. The total costs of market players were estimated based on the results of the primary survey data. The PSA data were used to determine the farmer's cost of rice production. The different prices for paddy rice trading, rice milling, and rice trading were estimated based on the declared procurement and selling prices at each level. The initial MC values of fresh paddy reported by paddy traders and MR reported by rice millers across locations were used in the analysis. The analysis of costs, profits, and margins of market players are sensitive to the assumed conditions or scenario in an area. The following is an outline of the base scenario where the basic assumptions are based on the most popular practices of the market players in the marketing chain identified.

(1) Rice quality is that of well-milled special rice.
(2) Farmers have no transport cost.
(3) Paddy traders have transport cost from farm.
(4) Millers shoulder both pick-up cost from paddy traders and delivery cost to wholesalers.
(5) Wholesalers shoulder the delivery cost to retailers.
(6) There is no transport cost for retailers.
(7) Consumers pick up from retail markets and handle transport cost to point of consumption.
(8) Millers buy only dry paddy and no drying cost.

Scenario A (fresh paddy to milled rice)

Tables 46 to 49 present the average relative financial position of value chain players under scenario A at the national, island, and regional levels. It also shows the percentage share in added cost, profit, and price of value chain players involved in the production, processing, and marketing of milled rice at the national and island levels while regional level shares are shown in the final report of Mataia et al., (2017). Under scenario A, farmers sell fresh paddy directly to paddy traders. At the national level, farmers spent PhP 10.87/kg and received a profit of PhP 5.44/kg at a selling price of PhP 16.31/kg of fresh paddy. At this level, farmers got the biggest profit share of about 58% of the total profit of VCA players.

In Luzon, farmers spent an average of PhP 10.93/kg and got a profit of PhP 4.78/kg with a profit share of 55% (Table 47). Among Luzon regions, Bicol region (PhP 6.42/kg) and Central Luzon (PhP 10.06/kg) spent the lowest and received the highest profit with shares of 65% and 61%, respectively. MIMAROPA and Cagayan Valley spent more in rice production and had moderate profit shares of about 50%. Ilocos region spent the highest (PhP 12.70/kg) and received the lowest profit (PhP 3.27/kg). The high labor input contributed the most to the high production cost while a lower selling price led to low profit in the region. In the Visayan region, Western and Eastern Visayas spent about PhP 10.00–11.00/kg (Table 48) and received a moderate profit share of about 50%. Central Visayas spent more at PhP 13.63/kg and got the lowest profit of about PhP 2.00/kg. As mentioned earlier, the high cost of production in the region pertains to the high value of the land. Regions in Mindanao received higher profit in rice farming at an average of more than PhP 6.00/kg with a profit share of 60% (Table 49). Zamboanga Peninsula and Northern Mindanao attained a profit of more than PhP 7.00/kg while Davao region and SOCCSKSARGEN had around PhP 6.00/kg. The relatively higher selling prices led to higher profit in these regions.

Paddy traders as collectors of paddy from the farmers had a share of 8% (PhP 2.56/kg) in the added cost and about 5% (PhP 0.50/kg) in profit for drying fresh paddy and selling it as dry paddy to rice millers at the national level (Table 46). The added unit cost is attributed to shrinkage losses (loss in weight due to drying from 22% to 14% MC) valued at PhP 1.66/kg and marketing cost of PhP 0.88/kg. On average, paddy traders in Luzon incurred an added unit cost of PhP 2.80/kg (9% share) and received a profit of PhP 4.78/kg (6% share). Cagayan Valley (PhP 0.83/kg) achieved the highest profit, while Ilocos (PhP 0.28/ kg) region got the lowest (Table 47). The added unit cost and profit shares of paddy traders in Mindanao were comparable with those in Luzon (Table 49). The Visayas, on average, also spent similar amounts but received the lowest profit of PhP 0.34/kg, owing to the lower selling prices of dry paddy (Table 48).

Rice millers, being the next layer in the chain, spent an additional PhP 14.67/kg or about 47% of total added unit cost for handling the processing of paddy into milled rice and packing, storing, marketing, and distributing milled rice to wholesalers at the national level (Table 46). The added unit cost covers

transforming paddy into milled rice (at an average MR of 63.88%, 1.56 kg of paddy rice is needed to recover 1 kg of milled rice) valued at PhP 11.05/kg and marketing cost of PhP 3.57/kg. Their profit share of about 20% (PhP 1.83/kg) was relatively lower than their added unit cost due to the relatively high prices of dry paddy and marketing cost. The added unit cost and profit share of rice millers varied across locations due to different MR, marketing costs, and selling prices. On average, rice millers in Luzon spent an additional PhP 13.42/kg and received a profit of PhP 1.45/kg (Table 47). These values were relatively lower than those in the Visayas and Mindanao. Visayan rice millers had shares of 48% (PhP 14.49/kg) in added unit cost and 20% (PhP 1.72/kg) in profit (Table 48). For Mindanao, the added unit cost and profit share were 49% (PhP 16.06/kg) and 19% (PhP 2.02/kg), respectively (Table 49).

Rice wholesalers, on average, had small shares of 7% (PhP 2.06/kg) in added unit cost and 6% (PhP 0.58/kg) in profit for the marketing of milled rice to retailers. In Luzon, added unit cost was higher at PhP 3.15/kg but profit was similar at PhP 0.59/kg (Table 47). Rice millers in the Visayas, on average, spent less at PhP 1.39/kg and received the highest profit of PhP 0.83/kg (Table 48). In Mindanao, they spent an additional PhP 2.16/kg and received the lowest profit of PhP 0.33/kg, which is caused by higher marketing costs (Table 49).

Retailers, the last player in the marketing chain, incurred the lowest added cost, amounting to PhP 1.17/kg, but they received the highest profit among traders at PhP 1.08/kg (Table 46). In terms of added unit cost, retailers in Mindanao (PhP 1.40/kg) spent more relative to their counterparts in Luzon (PhP 1.11/kg) and Visayas (PhP 1.02/kg). However, due to different prices of milled rice across regions, retailers from Visayas acquired the highest profit at PhP 1.78/kg. Retailers in Luzon and Mindanao both received a profit of PhP 1.28/kg.

On average, decomposing the margin shares at the retail price of milled rice (PhP 41.00/kg), the farmer's share was about 40%; while those of paddy traders, rice millers, and rice traders comprised the remaining 60% of the margin, 40% of which was attributed to rice millers' share (due to the value of by-products) (Table 46). Similar trends in margin distribution were observed in Luzon, Visayas, and Mindanao regions.

Table 46. Average relative financial position of value chain players engaged in transforming fresh paddy into milled rice, Philippines, 2015

Player	Product	Cost			Profit			Margin	
		Total unit cost (PhP/kg)	Added unit cost (PhP/kg)	% to added unit cost	Selling price (PhP/kg)	Unit profit (PhP/kg)	% to profit	Unit margin (PhP/kg)	% to price
Farmer	Fresh paddy	10.87	10.87	35	16.31	5.44	58	16.31	40
Paddy trader	Dry paddy	18.87	2.56	8	19.37	0.50	5	3.05	7
Rice miller	Well milled rice	34.03	14.67	47	35.86	1.83	20	16.49	40
Wholesaler	Well milled rice	37.92	2.06	6	38.51	0.58	6	2.65	7
Retailer	Well milled rice	39.68	1.17	4	40.75	1.08	11	2.24	6
Total			31.33	100		9.43	100	40.75	100

Table 47. Average relative financial position of value chain players engaged in transforming fresh paddy into milled rice, Luzon, Philippines, 2015

Island/Region	Player	Product	Cost			Profit			Margin	
			Total unit cost (PhP/kg)	Added unit cost (PhP/kg)	% added unit cost	Selling price (PhP/kg)	Unit profit (PhP/kg)	% Profit	Unit margin (PhP/kg)	% to Price
Luzon										
	Farmer	Fresh Paddy	10.93	10.93	34	15.71	4.78	55	15.71	39
	Palay trader	Dry Paddy	18.51	2.80	9	19.03	0.52	6	3.32	8
	Rice miller	Well milled rice	32.86	13.82	43	34.31	1.45	17	15.27	38
	Wholesaler	Well milled rice	37.46	3.15	10	38.05	0.59	7	3.74	9
	Retailer	Well milled rice	39.16	1.11	3	40.45	1.28	15	2.40	6
				31.81	100		8.63	100	40.45	100
Ilocos Region	Farmer	Fresh Paddy	12.70	12.70	43	15.97	3.27	40	15.97	43
	Palay trader	Dry Paddy	18.14	2.17	7	18.43	0.28	3	2.46	7
	Rice miller	Well milled rice	31.49	13.06	45	32.36	0.87	11	13.93	37
	Wholesaler	Well milled rice	32.99	0.63	2	34.42	1.43	18	2.06	6
	Retailer	Well milled rice	35.07	0.66	2	37.36	2.28	28	2.94	8
				29.23	100		8.13	100	37.36	100
Cagayan Valley	Farmer	Fresh Paddy	11.43	11.43	37	16.02	4.59	51	16.02	41
	Palay trader	Dry Paddy	18.89	2.86	9	19.72	0.83	9	3.70	9
	Rice miller	Well milled rice	33.63	13.91	46	35.48	1.85	21	15.76	40
	Wholesaler	Well milled rice	36.58	1.09	4	36.79	0.21	2	1.30	3
	Retailer	Well milled rice	38.02	1.23	4	39.49	1.47	16	2.70	7
				30.53	100		8.96	100	39.49	100
Central Luzon	Farmer	Fresh Paddy	10.06	10.06	33	16.88	6.82	61	16.88	40
	Palay trader	Dry Paddy	20.06	3.18	10	20.70	0.64	6	3.82	9
	Rice miller	Well milled rice	34.98	14.28	47	36.17	1.18	11	15.46	37
	Wholesaler	Well milled rice	37.59	1.42	5	38.23	0.64	6	2.06	5
	Retailer	Well milled rice	39.94	1.71	6	41.81	1.87	17	3.58	9
				30.65	100		11.15	100	41.81	100
MIMAROPA	Farmer	Fresh Paddy	10.73	10.73	35	15.07	4.34	49	15.07	38
	Palay trader	Dry Paddy	18.21	3.14	10	18.67	0.45	5	3.60	9
	Rice miller	Well milled rice	31.87	13.20	43	34.26	2.39	27	15.59	39
	Wholesaler	Well milled rice	36.64	2.38	8	36.73	0.09	1	2.47	6
	Retailer	Well milled rice	37.98	1.25	4	39.55	1.57	18	2.82	7
				30.70	100		8.84	100	39.55	100
Bicol Region	Farmer	Fresh Paddy	6.42	6.42	24	14.63	8.21	65	14.63	37
	Palay trader	Dry Paddy	17.25	2.63	10	17.65	0.40	3	3.02	8
	Rice miller	Well milled rice	32.31	14.66	55	33.27	0.96	8	15.62	40
	Wholesaler	Well milled rice	34.67	1.41	5	35.14	0.46	4	1.87	5
	Retailer	Well milled rice	36.48	1.35	5	39.13	2.65	21	3.99	10
				26.45	100		12.68	100	39.13	100

Table 48. Average relative financial position of value chain players engaged in transforming fresh paddy into milled rice, Visayas, Philippines, 2015

Island/Region	Player	Product	Cost			Profit			Margin	
			Total unit cost (PhP/kg)	Added unit cost (PhP/kg)	% added unit cost	Selling price (PhP/kg)	Unit profit (PhP/kg)	% Profit	Unit margin (PhP/kg)	% to Price
Visayas										
	Farmer	Fresh Paddy	11.05	11.05	36	15.42	4.37	48	15.42	39
	Palay trader	Dry Paddy	17.91	2.49	8	18.26	0.34	4	2.83	7
	Rice miller	Well milled rice	32.75	14.49	48	34.47	1.72	19	16.21	41
	Wholesaler	Well milled rice	35.86	1.39	5	36.68	0.83	9	2.21	6
	Retailer	Well milled rice	37.70	1.02	3	39.48	1.78	20	2.80	7
				30.43	100		9.05	100	39.48	100
Western Visayas	Farmer	Fresh Paddy	10.86	10.86	37	16.45	5.59	50	16.45	41
	Palay trader	Dry Paddy	18.94	2.49	9	19.29	0.34	3	2.84	7
	Rice miller	Well milled rice	32.98	13.69	47	34.63	1.65	15	15.34	38
	Wholesaler	Well milled rice	35.78	1.14	4	36.75	0.97	9	2.12	5
	Retailer	Well milled rice	37.56	0.81	3	40.08	2.52	23	3.33	8
				28.99	100		11.08	100	40.08	100
Central Visayas	Farmer	Fresh Paddy	13.63	13.63	43	15.54	1.91	21	15.54	38
	Palay trader	Dry Paddy	17.77	2.23	7	18.03	0.26	3	2.49	6
	Rice miller	Well milled rice	32.12	14.09	44	36.45	4.32	48	18.42	45
	Wholesaler	Well milled rice	37.65	1.21	4	38.25	0.60	7	1.80	4
	Retailer	Well milled rice	39.14	0.89	3	40.97	1.83	20	2.72	7
				32.05	100		8.93	100	40.97	100
Eastern Visayas	Farmer	Fresh Paddy	9.14	9.14	33	14.28	5.14	50	14.28	38
	Palay trader	Dry Paddy	17.03	2.75	10	17.46	0.43	4	3.17	8
	Rice miller	Well milled rice	30.89	13.43	48	31.91	1.02	10	14.45	38
	Wholesaler	Well milled rice	32.96	1.05	4	33.54	0.58	6	1.63	4
	Retailer	Well milled rice	34.87	1.34	5	37.96	3.09	30	4.42	12
				27.71	100		10.25	100	37.96	100

Table 49. Average relative financial position of value chain players engaged in transforming fresh paddy into milled rice, Mindanao, Philippines, 2015

Island/Region	Player	Product	Cost			Profit			Margin	
			Total unit cost (PhP/kg)	Added unit cost (PhP/kg)	% added unit cost	Selling price (PhP/kg)	Unit profit (PhP/kg)	% Profit	Unit margin (PhP/kg)	% to Price
Visayas										
	Farmer	Fresh Paddy	11.05	11.05	36	15.42	4.37	48	15.42	39
	Palay trader	Dry Paddy	17.91	2.49	8	18.26	0.34	4	2.83	7
	Rice miller	Well milled rice	32.75	14.49	48	34.47	1.72	19	16.21	41
	Wholesaler	Well milled rice	35.86	1.39	5	36.68	0.83	9	2.21	6
	Retailer	Well milled rice	37.70	1.02	3	39.48	1.78	20	2.80	7
				30.43	100		9.05	100	39.48	100
Western Visayas	Farmer	Fresh Paddy	10.86	10.86	37	16.45	5.59	50	16.45	41
	Palay trader	Dry Paddy	18.94	2.49	9	19.29	0.34	3	2.84	7
	Rice miller	Well milled rice	32.98	13.69	47	34.63	1.65	15	15.34	38
	Wholesaler	Well milled rice	35.78	1.14	4	36.75	0.97	9	2.12	5
	Retailer	Well milled rice	37.56	0.81	3	40.08	2.52	23	3.33	8
				28.99	100		11.08	100	40.08	100
Central Visayas	Farmer	Fresh Paddy	13.63	13.63	43	15.54	1.91	21	15.54	38
	Palay trader	Dry Paddy	17.77	2.23	7	18.03	0.26	3	2.49	6
	Rice miller	Well milled rice	32.12	14.09	44	36.45	4.32	48	18.42	45
	Wholesaler	Well milled rice	37.65	1.21	4	38.25	0.60	7	1.80	4
	Retailer	Well milled rice	39.14	0.89	3	40.97	1.83	20	2.72	7
				32.05	100		8.93	100	40.97	100
Eastern Visayas	Farmer	Fresh Paddy	9.14	9.14	33	14.28	5.14	50	14.28	38
	Palay trader	Dry Paddy	17.03	2.75	10	17.46	0.43	4	3.17	8
	Rice miller	Well milled rice	30.89	13.43	48	31.91	1.02	10	14.45	38
	Wholesaler	Well milled rice	32.96	1.05	4	33.54	0.58	6	1.63	4
	Retailer	Well milled rice	34.87	1.34	5	37.96	3.09	30	4.42	12
				27.71	100		10.25	100	37.96	100

Scenario B (dry paddy to milled rice)

Tables 50 to 53 present the average relative financial position of value chain players under scenario B at the national and regional levels. The percentage share in added cost, profit, and price of value chain players involved in the production, processing, and marketing of milled rice at the national and island levels are also shown. The regional share levels are shown in the final report of Mataia et al., (2017). In this scenario, farmers dry their harvest before selling to paddy traders; hence they bear the cost of drying and shrinkage losses. Given these changes, farmers had increased cost, on average, PhP 12.21/kg (Table 50). Despite the additional cost, farmers increased their profit from PhP 5.38/kg to PhP 6.10/kg, about 3% increase in profit shares. Farmers captured part of the profit that goes to paddy traders. On average, the profit of paddy traders was reduced from PhP 0.50/kg to PhP 0.34/kg. In Luzon, an increase in farmer's profit was seen, owing to the selling of dry paddy. It ranged from PhP 0.34/kg to PhP 1.26/kg (Table 51). In the Visayas, the range was PhP 0.60–PhP 0.79/kg (Table 52), whereas that for Mindanao was PhP 0.54–PhP 1.01/kg (Table 53). This implies that there is really an income incentive if farmers expand their function and strategically sell their produce. Since the product of rice traders and millers is milled rice, there are no changes in their added unit cost and profit shares. Hence, their relative financial positions in the value chain were not affected under this scenario.

Overall, considering the cost of investment, farmers still have the highest profit as well as net profit-cost ratio. Farmers, however, only produce and trade a small quantity of paddy rice, averaging about 8 t a year per farmer. Besides, the profit turnover in rice farming is very slow because profit is earned from a 4-month cropping period. For paddy traders and rice millers, at the assumed prices, gross margins are not very high on a per-unit basis. However, they get their high profit from the large volume of paddy traded (for paddy traders) and milled each day (for rice millers) and the more frequent volume turnover for both. Some millers appear to get net returns only from the added revenue from the sale of milling by-products. Similarly, even with the higher profit margin of rice retailers compared with wholesalers on a per-unit basis, rice wholesalers still get higher total returns in rice trading owing to the business volume and turnover. Retail stores may have higher returns on a per-unit basis, but the volume handled is also not as much as that handled by rice millers and wholesalers.

If the marketing chain is such that rice millers procure directly from farmers, even with additional costs of drying and transportation and, most often, additional payment for commission agents, they can capture the profit per kilogram, which otherwise would have gone to the paddy rice traders. Also, when a rice miller acts at the same time as a wholesaler, providing rice supply directly to retailers, they also capture the margin of the rice wholesalers. Similarly, if a farmer has access to processing and storage facilities, so that he can strategically sell his produce—i.e., sell directly to rice millers at a strategic time—he may be able to capture part of the margin that goes to paddy rice traders.

Table 50. Average relative financial position of value chain players engaged in transforming dry paddy into milled rice, Philippines, 2015

Player	Product	Cost			Profit			Margin	
		Total unit cost (PhP/kg)	Added unit cost (PhP/kg)	% added unit cost	Selling price (PhP/kg)	Unit profit (PhP/kg)	% Profit	Unit margin (PhP/kg)	% to Price
Farmer	Dry Paddy	12.21	12.21	40	18.30	6.10	61	18.30	45
Palay trader	Dry Paddy	19.02	0.72	2	19.37	0.34	4	1.06	3
Rice miller	Well milled rice	34.03	14.67	47	35.86	1.83	18	16.49	40
Wholesaler	Well milled rice	37.92	2.06	7	38.51	0.58	6	2.65	7
Retailer	Well milled rice	39.68	1.17	4	40.75	1.08	11	2.24	5
Total			30.82	100		9.93	100	40.75	100

Table 51. Average relative financial position of value chain players engaged in transforming dry paddy into milled rice, Luzon, Philippines, 2015

Island/Region	Player	Product	Cost			Profit			Margin	
			Total unit cost (PhP/kg)	Added unit cost (PhP/kg)	% added unit cost	Selling price (PhP/kg)	Unit profit (PhP/kg)	% Profit	Unit margin (PhP/kg)	% to Price
Luzon	Farmer	Dry Paddy	12.24	12.24	39	17.83	5.59	60	17.83	44
	Palay trader	Dry Paddy	18.66	0.83	3	19.03	0.38	4	1.20	3
	Rice miller	Well milled rice	32.86	13.82	44	34.31	1.45	16	15.27	38
	Wholesaler	Well milled rice	37.46	3.15	10	38.05	0.59	6	3.74	9
	Retailer	Well milled rice	39.16	1.11	4	40.45	1.28	14	2.40	6
				31.15	100		9.29	100	40.45	100
Ilocos Region	Farmer	Dry Paddy	14.12	14.12	49	17.73	3.61	43	17.73	47
	Palay trader	Dry Paddy	18.20	0.48	2	18.43	0.22	3	0.70	2
	Rice miller	Well milled rice	31.49	13.06	45	32.36	0.87	10	13.93	37
	Wholesaler	Well milled rice	32.99	0.63	2	34.42	1.43	17	2.06	6
	Retailer	Well milled rice	35.07	0.66	2	37.36	2.28	27	2.94	8
				28.94	100		8.41	100	37.36	100
Cagayan Valley	Farmer	Dry Paddy	12.81	12.81	43	18.05	5.25	55	18.05	46
	Palay trader	Dry Paddy	19.02	0.96	3	19.72	0.70	7	1.67	4
	Rice miller	Well milled rice	33.63	13.91	46	35.48	1.85	20	15.76	40
	Wholesaler	Well milled rice	36.58	1.09	4	36.79	0.21	2	1.30	3
	Retailer	Well milled rice	38.02	1.23	4	39.49	1.47	16	2.70	7
				30.01	100		9.48	100	39.49	100
Central Luzon	Farmer	Dry Paddy	11.36	11.36	38	19.13	7.77	65	19.13	46
	Palay trader	Dry Paddy	20.26	1.14	4	20.70	0.44	4	1.58	4
	Rice miller	Well milled rice	34.98	14.28	48	36.17	1.18	10	15.46	37
	Wholesaler	Well milled rice	37.59	1.42	5	38.23	0.64	5	2.06	5
	Retailer	Well milled rice	39.94	1.71	6	41.81	1.87	16	3.58	9
				29.91	100		11.90	100	41.81	100
MIMAROPA	Farmer	Dry Paddy	12.27	12.27	41	17.33	5.06	54	17.33	44
	Palay trader	Dry Paddy	18.39	1.06	4	18.67	0.28	3	1.34	3
	Rice miller	Well milled rice	31.87	13.20	44	34.26	2.39	25	15.59	39
	Wholesaler	Well milled rice	36.64	2.38	8	36.73	0.09	1	2.47	6
	Retailer	Well milled rice	37.98	1.25	4	39.55	1.57	17	2.82	7
				30.16	100		9.39	100	39.55	100
Bicol Region	Farmer	Dry Paddy	7.44	7.44	29	16.91	9.47	69	16.91	43
	Palay trader	Dry Paddy	17.42	0.51	2	17.65	0.24	2	0.74	2
	Rice miller	Well milled rice	32.31	14.66	58	33.27	0.96	7	15.62	40
	Wholesaler	Well milled rice	34.67	1.41	6	35.14	0.46	3	1.87	5
	Retailer	Well milled rice	36.48	1.35	5	39.13	2.65	19	3.99	10
				25.36	100		13.78	100	39.13	100

Table 52. Average relative financial position of value chain players engaged in transforming dry paddy into milled rice, Visayas, Philippines, 2015

Island/Region	Player	Product	Cost			Profit			Margin	
			Total unit cost (PhP/kg)	Added unit cost (PhP/kg)	% added unit cost	Selling price (PhP/kg)	Unit profit (PhP/kg)	% Profit	Unit margin (PhP/kg)	% to Price
Visayas	Farmer	Dry Paddy	12.31	12.31	41	17.22	4.91	52	17.22	44
	Palay trader	Dry Paddy	18.02	0.80	3	18.26	0.24	3	1.04	3
	Rice miller	Well milled rice	32.75	14.49	48	34.47	1.72	18	16.21	41
	Wholesaler	Well milled rice	35.86	1.39	5	36.68	0.83	9	2.21	6
	Retailer	Well milled rice	37.70	1.02	3	39.48	1.78	19	2.80	7
				30.01	100		9.47	100	39.48	100
Western Visayas	Farmer	Dry Paddy	12.05	12.05	42	18.25	6.20	53	18.25	46
	Palay trader	Dry Paddy	19.05	0.80	3	19.29	0.24	2	1.04	3
	Rice miller	Well milled rice	32.98	13.69	48	34.63	1.65	14	15.34	38
	Wholesaler	Well milled rice	35.78	1.14	4	36.75	0.97	8	2.12	5
	Retailer	Well milled rice	37.56	0.81	3	40.08	2.52	22	3.33	8
				28.50	100		11.58	100	40.08	100
Central Visayas	Farmer	Dry Paddy	14.58	14.58	46	17.27	2.69	28	17.27	42
	Palay trader	Dry Paddy	17.88	0.61	2	18.03	0.15	2	0.76	2
	Rice miller	Well milled rice	32.12	14.09	45	36.45	4.32	45	18.42	45
	Wholesaler	Well milled rice	37.65	1.21	4	38.25	0.60	6	1.80	4
	Retailer	Well milled rice	39.14	0.89	3	40.97	1.83	19	2.72	7
				31.38	100		9.59	100	40.97	100
Eastern Visayas	Farmer	Dry Paddy	10.30	10.30	38	16.14	5.84	54	16.14	43
	Palay trader	Dry Paddy	17.13	0.99	4	17.46	0.33	3	1.32	3
	Rice miller	Well milled rice	30.89	13.43	50	31.91	1.02	9	14.45	38
	Wholesaler	Well milled rice	32.96	1.05	4	33.54	0.58	5	1.63	4
	Retailer	Well milled rice	34.87	1.34	5	37.96	3.09	28	4.42	12
				27.11	100		10.85	100	37.96	100

Table 53. Average relative financial position of value chain players engaged in transforming dry paddy into milled rice, Mindanao, Philippines, 2015

Island/Region	Player	Product	Cost			Profit			Margin	
			Total unit cost (PhP/kg)	Added unit cost (PhP/kg)	% added unit cost	Selling price (PhP/kg)	Unit profit (PhP/kg)	% Profit	Unit margin (PhP/kg)	% to Price
Mindanao	Farmer	Dry Paddy	12.21	12.21	38	19.43	7.21	64	19.43	44
	Palay trader	Dry Paddy	19.99	0.56	2	20.36	0.37	3	0.93	2
	Rice miller	Well milled rice	36.43	16.06	49	38.45	2.02	18	18.09	41
	Wholesaler	Well milled rice	40.70	2.25	7	41.03	0.33	3	2.58	6
	Retailer	Well milled rice	42.42	1.40	4	43.69	1.26	11	2.66	6
				32.48	100		11.20	100	43.69	100
Zamboanga Peninsula	Farmer	Dry Paddy	11.70	11.70	34	19.43	7.73	65	19.43	42
	Palay trader	Dry Paddy	19.97	0.54	2	20.28	0.31	3	0.85	2
	Rice miller	Well milled rice	37.04	16.76	49	39.05	2.02	17	18.78	40
	Wholesaler	Well milled rice	42.24	3.19	9	42.82	0.58	5	3.77	8
	Retailer	Well milled rice	45.17	2.35	7	46.46	1.29	11	3.64	8
				34.53	100		11.93	100	46.46	100
Northern Mindanao	Farmer	Dry Paddy	11.53	11.53	38	20.57	9.05	74	20.57	48
	Palay trader	Dry Paddy	21.13	0.56	2	21.51	0.37	3	0.93	2
	Rice miller	Well milled rice	37.01	15.50	51	38.24	1.23	10	16.74	39
	Wholesaler	Well milled rice	39.90	1.66	5	40.21	0.30	2	1.96	5
	Retailer	Well milled rice	41.32	1.11	4	42.67	1.35	11	2.46	6
				30.36	100		12.30	100	42.67	100
Davao Region	Farmer	Dry Paddy	13.44	13.44	41	20.05	6.62	60	20.05	46
	Palay trader	Dry Paddy	20.17	0.11	0	20.92	0.75	7	0.87	2
	Rice miller	Well milled rice	38.16	17.23	53	40.06	1.90	17	19.14	44
	Wholesaler	Well milled rice	41.10	1.04	3	41.37	0.27	2	1.31	3
	Retailer	Well milled rice	42.32	0.95	3	43.89	1.57	14	2.52	6
				32.78	100		11.12	100	43.89	100
SOCCSKSARGEN	Farmer	Dry Paddy	11.80	11.80	39	18.60	6.80	64	18.60	45
	Palay trader	Dry Paddy	19.69	1.09	4	19.88	0.19	2	1.28	3
	Rice miller	Well milled rice	34.71	14.83	49	37.86	3.15	30	17.98	44
	Wholesaler	Well milled rice	39.53	1.67	5	39.71	0.18	2	1.85	4
	Retailer	Well milled rice	40.89	1.18	4	41.22	0.33	3	1.51	4
				30.58	100		10.64	100	41.22	100

Photo: PhilRice

CHAPTER 5

MARKET ANALYSIS

A. Markets and Market Trends

Foreign markets

Imports

The Philippines is a net importer of rice because the country's domestic production lags behind local demand. The upsurge in total consumption is primarily due to its population growth of about 2% per year. From 2005 to 2015, the import volume of rice varied yearly, depending on the government's perceived requirement to augment local production. During this period, the most notable import volumes of more than 2.4 M t (valued at US$1.78 billion FOB) and 2.3 M t (US$1.5 billion FOB) were registered in 2008 and 2010, respectively (Figure 27). In 2008, the world financial crisis spiked food prices and, at that time, consumers had to queue for a fixed purchase allocation of 5 kg of NFA rice. The El Niño phenomenon compelled the government to import a high volume of rice in 2010 to stabilize rice prices at the retail market. In 2011, the country implemented a rice self-sufficiency policy, which, in effect, reduced the import volume at the level of commitments with ASEAN. Thus, the level of import arrivals of rice was reduced and reached its lowest volume of just 0.405 M t in 2013. After 2013, imports escalated again to more than 1 M t mainly to cover production losses brought about by typhoons and to replenish buffer stocks in preparation for the lean months in the succeeding years.

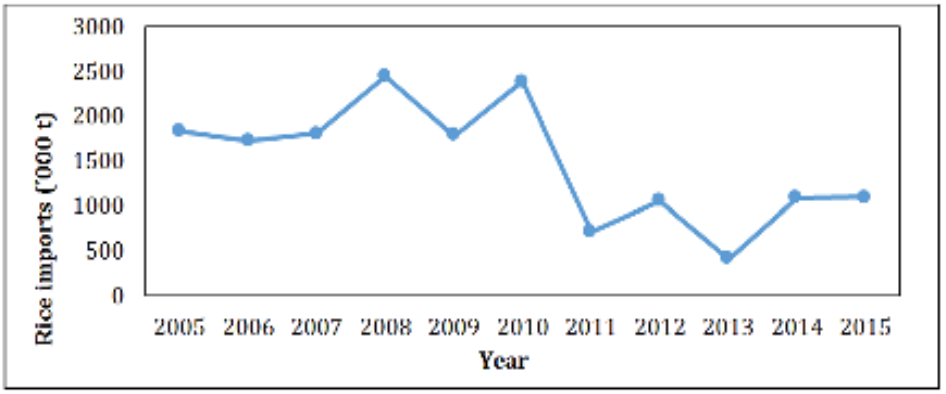


Figure 27. Trends in rice imports, Philippines, 2005-2015
(Source: PSA, 2016)

Major sources of rice imports through the years are Vietnam, Thailand, China, the United States (US), and India. In 2015, the total rice import reached about 1.1 M t valued at US$ 438.4 billion FOB, mostly coming from Vietnam (53%) and Thailand (46%) (PSA, 2016). The country also acquired a minimal import volume of rice from India, China, Singapore, Indonesia, and the United Arab Emirates. Of the total import arrivals, 50% was handled by NFA; 40% was allocated to the private sector; and the rest covered the country's commitment through minimum access volume (MAV) in ASEAN economic integration. These rice imports entered the country through the following major ports: Manila International Container (23%), Cebu City (22%), Subic Area Free Port SBMA Olongapo City (17%), Manila South Harbor (9%), and San Fernando, La Union (7%). About 3-4% share each to total import`arrivals entered the ports of Batangas; Legaspi City; Albay; Iloilo City; Cagayan de Oro City; Pulupandan, Negros Occidental; and Davao City.

Exports

Despite being a net importer, the country managed to export a reasonable quantity of mostly specialty rice to other countries. Generally, these exports were classified as "rice in husk, suitable for sowing;" "rice in husk, other than suitable for sowing;" "rice husked–Thai Hom Mali;" "semi/wholly milled glutinous rice;" and "other rice" probably of heirloom varieties; "Basmati rice;" and specialty rice such as pigmented, aromatic, and glutinous.

The country's level of exports in the past decade varied from year to year, subject to other countries' demand (Figure 28). The highest volume of exports of more than 2,600 t valued at US$ 5.39 M FOB was recorded in 2013. This year also coincided with the country's lowest record of volume of imports. The major export destinations are China, US, Singapore, Malaysia, Vietnam, Pakistan, Bangladesh, Japan, Hong Kong, United Arab Emirates, and Canada.

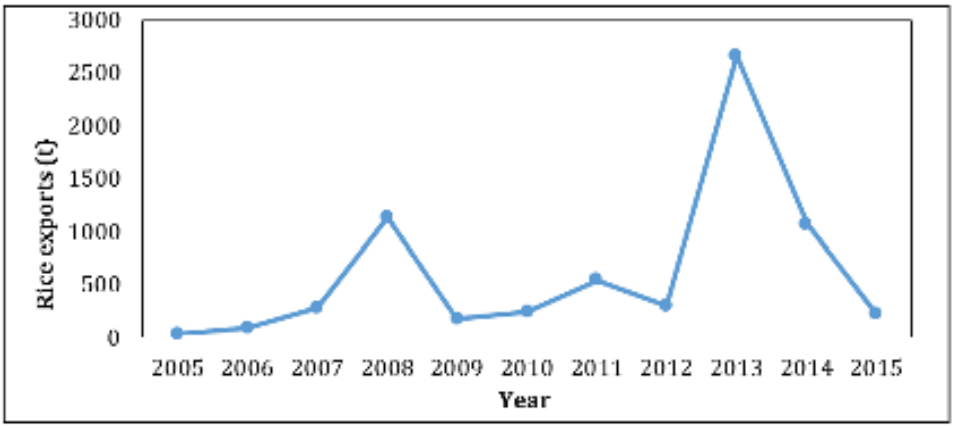


Figure 28. Trends in rice exports, Philippines, 2005-2015.
(Source: PSA, 2016)

Since ordinary white rice is not the only rice traded in the world market and, given that the country's rice exports are composed mostly of specialty rice, there is a big market opportunity for this kind of rice. In fact, demand for this type of rice is growing due to increasing income and rising awareness of their nutritional value (Chaudhary, 2003). Production of specialty rice could serve as a viable enterprise for Filipino farmers as the country faces a more liberal rice trade in the coming years.

Domestic markets

Rice supply

The country's domestic supply of rice is generally produced from a harvested area of more than 4 M ha with an average yield of 4 t/ha. Over the past 10 years, paddy production increased by 24%, from about 14.6 M t in 2005 to 18.15 M t in 2015. During this period, production has increased at an average of 2.2% per year, with the highest growth of 7.48% recorded in 2012. This was brought about by increases in yield and area harvested. Rice imports went down from more than 2 M t to 1 M t at the same time. Accordingly, self-sufficiency level has improved from a low of 81% in 2010 to its peak of almost 97% in 2013 before slightly going down to 92% in 2014 (PSA, 2015). In spite of this increase, annual production was observed to fall short of demand. It is projected that, among all ASEAN countries, the Philippines has the highest projected population growth rate of a cumulative 22% from 2012 to 2025 (Dawe, 2012). This indicates that the country will continue to depend on the world market to meet its domestic requirements. The imported rice in the country will fill up the supply gaps in places where it is needed and should not be competitive in areas where domestic rice is abundant.

Generally, rice is not produced in the cities. Rice-farming households in the rural sector grow rice to supply the needs of the urban population. They need to produce enough rice not only for themselves and for the non-rice-producing sector but also for the urban population (about 48% of total population) who live in areas where no rice is produced (Bordey et al., 2016). Consequently, rice production, until now, has been concentrated in Luzon, which accounts for about 59% of the country's total paddy production in 2015 (Figure 29). The bulk of the production came from Central Luzon (18%), Cagayan Valley (14%), and Ilocos (10%) regions. The major rice-producing provinces with significant net surpluses are Nueva Ecija and Tarlac in Central Luzon, Isabela and Cagayan in Cagayan Valley, and Pangasinan in Ilocos. In the Bicol region, Camarines Sur remained a major rice producer and supplier. Mindoro Occidental and Mindoro Oriental have accounted for the largest share (68%) of rice supply in the MIMAROPA region. Kalinga is the biggest source (38%) of rice in CAR.

Mindanao, including the ARMM and CARAGA regions, accounts for about 23% of total paddy production. All the regions contributed almost the same share, about 3-4%, with the largest share (7%) coming from SOCCSKSARGEN region. North Cotabato and Sultan Kudarat are the two major rice-producing

provinces with significant net surpluses in this region. Zamboanga del Sur in the Zamboanga Peninsula, Maguindanao in ARMM, and Agusan del Sur in CARAGA are the provinces with the biggest shares in rice production and surpluses in these regions.

The Visayas Island contributes the remaining 18% of total rice production, which mostly come from the Western Visayas region. Iloilo, Capiz, and Antique accounted for the largest shares of rice supply with significant net surpluses. Leyte is the biggest producer and contributor of rice supply in Eastern Visayas.

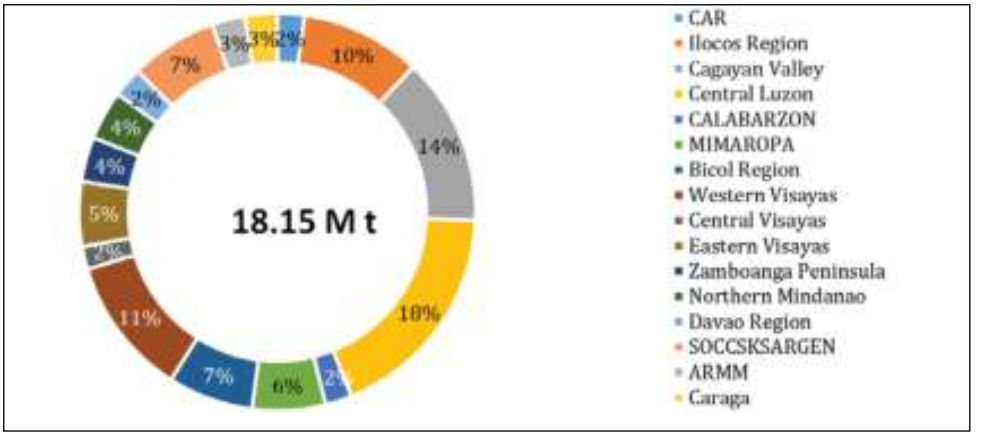


Figure 29. Percent distribution of total paddy production, by region, Philippines, 2015 (Source: PSA, 2016)

Rice demand

The biggest demand comes from food consumption of the fast-growing population, which accounts for around 89% of rice utilization, with an average national per capita consumption of 114.27 kg rice/yr. Other accounted uses for rice are for seeds (2%) and feed and waste (9%). The country's total demand for rice increased from 12.37 M t in 2012 to about 13 M t in 2015. Consequently, rice deficit escalated from just 0.65 M t to more than 1 M t in the same period. Using the current per capita consumption of 114.27 kg rice/yr and an annual population growth rate of about 2%, it is projected that the country's total requirement will reach about 13.36 M t in 2017, 13.96 M t in 2020, and 14.95 M t in 2025 (Table 54). On average, rice demand in all regions will increase by about 3% in 2017, 7% in 2020, and 13% in 2025. Among the regions, CALABARZON, Central Luzon, NCR, Central Visayas, ARMM, Northern Mindanao, Davao Region, and SOCCSKSARGEN recorded the highest projected rice requirements in all periods. This implies that rice shortage in the country will continue to happen because of population growth. Thus, the country has to increase local production through yield-enhancing technologies such as use of hybrid varieties, high-quality seeds, and improved agronomic techniques.

Rice production and use

Table 55 shows the rice production and use estimates in 2015 at the national and regional levels. Matching the country's total demand with its available rice supply in the market, records show that many of the regions, as well as provinces, do not produce enough rice to meet local demand. Rice demand in these areas has to be filled up from outside sources, including rice imports. Rice flow generally takes place within the provinces of the regions before rice is moved to other deficit areas.

Among the rice surplus regions in Luzon are Ilocos (0.397 M t), Cagayan Valley (1.010 M t), Central Luzon (0.583 M t), and MIMAROPA (0.220 M t). Collectively, these four regions had a total surplus of 2.21 M t (Table 55). However, this volume was scanty and deficient by more than 0.41 M t to supply the rice shortage in CALABARZON (1.382 M t) and Bicol (4,291 t) regions, including the huge total rice requirement of the National Capital Region, which is 1.23 M t or about 10% of the country's total requirement. In the Visayas Island, the total rice surplus of about 0.12 M t came from Western Visayas. This volume was barely

Table 54. Projected domestic rice demand, by region, Philippines, 2015-2025

Region	Base year (2015)	2017	2020	2025
		(t)		
Philippines	**12,881,200**	**13,356,670**	**13,955,490**	**14,953,522**
NCR	1,232,251	1,267,493	1,320,356	1,408,462
CAR	264,863	267,926	276,348	290,384
Ilocos Region	758,251	774,773	795,398	829,774
Cagayan Valley	608,619	620,025	636,271	663,347
Central Luzon	1,564,362	1,613,450	1,690,846	1,819,838
CALABARZON	1,637,744	1,730,158	1,855,301	2,063,874
MIMAROPA	483,064	494,239	511,946	541,458
Bicol	826,182	843,288	871,514	918,558
Western Visayas	1,216,574	1,247,474	1,287,334	1,353,767
Central Visayas	644,454	661,217	693,623	747,634
Eastern Visayas	657,580	674,036	700,663	745,040
Zamboanga Peninsula	430,154	443,975	457,973	481,304
Northern Mindanao	553,194	578,049	603,655	646,331
Davao Region	492,782	508,809	532,851	572,919
SOCCSKSARGEN	634,786	656,112	687,455	739,694
ARMM	536,630	557,927	600,393	671,169
CARAGA	358,559	366,668	378,995	399,540

Note: National per capita consumption used was 114.27 kg/yr.
The 2010-2015 annual population growth rate of census was used.
Seed and feed and waste quantities were assumed to be constant.

Table 55. Rice production and use estimates, by region, Philippines, 2015

Region/Province	Food use		Seeds	Feed and wastes	Total use	Rice production	Surplus (Deficit)	Population	Sufficiency level
	Total	Per capita							
	(t)	(kg)	(t)	(t)	(t)	(t)	(t)		(%)
PHILIPPINES	**11,620,844**	**114.27**	**231,682**	**1,120,752**	**12,881,200**	**11,797,395**	**(1,083,853)**	**101,562,300**	**92**
NCR	1,232,251	97.40			1,232,251		(1,232,251)	12,651,700	
CAR	232,008	130.09	5,547	24,756	264,863	260,592	(4,271)	1,783,500	98
Ilocos Region	630,739	122.81	20,547	109,737	758,251	1,155,129	396,877	5,136,000	152
Cagayan Valley	426,395	121.90	29,064	153,736	608,619	1,618,271	1,009,604	3,497,900	266
Central Luzon	1,323,000	119.20	34,813	204,041	1,564,362	2,147,802	583,440	11,098,900	137
CALARBARZON	1,616,841	114.45	5,626	24,262	1,637,744	255,390	(1,382,354)	14,127,200	16
MIMAROPA	401,521	129.97	14,111	66,803	483,064	703,191	220,128	3,089,300	146
Bicol Region	729,358	120.91	17,032	78,080	826,182	821,891	(4,291)	6,032,100	99
Western Visayas	1,062,928	137.96	30,965	127,009	1,216,574	1,336,936	120,361	7,704,400	110
Central Visayas	613,756	82.42	5,097	20,760	644,454	218,526	(425,928)	7,446,800	34
Eastern Visayas	583,919	128.70	13,351	59,015	657,580	621,211	(36,369)	4,537,200	94
Zamboanga Peninsula	385,636	105.49	8,142	40,865	411,305	430,154	18,849	3,655,600	105
Northern Mindanao	508,054	107.94	8,148	44,776	553,194	471,328	(81,866)	4,706,700	85
Davao Region	460,560	92.80	4,937	27,285	492,782	287,214	(205,568)	4,963,100	58
SOCCSKSARGEN	538,543	125.50	16,914	79,759	634,786	839,569	204,782	4,291,200	132
CARAGA	321,011	118.16	7,719	29,721	358,559	312,852	(45,706)	2,716,700	87
ARMM	489,799	118.77	9,670	30,147	536,630	317,340	(219,290)	4,124,000	59

Source of basic data: PSA, 2015.

Table 56. Provincial rice self-sufficiency level, by island, Philippines, 2015

Insufficient/deficit provinces			Marginally sufficient provinces	Highly sufficient provinces
Luzon	**Visayas**	**Mindanao**	**Luzon**	**Luzon**
Benguet	Aklan	Zamboanga City	Abra	Apayao
Mt. Province	Guimaras	Zamboanga del Norte	Ifugao	Kalinga
Bulacan	Negros Occidental	Camiguin	Ilocos Sur	Ilocos Norte
Pampanga	Bohol	Lanao del Norte	La Union	Cagayan
Zambales	Cebu	Misamis Occidental	Bataan	Isabela
Batangas	Negros Oriental	Misamis Oriental	Palawan	Pangasinan
Cavite	Siquijor	Compostela Valley	Camarines Sur	Nueva Vizcaya
Laguna	Northern Samar	Davao City	**Visayas**	Quirino
Quezon	Eastern samar	Davao del Norte	Iloilo	Aurora
Rizal	Western Samar	Davao Oriental	Capiz	Nueva Ecija
Marinduque	Southern Leyte	Sarangani	Leyte	Tarlac
Romblon		South Cotabato	**Mindanao**	Mindoro Occidental
Albay		Basilan	Zamboanga Sibugay	Mindoro Oriental
Camarines Norte		Sulu	Maguindanao	**Visayas**
Catanduanes		Tawi-tawi	Agusan del Sur	Antique
Masbate		Lanao del Sur		Biliran
Sorsogon		Agusan del Norte		**Mindanao**
		Surigao del Norte		Zamboanga del Sur
		Surigao Sur		Bukidnon
		Dinagat Islands		North Cotabato
				Sultan Kudarat

Source: PSA, 2016

enough to augment the total rice shortage in Central Visayas of about 0.426 M t (Table 55). Except for SOCCSKSARGEN and Zamboanga Peninsula, all regions in Mindanao have limited rice availability. Mindanao Island had a total rice shortage of about 0.552 M t. In particular, ARMM had the largest deficit of about 0.22 M t; followed by Davao region with 0.205 M t; Northern Mindanao and CARAGA regions had deficits of 0.082 M t and 0.045 M t, respectively (Table 55).

Table 56 shows the provincial summary of rice self-sufficiency, while the provincial details of rice production, utilization, and sufficiency level estimates are reported in the final report of Mataia et al., (2017). In 2015, 48 provinces were under the category of insufficient (<100%) or provinces that have inadequate rice supply; 13 provinces were marginally sufficient (100% to ≤ 150%); and 20 provinces were highly sufficient (>150%) with huge rice surpluses (Table 56). In Luzon, the high-demand centers with large shortfalls include the urbanizing provinces surrounding Metro Manila: Bulacan and Pampanga in Central Luzon; and Rizal, Cavite, Batangas, Laguna, and Quezon in CALABARZON (Southern Luzon A). Marinduque and Romblon in MIMAROPA, Benguet and Mountain Province in CAR, and Albay and Masbate in Bicol are the largest rice-deficit provinces in these regions. Among provinces in the Visayas, Cebu City recorded the highest shortage of about 0.37 M t, and the rest of the deficits are seen in Aklan, Guimaras, Bohol, Siquijor, Southern Leyte, Negros Occidental and Oriental, and Northern, Eastern, and Western Samar. These provinces have high rice requirements but limited supply. They usually augment their rice deficit through importation from their neighboring surplus provinces. In Mindanao, most of the provinces have inadequate supply of rice. However, the cities of Davao and Zamboanga, Davao del Norte, Misamis Oriental, and Sulu recorded the highest level of rice self-insufficiency.

Overall, mostly urbanized and large provinces as well as metropolitan areas requiring higher volume comprise the areas with large rice deficits in all regions. This implies that rice in the country is widely moved from production areas to consumption centers. Thus, there is a need for the surplus areas to work on their competitiveness, particularly those catering to the demand in other areas, which serve as a port of entry for imported rice. In 2015, the country's total imports of about 1.1 M t were brought to large deficit areas, including Metro Manila (32%), Cebu City (22%), Olongapo City (17%), and La Union (7%). About 20% of the total imports were distributed almost equally to Cagayan de Oro City, Davao City, Albay, Batangas, Negros Occidental, and General Santos City. A marginal volume of imports (2%) was supplied to Iloilo, Zamboanga, and Laguna.

The country's domestic market for rice is handled both by the government through NFA and the private sector. However, the private sector still dominated the market with almost 98% share to total rice supply. From 2005 to 2015, the average procurement of NFA was only 2% of the total rice production (Table 57). In 2015, their procurement mostly came from major rice-producing regions, including Central Luzon, Cagayan Valley, Ilocos, and MIMAROPA. The NFA's

local procurement and rice importation are used to build up the government's buffer stocks, the strategic rice reserve (SRR) and rice stabilization. The SRR refers to the amount of stock that is equivalent to a minimum of 15-day national rice consumption maintained year-round in government depots for food security purposes in times of calamity and emergency. On the other hand, rice stabilization refers to the buffer stock equivalent to at least 30-day national rice consumption by July 1 of every year, inclusive of the 15-day SRR for stabilization purposes in deficit areas and during lean periods. Given the small procurement share in domestic production and untimely arrival and insufficiency of imports, the NFA until now could not even maintain the 30-day buffer stock. This implies that the government has a weak impact on producer and consumer prices. Many studies highlighted the distorting effect of NFA interventions in reducing the incentives to traders to undertake optimal inventory, purchasing, and selling decisions in the market (Yorobe et al., 2004).

By June 2017, quantitative restrictions (QR) on rice will be lifted in the country. It will give both challenges and opportunities in the rice market. The removal of QR will open the market for the influx of imported rice. More affordable rice will be available to consumers. However, cheaper rice means lower prices for farmers and processors. This could adversely affect their income if they will not adjust. Thus, competitiveness both at the production and marketing levels should be improved.

Table 57. Total paddy procurement of NFA and private sector, Philippines, 2005-2015

Year	Paddy production (t)	Procurement (t)	
		NFA	Private sector
2005	14,603,005	76,394	14,526,611
2006	15,326,706	74,072	15,252,634
2007	16,240,194	32,577	16,207,617
2008	16,815,548	683,045	16,132,503
2009	16,266,417	453,056	15,813,361
2010	15,772,319	502,085	15,270,234
2011	16,684,062	274,981	16,409,081
2012	18,032,525	360,882	17,671,643
2013	18,439,420	365,582	18,073,838
2014	18,967,826	26,481	18,941,345
2015	18,149,838	227,935	17,921,903

Source: PSA, 2016

Table 58. Number, capacity, and sufficiency level of storage facilities, by region, Philippines, 2015

Region	2015 Fresh paddy production (t)	Total storage capacity (t/yr)	Surplus/ (deficit) (t/yr)	Surplus/ (deficit) (no. of units)	Sufficiency level
Philippines	**18,149,838**	**13,014,045**	**(5,135,792)**	**(7,133)**	**0.72**
CAR	400,911	255,070	(145,841)	(203)	0.64
Ilocos Region	1,777,121	2,410,528	633,407	880	1.36
Cagayan Valley	2,489,647	1,532,757	(956,891)	(1,329)	0.62
Central Luzon	3,304,310	2,516,913	(787,397)	(1,094)	0.76
CALABARZON	392,907	409,839	16,932	24	1.04
MIMAROPA	1,081,833	885,190	(196,643)	(273)	0.82
Bicol	1,264,448	492,021	(772,428)	(1,073)	0.39
Western Visayas	2,056,824	833,192	(1,223,632)	(1,699)	0.41
Central Visayas	336,194	1,384,577	1,048,383	1456	4.12
Eastern Visayas	955,709	335,425	(620,284)	(862)	0.35
Zamboanga Peninsula	661,775	151,255	(510,520)	(709)	0.23
Northern Mindanao	725,120	481,933	(243,187)	(338)	0.66
Davao Region	441,868	295,028	(146,841)	(204)	0.67
SOCCSKSARGEN	1,291 ,644	742,823	(548,821)	(762)	0.58
CARAGA	481,312	178,435	(302,877)	(421)	0.37
ARMM	488,215	109,060	(379,155)	(527)	0.22

Source: PhilRice, 2013.

B. Market Facilities

Storage facilities

Based on storage inventory (Rice Industry Primer Series, 2013), the country has 16,350 warehouses; 102 outdoor storage facilities; 16 bulk silos; and 375 NFA warehouses that are used in the market. Collectively, these units have a total capacity of about 13.01 M t/year. With this capacity, only 78% of total production in 2015 was accommodated. There was a shortage of 22% or about 7,133 units of storage. Except for Ilocos, CALABARZON, and Central Visayas, all regions have insufficient storage facilities (Table 58).

Similarly, inadequate storage facilities were also observed in all major rice-producing provinces, particularly Nueva Ecija, Isabela, Cagayan, Pangasinan, and Camarines Sur in Luzon; Iloilo and Negros Occidental in the Visayas; and North Cotabato and Sultan Kudarat in Mindanao. In contrast, Cebu and Davao City, the two largest deficit areas, have many storage facilities that are more than enough to meet their needs (Mataia et al., 2017). Given the seasonality of production and the limited supply of rice in the country, sufficient and effective storage facilities are critical. This is to ensure enough supply of paddy or rice during lean months. Accordingly, appropriate distribution of storage facilities in all strategic areas is necessary.

Drying facilities

In terms of drying, both mechanical and solar drying facilities are used in the market. These facilities are either government- or privately-owned. The government, through the Department of Agriculture (DA/NFA), has 2,160 units of flatbed dryers and 434 mechanical dryers. As to privately-owned drying facilities, existing units are 438 flatbed dryers, 1,330 recirculating dryers, 671 mobile flash dryers, 9 in-store dryers, and 46,225 multipurpose drying pavements. Solar drying is still a popular method of drying paddy in the country as shown in the number of units and as reported by most survey respondents. Together, these dryers have a total capacity of 18.09 M t/year. However, this capacity falls short by 17% (3.82 M t or about 10,614 units) to dry the total 2015 supply of about 21.91 M t fresh paddy (Table 59).

Among the regions, Cagayan Valley, Northern Mindanao, Davao region, and CALABARZON recorded the highest surplus units of drying facilities (Table 59). In contrast, Central Luzon and Western Visayas have inadequate drying units of about 4,475 and 3,357, respectively. The distribution and sufficiency level of drying facilities across provinces are presented in Appendix Table 6.3. The record shows that all major rice-producing provinces in the country have insufficient drying facilities. Thus, it is not surprising that drying of paddy in public pavements or cemented roads remains popular in all areas in the country, particularly during the dry season. Solar drying is generally cheaper than mechanical drying because of zero fuel cost. However, solar drying negatively affects the quality of milled rice.

Table 59. Number, capacity, and sufficiency level of drying facilities, by region, Philippines, 2015

	2015 Fresh Paddy Production (t)	Total drying capacity (t/yr)	Surplus/(deficit) (t/yr)	Surplus/(deficit) (no. of units)	Sufficiency level
Philippines	**21,909,797**	**18,088,795**	**(3,821,002)**	**(10614)**	**0.83**
CAR	483,965	601,723	117,759	327	1.24
Ilocos Region	2,145,273	1,629,082	(516,192)	(1434)	0.76
Cagayan Valley	3,005,408	3,775,272	769,864	2139	1.26
Central Luzon	3,988,838	2,377,925	(1,610,913)	(4475)	0.60
CALABARZON	474,302	714,725	240,422	668	1.51
MIMAROPA	1,305,948	791,237	(514,711)	(1430)	0.61
Bicol	1,526,394	1,050,662	(475,731)	(1321)	0.69
Western Visayas	2,482,920	1,202,458	(1,280,463)	(3557)	0.48
Central Visayas	405,841	445,469	39,628	110	1.10
Eastern Visayas	1,153,696	529,699	(623,997)	(1733)	0.46
Zamboanga Peninsula	798,870	685,531	(113,339)	(315)	0.86
Northern Mindanao	875,337	1,241,117	365,779	1016	1.42
Davao Region	533,406	792,864	259,458	721	1.49
SOCCSKSARGEN	1,559,224	1,626,389	67,165	187	1.04
CARAGA	581,021	552,211	(28,810)	(80)	0.95
ARMM	589,355	72,432	(516,923)	(1436)	0.12

Source of basic data: PhilRice, 2013

The low head rice recovery or the higher percentage of broken rice is one example. Beltran et al. (2016) showed that the Philippines has the lowest average head rice recovery, only 43%, relative to Vietnam, Thailand, and Indonesia. This is below the standard for premium milled rice, which is 48% and above (RTWG, 1997). Just like storage, sufficient and suitable drying in all strategic areas is important to ensure an adequate supply of good-quality rice in the market.

Rice mill facilities

Table 60 shows the available units of rice mill facilities at the national and regional levels. Three types of rice mill in the market exist: single-pass, multi-pass, and micro mill. The country has a total of 24,420 units of single-pass, 904 units of multi-pass, and 48 units of micro mills. Collectively, these mills have a total capacity of 20.75 M t/year. Unlike in the case of storage and drying facilities, this capacity exceeded the total supply of paddy in 2015 by 14% (2.6 M t) or about 3,642 units with an average capacity of 720 t/year. This implies that rice mills in the country are generally underutilized as shown in Section D. Beltran et al. (2016) found that most of the rice mills in the country do not operate at full capacity. They operate only for about 8 hr a day during ordinary seasons and 16 hr at peak periods. This underutilization of rice mills appears to be caused by the low volume of paddy supply in the country.

Across regions, different levels of rice mill sufficiency exist. An inventory reveals that Cagayan Valley and Central Luzon in Luzon and all regions in Mindanao have inadequate rice mill facilities. The rest of the regions recorded an excess of these facilities. The same situation prevails across provinces (Mataia et al., 2017). The number of rice mills in all major rice-producing provinces is insufficient, while the opposite exists in provinces with a low volume of paddy supply. For example, Nueva Ecija and Isabela, the top two rice-producing provinces, have a limited number of rice milling facilities particularly during peak harvest season. This is in contrast to all provinces in CALABARZON where they have excess units of rice mills. Rice millers in Iloilo and Negros Occidental go to neighboring provinces to procure more paddy to fully utilize their rice mills. The opposite happens in most provinces in Mindanao because many areas in the island do not have enough rice mill facilities. These results highlight the need to put up rice mill facilities in more strategic locations in the country.

C. Market Standards

Establishing quality standards in the rice industry is a critical step to ensure safety, quality infrastructure, and competitiveness as they relate to the whole rice value chain and all stakeholders involved. For consumers, this will protect their fundamental rights to safety and being adequately informed, ensuring their high satisfaction; for businessmen, this will help them build a positive reputation, increase sales, reduce cost, and enhance profitability in the long run.

With its mandate to promote the growth and development of the rice industry, the government, through NFA, had initiated and developed the Philippine Grain Standardization Program (PGSP) in 1996 to institutionalize the implementation of the National Grain Standards for Rice (NGSR), which were updated in March 2013. The NGSR is a set of rules prescribing standard specifications on quality, packaging, labeling, and tests and analyses of rice to help ensure efficiency, order, and fair trade in grain production and marketing (NFA, 2013). The NGSR generally requires that (1) the moisture content of rice should not exceed 14% on an "as-received" basis; (2) rice should be free from objectionable and foreign odors, live insect pests, and other contaminants; and (3) rice should not contain chemical residues in excess of the maximum limits recommended by the joint FAO-WHO Codex Alimentarius Commission.

The NGSR also specifies standard classifications and grading for both paddy (Table 61) and milled rice (Table 62) on the basis of size, degree of milling, variety, and purity. Paddy is classified according to the size of brown rice grains: very long, long, medium, and short (Table 61). On the other hand, milled rice is classified based on (1) the size of the whole grain (very long, long, medium, and short grains) and (2) the degree of milling (overmilled, well milled, regular milled, and undermilled rice) (Table 62). As to genetic characteristics, both paddy and milled rice are categorized in terms of the variety of their respective paddy rice form. These are either modern or traditional varieties, including special paddy and rice. In terms of grading, the paddy must conform to given grade requirements defined by purity (percentage of paddy free of foreign matter) and additional minimum defective counts. There are four established grades: premium grade has the highest purity of 98%, and this is then followed by grades 1-3. For milled rice, grading involves measuring the percentage of head rice and observing minimum defects. Based on this, NFA has established six grades, with premium having the highest percentage of head rice (95%), followed by grades 1-5.

Practices (GAP) for rice contains guidelines for proper production, harvesting and on-farm post-harvest handling, and storage practices for paddy. The GAP was emphasized on six key areas: farm location, farm environment, farm structure and facility maintenance, farming practices, worker's health and safety, and farm management. The PNS also covered guidelines on pesticide residue limits on rice for food safety purposes. The active ingredients and residue limits in pesticides are clearly presented in PNS pesticide residues in rice with maximum residue limits (MRL). Moreover, additional standards were also established for rice milling facilities. According to PNS, rice mills shall be classified based on the method of operation (i.e., single pass or multiple pass) or type of huller (i.e., under-runner stone disc, rubber roll type or centrifugal). With these classifications, rice mills shall be allowed to have a minimum performance specification in hulling efficiency, milling recovery index, percent head rice index, and quantity of paddy per kilogram milled rice, while milling degree shall be well milled, and maximum noise level.

Table 60. Number, capacity, and sufficiency level of milling facilities, by region, Philippines, 2015

Region	2015 Paddy production (t)	Total milling capacity (t/yr)	Surplus/ (Deficit) (t/yr)	Surplus/ (Deficit) (no. of units)	Sufficiency level
Philippines	**18,149,838**	**20,754,690**	**2,604,852**	**3462**	**1.14**
CAR	400,911	1,357,273	956,362	1271	3.39
Ilocos Region	1,777,121	3,147,035	1,369,914	1820	1.77
Cagayan Valley	2,489,647	1,689,705	(799,942)	(1063)	0.68
Central Luzon	3,304,310	2,345,998	(958,313)	(1274)	0.71
CALABARZON	392,907	941,113	548,206	729	2.40
MIMAROPA	1,081,833	1,300,685	218,852	291	1.20
Bicol	1,264,448	1,796,143	531,695	707	1.42
Western Visayas	2,056,824	4,031,858	1,975,034	2625	1.96
Central Visayas	336,194	604,135	267,941	356	1.80
Eastern Visayas	955,709	1,235,840	280,131	372	1.29
Zamboanga Peninsula	661,775	326,585	(335,190)	(445)	0.49
Northern Mindanao	725,120	591,465	(133,655)	(178)	0.82
Davao Region	441,868	224,245	(217,623)	(289)	0.51
SOCCSKSARGEN	1,291,644	635,510	(656,134)	(872)	0.49
CARAGA	481,312	436,050	(45,262)	(60)	0.91
ARMM	488,215	91,053	(397,163)	(528)	0.19

Source of basic data: PhilRice, 2013.

Finally, there are also standards set specifically for organic rice. These cover post-harvest operations, packaging, labeling and quality standards needed for the commodity to be confidently labeled organic. Organic milled rice must also conform to specific grade requirements categorized by maximum percentage of broken rice, brewer's rice, defectives, and paddy per kilogram of rice.

Although the government set these standards, the private marketing players including traders and millers have their own quality standards in buying paddy and milled rice. They use these standards to ensure their profits as well as to secure customer satisfaction and loyalty. Based on the 2014 marketing survey, traders' paddy procurement was commonly based on the size of the paddy. They prefer to buy paddy that are long-grained, known to have good eating quality when milled, and that have lower moisture content when bought. For milled rice, traders prefer to buy and sell rice with good eating quality as this trait commands a higher price.

Table 61. Quality standards for paddy in the Philippines, 2015

Parameter	Grade			
	Premium grade	Grade No. 1	Grade No. 2	Grade No. 3
Classification Grain size	Very long/long/ medium/short	Very long/long/ medium/short	Very long/long/ medium/short	Very long/long/ medium/short
Variety	Traditional/ modern	Traditional/ modern	Traditional/ modern	Traditional/ modern
Grade factors				
(% by weight)				
Minimum purity	98.00	95.00	90.00	85.00
Maximum foreign material	2.00	5.00	10.00	15.00
(a) Weed seed and other crop seed, maximum	0.10	0.10	0.25	0.50
(b) Other foreign materials, maximum	1.90	4.90	9.75	14.75
Defectives				
Chalky and immature kernels, maximum	3.00	6.00	12.00	20.00
Damaged kernels, max	0.50	1.50	3.00	5.00
Contrasting types, max	3.00	6.00	10.00	18.00
Red kernels, max	1.00	3.00	5.00	10.00
Discolored kernels, max	0.50	2.00	4.00	8.00
Moisture content, max	14	14	14	14

NOTE: Special varieties of paddy shall be graded and designated according to the grade requirements of this standard and shall be identified under a specific variety (e.g., Dinorado, Sigadis, Milagrosa, Sampaguita, Sinandomeng, Kalinayan, Baysilanon, and other varieties certified by the National Seed Industry Council [NSIC]).
Source: NFA, 2016

Table 62. Quality standards for milled rice in the Philippines, 2015

Parameter	Grade					
	Premium grade	Grade No. 1	Grade No. 2	Grade No. 3	Grade No. 4	Grade No. 5
Classification						
Grain size	Very long/long/ medium/short/	Very long/long/ medium/short	Very long/long/ medium/short	Very long/long/ medium/short	Very long/long/ medium/short	Very long/long/ medium/short
Degree of milling	Overmilled/ Well milled rice	Well milled rice	Regular milled rice	Regular milled rice	Regular milled rice	Regular milled rice
Variety	Traditional/ modern	Traditional/ modern	Traditional/ modern	Traditional/ modern	Traditional/ modern	Traditional/ modern
Grade factors (% by weight)						
Brokens, max (total including brewers)	5.00	10.00	15.00	25.00	35.00	45.00
Brewers, max	0.10	0.20	0.40	0.60	1.00	2.00
Defectives:						
Damaged kernels, max	0.50	0.70	1.00	1.50	2.00	3.00
Discolored kernel, max	0.50	0.70	1.00	3.00	5.00	8.00
Chalky kernel, max	4.00	5.00	7.00	7.00	10.00	15.00
Immature kernel, max	0.20	0.30	0.50	2.00	2.00	2.00
Contrasting type, max	3.00	5.00	10.00	-	-	-
Red kernel, max.	1.00	2.00	4.00	5.00	5.00	7.00
Foreign matter, max	0.025	0.10	0.15	0.17	0.20	0.25
Paddy, max. (no. per 1,000 g)	10.00	15.00	20.00	25.00	25.00	25.00
Moisture content	14.00	14.00	14.00	14.00	14.00	14.00
Milling degree	OMR/WMR	WMR	RMR WMR (Super)	RMR WMR (Super)	RMR WMR (Super)	RMR WMR (Super)

Source: NFA, 2016 The packaging and labeling of milled rice are uniquely detailed for each of the identified standard classifications (Table 63). The packaging for milled rice is differentiated according to the degree of milling and to its type such as special rice. Specifically, these are described in terms of prescribed package size, type of material used, color of packaging material, price tags, and required information for the labels. For retailing of milled rice, labeling of price tags must follow the standard requirements that include size, color, color on print of price tag, and prescribed information. The Bureau of Agriculture and Fisheries Standards (BAFPS) also established the Philippine National Standards (PNS) for proper growing and pesticide residue limits in rice. The good agricultural

Table 63. Standards for packaging and labeling of milled rice in the Philippines

Commodity, classification and grade	Packaging			Labeling
	Package size (kg)	Type of material	Color of packaging material	Required information
Big package	15, 20, 25, 30, 35, 40, 45, 50 (multiples of 5)	Woven, polypropylene (WPP), non- transplanted or transparent type)		
Special rice	One cavan of rice or corn commodity shall be a unit containing 50 kg net weight of such commodity. The words (when "packed" and "as packed" following the net weight shall not be allowed)		Sky blue	Classification (i.e., whether well milled, regular milled or undermilled for rice)
Premium grade rice			Light yellow	
Well milled rice			White	Variety (optional, except for special rice)
Grade no. 1				
Grade nos. 2, 3, 4 or 5 (super)				Grade (i.e., whether premium grade, grade nos. 1, 2, 3, 4 or 5)
Regular milled rice			White	
Grade nos. 2, 3, 4 or 5				Net weight (kg)
Under milled rice			White	
Grade nos. 2, 3, 4 or 5 (ordinary)			Transparent WPP sacks shall be fully or partially color-coded for special and premium grade rice but shall be strictly colored white for other grades. However, the color-coded portion shall be dominant in proportion with the background.	Name and address of miller Name and address of owner (in case of custom milling) Iron-enriched rice (starts in 2004)

Source: NFA, 2016

D. Price Trends and Structure

Price trends of paddy and milled rice

Trends in the world price of rice are generally stable. Historically, prices of rice have been much higher in the Philippines than the world price (Figure 30). Accordingly, the country has the highest farmgate prices of dry paddy compared with its major sources of imports such as Thailand and Vietnam in 2000-2012 (Figure 31). In recent years, Thailand has higher farmgate prices than the Philippines because of the former's government-guaranteed support price to farmers (i.e., government pledging scheme). Despite the higher prices in the country, minimal fluctuations in domestic rice prices were observed in the same period. Consequently, this translated into minimal changes in the growth rate of average farmgate, wholesale, and retail prices (Table 64). The comparative annual growth rate of farmgate price ranged from 5% to 8.09%, whereas milled rice selling prices ranged from 5.86% to 6.29% for wholesale and from 5.82% to 6.27% for retail.

Table 64. Average annual prices (PhP/kg) and growth rate (%) of farmgate, wholesale, and retail prices of rice, Philippines, 2005-2015

Item	Farmgate		Wholesale		Retail	
	Average price (PhP/kg)	Growth rate (%)	Average price (PhP/kg)	Growth rate (%)	Average price (PhP/kg)	Growth rate (%)
Dry Paddy (Fancy)	14.77	5.00	-	-	-	-
Dry Paddy (Other variety)	14.68	8.09	-	-	-	-
Special rice	-	-	36.42	5.86	40.53	5.82
Premium rice	-	-	33.67	6.29	36.09	6.22
Well milled rice	-	-	30.40	6.18	33.05	6.27
Regular milled rice	-	-	27.74	6.06	29.85	5.98

Source: PSA-BAS (2016).

Figure 30. Trends in world and domestic prices of milled rice, 2005-2015
(Source: FAO, 2016)

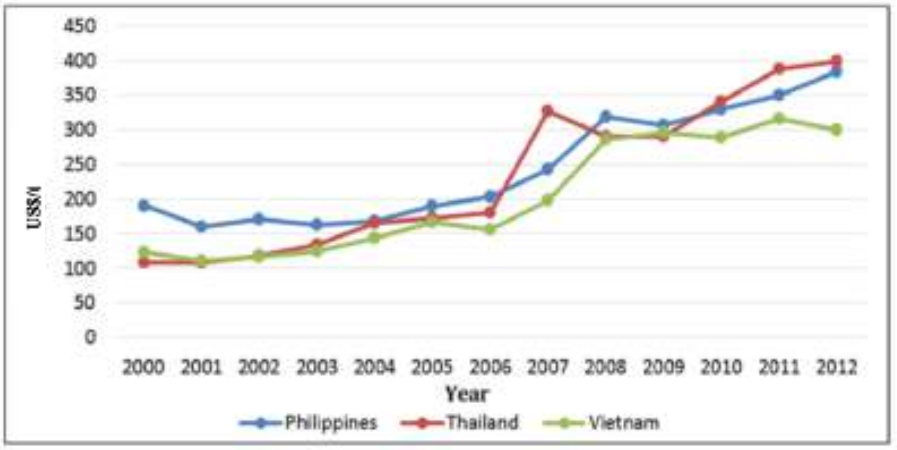


Figure 31. Trends in farmgate prices (US$/t) of rice in Asia, by country, 2000-2012 (Source: FAO, 2016)

Figure 32 shows the trend in domestic farmgate prices of paddy from 2005 to 2015. Paddy prices are generally increasing during this period with an average of PhP 14.77/kg for fancy and PhP 14.68/kg for other varieties. Farmgate prices rose from 2007 to 2008 and from 2013 to 2014. The price shock during 2007-2008 was brought by the world food crisis, while high demand from traders and vulnerability to market forces of the rice buffer stock held by the government at the end of the year caused the price hike in 2013-2014. Higher farmgate prices with values above the national average were observed in most of the major rice-producing provinces covered in the study, with Nueva Ecija, Tarlac, Bulacan, Pangasinan, Pampanga, and Bohol on top of the list (Mataia et al., 2017). On the other hand, Oriental Mindoro, Camarines Sur, Iloilo, Negros Occidental, Leyte, and Agusan del Sur had farmgate prices lower than the national average. Farmgate prices in Isabela were just comparable with the national average.

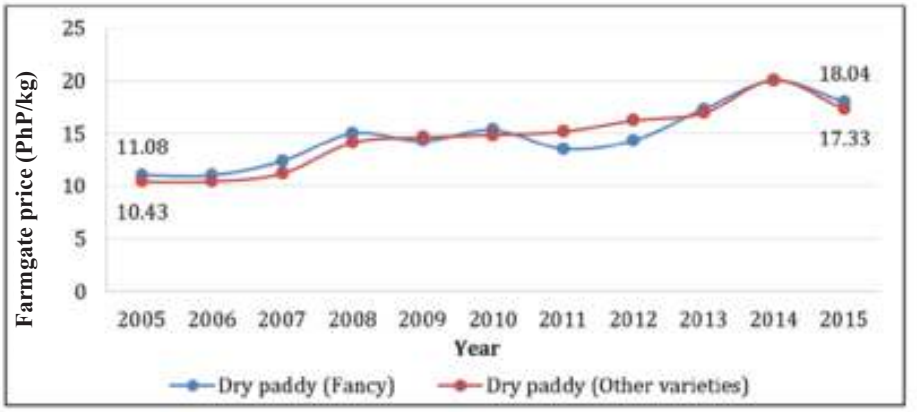


Figure 32. Trends in average farmgate prices of paddy, Philippines, 2005-2015 (Source: PSA, 2016)

The trend in wholesale price of milled rice is presented in Figure 33. It generally increased at a faster rate than the farmgate price in the same period. The

wholesale price of all types of milled rice almost doubled during this period, with an average of PhP 36.42/kg for special rice, PhP 33.67/kg for premium rice, PhP 30.40/kg for well-milled rice, and PhP 27.74/kg for regular milled rice. Unlike farmgate price, the wholesale price of milled rice skyrocketed only in 2008 during the world rice crisis at a very huge rate. Since then, prices of milled rice in the market had not gone down. The movements of wholesale prices of milled rice were practically similar in all provinces, although lower average values were observed (Mataia et al., 2017). Wholesale prices higher than the national level were recorded in major trading centers in Manila, Bulacan, Zambales, Benguet, and in the cities of Cebu, Davao, and Zamboanga.

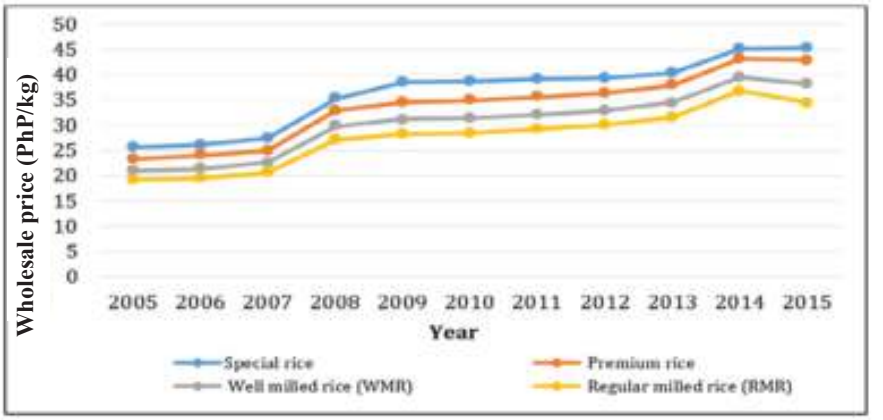


Figure 33. Trends in average wholesale prices of milled rice, 2005-2015
(Source: PSA, 2016)

The trend in retail price of milled rice generally followed the behavior of wholesale price (Figure 34). The retail price of all types of milled rice likewise increased by almost two-fold from 2005 to 2015. On average, the retail price of special rice reached about PhP 40.53/kg; it was PhP 36.09/kg for premium rice, PhP 33.05/kg for well-milled rice, and PhP 29.85/kg for regular milled rice. A large increase in prices in 2008 was also manifested in retail prices. The upward

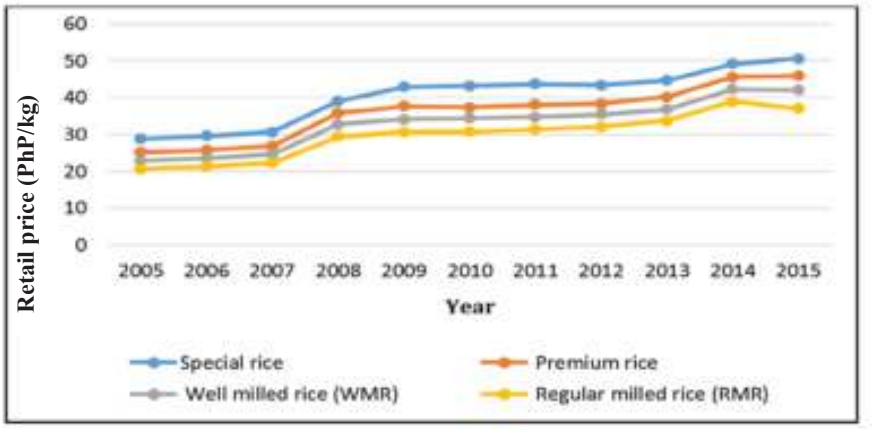


Figure 34. Trends in average retail prices of milled rice, 2005-2015
(Source: PSA, 2016)

movement in retail prices was also noted in all provinces covered (Mataia et al., 2017). Unlike wholesale prices, provincial average values of retail prices were comparable with the national average. Consistently, all major trading centers posted higher retail prices than the national average.

The seasonality of rice production greatly influenced the upward movement of paddy and rice prices. Rice is a biological commodity, meaning there is a time lag between planting and harvesting. The seasonality in rice prices reflects the seasonality in production, with prices increasing during lean months and getting depressed during harvest season. The two distinct cropping seasons for rice in the country are the dry and the wet. Dry season begins in November until April, and wet season during the rest of the year.

In times of unwarranted rice price hikes, the NFA injects into the retail market its rice stocks that come from importation and domestic procurement. NFA ensures the availability of rice supply at a price lower than the market price. Moreover, when prices of paddy at the farm level dip, the NFA procures from farmers to mitigate their losses. A regulated procurement price is now set at PhP 17/kg at 14% moisture content. An incentive of PhP 0.50/kg is given to farmers' cooperative or organization where the farmer, from whom the paddy was purchased, is a member. However, NFA generally fails to defend the given procurement price. The commercial farmgate prices do not follow the NFA's procurement price. In fact, there are periods when the farmgate price offered by private traders is even higher than the NFA price.

Price structure of paddy and milled rice

Farmers commonly trade their produce with traders and processors. Processors transform paddy into milled rice for a higher market value. Milled rice is a commodity that is bought from the market, cooked, and eaten by consumers. This price structure shows how prices of paddy from the farm transmit into prices of milled rice in the market.

Figure 35 shows the price ladder of paddy to milled rice in the country in 2014. On average, the price difference between wet and dry paddy ranged from PhP 0.50 to PhP 1.00/kg during the dry season and from PhP 1.00 to PhP 3.00/kg during the wet season. Using the farmgate price of dry paddy at 14% moisture content, farmers sold their harvests to traders and rice millers (i.e., processors cum wholesalers) at PhP 20.01/kg for fancy rice varieties and PhP 20.07/kg for other rice varieties. Rice millers processed the paddy into milled rice and sold it to wholesalers and wholesaler-retailers at a price almost twice that of paddy price: PhP 45.15/kg for special rice, PhP 43.12/kg for premium rice, PhP 39.51/kg for well-milled rice, and PhP 36.78/kg for regular milled rice. About PhP 2.00 to PhP 4.00/kg was added to the wholesale price of milled rice, depending on its classification at the retail market. The special rice was sold at a retail price of PhP 49.05/ kg; it was PhP 45.60/kg for premium rice, PhP 42.32/kg for well-milled rice, and PhP 38.93/kg for regular milled rice.

Using survey data, price structures by island are presented in Figures 36 to 38. In Luzon, farmers in Ilocos Region, MIMAROPA, and Bicol Region, on average, traded their fresh and dry paddy to paddy traders or assemblers at less than PhP 16.00/kg and below PhP 18.00/kg, respectively (Figure 36). Higher farmgate prices of both fresh (> PhP 16.00/kg) and dry paddy (> PhP 18.00/kg) were observed in Central Luzon and Cagayan Valley probably due to strong competition among buyers in these markets. For all regions, paddy traders and assemblers had a markup of about PhP 1.00 to PhP 1.50/kg to the procurement price of dry paddy as their selling price to rice millers. Three types of milled rice are available in the market in all regions: premium rice, well-milled rice, and regular milled rice. The processors' wholesale prices for premium rice ranged from PhP 36.00 to PhP 47.00/ kg, PhP 35.00 to PhP 39.50/kg for well-milled rice, and PhP 29.00 to PhP 33.50/kg for regular milled rice. Across regions, about PhP 2.00 to PhP 10.00/kg was added to the wholesale price of milled rice, depending on its classification at the retail market (Figure 36).

The price structure in the Visayas Island is generally similar to that in Luzon (Figure 37). On average, farmers in all regions sold their harvests to paddy traders and assemblers at prices ranging from PhP 15.00 to PhP 17.50/kg for fresh paddy and from PhP 16.00 to PhP 19.00 /kg for dry paddy. Processors sold their milled rice at wholesale prices ranging from PhP 38.00 to PhP 46.00/kg for premium rice, PhP 35.00 to PhP 40.00/kg for well-milled rice, and PhP 32.00 to PhP 34.00/kg for regular milled rice. A markup of about PhP 2.00 to PhP 10.00/kg per classification of milled rice was added when sold in the retail market.

Figure 38 shows the price structure existing in Mindanao Island. Similar to Luzon and the Visayas, producers in all regions traded their produce with paddy traders and assemblers. Nevertheless, all regions in Mindanao commanded higher farmgate prices than did in other regions in Luzon and the Visayas. Paddy traders and assemblers' procurement price of fresh paddy ranged from PhP 16.00 to PhP 19.00/kg; for dry paddy, it was PhP 18.00 to PhP 20.00/kg. A markup of less than PhP 1.00/kg was added when they sold the paddy to processors. At the wholesale market, processors sold their milled rice at these prices: about PhP 40.00 to PhP 43.00/kg for premium rice, PhP 37.00 to PhP 39.00/kg for well-milled rice, and PhP 35.00 to PhP 38.00/kg for regular milled rice. These classifications of milled rice were retailed in the market at PhP 42.00 to PhP 49.50/kg for premium rice, PhP 37.00 to PhP 39.00/kg for well-milled rice, and PhP 35.00 to PhP 38.00/kg for regular milled rice. Overall, prices of paddy and milled rice have been much higher in all regions in Mindanao relative to those in the Luzon and Visayan regions.

In terms of rice by-products, bran and hull are the most commonly sold in the market. In Luzon, bran was sold at an average price of PhP 10.12/kg while hull was sold at PhP 1.04/ kg. The highest prices of bran and hull were recorded in the Visayas region at an average of PhP 10.19/kg and PhP 2.05/kg, respectively. Prices of bran and hull in Mindanao are comparable with those in Luzon. In Mindanao markets, bran was traded at an average price of PhP 10.11/kg; hull was sold at PhP 0.81/kg.

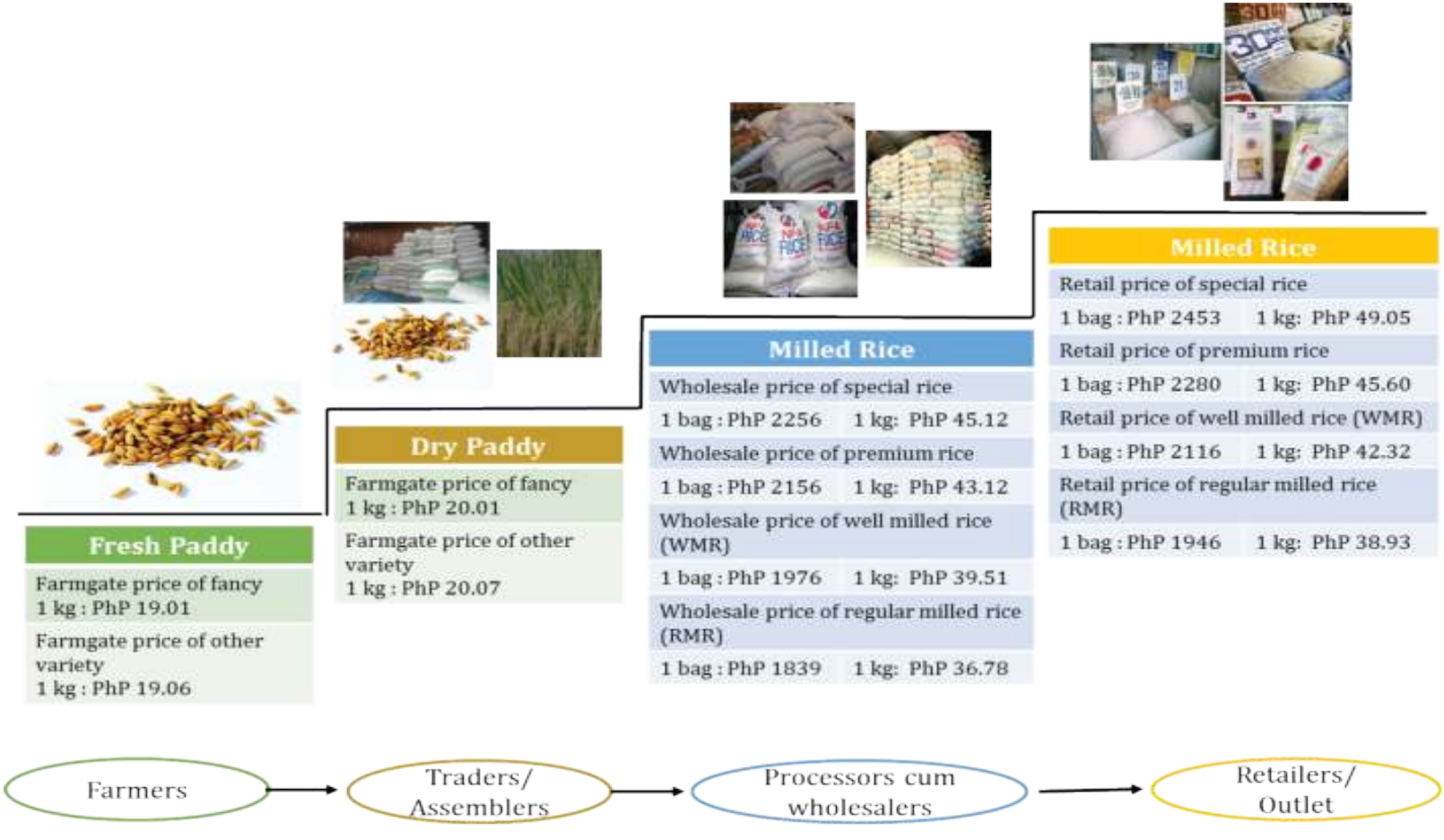


Figure 35. Price structure of paddy and milled rice, Philippines, 2014-2015

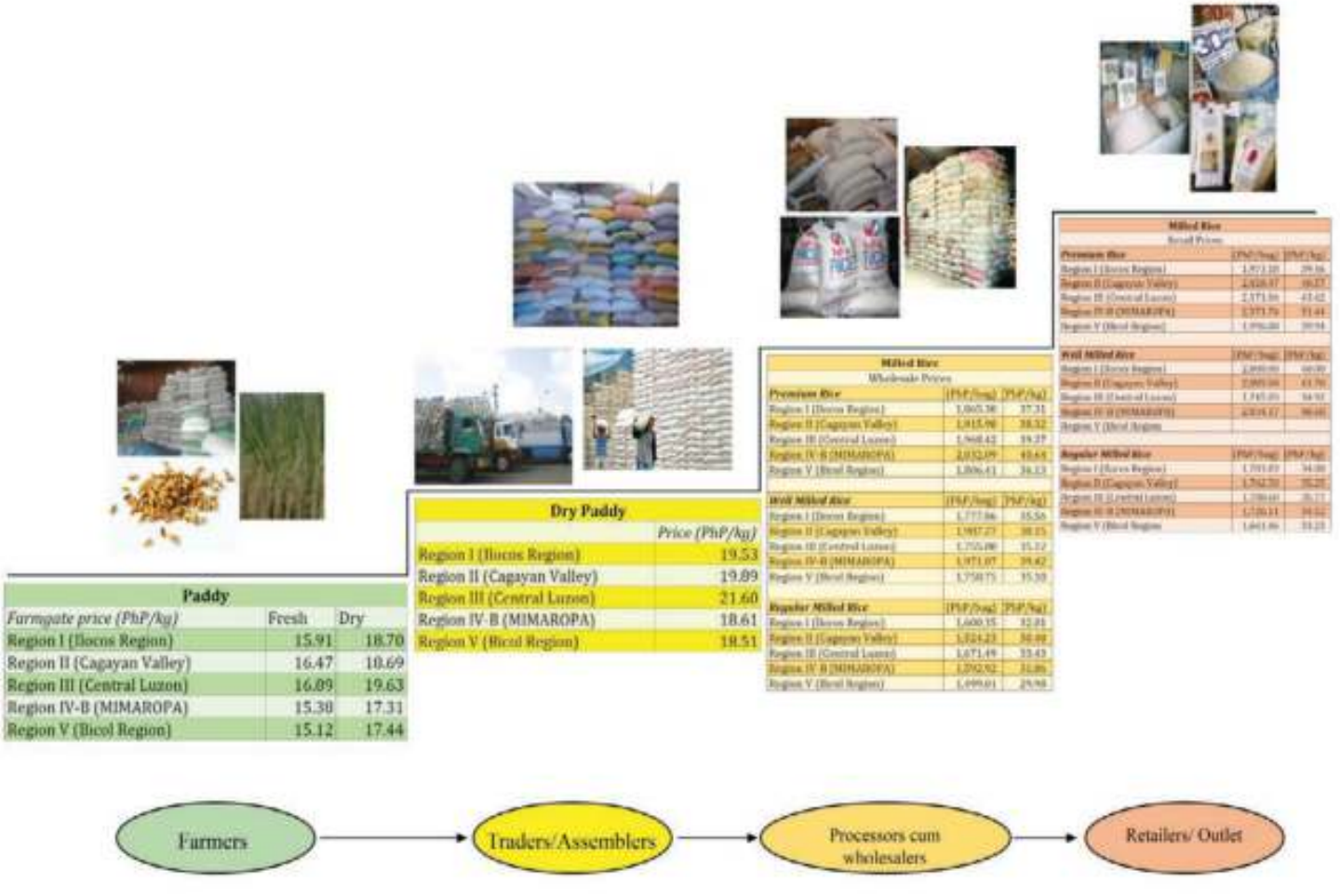
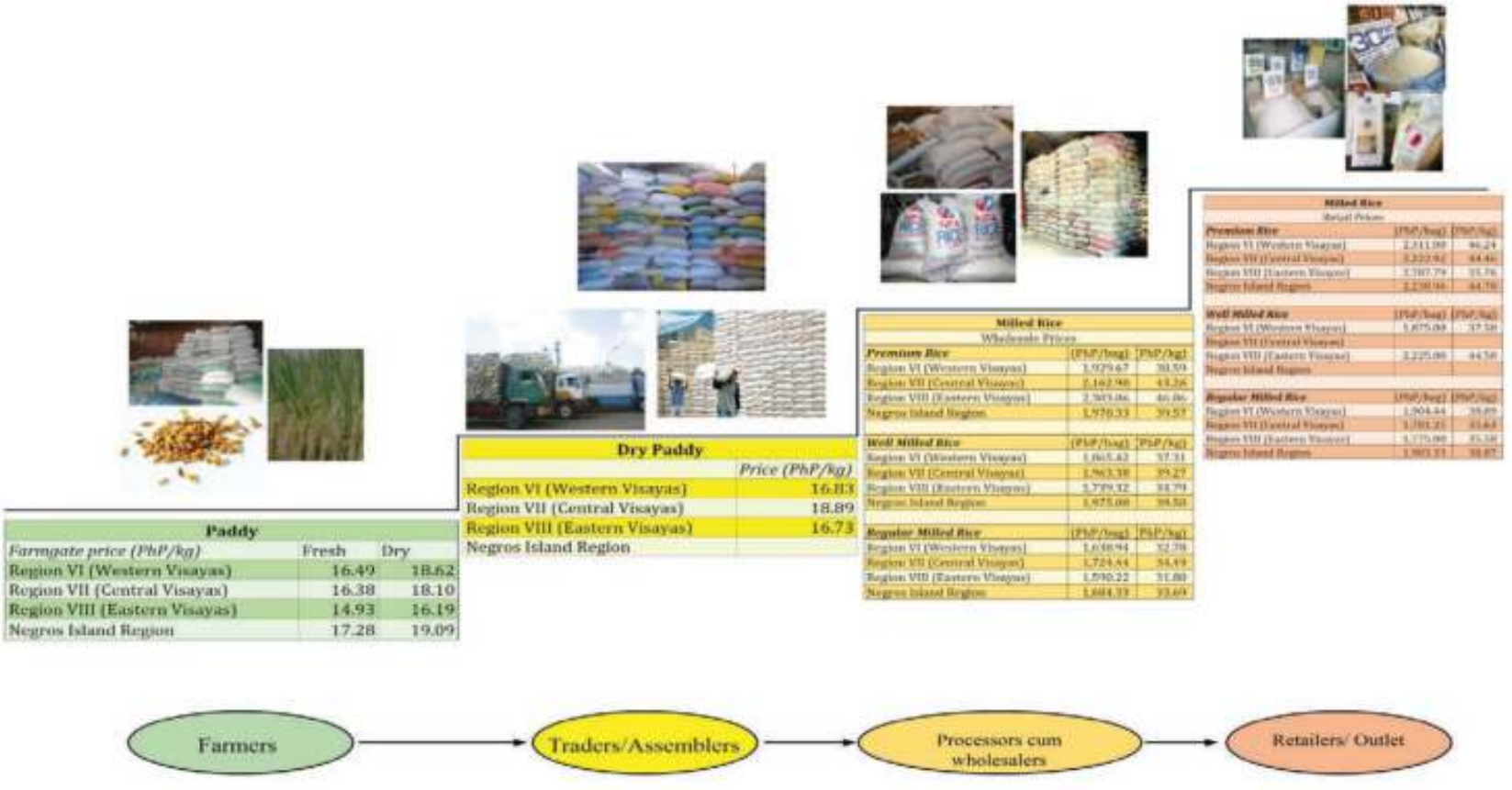


Figure 36. Price structure of paddy and milled rice, by region, Luzon, Philippines, 2014-2015



Paddy		
Farmgate price (PhP/kg)	Fresh	Dry
Region VI (Western Visayas)	16.49	18.62
Region VII (Central Visayas)	16.38	18.10
Region VIII (Eastern Visayas)	14.93	16.19
Negros Island Region	17.28	19.09

Dry Paddy	
	Price (PhP/kg)
Region VI (Western Visayas)	16.83
Region VII (Central Visayas)	18.89
Region VIII (Eastern Visayas)	16.73
Negros Island Region	

Milled Rice		
Wholesale Prices		
Premium Rice	(PhP/bag)	(PhP/kg)
Region VI (Western Visayas)	1,929.67	38.59
Region VII (Central Visayas)	2,162.98	43.26
Region VIII (Eastern Visayas)	2,303.06	46.06
Negros Island Region	1,978.33	39.57
Well Milled Rice	(PhP/bag)	(PhP/kg)
Region VI (Western Visayas)	1,865.42	37.31
Region VII (Central Visayas)	1,963.38	39.27
Region VIII (Eastern Visayas)	1,739.32	34.79
Negros Island Region	1,975.00	39.50
Regular Milled Rice	(PhP/bag)	(PhP/kg)
Region VI (Western Visayas)	1,640.94	32.78
Region VII (Central Visayas)	1,724.44	34.49
Region VIII (Eastern Visayas)	1,590.22	31.80
Negros Island Region	1,684.33	33.69

Milled Rice		
Retail Prices		
Premium Rice	(PhP/bag)	(PhP/kg)
Region VI (Western Visayas)	2,311.09	46.24
Region VII (Central Visayas)	2,222.92	44.46
Region VIII (Eastern Visayas)	2,387.79	55.76
Negros Island Region	2,230.56	44.70
Well Milled Rice	(PhP/bag)	(PhP/kg)
Region VI (Western Visayas)	1,875.09	37.50
Region VII (Central Visayas)		
Region VIII (Eastern Visayas)	2,225.00	44.50
Negros Island Region		
Regular Milled Rice	(PhP/bag)	(PhP/kg)
Region VI (Western Visayas)	1,904.44	38.09
Region VII (Central Visayas)	1,781.25	35.63
Region VIII (Eastern Visayas)	1,775.00	35.50
Negros Island Region	1,903.33	38.07

Farmers → Traders/Assemblers → Processors cum wholesalers → Retailers/ Outlet

Figure 37. Price structure of paddy and milled rice, by region, Visayas, Philippines, 2014-2015

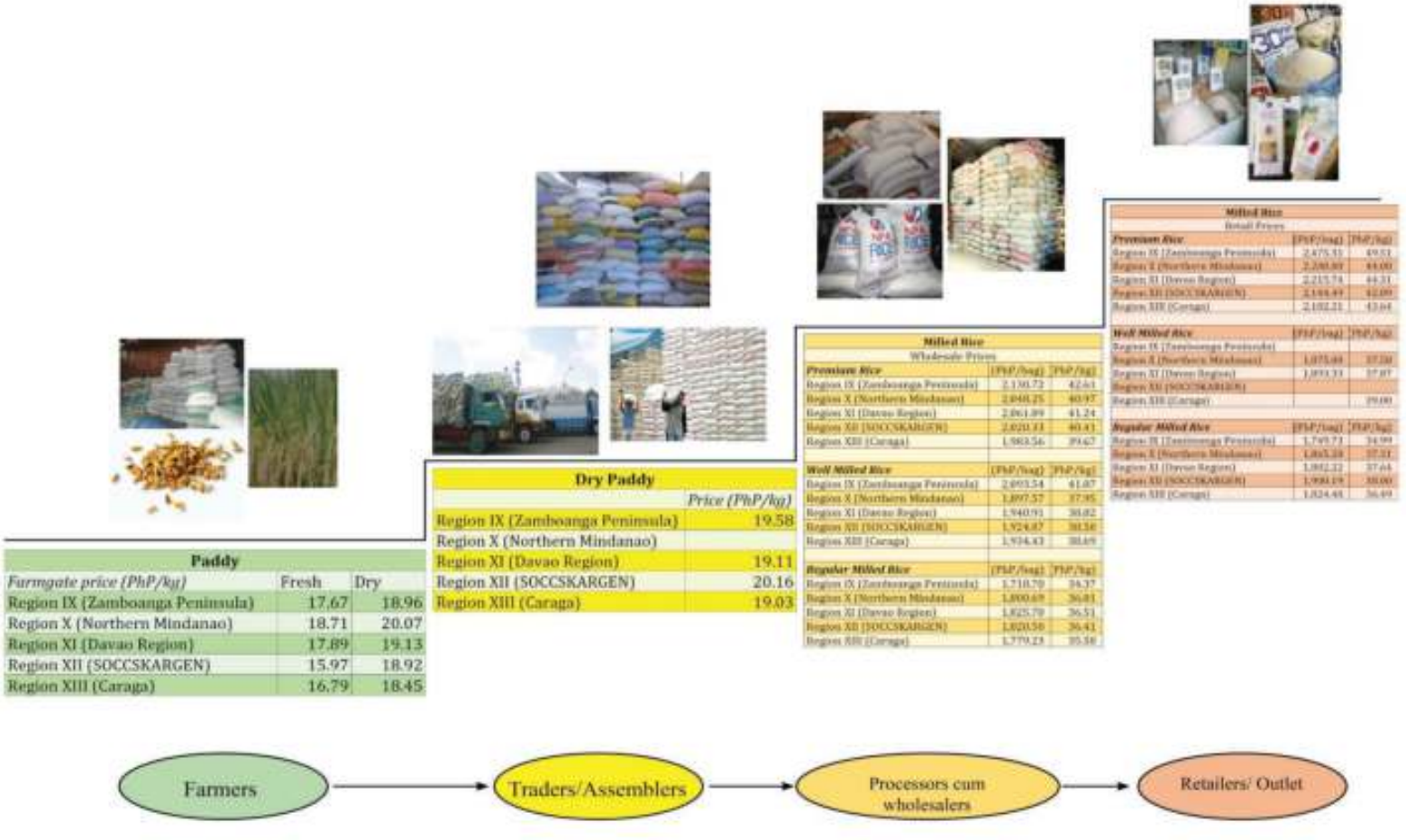


Figure 38. Price structure of paddy and milled rice, by region, Mindanao, Philippines, 2014-2015

Photo: PhilRice

CHAPTER 6

SUPPORT SERVICES

This chapter presents the financial and non-financial support services extended to farmers and market players in the rice value chain in the Philippines. These are being provided by national and regional government agencies, local government units (LGUs), international organizations, and non-government organizations (NGOs) through various programs and projects that would help enhance the performance of the rice industry in general and that of the stakeholders in particular.

A. Financial Services

Credit support services

Two sources of credit are accessed by small farmers. These are the informal and formal credit sources. Informal credit sources are composed of informal moneylenders such as paddy traders, agricultural input suppliers, millers, large farmers, friends, relatives, land owners, and overseas contract workers. The formal sources are the commercial banks, rural banks, cooperatives, cooperative banks, and credit guarantee institutions. It also includes the government's credit programs for farmers and fisherfolk.

Results of the RBFHS for crop year 2011-2012 revealed that more than half (54-55%) of the farmer-respondents self-financed their operation, of which two-thirds were farmers cultivating half a hectare and below, which might imply that credit is not accessible to them. Forty-five percent of the farmers obtained credit from either formal or informal sources. The leading formal sources of credit were the lending institution, cooperative, rural bank and LBP. LBP is the only and the largest source of credit for small farmers in the Philippines. The informal sources were professional moneylenders (private individuals), traders, input dealers, relatives, friends, etc. Most farmers prefer to borrow money from informal sources because they have immediate need for cash to finance rice production, especially for input purchase and for payment of hired labor. Others borrow not only for rice production but for household expenses and children's education. They prefer to borrow from informal sources because of the low transaction cost (more accessible, no collateral is required, and there is less paper work) despite the high interest rate, which was 5% per month on average. A survey conducted by the Agricultural Credit Policy Council (ACPC) in 2014 revealed that 53% of farmers and fisherfolk obtained their loans from formal sources, whereas the rest borrowed from private lenders usually at usurious rates (Corpuz, 2016).

Results of the survey on farmers conducted in this study showed that, on the average, 27% of the farmer-respondents have marketing tie-ups with buyers of their rice harvest. Paddy traders, cooperatives, and millers do provide a small amount of credit directly to farmers. It could be in the form of cash or material inputs, and farmers are obliged to sell their paddy to these lenders. Some charge interest, while others buy the paddy at less than the procurement price, which ranges from PhP 0.25 to PhP 1.00/ kg. These buyers extend credit to help secure produce of sufficient quantity and quality.

Financing is also essential for the operation and growth of the trading and milling business of the market intermediaries. Small-scale paddy traders and millers preferred to borrow operating capital from friends and relatives because the interest rate is flexible and transaction cost is less. However, for the investment capital needed to acquire or upgrade market facilities, they resorted to using their own cash. The large and established millers and traders borrowed from private commercial banks and government banks (e.g., Land Bank of the Philippines). These banks extend good credit terms to qualified and trustworthy borrowers, offering reasonable interest rates of 3% and 3.5% per annum, respectively. Also, under the Agri-Agra Law, NFA-registered millers and wholesalers can avail of loans for the construction and upgrading of market facilities and infrastructure that will benefit the agri-agra sector.

Only a few of the market intermediaries availed of investment capital compared with those who borrowed for working capital. Among those that loaned for capital investment, many were millers/processors (11%) and paddy traders (15%). Capital was used largely for upgrading and purchase of milling, postharvest, and market facilities. Average interest rate was variable, depending on the loan source. Higher interest rate was availed of by millers for long-term loans averaging 19 months. On the other hand, most of the market intermediaries borrowed operating capital for a duration of 1 year. Average interest rates ranged from around 4% to 10.59% per loan period.

The government recognizes the fact that provision of timely, sufficient, accessible, and affordable credit is a key intervention in boosting the country's agricultural sector. Credit is a critical input for carrying out the key strategies of the Food Staples Sufficiency Program (FSSP), namely: (1) purchase of yield-enhancing inputs such as seeds and fertilizer; (2) acquisition of farm machinery, equipment, and facilities to strengthen farm mechanization; and (3) provision of low-interest loans to reduce production cost and raise the income of farmers.

The Agricultural Credit Policy Council (ACPC) is an attached agency of the Department of Agriculture (DA), which coordinates all credit policies and program in support of the department's policy and program priorities. It plays a unique and critical strategic role in improving access of small farmers and fisherfolk to formal credit. It is the only government agency with the legal authority to synchronize all agricultural credit policies and financing programs of the government to

ensure a well-coordinated and continually responsive strategy and intervention in agricultural finance (Corpuz and Paguia, 2013). Its role was further expanded as administrator of the Agro-Industry Modernization Credit and Financing Program (AMCFP) by Republic Act 8435 or the Agriculture and Fisheries Modernization Act (AFMA).

The AMCFP was created to widen and facilitate access to agricultural credit. It is now the DA's umbrella credit program for agriculture and fisheries, which provides credit and financing for farm, off-farm, and non-farm income-generating projects of small farming and fishery households. The AMCFP has the following features: (1) it is demand-driven and not supply-led; (2) it is not commodity-specific but covers a whole gamut of income-generating projects that farm households may choose to undertake; (3) the government is not involved in any credit decision-making as the program is implemented as a two-step loan program with government financial institutions as wholesalers and qualified private banks as retailers; and (4) it adopts market-determined rates as opposed to the subsidized rates of the past.

Funds are provided as loans to government financial institutions such as the Land Bank of the Philippines (LBP) and the People's Credit and Finance Corporation (PCFC) as the credit wholesalers, which in turn, relend the funds to qualified credit retailers that include rural banks, cooperative banks, and other organizations engaged in lending to small farms and fisherfolk. The following are the existing credit support programs under the AMCFP.

a. Department of Agriculture-Sikat Saka Program

In support of the government's FSSP, the DA, LBP, and ACPC jointly launched the DA-Sikat Saka Program (DA-SSP) in January 2012. It is a direct credit program aimed at providing timely, adequate, and affordable production credit to small paddy farmer-borrowers who do not have access to loans for their paddy production.

The SSP targets eligible small rice farmers in irrigated areas who own at least 0.5 ha but not exceeding 5 ha. A farmer should be a member of an irrigators' association (IA) or small water impounding association, has no outstanding loan for paddy production purposes with LBP and other financing institutions, and has attended a seminar on financial education or any similar training conducted by the Agricultural Training Institute (ATI). The amount of loan is based on the credit needs of the farmer per farm plan and budget but not to exceed PhP 41,000.00 per hectare for inbred rice production and PhP 50,000.00 per hectare for hybrid rice. Farmers are charged with a lower annual interest rate of 15% for the first two cycles and reduced by 1% for every succeeding cycle up to the 8th based on the good payment performance of the farmer-borrower. The program also introduced the use of automated teller machines in the release of loans and repayment of farmer-borrowers with the hope of bringing about an empowering impact to farmers in the countryside.

To complement credit delivery, technical support is being extended to farmer-beneficiaries in the form of extension and training from the ATI. The NFA is in charge of the processing and market linkage of farmers. The National Irrigation Administration (NIA) provides organizational support to potential IAs and it identifies, mobilizes, and guides IAs to become credit consolidators. The Philippine Crop Insurance Corporation (PCIC) provides insurance coverage for loans under the program.

The program was initially pilot-tested for 1 year or two cropping cycles in the four-major rice-producing provinces of Isabela, Nueva Ecija, Iloilo, and North Cotabato. The program has since been extended to include the top 45 rice-producing provinces nationwide. As of December 31, 2015, Sikat Saka has released nearly PhP 2.62 B (USD 56.7 M) in loans to 13,794 rice farmers (Corpuz, 2016). This is translated into only 0.57% of the 2.4 M rice farmers all over the country.

b. Agricultural Microfinance Program

The Agri-Microfinance Program (AMP) for small farmers and fisherfolk and their households is a joint program of ACPC and the PCFC, which lends to small farming and fishing households through its network of microfinance institutions (MFIs) such as cooperative/rural banks, cooperatives, NGOs, and other people's organizations. It provides short-term loans for income-generating activities, whether farm, off-farm, or non-farm of small farming and fishing households. Interest rates on loans are market-determined, and repayment schedule is cash-flow-based, which means that payment is based on the borrowers' timing of cash flows. As of December 31, 2015, a total of PhP 1.13 B (USD 24.5 M) has been released by PCFC-accredited MFIs to 96,676 small farming and fishing households (Corpuz, 2016).

c. Agro-Industry Modernization Credit and Financing Program-Cooperative Banks Agricultural Lending Program (AMCFP-CBAP)

The AMCFP-CBAP is a depository mode of credit delivery that complements the wholesaler-retailer scheme of the AMCFP. The program entails the extension of stable, low-cost funding support to eligible cooperative banks that lend to small farmers/fisherfolk. Through the program, cooperative banks expand their agri-fishery loan portfolio while lowering the pass-on rates to farmers and fisherfolk borrowers.

Eligible farmer and fisherfolk borrowers are charged pass-on rates of not more than 15% per annum, for either agricultural production or microfinance loans. The commodities financed by this program include rice, corn, high-value commercial crops, fishery, and other commodities prioritized by the DA. As of December 31, 2015, almost PhP 3.0 B (USD 65 M) in loans has been released by ACPC's cooperative bank partners to 57, 564 farmers and fisherfolk borrowers under the depository mode scheme (Corpuz, 2016).

There are also other credit and microfinance programs implemented by the DA, the Department of Agrarian Reform (DAR), and LBP specifically to agrarian reform beneficiaries (ARBs).

d. Agrarian Production Credit Program

The Agrarian Production Credit Program **(**APCP) is a retail-lending program that makes credit and other necessary interventions more accessible to agrarian reform beneficiary organizations (ARBOs). This is a credit program designed to help prepare ARBOs to become credit conduits of the bank under the regular lending window. It has a nationwide coverage and eligible borrowers are cooperatives, farmers' organizations, and rural banks. It offers short-term loans that would be used to finance farm inputs in growing crops, serve as working capital for agri-enterprise and livelihood projects, and purchase tools, equipment, and machinery.

e. Agricultural Credit Support Project

The Agricultural Credit Support Project (ACSP) is jointly implemented by the DA, DAR, Department of Environment and Natural Resources (DENR), and LBP to provide credit assistance to ARBs through their respective organizations and support their on-farm and off-farm activities be they under individual or communal projects. Eligible borrowers are ARBOs, farmers' organizations, people's organizations, and other conduits such as cooperatives, rural banks, and NGOs, whose projects include crop production (short and long gestating crops) and agri-enterprise and agri-related livelihood projects. It offers short-term loans with a pass-on rate to sub-borrowers of 15% per annum, while term loans with more than 1 year but not to exceed 7 years have an interest rate of 16% per annum. Interest rates for short-term loans are 8.5% per annum and 9.5% for term loans, both inclusive of 2% interest rebate for prompt payment and adherence to prescribed pass-on rates.

While there are several credit services that specifically address the needs of small farmers, very few could be identified that offer specific support to the other rice value chain actors such as small-scale traders or retailers. In general, not only do farm households but other value chain actors as well prefer informal loan providers due to lower transactions costs brought about by less paper work, no collateral, and short time between application and loan disposition.

Crop insurance

The PCIC is the country's sole crop insurance provider. A government-owned and-controlled corporation (GOCC) administratively under the DA, it is mandated to help stabilize the income of farmers and promote the flow of credit in the countryside by providing insurance protection particularly to subsistence farmers and fishers against loss of crops and non-crop agricultural assets on account of natural calamities such as typhoons, floods, earthquakes, and volcanic eruptions,

plant pests and diseases, and/or other perils. The major insurance partner of PCIC is the LBP through its 37 lending centers and 72 branch offices.

The PCIC has two program classifications for crop insurance: regular and special. Under the regular program, the farmer pays his premium share and the government shoulders about 55% through subsidy provision. The special program provides full (100%) premium subsidy, making the crop insurance premium free of charge to the farmer and lending institution (Pagaddu, 2016).

The following are the PCIC special rice insurance programs:

a. Registry System for the Basic Sectors in Agriculture (RSBSA) Agricultural Insurance Program (AIP)

This is a full-premium subsidy insurance program for all subsistence farmers listed in the RSBSA. The national government appropriated the sum of US$21.381 M and US$27.796 M as subsidy fund pursuant to Fiscal Year 2014 GAA, Republic Act 10633 and FY GAA, RA 10651, to be exclusively for the full premium subsidy of RSBSA-listed farmers.

b. DA-LBP Sikat Saka Program

The amount of coverage on a per-hectare basis shall be up to 120% of the amount of loan granted by LBP at PhP 41,000 per hectare for inbred and PhP 51,000 per hectare for hybrid. As of 2015, a total of 12,899 farmers covering 30,803 ha have availed of this insurance program of the government (PCIC, 2015).

c. DAR-Agrarian Reform Beneficiaries Agricultural Insurance Program (DAR ARB AIP)

This is a joint insurance program by the DAR and the PCIC, which aims to provide agriculture and term-life insurance protection to ARBs. This program provided full premium subsidy to agrarian reform beneficiaries or household members of ARBs through DAR's credit programs, namely the Agrarian Production Credit Program (APCP), the Credit Assistance Program for Program Beneficiaries Development (CAP-PBD), the Agrarian Reform Community Connectivity and Economic Support Services (ARCCESS), as well as their microfinance programs.

d. DA Weather Adverse Rice Areas (WARA) Crop Insurance Program

This insurance program aims to encourage farmers in climate change-affected areas to produce rice. It aims to provide crop insurance subsidy to rice farmers in flood-prone areas to mitigate losses that might be incurred by farmers due to the effect of climate change in the various provinces of the country. Eligible farmers are those identified and verified by the DA-regional offices (DA-RFOs), who are located in climate change-prone areas and who grow rice under adverse

climatic conditions. It was launched in 2012 along with the Sikat Saka Program. A total of 21,017 farmers were enrolled in 2015 covering 25, 718.73 ha of rice land.

e. DA Rice High Yield Technology Adoption (HYTA) Crop Insurance Program

This is a crop insurance program for subsistence farmers participating in the DA Rice HYTA Program, which promotes the use of high-quality seeds such as hybrid and certified seeds and other yield-enhancing inputs to increase farm productivity. Covered in 2015 were 6,353 farmers cultivating 7,686.43 ha (PCIC, 2015).

f. NIA-Third Cropping Rice Program

In line with the DA's rice self-sufficiency target at the end of 2013, the DA-NIA Third Cropping Program was launched in 2012. It aimed to encourage farmers to engage in a third cropping and plant from August to September 2012 to veer away from the typhoon-prone months. Farmer-irrigators who will agree to engage in third cropping for the said months will be given a free insurance coverage of P10,000 per hectare by the PCIC. This free insurance subsidy was included as an incentive for farmers to plant for the third cropping. A total of 1,901 and 1,456 farmers were enrolled in 2013 and 2014, respectively. Most of the farmers who availed of this insurance benefit came from Regions II and VI.

g. Others

Other insurance programs offered by the government include the crop insurance program for subsistence farmers and fishers directly hit by typhoon Yolanda. Farmers who availed of this insurance had full premium subsidy coverage of their farm investments, including accident and dismemberment security scheme in areas hit by the typhoon. This was implemented to provide financial relief to farmers and fishers directly and adversely affected by Yolanda. A total of 48,977 rice farmers covering 51,490.30 ha had benefited from the said program (PCIC, 2015).

B. Non-Financial Services

The institutions that support the rice industry through various non-financial services such as research and development programs; extension; irrigation; provision of farm machinery, equipment and postharvest facilities; marketing; and other infrastructure support are presented in Table 65.

Table 65. Institutions providing non-financial services to the rice industry

Institution	Description/Functions/Services
1. Department of Agriculture (DA)	DA, through its National Rice Program, is mainly concerned in rice farming and in uplifting the lives of Filipino farmers. This program integrates government initiatives and interventions for the agricultural sector, namely, food security and self-sufficiency, sustainable resource management, support services from farm to table, and broad-based local partnerships. Various government interventions are being undertaken from the national to the local levels in the form of support to rice production; irrigation development services; other infrastructure and postharvest development services; market development services; extension support, education, and training services; and research and development services.
2. Philippine Rice Research Institute (PhilRice)	PhilRice is a government corporate entity attached to the DA with a vision of a rice-secure Philippines. Its mission is to improve the competitiveness of Filipino rice farmers 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. The functions of PhilRice are as follows: • To serve as the coordinating center of a national network of rice research stations located in the different agro-ecological regions of the country; • To plan and carry out research and development activities, specifically in the areas of varietal development, planting and fertilizer management, integrated pest management, farm mechanization and postharvest engineering, farming systems, training and technology transfer, and social science and policy research; • To verify, package, and transfer economically viable technologies, giving emphasis on the social engineering aspects necessary for group endeavor; • To provide the database or policy formulation that will stimulate and sustain rice production, marketing, and consumption; • To organize and develop strong training programs for rice scientists, research managers, and extension workers; and • To publish and disseminate research findings and recommendations.

3. International Rice Research Institute (IRRI)	IRRI is an international agricultural research and training organization founded in 1960, with headquarters in Los Baños, Laguna, in the Philippines and offices in 17 countries. It is known for its work in developing rice varieties that contributed to the Green Revolution in the 1960s. IRRI develops new rice varieties and rice crop management techniques that help rice farmers improve the yield and quality of their rice in an environmentally sustainable way. The Institute works with its public and private sector partners in national agricultural research and extension systems in major rice-growing countries to do research, training, and knowledge transfer. Its social and economic research also informs governments to help them formulate policies to ensure equitable supply of rice. IRRI was instrumental in the establishment and creation of PhilRice in 1985. It works closely with the DA and its agencies, particularly PhilRice. IRRI and PhilRice have since collaborated on many research projects to help improve rice production. It is also supported by other DA-attached agencies and bureaus such as BAR, BPI, ATI, and the Bureau of Soils and Water Management (BSWM). It also collaborates with other national agencies, local government, NGOs, universities, and experts in the country. Current research and development initiatives with the Philippines include: • IRRI supports the country's rice program as it provides technical support to accelerate the delivery of high-yielding rice varieties and related technologies, and unify capacity-building support by providing training for national, regional, and local rice trainers. • IRRI is working on a new generation of "problem-solving" rice to help boost rice production in marginal areas and help the Philippines increase its productivity. New varieties are released every year. • IRRI share premium seeds to Arakan Valley farmers in Mindanao to help them become producers of high-quality varieties. • IRRI and PhilRice are working with other local partners in developing Golden Rice, which contains beta-carotene, a source of vitamin A. • IRRI and its partners are developing real-time maps using satellite data to accurately gauge the status of rice production at any given time and aid decision making. • It is also working with local partners to deliver location-specific crop management advice to farmers that help raise their input-use efficiency and income though the use of a tool called Rice Crop Manager. Other ICT tools developed by IRRI include the Rice Doctor, Rice Knowledge Bank, and We • Rise to aid in extension and training efforts. • IRRI develops solutions to problems with rice tungro disease, rat infestation, and poor soil conditions through participatory action research.

4.Bureau of Agricultural Research (BAR)	BAR was created in 1987 through EO 116 to ensure that all agricultural research is coordinated and undertaken for maximum utility to agriculture. It is mandated to tap farmers, farmers' organizations, and research institutions, including SUCs, in the conduct of research for the use of DA and its clientele, particularly the farmers and fisherfolk. It is the DA's central coordinating agency for research and development. BAR is committed to consolidate, strengthen, and develop the agriculture and fisheries R&D system for the purpose of improving its effectiveness and efficiency by ensuring customer satisfaction and continuous improvement through work excellence, teamwork and networking, accountability, and innovation. It provides funds for research and identifies technologies generated from the research network.
5. Department of Agrarian Reform (DAR)	DAR is in charge of the direction and coordination of the national agrarian reform program. The DAR also formulates and enacts policies, plans, and programs for the distribution and cultivation of all agricultural land. It plays a role in the national rice program by engaging in these tasks: • Coordinates the implementation of programs in the agrarian reform communities (ARCs) through the provincial/municipal agrarian reform officers (PARO/MARO); • Assists in establishing links between farmers' organizations and agribusiness enterprises that will provide market opportunities to farmers and facilitate access to production inputs, new technologies, and credit facilities; • Assists LGUs in selecting ARC sites; • Assists agricultural technicians (ATs) in the implementation of municipality/city rice program plans and in the conduct of trainings for ARC farmer-members; and • Assists ATs in organizing farmer groups in non-ARC communities.

6. Bureau of Plant Industry (BPI)	BPI is a government agency that implements programs of the DA to help the Filipino farmers conserve and manage plant genetic resources; improve crop farming systems through R&D; produce quality seeds and planting materials; conduct plant pest surveillance and forecasting; assist farmers on pest management system and control strategies; enforce plant quarantine laws, rules, and regulations; implement farm mechanization; provide analytical services to characterize physico-chemical, microbiological, and other features of pesticide residues; and provide services related to seed testing, seed certification, and planting material certification. BPI, as one of the staff bureaus of the DA, is mandated to serve and support the Philippine plant industry sector. It is therefore committed to meeting and satisfying the needs of its stakeholders in the areas of crop research, protection and production, analytical services, seed quality assurance, plant quarantine, agricultural engineering services, and food safety, as well as complying with and implementing existing regulations and giving support to or advocating the formulation of new regulations.
7. National Irrigation Administration (NIA)	NIA maintains and rehabilitates existing irrigation systems. It conducts training courses and institution-building activities for the IAs. NIA provides technical assistance to LGUs on the maintenance, management, and repair of irrigation systems. It also coordinates schedules of irrigation water releases and cut-offs with LGUs and mobilizes its technicians to provide technical assistance to farmers.
8. Bureau of Soils and Water Management (BSWM)	BSWM is an agency of the Philippine government under the DA, which is responsible for advising and rendering assistance on matters relative to the utilization of soil and water as vital agricultural resources. Its functions include: • providing technical assistance on crafting balanced fertilization strategies, small water-impounding projects, shallow tube wells, and small farm reservoirs; • characterizing and mapping aquifers; • conducting research and development on small-scale irrigation systems and soil management and fertilization; and • providing soil analysis services to farmers.

9.Agricultural Training Institute (ATI)	ATI is an agency of the Philippine government under the DA, that is responsible for training agricultural extension workers and their clientele; conducting multi-level training programs to promote and accelerate rural development; and ensuring that research results are communicated to farmers through appropriate training and extension activities. This government agency was established in 1987 when the DA was reorganized under EO 116, where the Bureau of Agricultural Extension (BAEx), the Philippine Agricultural Training Council (PATC), and the Philippine Training Center for Rural Development (PTC-RD) merged. Its role as the DA's extension and training arm was strengthened with Republic Act 8435 or the Agriculture and Fisheries Modernization Act (AFMA) of 1997. The institute is mandated to • lead in the formulation of the national agriculture and fisheries extension (AFE) agenda and budget; • prepare an integrated plan for publicly funded training programs in agriculture and fisheries; • formulate and issue guidelines in planning, implementing, monitoring, and evaluating AFE programs; and • assist, in coordination with state universities and colleges, the local government unit extension system by improving their effectiveness and efficiency through capability building and complementary extension activities such as technical assistance, training of LGU personnel, improvement of physical facilities, extension cum research, and information support services. • Under the Department Order No. 3, series of 2007, the Institute was mandated to lead in the provision of e- Extension services in collaboration with various agencies, bureaus, and organizational units of DA. This is to integrate and harmonize ICT-based extension delivery system for agriculture and fisheries.
10. Philippine Center for Postharvest Development and Mechanization (PHilMech)	• Provides technical assistance on equipment testing and accreditation; • Conducts research and development on Philippine technologies and farm mechanization; and • Establish postharvest facilities.
11. Philippine Statistical Authority (PSA)	PSA is a new government agency created by RA 10625 that merges the statistical units of the national government agencies, including the Bureau of Agricultural Statistics (BAS). This bureau, previously under DA, managed databases on rice statistics used as official reference of many data users.

12. National Food Authority (NFA)	NFA was established under Presidential Decree No. 4 of 1972, then called the National Grains Authority. It was established to encourage grain production and productivity and assure a "fair return" on investment of producers. Its mandate is to maintain food security in staple cereals in times and places of natural or man-made calamity/emergency, as well as stabilize staple supply and prices. To do so, it was given a broad set of powers, including: • maintaining a national buffer stock; • procuring and selling grain; • monitoring grain storage; • seizing stocks in case of hoarding; • establishing and enforcing standards in grading, sampling, and inspection; • registering, licensing, and supervising warehouses, mills, and other businesses related to grains; • control the importation of grains so as to maintain parity between domestic and world prices; and • control the export of grains. The NFA also regulates a number of rice-related processing and servicing activities: • mechanical drying, threshing, and other post-production equipment • transportation • milling • warehousing • manufacture of rice-based and corn-based products • grain packaging • retailing/wholesaling • importing/exporting/indenting
13. Department of Public Works and Highways (DPWH)	DPWH, in coordination and collaboration with DA and LGUs, is in charge of planning, prioritizing, and constructing roads and road networks with significant impact on the transport of agricultural and fishery commodities. DA and DPWH coordinate in the implementation of farm-to-market road (FMR) projects. The budget appropriation for FMRs is released to and administered by the DPWH, while the DA identifies the location and site where such projects may be constructed through its regional field units (RFUs) in coordination with LGUs. DPWH is designated to provide all assistance to expedite its implementation.
14. DA-regional field offices (DA-RFOs)	They are responsible for overall planning, coordination, and monitoring of rice program implementation in the regions. They provide the policy framework, help direct public investment and extend support services to farmers in collaboration with other government and private service providers. Together with the LGUs, the field offices provide organizational development support to rice farmers.

15. DA-local government units (DA-LGUs)	They are responsible for providing extension services and production support to rice farmers.
16. State universities and colleges (SUCs)	SUCs are tapped by rice programs and other research and extension institutions to conduct location-specific research and development and extension activities within provinces or regions, to serve as venue for training of LGU technicians, and to mobilize farm land for seed production use.

C. Issues on Support Services

Several government agencies, NGOs, and SCUs are actively supporting the rice industry. The following are the issues on support services on credit and finance, insurance, research and development, irrigation, mechanization, postharvest facilities, farm-to-market roads, and extension and training services.

Credit

Credit support from the government is generally increasing. Through the mandatory Agri-Agra law, which requires banks to lend 25% of their portfolio for agricultural and agrarian projects, rural banks are able to extend their services in the countryside to help finance farmers and fisherfolk. However, in spite of government efforts to increase the flow of credit to the rural sector, small rice farmers continue to find it difficult to gain access to formal credit and financing. Small farmers are often unable to meet the basic documentary and collateral requirements needed to access formal financing and so they continue to depend on informal credit sources. Furthermore, formal credit providers require farmer-borrowers to be a member of an organization like the DA Sikat Saka credit program, which requires a farmer-borrower to be a member of an IA before he can avail of such loan. Many small farmers are not yet members of an organization, which limit their entitlement for a loan.

The RSBSA serves as a common reference of government agencies in identifying beneficiaries of their programs. The registry, however, still needs to be validated to come up with a comprehensive master list. Farmers who are not included in the registry therefore are left out from receiving benefits afforded to those listed in the RSBSA.

Crop insurance

In terms of crop insurance, a remarkable increase in the number of rice farmers who enrolled in the different rice crop insurance programs offered by PCIC in 2015 was observed. A total of 460,046 rice farmers were covered by crop insurance in 2014 (this was 16.05% higher). The area covered 600,491.49

ha (13.18% higher) (PCIC, 2015). Generally, the remarkable increase in insurance production can be traced to the effectiveness of marketing tact taken by the PCIC as well as the continued allocation of social insurance funds for farmers in a number of government programs. According to PCIC, there was an increase in number of members of farmers' associations, cooperatives, and other lending institutions that participated in the LBP's rice production loan program, which provided automatic crop insurance cover for the borrowers. Another reason was the provision of full insurance premium subsidy for rice and corn farmers from 75 provinces listed in the RSBSA. In spite of these developments, only 19.17% of the 2.4 M rice farmers have availed of crop insurance. Adoption of crop insurance is still wanting. Among the leading constraints to adoption was the lack of awareness and no perceived benefits to farmers; hence the tie-up of an information drive with rice production-related training is recommended (Bordey and Arida, 2015).

Research and development (R&D) services

Research and development (R&D) activities are continuously supported and undertaken by the government and other local and international research institutions and networks. Among the results of these research activities were new rice varieties, which include inbred varieties that can yield up to 11.7 t/ha and hybrid varieties that can yield up to 12 t/ha. Rice varieties that can tolerate adverse conditions such as prolonged submergence, saline-intruded water, cool elevated, and drought were also developed. In addition to these were rice lines that are well-adapted to rainfed conditions called green super rice. Location-specific technologies were also established to match the developed technologies with the local condition to maximize adaptability and productivity. There were also farming system models developed to address household income through diversification, intensification, and integration. A favorable policy environment is also one of the many products and interventions derived from rice R&D.

According to Hossain and Pingali (1998), R&D institutions have significantly contributed to the technological advancement in rice production. However, despite these contributions and benefits, public spending on R&D has historically been less than the optimal. R&D investment was observed to have a low intensity ratio, which implies insufficient budget allocation. The R&D expenditure as percentage of gross domestic product (GDP) in 2002 was 0.15%, which was equivalent to PhP 5.8 B, and even lower in 2009 at 0.11%, which was equivalent to PhP8.8 B (Regalado, 2014). It was also stated in this paper that R&D expenses in nominal terms increased from 2002 to 2009, but since GDP also increased, it resulted in reduced share of R&D expenses to GDP from 2002 to 2009. And when compared with Asian neighboring countries, the Philippines lagged behind at 0.12% in 2009 to that of Malaysia at 0.64% and Thailand at 0.2% (Regalado, 2014).

Irrigation

Irrigation is a critical component in the Philippines' agricultural development, considering that it is heavily dependent on rice production. Irrigation

effectively doubles rice-cropping intensity. A total of 1.73 M ha of the total irrigable area has irrigation facilities equivalent to 57.33% irrigation development level. The number could be less because some of the existing irrigation systems have been damaged by calamities that hit the country and there are also some that have to be rehabilitated. Out of these presently irrigated areas, about 43.55% is being served by the national irrigation systems (NIS), 35.57% by communal irrigation systems (CIS), 10.85% by private irrigation systems (PIS), and 9.99% by other government-assisted irrigation projects (NIA, 2017). Regions with high remaining areas to be developed (more than 40%) are Central Luzon, CALABARZON, MIMAROPA, and Bicol in Luzon; Western Visayas in the Visayas; and Northern Mindanao, Davao Region, SOCCSKSARGEN, CARAGA, and ARMM in Mindanao.

The government's top programs include expanding irrigation area and improving irrigation performance, with special attention given to averting natural devastation. Climate change and water competition, aggravated by watershed degradation and El Niño episodes, are putting a strain on the dependability of water supply for irrigation. NIA's approved budget for 2017 reached PhP 36.36 B. On top of the approved budget, an amount of PhP 2.3 B was also approved to implement "free irrigation" starting 2017. This is intended to subsidize the personnel services of the agency, the MOOE of NIA and the IAs, and the O &M of existing irrigation facilities. This additional budget will help farmers by freeing them from paying the irrigation service fee, which is currently being collected by the agency as mandated by law (NIA, 2017).

Production support services

Production support included production of breeder seed of inbred varieties and of nucleus/breeder seeds of hybrid rice for seed growers. The government also ensured that high-quality seeds and varieties are available to farmers. Community seed banks were established and rehabilitation, establishment, and distribution of simple seed processing equipment were done. Cost-reducing and yield-enhancing technologies were promoted by the government. PhilRice developed the *PalayCheck* system for irrigated rice, which is a package of technology (POT) being promoted by the DA and the LGU agriculture offices. This is the module for rice production being used by the ATI in its training programs for farmer leaders and extension personnel. This rice POT has eight key checks that will allow farmers attain high yields at optimal cost.

POTs for rainfed, upland, saline-prone, and submergence-prone environments have not yet been fully developed, although released varieties appropriate for each are available. Instead, crop management recommendations are adjusted according to the presence or absence of the stress factor during critical growth periods of the crop.

Nutrient management is a vital factor in rice production. Improper management can result in low yield. Hence, various nutrient management techniques have been developed and promoted for more precise application, including the

nutrient omission plot, the minus-one element (MOET), and the leaf color chart. ICT-based nutrient management applications such as Rice Crop Management (RCM) and MOET App have likewise been developed.

Farmers had not been applying the optimal amount of fertilizers required by the rice crop. The general NPK recommendation with basal and two top-dress applications for lowland irrigated areas where P and K are not deficient is 73-28-38 for wet season and 107-40-60 for dry season (PhilRice, 2017*)*. RBFHS data, however, show that application rates of NPK in irrigated areas were 78-7-10 for the 2nd semester harvest in 2011 and 81-8-11 for the 1st semester harvest in 2012 (PhilRice, 2017). In a comparative study among major rice-producing countries in Southeast Asia, Nueva Ecija farmers applied 114-18-25 in the 2013 dry season and 107-15-23 in the 2014 wet season (Manalili et al., 2016).

Nitrogen in irrigated areas was underapplied nationwide during the dry season when potential yield levels are high, but overapplied during the wet season, the lower yielding season, owing to more inefficient uptake of applied fertilizers. The actual amounts of P and K applied were consistently lower than *PalayCheck*'s recommended rates for deficient areas.

Fertilizers are more expensive in the Philippines than in other major rice-producing countries in Southeast Asia because the government does not offer any price subsidy (Manalili et al., 2016). The functions of the Fertilizer and Pesticide Authority (FPA) extend to handling licensing, import control, enforcing product quality and adherence to safety monitoring, product registration, etc. It does not regulate selling prices. Thus, prices are completely dependent on market forces. In 2011-2014, rice shared 38% of total consumption in the country, of which 72% was imported (How, 2015).

Farm mechanization and postharvest facilities

In spite of the government's efforts to implement its mechanization program, the level of mechanization in the country is still low and lags behind its neighbors in Asia. It is attributed to the high acquisition cost of machines (an individual farmer usually cannot afford to buy them) and the small and fragmented landholdings of farmers.

The government has implemented programs and projects to address production problems and postharvest losses in rice production. These programs cover various stages of the rice supply chain such as on-farm postharvest activities, processing, logistics, marketing, and trading. The government allotted a PhP 6 B budget for its farm mechanization program from 2011 to 2016 to further increase productivity and incomes of small farmers. The amount was used to purchase various production and postharvest machinery and equipment, which the DA provides to qualified farmers' groups and cooperatives, IAs, and LGUs under counterpart schemes. The government subsidized up to 85% of the cost of farm production-related machinery and equipment. Table 66 shows the annual summary

of production and postharvest machinery and facilities procured and distributed by DA. A total of 18,027 units of production machinery were procured and distributed by DA from 2011 to 2016. Production machinery included four-wheel tractors with leveler/attachments, hand tractor implements, mini four-wheel tractors with accessories/attachments, power tillers with trailer and accessories, drum seeders, ride-on-type transplanters, walk-behind transplanters equipment used in the construction of diversion dams and small water-impounding projects, irrigation pumps (diesel and electric), and those used in the rehabilitation of diversion dams. Distribution was highest in 2013 at 10,127 units of production machinery.

Postharvest machinery included combine harvester haulers, mini combine harvesters, multi-crop combine harvesters, reapers, and threshers. A total of 3,760 units were awarded to target beneficiaries from 2011 to 2016. As to postharvest facilities, 12,172 units were distributed and awarded to cooperatives and farmers' associations in the same period. These included flatbed dryers, multi-purpose drying pavement (MPDP), recirculating dryers, paddy sheds, warehouses, rice mills, and rice processing centers (RPCs).

Table 66. Annual summary of production and postharvest facilities distributed to farmer-beneficiaries, Philippines, 2011-2016

Type of machine	2011	2012	2013	2014	2015	2016	Total
				(no. of units)			
Production machinery	1,986	2,135	10,127	1,760	1263	756	18,027
Postharvest machinery	126	1,006	1,516	378	431	303	3,760
Postharvest facilities	425	3,823	6,329	1,098	272	225	12,172
Total	**2,537**	**6,964**	**7,972**	**3,236**	**1,966**	**1,284**	**3,959**

Source: DA-CAFED, 2017

A grant worth PhP 649 M was given by the Korean International Cooperation Agency (KOICA) for the establishment of four RPCs in Pangasinan, Iloilo, Bohol, and Davao del Sur. However, such centers were found to be underutilized mainly because of lack of capital to procure paddy. The monetary contribution as working capital from DA and RPC beneficiaries (farmers' organizations) as required by the agreement with KOICA was inadequate relative to the design capacities of the RPC. Moreover, Bohol and Pangasinan RPCs have been operating at a loss. In addition to lack of capital, other problems were evident in the operational aspects such as the non-preparedness of the recipient farmers' organizations. Also, some of the RPCs were not profitable due to management issues, lack of proper oversight, and local politics. There were delays in the operational turnover to recipient farmers' organization arising from the LGU's desire to have a greater role in RPC operations, which is in conflict with the original project concept. Despite these limitations, the presence of RPCs in those areas somewhat reduced quality problems and physical postharvest losses. Paddy procured by the RPCs can be dried immediately since each facility is equipped with five batch-recirculating dryers with a total drying capacity of 6 t/day.

The RPCs also helped increased farmers' income as they benefited from the buying price margins of PhP 0.79-1.11/kg for wet paddy compared with that offered by private traders and millers, especially during wet season. The RPCs also provided a safety net for farmers during periods of oversupply (wet-season harvest), when private traders do not accept wet paddy or offer very low buying prices.

The government, through PHilMech's lead, had funded and established 170 RPCs from 2011 to 2016 in the major rice-producing provinces of the country.

Drying facilities for padd*y* are still insufficient. Although multi-purpose drying pavements have been extensively built around the country, they could only be used under sunny conditions. The DA, through the Mechanical Drying Support to Farm Clusters project of PHilMech, provided 2,189 units of flatbed dryers (FBDs) to farm clusters nationwide (Caliguiran, 2010). The deed of conditional donation stipulated that the recipients maintain the operational condition of the FBDs. In the ocular inspection conducted in 2011 of 19% of the FBDs donated, the Commission on Audit found that 87% of the FBDs was being utilized (COA, 2017). Some of these FBDs largely cater to seed production. Nevertheless, many were underutilized as some groups operated their facility only during the wet months and they reverted to the cheaper solar drying during the dry season. A number of the units were abandoned and in dilapidated condition, while others were poorly maintained. Some underutilized units were eventually relocated to sites with more potential farmer users. Recirculating dryers have become very popular, but they are expensive and mostly owned by rice millers. Only a few farmer groups own unit/s of the facility. Improper drying results not only in physical losses but also inferior grain quality and poor milling recovery. The availability of mechanical dryers is essential during the wet season. A significant volume of paddy had become unmarketable because of poor drying.

Farm-to-market roads

In the AFMA Act, DA is mandated to undertake infrastructure projects, including FMRs. In coordination with LGUs and the local farmers and fisherfolk, DA identifies priority locations of FMRs based on the number of beneficiaries and their families and the importance of agriculture and fisheries in the area. LGUs are required to share not less than 10% of the project cost, depending on how much their internal revenue allotment is.

Implemented in 2010, the Farm-to-Market Road Development Program (FMRDP) aims to (1) construct, restore, and rehabilitate rural roads; (2) reduce transportation cost of farm inputs and outputs as well as minimize postharvest losses; (3) improve access of farmers, fisherfolk, and residents in the area to basic services such as health and education; and (4) connect farms/coastal areas to main roads to promote agro-tourism. It was a joint undertaking of DA through its regional field offices, DPWH, and LGUs.

From 2010 to 2016, the FMRDP was given PhP 45,969 M for 11,960 FMR projects (Figure 39). Only 8,347 projects, however, were funded. Of these, 7,551 were implemented and 7,004 were completed (Table 67).

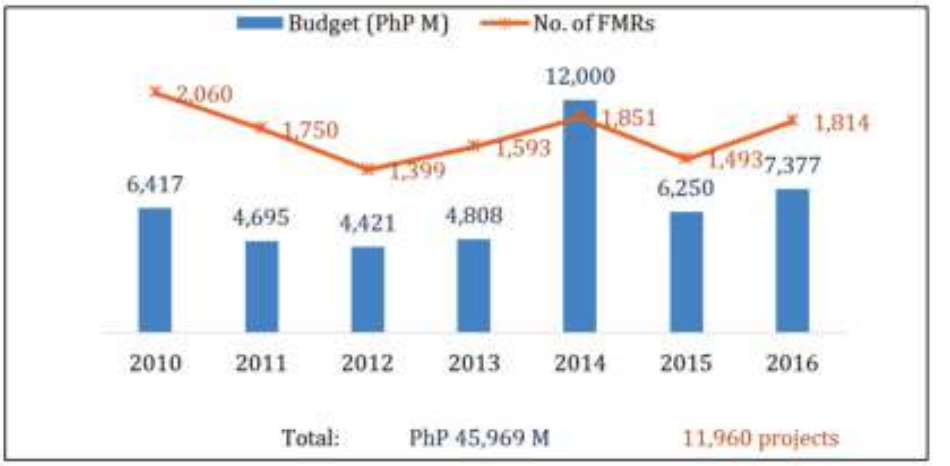


Figure 39. Appropriation for the farm-to-market road development program, 2010-2016 (Source: COA, 2017)

Overall, the country's road network is, at the least, comparable with many neighboring developing member countries in terms of ratio of road length to land area, road population, and per capita GDP in US$. Considering the quality of the road system in terms of the percentage of paved roads and roads in good or fair condition, however, the Philippines lags well behind most of them (ADB, 2012).

Extension support, education, and training services

To disseminate technologies developed from research, agricultural extension support services are provided to rice farmers for easy access to information and for technology promotion purposes. Other than the ATI, some R&D institutions are mandated to do extension work such as PhilRice and PHilMech. Innovations in extension delivery via text- and web- based messaging formats were also adopted to hasten the delivery of information. Other modes of extension service were continuously conducted such as farmers' field schools, on-farm demonstrations, school-on-the-air, and other specialized training courses. The on-farm demonstrations proved that higher farm productivity can be attained when good seeds of modern inbred varieties are used and the best crop management practices are applied. This was shown by yields reaching 6-7 t/ha among farmers who have witnessed such demonstrations.

The devolution of extension functions and services to the LGUs as spelled out in the Local Government Code addresses the issues on technologies being viewed from the top-down. It was observed that the devolved extension system encouraged the broad-based participation of farmers and rural stakeholders. Greater empowerment of farmers was also achieved since they were provided

Table 67. Status of FMR projects, Philippines as of April 2017

Year	Number of FMR projects			
	Completed	Ongoing	Not implemented	Total
2010	858	4	220	1,082
2011	454	2	155	611
2012	657	7	85	749
2013	645	37	65	747
2014	1,783	20	48	1,851
2015	1,363	36	94	1,493
2016	1,244	441	129	1,814
Total	**7,004**	**547**	**796**	**8,347**
% share	83.9	6.6	9.5	

Source: COA, 2017

greater access or have become closer to service providers. However, crucial issues such as lack of funding support persist. Fund allocation for agriculture, in the general context, and for extension, in specific terms, compete with other major programs such as infrastructure, health, tourism, environment, and others. In most cases, infrastructure projects received the majority of the LGU budget, sharing an estimate of about 40% of the total funds (Ocenar et al., 2004). Mobility of extension workers is slow and limited. They are usually office-bound due to shortage of operational funds for travel. They encounter difficulties in providing extension services and support, especially to far-flung areas. Budgetary constraints also limit the production of information, education, and communication materials. LGU programs should be supported through a transfer of financial resources, thereby limiting funding dependency on the national government. Also, political interventions largely determine the type and quality of extension services to be provided. To some extent, political influence affects the hiring of staff, thereby affecting the focus of initiatives and the effectiveness of extension service delivery.

Photo: ABS-CBN

CHAPTER 7

BUSINESS-ENABLING ENVIRONMENT

A business-enabling environment is a set of interrelated conditions, which include laws, regulations, policies, public infrastructure, norms, customs, and international trade agreements that either facilitate or hinder the movement of a product or service along its value chain (USAID, 2016). The rice industry in the Philippines is supported by enabling policies, rules, and regulations. Being the primary staple in the food security of the Philippines, rice is regarded as a political and economic commodity.

The business-enabling environment of the rice value chain is more challenging than that of the industrial sector. Rice, like any other agricultural commodity, is perishable and variable in quality, and its supply is not regularly available throughout the year. These characteristics represent significant and uncontrollable sources of risk for investments by actors in the value chain.

The following are the enabling environments surrounding the rice value chain in the Philippines:

Credit Policy

Agri-Agra Reform Credit Act. The Agri-Agra Reform Credit Act of 2009 (RA 10000) was enacted to enhance access of the rural agricultural sector to financial services and programs that increase market efficiency and promote modernization in the rural agricultural sector. The law provides a credit, insurance, and financing system for the agriculture and fisheries sectors, particularly individual farmers and fisherfolk, including their workers and organizations, agrarian reform beneficiaries (ARBs), settlers, and agricultural lessees, through government and private banking institutions. This Act superseded PD 717 issued 34 years prior.

The law mandates all banking institutions, government or private, to set aside at least 25% of their total loanable fund for agriculture and fisheries credit, of which 10% of the loanable fund is appropriated exclusively for ARBs. Credit can be availed of for the following purposes: (1) agricultural production; (2) promotion of agribusiness and exports; (3) acquisition of work animals, farm and fishery equipment and machinery, farm inputs and animal stocks; (4) acquisition of land; and (5) construction, acquisition, and repair of facilities for production, processing, storage, and marketing.

The implementing rules and regulations of RA 10000 stipulate that any excess compliance in the agrarian reform credit allocation can be used to offset any deficiency in the agriculture allocation. Direct compliance covers actual loans

extended to qualified borrowers to finance their agriculture and agrarian reform activities. Alternative compliance to the mandatory credit allocation extends over various endeavors that help advance the agriculture sector, which include (1) investments in bonds issued by government-owned banks and/or in other debt securities, declared eligible by DA and DAR; (2) paid subscription of share of stocks to accredited rural financial institutions, Quedan and Rural Credit Guarantee Corporation (Quendancor) or the PCIC; (3) investments in special deposit accounts of rural financial institutions; (4) wholesale lending to accredited rural financial institutions for on-lending to the agriculture and agrarian reform sector; (5) rediscounting facility by universal and commercial banks (UKBs) to other banks covering eligible agricultural and agrarian reform credits; (6) extension of loans for the construction and upgrading of infrastructure; (7) extension of loans to relevant borrowers (including NFA-registered warehousemen, millers, wholesalers) to finance their activities within the scope of the Agro-Industry Modernization Credit and Financing Program mentioned in the AFMA law; and (8) extension of loans to NFA for its own purposes other than relending.

On the first year of implementation of the Agri-Agra Law in 2012, the banks nearly reached total compliance (94.6%) amounting to PhP 267 B. This dropped to 66.7% in 2014 equivalent to PhP 253 B. The compliance of thrift banks (TBs) and rural and cooperative banks (RCBs) was concentrated on direct lending, while UKB compliance leaned more toward alternative modes (Bangko Sentral ng Pilipinas, 2015).

As to compliance by component, the banks exceeded their compliance rates with the Agri component (143.6%) but fell short (21.1%) with the Agra component in 2012 (Table 68). In 2014, compliance rates dropped in both components at 101.2% and 14.9%, respectively. In both periods, UKBs concentrated more on alternative compliance with the Agri component, which shifted to direct compliance with the Agra component.

The very low compliance with direct lending to ARBs was due to the limited number of qualified borrowers (ACPC, 2015). Banks prefer alternative modes of compliance because they are less risky than direct lending and most UKBs do not have the expertise to handle Agri-Agra financing. Financial institutions consider agricultural lending very risky owing to the significant effect of unpredictable weather conditions on the sector's productivity. Likewise, profitability is constrained by deficient rural infrastructure such as farm-to-market roads, irrigation systems, and postharvest and storage facilities (Teves, 2014).

Irrigation development policy

The development of irrigation systems was prioritized to help boost productivity in rice. As of 2010, 49.3% of the 3.13 million ha total irrigable area in the country was irrigated. This increased by 10% in 2016 (Figure 40). The largest source of expansion, however, came from establishment of other irrigation structures and facilities such as small water-impounding systems, small farm

Table 68. Bank compliance with the Agri-Agra Law, by type and distribution, 2012 and 2014

Item	2012				2014			
	UKBs	TBs	RCBs	All	UKBs	TBs	RCBs	All
	in PhP B							
Total loanable fund	1,046.8	51.3	31.7	**1,129.8**	1,933.4	167.5	50.9	**2,151.7**
Minimum allocation requirement								
15% Agri	157.0	7.7	4.8	169.5	290.0	25.1	7.6	322.8
10% Agra	104.7	5.1	3.2	113.0	193.3	16.7	5.1	215.2
Total	261.7	12.8	7.9	282.5	483.3	41.9	12.7	537.9
Compliance with 15% Agri								
Direct	75.4	14.4	16.8	106.6	122.66	9.95	16.95	149.6
Alternative	132.8	3.2	0.7	136.7	172.3	4.47	0.22	177.0
Total	208.2	17.6	17.5	243.3	295.0	14.4	17.2	326.6
% compliance with allocation	*132.6*	*229.1*	*368.0*	*143.6*	*101.7*	*57.4*	*225.1*	*101.2*
Compliance with 10% Agra								
Direct	11.4	2.0	8.5	21.9	14.6	2.87	9.37	26.8
Alternative	0.8	0.4	0.8	1.9	5.0	0.01	0.25	5.3
Total	12.2	2.4	9.3	23.8	19.6	2.9	9.6	32.1
% compliance with allocation	*11.6*	*46.2*	*292.7*	*21.1*	*10.1*	*17.2*	*189.1*	*14.9*
Compliance with 25% quota								
Direct	86.8	16.3	25.3	128.5	137.2	12.8	26.3	176.4
Alternative	133.5	3.7	1.5	138.6	177.3	4.5	0.5	182.3
Total	220.4	20.0	26.8	267.1	314.6	17.3	26.8	358.7
% compliance with allocation	*84.2*	*156.0*	*337.9*	*94.6*	*65.1*	*41.3*	*210.7*	*66.7*

UKBs - universal and commercial banks TBs - thrift banks RCBs - rural and cooperative banks
Source: Bangko Sentral ng Pilipinas, 2015

reservoirs, diversion dams, and shallow tube wells. Development of these irrigation facilities was initiated by the Bureau of Soil and Water Management (BSWM), in collaboration with the LGUs and DA-RFOs. The Department of Agrarian Reform likewise developed irrigation facilities for some agrarian reform communities (COA, 2017).

Users of water from NIS had been paying irrigation service fees (ISF) to NIA since 1974 as mandated by PD 552. The ISF was based on the operating and maintenance (O&M) costs of the irrigation facilities. Similarly, ISF was charged by IAs on the use of CIS.

The clamor for free irrigation services had been considered by the government under previous leaderships over the years. The decision to fully subsidize irrigation services, however, was firmed up only recently with the passing

of separate bills by the Congress and the Senate in May 2017. The bicameral conference committee met in October to reconcile disagreeing provisions of House Bill 5670 and Senate Bill 1465. The committee ruled that the Free Irrigation Act only covers farmers with not more than 8 ha of farmholding. Likewise, any unpaid irrigation fees that these farmers owed NIA shall be condoned, including the corresponding penalties (Senate of the Philippines, 2017). And the government has to appropriate an annual budget for O&M costs in lieu of the ISF paid before by NIS and CIS users. Congress has yet to convene though to ratify the Act for the approval of the President.

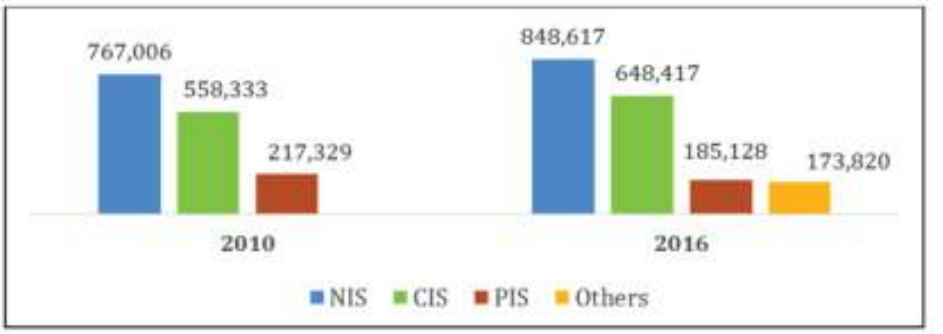


Figure 40. Irrigated areas (ha), by type of irrigation system, 2010 and 2016

Since NIA has been allocated additional O&M budget for 2017, free irrigation services took effect at the start of the year even before the bills were passed. The PhP 2.3 B allocation, however, cannot cover the entire O&M costs of CIS after setting aside the requirements of NIS. Hence, NIA set guidelines for NIS and CIS in the implementation of the irrigation subsidy. Irrigation services of farmers using NIS are fully subsidized, while minimal financial assistance is provided to the roughly 8,100 CIS throughout the country. Hence, farmers using CIS still have to pay minimal fees to their respective IAs to cover the remainder of the O&M requirements of their irrigation facilities (Panay News, 2017).

Seed Policy

Seed Act. RA 7308 or the Seed Industry Development Act of 1992 was enacted to promote and accelerate the development of the seed industry. Section 13 (e) specifically mentions that PhilRice is responsible in developing appropriate rice varieties designed under Philippine conditions and propagating them into breeder, foundation, and registered seeds and in extending all necessary technical assistance to ensure proper utilization of such seeds on the farm level. Since PhilRice is incapable of producing all the registered seed requirements of seed growers, the Rice Seed Network (SeedNet) was established in collaboration with SUCs. This arrangement weakened over the years and the SeedNet was no longer as closely monitored as before. PhilRice and SUCs likewise had to dispose of their seeds that were downgraded to certified seeds to recoup their production costs. On the other hand, farmer groups were recruited to produce registered seeds.

Adoption rates for tagged seeds from all ecosystems were 45% in the 2nd semester and 43% in the 1st semester harvests. Five years prior, adoption rates were lower by 16% and 13% (PhilRice, 2017). The increase in adoption was a result of extensive advocacy by the government. DA-RFOs and LGUs facilitated in making good-quality seeds accessible to farmers. Seed producers were provided intensive training programs specific for their accreditation. A series of administrative orders were released by the DA to amend the accreditation policy for rice seed growers (Table 69). Hybrid rice seed production guidelines were included in these administrative orders since hybrid rice production in the country expanded.

By 2011, roughly 6,000 seed growers of public rice varieties were registered nationwide (PhilRice, 2017). Currently, more seed companies are engaged in the local hybrid seed market, providing farmers more choices of high-performing varieties.

There may be a need, however, to amend RA 7308, or the Seed Industry Development Act of 1992. Some of its provisions are no longer realistic to the current setting of the local rice seed industry. Although numerous administrative orders had been issued by the DA to amend some provisions of the Act, other restrictions may impede the goal of the government to improve rice productivity through adoption of high-quality rice seeds. For one, the National Seed Quality Control Services (NSQCS) is the only entity authorized to certify seeds of locally-produced inbred and hybrid rice varieties and imported hybrid varieties. With merely 22 seed laboratory stations nationwide, NSQCS may not be able to accommodate the testing demand of seed producers and importers when adoption of quality seeds increases.

Seed pricing policy. The DA is the official body authorized to set the price of public rice seeds. Since 2005, the prices of registered, certified, and F_1 hybrid seeds were increased twice (Table 70). The adjustment of prices was prompted by the rise of paddy price, which was brought about by market forces. During these price shocks, seed growers were pressed to sell their certified seed stocks as commercial paddy since the market price of the latter exceeded the set price of the former. Any delay in releasing adjusted selling price of registered and certified seeds means losing a portion of the seed supply for use of farmers.

Fertilizer policy/ordinance

Dobermann and Fairhurst (2002) claimed that each rice straw residue provides 5-8 kg of N, 1.6-2.7 kg of P, and 14-20 kg of K. The amount of P applied, however, may not be sufficient for the rice crop, even if all rice straw residues are retained in the field. The "no rice straw burning" policy being imposed through LGU ordinances can, therefore, help reduce the application of inorganic fertilizers, especially K. This will lower fertilizer expense, which contributes 60% of material cost and 14% of total cost in rice production (PhilRice, 2017).

Table 69. DA administrative orders on guidelines in accreditation of rice seed growers

Year	Inbred seeds	Hybrid seeds
2005	• Individual, farmer group • Training on seed and production technology • Production area suitable with irrigation • Have access to seed postharvest facilities • Minimum of 1 ha production area • Accreditation valid for 3 years, performance validated before accreditation	• Individual, farmer group, seed company • Group registered at CDA • Training on hybrid seed production conducted by government agencies implementing the program • Hybrid seed producer for two seasons, wet & dry • Retooling every 3 years before renewal of accreditation • Accreditation valid for 3 years
2007	• 5-day training on inbred rice seed production and certification conducted by government agencies implementing the program, coordinated with BPI • Group registered at CDA and SEC • Seed company registered at SEC • 3-day retooling every 3 years before renewal of accreditation • Seed company technical staff trained on hybrid rice seed production • Production area fully irrigated, good drainage and fertile soil • Minimum of 1 ha production area • Accreditation valid for 3 years, performance validated before accreditation • Put up prominent signboards	• Group registered at CDA and SEC • Seed company registered at SEC • Training on season-long hybrid seed production and accreditation conducted by government agencies implementing the program, coordinated with BPI • 3-day retooling every 3 years before renewal of accreditation • Accreditation valid for 3 years with performance evaluation • Seed company technical staff trained on hybrid rice seed production • Provisional accreditation for those undergoing the season-long course, renewable after 1 year if 500kg/ha yield is met • Production area at least 1 ha, irrigated • PhP500 regular or PhP200 provisional accreditation fee • Field and facilities inspected by deputized seed inspectors from pre-planting to seed storage • Possess or have access to postharvest processing and storage facilities and equipment

Mechanization

Republic Act 10601 or the Agricultural and Fisheries Mechanization Law was passed in 2013. The Act aims to promote the development and adoption of modern, appropriate, cost-effective, and environmentally safe agricultural and fisheries machinery and equipment to enhance farm productivity and efficiency in order to achieve food security and safety and increase farmers' income.

Table 70. Selling price of public rice seeds by class, Philippines

Seed class	Selling price (PhP/kg)		
	2005	2008	2012
Breeder	150.00	150.00	150.00
Foundation	80.00	80.00	80.00
Registered	30.00	40.00	42.50
Certified	22.00	30.00	34.00
F_1 hybrid	120.00	195.00	212.00

As of 2015, DA had awarded around 1,400 units of combine harvesters nationwide (Mataia et al., 2016). The shift to mechanization of these activities indicates accrual of economic benefits not only to machine owners but also to rice farmers. However, aside from the obvious effect of the shift to mechanization on displaced labor, a problem has emerged that needs to be addressed immediately. The use of the combine harvester shortened the harvest period by about half, consequently putting pressure on the capacity of existing drying and storage facilities.

Some of the issues suggested by Lantin (2016) that need to be considered by the government in the formulation of agricultural mechanization policies and strategies are the following: (1) deliberate pursuit of national industrialization to support agriculture; (2) continued distribution of power and machinery which are "Made not in the Philippines"; (3) local manufacture of engines; (4) overhaul of policies and laws for farmland inheritance; (5) building of infrastructure for irrigation and drainage, transport for efficient agricultural mechanization; and (6) research, development, and extension on technologies for land leveling and precision agriculture, automation, and robotics.

Losses from lack of drying facilities are evident by the rampant use of the national road network. Although the Department of Public Works and Highways (DPWH) admonishes this practice, it has no local jurisdiction and pleads the LGUs to pass ordinances to resolve the problem. In Cagayan, for example, when the rainy season coincides with harvesting time of the second-semester rice crop, farmers and traders use the national road to dry their paddy. In many occasions, the paddy being dried could not be consolidated in time to save it from the damage caused by erratic rains. Hence, a significant volume of paddy is left to deteriorate on the roads (Figure 41).

LGU ordinances to prohibit drying of paddy on roads have been sporadic throughout the country. Insufficient drying facilities in the locality bound the hands of local executives in enacting ordinances or strictly implementing existing ordinances. Hence, this activity in the value chain should be given serious consideration to help reduce losses from current inefficiencies.

Figure 41. Rain-damaged paddy being dried on national road, Cagayan, 2017

Marketing and price policies

As part of the stabilization program of the government, it has established a price subsidy system that allows market intervention through National Food Authority (NFA)'s paddy procurement and rice distribution programs. These price policies are largely motivated by two conflicting objectives of controlling prices at the farm and consumer levels, that is, keeping farm prices high enough to encourage paddy production and ensure prices received by farmers are remunerative, while making rice prices low and affordable to consumers. Dawe (2006) stated that government procurement price have mixed effects on raising farm prices and are typically not effective support prices. In the Philippines, NFA paddy procurement is very limited in terms of the proportion to national paddy production, thus only a few farmers are able to benefit from the support price and mostly, these are the big or progressive farmers. NFA procurement accounts for only a smaller share of 2-5% (with a record low of 0.1% in 2014) of national paddy production; it is, thus, unable to influence farm price in the market. Figure 42 shows that farmgate prices offered by private buyers exceeded the NFA support price. Most farmers choose to sell to private paddy traders as transactions are more convenient. The only time that procurement of NFA shot up was when the market price of paddy abnormally increased in 2014.

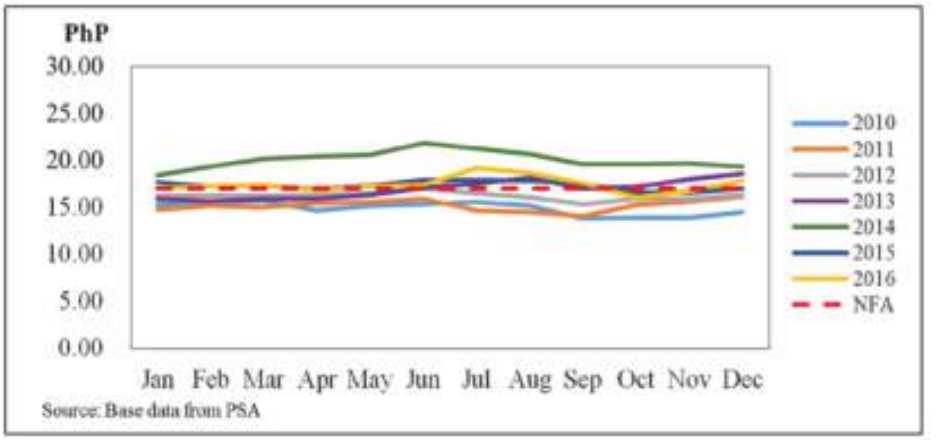


Figure 42. Average monthly farmgate price vs NFA support price (PhP/kg) of paddy, Philippines 2010-2016

NFA had been maintaining for several years the PhP 17.00/kg support price of clean and dry paddy, including incentives of PhP 0.20/kg for delivery and PhP 0.20/kg for drying. Another PhP 0.30/kg delivered has been afforded to organized farmers to add to their cooperative development incentive fund (CDIF). In 2012, the delivery incentive was increased up to PhP 0.50/kg, pro-rated according to distance of the farm from the nearest NFA buying station.

In contrast, various studies found that the pricing policy is biased toward the consumer sector, that is, average retail prices have approximated the ceiling prices only from 1990 to 1993. Beyond these years, retail prices went up and were consistently above the government ceiling retail prices. This suggests that the government price policies that aim to stabilize prices are not successful in defending both the farm and consumer prices. According to Clarete (no date), there is a PhP 1.03 cost for every peso of price subsidy that is delivered by the NFA. Thus, the price support is considered very expensive.

Likewise, the timing of market injections by NFA had been raised by traders and millers in the VCA survey. Injections were perceived by traders and millers as happening at the time of arrival of NFA imports to the country and not following the schedule of release of NFA milled rice in the market. In 2013, imports of NFA arrived at Philippine ports during lean months–May-July and December-February (BOC, 2017). Each NFA warehouse has a marketing plan on the volume and schedule of distribution to all its covered locations. NFA increases distribution from its planned volume only during lean months when demand is high and household stocks of farmers become depleted. In some instances, recently, however, the arrival of imports was delayed and it coincided with peak harvesting. The stringent protocols imposed by the Philippines on procurement delayed the processing of transactions. In cases like this, the delayed stocks are carried over to the succeeding distribution activities.

Rice consumption advocacy

Managing food staple consumption has been actively advocated by the government in recent years. It encourages consumption of unpolished rice, reduction of food wastage, and diversification of food staple consumption. All three schemes can help reduce the rice requirements of the country. Unpolished rice (brown rice) has 10% higher milling recovery than polished (regularly milled) rice. Hence, higher demand for brown rice means less paddy to produce the same volume of regularly milled rice. Rice waste reduction means less per capita allocation. And eating other food staples reduces per capita rice consumption.

The Be RICEponsible Campaign served as the advocacy platform for managing food staple consumption. With PhilRice spearheading the implementation of the campaign, various modalities were used to motivate the public to do their part in achieving rice self-sufficiency in the country. Briefings, radio and television ads, distribution of collaterals, etc. were done nationwide. The general public was convinced to eat brown rice, reduce wastage, and eat other staples mixed with or alternately to rice. Local policymakers were likewise encouraged to issue ordinances and resolutions to institutionalize the availability and default-serving of half-cup rice in food establishments. A total of 46 local ordinances (provinces-8; municipalities-17; cities-21) were created and adopted while 11 resolutions were approved. Farmer groups were persuaded to process brown rice.

Using the consumption and residual data of USDA (2017) and the 1.9% population growth rate data of PSA (2012), the campaign appears to be effective based on the 2% average annual decrease in per capita rice consumption of Filipinos in 2014-2016.

Land conversion policy

The conversion of agricultural land for non-agricultural purposes has been a controversial issue in the last 28 years. In recent years, widespread conversion of prime agricultural land was prompted by rapid population growth and urbanization.

The Comprehensive Agrarian Reform Law (CARL) or RA 6657 of 1988 has provisions on land conversion. It states that, when the land ceases to be economically feasible and sound for agricultural purposes or the locality has become urbanized and the land will have greater economic value for residential, commercial, or industrial purposes, the DAR may authorize the reclassification or conversion of the land and its disposition.

RA 8435 or the AFMA Law was more specific in its land conversion policy. It enunciated a 5-year conversion moratorium, starting in February 1998, which prohibits the conversion of irrigated land, irrigable land already covered by irrigation projects with firm funding commitments, and land with existing or having the potential for growing high-value crops that was delineated and included within the Strategic Agriculture and Fisheries Development Zone (SAFDZ). An

additional provision, however, allows conversion of up to 5% of the land located within the SAFDZ; here, the land owner pays DA the amount equivalent to the government's investment cost plus inflation.

From 1988 to 2016, DAR had approved the conversion of 97,593 ha of agricultural land (Cabildo et al., 2017). More than half (59%) of the total area converted involved single applications for more than 5 ha. The land was predominantly (58%) converted for residential purposes, meaning large housing subdivisions.

The effect of the conversion of rice land for other purposes was most significant among provinces near Metro Manila. Discounting the development of irrigation facilities in the past 28 years, which allowed land-use intensification in rice production, harvested rice area contracted in Batangas (-61%), Cavite (-40%), Quezon (-30%), Laguna (-8%), and Bulacan (-3%) between 1988 and 2016. The 21-81% expansion of harvested area in other adjacent provinces such as Pampanga, Bataan, and Zambales confirms rice intensification during the same period.

Francisco and Mataia (2008), in their study, obtained secondary data on land conversion of rice farms from different provincial offices and NGOs. They found, however, sketchy records and data discrepancies between sources. Entities, such as the Provincial Assessor's Office and the Provincial Agrarian Reform Office, whose functions covered only processing of rice land for conversion into residential, commercial, or industrial use had low figures. The shift from rice production to other agriculture-related endeavors was not included in the records of the provincial planning and development offices. The authors considered the records from the provincial agriculture offices (PAOs) as the most comprehensive since they had the highest figures.

The data the researchers obtained from the PAOs showed that 46,089 ha of rice land were converted nationwide to other uses in 2003-2007. Almost half (44%) were rainfed areas, but what is alarming is that 39% were irrigated. Nevertheless, 93% of the conversions were simply a shift to other agricultural uses. Irrigated areas were converted into farms for livestock and poultry (33%) and other temporary crops (32%). Rice was replaced mostly by other temporary crops, (44%) in rainfed areas. Upland rice areas were primarily converted in order to grow permanent crops (55%).

Transport infrastructure policies

The basic role of transport is to provide or improve access to different locations of both freight and individuals. Transport facilities and infrastructure are essential to each actor in the rice value chain for input procurement and trading. Likewise, a well-developed transport infrastructure eases access of farmers to services, including technology, credit, and banking.

National roads. The road network in the country is heavily utilized in the rice value chain to move paddy and milled rice from the source to the destination. The DPWH is responsible for national roads and bridges, whereas the LGUs are in charge of provincial, municipal, and barangay roads.

The development of the highway network in the Philippines is one of the major national programs being implemented by the government to support the overall socioeconomic development of the country. Between 2011 and 2016, the budget of DPWH for highway development has increased, on the average, by 25% annually. By 2016, this was thrice the PhP 68 B allocation in 2011. As of 2016, 91.6% of the 32,770-km national network of the country was paved, a significant improvement from the 20.8% level in 2011 (DPWH, 2017). The budget increase accommodated rigorous quality upgrading of the road network, including (1) increasing the thickness of concrete pavement from 23 cm to 28 cm in some of the heavily traveled national road sections to withstand the allowable load of hauling trucks and trailer trucks and (2) intensive road-widening projects nationwide to boost business, commerce, and tourism.

Truckers sometimes overload their vehicles to lower transport expenses. The soundness of the roads deteriorates rapidly because of this. To provide for adequate maintenance of roads, the government decided that vehicle owners share the cost. In 2000, RA 8794 was enacted; this imposes a motor vehicle user's charge (MVUC) to be collected by the Land Transportation Office (LTO) from vehicle owners as part of the annual vehicle registration. Rates were set according to vehicle type, ownership, and intended use.

For trucks and trailer trucks, DPWH came up with a matrix of a maximum allowable gross vehicle weight (GVW) on the road, depending on truck type, number and location of chassis, and number of wheels. In case of violation of GVW restrictions, the owner pays a penalty equivalent to 25% of the MVUC applicable to the truck or trailer truck at the time of infringement. The penalty is waived for those with below 5% overload violation. If either a dual-wheel axle load exceeds 13.5 t or the vehicle load exceeds 150% of the maximum allowable GVW, the vehicle is not permitted to proceed on the roadway. The maximum allowable GVW ranges from 16,880 to 41,000 kg, depending on the type of truck or trailer truck.

From 2001 to 2010, the anti-overloading policy was not enforced by the government because the load limits were deemed unclear, inconsistent, and unrealistic vis-à-vis international standards. In 2011, however, the government decided to put into effect this provision of RA 8794. DPWH released a public advisory on the implementation of the anti-overloading policy. Indicated in the advisory is a general guideline stating that trucks and trailer trucks were not to exceed the 13.5 t per axle limit (Chua, 2011). Attached to the public advisory was a matrix of the specified maximum allowable GVW according to the axle and wheel configurations of the vehicles (LTO, 2012). This caused strong opposition from truckers and the government had to defer enforcement.

After amending the prescribed maximum allowable GVW of trucks, DPWH enforced the anti-overloading policy in 2013. Nonetheless, it offered a moratorium to codes 12-2 and 12-3 trucks, the most common types in the country's trucking sector. These are 18-wheeler semi-trailer trucks with five axles and 22-wheeler trailer trucks with three axles each on its motor vehicle and trailer. The maximum allowable GVW of these units were amended from 37.8 to 41.5 t and from 41 to 42 t, respectively. The enforcement of the GVW restrictions of these trucks was extended every year, the latest is until the end of 2017 (Almonte, 2017).

Together with LTO and the Philippine National Police (PNP), DPWH enforces the anti-overloading policy. LTO imposes penalties for violation through issuance of temporary operator's permit indicating the excess load and the corresponding penalty to be paid. PNP ensures that overloaded trucks are not allowed on the roadway. DPWH operates 18 permanent weighbridges, which are installed on primary national highways throughout the country. In addition, 15 mobile weighing stations are positioned within Metro Manila (DPWH, 2017).

Although RA 8794 was enacted in 2000, DPWH has yet to fully implement its anti-overloading provisions. One way to resolve the friction with the trucking sector is to come up with maximum tolerable GVW figures that are proximate to those set by the truck manufacturers, which will not severely damage and cause premature deterioration of roads. The concern, therefore, is whether the quality of existing infrastructure is at par with international road standards, which is an indirect factor to consider when international manufacturers design their trucks. In its visual road condition survey in 2015, DPWH was able to manually survey 91% of the national roads throughout the country (Figure 43). It was found that 39% were in good condition and 35% were in fair condition.

Item	% of Total Length Assessed			
	Primary	Secondary	Tertiary	All
Good	39	37	40	39
Fair	33	39	32	35
Poor	18	17	18	18
Bad	10	7	9	8
% assessed	92	90	91	91%

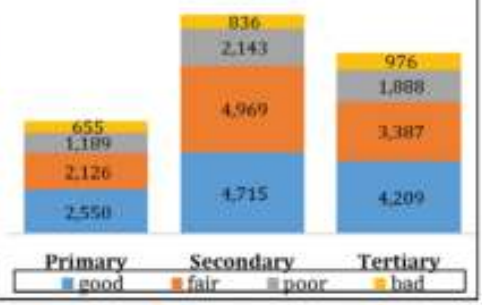


Figure 43. Condition of national paved roads as assessed by DPWH using the visual condition index, 2015 Source: DPWH[2], 2017

Local roads. Since the implementation of the Local Government Code or RA 7160, LGUs have the responsibility to develop and manage their respective local roads from the barangay to the provincial level. Many LGUs, however, need external fund sources to implement their road projects. Local road development, therefore, has been highly dependent on the financial capacity and priorities of the

LGU. A provision of RA 7160, though, stipulates that the national government may provide for (or augment) the needs of the LGUs.

Consequently, the Conditional Matching Grant to Provinces (CMGP) program has been included in the 2017-2019 rolling infrastructure plan of the national government. Provinces that attain the Seal of Good Local Governance and Good Financial Housekeeping are covered by the program. A budget of PhP 18.03 B was allocated by the national government in the 2017 GAA for the repair, rehabilitation, and improvement of provincial roads (DILG, 2017).

Long-distance interisland shipping. Interisland shipping is a vital component of Philippine economic development, owing to the country's archipelagic geography. It facilitates 98% of domestic interisland trade of commodities, including rice (ADB, 2010). For the rice industry, its importance in the value chain cannot be over emphasized as this staple food of Filipinos has to be moved from surplus to deficient islands.

The Philippine Ports Authority is responsible for financing, management, and operation of public ports throughout the country, except the port of Cebu. On the other hand, the Maritime Industry Authority (MARINA) was created to integrate the development, promotion, and regulation of the maritime industry in the Philippines.

Normally, rice is transported in bulk between islands through traditional long-distance interisland shipping services. Inefficiencies in various aspects of domestic shipping, however, made interisland transport very expensive. The inefficiencies come from inadequate port and vessel capacities, ineffective port management and administration, and constraints arising from anti-competitive policies and regulation. The lack of competition in the shipping industry weakens incentives to minimize costs, which could be simply passed on to the consumers of the service (Llanto et al., 2005). The limited capacity of domestic cargo vessels causes inefficiency from having more turnaround trips, thus resulting in extremely high shipping costs. As a result, freight traffic on interisland shipping services has remained at the mid-1990 level (ADB, 2012).

To make the domestic merchant fleet strong and competitive, the Philippine government passed RA 9295 or the Domestic Shipping Development Act of 2004. To expand and modernize the domestic merchant marine industry, the Act has the following provisions: (1) promote deregulation in the domestic shipping industry, encourage effective competition, free enterprise, and market-driven rates that are sensitive to the demands of the public; (2) promote Filipino ownership of vessels and attract private capital investment; (3) provide assistance and incentives to owners; (4) encourage the upgrade of fleet and crew; (5) ensure viability of operation; and (6) encourage the development of a viable shipbuilding and ship repair industry. MARINA, however, has the authority to draw the rules and regulations for fair rates in monopolized routes. The investment incentives enjoyed by fleet owners include exemption from value-added tax for purchase of vessels, equipment, and

paraphernalia with certain provisions; net operating loss carryover; and accelerated depreciation of fixed assets.

With more serious maritime accidents occurring in 2008 and 2009, EO 909 was issued in 2010 to encourage investments in newly constructed ships and brand-new vessels by providing incentives to owners and operators. The incentives are accorded only if the vessel is recognized as such by the International Association of Classified Societies. The incentives include granting pioneer status (benefits and privileges indicated in Memorandum Order [MO] No. 299 of 2009); protection of investment for 6 years by paying only 50% of various fees charged by MARINA; priority in the issuance of Certificate of Public Convenience in any route the owner proposes to operate; a moratorium on the deployment of additional bottoms on any routes the new vessel is deployed; provision of special ramp or berthing facility in PPA ports; and exemption from VAT and other import duties and taxes pursuant to RA 9295 and MO 299.

As a result, the number of domestic cargo vessels increased by 12% in the past 5 years, 84% of which were built locally. This implies more competitive shipping rates. The average age of domestic cargo vessels, however, remained at 16 years, while that of overseas bulk carriers owned by Filipino nationals consistently decreased from 10 to 4 years between 2012 and 2016 (MARINA, 2017). The condition of a vessel decreases over time and, if maintained poorly, can affect its seaworthiness, which consequently prevents cargoes from reaching their destinations on time. Domestic cargo shipping has become more problematic when the daytime truck ban ordinance was enforced in Metro Manila in 2014. Cargoes got stuck for 3-7 days in the Batangas and Manila ports (Nicavera, 2015), which entailed additional costs.

Road Roll-on/Roll-off Terminal System (RRTS). For short-distance conveyance between islands, rice has been transported in small bulk via the roll-on/roll-off (Ro-Ro) vessels. Ro-Ro transport entails loading and discharging of vehicles with cargo between a Ro-Ro vessel and the shore via a ramp in terminals. Since loading and off-loading of cargoes are not required, handling costs are eliminated and the goods reach their destinations faster.

The role of the Ro-Ro system was recognized by the government as a solution to minimize the impact of the domestic shipping problem. EO170 was issued in 2003 to promote private sector participation and investment in the development and operation of the RRTS. The RRTS, a vital component of the government's agri-fisheries modernization and food security programs, was a strategy to increase access between islands and regions and to improve efficiency and lower the cost of interisland transport of goods.

The RRTS involves a network of terminals all over the country, not more than 50 nautical miles apart, linked by Ro-Ro vessels. Integrated with the national highways, the RRTS covers three nautical highways connecting Luzon, Visayas, and Mindanao, with lateral connections. In 2015, the RRTS included Ro-Ro ferry

routes along the Pan-Philippine highway (Figure 44). The terminals are envisioned to be operated by private investors and existing government-owned terminals privatized.

Figure 44. The RRTS nautical highway routes

The coverage of the RRTS in EO170 was expanded in EO170-A, issued on the same year, by including long-haul Ro-Ro vessels. This means that route distance is no longer limited to a maximum of 50 nautical miles. The EO was again amended in 2005 (EO170-B) to include more Ro-Ro-capable ports in the RRTS since only 115 public ports and roughly 30 private ports were operating commercially in the country, while more than 350 existing private non-commercial ports have the potential to be converted into private commercial ports to become part of the RRTS network.

The Ro-Ro system developed rapidly upon the issuance of EO170. The initial impact of the system increased the frequency of transit and delivery of goods and reduced transport costs. Businesses started to change their business models and market access of farmer groups was enhanced (ADB, 2010).

Trade policy

The Philippines' rice trade policy is generally governed by the RA 8178, which stipulates the replacement of quantitative restrictions (QR) on agricultural products, except rice, with tariffs (The Official Gazette, 2016). Administered with this trade policy, the country joined the World Trade Organization (WTO) in 1995. Since then, the country employed the tariff rate-quota system to protect the domestic rice industry from the influx of cheaper imported rice (Bordey et al., 2016). Under this, the government can restrict the volume of rice to be imported (i.e., QR) provided it is not less than the minimum access volume (MAV). Imported rice within the MAV is levied with an in-quota tariff but is subject to an out-quota tariff if importation exceeds the MAV.

Over the years, the in- and out-quota tariffs also decreased. The in-quota tariff started at 50% from 1995 to 2004 then went down to 40% from 2005 to 2015 (Bordey et al., 2016). Correspondingly, the out-quota tariff declined from 100% in 1995-2004 to 50% in 2005-2015 (Hoang and Meyers, 2015). Likewise, MAV increased from 59,000 t in 1995 to 119,460 t in 1999 and to 239,940 t in 2004 (Intal and Garcia, 2005). Furthermore, MAV increased to 350,000 t in 2005 after the government successfully negotiated for QR extension until 2015. When QR extension concluded in June 2017, the country obtained from the WTO a waiver on this commitment until 2017. In return, the country agreed to a higher MAV, 805,200 t (FAO 2015). Upon approval of the waiver, the tariff rate was further reduced to 35% for most favored nations (MFN).

Aside from its WTO commitments, the Philippines, as a country member of the Association of Southeast Asian Nation (ASEAN), was also a signatory to the ASEAN Free Trade Agreement (AFTA). Under this agreement, efforts were made to liberalize the flow of rice trade within Southeast Asia. However, the country considered rice as highly sensitive to its food security and thus, subject to high tariff rates of 40% until 2014. To extend economic integration, ASEAN country members agreed to become the ASEAN Economic Community by end of 2015. As such, the country's tariffs on imported rice from ASEAN members were further reduced to 35% (ASEAN 2008).

Beyond 2017, it may be difficult for the country to negotiate for an extended implementation of QR. Nevertheless, the effect of QR expiration can only be felt after amending the RA 8178. Currently, there is a move to amend this Act to implement a tariffication trade policy. Under this trade regime, all existing QRs such as import quotas or prohibitions, imposed on agricultural products will be lifted and replaced by tariffs. According to some analysts, removing the QR on rice by amending RA 8178 would allow the government to generate significant revenues from rice importation. Also, with imposition of tariff, rice importers will be able to operate on an equal footing relative to that of QR. The QR import policy of the government has encouraged unscrupulous businessmen to smuggle rice into the country to dodge paying import dues.

However, Philippine farmers are less competitive than their counterparts in Vietnam and Thailand, the major rice-exporting countries worldwide. A comparative study among major rice producers in Asia showed that the country's ordinary white rice (regular milled) was more expensive than imported rice with similar quality (25% broken rice) even at 35% tariff rate when QR is eliminated (Bordey et al., 2016). Given this, rice in the country can be said to be less competitive. Under free trade, cheaper imported rice will flood the local market and will challenge the competitiveness of domestic farmers. Thus, the country should continue working on increasing its rice yield and reducing its production cost.

Excise tax on fuel

The recent passing of RA 10963 or the Tax Reform for Acceleration and Inclusion (TRAIN) law will have significant impact on rice farmers. The excise tax imposed on diesel (PhP 2.50/li) and gasoline (PhP 7.00/li) (DOF, 2017), the prevalent fuel used in rice farming activities, decreases further their rice productivity. The increase in fuel cost directly affects the cost of mechanized land preparation, pump irrigation, and mechanized drying. The upward movement of fuel prices will consequently snowball to other goods and services.

Photo: PhilRice and Philstar

CHAPTER 8

CONSTRAINTS AND OPPORTUNITIES

Several constraints and opportunities affect the performance of key players in the Philippine rice value chain. Table 71 summarizes these constraints and opportunities gathered from the farm-level survey and key informant interviews in the major rice-producing provinces of the country. These were validated during meetings and consultations with different stakeholders in the three major islands of Luzon, Visayas, and Mindanao. The constraints mentioned were almost similar across regions and provinces (Tables 71-73)

A. Input Provision and Production

Mismatch of available high-quality variety seeds with farmers' preference

The limited supply of high-quality seeds of varieties that farmers prefer is one of the constraints identified by some of the respondents. There is often a mismatch between what is sought by farmers and what is offered by seed producers. Basic seeds of popular varieties are usually insufficient when demand soars. It has been proven that use of high-quality seeds results in higher yield potential of 10 to 20% over those of so-called good seeds. Hybrid seed has a 30% yield advantage over inbred varieties. The adoption of high-quality seeds increased from 15% in 1996/97 to 44% in 2011/12 (PhilRice, 2017). The increasing adoption of high-quality seeds was due to the extensive advocacy of the government.

DA-RFOs and LGUs facilitate in making good-quality seeds accessible to farmers. Seed producers are provided intensive training programs specific for their accreditation. There are 1,728 accredited individual seed growers in the Philippines as of 2015, with total accredited seed production areas of 13,653 ha, 65% of which are in Luzon, 12% in the Visayas, and 23% in Mindanao. Currently, more seed companies are engaged in the local hybrid seed market, providing farmers more choices of high-performing varieties. The presence of an informal seed distribution system makes high-quality seeds more accessible to farmers. The informal seed system involves local seed selection, production, and distribution wherein the farmers themselves produce, distribute, and access seeds directly from their own harvests or through exchange with other farmers. Some LGUs are implementing seed subsidy programs to farmers in their respective municipalities.

In 2011, community seed banks (CSBs) were established, which was considered an extension tool to increase farmers' access to high-quality seeds. The CSB is controlled and operated by farmers within the community. This is to encourage seed production and exchange among farmers within and outside the

community and between farmers and breeding institutions for greater diversity. The general objective is to increase and promote farmers' access to high-quality seeds through a sustainable CSB that is organized, developed, and managed by farmers, IAs, FAs, upland farmers' organizations (UFOs), POs, and non-government organizations (NGOs).

High price of material inputs (hybrid seeds, fertilizers, pesticides, fuel, and oil)

At the input supply level, high and often fluctuating prices are a problem. This affects the dealers' margins. Due to high prices, farmers are not able to buy the necessary inputs in rice production because of their lack of or limited financial capital, which might result in lower rice productivity. The high cost of inputs is one of the reasons economic returns in rice production are low. And this is being experienced by farmers in all rice-producing provinces of the country. Production inputs include seeds (particularly high-quality seeds such as certified and hybrid seeds), fertilizers, pesticides, and fuel and oil. Some farmers wanting to venture on hybrid rice production are constrained by the higher price (compared with that of inbred varieties). Fertilizer price in the Philippines was the highest among six countries as revealed by a study that compared the competitiveness of Philippine rice with that of its Asian neighbors (Manalili et al., 2016). Although pesticide use of farmers is minimal, its high price is also a problem when farmers need to mitigate production losses due to pests and diseases. Additionally, there is a continuing increase in the prices of petroleum products that farmers use for land preparation, planting, irrigation, threshing, milling, transporting, and marketing of produce. The high price of oil is also a heavy burden. The high prices of inputs thus prevent farmers from using the required amounts of inputs.

Low-cost credit support from government programs such as the DA's Sikat Saka credit program is available to individual farmers who are members of farmers' associations and irrigators' associations. Farmers who will take advantage of these government programs will be able to buy the material inputs needed to improve their rice productivity.

A reduction in production cost can be achieved through the use of good farming practices such as integrated pest management (IPM) and integrated nutrient management. The use of cost-reducing technologies such as organic fertilizers and pesticides are also being promoted. Utilization of farm wastes and other locally available biomass, including non-burning of rice straw in the field, is also being promoted. Rice straw, when scattered and incorporated in the soil, can be a good source of additional fertilizer for the rice crop.

The DA has supported research to enhance the capabilities of the Rice Crop manager (RCM) and ensure its nationwide dissemination since 2013. The RCM uses results of research and existing knowledge to provide farmers in irrigated and rainfed lowlands with 'precise' field- and farmer-specific recommendations. The RCM is an application that can be accessed via a smartphone or a computer with

internet connection. It allows extension officers to give farmers recommendations on nutrient, pest, weed, and water management, depending on the specific variety they use, their yield from the previous season, and the site-specific conditions of their field. Given its importance and benefits in increasing yield and income to farmers, its access to farmers should be further intensified and improved. To hasten its use, the poor internet connectivity in the rural areas should also be improved.

Too many varieties that lead to misclassification

Many rice varieties have been bred and released in the Philippines, which led to a wide range of varieties planted by farmers in the Philippines. This led to misclassification in the market by traders and millers, which resulted in lower prices of paddy offered to farmers. It could also put millers at a disadvantage because it would be difficult to achieve optimal milling recovery. In a study conducted by Litonjua et al. (2016), a smaller number of varieties were reported in China, Vietnam, and India. These were practiced to minimize mixtures to maintain the same quality for export purposes (Beltran et al., 2015; Mataia et al., 2015).

Public rice breeders PhilRice, BPI, UPLB, and IRRI develop and submit promising lines to the Rice Varietal Improvement Group (RVIG), a multi disciplinary, multi agency body that tests, evaluates, and recommends promising lines to the NSIC for approval and release as commercial varieties for all or specific regions of the country.

High yield, good grain quality, and resistance to pests and diseases are some of the most important characteristics that farmers consider when choosing a rice variety (Launio, 2008). A study conducted by Laborte et al. (2015) on farmers' preference for rice traits (from a survey conducted in Central Luzon from 1966 to 2012) found that farmers adopt modern varieties that are high-yielding, mature faster, and have long and slender grains, high milling recovery, and intermediate amylose content. Many rice varieties are considered high yielding and have long and slender grains. These are more preferred by millers, traders, and consumers, thus commanding a higher market price. Information on the recommended varieties, together with their agronomic traits, grain quality features, and resistance to pests and diseases are available for dissemination to seed growers and farmers which serve as guide in identifying varieties suitable to each region or province.

Inadequate water supply

Water is the most important variable to achieve high rice yields. Severe water deficiency during reproductive and flowering stages significantly reduces rice yields. Inadequate water hounds Filipino rice farmers. The impact of limited irrigation water is severe, especially during DS. The country has about 3.1 M ha of irrigable land, with up to 3% slope, and these are primarily devoted to rice and corn. A total of 1.73 M ha of the total irrigable area has irrigation facilities equivalent to 57.33% irrigation development level. There are still some regions with large areas that need to be developed (more than 40%): Central Luzon, CALABARZON,

MIMAROPA, and Bicol in Luzon; Western Visayas in the Visayas; and regions Northern Mindanao, Davao, SOCCSKSARGEN, CARAGA, and ARMM in Mindanao.

The government has allocated funds for the construction of irrigation facilities and rehabilitation of dysfunctional ones. One of the top programs is the expansion of irrigation area and improvement of irrigation performance, with special attention given to averting natural devastation. Climate change and water competition, aggravated by watershed degradation and El Niño episodes, are putting a strain on the dependability of water supply for irrigation. The governmental and non-government agencies should enforce and fast-track the construction and rehabilitation of irrigation facilities and the expansion of irrigation facilities to formerly rainfed rice land especially in low and medium-yielding provinces.

The government, through BSWM, has also embarked on small-scale irrigation projects (SSIP) such as the small water -impounding projects, small diversion dams, shallow tube wells, and small farm reservoirs. The use of SSIPs has positive impacts as it provides supplemental irrigation; serves other incidental functions such as flood control structures; and caters to other economic uses such as those for fishery and livestock production. One of the appropriate tools to uplift the living conditions of marginal upland farmers, SSIPs provide adaptation measures to enable farmers cope with the adverse impact of extreme climate events such as floods or droughts.

Effective and efficient water-saving and management technologies such as alternate wetting and drying (AWD) and controlled irrigation is being promoted to help farmers whose farms are located in the tail-ends of irrigation canals. The integrated water management approach must be conveyed to farmers.

Shortage and high cost of labor

Shortage of labor in labor-intensive activities was reported in most provinces as some laborers favor non-farming employment activities. In addition, labor cost in rice production is the largest cost item, 36% of total cost (Launio et al., 2015). Compared with other major rice-producing countries, it is more than double that of Vietnam, Thailand, and India. The wide use of combine harvesters enables farmers' harvesting, threshing, and hauling activities to be done and paid as a single activity in Thailand and India, unlike in the country where these are paid as separate activities. The use of combine harvesters though is already gaining popularity nationwide. A study by Arida et al. (2016) shows that combine harvesters reduce labor use and cost in harvesting, threshing, and hauling operations, as well as costs of fuel and oil, machine custom rent for threshing and hauling, sacks and twine, and food costs during harvesting and threshing activities.

Crop establishment through manual transplanting is another labor-intensive activity in rice farming that adds to labor cost. Direct seeding is commonly practiced in Thailand and Vietnam through the use of mechanized sprayers, which

thereby reduces crop establishment cost. Direct-seeded rice matures earlier than transplanted rice. Hence, labor requirements and expenses for crop establishment and the time spent on crop management are reduced.

Limited access to production machinery

Rice production operations in the country are still largely done manually. Manual and animal labor is used by majority of the farmers in planting, weeding, spraying, and harvesting, whereas mechanical power is applied mostly in land preparation and threshing. Drying is accomplished through a mix of mechanical power and manual labor, while majority performs milling through use of rice mills. The farm machinery used in rice production are power tillers, water pumps, transplanters, seeders, mechanized weed control, knapsack sprayers, reapers, dryers, and mills, and a very recent development, combine harvesters. On the other hand, labor for on-farm operations, from postharvest to milling and marketing is provided by the rural communities' labor force, which is mostly unskilled, with the exception of the machinery operators. Farm operations are usually done manually because farmers lack the capital needed to acquire the appropriate modern farm machines and implements.

The government recognizes the challenge of minimal mechanization and has indeed set as one of its priorities the increase in farmers' access to farm machinery through RA 10601 (Agricultural and Fisheries Mechanization Act) of 2013. The Act aims to promote the development and adoption of modern, appropriate, cost-effective, and environment-safe agricultural and fisheries machinery and equipment to enhance farm productivity and efficiency in order to achieve food security and safety and increase farmers' income.

Another opportunity is the presence of government agencies such as PHilMech and PhilRice, which conduct research on new appropriate farm machines that would enhance productivity and reduce losses in rice production. Farm machinery that are appropriate for smaller plot size should be developed and tested to cater to the needs of farmers whose farm areas and plots are small.

Pest and disease incidence

Farmers face the challenge of pests and diseases, which remarkably lower yields. Although the use of IPM has been extensively promoted, many farmers still use chemicals in controlling rice pests and diseases. There are still farmers who lack knowledge and resources to effectively control rice pests and diseases. The more commonly encountered pests are rice black bugs, golden apple snails, weeds, green leafhoppers, stem borers, and brown planthoppers.

Farmers in the Philippines were the least users of pesticides compared with their counterparts in other countries (Beltran et al., 2016). The low pesticide use has been documented and demonstrated in many studies. The reasons for the low usage include relatively high prices, strong educational campaigns on dangers associated

with pesticide use, and adoption of the IPM approach (Moya et al., 2015). Pest and disease management components are continuously included in training courses conducted for farmers. Relevant information on IPM and use of biological control agents are provided to farmers through LGU extension workers. Pest and disease-resistant rice varieties are also available.

Another opportunity is the presence of a government project called the Philippine Rice Information System (PRISM). A project of DA, PhilRice, and IRRI, it aims to develop a monitoring and information system for rice production in the Philippines. PRISM's main purpose is to gather and organize information on rice area and yield to provide information to key stakeholders, The system relies on data from remote sensing, crop models, in-field crop surveys, farmer interviews, weather data, official statistics, and other fieldwork to deliver actionable information on rice crop seasonality, area, yield, damage from flood or drought, and yield-reducing factors such as diseases, animal pests, and weeds (PhilRice, 2017). Timely and accurate advisory on pest population, outbreaks and management is needed by farmers and these can be provided through PRISM.

Limited access to modern rice technologies and practices

In spite of government programs and efforts to disseminate and promote modern rice technologies and practices, many farmers still have limited access to such technologies. Since the devolution of the extension functions and services to the LGU, the mobility of extension workers has been slow and limited. They are usually office-bound due to shortage of operational funds for travel. They find it hard to provide extension services and support, especially to far-flung areas. Budgetary constraints also limit the production of IEC materials.

The use of information portals such the Pinoy Rice Knowledge Bank, PhilRice Text Center, and Farmers' Contact Center is being promoted to increase awareness among farmers. The Pinoy Rice Knowledge Bank is a rich source of information to help farmers improve and localize their farming practices as it contains most information on rice farming and downloadable materials such as videos and powerpoint presentations on yield-enhancing and cost-reducing technologies in rice farming (PhilRice, 2017). The PhilRice Text Center is a SMS-based helpdesk and customer support that links experts, agricultural extension workers, and farmers by answering rice-related queries through text messaging. The Farmers' Contact Center, on the other hand, caters to voice and text messages as an alternative delivery channel for farm and business advisory services. This is being implemented by the DA through ATI, in collaboration with partner institutions in the Department of Science and Technology (DOST), LGUs, SCUs, and other stakeholders in agriculture and fisheries extension. The use of information portals mentioned above could be an effective tool in increasing awareness and adoption of new technologies because of the popularity of the use of cellular phones. Results of the study conducted by the Socioeconomics Division (SED) of PhilRice on the regular monitoring of rice-based farm households showed that 79% of the 2,500

farmer-respondents in WS 2011 owned cellular phones and that 74% of those cellular phone owners signify their willingness to receive information on rice through text messaging.

Limited financing/credit to expand production

A key need of farming households is access to financial capital. Increasing prices of farm inputs, fuel, and machine rental as well as labor cost limit the capacity of farmers for further investments. Farm households not able to finance their production depend on loans and cash advances mostly from informal financiers. They are highly dependent on informal credit with high interest rates. Some are often associated with paddy-tied credit-output relationships, as farmers who are indebted are obliged to sell their paddy to traders who provided them credit in cash or in terms of material inputs. These arrangements are sometimes unfavorable to farmers because of their limited options in choosing a buying party who could offer better prices. Some farmers want to become independent of these financial ties. Farm households perceive loans from formal sources as less accessible due to complicated application procedures and formal requirements. Lack of collateral limits access to formal loans. The high transaction costs (more paper-work), geographical distance, as well as little trust in banks make farmers unwilling to borrow money from formal credit institutions. Thus, there is a need to improve access of farmers to formal loans and credit.

Funds are provided as loans to government financial institutions such as the Land Bank of the Philippines (LBP) and the People's Credit and Finance Corporation (PCFC) as the credit wholesalers, which, in turn, relend the funds to qualified credit retailers that include rural banks, cooperative banks, and other organizations engaged in lending to small farmers and fisherfolk.

The agricultural credit and financing programs of the DA through ACPC help farmers access timely and adequate credit at affordable interest rates. These are the 1) Sikat Saka Program (SSP), 2) Coop Banks Agri-lending Program (CBAP), 3) Agri-Microfinance Program (AMP), and 4) Agricultural and Fisheries Financing Program (AFFP). The Registry System on Basic Sectors in Agriculture, where eligible farmers are listed, gives them more access to these credit support programs of the government.

Climate change/unfavorable weather condition resulting in high production losses

This is one of the key challenges that affect all actors in the rice value chain, especially farmers. Weather disturbances, causing heavy rains, flooding, and droughts have adverse effects on rice production. The timing of typhoon occurrence bears the most damage and economic loss during the stage of the crop when it is full of grains and about to be harvested. Floods during harvest cause huge losses either by plant damage or foregone cropping due to unavailable water supply.

Consequently, there is limited paddy supply to millers and traders to keep them in operation at such times. Also, the farmers' loan repayment capacity diminishes since they mostly depend on rice revenues to pay their debt.

Climate-smart technologies and practices such as diversified farming, cultivation of varieties adapted to various ecosystems and stresses, controlled irrigation, and use of machinery that consume renewable energy must be introduced and promoted to farmers. Farmers should also be provided with timely, accurate, and site-specific weather and climate advisories. Although occurrences of erratic weather are beyond human control, it is possible to adapt to or mitigate the effects of adverse weather with a timely forecast.

Low access to crop insurance

Another constraint identified is the low access of farmers to crop insurance. Many farmers do not know what crop insurance programs of PCIC are available and some perceive not getting any benefits from these. Information drives can be tied up with rice production-related training and PCIC may designate one staff in every municipality to increase the agency's accessibility to farmers. The government also need to increase the budget allocation to PCIC so that more farmers could avail of the rice crop insurance.

B. Paddy Assembly/Aggregation

A few problems in paddy assembly/aggregation were mentioned by traders.

Limited knowledge on paddy grades and standards set by NFA and BAFPS

One of the major constraints identified in the assembly or aggregation segment is the limited knowledge of some paddy traders and farmers on paddy grades and standards. NFA, in collaboration with the public and private sectors, has initiated the Philippine Grains Standardization Program (PGSP) to support the rice production and enhancement program of the government. With legal provisions under the 1997 AFMA, NFA sought the adoption of the PGSP as Philippine National Standards (PNS) to be undertaken by the Bureau of Agriculture and Fisheries Standards (BAFPS).

Because there are new traders and farmers entering the rice trading business, there is a need to intensify the dissemination of information on existing paddy grades and standards. Although NFA regularly conducts training on grain classification and standards, these should be expanded to each district and through general assemblies. Other stakeholders such as the millers, through their local leadership, can cooperate with NFA in training their members regarding paddy and milled rice standardization.

Limited advocacy for paddy grading and standardization for new traders

Paddy traders who are new in the paddy trading claimed that they lack seminars on paddy grades and standards. Strict implementation of the set standards and grades of paddy and rice should be done. Individuals or group of traders who are new in the business should be required by NFA to attend seminars on grain classification as part of licensing requirements. The NFA and LGUs should partner in closely monitoring and supervising paddy trader compliance.

Malpractices in selling - scaling or weighing, deductions, and quoting lower prices than actual

Some buyers (traders) intentionally adjust their weighing scales (contrary to standardized weights) to read lower weights and, by so doing, cheat farmers. To overcome this challenge, the government (DA-LGU) should regularly inspect traders' weighing scales for conformity to standard weights and enforce the set weight standards to protect farmers from this malpractice. Other traders enforce weight deductions from the total number of kilograms being sold by farmers and this depends on the paddy's MC. A task force should be created to regularly monitor the traders' activities to protect farmers and other small-scale traders. Moisture meters are provided by the DA and NFA to farmers' organizations or cooperatives so that farmers know the actual MC of their paddy. MC is one of the basic quality criteria used for price determination.

Limited mechanical drying facilities

Most of the time, farmers are forced to sell their produce immediately after harvest, when prices are low due to lack of postharvest facilities such as dryers and storage areas. Proper drying of rice is one of the most important postharvest practices that greatly affect the quality of milled rice. This task may be performed by farmers, assemblers, or millers to reduce the MC of paddy to a level that is good for milling. Drying is done through the use of solar and mechanical dryers. Solar drying is more preferred due to the availability of solar power and the high cost of acquisition, operation, and maintenance of mechanical dryers. But sun drying entails added cost, which comes in terms of losses. Improper drying may result in poor milling recovery and a high percentage of broken grains, leading to a lower quality grade of rice and, consequently, a lower price.

In recognition of the critical role of proper drying, the DA promoted the use of mechanical dryers to farmers' associations and cooperatives. DA provided mechanical dryers and multipurpose drying pavements to these farmer groups. But there is still insufficiency of these facilities in all major rice-producing provinces in the country. It was more evident in Central Luzon and Western Visayas. As shown in Chapter 5, the total capacity of all existing dryers (solar and mechanical) in the country fell short by 17% of the total rice supply in 2015.

Low farm gate price of paddy during peak harvests

The farm-gate price of paddy is generally low during peak harvest months and becomes higher in later months when there is no paddy in farmers' hands. Most farmers cannot hold paddy for a long time and want to sell it as quickly as possible to pay their loans back and to invest money for another crop. Therefore, they have to accept the low price offered by private traders particularly in rice surplus but far-flung producing provinces. Coupled with high prices of inputs such as seeds, fertilizers, pesticides, and fuel, rice production become less profitable and less attractive to small-scale farmers. The NFA offers a price support of PhP 17/kg of dry and clean paddy. The farmers must be encouraged to dry their paddy and avail of this price support of the government. However, the price support must be reviewed by the NFA council as it calls for an increase due to soaring prices of inputs. Moreover, this price has not been changed since it was set in 2008.

C. Processing and Marketing

Insufficient modern milling, mechanical drying, weighing and storage facilities, which result in low-quality milled rice and high marketing cost

Proper drying and storage of paddy improve grain quality and milling efficiency. All major rice-producing provinces have insufficient facilities, which only accommodated 78% of total paddy production in 2015 (see Chapter 5). Inadequate storage facilities are also observed in all major rice-producing provinces, particularly in Nueva Ecija, Isabela, Cagayan, Pangasinan, and Camarines Sur in Luzon; Iloilo and Negros Occidental in the Visayas; and North Cotabato and Sultan Kudarat in Mindanao. On the other hand, the cities of Cebu and Davao have surplus storage facilities, more than enough to cater to their needs.

As to milling facilities, it was reported that total capacity exceeded total supply of paddy in 2015. However, 24,420 units (96.25%) are single-pass with 50-55% recovery. There were only 48 units of compact rice mills (0.20% of total units) that can recover 60% at best and 904 multipass mills (3.56%) with a recovery rate of 65-70%. According to PHilMech, the best milling facilities should have a milling recovery of 68-72%. There were five rice-processing centers established through a Korean International Cooperation Agency grant in Pangasinan, Davao del Sur, Bohol, Iloilo, and South Cotabato.

It was found that Cagayan Valley and Central Luzon and all regions in Mindanao have inadequate rice mills. Similarly, there were insufficient rice mills in major rice-producing provinces, particularly in Nueva Ecija and Isabela, while provinces with low paddy supply have excess milling facilities. Nueva Ecija and Isabela have insufficient milling facilities.

High marketing cost

The marketing cost of rice is high due to lower economies of scale and underutilized rice mills, high cost of transport and packing, and high paddy prices that increase the cost of capital (see section D of Chapter 4). The high transportation cost is due to poor road quality, fewer lanes, and the tendency to pass through urban areas instead of through the outskirts, which may cause longer travel times. When compared with Thailand's practice of using 30-ton trucks to haul rice from rice-growing areas to the large cities, it was found that this was more than double the capacity of trucks used in the Philippines (Beltran et al., 2016). In addition, loading and unloading of rice to and from the truck are done manually, which entails a higher cost compared with the use of conveyor belts in Thailand and Vietnam.

Milling cost is also high due to underutilization of rice mills; these operate only for 8 hours a day during ordinary season and for 16 hours during peak periods. Additionally, millers mentioned the high cost of electricity, which makes milling fees high, especially in Mindanao provinces. Electricity outage is also a common occurrence, affecting both millers and farmers in Mindanao. In the absence of electricity to run the milling machines, mills close down or millers turn to the more expensive alternative of using diesel engines. It also inconveniences farmers who seek milling services-sometimes they have to travel back home and return at a later time or look for other distant mills to have their rice milled. This high electricity price increases cost of operation and reduces margins; it also causes millers to charge high milling fees and thereby reduce farmers' proceeds.

Packaging cost also contributes to high marketing cost (see Sections D and F in Chapter 4). Paddy sacks are used to transport paddy from the field to the rice mill, which can only be used twice, while sacks are also used to pack milled rice.

The government gives high priority to infrastructure development such as roads and bridges. It has also renewed interest to develop the train system in some parts of the country to lessen travel time and lessen transportation cost. It has also increased its budget allotment for the construction of new port facilities and renovation of new ones to provide quality services of the Ro-Ro ships for cargo and passengers, especially in the Visayas and Mindanao.

Another opportunity is the presence of rice mills that generate rice-husk that can be used for power generation. The establishment of rice husk-powered plants is already gaining popularity, as they reduce dependence on electricity, which certainly can reduce milling costs. Investment on the use of solar panels is also encouraged, although initial establishment cost is high.

Rice processing centers were provided to some cooperatives and farmers' association, but their present status and needs should be assessed to know if there is a need for an upgrading of its facilities.

Untimely rice importation arrival that coincides with peak harvest

The arrival of imports during peak harvest months was also mentioned as one of the constraints in the marketing segment. Untimely arrival of imports will drive down the prices of rice, thus exacerbating low paddy prices, which is detrimental to smallholder farmers.

Timely decision-making on rice importation by NFA should be done to make imported rice available in domestic markets during lean months. Import permits on rice should be issued on time so that farmers' cooperatives and private firms will have enough preparation for the necessary paper work. Imports should come in before summer and the harvest months so as not to affect the price of paddy. The volume of rice to be imported should be carefully determined by considering the deficit in local production at the end of each year.

Rice smuggling: undocumented rice supply flooding the market on lean months

The presence of smuggled rice in the market was mentioned by some traders and millers in Luzon, Visayas, and Mindanao. There is a high supply of undocumented or smuggled rice in the market even during harvest months. These are cheaper and have quality traits comparable with those of domestic rice in the market, thereby making local rice less competitive. There is a need to improve the country's level of competitiveness in rice production and marketing. The extension of QRs must be discouraged, and tariffs should be imposed instead. Tariff generates revenues for the government and discourages bribery. For tariff to be effective, it should be just enough to encourage companies to import rice that meets local demand.

Limited procurement funds of small- and medium-scale traders and millers

Small- and medium-scale rice traders and millers whined about limited procurement funds. LBP has small and medium (SME) credit facility that can support entrepreneurs in starting or expanding their business operations. Funds are also provided as loans to government financial institutions such as LBP and the PCFC as the credit wholesalers, which in turn, relend the funds to qualified credit retailers that include rural banks, cooperative banks, and other organizations engaged in lending to small farmers and fisherfolk.

The agricultural credit and financing programs of the DA through ACPC help small to medium entrepreneurs to access timely and adequate credit with affordable interest rates. These include the following: 1) Sikat Saka Program (SSP), 2) Coop Banks Agri-lending Program (CBAP), 3) Agri-Microfinance Program (AMP), and 4) Agricultural and Fisheries Financing Program (AFFP). With the Registry System on Basic Sectors in Agriculture, where eligible farmers are listed, gteater access to the credit support programs of the government is ensured.

Poor farm-to-market roads

The poor condition of existing road networks, especially the barangay road networks and those outside the vicinity of the production areas, poses a threat to the industry. For one, it can increase transportation cost, leading to lower competitiveness of rice products. With no good roads, farmers are often forced to depend on middlemen to bring their products to the market. Even if they take the trouble of bringing the products themselves, the difficult trip often adds to their costs.

The government gives high priority to infrastructure development. It has implemented the Farm-to-Market Road Development Program (FMRDP), which is a joint undertaking of DA through its regional field offices, DPWH, and the LGUs. This programs aims to (1) construct, restore, and rehabilitate rural roads; (2) reduce transportation cost of farm inputs and outputs as well as minimize postharvest losses; (3) improve access of farmers, fisherfolk, and residents in the area to basic services such as health and education; and (4) connect farms/coastal areas to main roads to promote agro-tourism.

The Duterte administration has the "Build Build Build" program, which is the centerpiece of 10-point socioeconomic agenda. A US$100 M loan for the Infrastructure Preparation and Innovation Facility was approved by the Asian Development Bank (ADB), which will support the government in accelerating the delivery of high-quality public infrastructure projects under the said program. The total cost of the facility is $164.06 M, with the Government of the Philippines contributing $64.06 M. The project is expected to be completed in the second quarter of 2021 (ADB, 2017).

Port congestion during peak season (Iloilo-Zamboanga, Iloilo-Bacolod, Iloilo-Cebu, and all interisland routes)

The efficient movement of goods is crucial to economic growth. In developing countries, the lack of proper infrastructure, including ports, can mean the difference between sustainable progress and persistent under-development. Port congestion during peak season was mentioned by some traders in Cebu. The worsening traffic, poor infrastructure, and port congestion in major cities in the Visayas islands continue to pose risks to rice production growth. The government has increased the budget of maritime transport to PhP 4.2 B in 2017, which is almost double the amount in 2016 for the Maritime Safety Capability Improvement Project, and PhP1.8 B for the Philippine Posts and Coast Guard Capacity Development. This will be used for the construction of new port facilities and renovation of new ones to provide quality services of the Ro-Ro ships for cargo and passengers in the Visayas and Mindanao.

High interisland freight rate for rice

The high interisland freight rate for rice increases the price of rice in the local market. RA10668, also known as the Cabotage Law, allows a registered foreign vessel to carry foreign cargo from a Philippine port of entry to a port of final destination in the country. By fully implementing RA 10668, there will be increased competition among shipping companies, which will lower the cost of shipping of domestic and international goods. In addition, the government needs to allocate funds for the upgrading of port facilities to take advantage of the Cabotage Law and make use of foreign vessels in grain transport.

Low paddy supply

The low paddy supply is reflected in the underutilization of many rice mills. PhilRice and other R&D institutions are tasked to develop new technologies and practices that could increase productivity as well as cost-reducing technologies that could increase profitability. Appropriate crop management practices such as the use of high-quality seed, nutrient and water management, and decision tools such as the Rice Crop Manager are being promoted to farmers nationwide; if these were adopted, would enhance productivity, profitability and competitiveness of the rice industry would be enhanced.

Government support services such as the provision of low cost credit, crop insurance, production support, mechanization, public investments on irrigation and farm-to-market roads and price support would motivate farmers to adopt modern rice technologies which will result to higher productivity, thus increasing paddy supply in the country.

Limited entrepreneurial skills of FOs and cooperatives engaged in rice milling and marketing

The DA, through the DA-RFOs, has provided rice processing centers (RPCs) to selected farmers' organizations and cooperatives nationwide, aiming to increase farmers' income by integrating them into the whole rice value chain. However, many of them do not have the entrepreneurial and trading skills to operate a processing center. There are available training programs on entrepreneurship and business planning that can be tapped from SUCs (e.g., UPLB-CEM-ICOPED) and private sectors, including NGOs.

Table 71. Constraints and opportunities in input provision and production and upgrading strategies in the rice value chain, Philippines, 2015

Constraint	Opportunity
Input provision/production	
1) Mismatch of available high-quality variety seeds with farmers' preference	■ Use of high quality seeds has 10-30% yield advantage over ordinary or farmers' seeds ■ Intensive training programs specific for their accreditation are being provided to seed producers by the government ■ There are 1,728 accredited individual seed growers in the Philippines as of 2015, with total accredited seed production areas of 13,653 ha ■ More seed companies are engaged in the local hybrid seed market, providing farmers more choices of high-performing varieties ■ Presence of informal seed distribution system, where farmers can access high quality seeds ■ Local government units (LGUs) distribute high-quality seeds; wherein some provide a variable degree of local subsidy to price of seed provided to farmers ■ Implementation of community seed banks (CSB), which is considered an extension tool to increase farmers' access to high-quality seeds
2) High price of material inputs (hybrid seeds, fertilizers, pesticides, and fuel and oil)	■ Availability of low-cost credit by the government will enable farmers to buy material inputs needed to improve rice productivity
	■ More seed companies are engaged in the local hybrid seed market, providing farmers more choices of high-performing varieties

	■ Availability of good farming practices such as integrated pest management and integrated nutrient management and cost-reducing technologies such as use of organic fertilizers and pesticides (bio-control agents)
	■ Availability of farm wastes and local biomass
	■ Availability of appropriate crop management practices and technologies on nutrient, pest and water management
3) Too many rice varieties, which leads to misclassification	■ Presence of public rice breeders PhilRice, BPI, UPLB, and IRRI, which develop and submit promising lines to the Rice Varietal Improvement Group (RVIG), a multi-disciplinary, multi-agency body that tests, evaluates, and recommends promising lines to the NSIC for approval and release as commercial varieties for all or specific regions of the country.
	■ Available information on the recommended varieties, together with their agronomic traits, grain quality features, and resistance to pests and diseases
4) Inadequate water supply	■ Availability of funds from the government for the construction of irrigation facilities and rehabilitation of dysfunctional facilities ■ The government through BSWM has also embarked on small-scale irrigation projects such as small water-impounding projects, small diversion dams, shallow tube wells, and small farm reservoirs
	■ Availability of water-saving technologies such as alternate wetting and drying (AWD)
5) Shortage/high cost of labor	■ Farm machinery are important to increase quantity and quality of rice produce and to lower labor cost

	■ The government recognizes the importance of farm mechanization in the improvement of farm productivity ■ Availability of machinery and technologies (i.e., combine harvester and direct seeding) that could cut labor costs in rice production
6) Limited access to production machinery	■ Republic Act 10601 or the Agricultural and Fisheries Mechanization Law was passed in 2013. The Act aims to promote the development and adoption of modern, appropriate, cost-effective, and environmentally-safe agricultural and fisheries machinery and equipment to enhance farm productivity and efficiency in order to achieve food security and safety and increase farmers' income ■ Presence of government agencies such as PHilMech and PhilRice, which conduct research on new appropriate farm machines that would enhance productivity and reduce losses in rice production
	■ Presence of PHilMech and PhilRice who are in-charge of R & D of new appropriate farm machinery, that would enhance productivity and reduce losses in rice production
7) Pest and disease incidence (e.g., black bugs, stem borers, etc)	■ Availability of good farming practices such as integrated pest management and other cost-reducing technologies such as the use of organic pesticides (bio-control agents)
	■ Availability of pest- and disease-resistant rice varieties
8) Limited access to modern rice production technologies and practices	■ Presence of LGUs who are responsible for extension services to promote available packages/sets of rice technologies and practices
	■ Presence of information portals such the Pinoy Rice knowledge Bank, PhilRice Text Center and Farmers' Contact Center

9) Limited financing/credit to expand production	■ Presence of agricultural credit and financing programs of the Department of Agriculture through the Agricultural Credit and Policy Council to help farmers access timely and adequate credit with affordable interest rates. These are the 1) Sikat Saka Program (SSP), 2) Coop Banks Agri-lending Program (CBAP), 3) Agri-Microfinance Program (AMP), and 4) Agricultural and Fisheries Financing Program (AFFP)
	■ Presence of Land Bank of the Philippines (LBP), which provides credit to farmer cooperatives, and other microfinance institutions (rural banks and NGOs) for re-lending at affordable interest rates
10) Climate change/ unfavorable weather condition resulting in high production losses	■ Availability of climate-smart technologies and practices such as diversified farming, cultivation of varieties adapted to various ecosystems and stresses, controlled irrigation, and use of machines that consume renewable energy
	■ Availability of regular and special crop insurance from PCIC
11) Low access to crop insurance	■ Availability of regular and special crop insurance from PCIC

Table 72. Constraints and opportunities in paddy assembly/aggregation in the rice value chain, Philippines, 2015

Constraint	Opportunity
Paddy Assembly/Aggregation	
1) Limited knowledge on paddy grades and standards set by NFA and BAFPS	■ NFA and Bureau of Agricultural and Fisheries Product Standards (BAFPS) have existing paddy grades and standards.
	■ NFA regularly conducts training on grain classification and standards to farmers
2) Limited advocacy for paddy grading and standardization for new paddy traders	■ NFA regularly conducts training on grain classification and standards to farmers
3) Malpractices in selling method --scaling or weighing, deductions, and quoting of prices lower than actual	■ Yearly calibration requirements implemented by LGUs
4) Limited mechanical drying facilities	■ DA provides mechanical drying facilities to farmers' associations/cooperatives
5) Low farm gate price of paddy during peak harvests particularly in major rice producing but remote surplus provinces	■ NFA price support of PhP 17/kg

Table 73. Constraints and opportunities in processing and marketing and upgrading strategies in the rice value chain, Philippines, 2015

Constraint	Opportunity
Processing and Marketing	
1) Insufficient modern milling, mechanical drying, weighing, and storage facilities, which result in low quality of milled rice and high marketing costs	■ Proper drying and storage of paddy improve grain quality and milling efficiency ■ NFA reported 188 modern rice mills in 2013 and 5 RPCs from KOICA
2) High marketing cost (due to high transport, drying, milling and packaging cost and labor intensive) plus the additional cost of agent /diser fees	■ Good road infrastructure lowers transportation cost. ■ The government gives high priority to infrastructure development. ■ FMRs can increase local trade and productivity, reduce transportation costs of farm input and output, and minimize post-harvest losses. ■ Implementation of the Farm-to-Market Road Development Program (FMRDP), which is a joint undertaking of DA through its regional field offices, DPWH and LGUs. This programs aims to (1) construct, restore, and rehabilitate rural roads; (2) reduce transportation cost of farm inputs and outputs as well as minimize postharvest losses; (3) improve access of farmers, fisherfolk, and residents in the area to basic services such as health and education; and (4) connect farms/coastal areas to main roads to promote agro-tourism. ■ Availability of government funds that will be used for the construction of new port facilities and renovation of new ones to provide quality services of the Ro-Ro ships for cargo and passengers in the Visayas and Mindanao. ■ Mechanization can reduce labor requirement and costs.

	▪ Republic Act 10601 or the Agricultural and Fisheries Mechanization Law was passed in 2013. The Act aims to promote the development and adoption of modern, appropriate and cost-effective and environmentally-safe agricultural and fisheries machinery and equipment to enhance farm productivity and efficiency in order to achieve food security and safety, and increase farmers' income
	▪ Availability of rice mills which generate rice husks that can be used for power generation
3) Untimely rice importation arrival, which coincides with peak harvest months	▪ Timely arrival of imported rice will not affect paddy and rice price in the domestic market
4) Rice smuggling: large undocumented rice supply which floods the rice market on lean months	
5) Limited procurement funds on the part of small- and medium-scale traders and millers	▪ Availability of small and medium enterprise (SME) credit facility from Land Bank of the Philippines which can support enterprenuers in starting or expanding their business operations ▪ Presence of agricultural credit and financing programs of the Department of Agriculture through the Agricultural Credit and Policy Council (ACPC) to help farmers access timely, adequate credit with affordable interest rates. These are 1) Sikat Saka Program (SSP), 2) Coop Banks Agri-lending Program (CBAP), 3) Agri-Microfinance Program (AMP), and 4) Agricultural and Fisheries Financing Program (AFFP)
6) Poor farm-to-market roads	▪ FMRs can increase local trade and productivity, reduce transportation costs of farm input and output, and minimize post-harvest losses ▪ Implementation of the Farm-to-Market Road Development Program (FMRDP), which is a joint undertaking of DA through its regional field offices, DPWH, and LGUs. This programs aims to (1) construct, restore, and rehabilitate rural roads; (2) reduce transportation cost of farm inputs and outputs as well as minimize postharvest losses; (3) improve access of farmers, fisherfolk, and residents in the area to basic services such as health and education; and (4) connect farms/coastal areas to main roads to promote agro-tourism

7) Port congestion during peak season (Iloilo-Zamboanga, Iloilo-Bacolod, Iloilo-Cebu, all interisland routes)	■ Availability of government funds that will be used for the construction of new port facilities and renovation of new ones to provide quality services of the Ro-Ro ships for cargo and passengers in the Visayas and Mindanao
8) Low paddy supply	■ Presence of institutions such as PhilRice, PHilMech, and SUCs who are responsible for rice research and development of yield-enhancing and cost-reducing technologies and practices Availability of appropriate crop management practices such as the use of high-quality seeds, nutrient, pest and water management, and decision tools such as the Rice Crop Manager, which are being promoted to farmers ■ to enhance productivity, profitability and competitiveness ■ Public investment on large-scale irrigation facilities, small scale irrigation projects and farm-to-market roads
	■ Presence of rice R&D institutions like PhilRice and PHilMech ■ Availability of climate-smart technologies and practices such as cultivation of varieties adapted to stress environments, controlled irrigation, and machinery that use renewable energy ■ Availability of appropriate postharvest facilities
	■ NFA price support of PhP 17 kg
9) High inter-island freight rates for rice	■ RA 10668 now allows a registered foreign vessel to carry foreign cargo from a Philippine port of entry to a port of final destination in the country
10) Limited entrepreneurial skills of farmers' organizations and cooperatives engaged in rice milling and marketing	■ The DA, through the DA-RFOs, has provided rice processing centers to selected farmer organizations and cooperatives nationwide
	■ Availability of training programs on entrepreneurship and business planning that can be tapped from SUCs (e.g., UPLB-CEM-ICOPED) and the private sector, including NGOs

Photo: PhilRice and PIXABAY

CHAPTER 9

COMPETITIVENESS DIRECTIONS

A. Competitiveness Vision

The Philippines continues to experience rice insecurity that stems from insufficient supply and high domestic prices, which are attributed to low yield and higher production and marketing costs relative to its ASEAN rice-producing neighbors. Within the next 5 years, the rice industry should concentrate on R&D to come out with yield-increasing, postharvest loss-reducing, and cost-minimizing technologies, product development, as well as those that improve efficiency in the rice value chain to enhance the level of competitiveness.

As the rice industry prepares for the ASEAN economic integration or free trade as well as the termination of QRs, it is critical that the rice sector propose changes and initiate reforms to fully realize its desired goals and improve its competitiveness. These changes and reforms emanate from the survey and key informant interviews in the provinces covered, which were assessed and validated by stakeholders through meetings and consultation workshops held in the three major islands of the country. The innovations are wholly directed to increase the income of farmers and boost the development of the rice industry. Likewise, consumer access to quality, safe, and nutritious rice and rice products is ensured.

The following are the specific interventions that can be initiated and continuously pursued to raise the competitiveness of the rice industry.

1. Improve the yield of high-quality varieties and reduce postharvest losses in order to increase and sustain the volume of quality rice supply.

2. Reduce cost of production by promoting labor-saving, cost-reducing, and climate-smart technologies and practices to lower the per-unit cost of paddy and consequently the price of milled rice.

3. Strengthen training and extension delivery services to accelerate the delivery of the latest production, postharvest, and processing technologies to farmers and other value chain actors.

4. Reduce marketing cost or margin through better logistics, support of mechanization of processing and marketing facilities, improvement of rice quality, and increased competition.

5. Provide economic incentives and ensure enabling environments such as appropriate price support, right timing of NFA paddy procurement in

major rice-producing and remote surplus provinces given adequate budget allocation, greater access to low-cost credit, and expansion of affordable crop insurance to farmers and other value chain actors.

6. Enhance the share of farmers in the rice market by providing them with regular market information and assistance in linking with potential markets or by integrating them into the rice value chain.

7. Proper management of the supply and demand situation to stabilize rice prices.

8. Increase income opportunities of farmers and other value chain actors by embarking on product development of rice and rice by-products for agri-business opportunities.

B. Upgrading Strategies and Interventions

Based on results of the value chain analysis and the identified changes and innovations deemed necessary, the following upgrading strategies and specific interventions are suggested to improve the competitiveness of the rice industry in general and of specific segments of the value chain in particular.

Improving rice yield

1. Increase and sustain the widespread adoption of preferred high-quality seed varieties (e.g., hybrid, certified seeds, and home-saved seeds produced by farmers) that underwent proper seed management and selection protocols. This can be done by making high-quality seeds accessible to farmers through

   a) establishment of community seed banking to promote an informal seed system exchange, especially in areas with low access to high-quality seed, which can be facilitated by DA-RFOs in partnership with the concerned LGUs;

   b) building of satellite seed testing facilities per major rice-producing province to facilitate seed certification activities with BPI and DA as the lead agencies;

   c) matching seed demand with supply by assessing the seed demand of farmers (i.e., the preferred variety) to be done by PhilRice, DA-RFOs in collaboration with LGUs;

   d) developing and promoting an effective seed delivery system (e.g., mobile seed center or *lakbay binhi* in remote areas where high-quality seed is not accessible), which can be spearheaded by PhilRice in partnership with ATI LGUs;

e) reactivating and strengthening the seed network by tapping BPI, DA, PhilRice, and seed grower associations;

f) providing farmers and seed growers with real-time seed information, which can be done by PhilRice, DA-RFOs and LGUs; and

g) adopting a selective seed subsidy scheme (particularly for poor farmers) in vulnerable rice-producing areas, which will be facilitated by DA, DA-RFOs, and the concerned LGUs.

2. Ensure the adoption of appropriate crop management practices (e.g., nutrient, pest, and water management) for greater use efficiency through

   a) extensive promotion of the latest technologies and practices by means of farmers' field schools using the *PalayCheck* platform in every rice producing area;

   b) enhancing the capability of the Rice Crop Manager (RCM) tool to provide farmers with 'precise' field- and farmer-specific recommendations on nutrient, pest, weed, and water management; and

   c) ensuring nationwide adoption of RCM by improving farmer access to this decision tool through support from LGUs, DA-RFOs, PhilRice, IRRI, ATI and LGUs, which are the responsible agencies to implement it.

3. Boost public investment in irrigation to raise average cropping intensity for all irrigation systems in regions still with areas to be developed. This can be done by means of

   a) prioritizing investment on small-scale irrigation projects such as SWIP, SDD, STW, SFR, and CIS, prioritizing large rainfed farms not serviced by the NIA system. BSWM, NIA in collaboration with LGUs can be tapped to handle this.

   b) scaling up the construction of new large-scale irrigation systems and rehabilitating dysfunctional ones in major rice-producing provinces with large rainfed areas and near watershed expanses by tapping NEDA, NIA, DA, LGUs, and the private sector.

4. Promote the use of appropriate machinery to improve efficiency and productivity such as:

   a) MP seeder for direct seeding method;

   b) mechanical transplanter for transplanting, with the provision of technology on how to raise seedling;

c) combine harvester for nationwide adoption in harvesting and threshing. PhilRice can be tapped to do it in partnership with ATI, and LGUs.

5. Tap PhilRice in partnership with ATI, DA-RFOs and LGUs in the investment and extensive promotion of yield-enhancing technologies and practices in provinces identified by PhilRice with yield less than the national mean yield of 4 t/ha.

Reducing production and postharvest losses

1. Conduct research on new and appropriate farm machinery to reduce rice production losses, which can be done by PHilMech and PhilRice in partnership with the private sector and SUCs.

2. Promote climate-smart technologies and practices such as cultivation of varieties adapted to stress environments, controlled irrigation, and machinery that use renewable energy, which can be facilitated by PhilRice, ATI, DA-RFOs, and LGUs.

3. Provide farmers with timely, accurate, and site-specific weather and climate advisories to enable them to plan climate adaptation measures by tapping DOST (PAG-ASA), PhilRice, and LGUs.

4. Enhance access to and increase adoption of appropriate postharvest facilities by way of

   a) creating and improving existing machine service centers with custom service provisions (e.g., renting or servicing of machinery) in areas with low access to postharvest facilities by tapping PHilMech in partnership with DA-RFOs and LGUs;

   b) providing low-cost credit to farmers' associations or private individuals who have plans to engage in establishing machine service centers prioritizing areas with type II climate or those that typically experienced lengthy rainy season, which can be handled by ACPC in partnership with PAGASA and LGUs;

   c) improving postharvest value chains by developing and pilot village business models for postharvest and processing activities to enhance access by tapping PHilMech, LGUs and private sector;

   d) developing systems and tools for strengthening postharvest support services such as facility that has to be financed, distributed and maintained which will be facilitated by PHilMech and DA-RFOs;

   e) encouraging LGUs to invest on common service drying and storage facilities for small farmers particularly in areas with inadequate drying

and storage facilities. The VCA results identified Central Luzon, Western Visayas and all major rice-producing provinces with limited drying and storage facilities;

f) strengthening farmers' cooperatives and encouraging farmers to join farmers' organizations/ associations so they can avail of postharvest facilities from DA under a counterpart scheme by tapping CDA, ATI, DAR, DA RFOs and LGUs;

g) NFA investing on drying facilities in strategic areas in major rice-producing provinces to accommodate the big volume of paddy during peak harvest;

h) establishing grain trading posts equipped with complete postharvest facilities under public-private partnerships, which will provide custom service to farmers and other value chain actors prioritizing major surplus production areas such as Pangasinan, Cagayan Valley, Central Luzon, MIMAROPA, Western Visayas, and SOCCSKSARGEN. This strategy can be done by NFA, DA, LGUs, the private sector, and farmers' cooperatives; and

i) encouraging farmers and traders to lessen dependence on customary solar drying method such as drying paddy on roads and highways that result in high drying losses (both quantity and quality) by tapping LGUs and PHilMech

5. Promote proper and efficient use of postharvest facilities by conducting competency-based training on the proper operation and servicing of postharvest facilities such as mechanical dryers and storage units, prioritizing farmers' cooperatives and farmers' associations that are beneficiaries of DA postharvest facilities. Tap PHilMech in partnership with reputable SUCs, ATI, and machine manufacturers and dealers.

Lowering production cost

1. Cut labor costs in labor-intensive operations in rice production by

   a) promoting widespread use of combine harvesters in harvesting, threshing, and hauling activities;

   b) encouraging the practice and/or mechanization of direct seeding as a crop establishment method; and

   c) promoting the development of modern, appropriate, and cost-effective farm machinery in other farm operations

2. Promote the use of good farming practices (such as integrated pest management and integrated nutrient management) and cost-reducing technologies (such as

use of organic fertilizers and pesticides [bio-control]) through additional field demonstrations in strategic areas in major rice-producing provinces.

3. PhilRice and other research institutions to prioritize research studies that stimulate productivity enhancement, develop cost-reducing technologies, and address the adverse impact of climate change.
   Strategies 1-3 can be facilitated by PhilRice in partnership with reputable SUCs, ATI, DA-RFOs, and LGUs.

4. Support the liberalization of fertilizer importation and/or subsidize the price of fertilizer in major production areas that are damaged by calamities by tapping DA, DTI, FPA, and assistance from Congress.

Accelerating delivery of latest production, postharvest, and processing technologies to farmers and other value chain actors

1. Establish a strong linkage between rice R&D and extension agencies to accelerate dissemination and adoption of modern production, and postharvest and processing technologies by assigning DA-BAR as the lead agency responsible for connecting R&D outputs to extension in collaboration with PhilRice, ATI, SUCs, and other research institutions.

2. Enhance technical knowledge of rice extension workers on latest technologies related to the rice value chain by conducting regular training through ATI, PhilRice, PHilMech, and concerned LGUs.

3. Strengthen the extension system to provide up-to-date technical and business advisory services through regular training or field visits to improve productivity and technical efficiency of farmers, which can be done by ATI, DTI, and reputable SUCs.

4. Increase the exposure of farmers to model farms, cooperatives, farm businesses, and research institutions through educational tours and cross-visits to increase their awareness of latest modern technologies as well as stimulate their entrepreneurial acumen, which can be carried out by LGUs, SUCs, and ATI.

5. Enhance technology adaptation through establishment of demonstration sites in strategic locations in key rice production areas by assigning DA-RFOs, PhilRice, LGUs, and SUCs.

6. Promote the use of information portals such as the Pinoy Rice Knowledge Bank, PhilRice Text Center, and Farmers Contact Center to increase farmers' awareness of rice farming management and practices, which will be done by PhilRice, ATI, in partnership with IRRI and DOST.

7. Conduct competency-based training of farmers, cooperatives, associations, and other value chain actors on proper operation and maintenance of postharvest and processing technologies to improve productivity and efficiency by tapping reputable SUCs, ATI, PHilMech, and private sector.

8. Carry out regular training on NFA and BAFPS grain quality grades and standards for farmers' cooperatives or associations and other value chain actors to be facilitated by NFA and BAFPS in partnerships with ATI and LGUs.

9. Revise the Local Government Code to improve the capability of LGU extension workers to deliver extension services to farmers through DILG, ATI, DA, and assistance from Congress.

Improving logistics, infrastructure, processing facilities and equipment, and marketing support to reduce marketing cost

1. Increase investment in public goods that have long-term impacts such as infrastructure and modern processing and marketing facilities to improve efficiency and productivity:

    a. Engage in the construction and rehabilitation of farm-to-market roads by tapping DPWH, DA and LGUs. Priority should be given to provinces that are far from ports like Abra, Apayao, Ifugao, Ilocos Norte, Cagayan, Nueva Vizcaya, Quirino, Nueva Ecija, Aurora, and Palawan in Luzon; Leyte, Southern Leyte, and Biliran in the Visayas; and North Cotabato, Maguindanao, and Agusan del Sur in Mindanao;

    b. Improve the density and quality of roads in major production areas and market centers to accommodate trucks with large capacity by tapping NEDA, ADB, DPWH, and the private sector;

    c. Establish railways and train systems in the long run to lessen travel time from major production areas to market centers through a comprehensive long-term national transport plan which will be carried out by DOTr, DPWH in partnership with NEDA, ADB, and the private sector;

    d. Expand major port areas to increase accommodation of large cargo ships and to lessen port congestion particularly during peak season. Based on results of the geographic flows of paddy and milled rice, milled rice from the major production areas entered the major ports of Manila (North and South) for Regions 1-3; Batangas port for MIMAROPA and Regions 4-A; Legaspi City port for Bicol region and Samar; Cebu City, Iloilo City and Pulupandan ports for Visayas; and Cagayan de Oro City, Davao City, Gen. Santos City, and Zamboanga City ports for Mindanao;

    e. Improve interisland water transport facilities such as the Ro-Ro nautical highway and port facilities to foster interregional trade. This will increase

access between islands and regions, improve efficiency, and lower the cost of interisland transport of goods by tapping PPA, MARINA and the private sector. Priority should be given to island provinces such as Mindoro Oriental, Mindoro Occidental, Negros Occidental, Samar provinces, Palawan, and Bicol;

f. Promote the use of solar panels and establish rice-husk-powered plants in major rice-producing areas to cut down dependence on electricity by tapping DOE, NEDA, and the private sector;

g. Support mechanization of rice processing and marketing by upgrading existing rice mills or establishing modern integrated rice mills or "state-of-the-art" rice mills with sophisticated postharvest facilities and support marketing and storage facilities (such as modern silos) through long-term loans with favorable terms or 'tax incentives.' This can be facilitated by DA, the private sector, and commercial banks;

h. Encourage farmers' cooperatives and associations to practice collective transport by tapping LGUs, DAR, CDA, and the Philippine Cooperative Center.

2. Lower interisland freight cost by (a) supporting the full implementation of RA10688 or the Cabotage Law to increase competition among shipping companies; and (b) encouraging investments for the upgrading of port facilities to enable use of foreign vessels in grain transport by tapping DA, DTI, PPA, and Congress.

3. Improve access to processing by proper positioning of milling and marketing facilities in major rice-producing areas where there is paddy surplus and insufficient number of mills. Based on results of market analysis, there are insufficient units of rice mill in all the major rice-producing provinces, particularly Isabela and Nueva Ecija, while there is a surplus in CALABARZON region. NFA can be tapped to handle this in partnership with DA-RFOs and the private sector (e.g., millers and traders).

4. Strengthen the implementation of grain grading and pricing standards to ensure quality by requiring farmers' cooperatives and other value chain actors to attend seminars on grain classification as part of NFA licensing. The standards should reflect quality rice and the incentives to plant and market quality rice should trickle down to the farmers' level, which will be handled by BAFPS in partnership with NFA, LGUs, and farmers' cooperatives and associations.

5. Intensify strict monitoring of traders' grain classification and weighing practices by

a) tapping LGUs to regularly conduct inspection of weighing scales for conformity to standard weights;

b) assigning NFA to require paddy traders to have a moisture meter machine upon approval of license for transparency; and

c) tapping DA, NFA and LGUs in providing one moisture meter machine each to farmers' cooperatives or associations

6. Improve the quality of paddy to achieve higher milling recovery through (a) breeding of varieties with similar grain shape and length and with high head rice recovery; (b) encouraging farmers to plant fewer varieties to reduce processing cost and improve rice quality; (c) mechanizing the drying of paddy to minimize the high percentage of broken rice and improve the overall quality of milled rice. PhilRice, BPI, NFA, DA-RFOs, PHilMech, and LGUs are the agencies responsible for these strategies.

7. Increase marketing competition by establishing wholesale grain markets with modern facilities, thus ensuring a competitive market place for buyers and sellers, including farmers. The creation of these markets will eliminate the duplication of functions of intermediaries involved in rice trading. It can also provide custom services such as weighing, drying, and temporary storage to both farmers and traders. They can make marketing information transparent to all players, thereby reducing opportunities for rent-seeking activities. The NFA in partnership with private investors can handle this function to provide the facilities for the paddy wholesale market. NFA will formulate guidelines on the operation mechanism for the use and rent of its facilities. The private sector will provide the operating capital and management of the wholesale grain center.

8. Explore the adoption of the warehouse receipt system as a mechanism to strengthen quality assurance and reduce transaction cost. Warehouse receipts are often used as a risk-management tool and as a way of providing small farmers better access to market opportunities. The system involves storing paddy in a warehouse that issues a receipt as proof of ownership. The receipt becomes a transferable instrument that can be used by farmers to sell paddy or that can be used as bank collateral for a short-term loan. This allows farmers to defer paddy sale until the lean season when prices traditionally rise. As borrowers, they can present their receipt to the bank as collateral for a loan equivalent to a certain percentage of the stored good. In the event of a default, the bank can immediately sell the goods to recover its losses. One of the key advantages of the warehouse receipt system is that it facilitates trade through easier liquidation of a commodity. Since warehouse receipts allow the transfer of the right of ownership without actual physical delivery, transaction costs are reduced. It could also help minimize overall logistics and collateral management costs (Briones et al., 2016). This strategy can be

piloted in Western Visayas and NEDA, NFA, LBP, RAFC, and DA-RFOs can be tapped for this task.

9. Liberalize investment in the processing business by allowing foreign direct investment for modernization of rice mills and integration of marketing operations to lower marketing cost and improve product quality by tapping DTI, NFA, and the private sector.

Improving economic incentives and enabling environments

1. Increase access to adequate and low-cost credit by (a) providing additional budget to expand the coverage of the Sikat Saka program and other credit facilities of ACPC to cover more farmers, (b) relaxing the requirements of formal banks to reduce transaction cost and enhance service delivery, (c) encouraging other farmers to join farmers' cooperatives or associations to enable them to avail of credit support from the government, (d) validating the list of farmers in RSBSA of PSA as many eligible farmers are not in the master list and cannot enjoy the benefits due them, (e) intensifying information dissemination to increase awareness of farmers and making farmers credit-worthy, and (d) expanding the ACPC credit support program to include other small value chain actors. ACPC, LBP, DA, DA-RFOs, PSA, ATI, LGUs, and microfinance can be tapped for these strategies.

2. Improve access of farmers to crop insurance through (a) integration of crop insurance information with rice production training to accelerate dissemination and improve awareness by tapping ATI and PCIC; (b) improvement of service delivery by designating one PCIC personnel per municipality to increase the agency's accessibility to farmers, which will be handled by PCIC in collaboration with LGUs; and (c) increased budget appropriations of PCIC to expand coverage of insured crop of farmers by tapping PCIC, Congress, DA, and NEDA.

3. Provide other support services to farmers and other value chain actors in the rice value chain:

    a. Right timing of NFA paddy procurement in major producing and far-flung surplus provinces where farmgate prices of paddy are more depressed during peak production months. This should be taken care of NFA and DA.

    b. Strengthen price support by revisiting the pricing scheme of NFA as it calls for an adjustment due to soaring prices of inputs and diesel, which will be handled by an inter-agency committee on rice that includes the NFA council, NEDA, DA, PSA, PhilRice, and other concerned agencies.

    c. Develop a better market information system for the concerned agency to deliver real-time prices to enable farmers and other value chain actors to

fully benefit from the efficient and timely delivery of market information by tapping PSA, DA-AMAS, DTI, and LGUs.

d. Promote e-trading system among grain industry players to improve access to market information. DTI, DA-AMAS, and the private sector can be tapped for this strategy.

Enhancing market shares of farmers in the rice value chain

1. Train farmers' cooperatives and associations on entrepreneurship to develop their business and trading skills in rice processing and marketing and to improve product quality for greater competitiveness by tapping DTI, DAR, SUCs, PhilRice, and ATI.

2. Strengthen market linkages of farmers by assisting them find potential and emerging markets. DA-AMAS, DTI, ATI, the private sector, and LGUs are the responsible agencies capable of carrying out this strategy.

3. Enhance farmers' access to processing and storage facilities so they can sell their produce strategically and enable them to capture part of the margin that goes to paddy traders, and miller-traders which can be done by DA-RFOs, KOICA, NFA, LGUs and farmers' cooperatives and associations.

4. Cluster rice farmers to encourage them to carry out additional value-adding activities by practicing collective or group marketing to be carried out by LGUs, CDA, farmers' cooperatives/associations, and PhilRice.

5. Provide a rice processing center (RPC) to an eligible group of farmers or cooperatives; however, they need to pass a competency-based training on entrepreneurship and machine operation before the RPC is awarded to them. They must have the necessary skills to manage and operate an RPC. DA-RFOs should be the responsible agency to do this strategy in partnership with PHilMech, NFA, ATI, and SUCs.

Managing rice supply and demand to stabilize paddy and rice prices

1. Improve the time of arrival of imports. This can be done by (a) judicious decision making on rice importation to make imported rice available during lean months and not during peak harvest period and (b) sensible issuance of import permits to private traders to have ample time for the necessary paper-work. These can be handled by NFA, PSA, DA, NEDA, and PhilRice.

2. Determine carefully the volume of rice to be imported by improving rice statistics per province, particularly on periodic rice supply and demand by tapping DA and PSA in collaboration with the LGUs.

3. Reduce NFA intervention in retail markets, especially during time of harvest. Volume of rice injection must be carefully determined and strategically done in areas where poverty incidence is high. NFA should be the responsible agency in partnership with DSWD and LGUs.

4. Strict monitoring of undocumented or smuggled rice in major ports to avoid flooding the market of cheaper imported rice. Tariffs on rice must be imposed to replace QRs to discourage smuggling. However, a variable tariff is proposed to make local rice competitive with imported rice by tapping the Bureau of Customs, NBI, NFA, DA, and Congress.

Embarking on product development of rice and rice by-products for agri-business opportunities to increase income of farmers and other value chain actors

1. Provide farmers and other value chain actors with assistance on product development for market opportunities through the conduct of training programs by tapping DOST, DTI, and SUCs.

2. Enhance the capacity of farmers in product packaging and labeling to improve quality through DOST and DTI assistance.

3. Encourage other end uses of rice (especially exotic colored glutinous rice - rice wine with local herbs, rice bran oil, nutraceuticals).

Strengthening the R&D thrust of PhilRice with focus on the following identified researchable areas:

Researchable area	Funding agency
1. Feasibility study on establishing farm service centers that will provide custom service from production to postharvest operations	DA/PHilMech
2. Adoption/utilization of production, postharvest, and processing equipment	DA/PhilRice/PHilMech
3. Benchmarking on the best postharvest and processing technologies/ practices in the rice industry	PHilMech
4. Comparative economic analysis of typical, modern, and farmer market channels	DA
5. Assessment of rice processing centers provided to farmers' cooperatives and associations	DA-RFOs
6. Development of rice and rice by products	PhilRice and private sector
7. Improvement of varieties with premium eating quality: e.g., high milling recovery, high yield, and resistance to major pests	PhilRice/IRRI
8. Evaluation of grain grading and standards to come up with technical regulation	BAFPS/NFA
9. Assessment of rice quality and quantity requirements of modern retailers	Private sector
10. Assessment of farmers' varietal preference	BPI/PhilRice
11. Evaluation of credit cost of formal and informal sources	ACPC
12. Effect of self-financing on farmers' technology adoption and productivity	ACPC/PhilRice
13. Economic analysis of bulk handling system	DA
14. Assessment of contractual arrangement (business model)	DA

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