PROCEEDINGS OF THE POLICY SEMINAR: IS RICE RESEARCH AND DEVELOPMENT WORTH INVESTING IN?

EDITED BY: Aileen C. Litonjua · Jayca Y. Siddayao · Alfrelyn G. Gregorio

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RICHMONDE HOTEL, ORTIGAS CENTER, PASIG CITY
DECEMBER 3, 2014

-- EDITED BY: AILEEN C. LITONJUA · JAYCA Y. SIDDAYAO · ALFRELYN G. GREGORIO --

2015
PHILIPPINE RICE RESEARCH INSTITUTE
SCIENCE CITY OF MUÑOZ, NUEVA ECIJA, PHILIPPINES

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POLICY SEMINAR

Richmonde Hotel, Ortigas Center,
Pasig City | 03 December 2014

FOREWORD

CALIXTO M. PROTACIO
Executive Director, PhilRIce

Rice is an indispensable crop in our country because it is our staple food. Furthermore, rice production and marketing are prime livelihood sources of many Filipinos. The Philippine Statistics Authority (PSA) points to palay as the biggest contributor (23%) in the Gross Value Added (GVA) of the Agriculture, Hunting, and Forestry industry group in the first semester of 2015.

The significant role of rice in the country cannot miss the attention of the government and other stakeholders. Resources have been invested to address the pressing issues and challenges of the sector. Resarch and Development (R&D) is one investment that has positively affected the industy, resulting in variety improvement, better crop management, and favorable policy environment, among other accomplishments. Despite these benefits, however, R&D institutions have commonly experienced budget cuts or reduction.

Sensitive to this situation, PhilRice organized and conducted the seminar "Is rice R&D worth investing in?" in December 2014 to increase appreciation of rice R&D especially by policymakers and national budget officers and donors. Rice researchers, extension workers, policymakers, the private sector, media, budget officers and donors, and other stakeholders learned and exchanged opinions about rice R&D and its role in the country's goal of attaining rice security.

These proceedings compile and document the paper presentations and discussions during the seminar. Rice stakeholders may refer to this material in crafting informed decisions.

We acknowledge the efforts of the Socioeconomics Division (SED) in successfully planning, organizing, and conducting the policy seminar and in publishing these proceedings.

We also thank the seminar speakers for allowing us to publish their discussion papers and presentations. We appreciate the Policy Research and Advocacy Team of SED who edited the proceedings.

OPENING REMARKS

NECITAS B. MALABANAN
Deputy Executive Director for
Administrative Services and Finance, PhilRice

Good morning to all of us! It is an honor to welcome everyone in this gathering today. There is one question that we will dwell in for the whole day. The question is: Is Rice Research and Development worth Investing In?

First of all, we, as an employee of PhilRice, have invested our lives, our hearts, and our talents toward high-end rice R&D in the country. And if someone will say, this is not worth investing in, it's tantamount to saying that what we do in PhilRice is worthless. How would you agree with that?

If this is not worth investing in, can we then feed the Philippine population, say for the next 20 years given only our present technology?

If this is not worth investing in, will there be a sustainable food security for all given our increase in population?

If this is not worth investing in, will our agriculture be competitive especially for the coming 2017 when quantitative controls will be removed for open market in ASEAN region?

Well obviously I answered the question with questions, simply because I wouldn't want to spoil the good and exciting discussions we will have later on from our good speakers. We trust that through this event we can remind the nation that research and development on rice must be boosted because without it, it may be impossible to reach the goals of local rice industry.

That's all for now, let us have a productive and meaningful day. Welcome and have a rice day!

IS RICE RESEARCH AND DEVELOPMENT WORTH INVESTING IN? AN INTRODUCTION

Aileen C. Litonjua

Rice is an important crop in the Philippines (PH). Results of the Rice-Based Farm Household Survey (RBFHS) of PhilRice showed that in July-December 2011, rice income accounts for more than 50% of household earnings of 68% of the farmer-respondents. FNRI (2008) reported that rice and rice products constitute 37% of the total food intake of Filipinos per day in 2008; cereals and cereal products supply most of their dietary calories.

The significant role of rice in the lives of Filipinos has earned great attention from the government and other rice stakeholders. Efforts to address the challenges and pressing issues of the rice industry include variety improvement, better management techniques, and favorable policy environment. These are some of the products and interventions derived from rice R&D.

According to Hossain and Pingali (1998), R&D institutions have significantly contributed in the technological advancement of rice production through genetically improved varieties and better cultivation practices. These have fueled production growth in the past years.

Francisco and Bordey (2013) concluded that PH R&D is a critical driver of rice productivity. Investments in R&D resulted in cost savings and improved productivity. However, despite these benefits, R&D investment was observed to have a low intensity ratio, which implies insufficient budget allocation.

Sebastian and Bordey (2006) asserted that R&D can contribute in attaining food security and alleviating poverty. Its impact on rice productivity can increase farmers' income and provide affordable and nutritious grains.

The gross impact of the Philippine Rice Research Institute, which leads in local rice R&D, was evaluated in 2008. Based on the review, a peso worth of investment in PhilRice earned an average of 17% net annual rate of return until 2006. The evaluators concluded that this return is more than the interest rate that the government could earn if the resources were just kept in banks (Rola, 2008).

Results of these studies need to be reiterated to our policymakers to promote deeper understanding and appreciation of rice R&D. In fact, there is a serious underinvestment in R&D despite studies showing its significant economic rates of return. R&D spending remained to be low from 2000 to 2012. Under AFMA, R&D should receive 10% of the annual budget allocation in agriculture but actual investment is short by 5.7 percentage points annually in 2000-2012 (Aquino et al., 2013).

This publication centers around the role of Rice R&D in attaining food security and poverty alleviation. Specifically, this proceedings include discussions and presentations on (1) the trends in PH's budget allocation for rice R&D; (2) the impact of rice R&D on rice productivity; (3) the impact of rice R&D on economic welfare; (4) the strategies in generating public funds for rice R&D; and (5) the private sector's points of view on Rice R&D.

REFERENCES:

Aquino, A.P., P.A.B. Ani, and M.A. Festejo [2013] An overview of policies and public sector investmetns in Philippine agriculture, http://ap.fftc.agnet.org/ap_db.php?id=65 Accessed 9 September 2014.

Food and Nutrition Research Institute-Department of Science and Technology (FNRI-DOST) [2008] Philippine Nutrition Facts and Figures 2008. Manila: FNRI.

Francisco, S.R. and F.H. Bordey [2013] Productivity Growth in Philippine Agriculture: Investments in Research, Development, and Extension: Implications on TFP. Philippines: Southeast Asian Regional Center for Graduate Study and Research in Agriculture, Bureau of Agricultural Research, Philippine Rice Research Institute.

Hossain, M. and P.L. Pingali [1998] "Rice Research, technological progress, and impact on productivity and poverty: an overview", in P.L. Pingali and M. Hossain, eds., Impact of rice research. Thailand: Thailand Development Research Institute and Philippines: International Rice Research Institute, 1-25p.

Rola, T.V., ed. [2008] An external review of PhilRice Impact. Commissioned by the DA-Bureau of Agricultural Resarch. Philippines: Bureau of Agricultural Research and Philippine Rice Research Institute.

Sebastian, L.S. and F.H. Bordey [2006] "Research and development", in A.M. Balisacan, L.S. Sebastian, and associates, eds., Securing rice, reducing poverty: challenges and policy directions. Laguna, Philippines: Southeast Asian Regional Center for Graduate Study and Research in Agriculture, 1-19p.

TRENDS IN THE PHILIPPINES' RICE R&D BUDGET ALLOCATION

MANUEL JOSE C. REGALADO

HIGHLIGHTS OF THE PRESENTATION

Budget allocation trends for R&D institutions and units, such as the Bureau of Agricultural Research (BAR), Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (PCAARRD), regional offices of the Department of Agriculture, and the PhilRice, are generally increasing in nominal terms. Meanwhile, the National Rice and Corn Program received a huge budget increase in 2010 but reduced in the succeeding years. Increased annual budget allocation for R&D institutions, however, is not an assurance that the country is providing enough for R&D.

Based on literatures, R&D investment in the Philippines is less than what is recommended. The percent share of R&D on the Gross Domestic Product (GDP) has reduced from 0.15% in 2002 to 0.11% in 2009. Moreover, compared with other countries, the Philippines invests relatively less on R&D. It was also observed that the private sector invests more on R&D than the public sector.

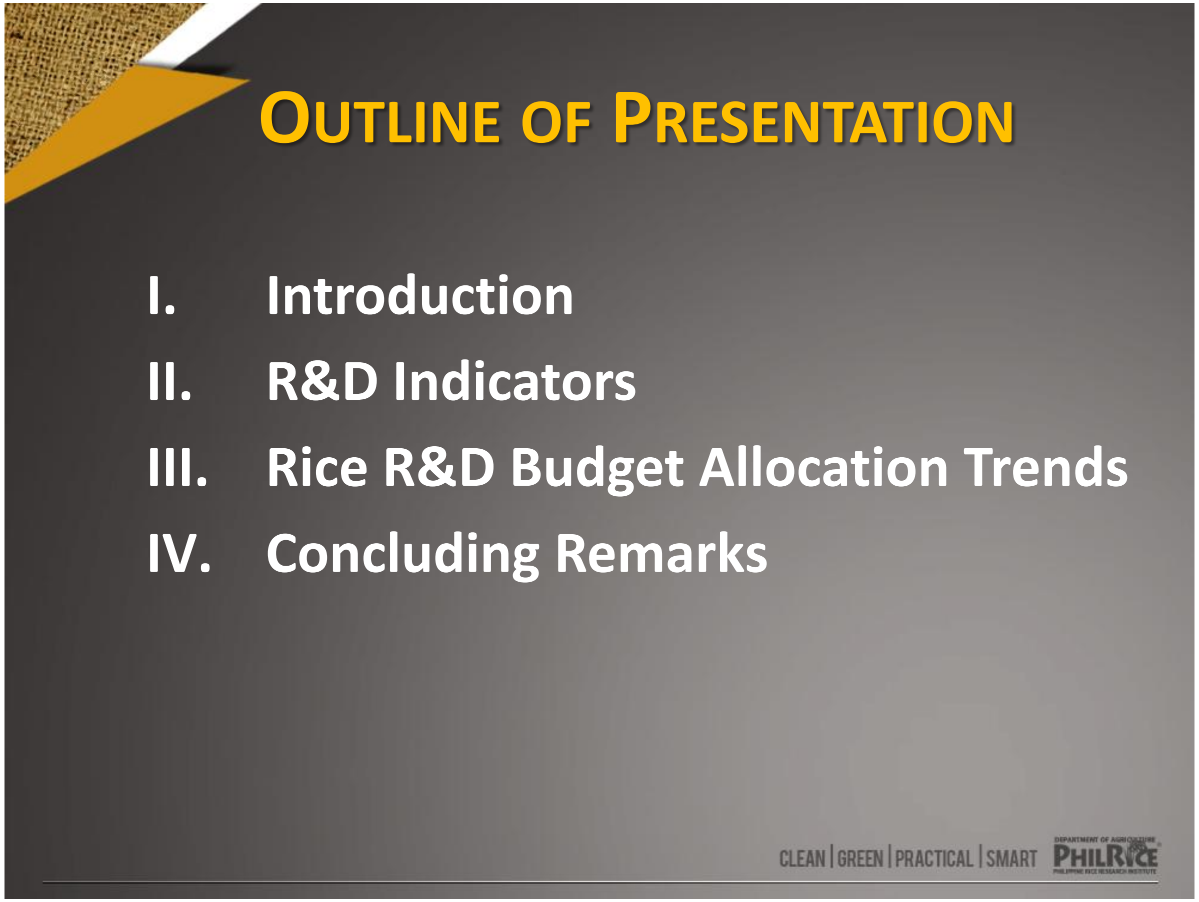
Investments on R&D were concentrated on crops, specifically on rice. This can be explained by the sector's importance to the Philippine economy as it contributes largely to the country's GDP.

Ideally, R&D investments should at least be at par with the value of production of the crop. However, data have shown that investments on rice R&D are relatively less than its production value. Therefore, this implies that increased budget allocation for rice R&D is still needed.

Investments in rice R&D can result in returns more than enough to cover government expenses on this endeavor. Hence, rice R&D is worth investing in.

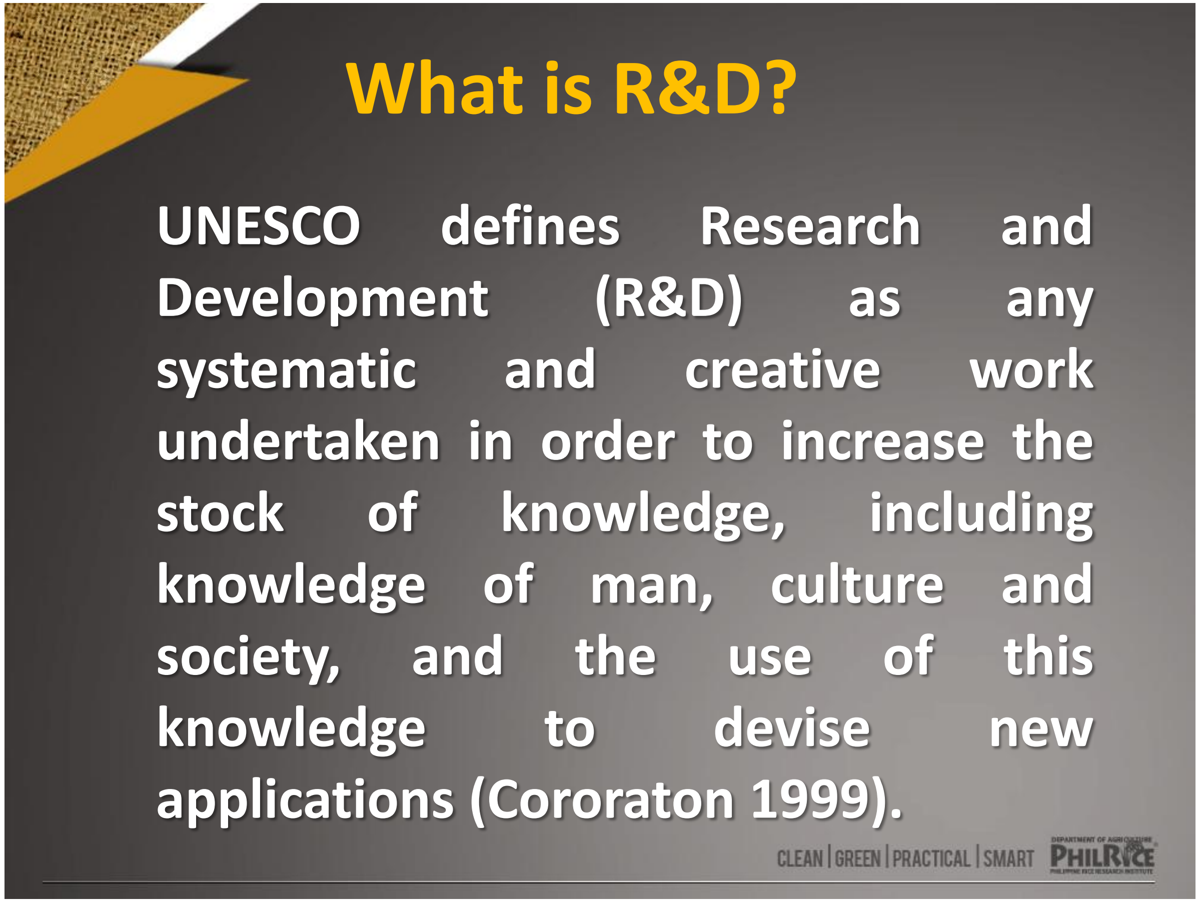
TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION

SLIDE TRANSCRIPT



The trend in budget allocation could help us answer the title of this seminar "Is rice R&D worth investing in?" The subtopics of this presentation are introduction, R&D indicators, rice R&D budget allocation trends, and concluding remarks.

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION



SLIDE TRANSCRIPT

Why should we invest in R&D?

UNESCO defines Research and Development (R&D) as any systematic and creative work undertaken in order to increase the stock of knowledge (take note of the word knowledge) including knowledge of man, culture, and society, and the use of this knowledge to devise new applications. This came from Ceasar Cororaton of PIDS in his paper Rates of return to R&D investment in the Philippines.

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION

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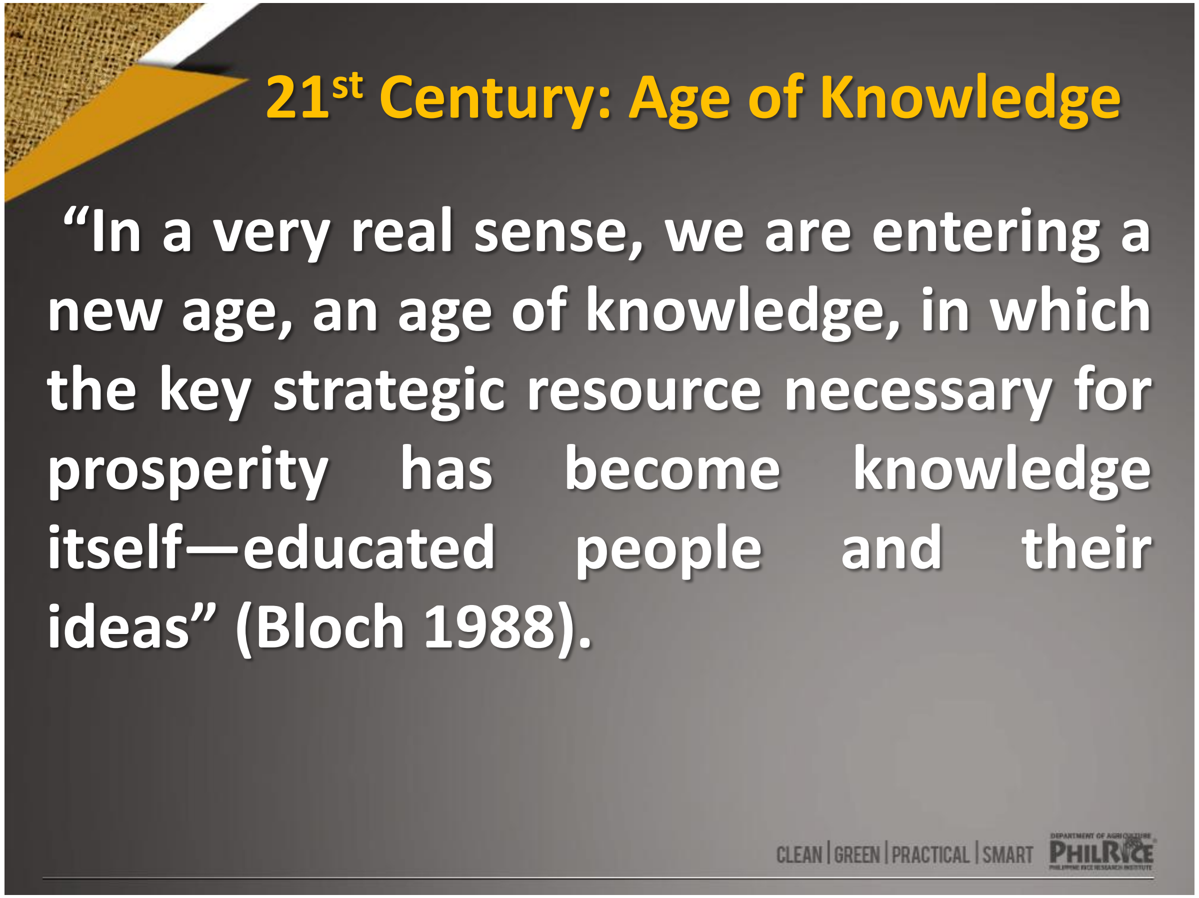

The reason I mentioned the word knowledge is because as early as the 20th century, some scientists say that we will be entering into the "age of knowledge".

21st Century: Age of Knowledge

This is from Eric Bloch, former Director of US National Science Foundation while he was in front of US congress in defense of the budget not only on some foundation but also on universities and research institutions, to which all of us belong.

"In a very real sense, we are entering a new age, an age of knowledge, in which the key strategic resource necessary for prosperity has become knowledge itself–educated people and their ideas" (Bloch 1988).

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION

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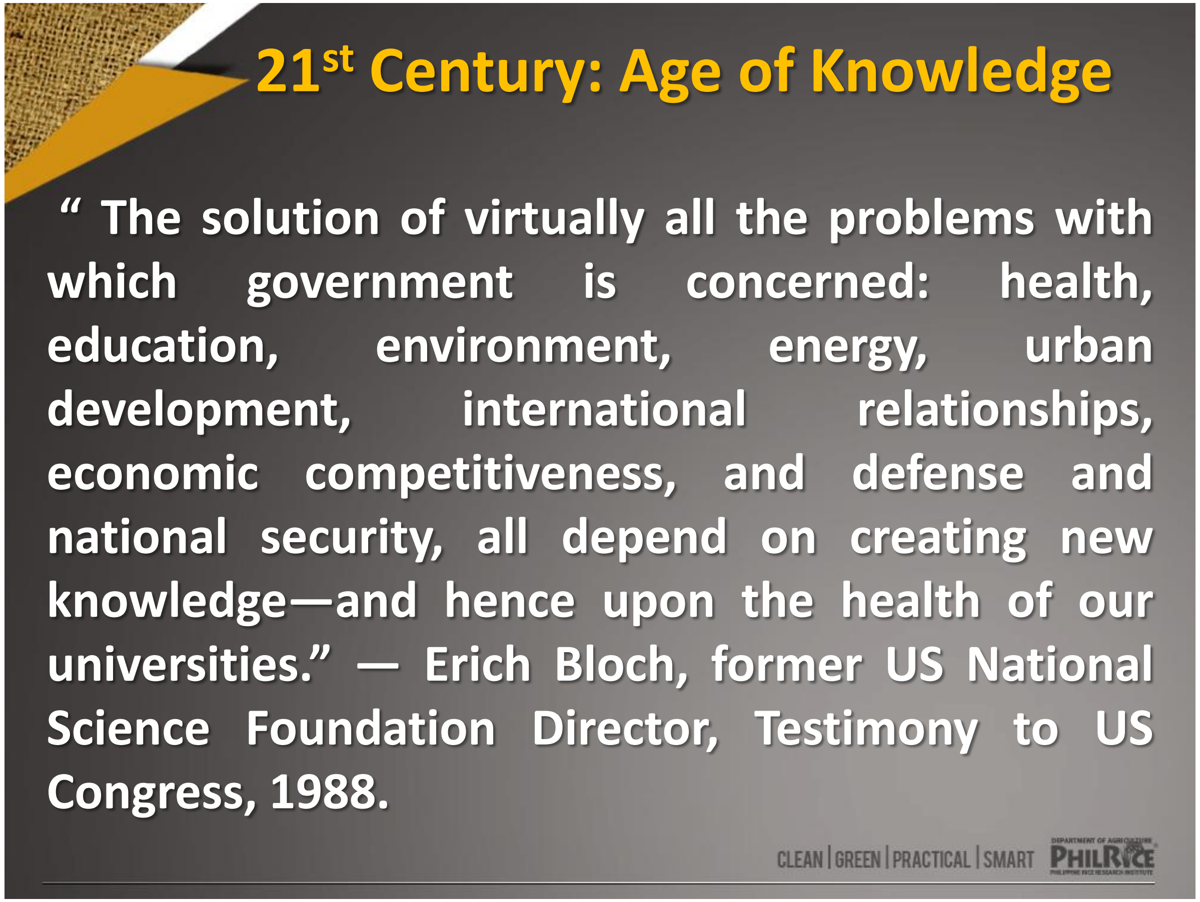

He also says:

"The solution of virtually all the problems with which government is concerned: health, education, environment, energy, urban development, international relationships, economic competitiveness, and defense and national security, all depend on creating new knowledge□and hence upon the health of our universities."

This is why it's important that R&D creates and contributes to the body of knowledge. We would probably understand why we require papers to be written because we cannot really contribute to the body of knowledge if we will not write or publish the results of our R&D activities.

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION

R&D Indicators - Philippines

Indicator	2002	2003	2005	2007	2009
Total R&D Personnel (Headcount)	9,325	13,488	14,087	14,649	16,673
No. of Researchers (Headcount)	7,203	8,866	10,690	11,490	13,091
Population Size (in Million People)	80.16	81.88	85.26	88.57	92
No. of R&D Personnel per million population	116	165	165	165	181
No. of Researchers per million population	90	108	125	130	142
GDP (current prices/ in million pesos)	3,963,873	4,316,402	5,444,038	6,648,619	7,678,917
Total R&D Expenditures (current prices/ in million pesos)	5,769.75	5,909.75	6,362.32	7,556.36	8,779
R&D Expenditures as % of GDP	0.15	0.14	0.12	0.11	0.11
Public R&D Expenditures* (current prices/ in million pesos)	1,615.59	1,584.73	2,268.20	2,660.39	3,138
% share of oublic to total RDE	*28%*	*27%*	*36%*	*35%*	*36%*
Private R&D Expenditures** (current prices/ in million pesos)	4154.16	4,325.01	4,058.54	4,895.97	5,641
% share of oublic to total RDE	*72%*	*73%*	*64%*	*65%*	*64%*
RDE per R&D Personnel (current prices, in thousand pesos)	619	438	449	516	527
RDE per Researcher (current prices, in thousand pesos)	801	667	592	658	671

* Includes expenditures of government agencies and state universities and colleges ; ** Includes expenditures of private industries, private universities and private non-profit institutions

From: Compendium of S&T Statistics, DOST 2012.

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This is the trend of investment in R&D as percentage of Gross Domestic Product (GDP) of the country.

The R&D expenditures as percentage GDP in 2002 was 0.15%. This is equivalent to PhP5.8 billion. In 2009, it's only 0.11%, which is equivalent to PhP8.8 billion. R&D expenses in nominal terms increased from 2002-2009, but since GDP also increased (to more than PhP7 trillion in 2009), it resulted in reduced share of R&D expenses to GDP from 2002 to 2009.

The private sector provides higher investment in R&D than the public sector. In 2002, the share of public to total R&D expenses is only 28%; 72% for the private sector. In 2009, government expenses comprise 36% of the total R&D expenditures, while 64% for the private sector. Nevertheless, government investment in R&D increased through time.

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION

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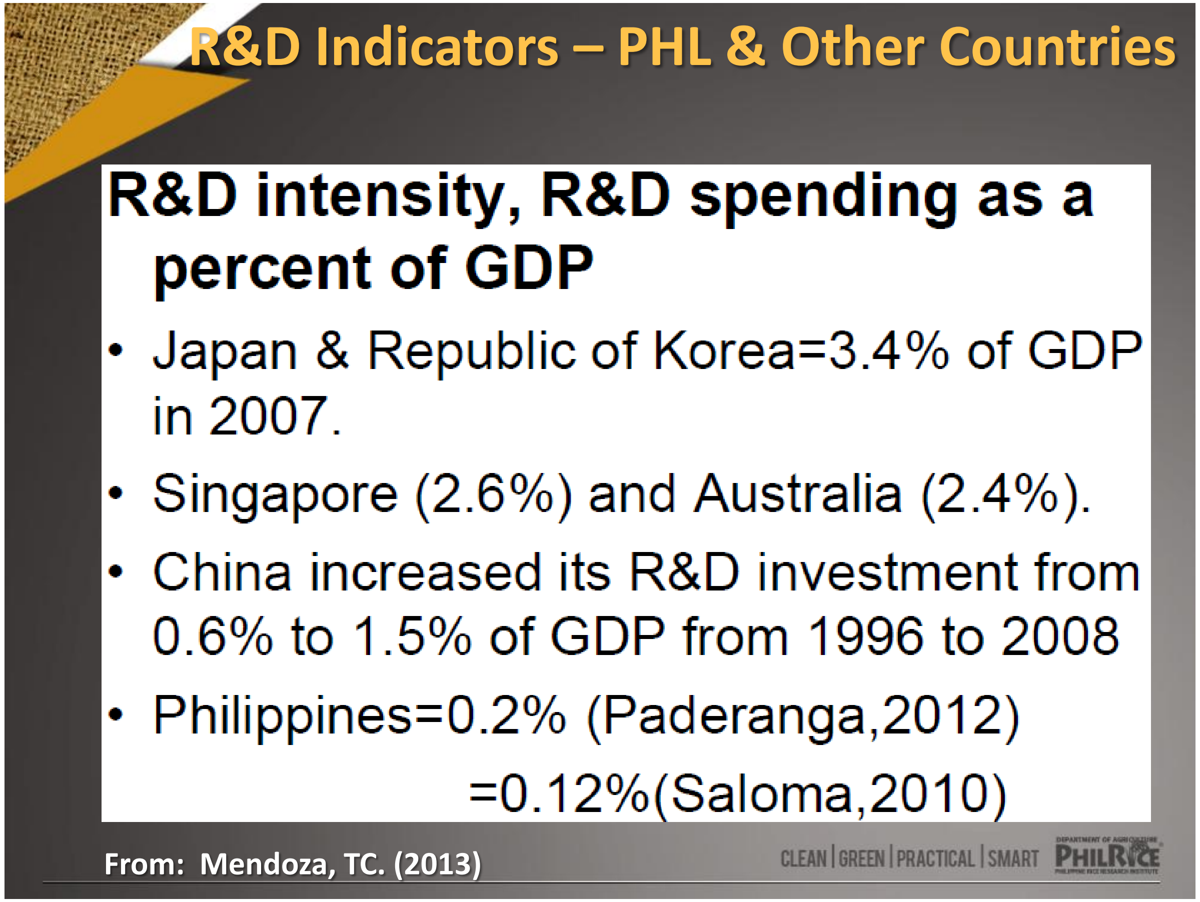

I got this presentation from one of the members of PhilRice's Board of Trustees (BOT), Dr. Teodoro Mendoza (2013), who compared R&D intensity (or R&D spending as a percent of GDP) of the Philippines and that of the other countries:

R&D investments in Japan & Republic of Korea amounted to 3.4% of their GDPs in 2007. Singapore's R&D investments share to GDP is 2.6%; Australia 2.4%. China increased it's R&D investment from 0.6% in 1996 to 1.5% of GDP in 2008. For the Philippines, Paderanga (2012) recorded 0.2% while Saloma (2010) estimated 0.12% of GDP.

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION

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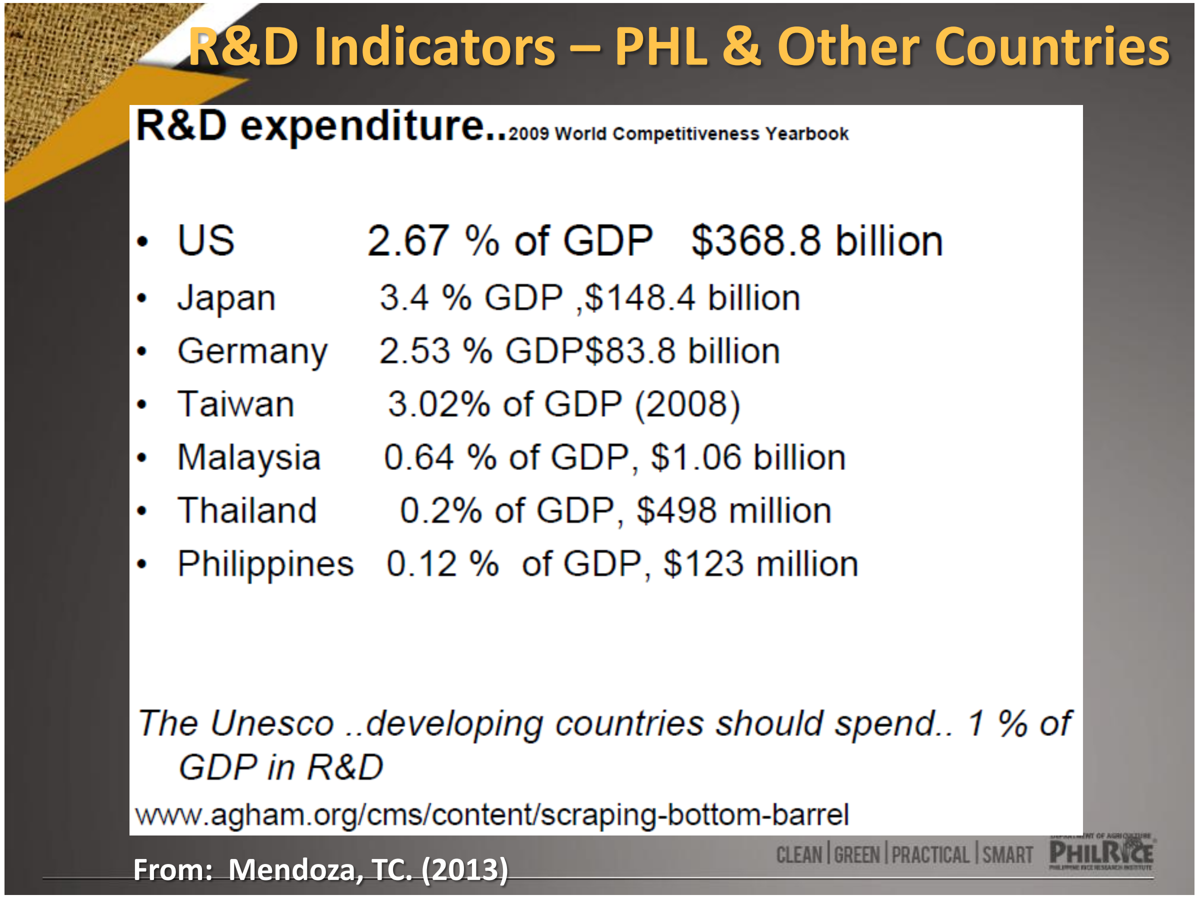
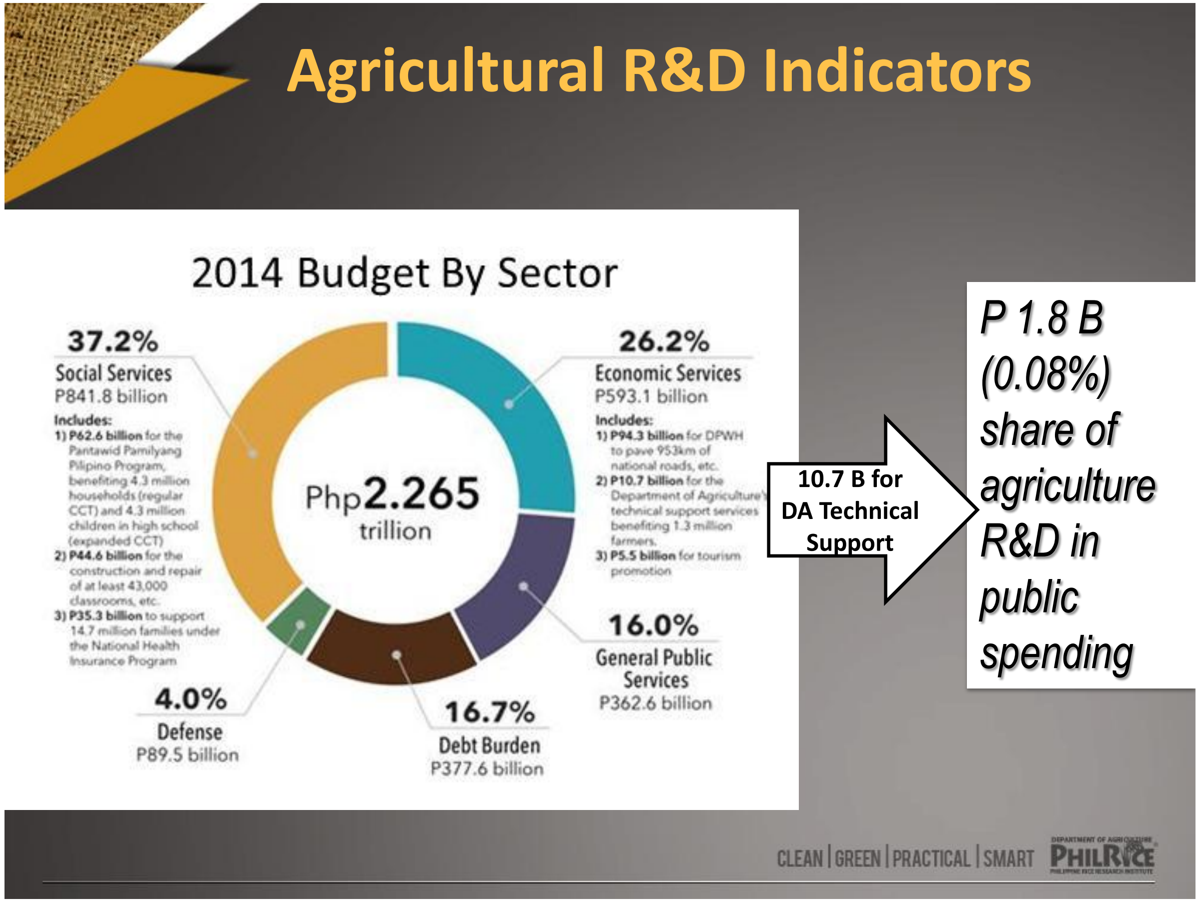


Compared with our Asian neighbors, Philippines invested only 0.12% of its GDP to R&D in 2009, amounting to $123 million. On the contrary, Malaysia's R&D spending was 0.64% ($1.06 billion) and Thailand's was 0.2% ($498 million) of their respective GDPs. This could partly explain for Thailand's more progressive rice industry; they gave importance to R&D investment. This just shows that the Philippines has the smallest investment in R&D.

According to the paper of Dr. Mendoza, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) is urging developing countries to invest at least 1% of GDP in R&D (both private and public sectors), whether it's agricultural or industrial. The knowledge that can be created through R&D will bring us new knowledge. The United State of America (USA) spent 2.67% of their GDP in R&D in 2009, which is almost $370 billion.

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION



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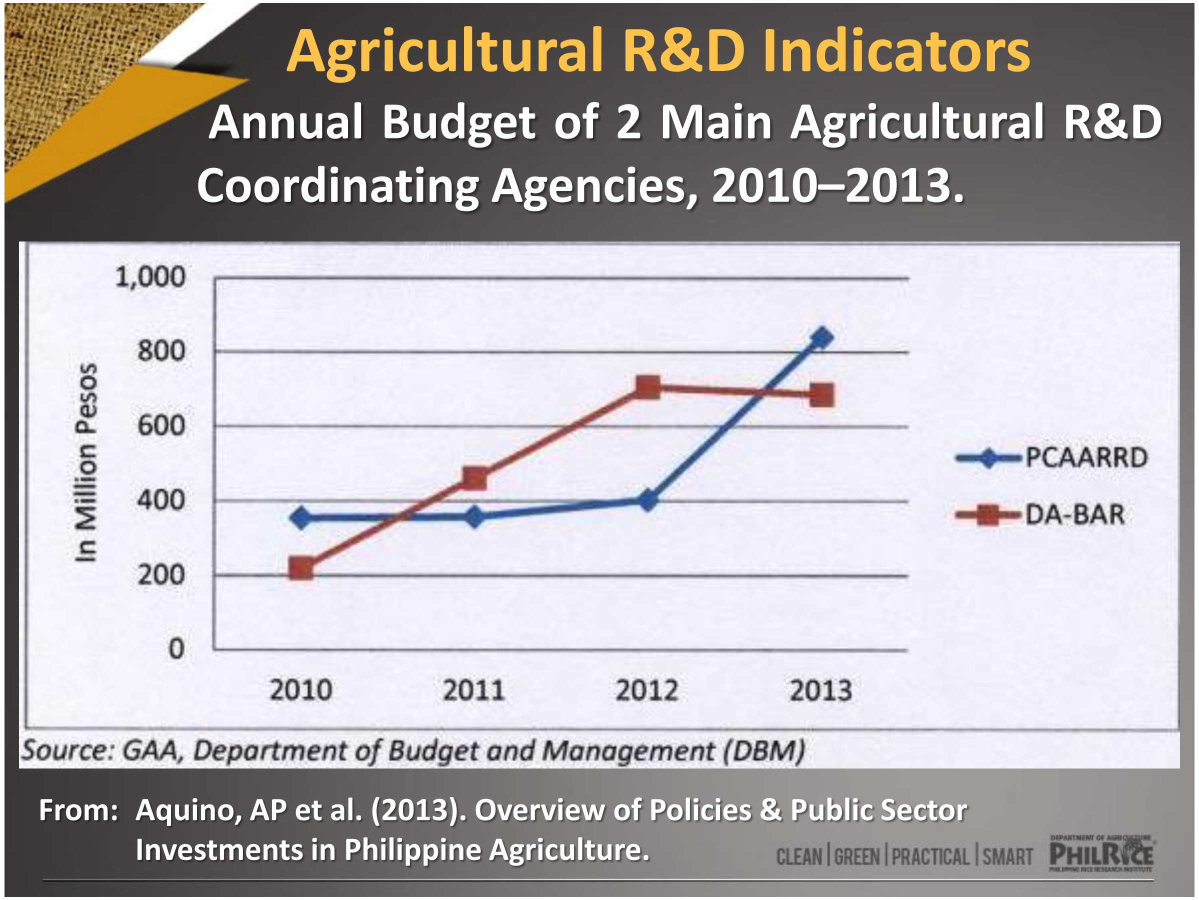
In 2014, the Philippines had a total budget of Php2.265 trillion, 26.2% of which was allotted for economic services, where agriculture belongs. Of the total budget for economic services (i.e., PhP593.1 billion) only PhP10.7 billion was given to the DA technical support services, which includes R&D budget amounting to PhP1.8 billion or 0.08% of the overall budget of the country.

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION



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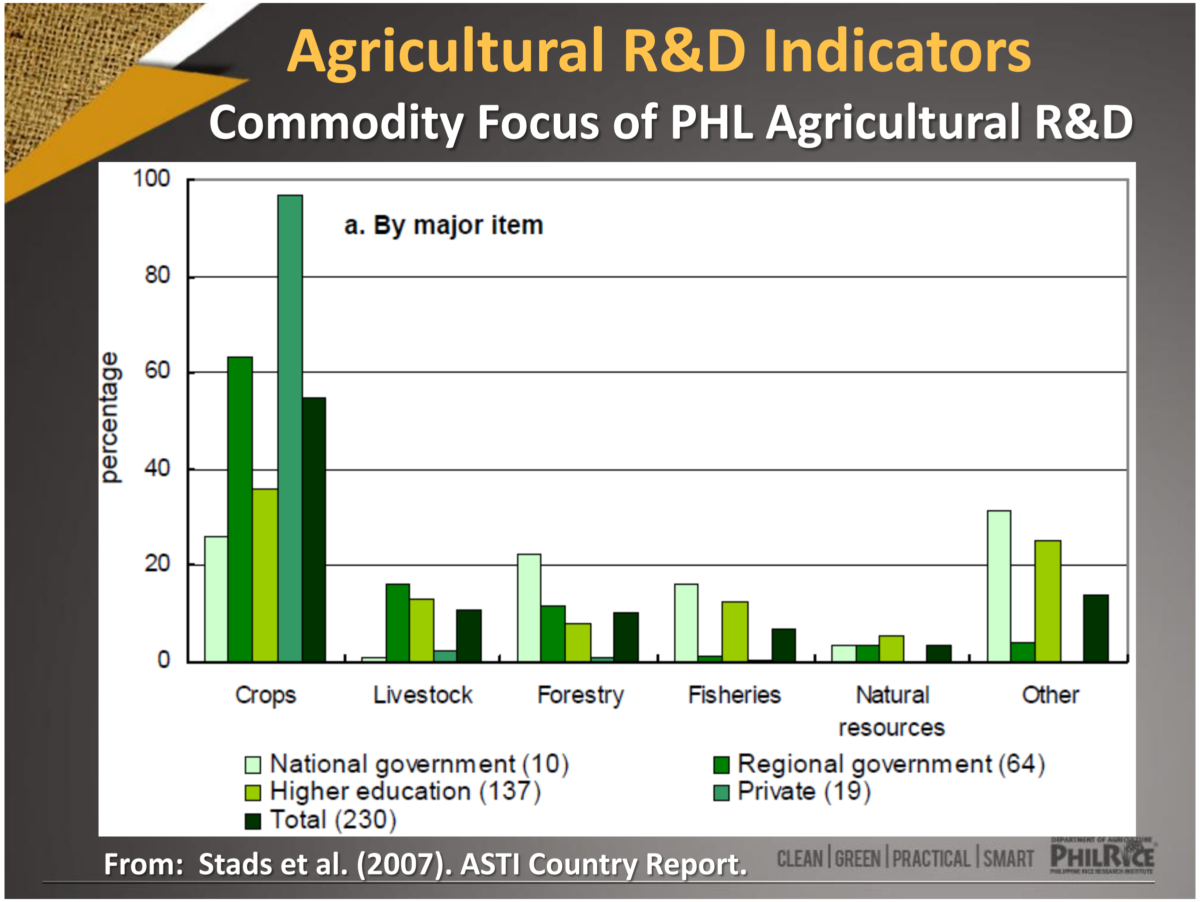
On the contrary, budget allotment for specific R&D coordinating institutions like the Bureau of Agricultural Research (BAR) of the Department of Agriculture (DA) and the Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (PCAARRD) of the Department of Science and Technology (DOST) increased in 2010-2013. DA-BAR increased by more than twice, while DOST-PCAARRD increased by about 100% (Aquino et al., 2013).

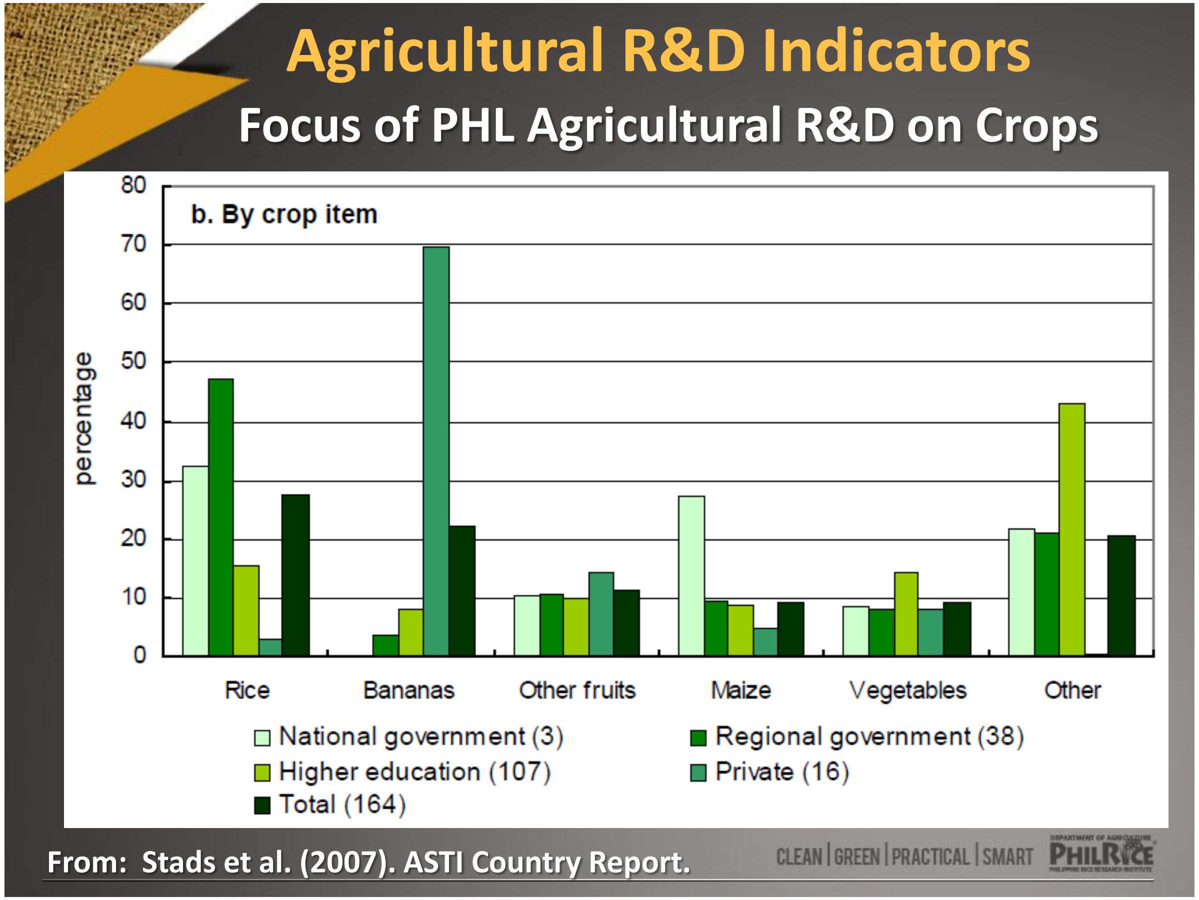
TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION



SLIDE TRANSCRIPT

Where did the budget on agriculture go? This graph is from the paper of Stads et al. (2007). They analyzed the R&D expenditures of agencies in the Philippines. Results show that the focus is on crops and less on the livestock. This is based on a survey of the national government constituting 10 institutions, 137 higher educational institutions, 64 regional government and 19 private. This totals to 230 institutions involving more than 3,000 researchers.

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION

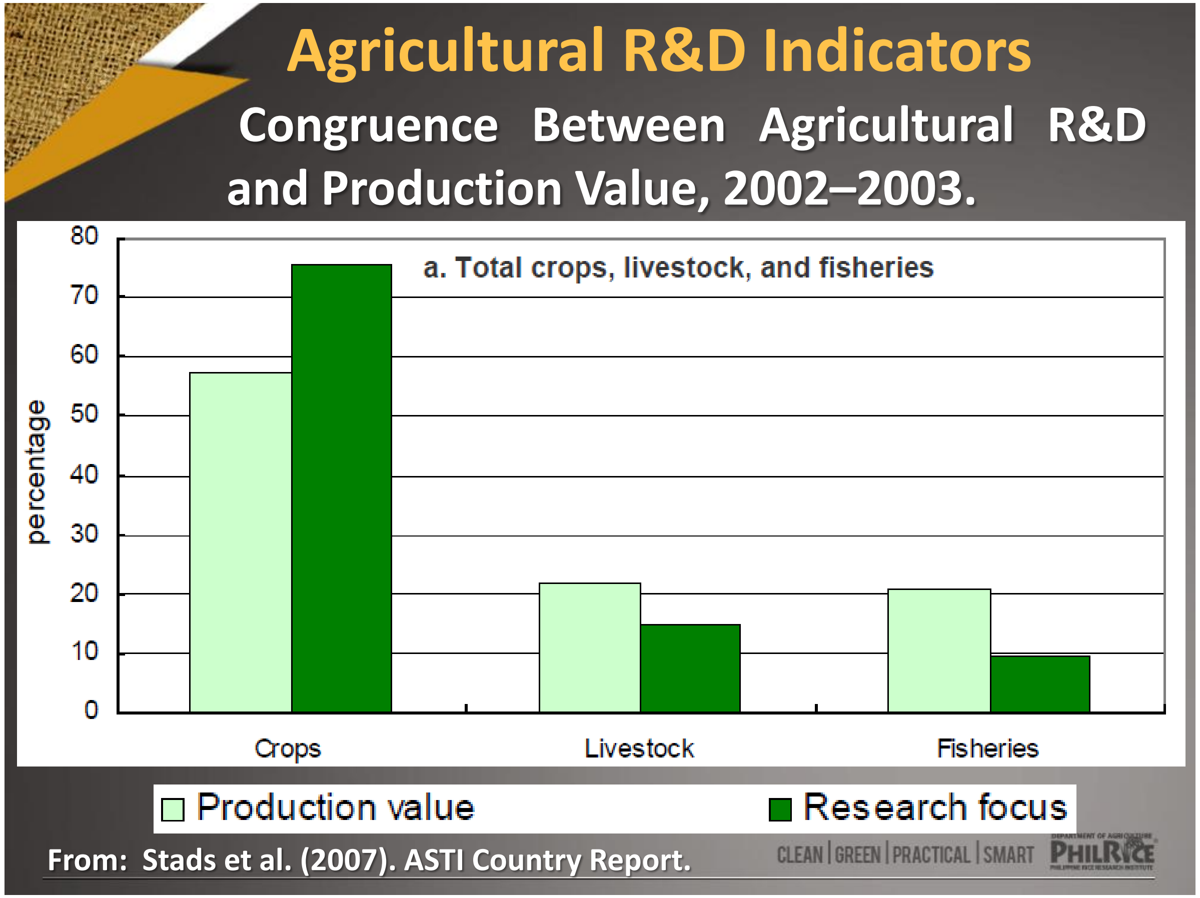


SLIDE TRANSCRIPT

Specifically, budget of R&D for crops is highly concentrated on rice except for banana. However, focus on banana mainly came from the private sector; only a small percentage came from the regional government, and almost none from the national government.

Why rice? The total value of agricultural crops produced in the Philippines in 2012 was PhP797.73 billion. Almost 37% of which came from rice production (equivalent to PhP292 billion). The Gross Value Added (GVA) in agriculture and fisheries was PhP1.247 trillion in the same year. Palay contributed 23% of this GVA. This could explain for more R&D focused on rice than other crops.

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION



SLIDE TRANSCRIPT

Stads and associates made a congruence model between R&D focus or investments and the production value of a product. Ideally, R&D focus or investment should be the same as that of the production value of a commodity. Their results show that for crops, the research focus or investment was higher than the production value in 2002-2003. Meanwhile, for livestock and fisheries, the production value was higher than the investment.

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION

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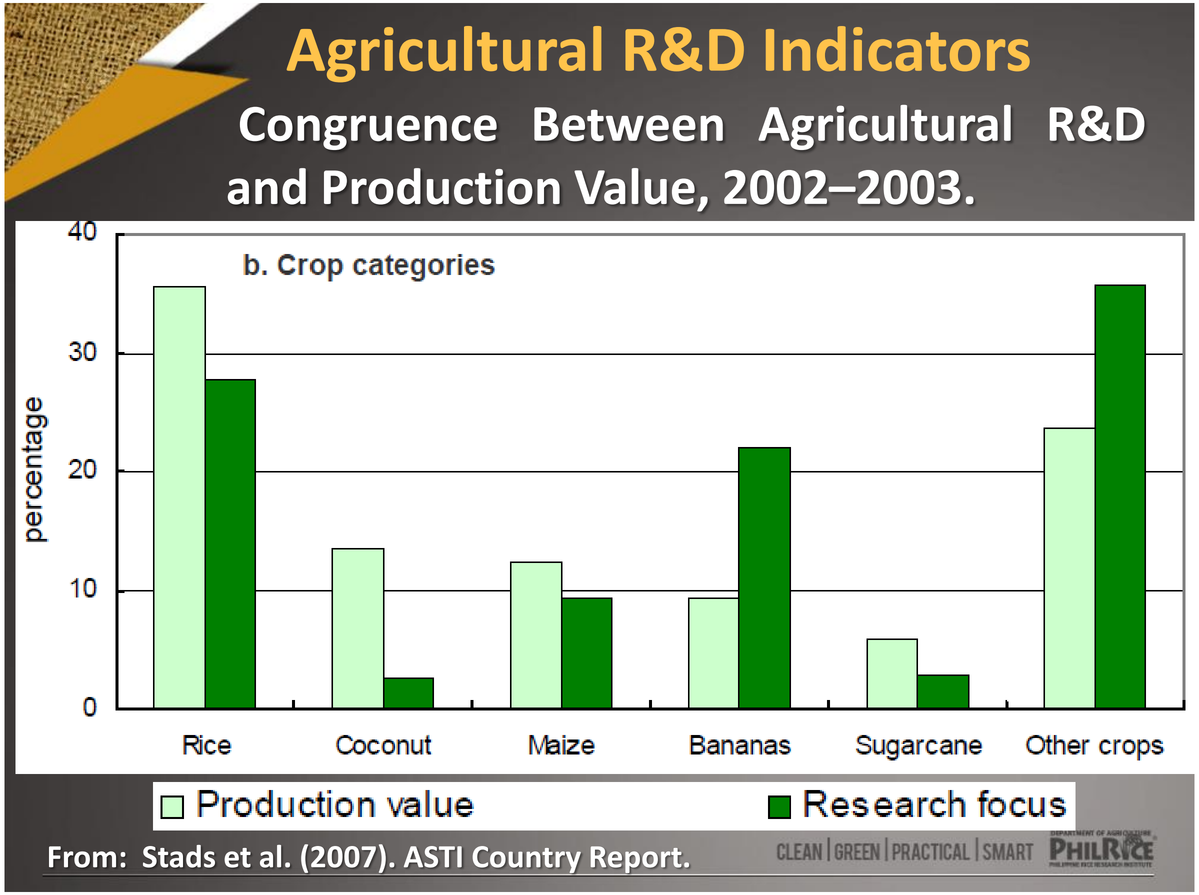
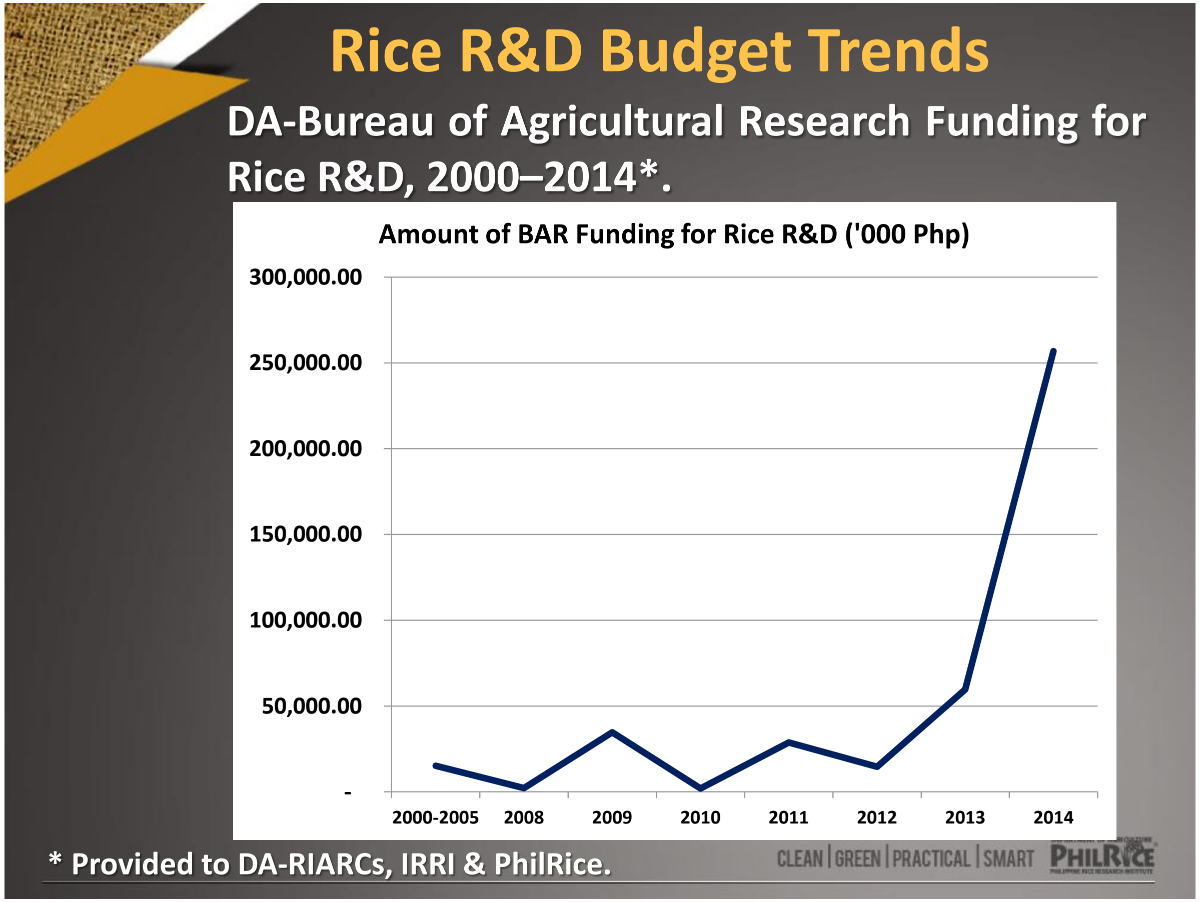


However, for specific crops, rice shows higher production value than R&D investment. This means that there should be an increase in R&D investment on rice and the other crops because ideally research focus should be at least the same as the production value.

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION



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Data from the Bureau of Agricultural Research (BAR) show that from 2000-2012, budget trend is almost intact but funding exponentially increased in 2013-2014. This may be explained by the revived Rice Self-sufficiency Program (RSSP), which was transformed into Food Staples Sufficiency Program (FSSP). It received a budget amounting to more than PhP250 million for rice, which is about 25% of BAR's budget for R&D.

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION

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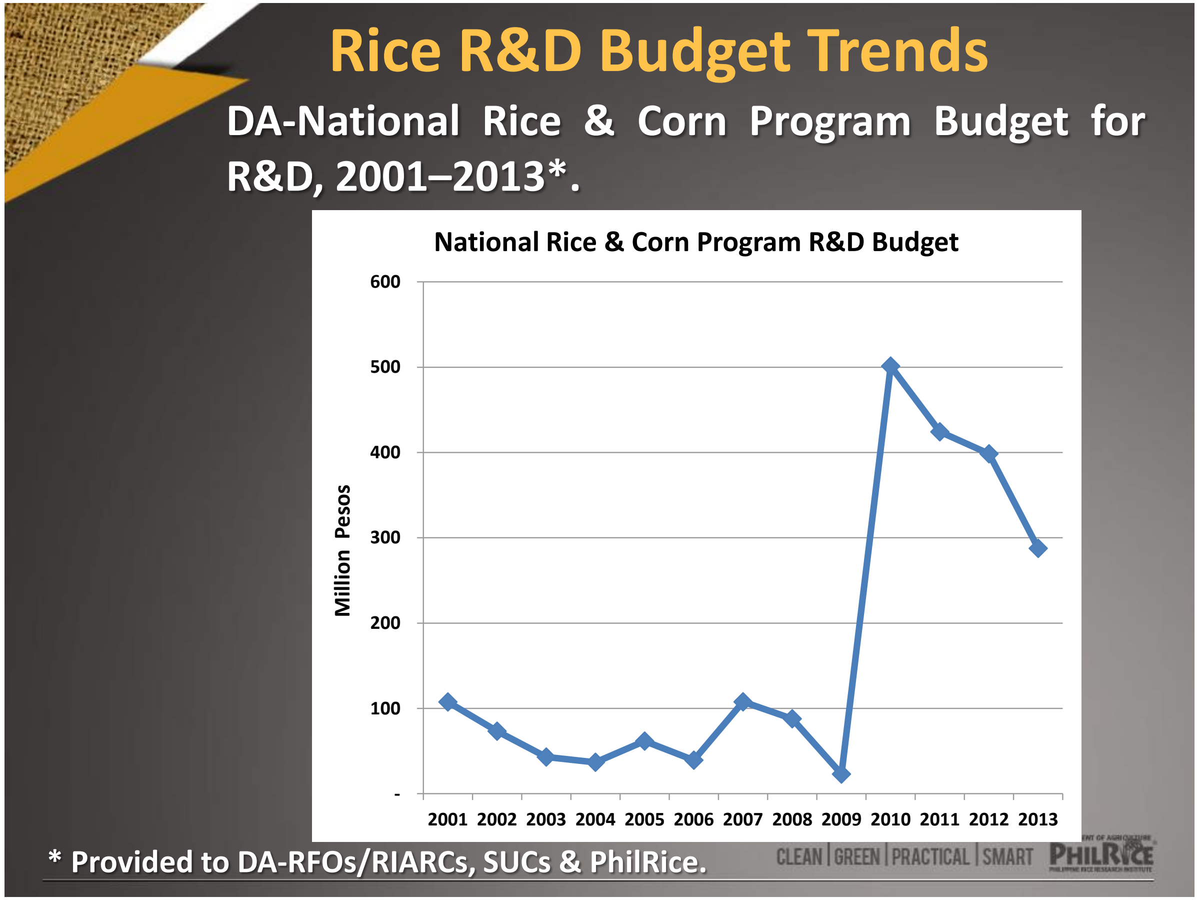

This is the budget trend of the National Rice and Corn Program. It decreased from 2001 to 2009, but drastically increased in 2010. However, the budget was reduced again in 2011-2013. This is becase the research component of the program was transferred to BAR. Only the development activities, such as deployment and demonstration, were retained under DA Rice and Corn Program.

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION

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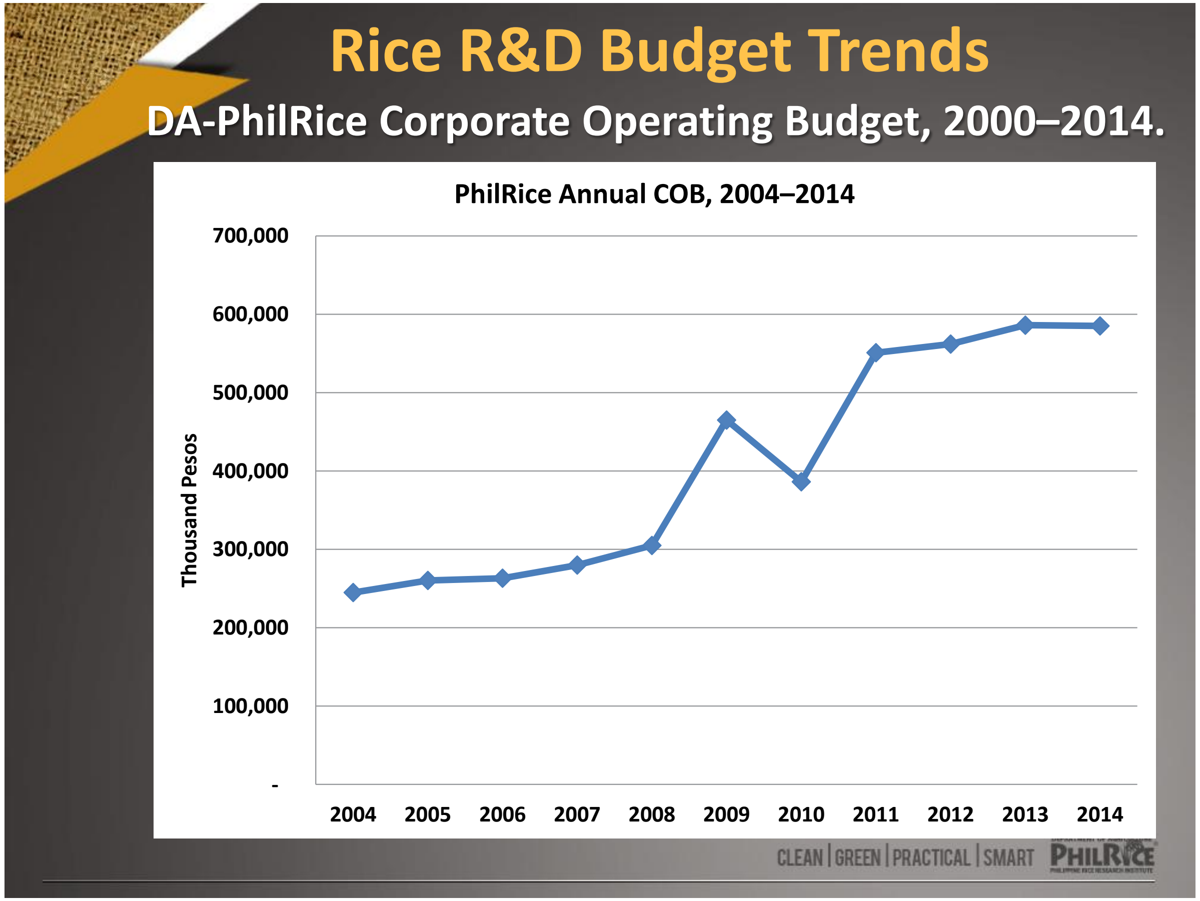

For PhilRice, the budget trend has increased from about PhP250 million in 2004 to almost PhP600 million in 2014.

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION

SLIDE TRANSCRIPT

Total Number of Studies by Discipline, 2013-2014

Programs, Divisions, Center, Stations	Core (PhilRice)		Externally Funded	
	2013	2014	2013	2014
Germplasm Management and Plant Breeding	53	89	17	13
Agronomy, Soils and Plant Physiology	69	58	18	11
Pest Management	27	16	6	4
Rice Chemistry	16	16	2	2
Rice Engineering	13	20	2	2
Seed Technology	16	16	1	1
Socio-economics	9	11	4	2
Communication, Training and Information Systems	71	69	19	14
TOTAL	**274**	**295**	**69**	**49**

Total Number of Studies, 2013-2014

Source of Funds	2013	2014
Core (PhilRice)	274 (80%)	295 (86%)
Externally Funded	69 (20%)	49 (14%)
Total Number of Studies	**343**	**344**

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Here are some studies conducted by PhilRice through its divisions and stations. In 2013 there were 274 core-funded studies (i.e., using PhilRice budget) and 69 externally-funded studies. The ratio of core-funded and externally-funded studies is 80%-20%. At present (2014), there are 295 core-funded studies and 49 externally-funded.

Conclusion — 2013 Highlight & Impact of Physical Performance

21 new rice varieties

- 8 for irrigated ecosystem (1 inbred, 7 hybrid)
- 2 for rainfed lowland dry-seeded areas
- 9 for saline-prone areas
- 2 special purpose

Potential Impact of New Rice Varieties

Ecosystem	Area Harvested (ha)	Yield Increase (t/ha)*	Potential Increase In Rice Production (t)	Value in Pesos @ P17/Kg
Irrigated	1,531,699	0.98	1,504,314.92	**25,573,353,611**
Saline	200,000	0.49	98,000.00	**1,666,000,000**
TOTAL			**1,602,314.92**	**27,239,353,611**

* *average yields of 2012 vs new rice varieties*

SLIDE TRANSCRIPT

One of the products (bread and butter) of PhilRice is the varieties.

Although these varieties are not all bred at PhilRice, most of them cannot pass as varieties if PhilRice did not take charge of national cooperative tests. These are 8 varieties for irrigated ecosystem (1 inbred and 7 hybrids); 2 varieties for rainfed lowland dry-seeded areas; 9 varieties for saline-prone areas; and 2 varieties with special purpose.

Our Corporate Services Division, in collaboration with the Socioeconomics Division, assessed the potential impact of these new varieties. Assuming that varieties for irrigated areas could result in a yield increment of 1 metric ton (mt) per hectare (ha), an irrigated area of 1.5 million ha could produce additional 1.5 million mt of palay, with a value of PhP26 billion (assuming PhP17/kg palay price). Additionally, using an estimated yield increment of about 0.50 mt/ha for saline varieties and a total of 200,000 ha of land, the potential increase in rice

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION

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TOTAL			1,602,314.92	27,239,353,611

** average yields of 2012 vs new rice varieties*

production in saline areas would be 98,000 mt with a value of Php1.66 billion. The total value of incremental yield in irrigated and saline areas would then be PhP27.2 billion.

If the government budget allotted for the Rice Program, BAR, PhilRice, and PCAARRD were summed up, it could worth more or less PhP1.5 billion. But the potential return or impact in monetary terms of the research products, such as varieties, could reach as high as PhP27 billion. Ten per cent of this return can even cover the estimated government investment of PhP1.5 billion. With this, can we now say that rice R&D is worth investing in?

TRENDS IN THE PHILIPPINE'S RICE R&D BUDGET ALLOCATION

REFERENCES:

Aquino, A.P., P.A.B. Ani, and M.A. Festejo. 2013. An Overview of Policies and Public Sector Investments in Philippine Agriculture, http://ap.fftc.agnet.org/ap_db.php?id=65&print=1.

Stads, G., P.S. Faylon, and L.J. Buendia. 2007. Agricultural R&D in the Philippines: policy, investments, and institutional profile, http://www.asti.cgiar.org/pdf/PhilippinesCR.pdf.

IMPACT OF RICE R&D INVESTMENTS ON COST OF PRODUCTION

Flordeliza H. Bordey

Barely three years before the extended Philippine quantitative restriction on rice expires in 2017, the country has yet to prepare for the inevitable competition with cheaper rice from abroad. It is more costly to produce rice in the country and it is one of the reasons why rice is more expensive in the Philippines. Moya et al. (2004) compared the costs of producing palay in Central Luzon, Philippines relative to that in Central Plain, Thailand, and Mekong Delta in Vietnam. Results indicated that in 1999, it costs US$ 96 to produce a ton of palay in Central Luzon, while it only takes US$59 and US$74 in Central Plain and Mekong Delta, respectively. Labor cost accounted for the major difference. Another study on comparative cost of production indicates that in January-June harvest of 2013, producing a ton of palay costs US$ 156 in Can Tho, Vietnam and US$ 212 in Suphan Buri, Thailand while it takes US$233 in Nueva Ecija, Philippines (Bordey et al. 2014). Fifteen years after the first study and labor cost still contributed the main difference. What must the country do in order to compete?

Investment on research and development (R&D) has long been perceived to have beneficial impacts on productivity and competitiveness. This article examines the impacts of public spending on R&D on cost of producing rice in the Philippines. In particular, the contribution of R&D investments in reducing the cost of rice production was measured using a cost framework and shadow prices. The effects of R&D investments in the demand for inputs were also assessed.

RICE R&D IN THE PHILIPPINES

Among different crops in Philippine agriculture, R&D in rice is probably the most organized. The Philippine Rice Research Institute (PhilRice), a government-owned and controlled corporation attached to the Department of Agriculture (DA), plans and coordinates the national R&D program for rice and rice-based farming systems. A network of 57 agencies composed of PhilRice experiment stations, regional agricultural research centers, and state universities implements rice R&D activities nationwide. Every year, researchers from these agencies send proposals to PhilRice central experiment station (CES) for approval and allocation of funds.

PhilRice has strong research collaboration with the International Rice Research Institute (IRRI), which was established in the country in 1960. IRRI is the largest non-profit agricultural research center in Asia and a part of the Consultative Group on International Agricultural Research. Donations from governments, development agencies, and foundations finance IRRI's R&D operations. However, with a global mandate, IRRI's R&D efforts cannot respond to the specific technology needs of the Philippines alone. Thus, PhilRice was created in 1985 to adapt IRRI's technologies to local conditions and promote a wider adoption in the country. Many of IRRI's innovations are tested first in the Philippines in partnership with PhilRice. In addition, IRRI plays an important role in the development of the human capital of local R&D workers and consequently on their research productivity through technical trainings, access to its facilities including the library, laboratories, and the International Rice Genebank.

The appropriated budget to PhilRice is the primary source of public funds for rice R&D in the Philippines (Figure 1). Since its full operation in 1987, PhilRice's real budget (in 2005 constant prices) rose from PhP 18 to 342 million in 2010. A series of declines in PhilRice's real budget were observed in the mid- and late-1990s until it finally stabilized to around PhP 200 million per year in the early- to mid-2000s. However, a significant decline to PhP 68 million was observed in 2011 due to the expiration of support from the Agriculture and Fisheries Modernization Act. Fortunately, the Department of Agriculture supplemented PhilRice's budget by PhP 242 million (PhP 322 million in nominal terms) in that year.

The National Rice Program (NRP) of the Department of Agriculture is the second major source of funds for R&D. This fund augmented the total rice R&D funds since 2000. From less than PhP 100 million in the early and late 2000s, the real budget of the NRP increased to more than PhP 300 million in 2010 and 2011.

Although IRRI's R&D activities are not tailored specifically for Philippine conditions, its R&D expenditures have huge spillover effects on the productivity of local R&D workers. IRRI's real budget grew from PhP 45 million in 1970 to PhP 3.3 billion in 2011. A significant increase in IRRI budget occurred in the late 2000s to early 2010s.

DATA SOURCES AND METHODS:

EMPIRICAL APPROACH

The transcendental logarithmic (translog) form was employed in modeling the restricted cost function. The translog form is a second order (Taylor series) approximation to an arbitrary twice-differentiable surface. It is flexible and allows for quadratic and interaction terms. It also does not impose a priori restriction on the elasticities of substitution between inputs. The translog form also permits non-constant returns to scale, non-neutrality and non-homotheticity of the production technology (Christensen, Jorgenson and Lau 1973).

The cost function model to be estimated is written as:

(1) $$\ln C = \alpha_0 + \alpha_Y \ln Y + \frac{1}{2}\alpha_{YY}(\ln Y)^2 + \sum_i \alpha_{Yi} \ln Y \ln W_i + \sum_k \alpha_{Yk} \ln Y \ln Z_k$$
$$+ \sum_i \beta_i \ln W_i + \frac{1}{2}\sum_i \sum_j \beta_{ij} \ln W_i \ln W_j + \sum_i \sum_k \delta_{ik} \ln W_i \ln Z_k$$
$$+ \sum_k \gamma_k \ln Z_k + \frac{1}{2}\sum_k \sum_l \gamma_{kl} \ln Z_k \ln Z_l + \lambda_t t + v$$

where C is the variable cost of rice production per region, Y is the total production of rice per region, W_i are prices of seed, fertilizer, labor, water, and machines, Z_k are stocks of public investments in research and development, t is the time trend, and v is the error term. The time trend variable was included to account for technical change over time[1]. To estimate a well-behaved cost function, restrictions on linear homogeneity in input prices and symmetry of the input-price Hessian matrix were imposed in the estimation. The parameter restrictions for linear homogeneity and symmetry are

(2) $$\sum_i \beta_i = 1; \sum_i \alpha_{Yi} = \sum_i \sum_j \beta_{ij} = \sum_k \delta_{ik} = 0$$

(3) $$\beta_{ij} = \beta_{ji} \text{ for } i \neq j$$

A total of 52 constraints were imposed in the estimation. The Shephard's lemma was applied to equation (1) to derive the cost share equations for each variable input i:

(4) $$S_i = \beta_i + \sum_j \beta_{ij} \ln W_j + \sum_k \beta_{ik} \ln Z_k + \alpha_{Yi} \ln Y$$

To satisfy the linear homogeneity condition, the cost share equations must add up to unity $\left(\text{i.e. } \sum_i S_i = 1\right)$.

The adding-up criterion leads to a singular error covariance matrix. Thus, the equation for water share was dropped in the estimation and its parameters were recovered from the estimated parameters of other cost shares. Using the iterated Zellner procedure for seemingly unrelated regression (SUR), a system of equations composed of the restricted cost function (equation 1) and four cost-share equations (equation 4) were estimated with the full set of constraints. The iteration of the SUR, until convergence gives the maximum likelihood estimates, is invariant to the choice of purged equation (Kmenta and Gilbert 1968).

The elasticities of cost with respect to output and public investments were computed as:

(5) $$\varepsilon_{CY} = \alpha_Y + \alpha_{YY} \ln Y + \sum_i \alpha_{Yi} \ln W_i + \sum_k \alpha_{Yk} \ln Z_k$$

(6) $$\varepsilon_{CZk} = \gamma_k + \sum_l \gamma_{kl} \ln Z_l + \sum_i \delta_{ik} \ln W_i + \alpha_{Yk} \ln Y$$

Equations (4), (5) and (6) were evaluated using the median data.

[1]A dummy variable for each year was included at first but this resulted in non-convergence of the iterated regression model. The interactions of t with output, input prices, and public investments variables were also excluded to facilitate convergence, and to avoid multicollinearity.

A MODEL OF COST IMPACTS OF PUBLIC INVESTMENTS

Public investments in R&D generate stocks of quasi-fixed inputs that affect knowledge, specialization, and human capital. These, in turn, affect the productive capacity of farms. These factors are quasi-fixed because public investments are external to the farms' decisions and cannot be adjusted instantaneously. Although the level of public investments and consequently the amount of quasi-fixed inputs are outside the realm of the producer's decisions, changes in these factors can affect private costs and productivity levels. The capacity utilization accounts for the changes in marginal costs due to changes in quasi-fixed inputs (Morrison and Schwartz 1994).

Let w_{Zk} be the shadow value or the negative of the marginal cost reduction due to the additional stock of Z_k, $\left(w_{Zk} = -\partial G / \partial Z_k\right)$.

The amount of a quasi-fixed factor Z_k is in its long run equilibrium level if the marginal benefit of additional stock (w_{Zk}) is equal to the marginal cost of using that additional stock (P_{Zk}). If the marginal benefit of Z_k is less than its marginal cost ($w_{Zk} < P_{Zk}$), then producers have an excess capacity of the quasi-fixed input. This implies that producers underutilize the existing stock of quasi-fixed input. Therefore, a decrease in investment is desirable to reduce the current stock of quasi-fixed input. If the quasi-fixed input has a larger marginal benefit compared to its marginal cost ($w_{Zk} < P_{Zk}$), then producers have an inadequate capacity of quasi-fixed input. This indicates an overutilization of current stocks of quasi-fixed input and the desirability of increasing investments (Morrison and Schwartz 1994).

The benefits of Zk can be expressed in terms of cost elasticity,

(7) $$\varepsilon_{CZk} = \frac{\partial \ln C}{\partial \ln Z_k} = \left(\frac{\partial G}{\partial Z_k} + P_{Zk}\right)\frac{Z_k}{C} = \left(-w_{Zk} + P_{Zk}\right)\frac{Z_k}{C}$$

Assuming a zero private price (P_{Zk}=0)[2] , equation (7) simplifies into

(8) $$\varepsilon_{CZk} = \frac{-w_{Zk} Z_k}{C} = -S_{Zk}$$

where S_{Zk} is the shadow share of Z_k. A negative cost elasticity (positive S_{Zk}) implies that the quasi-fixed input has decreased the costs and the benefits accrue to producers. This indicates that further investment is desirable in order to increase the existing stock of quasi-fixed input. On the other hand, a positive cost elasticity (negative S_{Zk}) suggests that the quasi-fixed input has increased the costs of production. This implies the need to decrease the investment to reduce the existing stock of quasi-fixed input. If the quasi-fixed input has a zero cost elasticity $\left(\text{i.e. } -\partial G/\partial Z_k = 0\right)$, then the current stock of quasi-fixed input is "just right" from the producers' point of view and should be maintained at that level (Morrison and Schwartz 1994).

However, since the provision of the quasi-fixed input has costs, a zero marginal benefit can be interpreted as an inefficiency of the investment. This suggests that the public investment fails to improve the cost productivity of producers. This concept was used in determining the optimality of R&D public investment.

DATA AND DESCRIPTION

Data on regional costs and returns of rice production were obtained from the Rice Statistics Handbook published by the Bureau of

[2] Rice producers do not directly pay the government for providing R&D services. The taxes paid by producers should not be counted as payment for these services because the government can spend those in other forms of public investments.

Agricultural Statistics (BAS) and PhilRice. The BAS used their 1991 and 2002 surveys as a benchmark for updating costs and returns data from 1992 to 2001, and from 2003 onwards[3]. The analysis utilized the data from 16 regions from 1992 to 2007 for a total of 256 observations. The use of aggregate data may lead to a potential simultaneity of prices as unobserved characteristics of each region can affect the market clearing conditions in those areas. To account for this, a "within" transformation of data prior to estimation[4] was made. The characteristics of the regional market equilibrium were assumed to be time-invariant and can be eliminated by the "within" transformation.

The costs of seed, fertilizer, labor, machines, and water constituted the variable cost. For the price of labor, the average regional real daily wage rate for rice farm workers was utilized. The price of seed was obtained by dividing each region's seed cost per hectare with the average quantity of seed applied per hectare. Machine rental rates were derived by adding 50 percent of the imputed thresher's share and 10 percent of the hired labor cost to the rental rates of machine in the farm budget. These items accounted for rentals of tractor and threshing machines[5]. Using the quantity shares as weights, the price of fertilizer was calculated as a weighted average price per bag of different fertilizer grades.

SPECIFYING STOCK VARIABLES FOR PUBLIC INVESTMENTS

Public investments in R&D yield economic services for more than one period. Thus, the stock levels of quasi-fixed inputs from R&D resulted from investments in prior periods. To account for this in constructing the stocks of quasi-fixed inputs, time-shape weights were used to distribute the economic services of public investments over time (Evenson 2001, pp.584-588). The segment-length approach was employed in constructing public investment stocks because it allows flexibility in segment lengths while imposing a reasonable shape over time[6].

[3] Ideally, an annual survey is the best source of data for this analysis. Given the data limitations, I proceed with the analysis noting that the process of data-generation can impact the outcome of the analysis.

[4] I implemented the within transformation by using the xtadata, fe command in STATA. The process of within transformation is similar to including dummy variables for each region. However, the use of within transformed data is better because it allows the coefficients to be estimated with larger degrees of freedom, unlike including 16 regional dummy variables in the model.

[5] Due to small farm sizes, the use of combined harvester-thresher is still not popular in the Philippines. Paddy rice is harvested manually and threshed using a machine. Threshing activities are often contracted out, thus, the thresher's share reflects the combined returns to farm workers and machine owners. Similarly, a part of the hired labor cost is for land preparation. This activity is also often contracted out suggesting that hired labor cost reflects the return to tractor owners and wages of the operator. Assumptions on percentages of costs attributed to machine rent are based on my personal knowledge of rice production in the Philippines.

[6] Time-shape weights can be estimated through either free-form, distributed lag, or segment-length approaches. The free-form approach can be implemented by including a number of lagged public investment variables in the econometric model. On the other hand, the distributed lag approach can be applied by imposing a functional form on the time shape. The segment-length approach can be implemented by constructing stock variables using alternative time-shape weights (i.e. an inverted trapezoid to account for a lag in adoption, and depreciation) and then choosing the model with minimum mean square error. Evenson notes that the free-form approach usually have unsatisfactory results because coefficients tend to oscillate between positive and negative values. On the other hand, the distributed lag approach imposes a very strong structure on time shapes. While crude, he prefers the segment-length approach.

Before generating the stock variable for rice R&D, public expenditure was deflated into 2000 constant prices using the consumer price index for rice. The stock of local R&D was derived from the sum of PhilRice's expenditures and the DA-National Rice Program budget allocation for R&D. The time-shape weights set by Evenson and Quizon (1991) were utilized because it described a logical progression of the future impacts of R&D. The first segment characterized a period when no impact is realized, which implied that R&D programs did not produce immediate impacts. The second segment described a period of increasing impact, which signified the rising contributions of R&D. The third segment represented the period of constant effect. This suggested that after reaching its peak, research service impacts did not "depreciate" because new inventions "build on" the inventions that they displaced. The stock of local R&D was constructed as:

$$(9)\quad Z_{it}^{LR\&D} = \theta_{it}\left(0.2LR\&D_{t-2} + 0.4LR\&D_{t-3} + 0.6LR\&D_{t-4} + 0.8LR\&D_{t-5} + \sum_{j=6}^{J} LR\&D_{t-j}\right)$$

where $LR\&D_t$ is the total public expenditures in R&D in period t, J corresponds to the time index for 1986, and θ_{it} is the share of region i in period t to the total value of rice production in irrigated areas. Since local R&D programs give greater emphasis on developing technology for irrigated areas, only the value of total rice production in irrigated areas was considered in calculating the share of each region[7].

The international R&D investment was assumed to have an indirect effect on costs by improving the productivity of local R&D. To capture this spillover effect, the international R&D variable appeared in the model as an interaction with the local R&D variable. The stock of international R&D for region i at period t was calculated as:

$$(10)\quad Z_{it}^{IRES} = \theta_{it}\lambda_j\left(0.2IR\&D_{t-2} + 0.4IR\&D_{t-3} + 0.6IR\&D_{t-4} + 0.8IR\&D_{t-5} + \sum_{k=6}^{K} IR\&D_{t-k}\right)$$

where $IR\&D_t$ refers to IRRI's expenditure in the Philippines in period t, and K refers to the time index for 1970. The weight, λ_j, was used to reflect the geographic distance of each region from IRRI's headquarters located in region 4A. Thus, the farther the region from IRRI's headquarters, the smaller the spillover effect[8].

RESULTS AND DISCUSSION:

RICE PRODUCTION TECHNOLOGY IN THE PHILIPPINES

Table 1 presents the iterated SUR estimates of the parameters of the translog cost function. On average, the model explains 67 percent of the variation in cost of rice production in the region. The estimated cost function satisfies the properties of monotonicity, concavity and homogeneity of degree one in prices, suggesting the feasibility of reconstructing the production technology. The evaluation of the estimated cost shares at the median data showed the monotonicity in input prices of the estimated cost function. The estimated cost shares are 0.08 for seed, 0.13 for fertilizer, 0.66 for labor, 0.09 for machinery, and 0.05 for water.

[7] The priority given to technology development for irrigated areas can be discerned from greater number of research projects and studies for favorable areas compared to unfavorable ecosystem. For more details, please see http://www.philrice.gov.ph//index.php?option=com_content&task=view&id=88&Itemid=126.

[8] I use the weights 0.6 for CAR, regions 1, and, 2; 0.8 for regions 3, 4B, and 5; and 1 for region 4A. These regions are within the Luzon Island. I use the weight 0.4 for the regions in Visayas Island, and 0.2 for the regions in Mindanao Island.

The estimated elasticity of cost with respect to output is 0.93, which is significantly different from zero at 99 percent confidence level. This indicates that the estimated cost function is monotonic in output. The 95 percent confidence interval (0.64, 1.22) of the estimated elasticity of cost with respect to output also shows that it is not significantly different from unity. This implies that the regional rice production is operating at a constant return to scale.

As expected, the own price elasticities of input demands are negative and significant. The estimated own price elasticities are -0.42 for seed, -0.33 for fertilizer, -0.20 for labor, -0.24 for machinery, and -0.38 for water (Table 2). This indicates that the Hessian matrix of the estimated cost function is negative semi-definite, which implies the concavity in prices of the estimated cost function at the point of verification. All estimated own-price elasticities are lower than unity in absolute terms suggesting that the demands for these inputs are inelastic.

Table 2 also summarizes the cross-price elasticities of input demands. The negative sign of estimated cross price elasticities implies that seed, machine and water are substitutes for labor. Labor constitutes the largest portion of cost of rice production in the region. In addition, there is also a competing demand for labor from non-rice and non-agriculture uses at the regional level. Thus, producers tend to substitute away from labor as its price increases.

Table 3 shows the impacts on input demands of investments in local R&D. A rise in the local R&D investment reduces the demands for seed and labor. This can be attributed to the crop management practices developed by the local R&D, such as a 20-40 kg/ha seeding rate, direct seeding, and designs of small farm machinery.

THE SHADOW SHARES OF PUBLIC INVESTMENTS

The elasticity of cost with respect to local R&D investment was negative and significant. In general, a percentage increase in the stock of the local R&D can lead to a 0.24 percentage decrease in cost. This is not surprising since the local R&D investment generates knowledge and applied technology that improves productivity. The negative cost elasticity of R&D indicates a positive shadow share, which means the over-utilization of the local R&D stock in the region. This suggests an inadequate amount of region-specific technology for rice production. Hence, incremental investment in the local R&D is necessary to generate more location-specific applied technology.

The signs of the estimated interaction term between stocks of local and international R&D investments also provide important policy implications. The estimated coefficient of the interaction between the local and the international R&D stocks is negative and significant (-0.014 with standard error of 0.005). This signifies that an increase in the international R&D stock augments the cost-reducing effect of local R&D stock. Thus, the local R&D can benefit further from the international R&D by implementing more collaborative research, sharing research output through integrated information systems, taking advantage of IRRI-sponsored training, and accessing advanced laboratories if needed.

SUMMARY AND CONCLUSION

The direct cost-effect of public investments in R&D was calculated using a cost framework. This paper has shown that rice R&D has lowered the demand for seeds and labor and has therefore generated cost-savings. Given that we still need to reduce our cost in the future implies that further investment in rice R&D is essential. Hence, the decline in the local rice R&D budget in the recent years must be arrested if not reversed in order to continue increasing the knowledge stock that affect the productive capacity of our farmers. Results also pointed-out the benefits from increasing collaboration between local and international rice R&D agencies.

LITERATURE CITED

Bordey FH, PF Moya, et al. Benchmarking the cost and profitability of paddy production in selected Asian rice bowls. Paper presented in the 4th International Rice Congress, Bangkok, Thailand. October 27-November 1, 2014.

Christensen L, D Jorgenson, L Lau. "Transcendental logarithmic production frontiers." Review of Economics and Statistics, 1973: 28-45.

Diewert W. "Applications of Duality Theory." In Frontiers of Quantitativ Economics, by M. Itriligator and D. Kendrick. Amsterdam: North Holland, 1974.

Evenson R. "Economic impacts of agricultural research and extension." In Handbook of Agricultural Economics Vol.1A Agricultural Production, by B. Gardner and G. Rausser, 573-616. Amsterdam: Elsevier Science, 2001.

Evenson R, J Quizon. "Technology, infrastructure, output supply, and factor demand in Philippine agriculture." In Research and productivity in Asian agriculture, by R. Evenson and C. Pray, 195-205. Ithaca, New York: Cornell University Press, 1991.

Kmenta J, R Gilbert. "Small sample properties of alternative estimators of seemingly unrelated regressions." Journal of American Statistical Association, 1968: 1180-1200.

Morrison C, A Schwartz. "Distinguishing external from internal scale effects: The case of public infrastructure." The Journal of Productivity Analysis, 1994: 249-270.

Moya PF, DC Dawe, D Pabale, M Tiongco, NV Chien, S Devarajan, A Djatiharti, NX Lai, L Niyomvit, HX Ping, GO Redondo, and P Wardana. 2004. The economics of intensively irrigated rice in Asia. In: Increasing the productivity of intensive rice systems through site-specific nutrient management. Dobermann A, Witt C, Dawe D, editors. Enfield, N.H. (USA) and Los Baños (Philippines): Science Publishers, Inc. and International Rice Research Institute (IRRI). pp. 29-58.

TABLES AND GRAPHS

Table 1. Results of the iterated seemingly unrelated regression estimates of the translog variable cost function for the Philippine rice sector, 1992-2007.

VARIABLE	COEFFICIENT		STANDARD ERROR
Output	1.968	***	0.546
$Output^2$	-0.149	***	0.053
Output x Seed Price	0.012	***	0.003
Output x Fertilizer Price	0.038	***	0.012
Output x Labor Price	-0.068	***	0.015
Output x Machinery Price	0.012	***	0.003

*, **, and *** indicate significance at 90%, 95%, and 99% confidence levels.

TABLES AND GRAPHS

Table 1. Continuation

VARIABLE	COEFFICIENT		STANDARD ERROR
Output x Water Price	0.007	***	0.002
Output x Local R&D Expenditure	0.055	**	0.021
Output x Irrigation Expenditure	-0.018		0.011
Output x Production Subsidy Expenditure	-0.003		0.020
Output x Extension Expenditure	0.021		0.021
Seed Price	0.248	***	0.038
Fertilizer Price	-0.276	**	0.137
Labor Price	1.241	***	0.174
Machinery Price	-0.144	***	0.034
Water Price	-0.070	***	0.024
Seed Price^2	0.039	***	0.003
Seed Price x Fertilizer Price	-0.005	*	0.003
Seed Price x Labor Price	-0.012	***	0.002
Seed Price x Machinery Price	-0.016	***	0.002
Seed Price x Water Price	-0.006	***	0.001
Fertilizer Price^2	0.067	***	0.009
Fertilizer Price x Labor Price	-0.045	***	0.009
Fertilizer Price x Machinery Price	-0.015	***	0.002
Fertilizer Price x Water price	-0.002		0.002
Labor Price^2	0.086	***	0.011

*, **, and *** indicate significance at 90%, 95%, and 99% confidence levels.

TABLES AND GRAPHS

Table 1. Continuation

VARIABLE	COEFFICIENT		STANDARD ERROR
Labor Price x Machinery Price	-0.018	***	0.002
Labor Price x Water Price	-0.010	***	0.001
Machinery Price^2	0.058	***	0.002
Machinery Price x Water Price	-0.009	***	0.001
Water Price^2	0.027	***	0.001
Local R&D Expenditure	-0.338	*	0.177
Irrigation Expenditure	0.181		0.132
Production Subsidy Expenditure	-0.017		0.146
Extension Expenditure	0.217		0.154
Local R&D Expenditure^w	-0.023		0.026
Local R&D Expenditure x International R&D Expenditure	-0.014	***	0.005
Local R&D Expenditure x Irrigation Expenditure	0.006		0.006
Local R&D Expenditure x Production Subsidy Expenditure	0.046	**	0.020
Local R&D Expenditure x Extension Expenditure	-0.078	***	0.017
Irrigation Expenditure^2	-0.022	***	0.005
Irrigation Expenditure x Production Subsidy Expenditure	0.013	**	0.005
Irrigation Expenditure x Extension Expenditure	-0.005		0.006

*, **, and *** indicate significance at 90%, 95%, and 99% confidence levels.

TABLES AND GRAPHS

Table 1. Continuation

VARIABLE	COEFFICIENT		STANDARD ERROR
Production Subsidy Expenditure^2	-0.057	***	0.017
Production Subsidy Expenditure x Extension Expenditure	0.018		0.017
Extension Expenditure^2	0.068	***	0.022
Seed Price x Local R&D Expenditure	-0.004	***	0.001
Seed Price x Irrigation Expenditure	-0.003	***	0.001
Seed Price x Production Subsidy Expenditure	-0.001		0.001
Seed Price x Extension Expenditure	-0.004	***	0.001
Fertilizer Price x Local R&D Expenditure	0.030	***	0.005
Fertilizer Price x Irrigation Expenditure	-0.006	**	0.002
Fertilizer Price x Production Subsidy Expenditure	-0.004		0.004
Fertilizer Price x Extension Expenditure	-0.035	***	0.003
Labor Price x Local R&D Expenditure	-0.034	***	0.006
Labor Price x Irrigation Expenditure	0.009	***	0.003
Labor Price x Production Subsidy Expenditure	0.008	*	0.005
Labor Price x Extension Expenditure	0.049	***	0.004
Machinery Price x Local R&D Expenditure	0.005	***	0.001
Machinery Price x Irrigation Expenditure	-0.001		0.001
Machinery Price x Production Subsidy Expenditure	-0.002	***	0.001

*, **, and *** indicate significance at 90%, 95%, and 99% confidence levels.

TABLES AND GRAPHS

Table 1. Continuation

VARIABLE	COEFFICIENT		STANDARD ERROR
Machinery Price x Extension Expenditure	-0.007	***	0.001
Water Price x Local R&D Expenditure	0.050	***	0.013
Water Price x Irrigation Expenditure	0.015	**	0.006
Water Price x Production Subsidy Expenditure	-0.035	***	0.012
Water Price x Extension Expenditure	-0.031	***	0.006
Time Trend	-0.026	***	0.007
Constant	-1.067		3.532
R-Squared	0.68		

*, **, and *** indicate significance at 90%, 95%, and 99% confidence levels.

TABLES AND GRAPHS

Table 2. Own- and cross-price elasticities of input demand.

VARIABLE	SEED		FERTILIZER		LABOR		MACHINERY		WATER	
Seed Price	-0.41	***	0.04		0.06	***	-0.11	**	-0.05	
	(0.10)		(0.03)		(0.01)		(0.05)		(0.08)	
Fertilizer Price	0.06		-0.35	*	0.06		-0.04		0.09	
	(0.05)		(0.21)		(0.04)		(0.04)		(0.07)	
Labor price	0.51	***	0.31		-0.21	***	0.45	***	0.44	***
	(0.07)		(0.22)		(0.06)		(0.09)		(0.10)	
Machinery price	-0.12	*	-0.03		0.06	***	-0.24	**	-0.11	
	(0.06)		(0.03)		(0.01)		(0.10)		(0.07)	
Water price	-0.03		0.03		0.03	***	-0.06		-0.38	***
	(0.05)		(0.03)		(0.01)		(0.04)		(0.08)	

Bootstrapped standard errors in parenthesis *, **, and *** indicate significance at 90%, 95%, and 99% confidence levels.

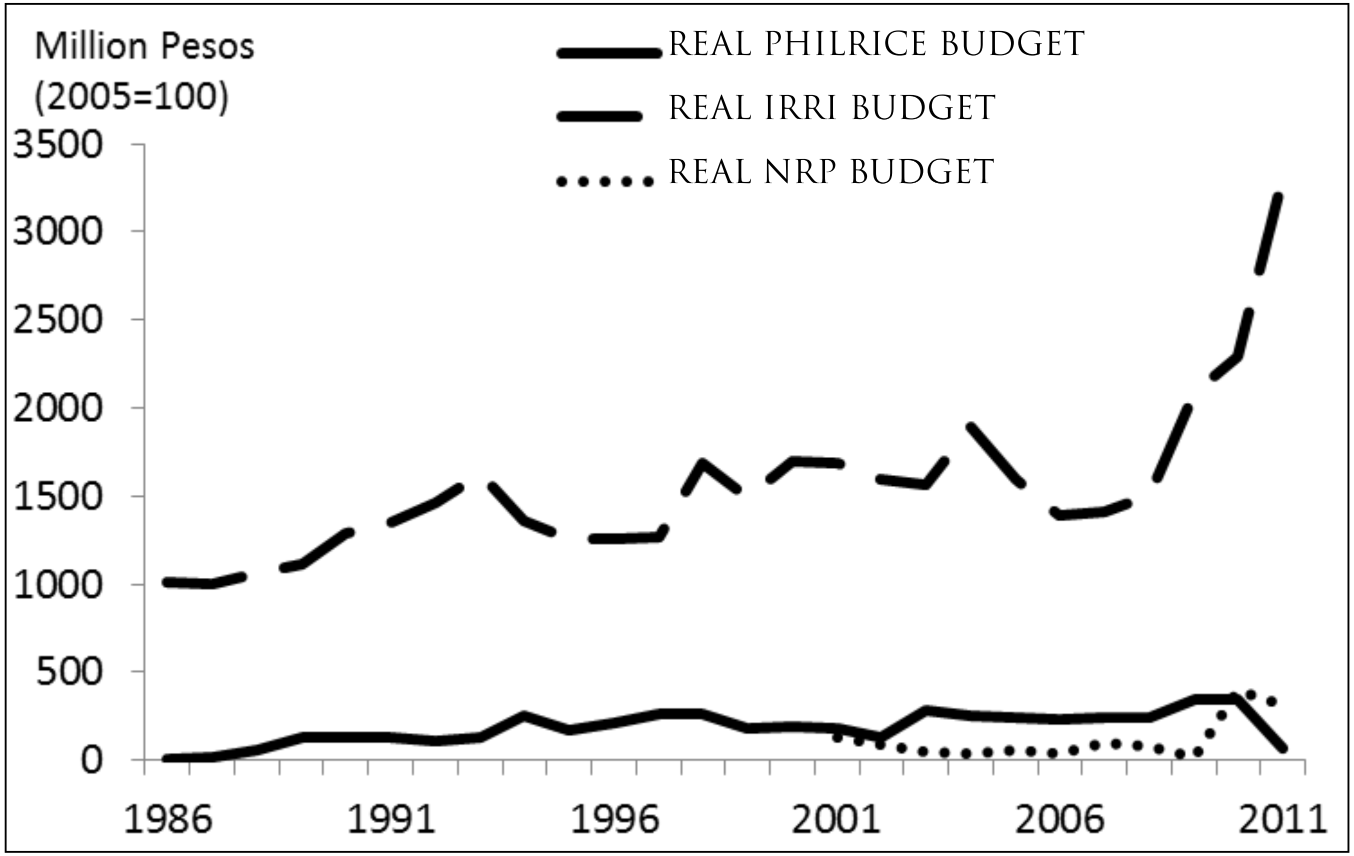
Table 3. The elasticities of input demands with respect to R&D investments.

VARIABLE	ELASTICITY	BOOTSTRAPPED STANDARD ERRORS
Seed	-0.29**	(0.12)
Fertilizer	-0.01	(0.14)
Labor	-0.29**	(0.13)
Machinery	-0.18	(0.12)
Water	0.81	(0.78)

*, **, and *** indicate significance at 90%, 95%, and 99% confidence levels.

TABLES AND GRAPHS

Figure 1. Rice R&D budget of Philippine Rice Research Institute, International Rice Research Institute, and Department of Agriculture-National Rice Program, in 2005 constant prices.



IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

Ramon L. Clarete

HIGHLIGHTS OF THE PRESENTATION

There is a need to continuously improve varieties through R&D to avoid deterioration of past varieties that could result in a lower yield. R&D creates improved varieties and keeps such improvement from deteriorating.

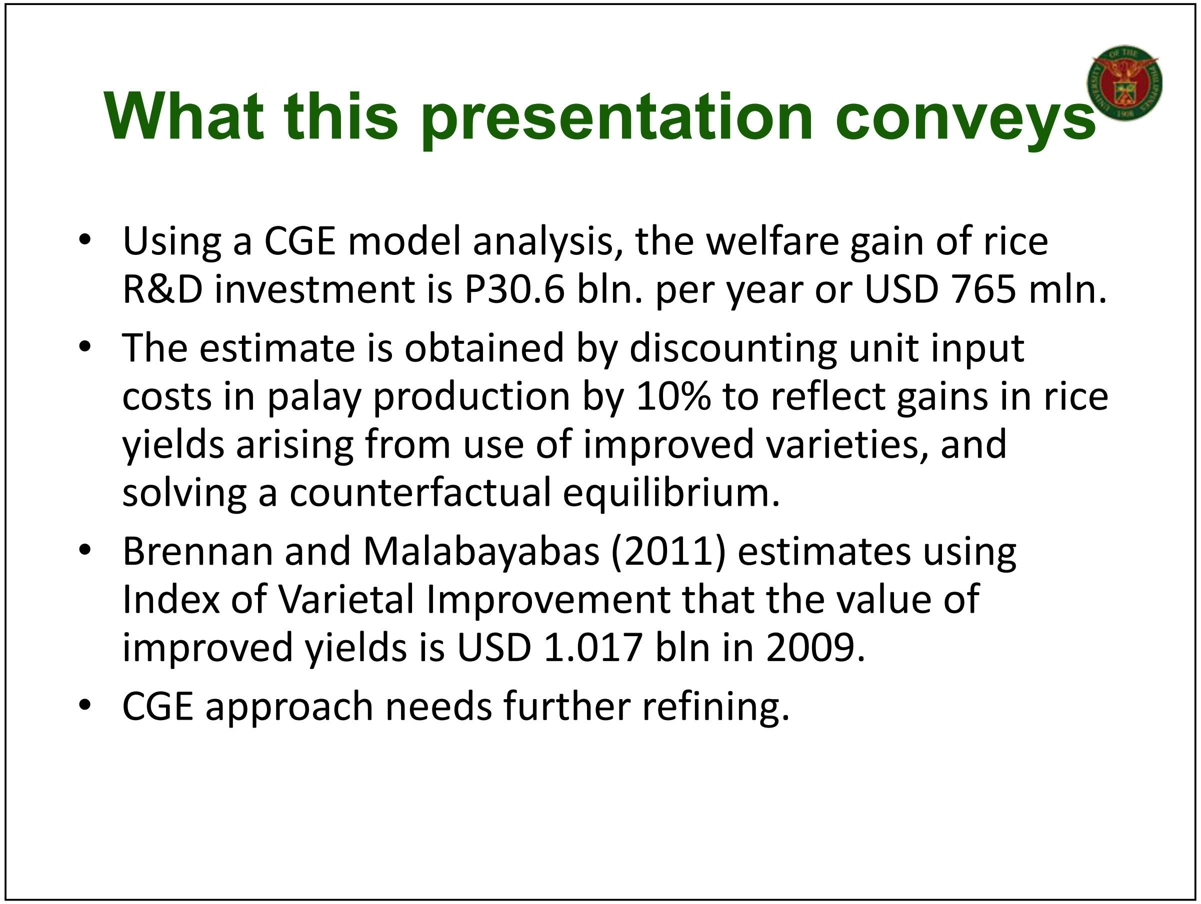
Increased yield is associated with the released improved varieties. Based on Brennan and Malabayabas (2011)[9], the rice varietal improvement resulted in yield gains of 11% between 1985 and 2009. Annual gain is 5.1%.

Results of CGE analysis showed that the farmer households' estimated gains from the introduction of improved rice varieties is PhP4.9 billion per year. This is 16% of the total gains from improved rice varieties. These results are just rough impact estimates of R&D on economic welfare; this study is still a work in progress. Nevertheless, this just shows that R&D has a positive impact on the economy.

[9] Brennan, J.P. and A. Malabayabas. 2011. International Rice Research Institute's contribution to rice varietal yield improvement in Southeast Asia. ACIAR impact assessment series report. No. 74. Asian Center for International Agricultural Research: Canbera. 111p.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

SLIDE TRANSCRIPT



This study used a Computable General Equilibrium (CGE) model to calculate the effect of varietal improvements in rice. The initial estimate is about PhP30.6 billion per year with the use of improved rice varieties. The estimate was obtained by discounting unit input costs by 10% to reflect the growth in the rice yields resulting from introduction and use of improved varieties.

Brennan and Malabayabas (2011)[10] tried to measure the value of rice varietal improvement using the Index of Varietal Improvement. In 2009, they came up with US$1.017 billion. There is a big discrepancy. This means that their approach needs further refining. That is why this work is in progress.

[10] Brennan, J.P. and A. Malabayabas. 2011. International Rice Research Institute's contribution to rice varietal yield improvement in Southeast Asia. ACIAR impact assessment series report. No. 74. Asian Center for International Agricultural Research: Canbera. 111p.

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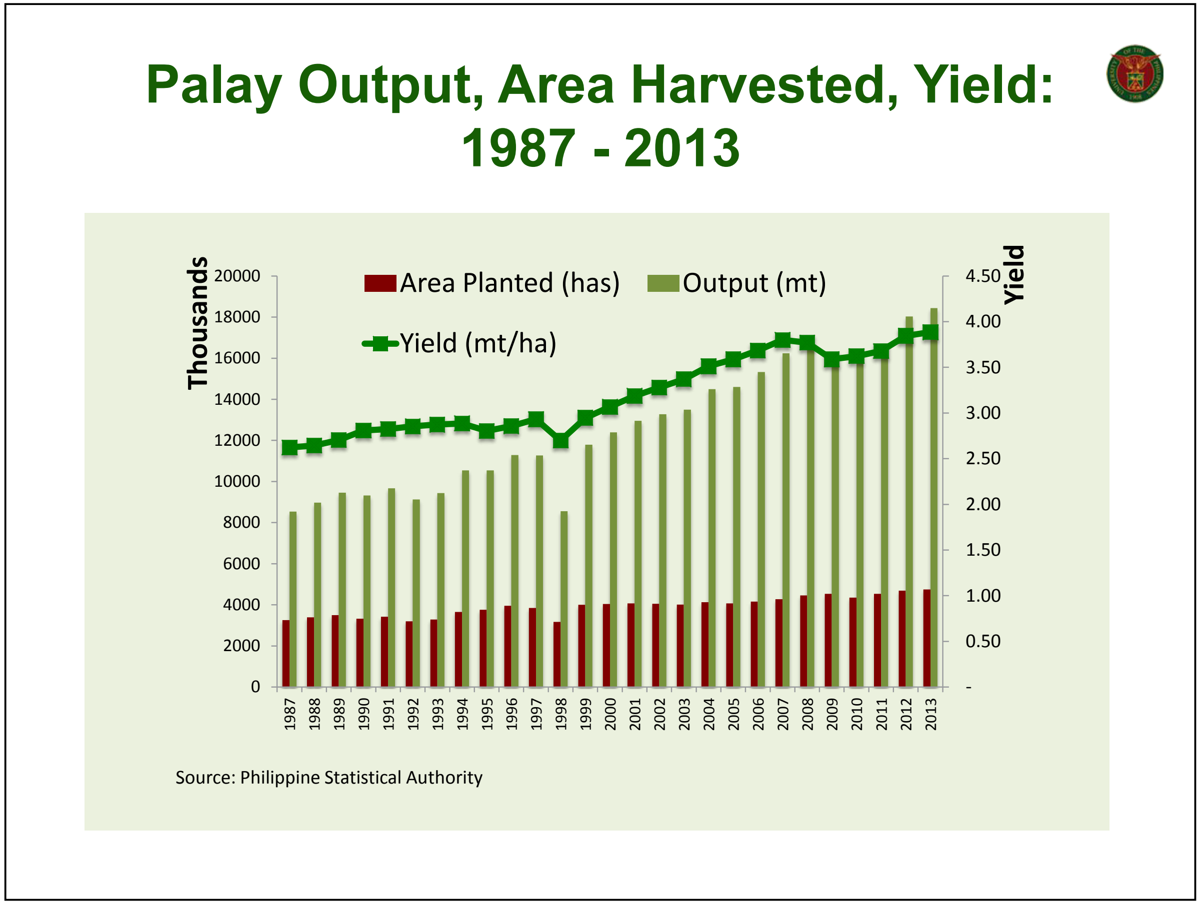
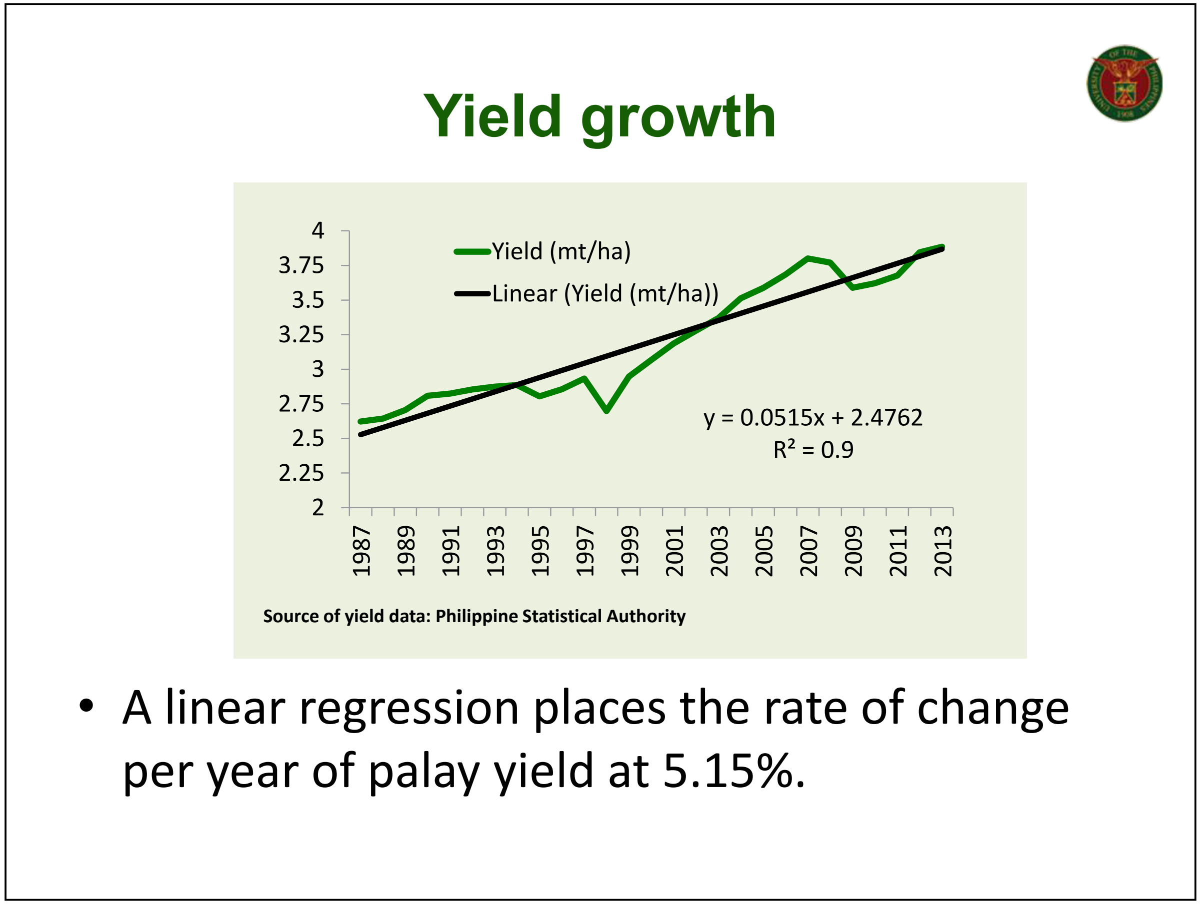


The graph shows a plot of area planted, yield harvested per year, and production of palay in 1987-2013. The calculative yield measured in the secondary vertical axis is a nicely growing rice yield growth.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

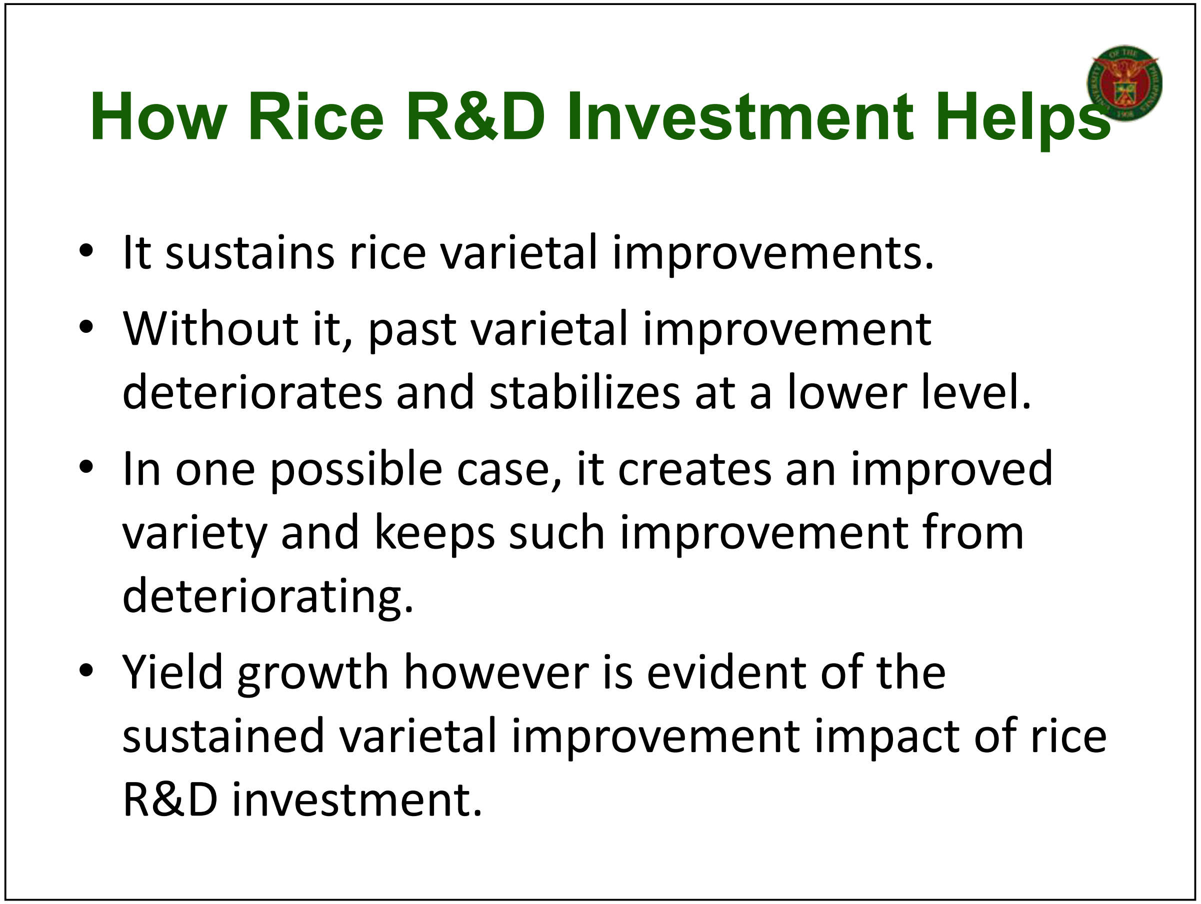
SLIDE TRANSCRIPT



This is the palay yield trajectory from 1987 to 2013, with a growth of about 5.15%.

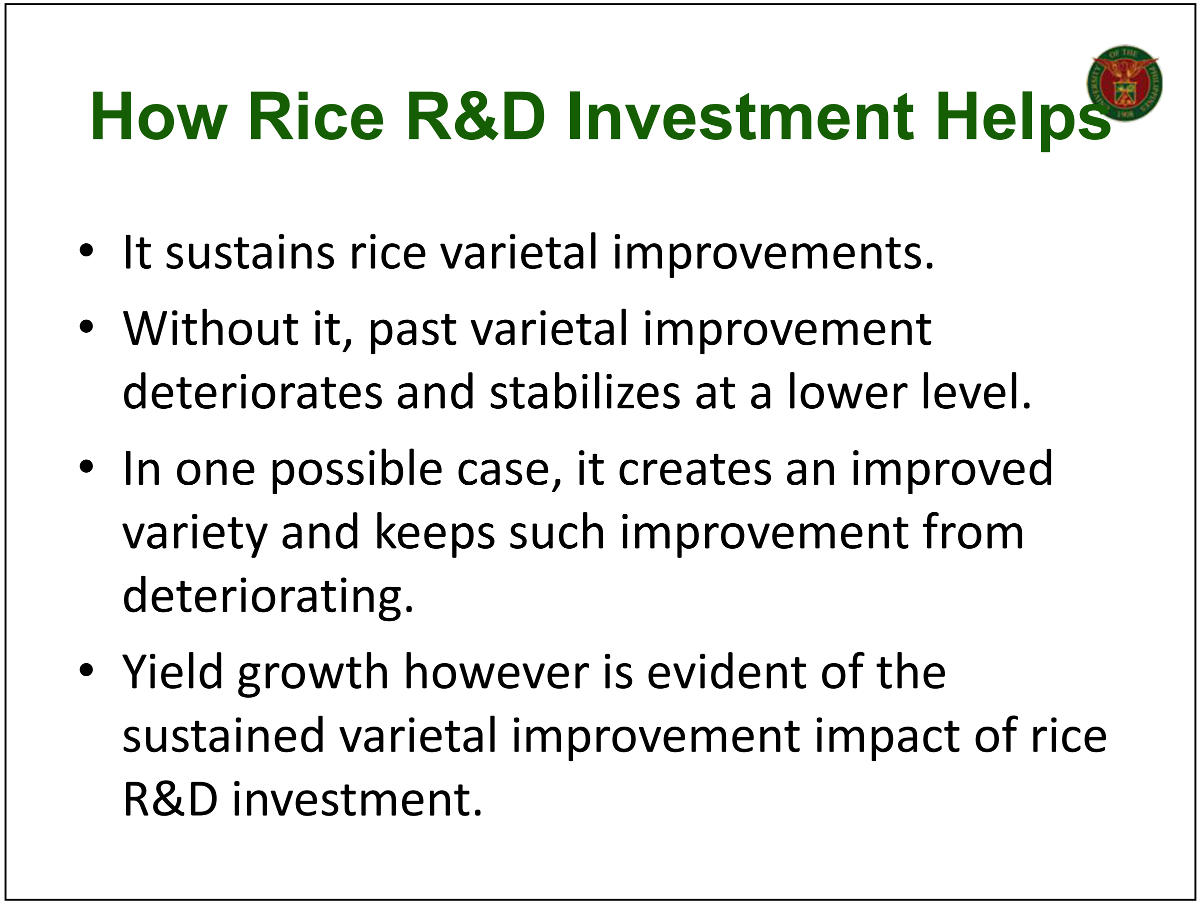
IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

SLIDE TRANSCRIPT



Government agencies like Department of Agriculture (DA), Bureau of Agricultural Research (BAR), Philippine Rice Research Institute (PhilRice), and International Rice Research Institute (IRRI) spend public funds for research and development in the rice sector. They continuously come up with a stream of varieties.

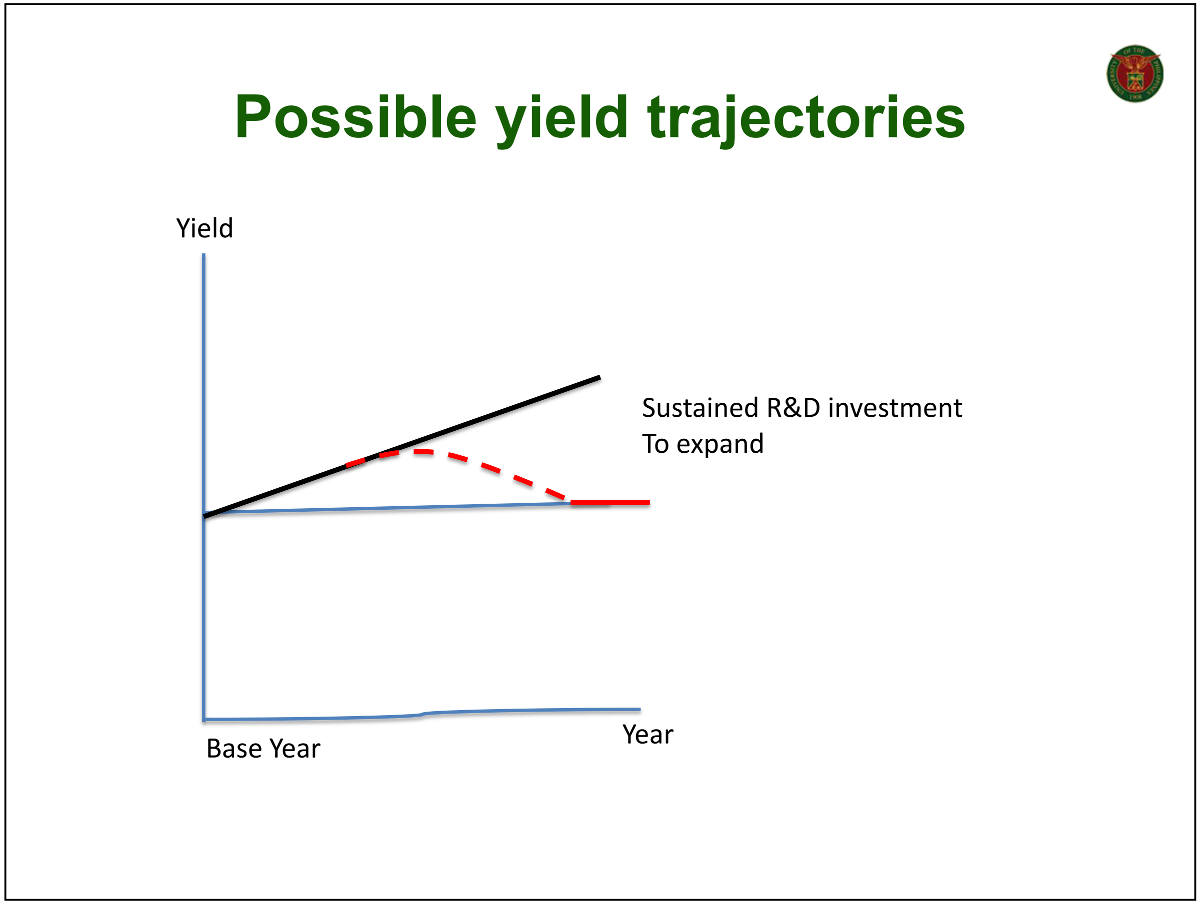
If this research was not there, it is possible that past varietal improvement can deteriorate and gradually settle yield at a lower level, as claimed by experts, including Brennan and Malabayabas. The continued investments in R&D for varietal improvement make sure that such particular event does not happen. It sustains, therefore, varietal improvement. R&D, therefore, creates an improved



variety and keeps such improvement from deteriorating. Let's just imagine one time shift in yields and then all our efforts will be just to sustain it. However based on the figure that we saw earlier, there is a modest growth of rice-use over time. It is evident that R&D investments are not only sustaining one chunk of the rice variety but continuously improving that particular rice variety, in general.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

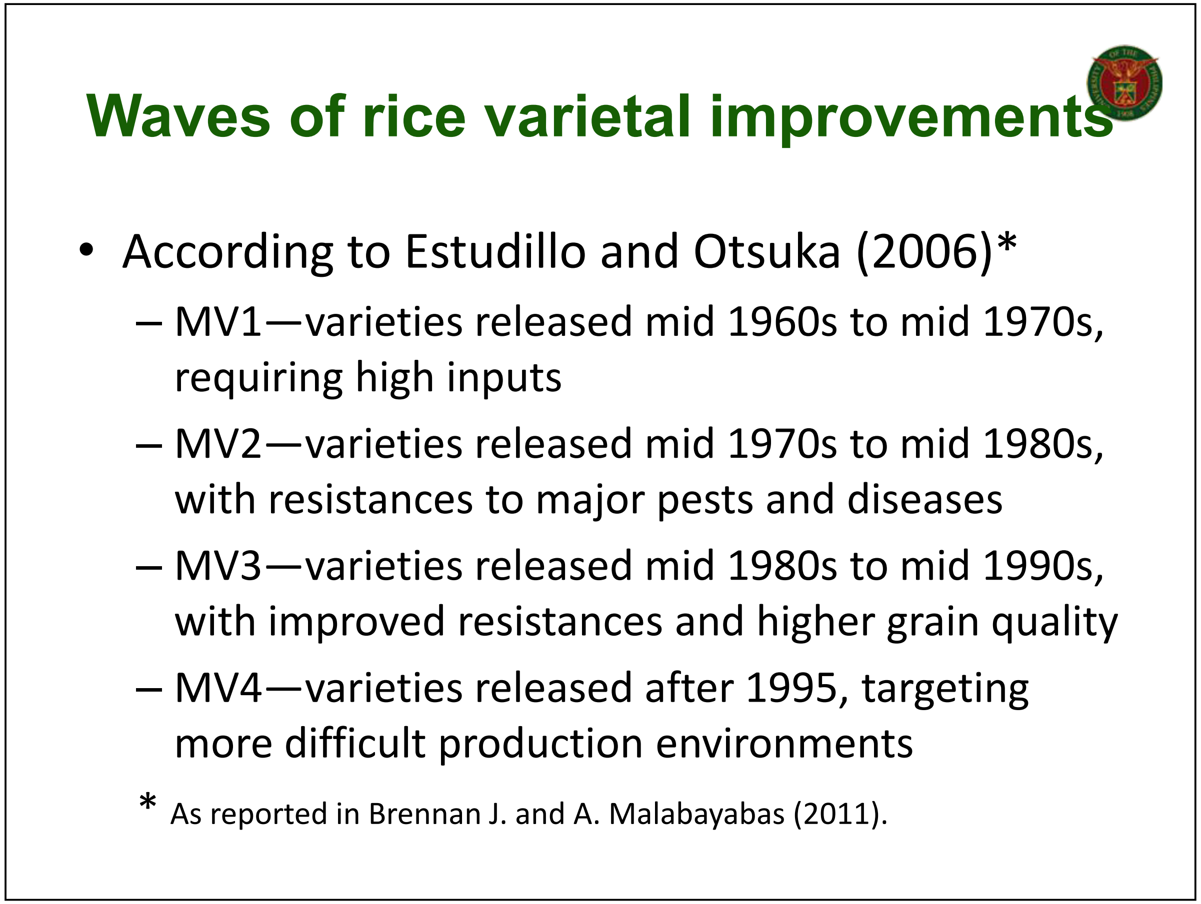
SLIDE TRANSCRIPT



This is a possible representation I have. We may have succeeded in increasing the yield (points to the black line), but we do not keep on sustaining varietal improvement. Then it (yield) gradually deteriorates (red dotted line) and it settles down on a lower value. The impact, therefore, of investments in rice yields will be the difference between the improved yield (black line) and the base line yields (blue line). figure that we saw earlier, there is a modest growth of rice-use over time. It is evident that R&D investments are not only sustaining one chunk of the rice variety but continuously improving that particular rice variety, in general.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

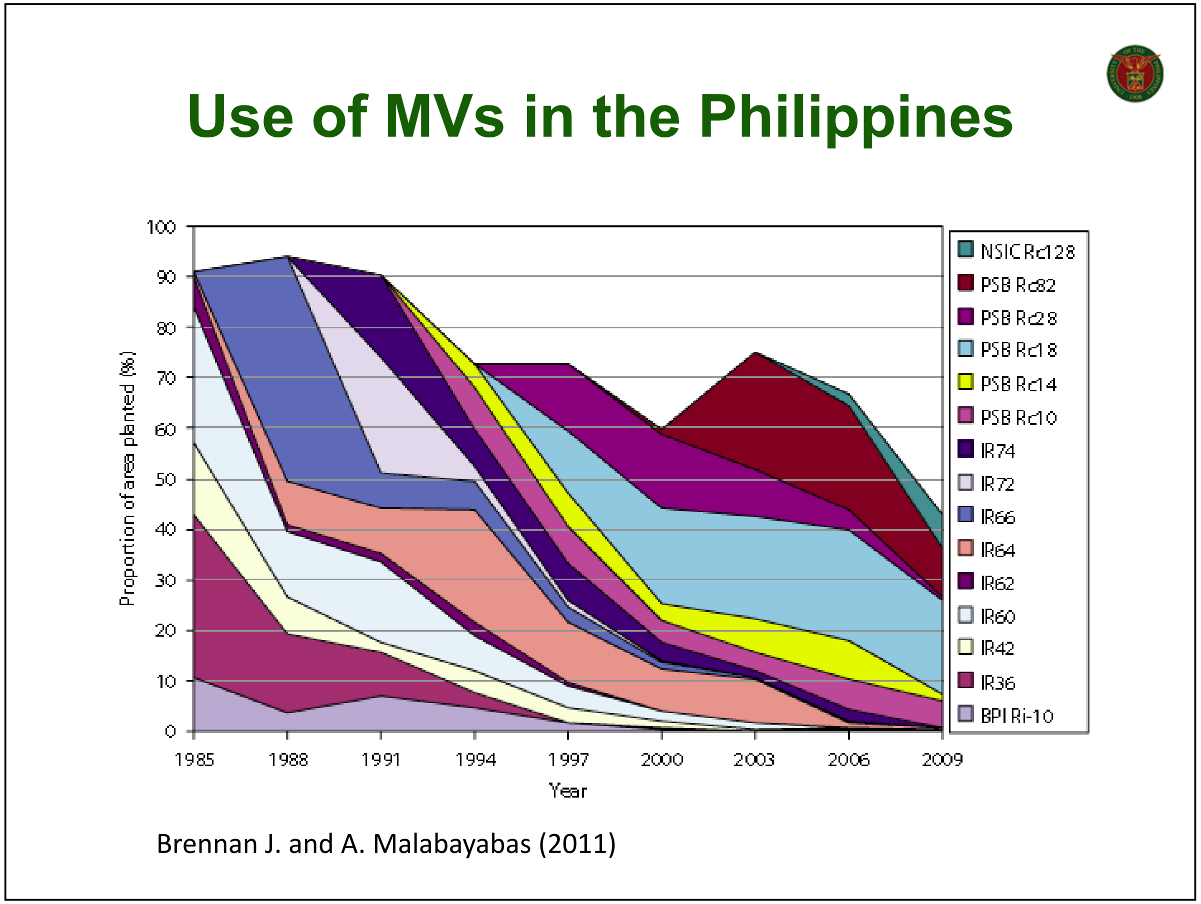
SLIDE TRANSCRIPT



As a matter of fact, there are waves of rice varietal improvements according to Estudillo and Otsuka (2006)*. Modern varieties 1 would be the ones released in mid 1960s and 1970s. These are the ones that require high inputs; between mid-1970s and mid-1980s, varieties with resistances to major pests and diseases; third wave, between mid-1980s to mid-1990s, those varieties with improved resistances and higher grain quality; after 1995, varieties that are targeted for more difficult production environments. These are reported in Brennan and Malabayabas.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

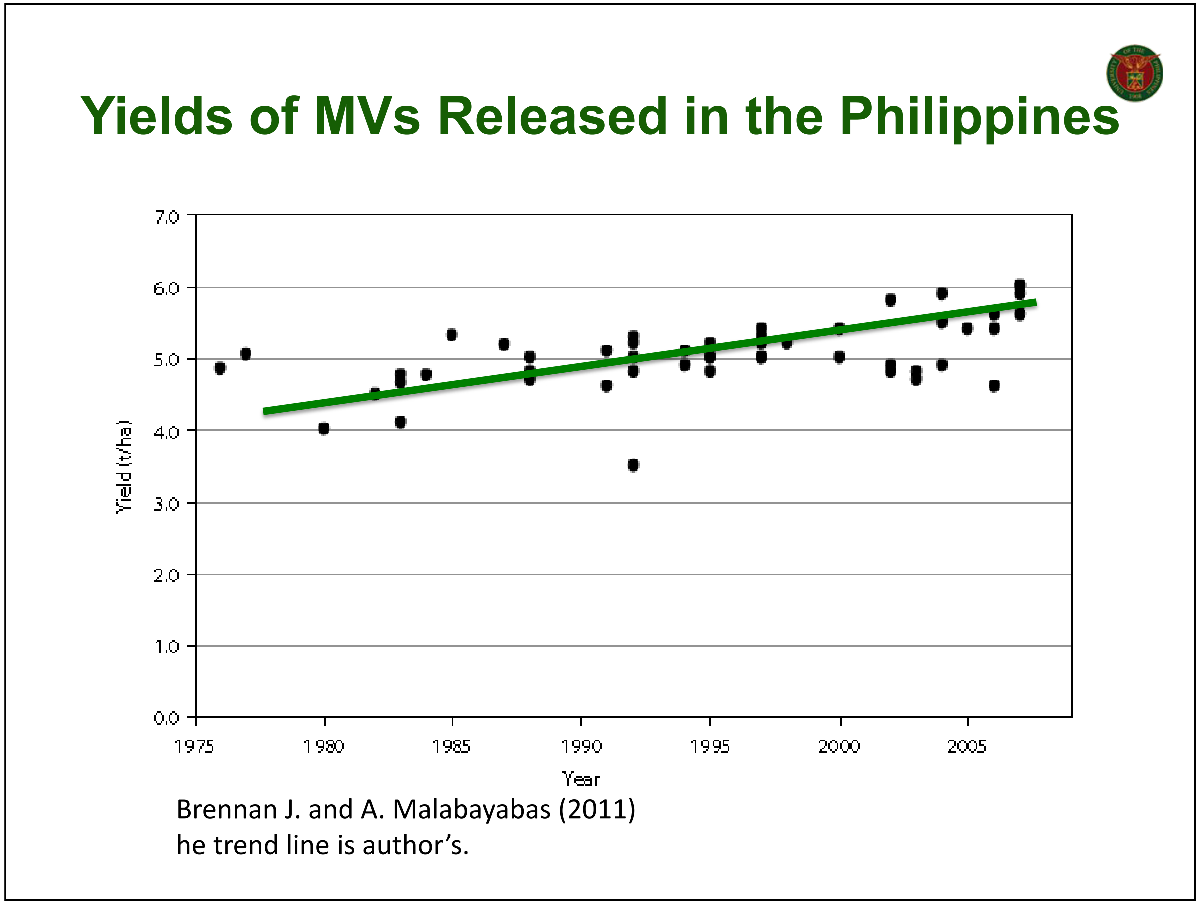
SLIDE TRANSCRIPT



This shows the pattern on how some older varieties just get replaced by the newer ones. For example, NSIC Rc128 replaced the earlier varieties; old varieties are no longer used. This is the kind of pattern of varietal improvements and use that we observed in this country. This is also true for Indonesia and Vietnam, which are also the subject of the study of Brennan and Malabayabas.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

SLIDE TRANSCRIPT



Brennan and Malabayabas plotted the yields associated with the release of varieties. There are some modest improvements in the yields through time. The message here is that we are getting better this year.

IVI Analysis

- Brennan and Malabayabas (2011) calculated an Index of Varietal Improvement (IVI), which is a weighted average of regional yield gains due to the use of improved varieties, weighted by the proportion of rice harvest area planted with them in the region.
- Study was from 1985 to 2009.

SLIDE TRANSCRIPT

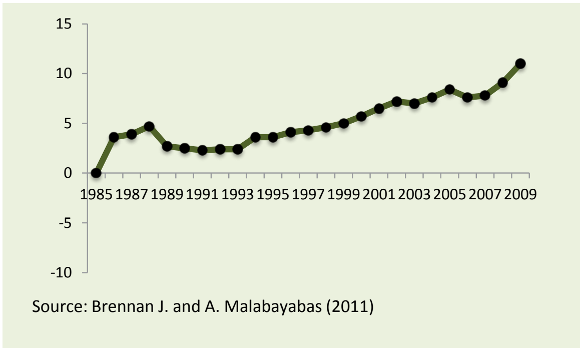
The approach was to use the Index of Varietal Improvement (IVI). In this particular approach, they had all the rice producing regions in the Philippines. From 1985 to 2009, they tried to ascertain the kind of varieties released and used at certain point in time and how much areas were planted with those varieties.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

SLIDE TRANSCRIPT

Yield gain, 1985 to 2009

- Using the IVI, rice varietal yields in the Philippines increased 11% between 1985 and 2009.
- Average annual gain is 5.104 %.



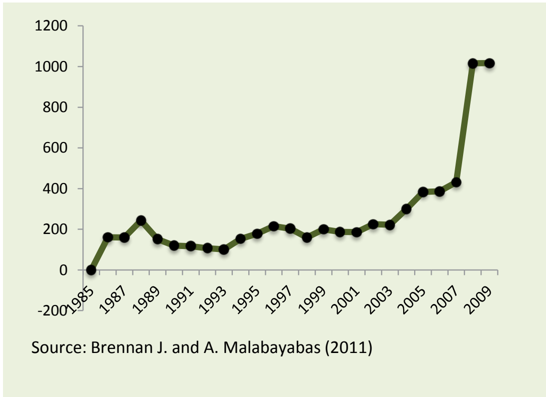
Brennan and Malabayabas came up with a weighted average gain per region with the several varieties introduced in a particular region. The important thing here is that they used the regions' weighted average yield increases to come up with an IVI index.

Their findings show that between 1985 and 2009, there is a major gain right away but decelerated after 1987, then continued to increase again in the following years. In 2007-2009, a sharp increase in the index was observed. The average annual gain is 5.104%.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

Value of Yield gains, 1985 to 2009

- They valued the gains at export price.
- They report that between in 2009, the Philippines gained $1.017 billion.



- The annual average gain is US$265 million (in constant 2009 dollars).

SLIDE TRANSCRIPT

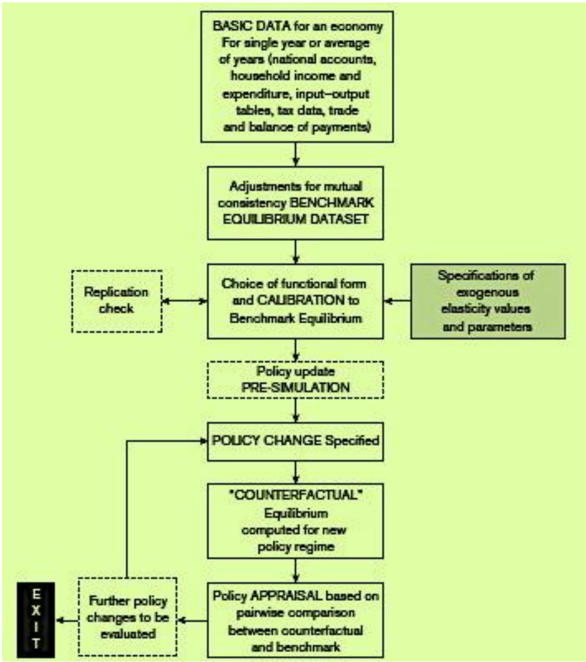
Brennan and Malabayabas tried to valuate yield gain using world prices in million dollars. A very sharp increase was observed in 2008 and 2009, but this is really an outlier. The annual average gain is US$265 million, in constant 2009 dollars.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

SLIDE TRANSCRIPT

A CGE Analysis

- A simulation on how the economy may be affected by "shocks", which is rice varietal improvements in this case.
- Makes use of a CGE model

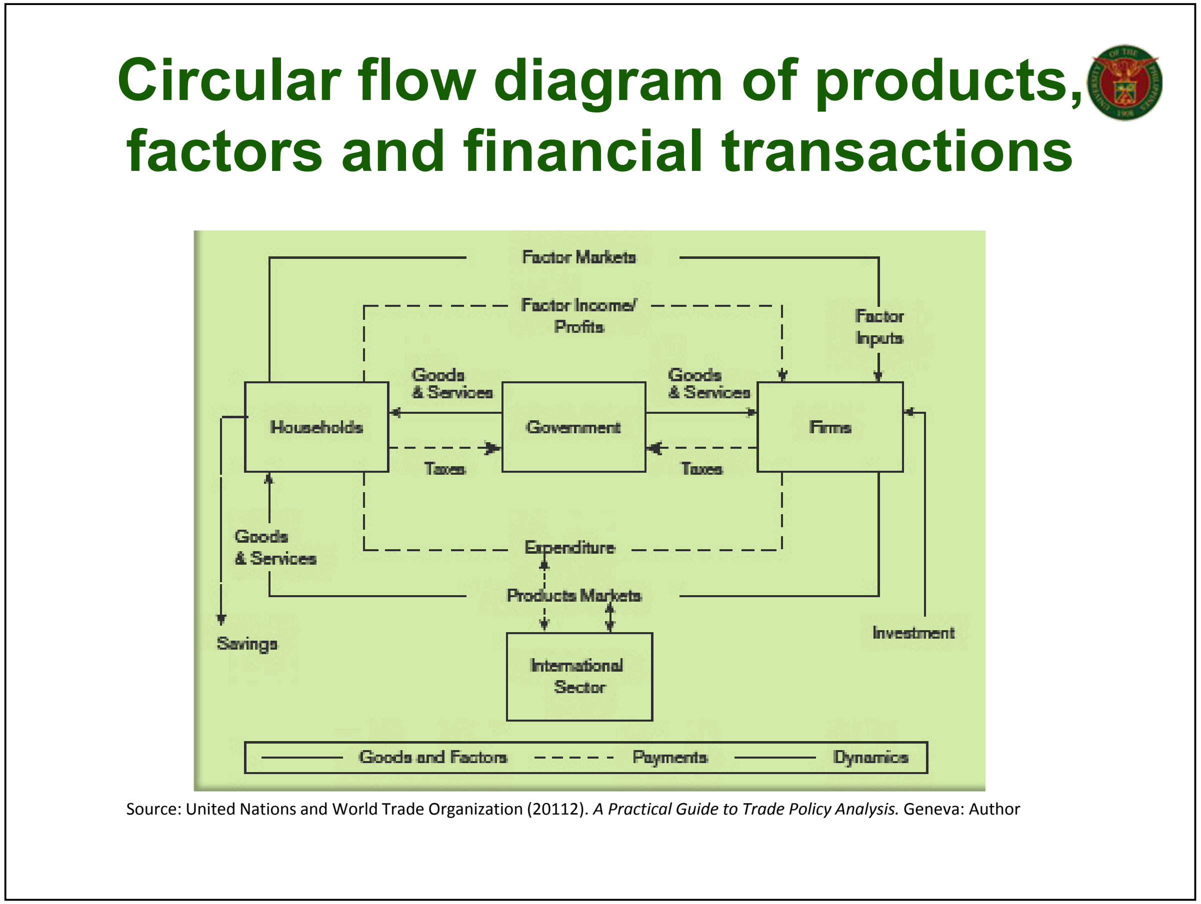


Source: United Nations and World Trade Organization (20112). *A Practical Guide to Trade Policy Analysis.* Geneva: Author

This is a Computable General Equilibrium (CGE). In this particular model, we simulate how the economy may be affected by shocks, which is rice varietal improvement. All things being the same, if you change the technology in rice production, what will the equilibrium be look like and how it is compared to the one before. This is a simulation.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

SLIDE TRANSCRIPT



The theory behind the model in economics is the interdependence of the various economic sectors of the economy: the consumers, producers, business firms, and the government. This is the so-called circular flow diagram of products, factors, and financial transactions. The CGE analysis involves a mimic of that particular circular flow diagram and come up with a numerical model of the Philippine economy.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

Philippine CGE Model

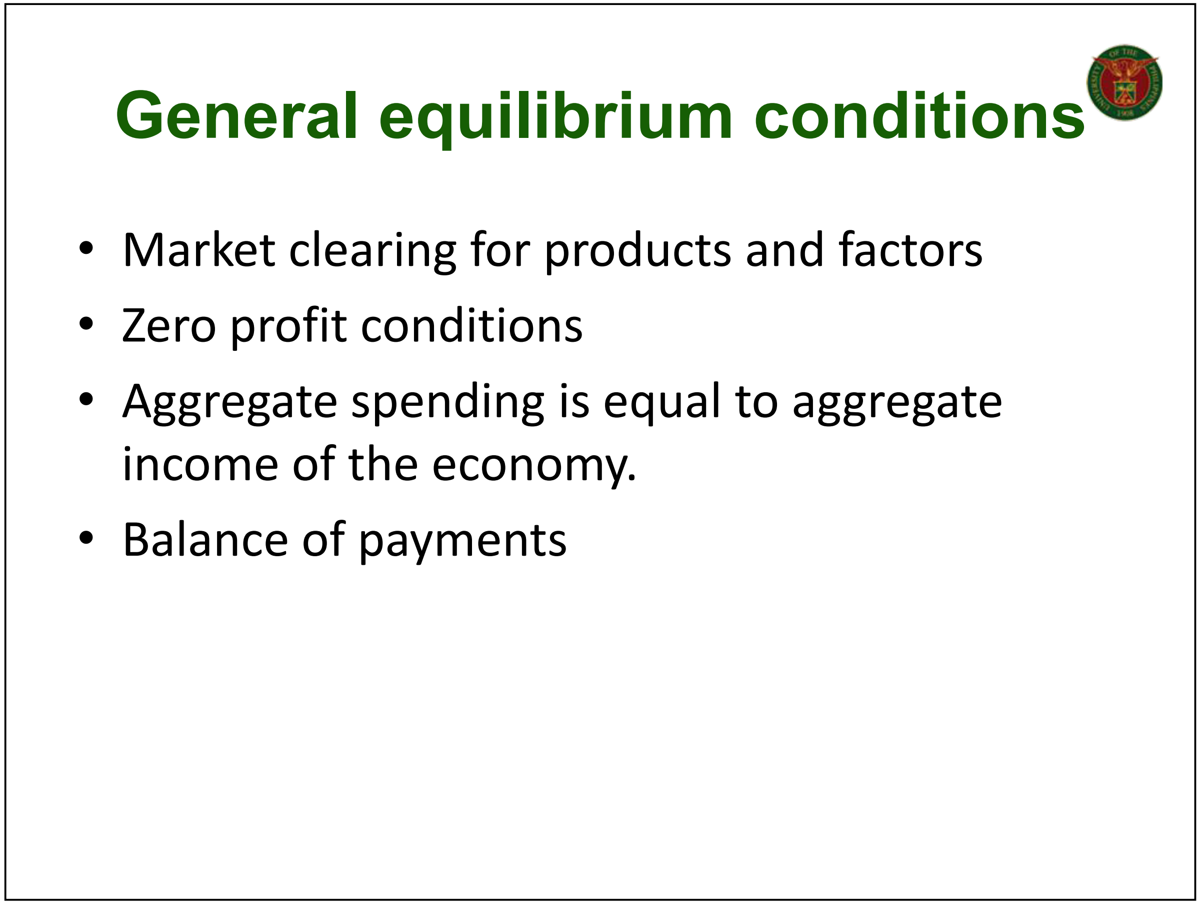
- Twenty seven industries, palay is one of these
- Three factors of production, skilled, low skilled labor, and capital
- 12 household groups
- Baseline data is 2009

SLIDE TRANSCRIPT

The model I used comprises of 27 industries. Palay is one of the industries, separate from milled rice. There are three factors of production: skilled labor, low skilled labor, and capital. There are 12 household groups: the first six household groups are urban-based household groups and the next six are rural-based household groups. Household classification is based on major sources of income. For example, household number 10, this is a rural-based household because they derive their income primarily on farming. They are the farmers.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

SLIDE TRANSCRIPT

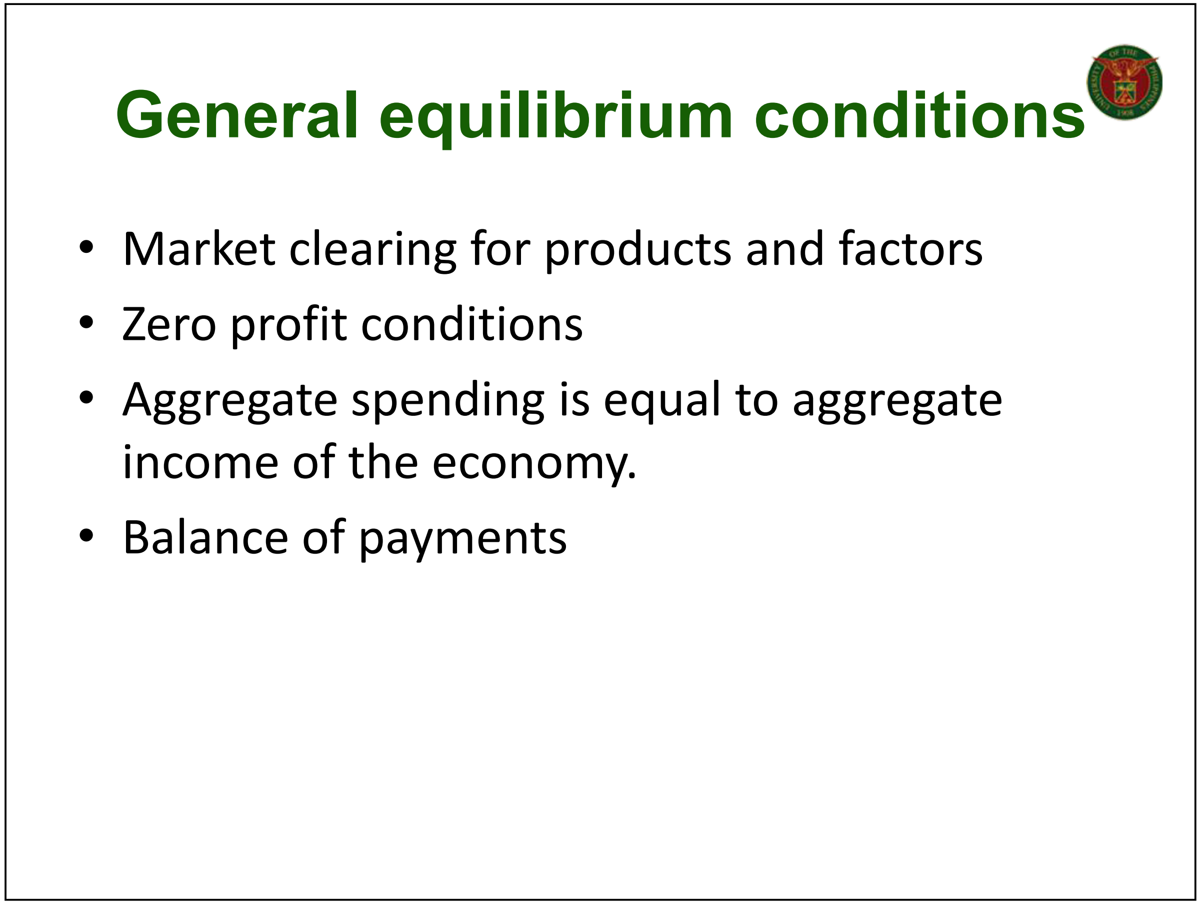


In this kind of model, we have some conditions to define equilibrium. First one is the supply and demand. This is the market clearing of all markets in the economy (e.g., product and factor markets). They are all equillibrated in the supply and quantity demand model, calculating the endogenous prices.

Second, the long-run balance or state of rest of the economy called the long-run equilibrium. This can happen when all the short-run profits are wiped out. This is called zero profit conditions. Although they have zero profit, these are still viable industries. It just means that there are no more short-run profits that will signal new business to enter.

Third is that all consumers and agents in the economy must spend exactly what their incomes are. Aggregate spending eqauls aggregate income.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE



Finally, we have balance of payments equilibrium with the rest of the world.

These conditions involve several equations that define an equilibrium. We solved the model first without the rice varietal improvement, and then solved it with the varietal improvement.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

Equivalent Variation of Income

Household group	Baseline income (in mln. PhP)	Proportionate change in Welfare	EV (in mln. pesos)
HH1	51,276.64	0.0116	594.81
HH2	756,111.70	0.0068	5141.56
HH3	281,718.14	0.0081	2281.92
HH4	165,064.60	0.0138	2277.89
HH5	642,157.41	0.0106	6806.87
HH6	490,482.10	0.008	3923.86
HH7	16,651.66	0.0095	158.19
HH8	108,728.68	0.0077	837.21
HH9	46,599.95	0.0094	438.04
HH10 (Farmers)	**284,192.96**	**0.0173**	**4916.54**
HH11	182,443.43	0.013	2371.76
HH12	80,261.06	0.0109	874.85
Total			30623.49

SLIDE TRANSCRIPT

In this method, it is only the palay industry that is affected here. The unit input cost of palay production is discounted to reflect the varietal improvement. It's like a sector-neutral technological change. What that means is that you can produce the same output at a much lower input cost. Equivalently, it can mean the use of the same amount of inputs but produce higher output because of the yield gain or the improvements in yields. But in my approach, I discounted the unit production costs to produce the same amount of output and solve the model to reflect the varietal improvement.

Welfare in economics can be measured in terms of equivalent variation in income. This pertains to the willingness of the people to pay so that we would have an economy with improved rice varieties. This amount of money that the people are willing to pay measures the welfare gained of having rice varieties. There is a formula for that.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

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HH11	182,443.43	0.013	2371.76
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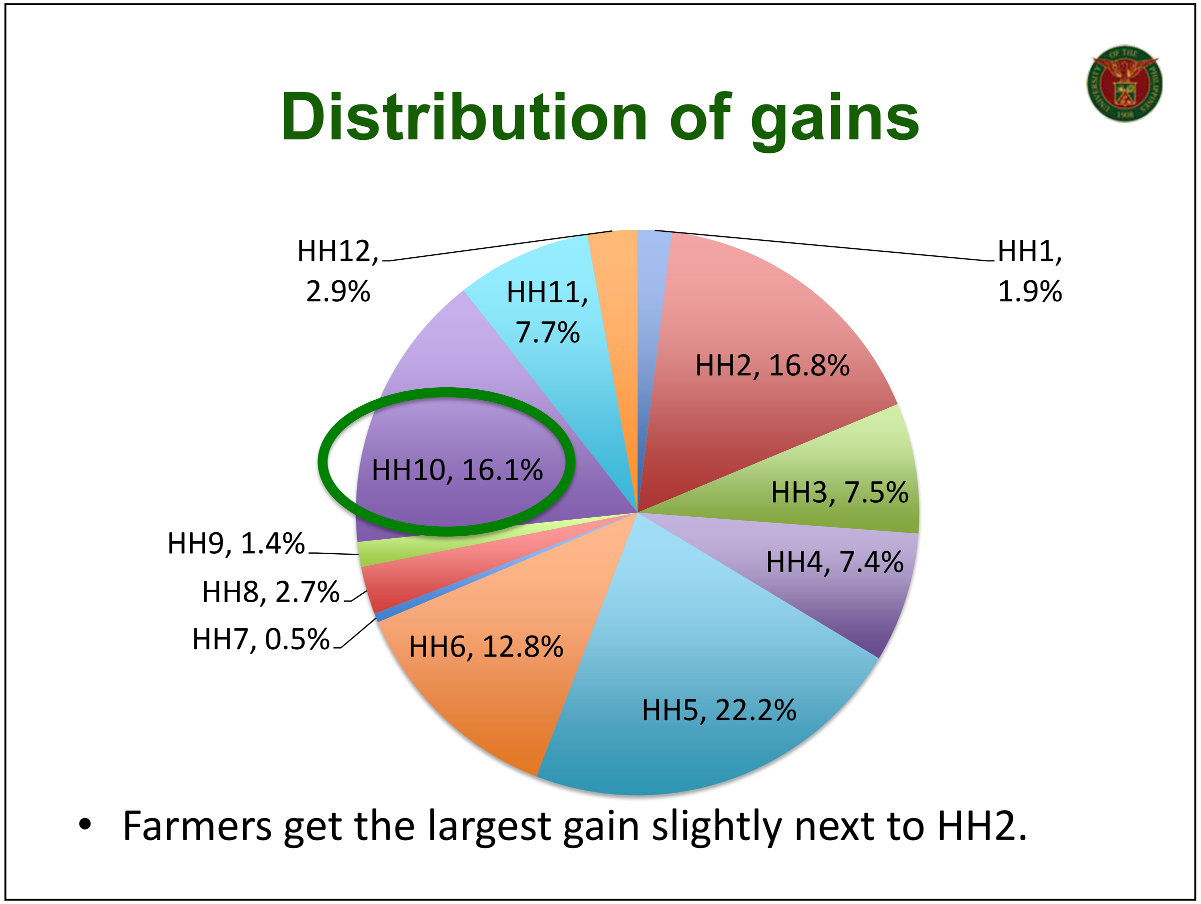
Total			30623.49

The proportionate change in welfare is the index of the well-being of a particular household group with baseline income of say PhP51 billion. This proportionate change in welfare is brought by the introduction of rice varieties. The gain, therefore, of household 1 is PhP594 million. The procedure was repeatedly done for all these 12 household groups. The first six households are urban-based while the last six are rural-based. Household 10 are those who are deriving their income from farming (i.e., farmers). They are actually getting PhP4.9 billion as gains per year because of the introduction of improved rice varieties. The total gain to the economy is around PhP30 billion.

IMPACT OF RICE R&D INVESTMENTS ON ECONOMIC WELFARE

SLIDE TRANSCRIPT



Based on the distribution of the total gains, farmers get 16% of this particular gain, which has to be divided by the number of farmers. Farmers (household 10) get the largest gain slightly next to household 2.

Economists use this particular measure (pertaining to CGE), the equivalent variations in income to define economic welfare resulting from a shock, i.e., any changes that will disturb the equilibrium of economy. This shock, in this case is the introduction and use of modern rice varieties. The gain is possible only because of investments by the public sector agencies like PhilRice or IRRI in sustaining varietal improvements.

This is one methodology to measure the werlfare effects of R&D. However, this is a very rough attempt. This is still a work in progress.

PRIVATE SECTOR'S PERSPECTIVE ON RICE R&D INVESTMENTS

Frisco M. Malabanan

HIGHLIGHTS OF THE PRESENTATION

The participation of the private sector in rice Research and Development (R&D) has begun when the implementation of Hybrid Rice Commercialization Program (HRCP) in the Philippines was launched in 2002. Since then until 2008, rice production and yield increased. In 2011, the government ceased its support to hybrid rice, which could be one of the reasons for the reduced production and yield in this year. In 2013, rice production increased but this was mainly attributed to increases in area harvested due to irrigation projects and not because of yield increase. This shows that R&D results such as hybrid rice technology, can positively affect rice productivity. Therefore, continue doing rice R&D.

Constraints and gaps need to be addressed to encourage privte-sector investments on rice R&D and commercialization of rice technologies. Some of the strategies that can be considered in implementing rice R&D are: a) Private-Public sector Partnership (PPP); b) clustering approach; and c) contract-growing and lease agreement schemes.

As a support to rice R&D, the national government needs to continuously provide sufficient budget to R&D institutions. Moreover, they have to create favorable conditions to encourage private sector's active participation in rice R&D.

PRIVATE SECTOR'S PERSPECTIVE ON RICE R&D INVESTMENTS

Overview of Rice Production in the Philippines

- Rice – staple food ½ of the worlds population
- Rice industry – 20.0 % of the GVA in Agriculture (CY 2013)

Year	Area Harvested (Million ha)	Volume of Production (Million mt)	Average Grain Yield (mt/ha)
2002	4.05	13.27	3.28
2005	4.07	14.60	3.59
2008	4.46	16.82	3.77
2011	4.53	16.67	3.67*
2012	4.69	18.02	3.84
2013	4.75	18.44	3.89

SL AGRITECH CORPORATION
"Agri-Technology for Mankind"

SLIDE TRANSCRIPT

Private sector's participation to rice Research & Development (R&D) was initiated when the Hybrid Rice Commercialization Program (HRCP) started in 2002. But, of course, the current level started some years before that.

I will highlight this overview of the rice production from 2002 to 2013 and relate this to the private sector's R&D investment later on. The production in 2002 was 13.3 million metric tons (mt) of palay and the average yield was only 3.28 mt per hectare (ha). This was when the rice program started highlighting the seed systems using both inbred and hybrid rice technology. In 2005, the production increased to 14.60 million mt and the average yield also increased to almost 3.6 mt/ha. This year was marked as the height of HRCP operations, wherein more than 350,000 ha was planted to hybrid rice.

However, government support through the hybrid rice program ended in the latter part of 2010 or 2011. The production in 2011 then decreased to 16.6 mt from 16.82 mt in 2008. Average yield also decreased from 3.8 mt/ha in 2008 to 3.67 mt/ha in 2011.The hybrid rice program and the seed systems were still operating in 2008.

In 2013, palay production increased again to 18.44 mt. However, this is mainly attributed to increases in area harvested brought by irrigation projects in the country. Area harvested increased from 4.4 million ha in 2008 to 4.75 million ha in 2013. The average yield in 2013 was only 3.89 mt/ha, which is very close to the yield in 2008, that is, 3.77 mt/ha. Therefore, the average yield in 2008 and 2013 did not increase dramatically to cause significant change in the total production. Therefore, the increase in production can be attributed mainly to the positive change in area harvested.

Based on the article that I reviewed, the hybrid rice technology partly brought this incremental increase in rice production and yield. The private sector, PhilRice, and IRRI has contributed to this impact through their R&D efforts.

But, of course, hybrid rice technology is just one of the factors that can increase production and yield. But the important point is that if we can encourage the private sector to invest more on rice R&D, particularly on hybrid rice, then the increase in the average yield can be attained in a much faster way. This is based on what we have experienced during the commercialization of hybrid rice in the country.

PRIVATE SECTOR'S PERSPECTIVE ON RICE R&D INVESTMENTS

SLIDE TRANSCRIPT

This is the summary of the development of the hybrid rice commercialization in the country, as well as the participation of the private sector in rice R&D since 2002. This was explained earlier.

PRIVATE SECTOR'S PERSPECTIVE ON RICE R&D INVESTMENTS

SLIDE TRANSCRIPT

On the side of the private sector, specifically SL Agritech, one development strategy employed in rice R&D is the Private-Public Sector Partnership (PPP). This involves partnering with PhilRice, IRRI, some State, Universities, and Colleges (SUCs), the Department of Agriculture (DA), PhilSCAT, and Local Government Units (LGUs) in extending matured rice technologies.

We are using also the cluster approach in technology demonstration (techno-demo) of seeds and rice commercialization. It aids in convincing farmers of the impact of the technologies being demonstrated, especially at a commercial scale. Previously, the techno-demo managed by PhilRice and DA-LGUs were implemented in 0.50 to 1 ha per location. But the farmers would say that this techno-demo became successful because it was managed by technical people, hence, may not work under commercial cultivation. But when we used the cluster approach, i.e., to pool 5 to 100 hectares of farmers' lands and use it as techno-demo fields, it became easier for us to convince the farmers that the technology we are demonstrating can be used in a commercial scale. It became easier for us to extend to farmers the matured technologies developed.

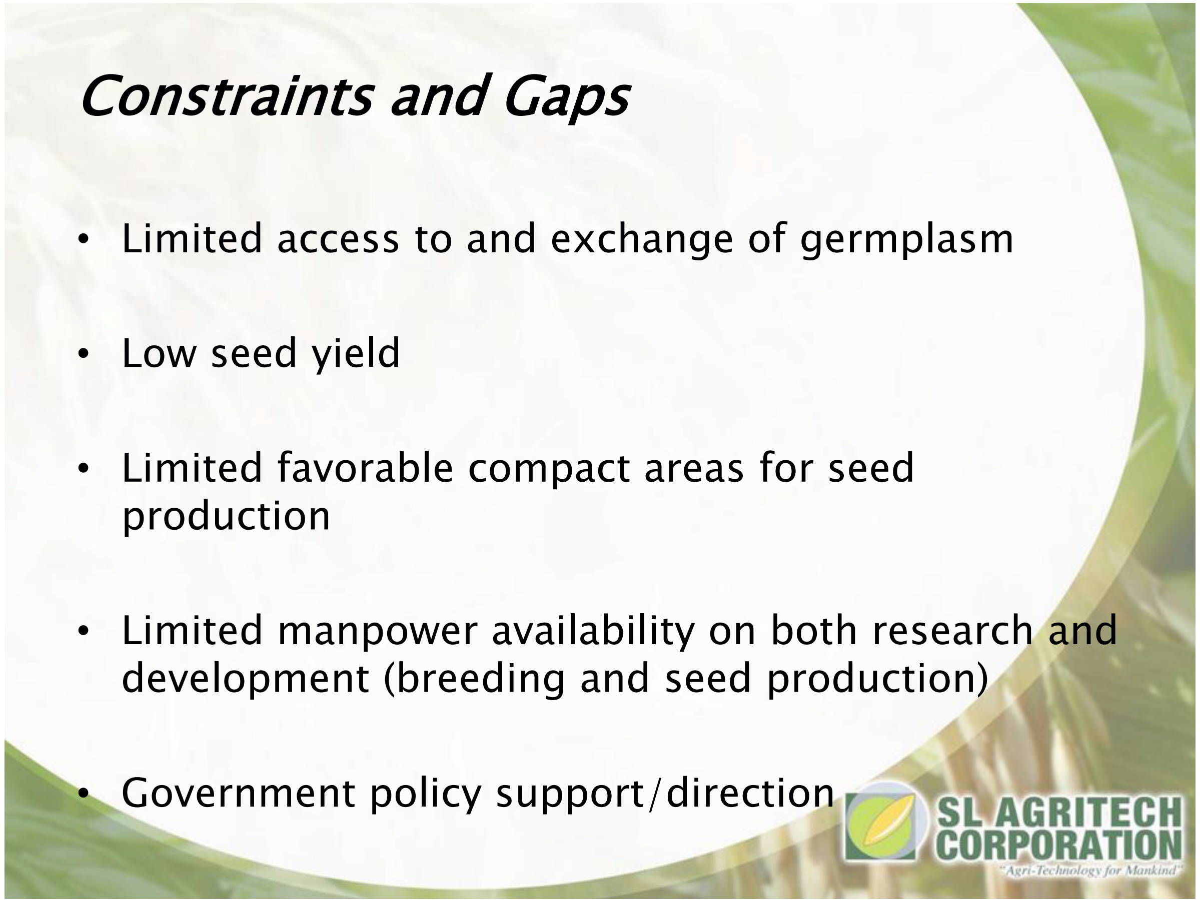
This is also true for PhilRice. The government should invest more on the demonstration of technology developed by our researchers at PhilRice, IRRI, and other public institutions.

The private sector is also using the contract-growing and lease agreement schemes in the commercialization of matured rice technologies developed both by the private and the public sectors.

SL Agritech uses the contract-growing scheme in the production of Doña Maria rice. Under this scheme, SL Agritech provides the seeds and the agri-biotech products to farmers at 0% interest and then the company buys back the produce at the right price. Currently, there are already some 6,000 ha contract-growing areas in Nueva Ecija. There are also contract growers in Laguna. Previously, SL Agritech had contract growers in Pangasinan, Nueva Vizcaya, and Tarlac but it was discontinued because the company thinks that the 6,000 ha of contract-growing areas in Nueva Ecija, hence is enough; no need to expand. This also saves resources because it is cheaper to concentrate in a bigger and in a closer area from the processing plant.

Under the lease agreement scheme, if the farmers have 10, 20, or 50 hectares, the company just lease it and farmers are paid a net amount of PhP30,000-PhP35,000 per ha per season. Aside from this, the company also employs the farmer-owner in managing the farm. In this case, we need the services of the technical people in this aspect of rice production. This will be highlighted more in one of the constraints and gaps, and the recommendations which I will be presenting later on.

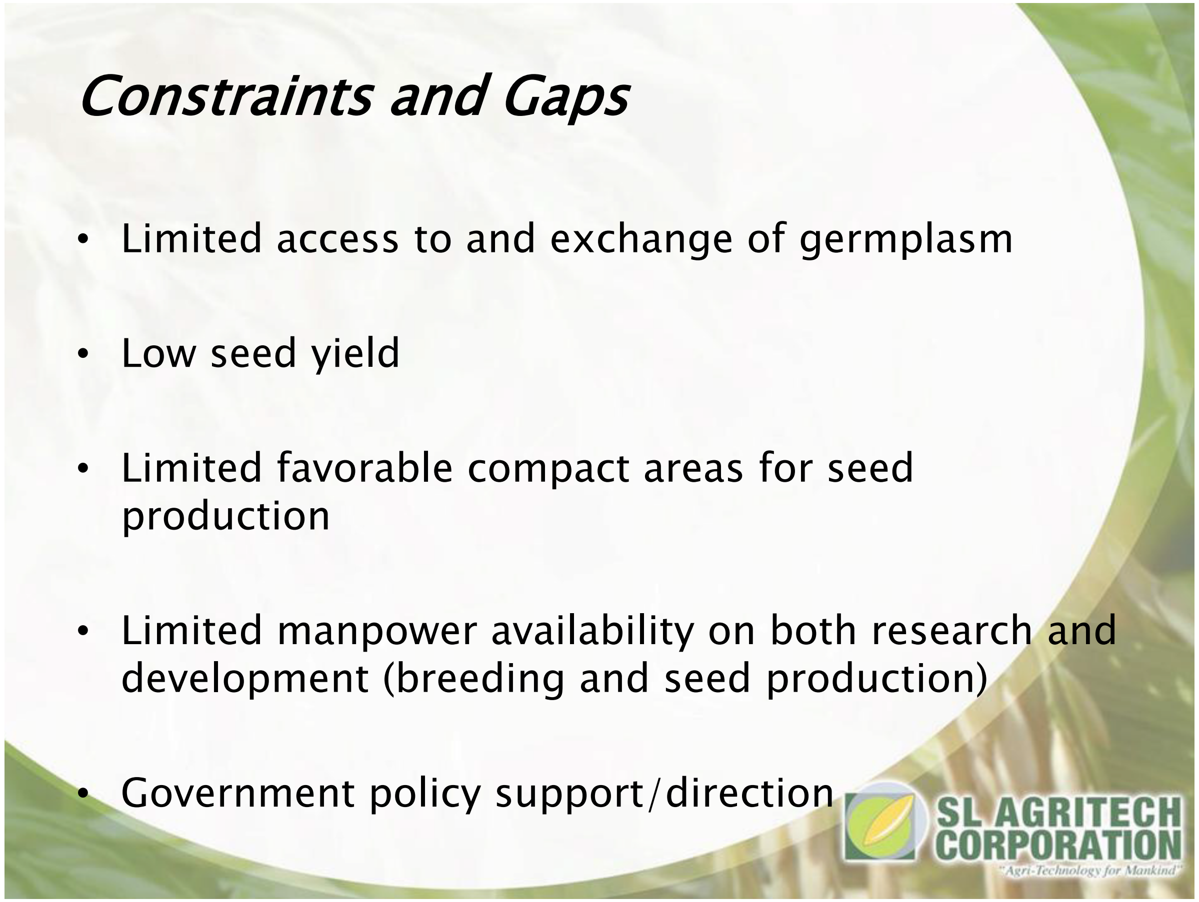
PRIVATE SECTOR'S PERSPECTIVE ON RICE R&D INVESTMENTS



SLIDE TRANSCRIPT

If these constraints and gaps could be addressed, then this would encourage the private sector to invest more on rice R&D in commercializing rice technologies.

First, limited access to and exchange of germplasm. This issue was highlighted also during a strategic planning workshop in Bangkok attended by representatives from tropical Asian countries. It was mentioned that the germplasm now is not that accessible to the private sector. In the Philippines, the private sector can access IRRI germplasm only if we are a member of the Hybrid Rice Research and Development Consortium. Based on the presentation of Dr. Regalado, the government is also providing funds to IRRI. Therefore, their outputs should be shared with the private sector that also pays tax to the national government. These taxes become part of the corporate support of the government. This is to hasten or fast-track the development of our own variety in the company that will result in the massive commercialization of technologies.



Second, low seed yield of hybrid. I think this is also related to the varietal development. The seed yield of the hybrid parentals is not that competitive with the current hybrid parentals of other companies. Low seed yield must be addressed through R&D to encourage private companies to use the matured technologies on hybrid. If this happens, then the private sector would be encouraged to commercialize PhiRice and IRRI hybrids in addition to private hybrid varieties.

Third, the private sector does not have much access to compact large areas for hybrid rice seed production. This hinders the private sector to increase utilization of or support to the technologies developed by PhilRice, IRRI, and other institutions.

Right now, our seed production of hybrid rice is only at Davao Oriental, where all other companies are also producing hybrid seeds. Therefore, land for seed production in Davao Oriental becomes limited. The public sector, therefore, should continue identifying favorable areas for hybrid seed production. This can increase investment on hybrid seed production of the private sector. Right now, we are producing seeds not just in the Philippines. We are producing also in China, Vietnam, and Bangladesh. Other private seed companies are also producing in India—most of them. If we can have compact favorable areas for hybrid seed production, then we can invest more in the Philippines and help the Filipino farmers increase their income. This will also hasten the utilization of hybrid rice technology in the country.

Fourth, limited manpower availabile for hybrid rice R&D, specifically on breeding and seed production. This is a problem not just in the Philippines. SL Agritech is still getting some technical people from China. Some private companies pirate and hire technical people from the public sector because they do not have source of technical people. The public sector develops the manpower. This should not be taken as a loss to the government because we are helping the industry grow. We should also look into training more people in R&D, especially on seed production. This will surely hasten the commercialization of our technology, specifically on hybrid rice production.

Fifth, government support or direction. If a program do well for the Filipinos, then this has to be sustained or maintained regardless of the administration or leaders in seat. If there is a technology that would help, then that must be added to the existing program to create continuous utilization of matured rice production technologies. As an example, hybrid rice commercialization ceased after 2011 even if it contributed to increases in palay production in the Philippines. Consequently, we were not able to immediately attain the expected increase in production. Now, the private companies are pleased with the current administration, through the National Rice Program, because it has supported again the adoption of high-yielding technologies, like hybrid rice technology. Hopefully, this support will continue and be strengthened in the coming years. Therefore, the government policy support and direction is very important to grow and expand the rice industry.

Based on a report done by the Bureau of Agricultural Statistics (BAS), the Philippines is already 97% self-sufficient. This means that a little more effort is needed to close this deficit. This can be easily solved by expanding hybrid rice production and inbred rice varieties that are resilient to adverse climatic conditions like saline, drought, flood, and other conditions. As an example, we planted one of our hybrid rice varieties in 2,500 ha coastal areas of Cagayan Valley. Surprisingly, we were able to attain an average yield of 7.5 mt/ha in most of these municipalities. The Provincial and Municipal Agriculturists can attest to this.

PRIVATE SECTOR'S PERSPECTIVE ON RICE R&D INVESTMENTS

SLIDE TRANSCRIPT

These are some of the recommendations that the private sector would like to highlight so that we can also increase our investment in rice R&D and commercialization of technology.

The first one was discussed earlier—facilitate access to and exchange of germplasm.

Second, PhilRice or public R&D institutions must be provided with higher budget to hasten the development of hybrid parentals, which are high-yielding and resilient to biotic and abiotic stresses. In developing a variety, the quality of the grains should be also based on market demands (market-driven). When I was still the Program Leader of the Technology Promotion Program of PhilRIce, one of the breeders asked why the private sector meddles with the quality of the grains he/she wants to develop. Of course, we have to breed what the market demands.

Otherwise, no one in the market will purchase it. We are pleased that the market-driven grain quality is now being addressed. Starting in 1980s or 1990s, better quality grains is already part of rice R&D targets.

Third, review the seed variety testing, registration, and recommendation protocol, especially for the hybrid. When we attended the Technical Working Group (TWG) meeting on rice, there was one recommendation on hybrid that is island-wide. This can have a problem because there are variations in the adaptability of hybrids even within one region.

The Rice Board will be submitting a resolution to the National Seed Industry Council (NSIC) to make variety recommendations more location-specific. This can fast-track the commercialization of the matured hybrid rice varieties. Recommendations should be location-specific so that if a private company focused only in one province, say Iloilo (Region VI), those well-performing varieties that have been tested in Iloilo can be recommended as a location-specific hybrid variety. This will fast track or hasten the commercialization of these matured hybrid rice varieties.

Fourth, facilitate more trainings of manpower on seed production. We need more experts on hybrid seed production. This is true not only in the Philippines but also in other Asia-Pacific countries.

Fifth, intensify seed production research. IRRI have been doing this massive research on seeds, particularly on increasing seed yields of hybrid parentals. In China, their hybrid rice scientists reported that they are getting very high seed yield. This is the reason why many seed companies commercialize their hybrid rice varieties. In the Philippines, public hybrids have low seed yield. A private company will not commercialize a public hybrid that will produce no profit. Profit is not possible if seed yield is low and the cost of production is high.

Sixth, promote joint venture research collaborations. The private sector is open to this partnership because we also have limited research facility when it comes to variety development, specifically for hybrid rice.

PRIVATE SECTOR'S PERSPECTIVE ON RICE R&D INVESTMENTS

SLIDE TRANSCRIPT

Next, the government needs to provide enabling facilities to farmers, like better access to credit and crop insurance coverage. If these facilities will be made accessible to farmers, then the private sectors can help them market their technology, e.g., seeds.

It was observed in Nueva Ecija that only few rice farmers plant hybrid rice in the rainy season. This is due to high risk associated with this season (especially in Central Luzaon and Cagayan Valley) because of typhoons. Farmers do not invest much on hybrid rice because of the possible production losses. If farmers have crop insurance coverage they can still recover 70% of their capital.

During the time of HRCP, we had data to show that hybrid rice can still produce high yield even in the wet season. This means that it is still profitable to plant hybrid in the wet season. Currently, private companies have already developed varieties adapted to wet season. More can be developed through

PRIVATE SECTOR'S PERSPECTIVE ON RICE R&D INVESTMENTS

partnership of the private and public sectors (like PhilRice and IRRI).

Next, DA-PhilRice to have more focused extension and promotion activities of their matured rice technologies. This can be done in partnership with the private sector. In extension or training of farmers, focus can be given on the production technology and mechanization. Many farmers are already adopting the mechanization program of the government. However, the industry lacks trained operators of machines like combine harvesters and mechanical transplanters.

Moreover, PhilRice should establish more techno-demo nationwide and budget must be allocated for this purpose. PhilRice had done this before. They have established 3,000 techno-demo nationwide before the Rice Seed System Program of the Department of Agriculture was implemented. This has increased awareness among farmers about the value of using high quality seeds.

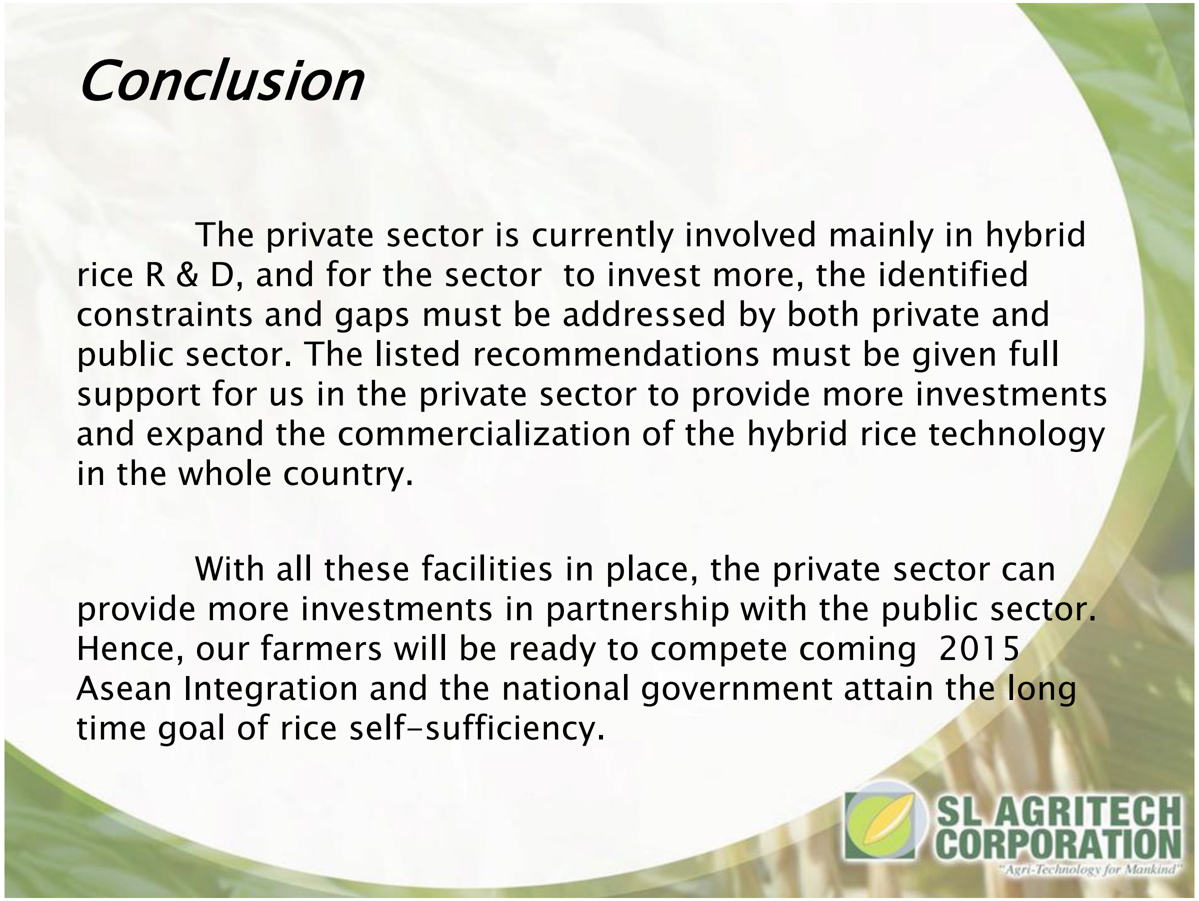
When I was the National Rice Seed Program Coordinator, the then Secretary Panganiban told me that before, I would not find any seed center with a sign board in Central Luzon. A business without a sign is a sign of no business. But now, the seed businesses in the area are already established. The Department of Agriculture, PhilRice, and the LGUs have invested a lot in educating farmers on the value of certified and hybrid rice seeds. Consequently, farmers are now buying certified inbred and hybrid seeds in many parts of the country.

Next one is on the provision of post harvest facilities, e.g., warehouse and drying facilities. This is specifically addressed to the Philippine Center for Postharvest Development and Mechanization (PhilMech). Based on our experience, we have a lot of palay from contract-growers but since we have limited drying facilities, we cannot process all the produce. This has resulted in high production losses, especially in the rainy season. The public sector then must continue to invest in these facilties for our farmers.

Next, marketing support especially in the wet season. Without marketing support from NFA, farmers will gain less as the price of palay is low, especially for those with no drying facilities; farmers are unable to store their produce because of moisture-related problems. Marketing support during the rainy season is a very critical support of the public sector.

Lastly, provide tax incentives to private companies who will be expanding or doing rice R&D in partnership with PhilRice, IRRI, and the National Rice Program of the Department of Agriculture. This was mentioned by the President and Chairman of SL Agritech.

PRIVATE SECTOR'S PERSPECTIVE ON RICE R&D INVESTMENTS



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In summary and conclusion, since rice is the main staple food of the Filipinos, the national government must provide the needed budget of PhilRice for them to do rice R&D that will continuously increase production and income of our rice farmers.

At the same time, the government must provide incentives to private sector doing rice R&D. They should be encouraged to invest more not only in rice R&D but also in the commercialization of matured rice technologies in the country.

"The national government needs to continuously provide sufficient budget to R&D institutions and create favorable conditions for private sector's active participation to R&D."

- DR. FRISCO M. MALABANAN

EX-ANTE EVALUATION OF THE PCAARRD S&T INDUSTRY STRATEGIC PLAN FOR RICE: A COST-BENEFIT ANALYSIS

Angelito T. Carpio AND Agham C. Cuevas

HIGHLIGHTS OF THE PRESENTATION

The Industry Strategic S&T Plans (ISP) of Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (PCAARRD) was crafted to provide science-based solutions that will help achieve the goals of food security and self-sufficiency program of the country. The main goal of rice ISP is to attain self-sufficient production by 2020 using sets of interventions. There are 16 ongoing interventions/projects under the rice ISP.

To validate whether the ISP objectives are achievable within the target period, ex-ante analysis was used to evaluate rice ISP projects before these are undertaken. Ex-ante aims to estimate the economic value of each ISP and provide recommendations for project improvement.

HIGHLIGHTS OF THE PRESENTATION

Based on the results, the rice ISP is a viable intervention that can give beneficial impact by 2020 as evident in the positive Net Present Value (NPV) and an Internal Rate of Return (IRR) greater than the opportunity cost. However, this is possible only if the technology chain continues by providing enough financial and technical support from concerned agencies like PCAARRD and DA. Factors affecting technology adoption, institutional barriers, and labor displacement issues must also be addressed to ensure maximum adoption of the technologies.

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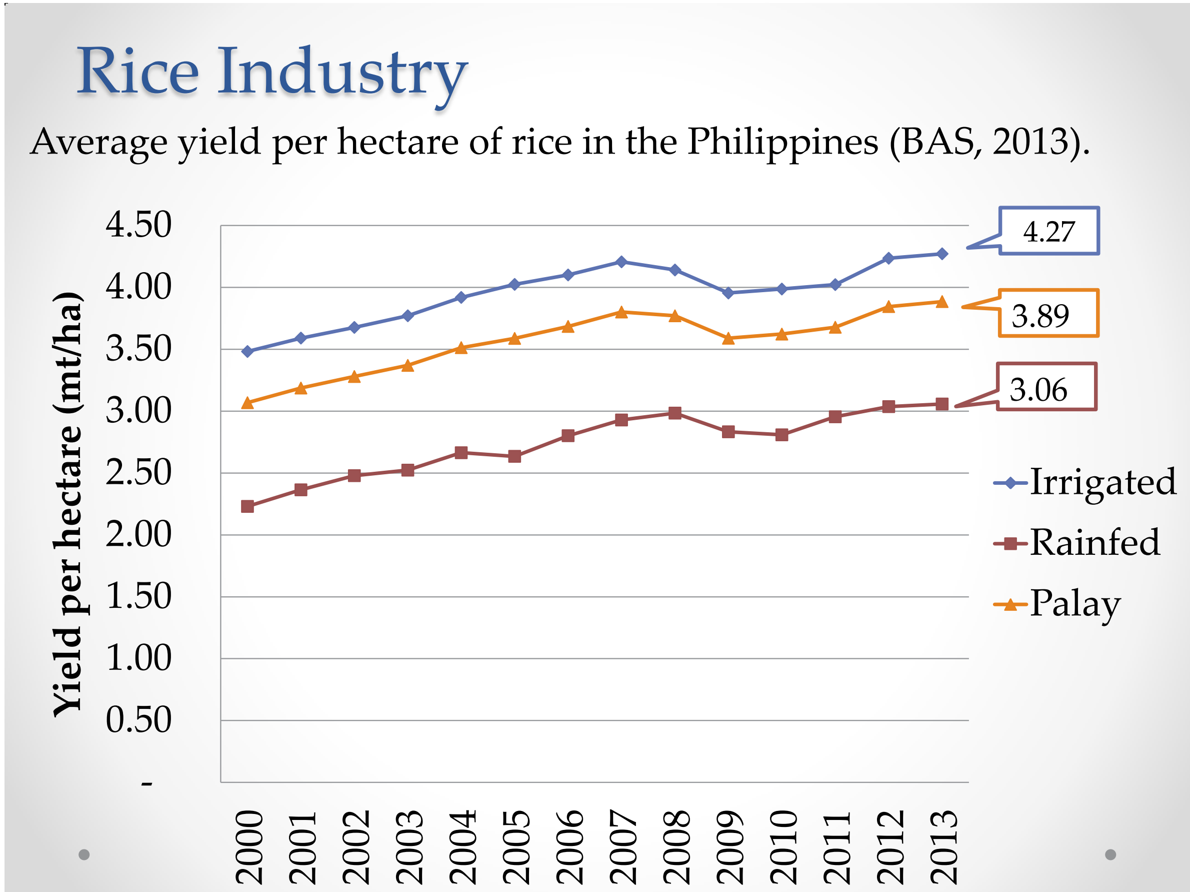
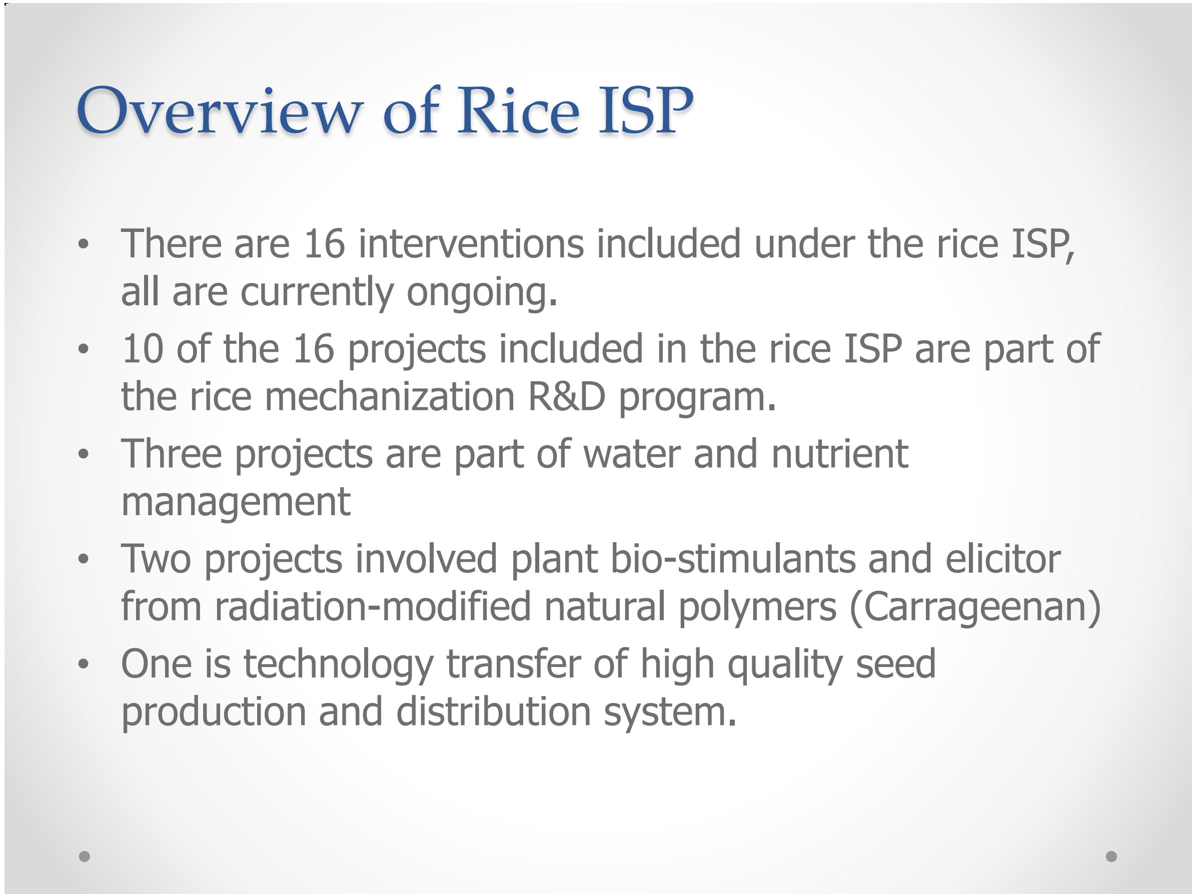


The figure shows the average yield per hectare of irrigated, rainfed, and all ecosystems from 2000 to 2013. The average yield per hectare for irrigated is 4.27 mt/hal; 3.89 mt/ha in rainfed.



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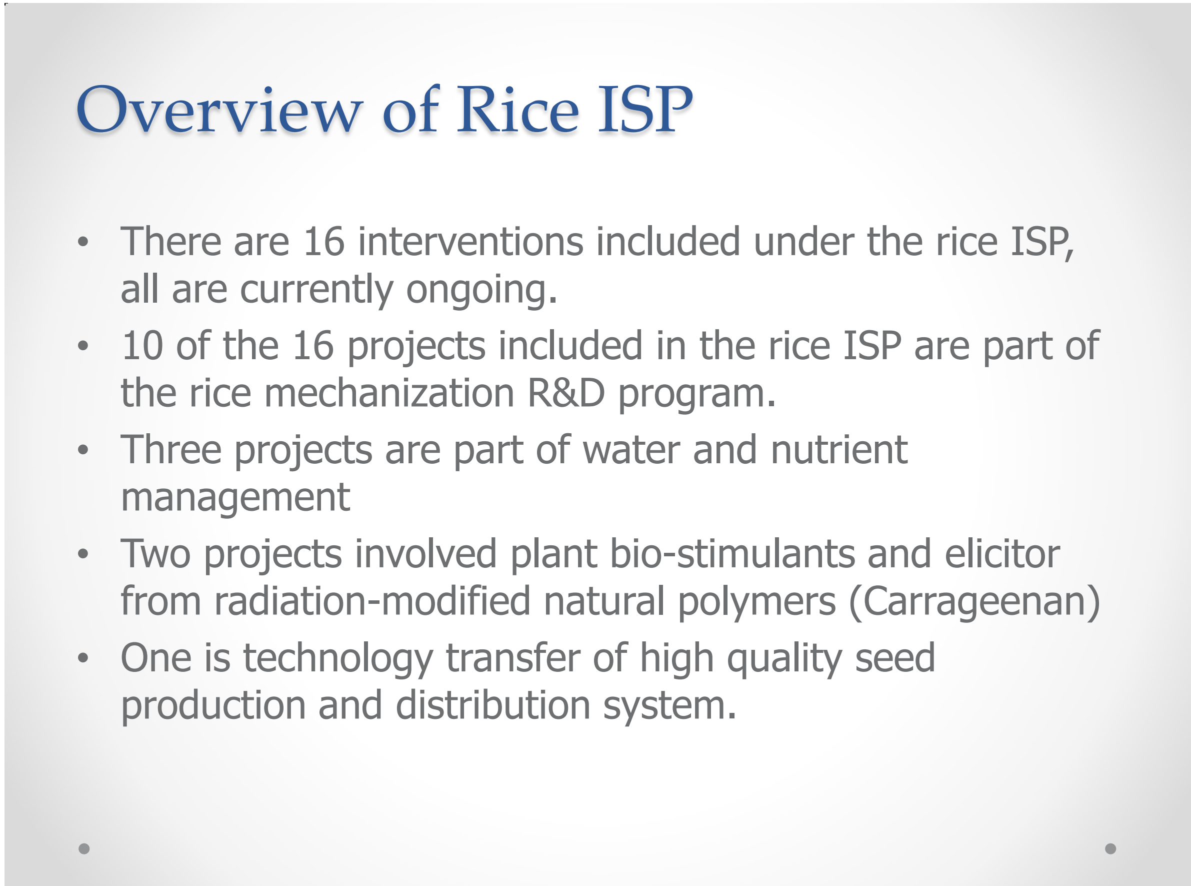
What is an ISP? An ISP is an industry strategic S&T plans that can provide science-based solutions that will help achieve the goals of the food security and self-sufficiency program of the country. It describes the targets of the industry of commodity and it prioritizes the ex-ante activities. PCAARRD believes that science is integral in achieving targets and goals of the industry. PCAARRD prioritizes ISP to set the vision and the direction of S&T in agriculture, agro-forestry, and aquatic.

For rice ISP, the main goal is to increase production by using sets of interventions. This means satisfying domestic requirements for food, seeds, and processing through domestic production without the need of importing rice from other countries because the supply is enough to meet the local market's demand. Specifically, the ISP on rice aims for self-sufficient production by 2020. To achieve this goal however, productivity must increase from 5.40 mt/ha in 2016 and then to 5.60 mt/ha by 2020.



There are 16 interventions under the rice ISP, all of which are currently ongoing. 10 out of 16 projects in the rice ISP are part of the rice mechanization R&D. Three (3) projects are part of the water and nutrient management. Two (2) projects involved plant bio-stimulants and elicitors from radiation-modified natural polymers. One (1) project focuses on the technology transfer and promotion of high quality seed production and distribution system aimed to continuously increase the direct access for quality and efficient rice seed production and distribution system.

SLIDE TRANSCRIPT

The rice ISP has identified the four most important interventions in rice that would translate to the attainment of goals of the industry specifically in increasing production. These interventions are the a) usage and distribution of high quality seeds (HQS), b) usage of bio-stimulants and elicitors, c) efficient water and nutrient management and d) reduction in postharvest losses and cost of production through improved farm mechanization, sub-component of which focuses on the promotion of brown rice as a staple through the fabrication of machineries as a response to the growing needs of the brown rice market for milling and drying services. To sum up, there are 16 interventions in rice to be subjected under the Ex Ante analysis, all of which are ongoing.

The project on increasing farmers' access to more quality rice seeds through efficient seed production system is currently implemented by PhilRice. It is being pilot tested in three (3) major provinces, Ilocos, Sultan Kudarat, and

Leyte. Presently, it has been expanded to some areas including the provinces affected by Yolanda such as Northern Samar and other provinces in Northern Cotabato where the seeds are really validated.

Projects involving plant bio-stimulants and elicitor from radiation-modified natural polymers are implemented by PhilRice and UPLB.

Smart-farming based nutrient and water management for rice production are also being implemented by PhilRice and UPLB.

On rice mechanization, the program focuses on enhancing rice production and post-production efficiencies through improvement and use of appropriate mechanization and postharvest technologies. PhilRice, PhilMech, and UPLB are the agencies implementing program.

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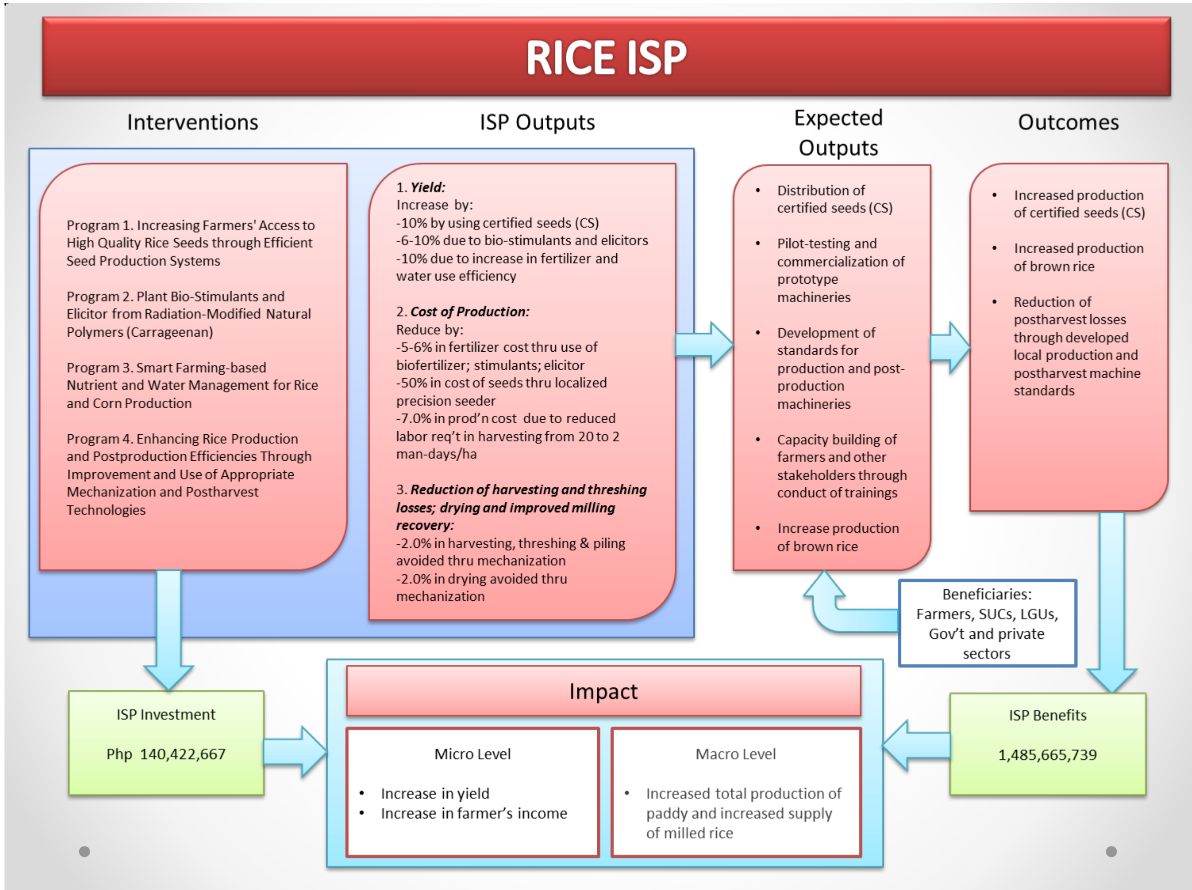
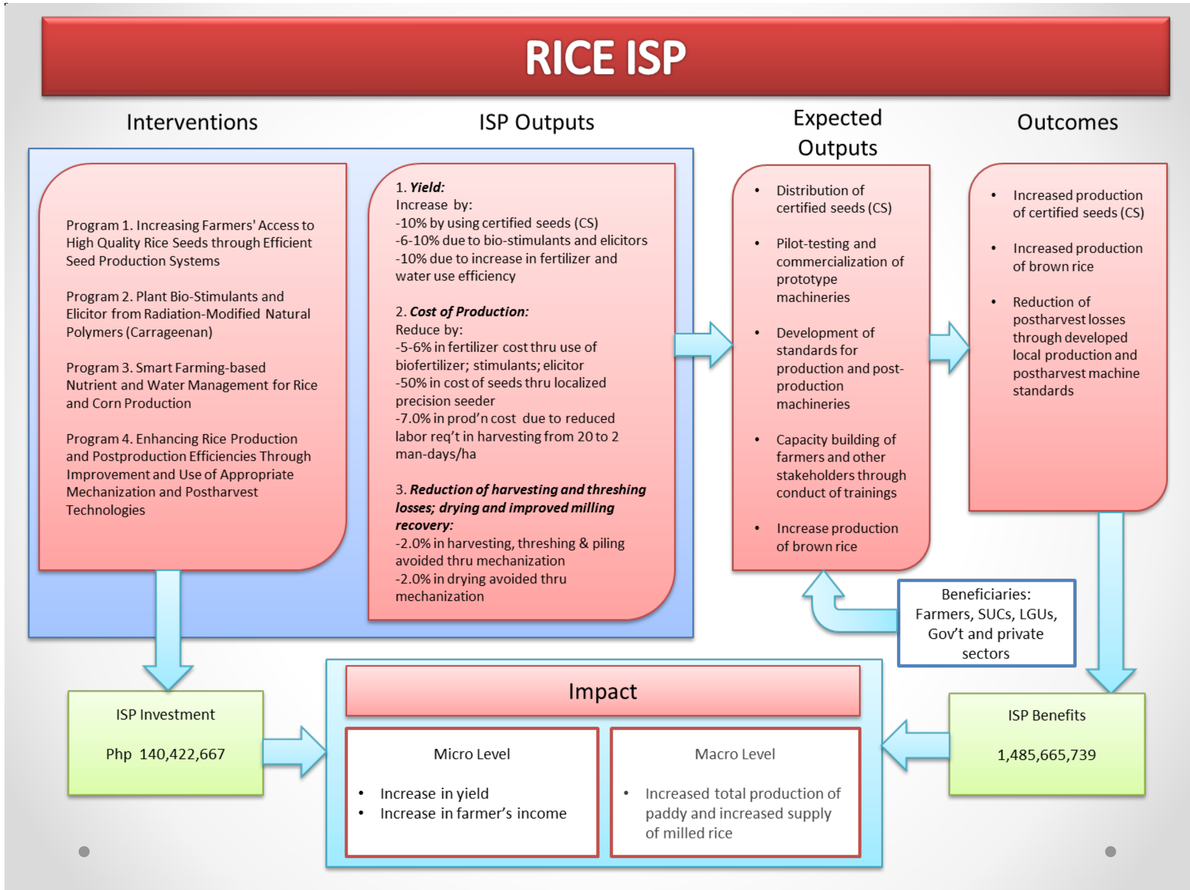


The next slide shows the technology chain of the rice ISP. The four major programs act as the interventions with an investment of Php140,422,667. As an output, the rice ISP aims to increase the yield by 10% by using certified seeds, 6-10% due to bio-stimulants and elicitors, and 10% due to increase in fertilizer and water use efficiency.

On cost of production side, the ISP's goal is to reduce fertilizer cost by 5-6% through the use of biofertilizer, stimulants, and elicitor, reduce cost of seeds by 50% through localized precision seeder, and reduce production cost by 7% through reduced labor requirement in harvesting from 20 to 2 mandays per hectare.
Harvesting and threshing losses can be reduced by mechanization, 2% in harvesting, threshing and piling and 2% in drying. This also results to improved milling recovery.

The expected outputs include (a) distribution of certified seeds; (b) pilot-testing and



commercialization of prototype machineries; (c) development of standards for production and post-production machineries; (d) capacity building of farmers and other stakeholders through conduct of trainings; and (e) increase production of brown rice. DTI and NSQCS conduct trainings.

The expected outcomes would be increased in production of certified seeds, increased production of brown rice, and reduction of postharvest losses through developed local production and postharvest machine standards.

The target beneficiaries of the four (4) programs are the farmers, SUCs, LGUs, government and private sectors.

The impacts on the micro level are increase in yield and increase in farmer's income. While the impact in macro level is increased in total production and increased in supply of milled rice.

SLIDE TRANSCRIPT

To validate whether the ISP objectives are achievable within the target period, ex ante evaluations of these project interventions primarily serve to aid decision making and to avoid the high cost of implementing interventions that may later be found to be ineffective.

The ex-ante team was tasked to evaluate and benchmark the result of the ISPs and value in the very possible incremental benefits of the ISP as a whole. In order to do that, the team needed to go to individual projects and evaluated the impact of each project. Through partial budget analysis, benefit-cost analysis, net present value (NPV), internal rate of return (IRR), and payback period, the financial impact of each project at the farm-level were computed. Technology adoption for each project was also included in the analysis to be able to establish the benefits of each project.

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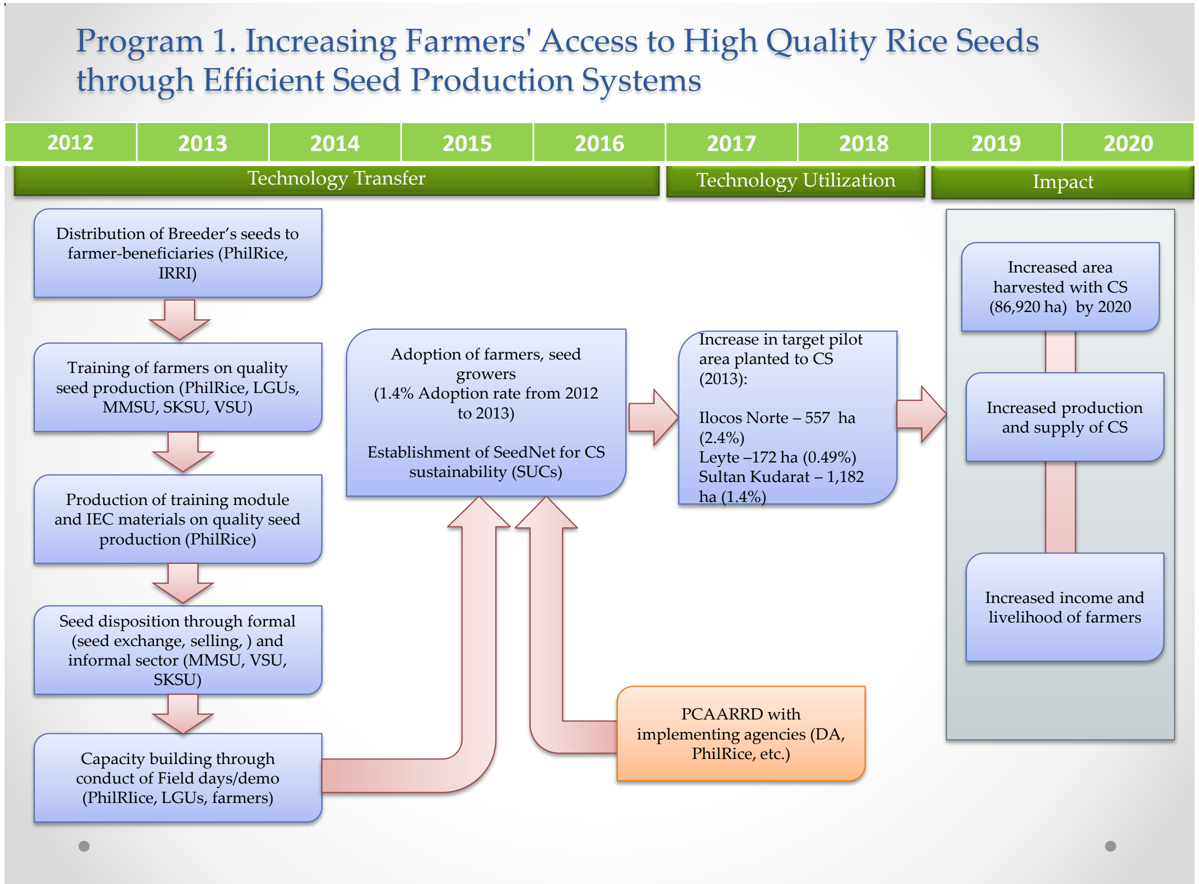

This slide shows the adoption pathway of the project starting from technology transfer up to technology impact. Certified seed (CS) production system is a technology transfer project that aims to increase the supply of certified seeds in selected rice areas which more than 50% of farmers are non CS-users. The project has four components: (1) Enhancing seed production system for SUC-SeedNet members with scientific interventions; (2) Enhancing seed production system for farmers through training and project-guided seed production system and monitoring; (3) Production of information, education, and communication (IEC) materials on quality seed production, and (4) Monitoring and impact evaluation of the project.

The ISP intervention is scheduled to conclude by 2016 which means that PCAARRD should have established the seed network that could supply at least 12 tons of these good quality seeds to be able to sustain the growth in yield.

EX-ANTE EVALUATION OF THE PCAARRD S&T INDUSTRY STRATEGIC PLAN FOR RICE: A COST-BENEFIT ANALYSIS

*AGHAM C. CUEVAS ON BENEFIT-COST ANALYSIS

SLIDE TRANSCRIPT

There are three alternative scenarios presented for this project. 1) 1% additional area planted with CS with 1 ton yield advantage was added to the total harvested area of the three pilot provinces every year. 2) 1% additional area planted with CS and with 0.5 ton yield advantage every year. 3) 1% additional area planted with CS and with 10% yield advantage every year.

The yield target of 5.40 mt/ha is achievable provided that an additional 1% target area at 0.5 tons yield advantage with high quality seeds at 40 kg/ha seeding rate each year. This translates to an additional yield of 148,102.07 kg for the three provinces (@ 15% yield advantage). Given that 37.78% is kept as seeds for the next season, 92,149.50 kg will be available for home consumption and disposal.

EX-ANTE EVALUATION OF THE PCAARRD S&T INDUSTRY STRATEGIC PLAN FOR RICE: A COST-BENEFIT ANALYSIS
*AGHAM C. CUEVAS ON BENEFIT-COST ANALYSIS

Projected average yield per hectare for the three provinces are as follows (pre-Yolanda estimates net of harvest kept as seeds): 4.32 mt/ha, 4.30 mt/ha, and 4.29 mt/ha given the three adoption scenarios. However, to achieve this, a total of 12 tons of good quality seeds need to be distributed through the informal seed sector each year.

EX-ANTE EVALUATION OF THE PCAARRD S&T INDUSTRY STRATEGIC PLAN FOR RICE: A COST-BENEFIT ANALYSIS
*AGHAM C. CUEVAS ON BENEFIT-COST ANALYSIS

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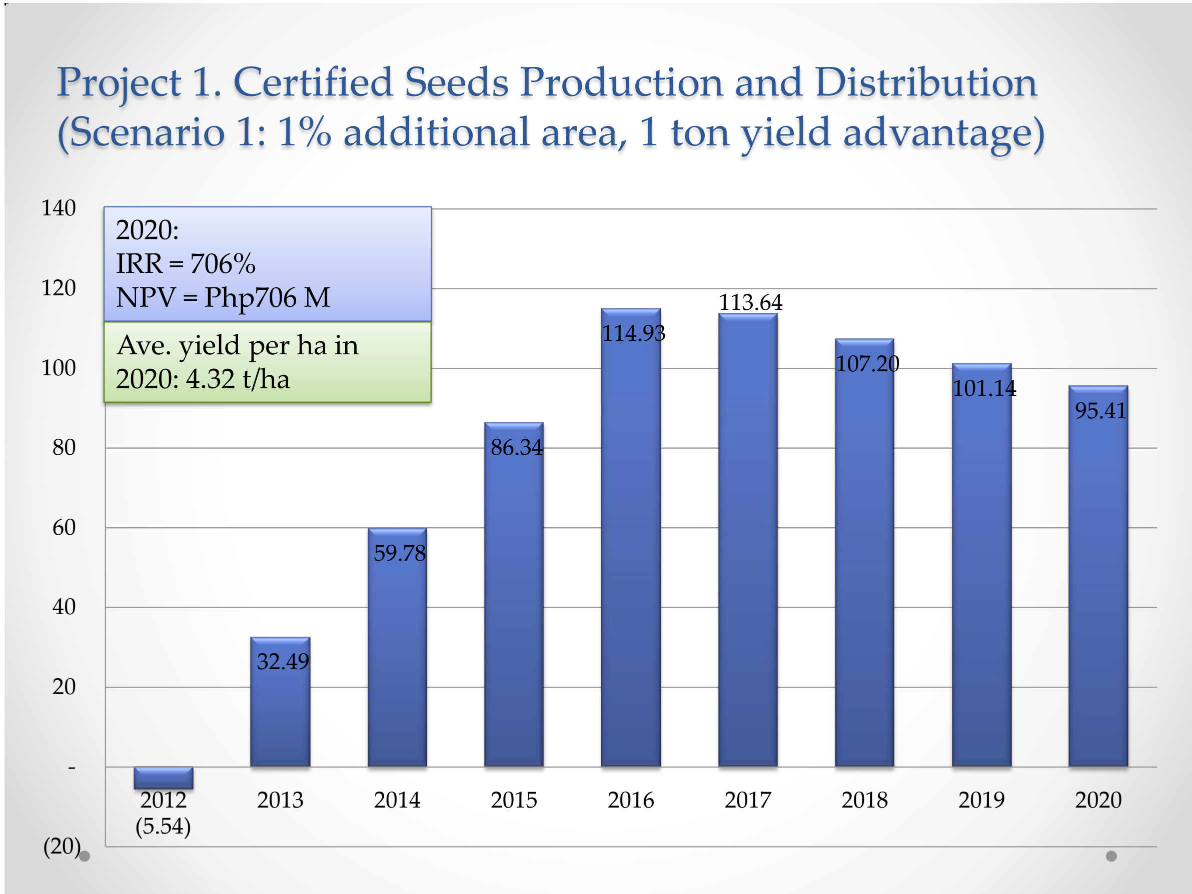

Based on the results, scenario 1, with 1 mt yield advantage, is expected to obtain an IRR of 706%, an NPV of Php706 million, and the average yield of 4.32 mt/ha.

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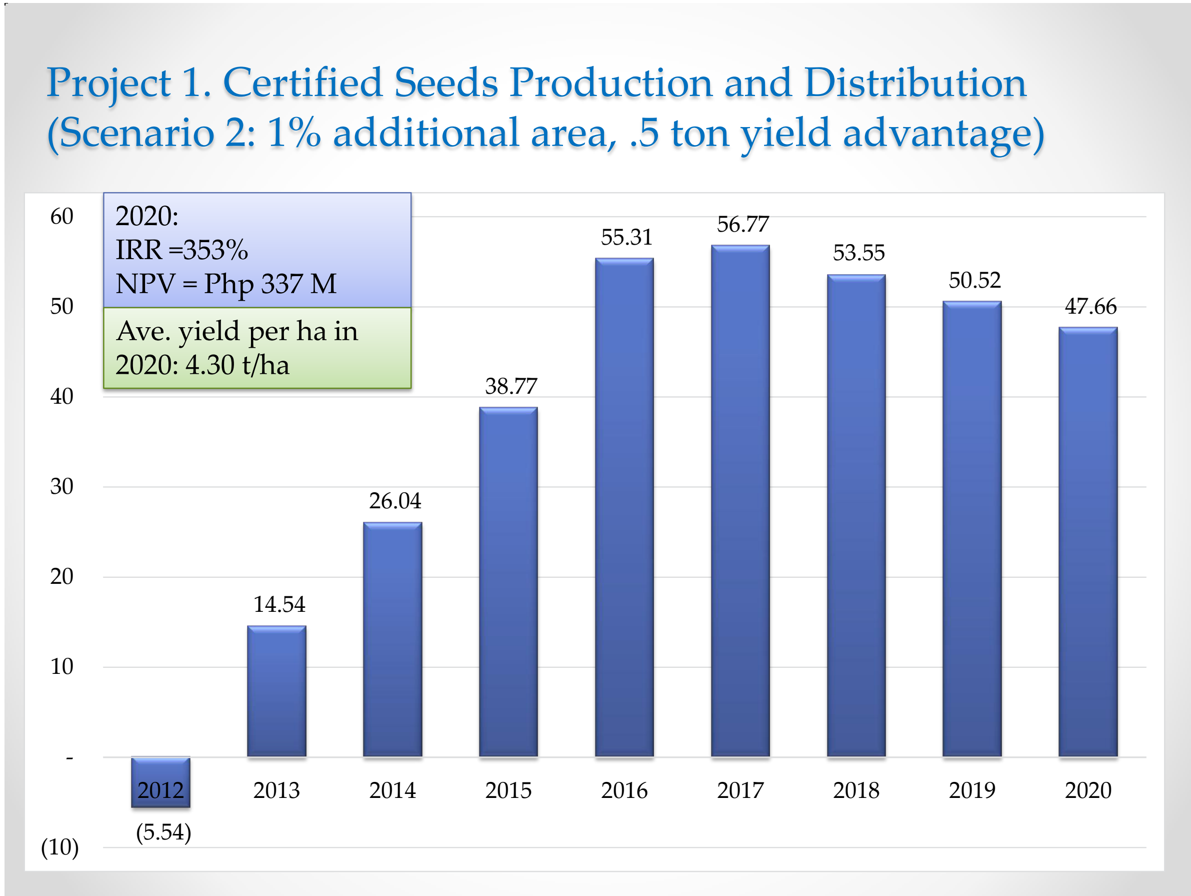

For scenario 2, the IRR is 353% and NPV is Php337 million. The average yield is 4.30 mt/ha.

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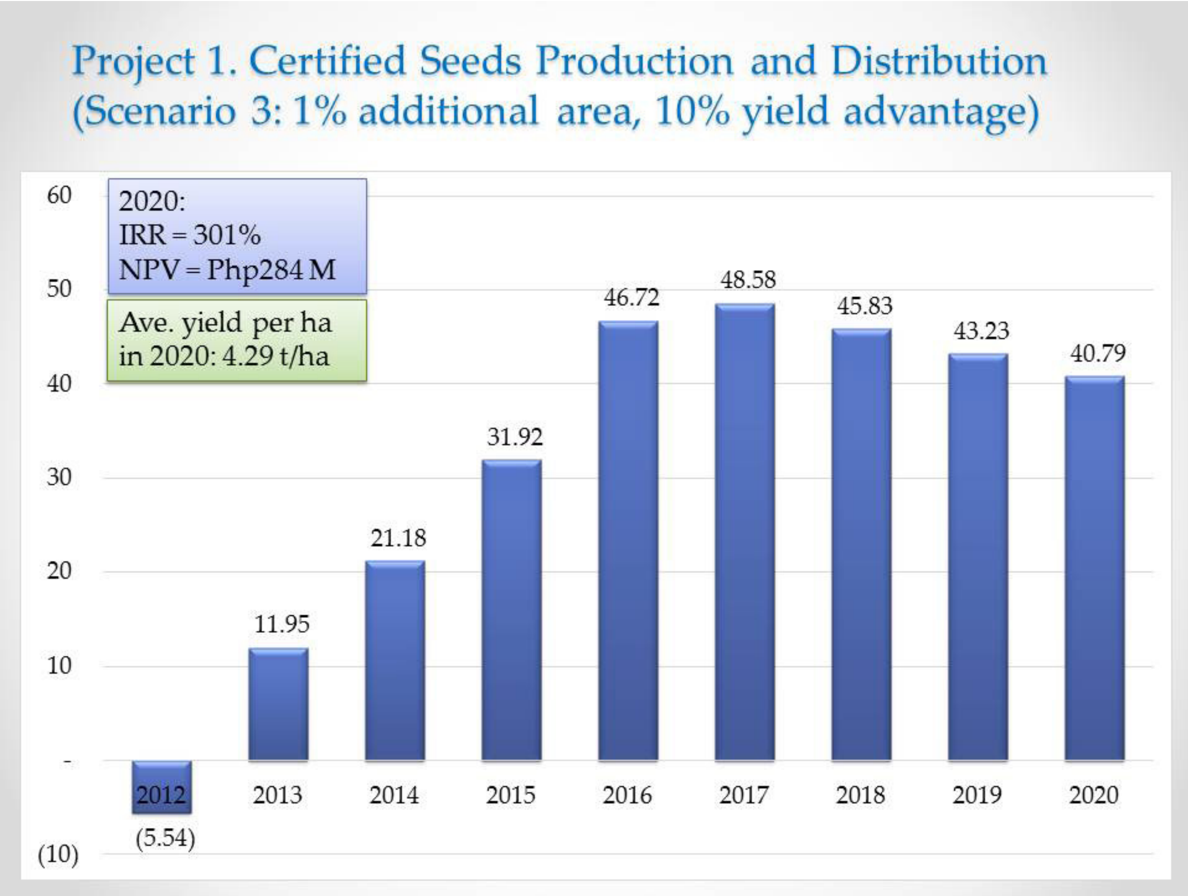
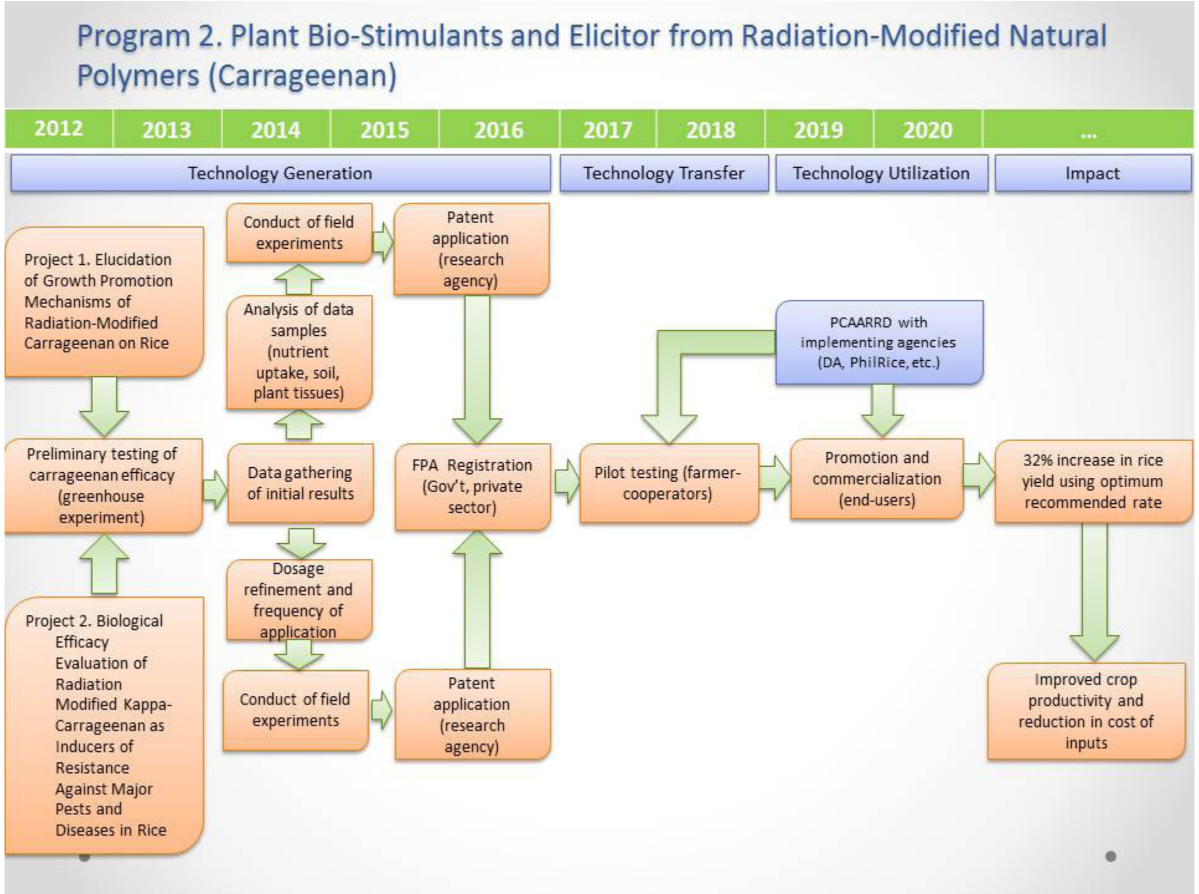


For scenario 3, the IRR is 301%, NPV is PhP284 million, and the average yield is 4.29 mt/ha. The seed distribution system is established and sustainable after 2016.



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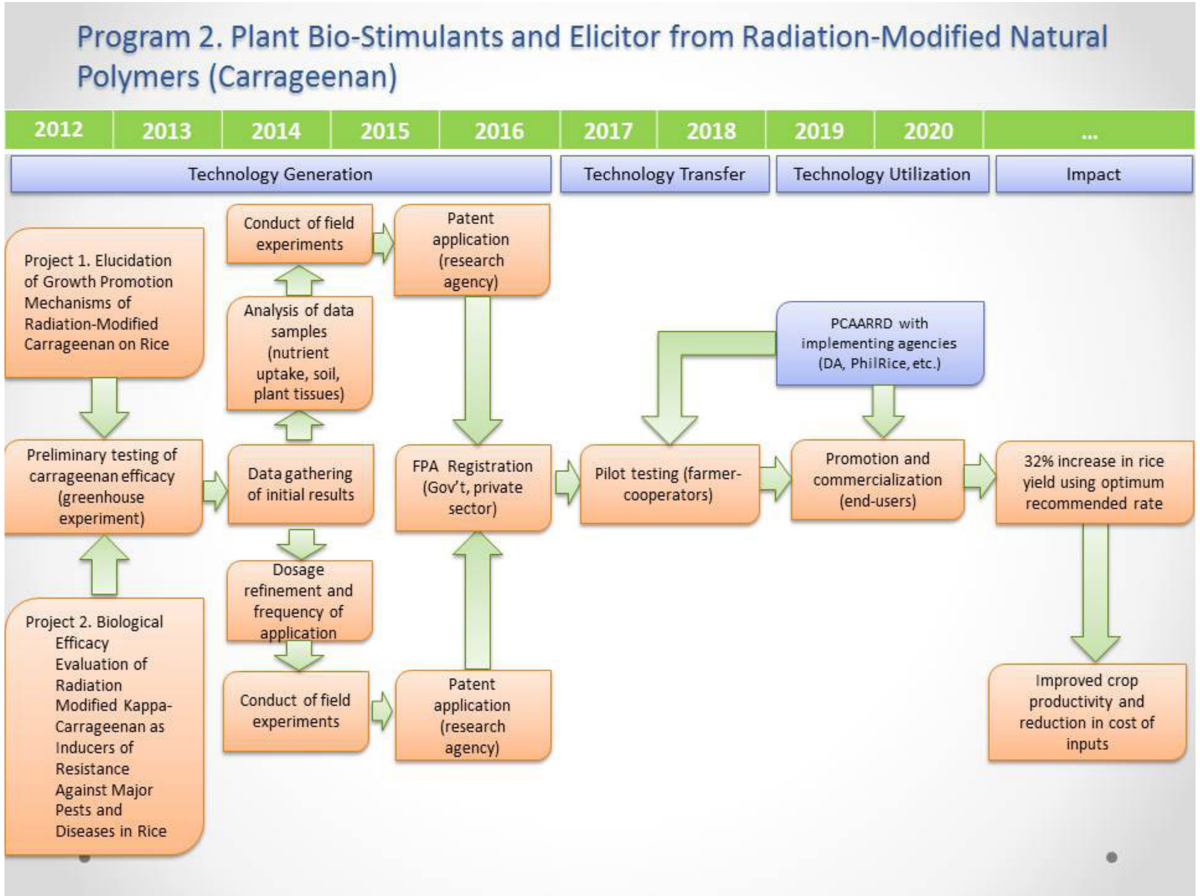
Program 2 investigates the use of the bio-stimulant carrageenan to induce pest and disease resistance and improve plant growth as a plant growth promoter (PGP) for rice. Since the program is a basic research, its main objectives are to study and identify the effectiveness in terms of optimum concentration as inducer and PGP to rice. The project team is currently conducting greenhouse and field trials to determine the efficacy of the bio-stimulants as PGP and inducers. After the trials, the project team will further conduct analysis of the initial results and according to the proponents; the dosage could be subjected to further refinement in terms of frequency of application. Once product refinement is finished, the end product will undergo a series of FPA registration and patent application. It will take about 2-3 years before a product is ready to be introduced in the market. For the technology transfer, PCAARRD could provide financial support for the promotion and commercialization of the product together with the research agency (PhilRice



and UPLB). This will allow the end-users (farmers) to test the efficacy of such products before a private sector/company will buy its intellectual property rights (IPR)

This experimental stage has very good results. From 2012 until 2016 will be the technology generation stage, 2017 to 2018 will be technology transfer, and by 2019 we will already be dealing with benefits wherein we have the technology utilization stage. In fact, there is 32% increase in rice yield. 30% increase in terms of reduction in losses due to diseases such as tungro. As far as tungro is concerned, the study provided a favorable result.

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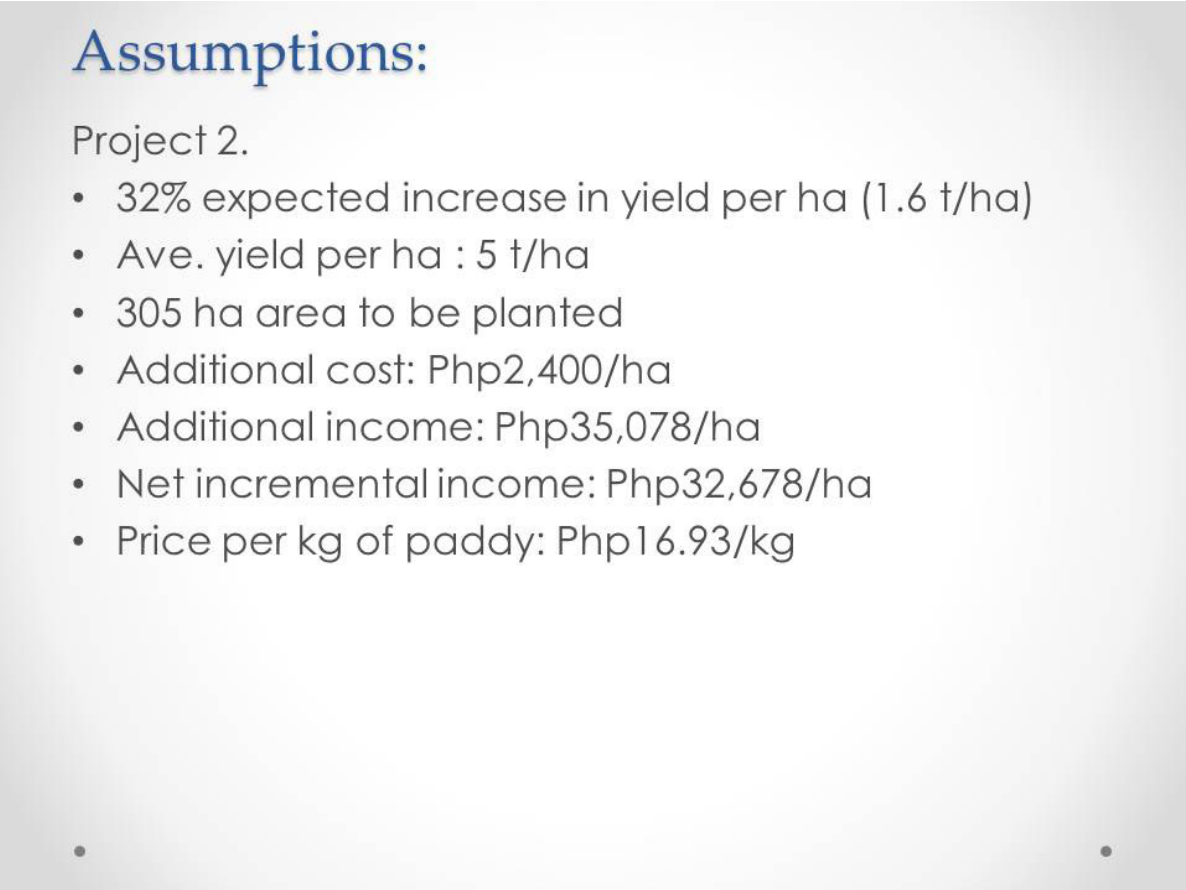

For project 2, it is assumed that the product results of this program will be pilot-tested where the CS project is being implemented. Hence, it will be tested initially in 305 ha which will start in 2017 as part of the technology transfer activities.

Based on the assumptions made, there is a 32% increase in rice yield or 1.6 mt/ha. The implementation of the ISP will be on the three provinces that were covered by the seed distribution system. Hence, all benefits are concentrated on those three provinces. Additional cost will be around PhP2,400/ha. The additional income is PhP35,078/ha and the net incremental income of PhP32,678/ha.

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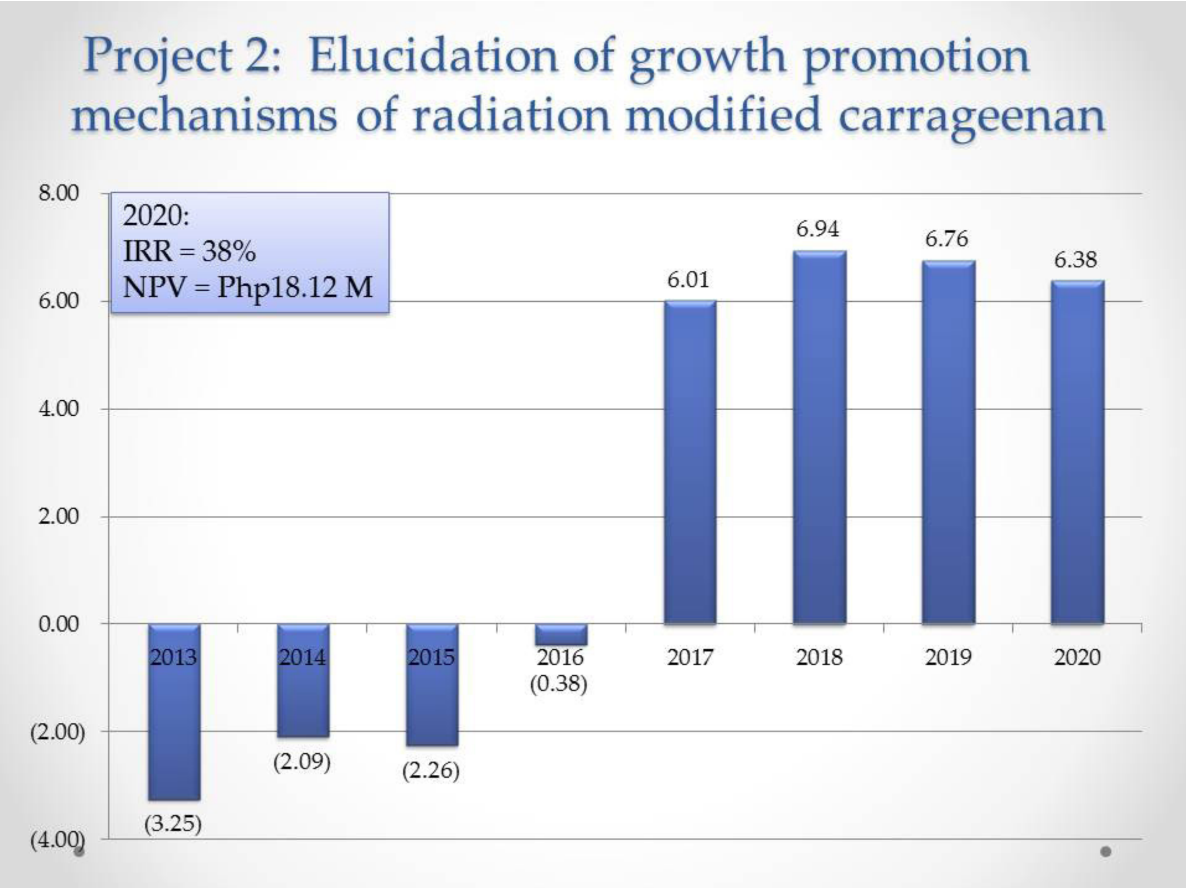

For the benefit cost analysis, IRR for project 2 is 38% and NPV is PhP18.12 million. Please note that a very conservative experimental area (305 ha) is assumed for this project.

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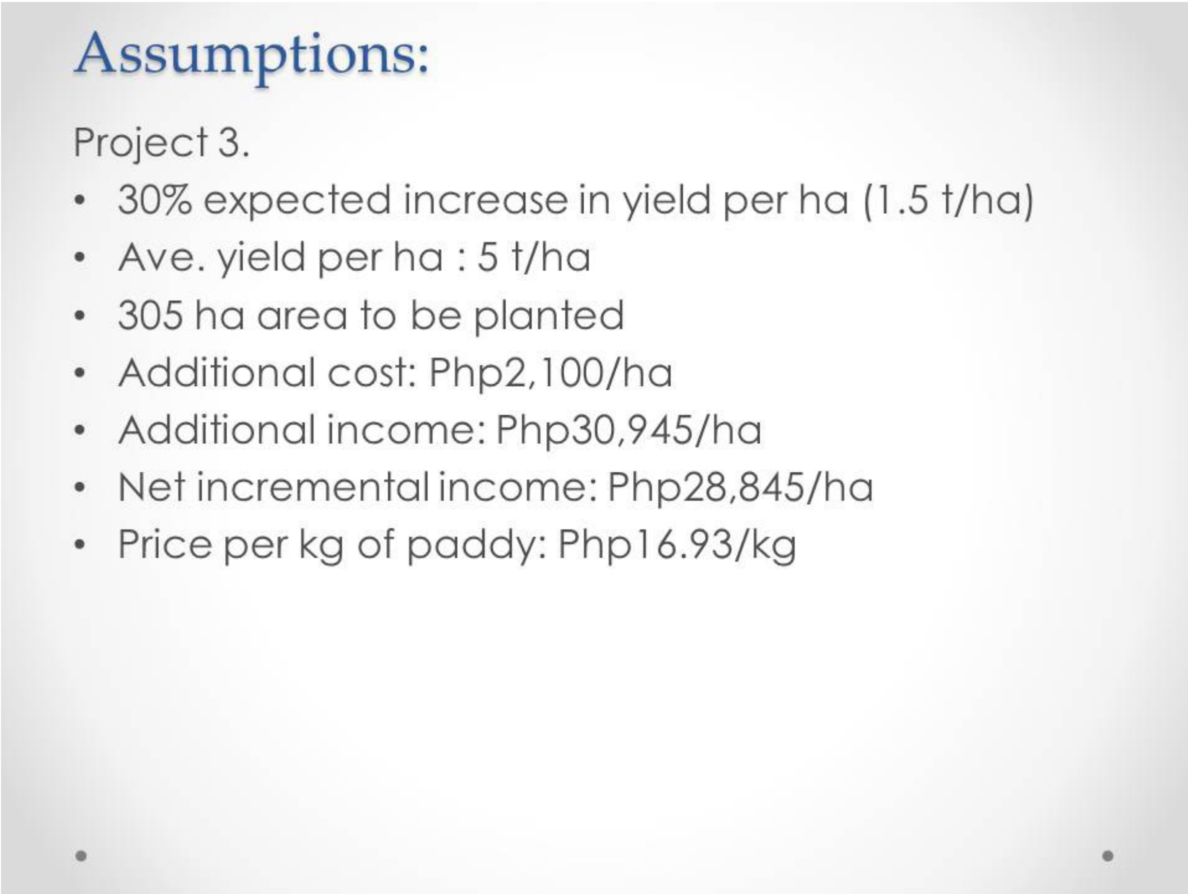
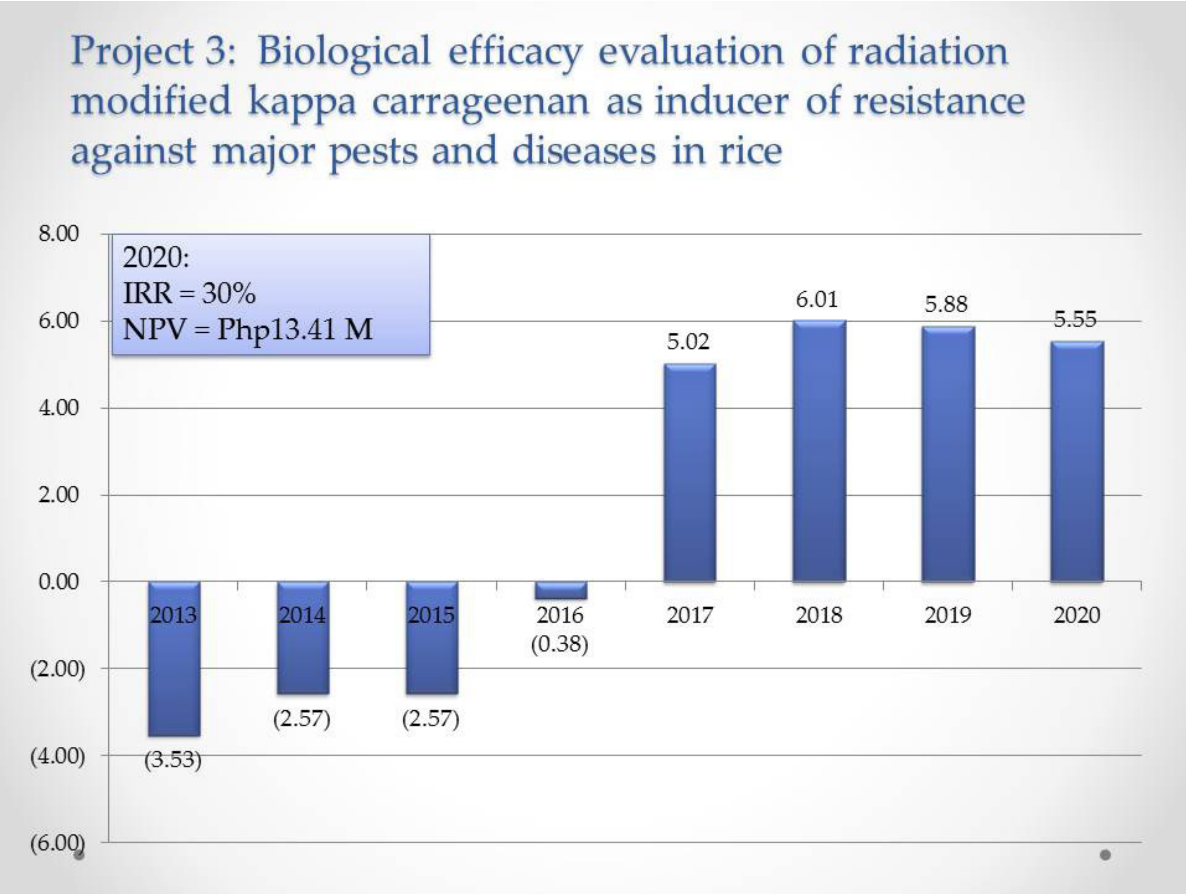


For project 3, this is for the control of tungro disease, 30% expected increase in yield and the net incremental income is PhP28, 845/ ha.



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The IRR is 30% and NPV is PhP13.41 million.

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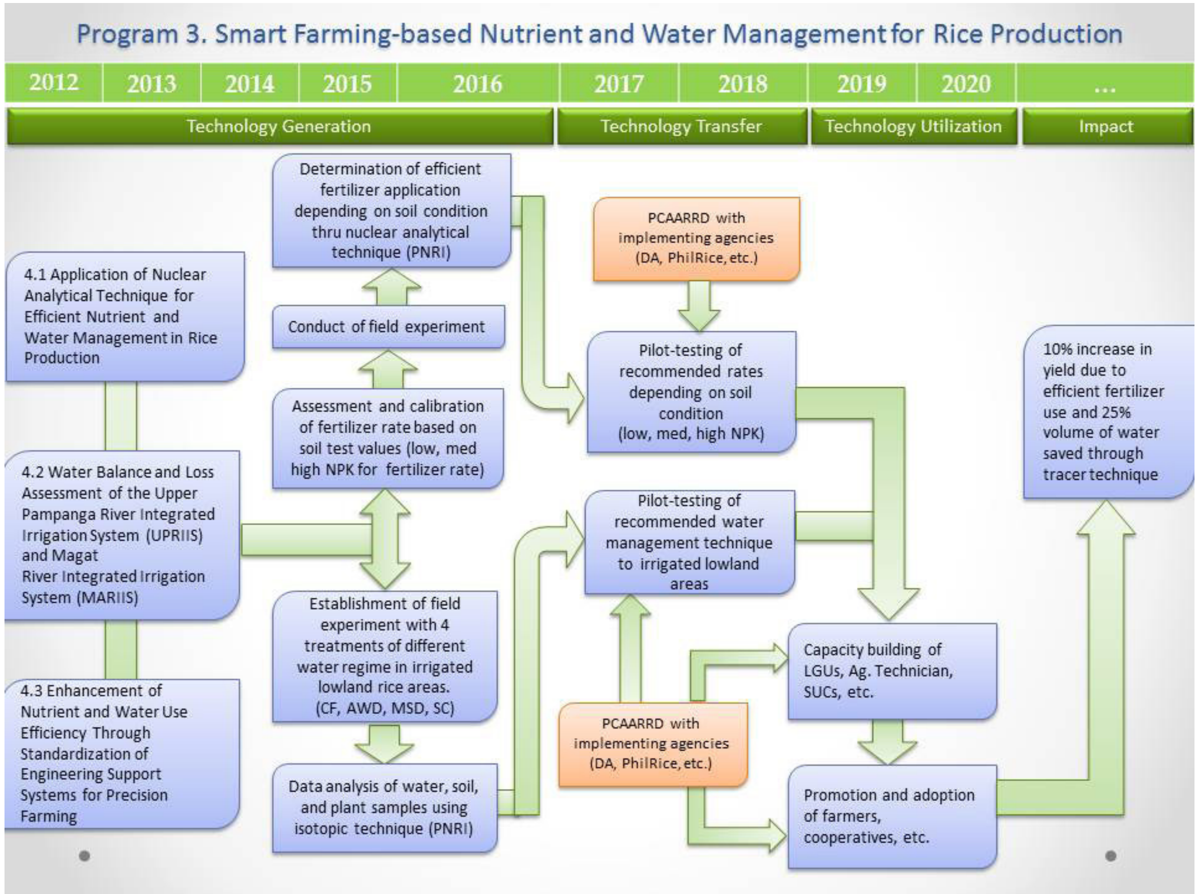


Program 3 entitled, "Smart Farming-based Nutrient and Water Management for Rice and Corn Production" focuses on developing precision and efficient technologies such as the use of nuclear isotopic techniques known to be an effective tool for nutrient, soils, and water resource determination and management, the development and application of high efficiency and precise fertigation systems, use of automated and controlled crop production systems, and the development and formulation of agricultural production technology standards for precision and smart farming systems, specifically for soil and water resources management (NUWAM, prop).

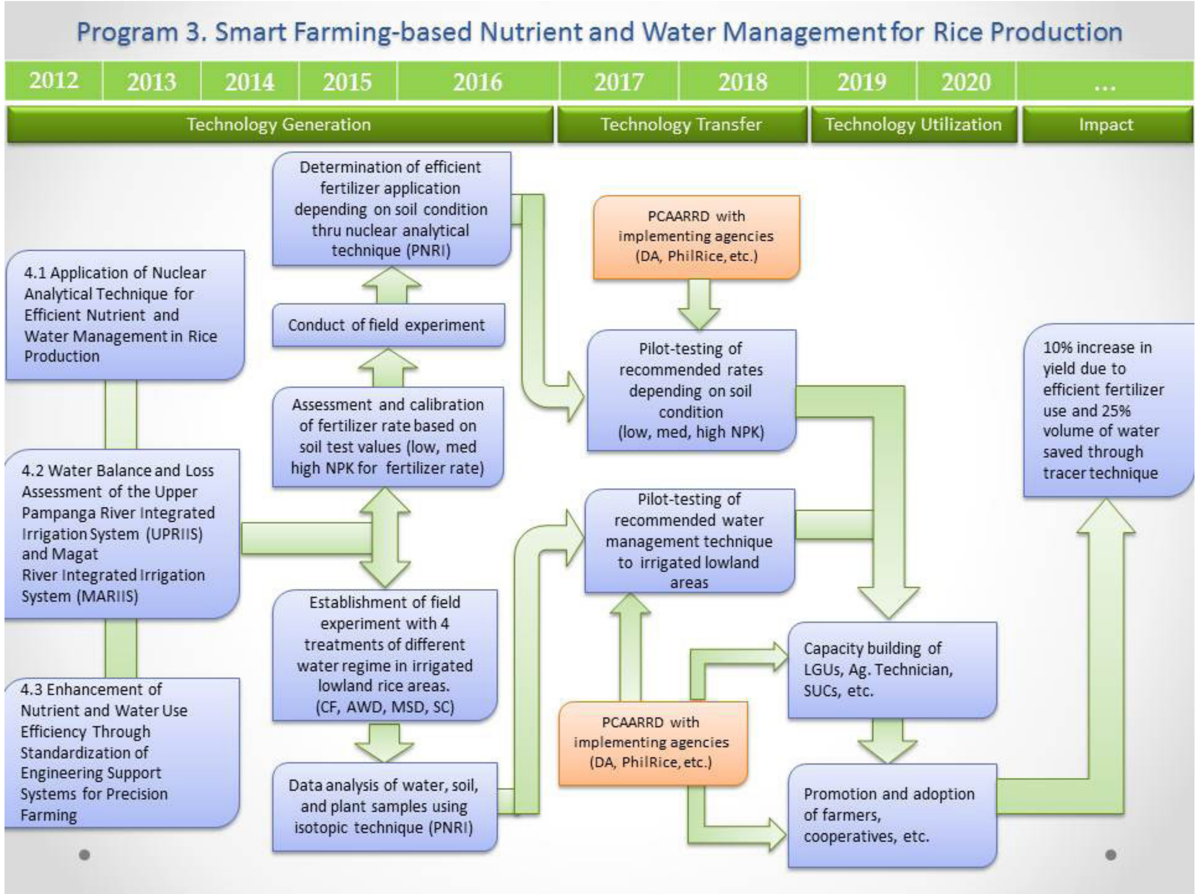
Project 4.1 aimed to increase uptake and reduce losses of soil nutrient and water resources used in rice production systems as well as to identify and promote/develop smart-farming technologies with high soil nutrient and water-use efficiency through nuclear analytical techniques. Project

4.2's main objective is to quantify the conveyance and application losses in the present irrigation systems, establish the crop coefficients of commonly used varieties of rice and corn, and develop numerical models for water balance accounting for rice and corn. Project 4.3 on the other hand, aims to develop standards for selected nutrient and water management systems. The program will run for 4.5 years. Projects 4.1 and 4.2 are basic and applied R&D initiatives respectively while project 4.3 is a pilot-testing of technologies developed by the former. Project 4.1 activities will include the assessment and calibration of fertilizer rate based on soil test values to determine the nutrient use efficiency at different soil fertility levels using nuclear analytical technique, and validate fertilizer recommendation at different agro-climatic conditions. This will be conducted through field experiments. Refinements of fertilizer recommendations at varying rates and time of application will then follow. Assessment of water use efficiency in different water saving technologies using stable isotope techniques will be conducted simultaneously. The water-saving technologies are 1) continuous flooding (CF), 2) alternate wetting and drying (AWD), 3) saturated condition (SC), and 4) mid-season drainage (MSD). This will also be done in field experiments. Field demonstrations of the identified best practices for fertilizer and water management is likewise to be piloted to demonstrate the effectiveness of a site-specific nutrient management and water-saving technologies in increasing agronomic efficiency and crop productivity.

Project 4.2 will commence at the assessment of conveyance and application losses in the Magat river integrated irrigation system (MARIIS) and upper Pampanga river integrated irrigation system (UPIIS) areas. This will be done to determine the actual conveyance efficiency and quantity of water losses in the system canals (main, lateral, and farm ditch canals) of MARIIS and UPIIS. Subsequently, Philippine Nuclear Research Institute (PNRI) will spearhead the measurement of the actual application efficiency and quantification of water losses in the field areas planted with rice. The establishment and validation of the crop coefficients of commonly used varieties of rice will then be done. Crop coefficients (Kc) are plant properties used to measure evapotranspiration (ET) (FAO). Lastly, the project will develop and recommend measures to reduce water losses and improve water management. The outputs of the project will be translated into a technology bulletin for information dissemination and will be given to target beneficiaries.

Conduct of technology transfer and promotion activities through pilot-testing will be undertaken once the projects have been completed. This will run for 2 years provided that PCAARRD will support the implementing agencies such as DA, PhilRice, UPLB, etc.

EX-ANTE EVALUATION OF THE PCAARRD S&T INDUSTRY STRATEGIC PLAN FOR RICE: A COST-BENEFIT ANALYSIS
*AGHAM C. CUEVAS ON BENEFIT-COST ANALYSIS



Technology utilization will have an impact of 10% increase in yield due to efficient fertilizer use and 25% volume of water saved through tracer technique.

This is where PhilRice experience can be very handy because we based the adoption rate on the water management and nutrient management which are agricultural component of the palaycheck system which is around 16%- 20% adoption rate.

In the adoption scenario, we assumed that there is a 5% incremental increase every year on adoption and the 20% that's around 40,000 ha. Hence, a very large IRR and NPV were computed.

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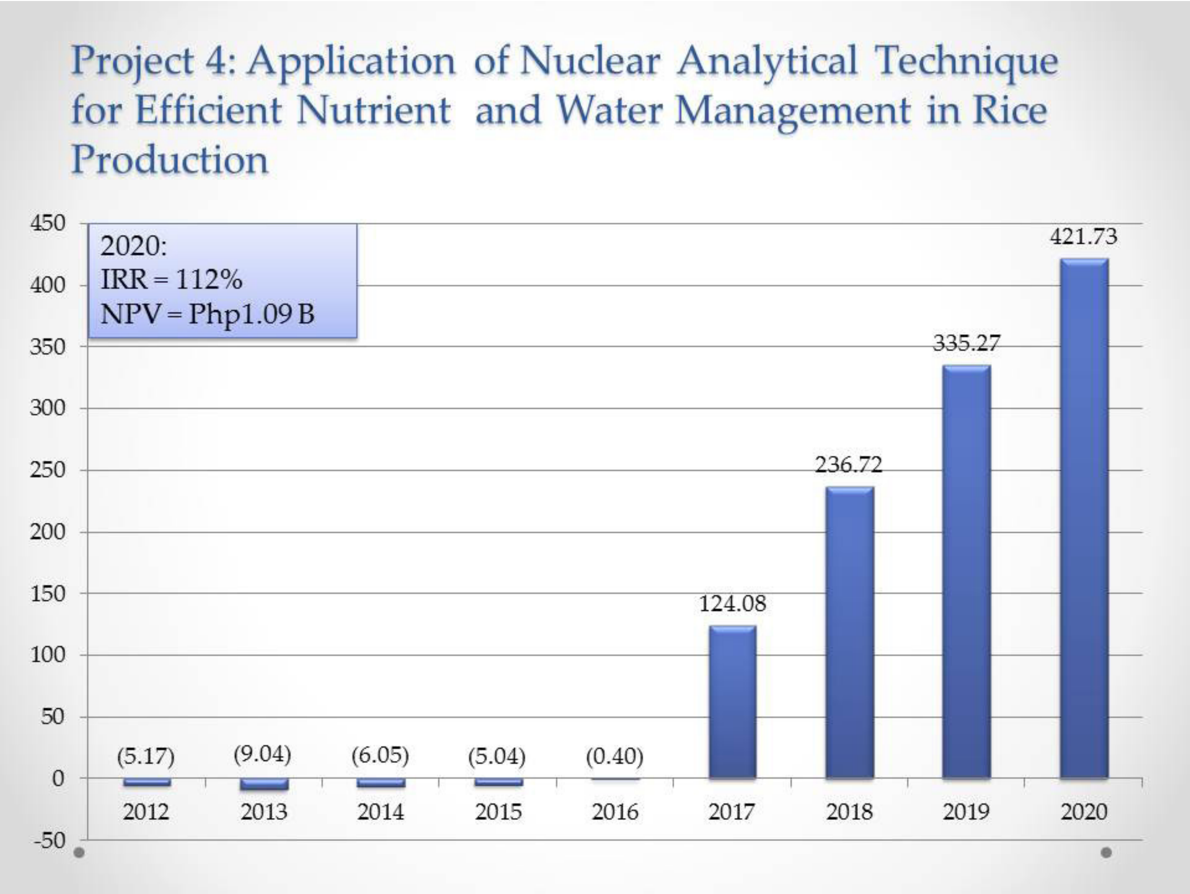

IRR is 112% and NPV is PhP1.09 billion.

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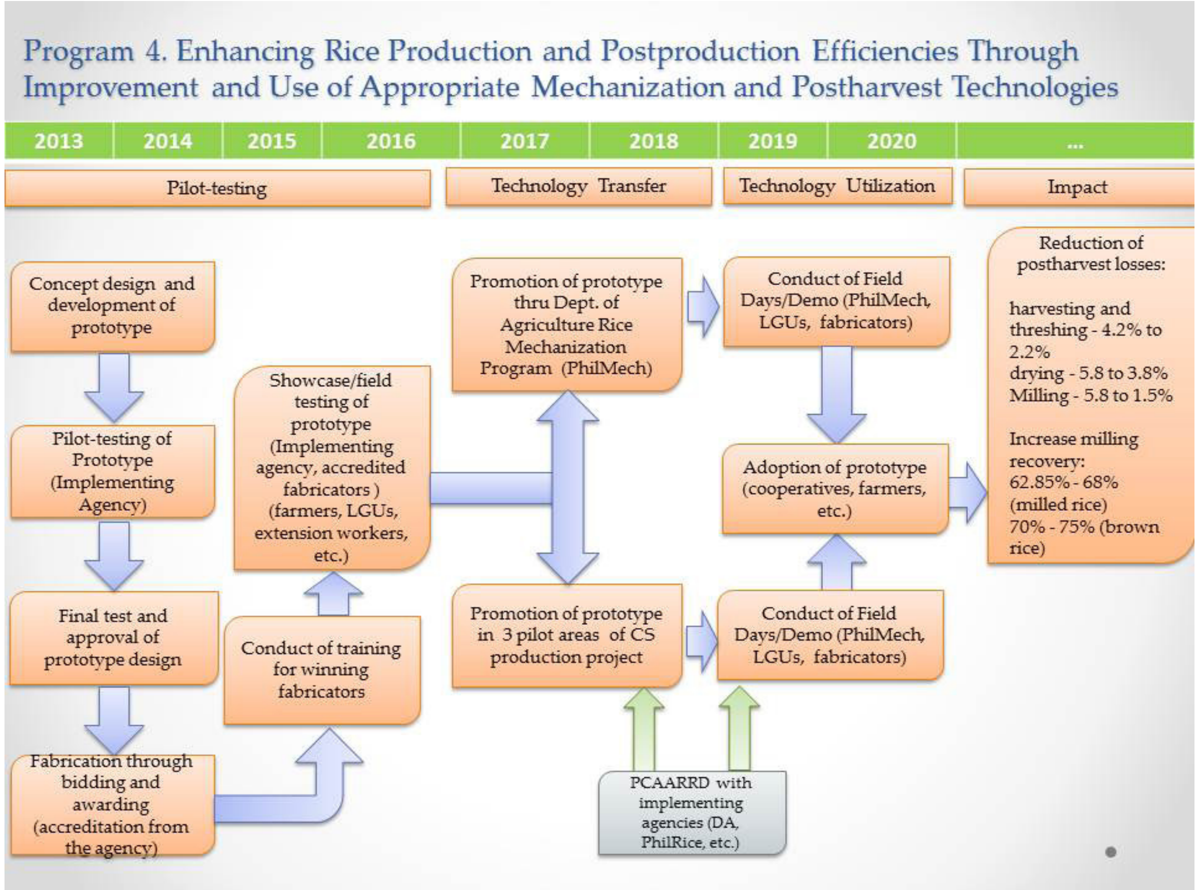
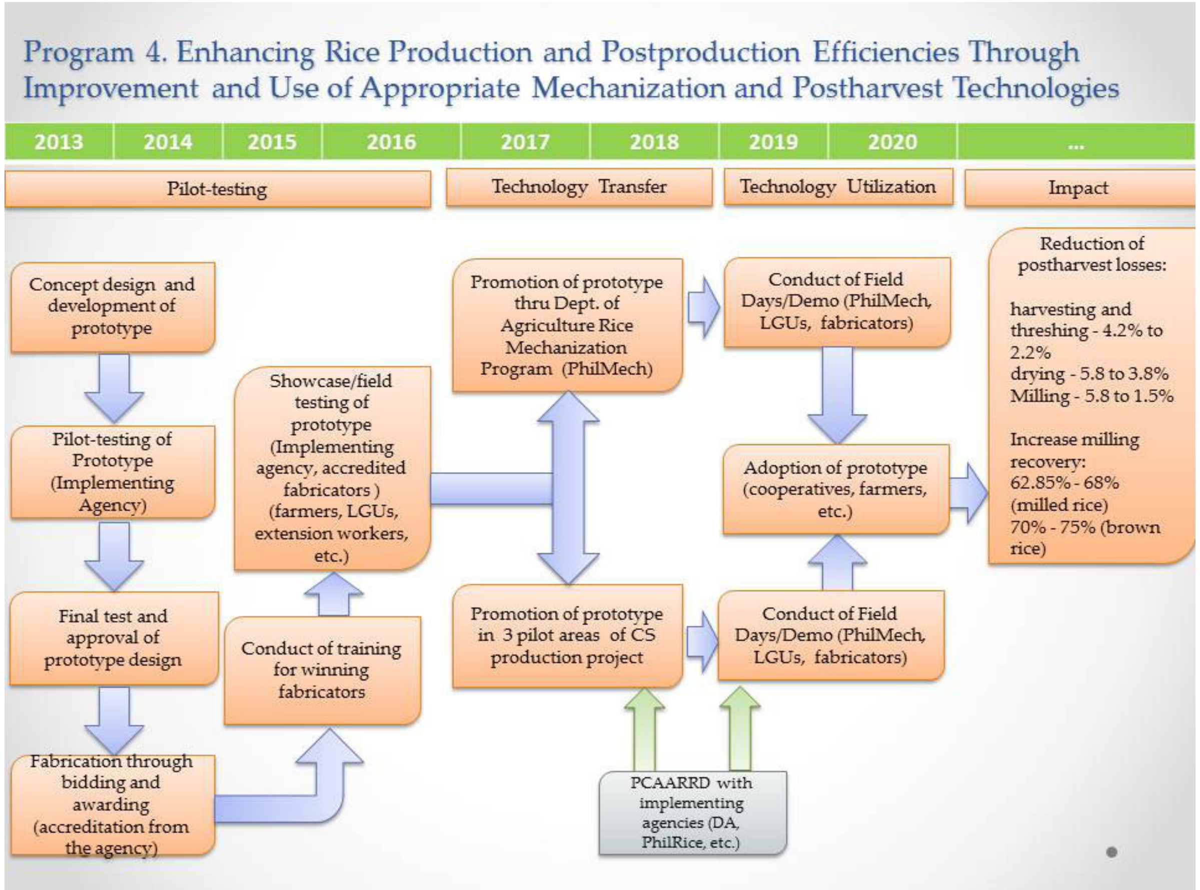
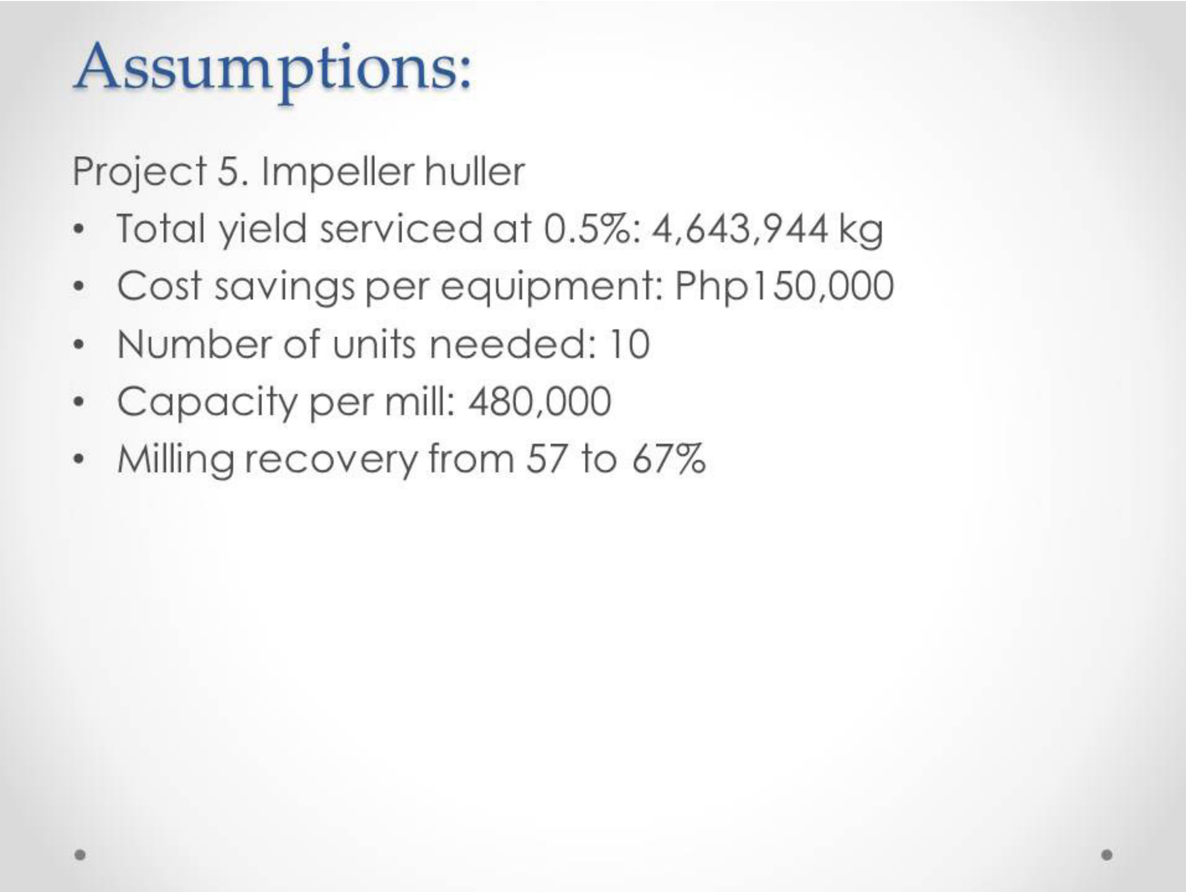


The rice farm mechanization program aims to reduce postharvest losses that will contribute to 5.40 mt/ha target of ISP by 2016 and eventually 5.60 mt/ha by 2020. It has ten (10) components wherein 9 of them are the pilot-testing of prototypes (technology generation stage). The main objective is to develop low-cost local type equipment with comparable performance to imported ones such as combine harvester, transplanter, precision seeder, etc. Implementing agencies such as PhilRice, PhilMech, MIRDC, and UPLB are tasked to design and develop the prototypes and to conduct a series of tests until the desired design and performance is met. These machines will be further evaluated by UPLB-AMTEC for test performance. Once it has passed the evaluation, the implementing agency will look for fabricators that will fabricate the equipment based on their standards. However, these fabricators should first apply for accreditation set by the research agency. The research agency together with accredited fabricators will showcase the



performance of the equipment through field demo/testing to farmers. Also, fabricators will take part in the training and handle the sales and after sales of the equipment.

The period 2013-2016 is devoted to the pilot-testing, 2017-2018 as technology transfer phase. Technology utilization should start by 2019-2020 but we need to hasten this because as our proposal, the prototype is being recommended to be within rice mechanization program of DA. Unfortunately, the program is set until 2016 only. The program's impacts include reduction of postharvest losses i.e. 4.2% to 2.2% harvesting and threshing losses, reduction of 5.8%-3.8% drying and milling losses will be reduced for 5.8% to 1.5%. There will be an increase in milling recovery of 62.85%-68/% for the regular milled rice and 70%-75% for brown rice.



SLIDE TRANSCRIPT

We assumed that the total yield serviced at 0.5%. The cost savings per equipment is around P150, 000. The number of units needed to serve is at least 10 units. The capacity per mill is 480, 000. The target of the proponents is to increase the milling recovery from the existing 57% to 67%.

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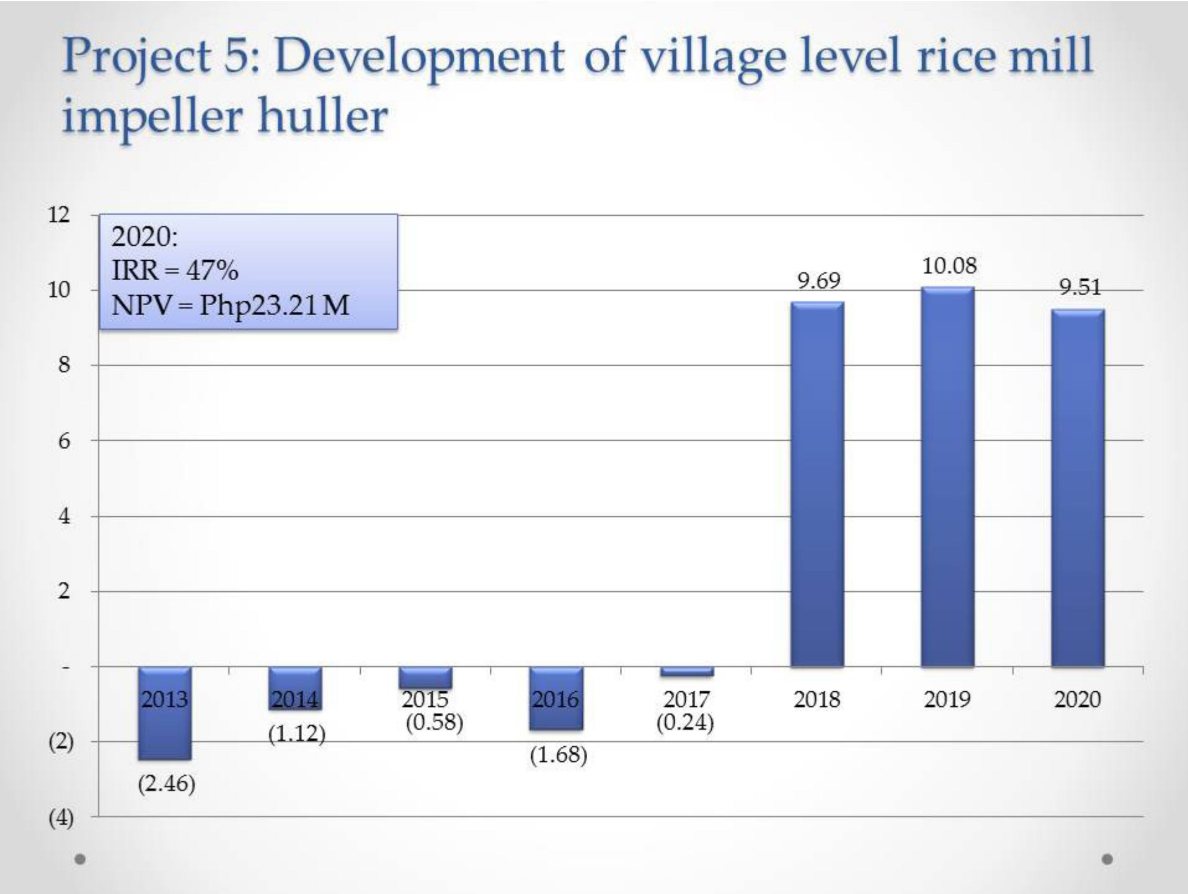

Based on the computation made, the village level impeller huller's total incremental benefit would reach PhP23.2 million by 2020 with an IRR of 47%.

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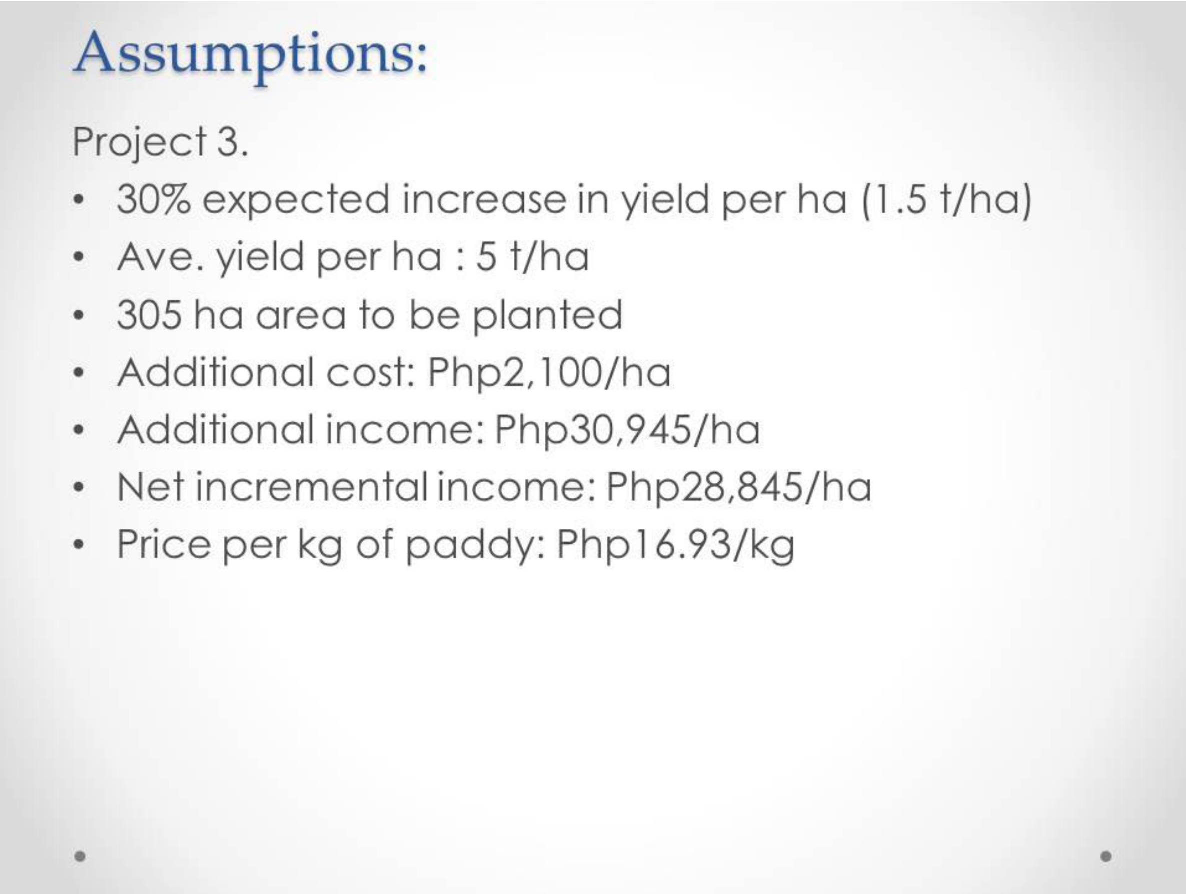

The precision rice seeder of the target area is 1,155 ha. The computed target area was taken from 0.02% actual utilization of machinery for the whole country in 2005. The cost savings per equipment is Php508,000. The reduced operating cost per hectare is around 10%. The local availability of parts is an advantage in terms of repair and maintenance. So instead of importing from Singapore just like the machine of tobacco, the proponents want it to be locally acquired. It will also boost the total fabrication industry for machineries. The potential improvement on yield is by 5% by using the precision seeder. Using the precision seeder, the estimated net financial impact is Php4,364.93. The number of units needed to service the area is 12.

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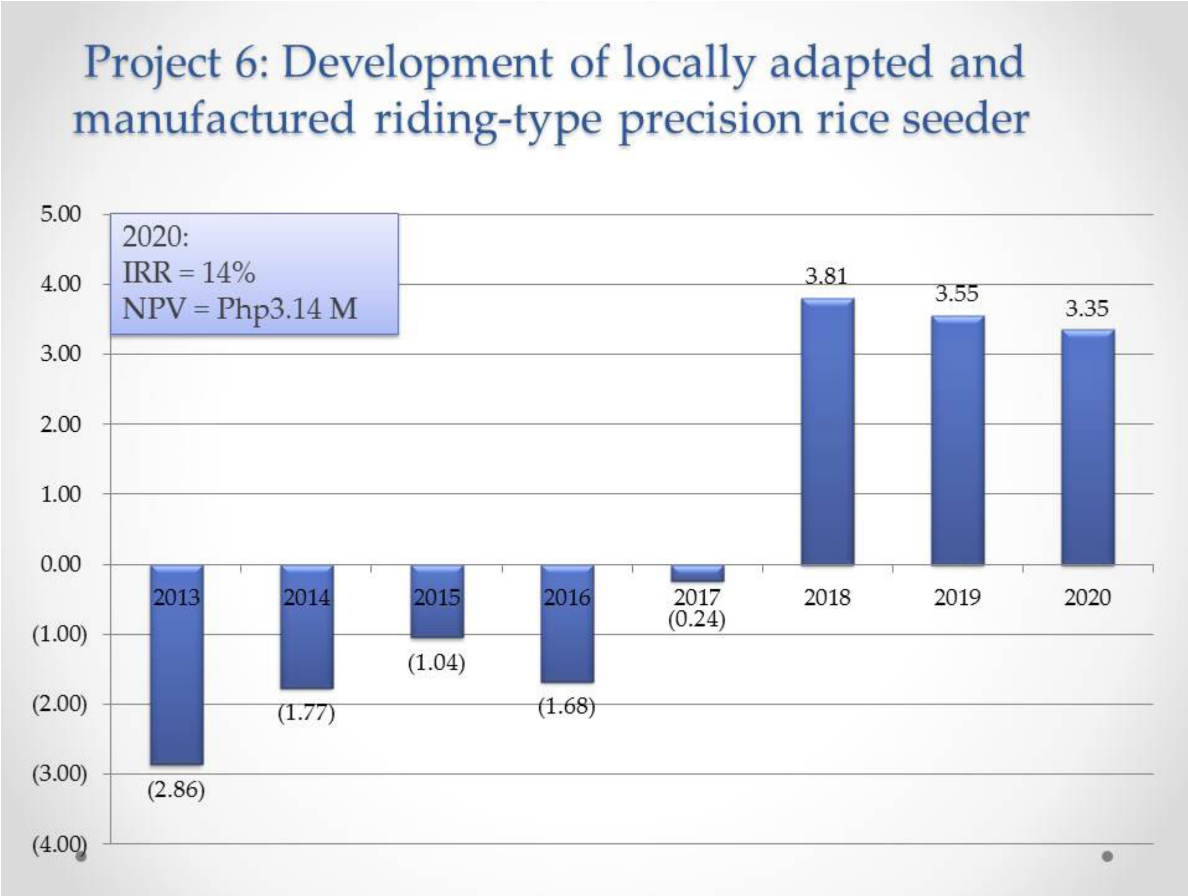

The calculated net incremental benefit is PhP3.14 million and IRR of 14% by 2020.

SLIDE TRANSCRIPT

The local riding type rice transplanter will reduce labor cost of Php4,663.82. The cost savings per equipment is P200,000. It has locally available parts for repair and maintenance and the net financial impact is 5,586/ha and the number of units needed is 12.

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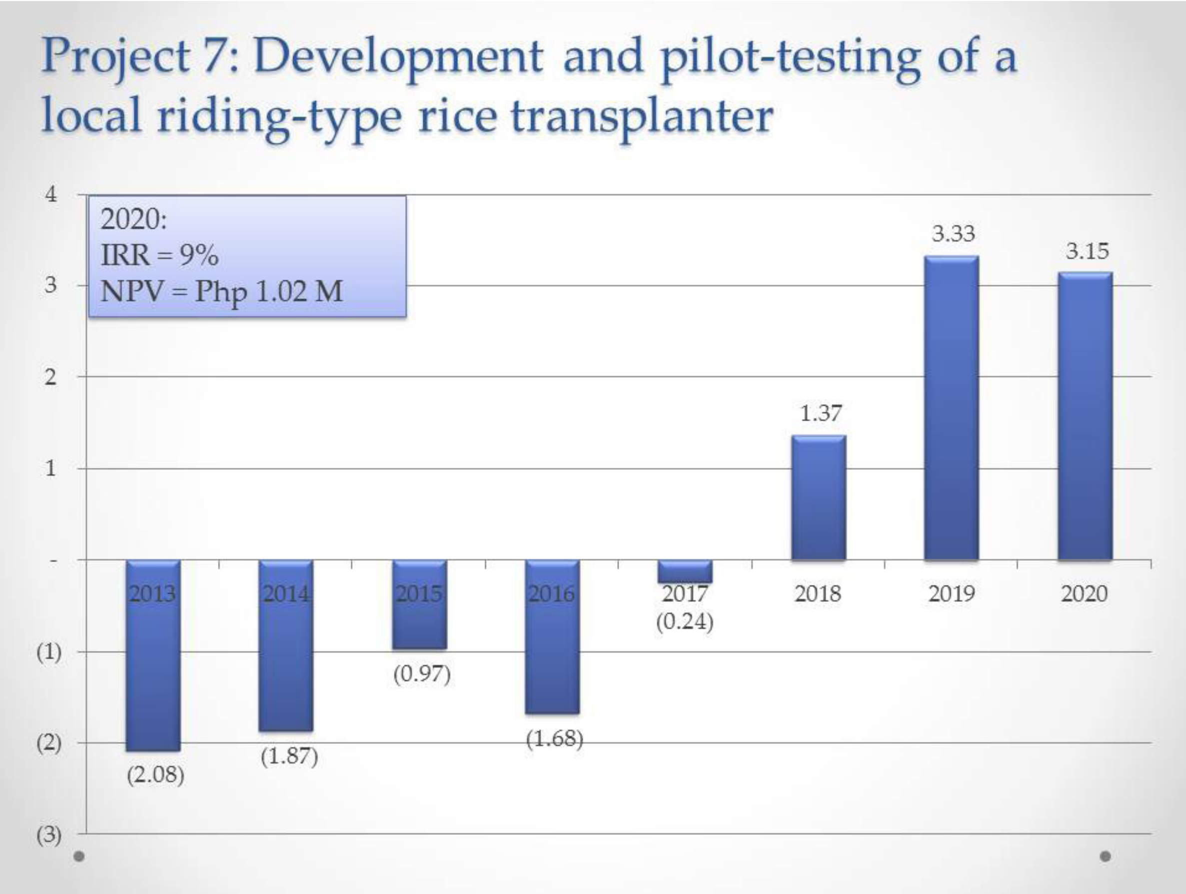

A total net incremental benefit of PhP1.02 million and PhP14.27 milion would be realized by 2020 with IRR of 9%.

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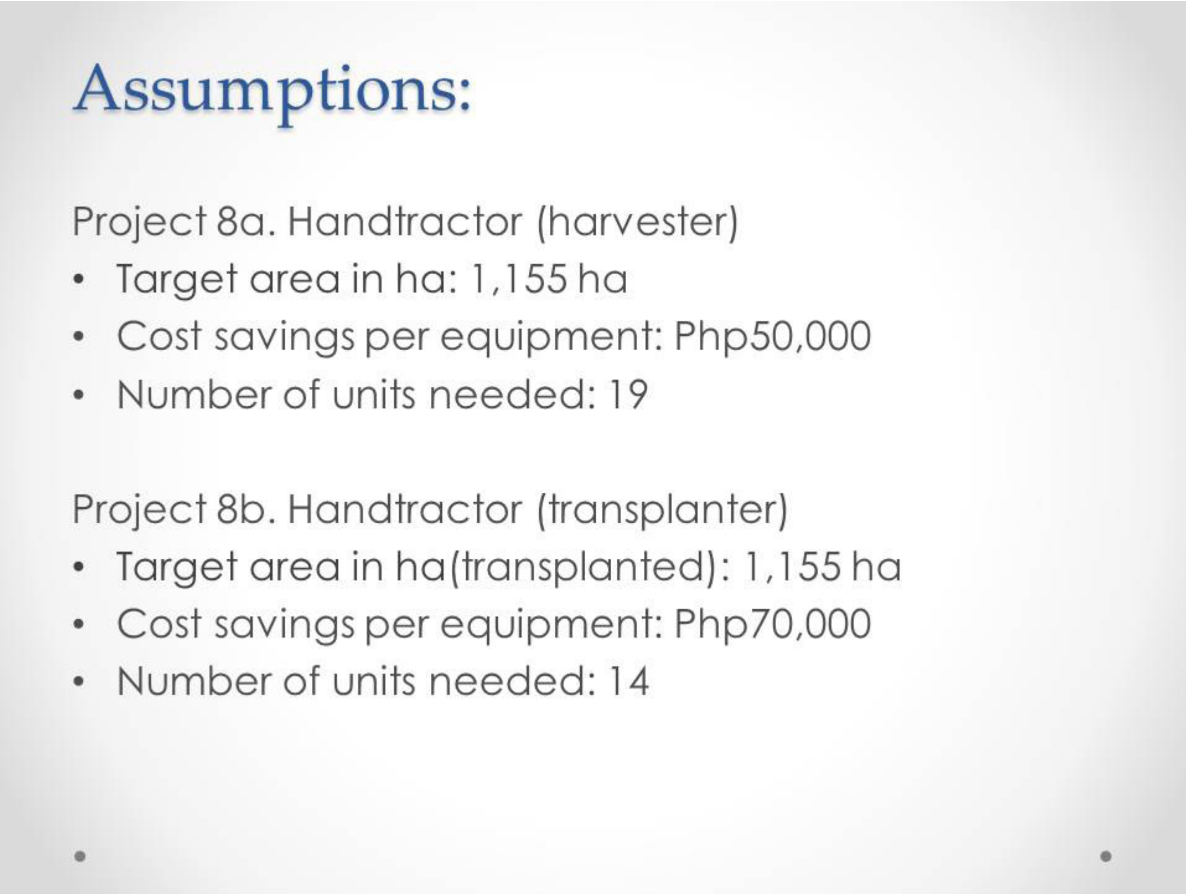

For handtractor attachment (harvester), the financial impact is PhP19,104.92. For the handtractor attachment (transplanter), the net financial impact is Php7,453.

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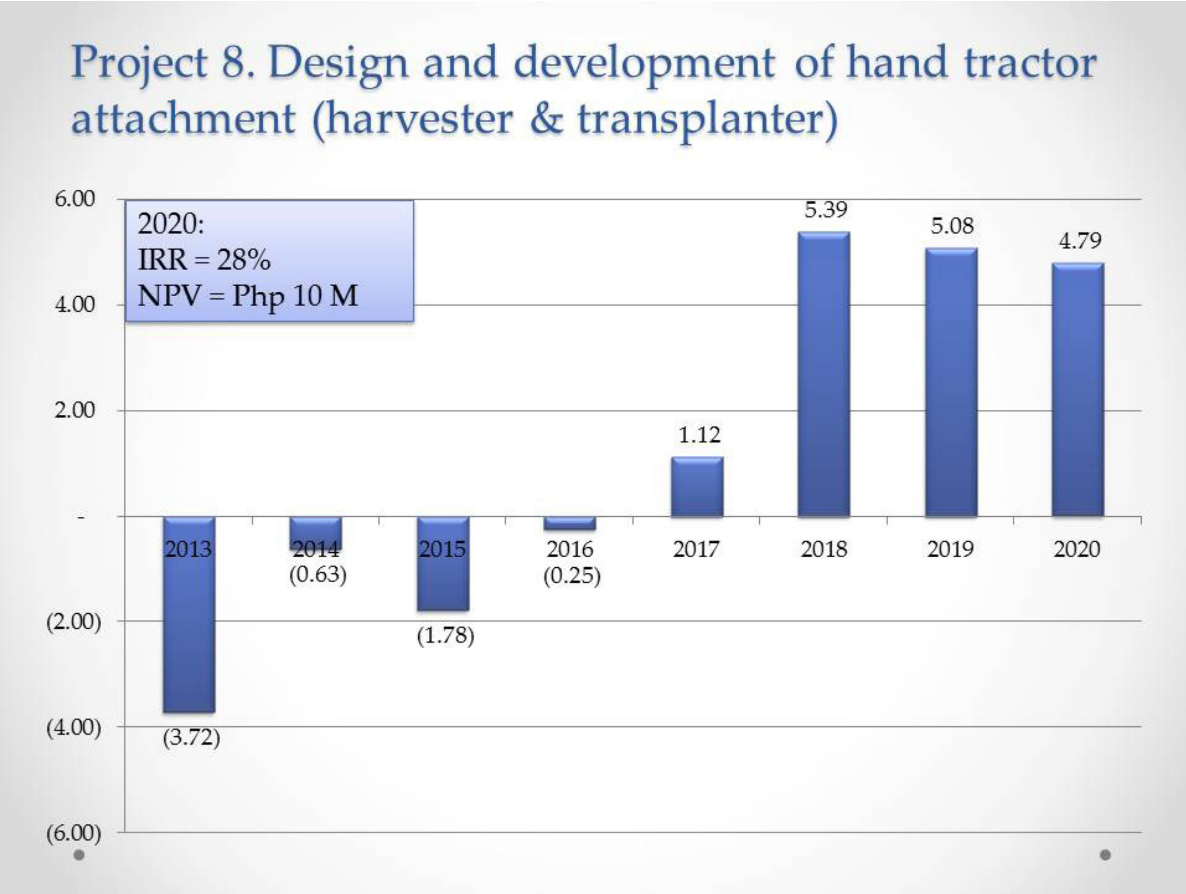

For the two projects, the IRR is 28% and NPV is PhP10 million.

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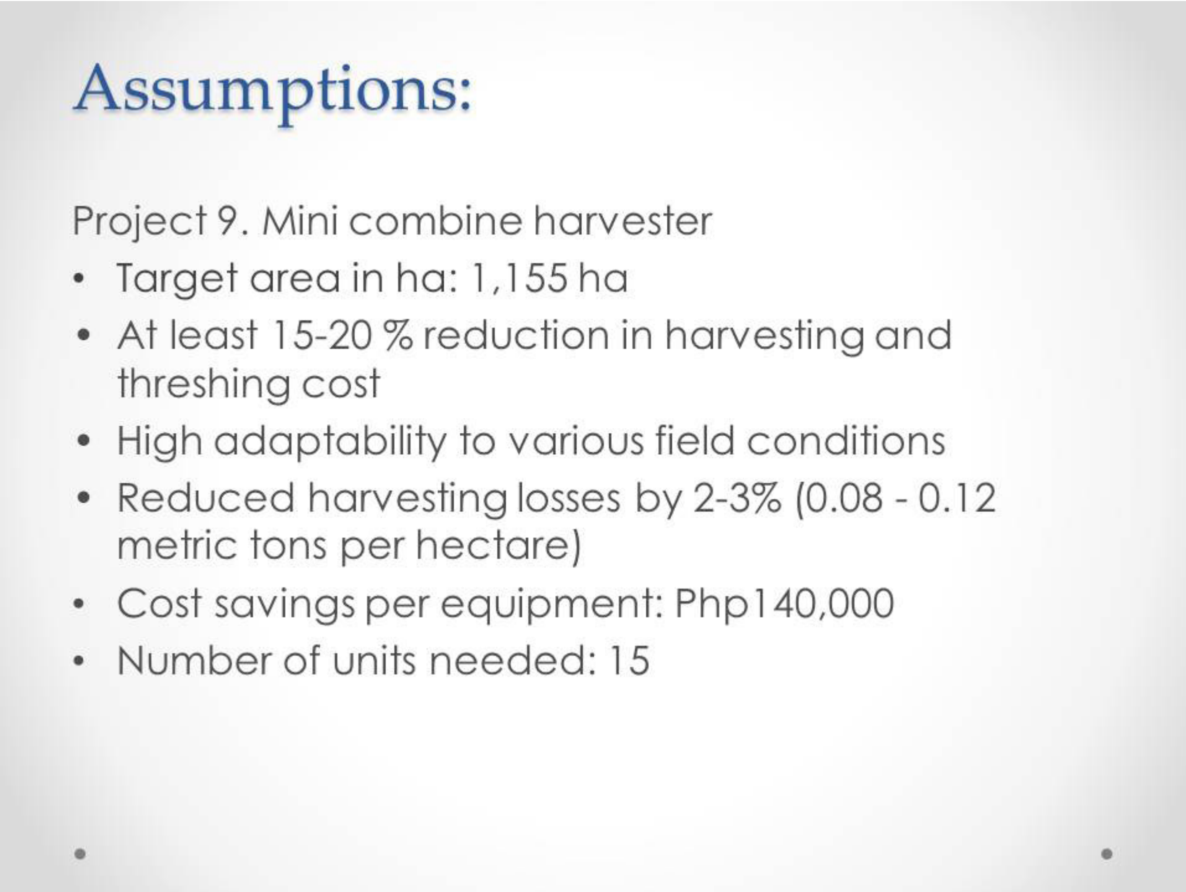

For mini-combine harvester, it has at least 15-20% reduction in harvesting and threshing cost, reduction in harvesting losses by at least 2-3%. Cost savings per equipment is PhP140,000. The net financial impact is PhP13,743.

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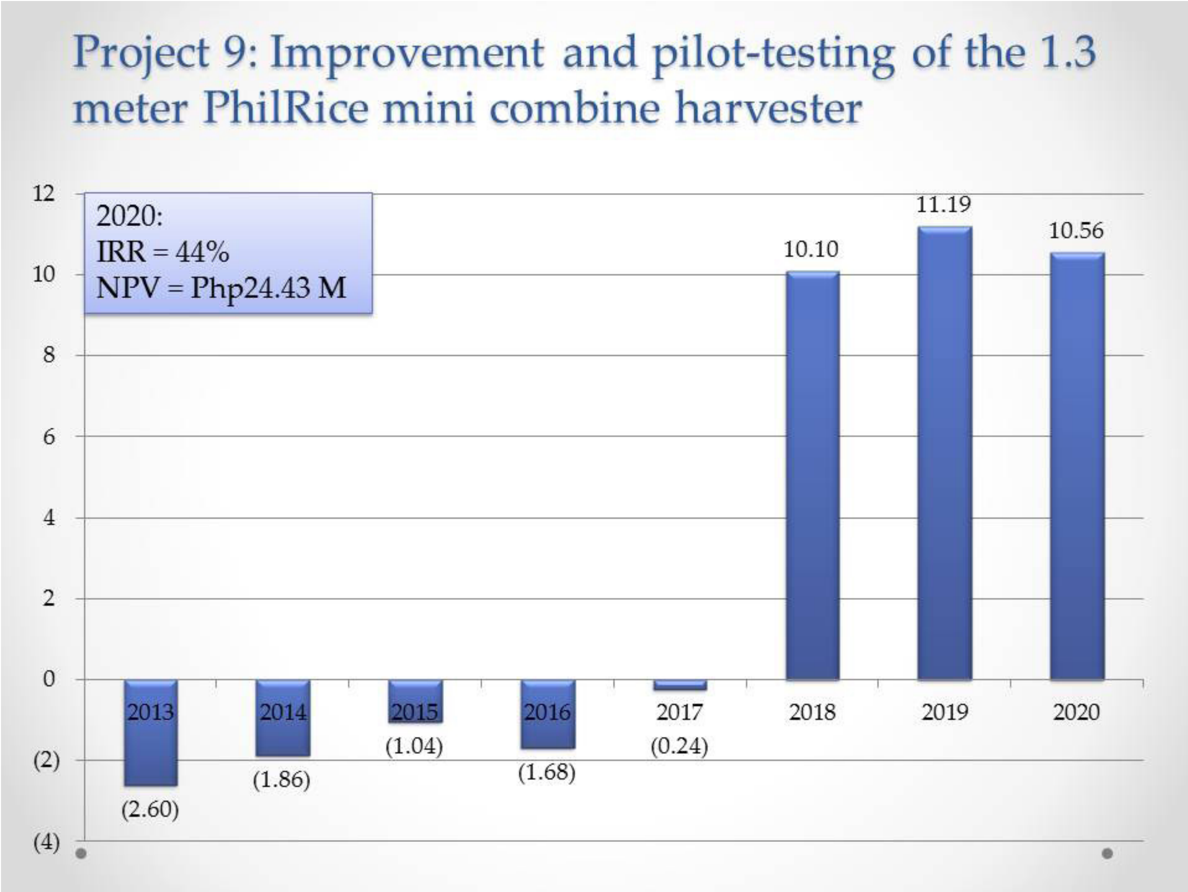

The project's investment will translate to a total net incremental benefit of Php24.23 million by 2020. The IRR are estimated at 44%.

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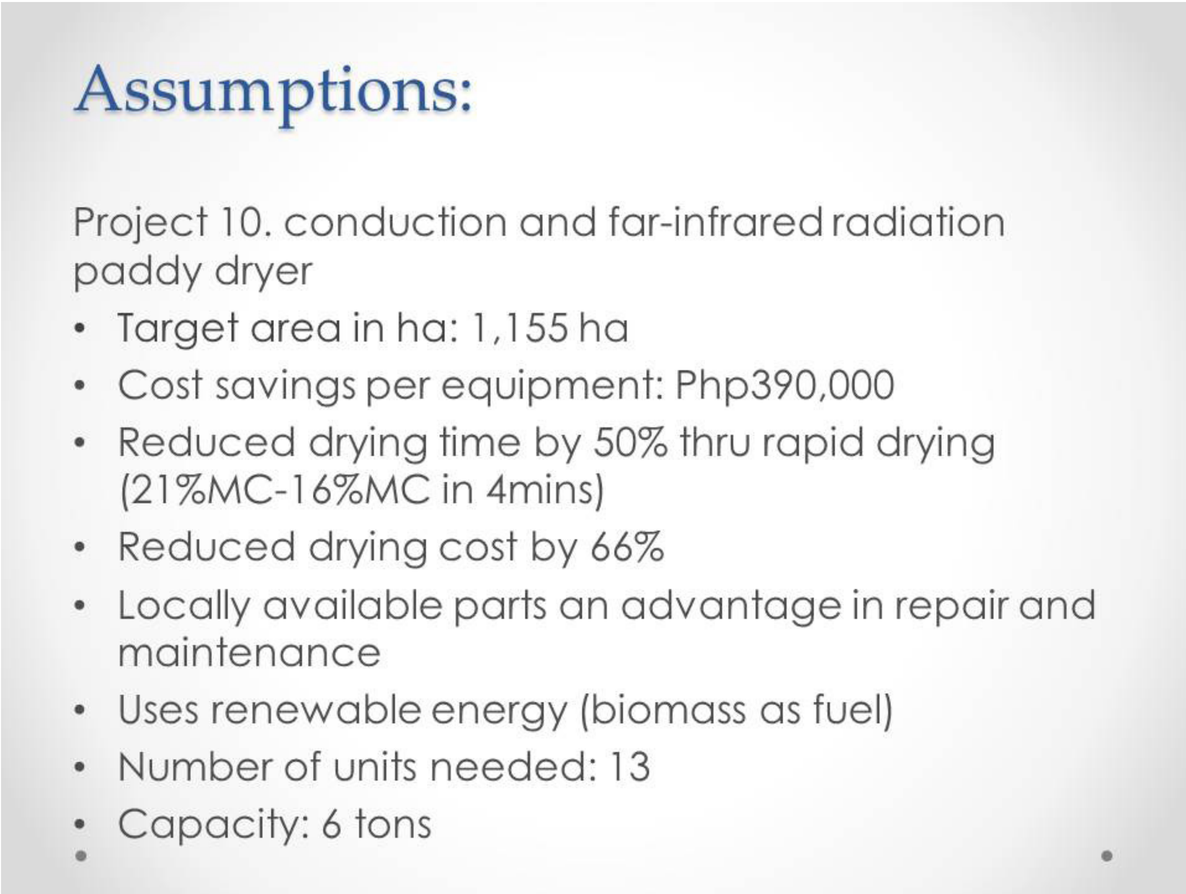

For conduction and far-infrared radiation paddy dryer, 13 units of FIR dryer should be fabricated to be able to service the whole target area. This could have an additional yield of 4,643.94 mt of paddy. The cost savings per equipment is PhP390,000. It will reduce drying cost by 66%. The net financial impact is estimated at PhP5,710.

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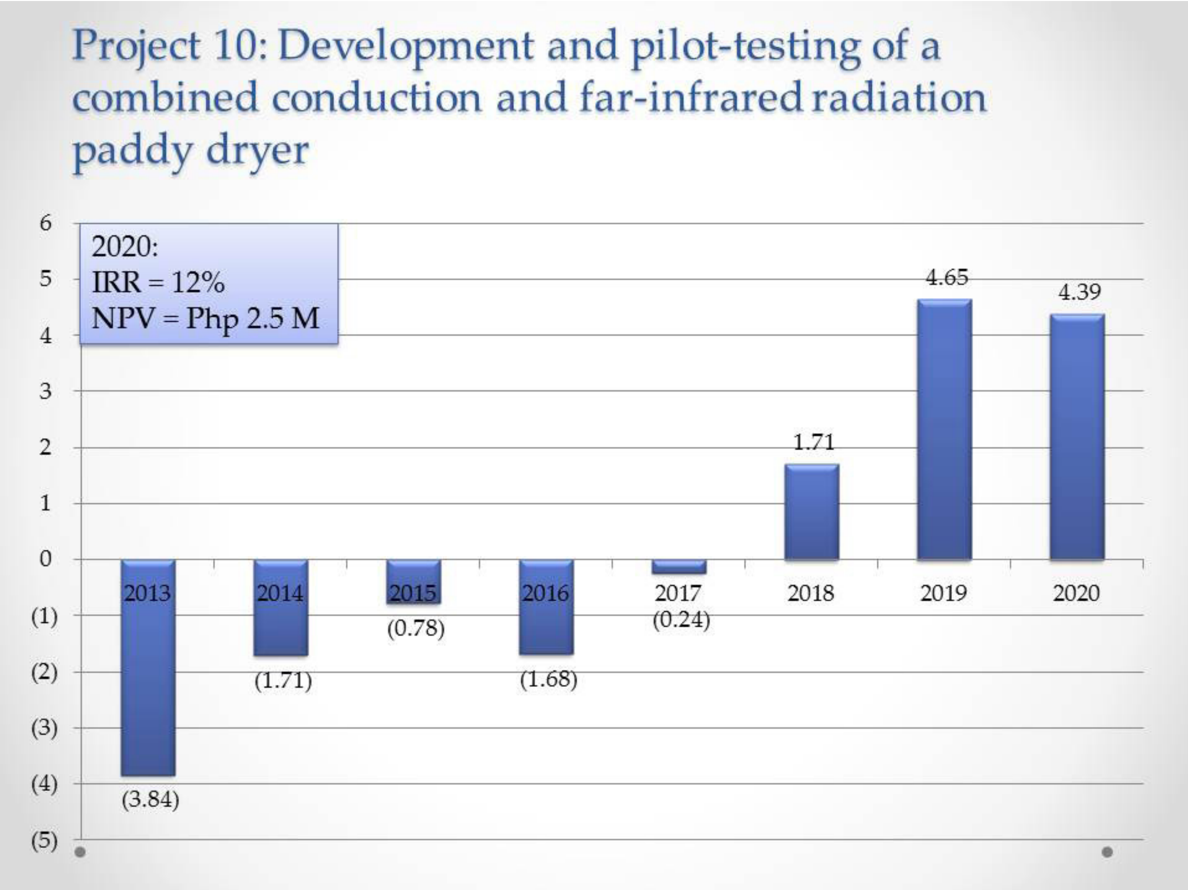

The total net return for project 10 is PhP2.5 million in 2020. The estimated IRR is 12%.

SLIDE TRANSCRIPT

For retrofitting, scenario 2 will serve as an example. We assumed that it will be operated by cooperatives who want to produce brown rice at 25% and milled rice 75%. Brown rice is sold at PhP60/kg.

The net financial impact provided that 25-75% production at PhP60/kg of cooperative-owned miller a positive incremental net income of PhP1.22 million is expected to accrue by 2017. Total retrofitting cost is PhP484,207.

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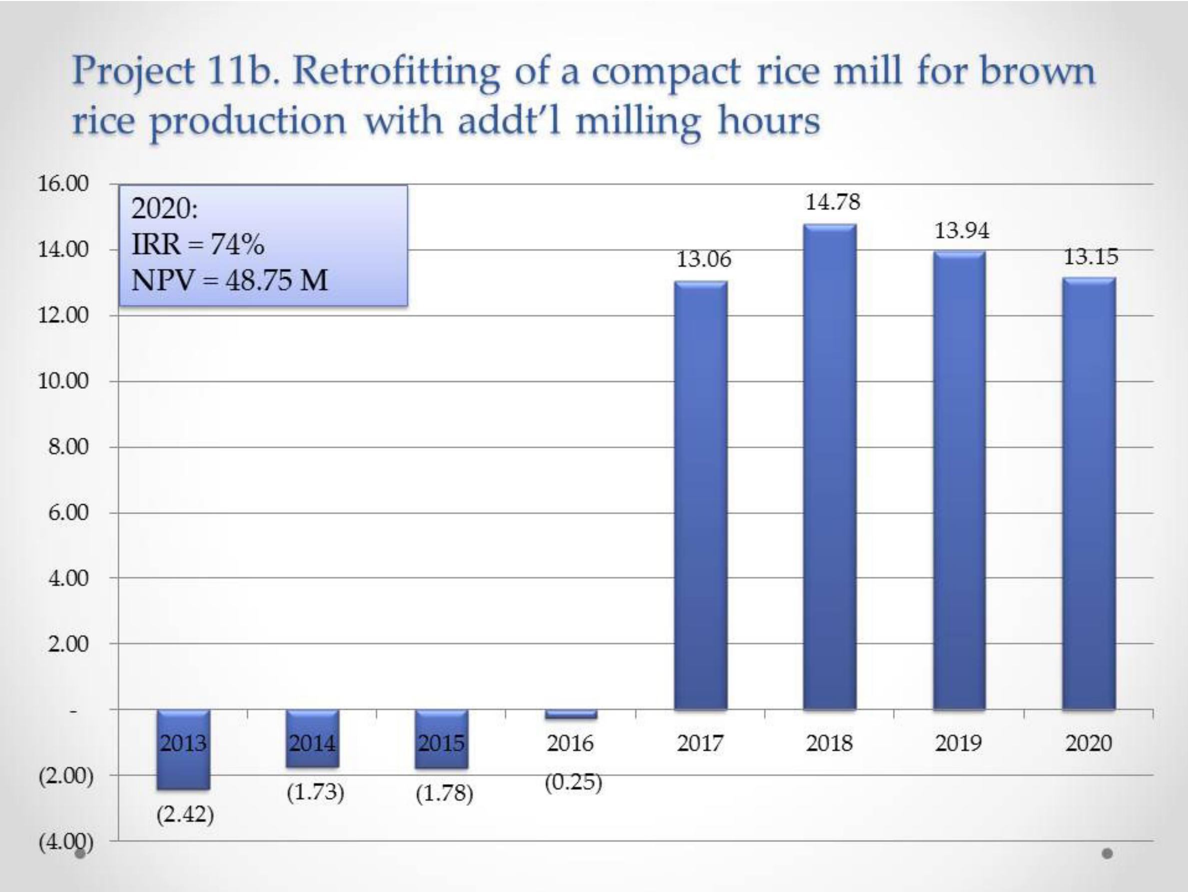

Based on the results, the benefits of the project will be realized starting 2017 since technology transfer will run for 2 years (2014-2016). The computed internal rate of return (IRR) is 74% and NPV is PhP48.75 million in 2020.

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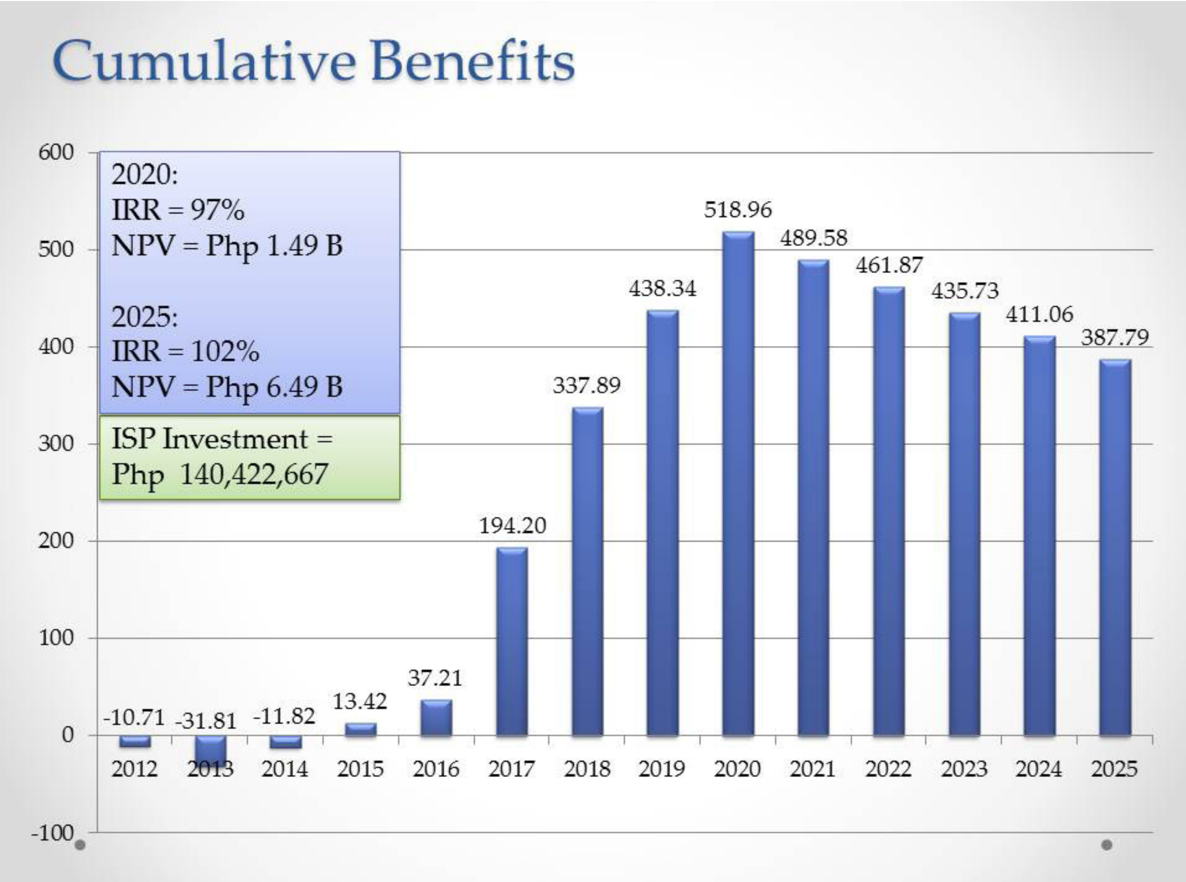

Computing all the benefits and costs of the 16 projects, the net benefit of rice ISP by 2020 is PhP1.5 billion and PhP6.5 billion by 2025 with an IRR of 97% and 102%, respectively.

SLIDE TRANSCRIPT

Output Capacity Per Equipment

Project	Output capacity	Number of equipment needed	Adoption rate per area to be serviced (ha)
Project 5	480,000 kg/mill	10 units	1,194
Project 6	48 has/season	12 units	1,155.21
Project 7	48 has/season	12 units	1,155.21
Project 8a (harvester)	30 has/season	19 units	1,155.21
Project 8b (transplanter)	40 has/season	14 units	1,155.21
Project 9	38 has/season	15 units	1,155.21
Project 10	6 tons per batch	13 units	1,155.21
Project 11	239.38 – milled rice 147.94 – brown rice	15 units	1,155.21
Project 12	n/a	n/a	
Project 13	n/a	n/a	
Project 14	n/a	n/a	

This slide shows the output capacity per equipment of each mechanization project. Using the adoption rate per area to be serviced, the total number of equipment (units) needed for each project was computed.

SLIDE TRANSCRIPT

Total Government Equipment Outlay

Project	Cost per unit	number of units	Total cost	Gov't. outlay
5. Impeller huller	450,000	10	4,500,000	3,825,000
6. Rice seeder	592,000	12	7,104,000	6,038,400
7. Transplanter	700,000	12	8,400,000	7,140,000
8a. Harvester	250,000	19	4,750,000	4,037,500
8b. Transplanter	300,000	14	4,200,000	3,570,000
9. mini combine	350,000	15	5,250,000	4,462,500
10. FIR dryer	390,000	13	5,070,000	4,309,500
11 Retrofitting	484,207	15	7,263,105	6,173,639
12. Fluidized bed dryer	n/a	-		
13. Superheated	n/a	-		
14. Standards	n/a	-		

Total Gov't cost: Php39,556,539

This table presents the cost per unit, number of units and the total cost of government equipment outlay needed to service the target area at 0.5% adoption rate. Under the rice mechanization program of the Department of Agriculture's (DA) counterpart scheme, 85% of the total cost of the equipment will be shouldered by the government while the 15% will be the counterpart of the farmer/cooperative-beneficiaries. Through this scheme, the adopters of the technology/equipment will reduce his added costs while increasing his income. The total government cost is estimated at PhP39.6 million.

Summary of IRR, NPV and Payback period

	Year 2020				Year 2025		
Project	IRR	NPV	Payback	Project	IRR	NPV	Payback
1	301%	284,652,835	0.44	1	301%	456,460,334	0.44
2	38%	18,119,095	4.09	2	46%	44,982,025	4.09
3	30%	13,412,262	4.40	3	38%	36,777,089	4.40
4	112%	1,092,088,133	4.17	4	143%	2,868,560,231	4.17
5	47%	23,211,404	4.51	5	56%	63,283,524	4.51
6	14%	3,136,359	4.61	6	27%	17,262,485	4.61
7	9%	1,017,100	6.19	7	25%	14,267,297	6.19
8	28%	10,003,469	4.73	8	37%	30,197,857	4.73
9	44%	24,430,819	4.60	9	53%	68,906,725	4.6
10	12%	2,495,350	5.99	10	26%	20,973,270	5.99
11	70%	44,385,011	3.44	11	75%	95,582,626	3.44
12	n/a	n/a	n/a	12	n/a	n/a	n/a
13	n/a	n/a	n/a	13	n/a	n/a	n/a
14	n/a	n/a	n/a	14	n/a	n/a	n/a

Internal rate of return (IRR), net present value (NPV) and payback period of each project were also computed. Project 1 obtained the highest IRR with 301% Payback period is usually ranging from 4-6 years since 2 years were allotted for technology transfer. Based on key informant interview conducted, PCAARRD allocates an estimated budget of Php 2.3 million for technology transfer of a project.

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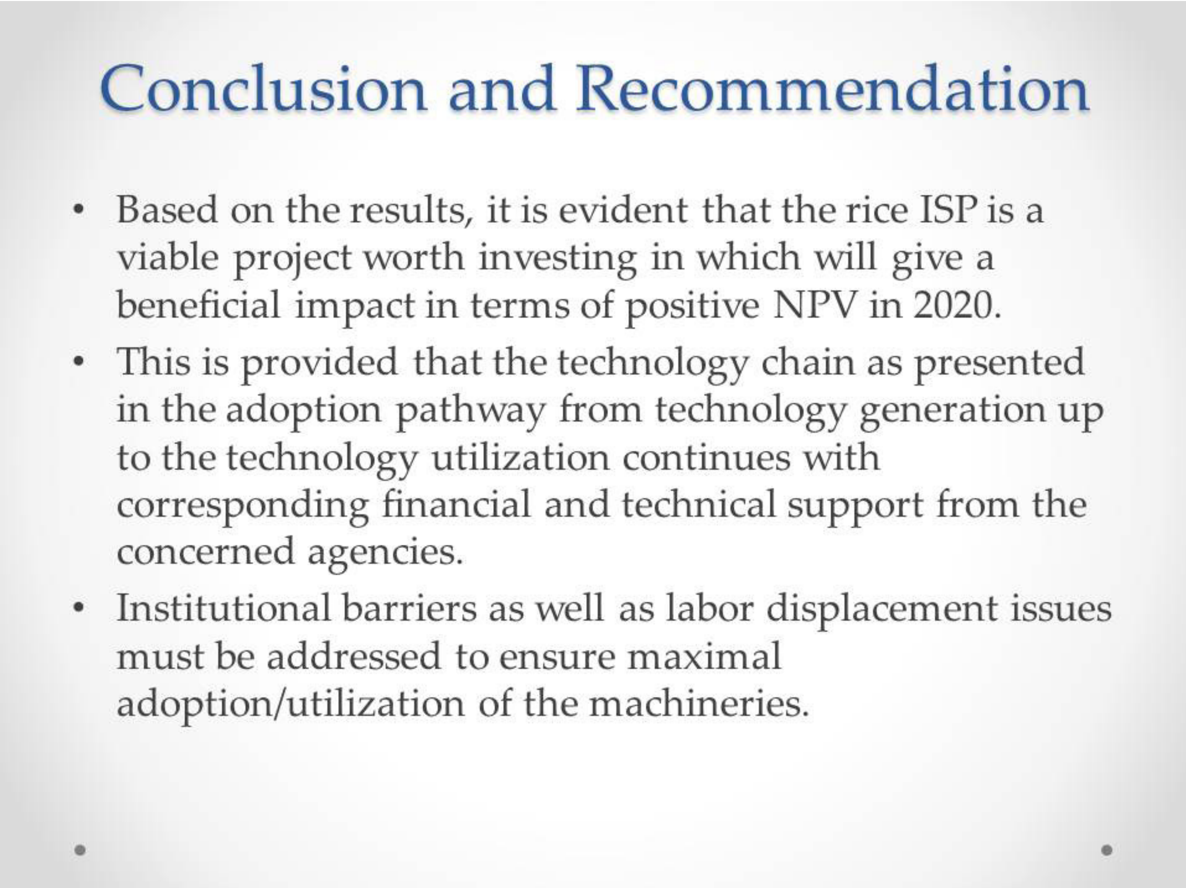


Based on the analysis, the rice ISP project will give beneficial impact by 2020. This will be realized provided that the technology chain as presented in the adoption pathway from technology generation up to the technology utilization continues with corresponding financial and technical support from the concerned agencies like PCAARRD especially DA for the rice mechanization program.

Factors affecting technology adoption, institutional barriers, and labor displacement issues must be addressed to ensure maximum adoption or utilization of the technologies especially in the mechanization program.

"The Industry Strategic S&T Plan (ISP) for rice of the Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (PCAARRD) aims for self-sufficient production by 2020. The beneficial impact of the plan can be realized by 2020 if the technology chain from generation to utilization is sustained."

- Mr. Angelito T. Carpio & Dr. Agham C. Cuevas

SUMMARIZED OPEN FORUM

Justifying the proposed budget based on the impact of R&D to farmers

Issues whether rice R&D impact has been felt by farmers were discussed. In the case of PhilRice, impact of R&D activities has been greatly felt by nearby areas. Muñoz ranked 5th class municipality before the establishment of PhilRice in the locality. But now, Muñoz is called a science city. Similarly, seed growers around PhilRice increased in number because research results became more accessible to them.

The importance of funds for the extension, promotion, and deployment of mature technologies was also recognized. Support should not stop from the generation of technologies (varieties, for example) but should continue until the intended farmer-users adopt them. These factors help in the realization of the impact of research results on farmers' welfare.

Technology adoption can also be influenced by the affordability of technologies. Providing a subsidy or credit scheme (like the "plant now, pay later" program of SL Agritech) could make this possible. Another plausible way is to help farmers earn more (thus, increasing financial capital) by providing other income opportunities aside from rice production. Alternatively, ways to reduce cost of rice production, especially on labor expenses, can be explored to increase farmers' savings.

Recently, PhilRice has launched the Rural Transformation Movement as a strategy to build rice-based rural communities. It converges R&D efforts to strategies on how to encourage farmers to be more than just rice producers but as agri-prenuers who explore other rice-based income sources. To accomplish this, necessary support on rice technologies, and related services and strategies have to be accessible to these communities. This movement is expected to raise farmers' income and help them to be more competitive.

On the amount of approved budget

It was clarified that R&D institutions receive less budget than what is being proposed not because the proposed budget is small, but because the available budget of the Department of Budget and Management (DBM) for appropriation is limited. Budget approval, therefore, is not solely dependent on the institute's strong defense or justification of the proposed budget. The DBM even released a circular that prohibits institutions to present their budget needs to policymakers because if proponents are able to justify the proposed budget, policymakers might approve it, which may not be in line with DBM's budget allocation.

Concern over unutilized budget was also raised during the discussion. It was observed that some institutions request for huge funds but show low utilization rate. In the case of R&D institutions, however, utilization is relatively higher compared with the other sectors. In the case of PhilRice, fund utilization in 2013 reached 90%. The 10% unutilized is partly because of administrative factors, such as processing supply and equipment procurement, which caused some delays in budget processing.

Private sector's rice R&D initiatives

Postharvest losses is one of the major problems in the rice sector. Can the private sector focus on addressing this problem?

In terms of mechanization per se, the Philippine Center for Postharvest Development and Mechanization (PhilMech) is in-charge of recommending appropriate equipment to preserve the quality of the grains. On the part of the private sector, some initiatives have been done such as the development of non-shattering hybrid rice varieties, for example, which are suited for mechanization. This property is in contrast with that of the other inbred varieties (e.g., PSB Rc18) that has weak panicle attachment. Nevertheless, these inbred varieties may be improved through R&D using the right genetic material.

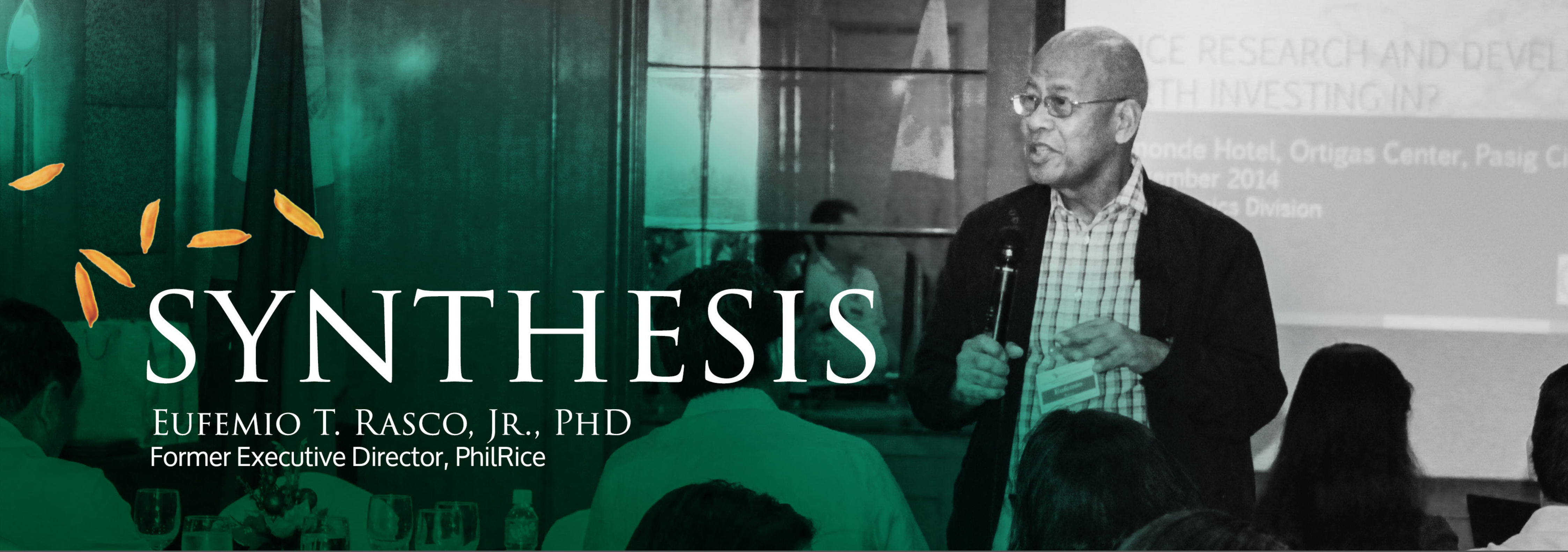
The private sector also recognizes the quality of grains as equally important in variety development. This is one factor that will dictate the competitiveness of the local harvests with those of the other nations, especially now that the ASEAN Integration is in place.

The private sector has also been involved in extending technologies to farmers. In fact, SL-Agritech has hired 17 extensionists deployed nationwide. The company has decided to invest in this activity because of the limited promotion activities done by the Department of Agriculture.

Public-private partnership in doing R&D

The private sector will continue to do RD&E activities but still need support from the government because if left alone, it will be very costly on their part. Public-private partnership (PPP), therefore, is one opportunity to facilitate the conduct of RD&E projects. This involves sharing of facilities and services for rice commercialization.

One partnership needed is on the conduct of technology demonstration in the field. The private sector needs people who will manage its implementation. All materials and additional technical assistance can be provided by the private sector, while the government can handle its management. Another partnership could be on the adoptability trial of hybrid and inbred varieties nationwide because the private sector cannot hire much people to do this. Private companies can nominate hybrid selections, for example, which involve some financial cost on their part. Adoptability trials can be done by the government as they have the facility and expertise to do this. Another plausible partnership is on sharing of germplasm for variety development. The private sector can be given easier access (facilitation of the process) to the germplasm, either for free or with a fee.



SYNTHESIS

Eufemio T. Rasco, Jr., PhD
Former Executive Director, PhilRice

I have four answers to the question "What is worth investing in rice R&D?" One is that the returns of R&D are good. This was adequately explained by our speakers Dr. Flordeliza H. Bordey and Dr. Ramon L. Clarete. A stronger proof that R&D gives good resturns is SL Agritech's huge investment on R&D. No private company would invest in activities that will give them no profit in return. Second, there is a continuing need to do R&D. For us to sustain the gains of the past R&D, we must continue doing R&D. New problems arise as we solve one problem. In producing hybrid rice, for example, it was later realized that we need to produce our own seeds. However, hybrid seed production is too costly if done domestically. This is an example of second generation problem that need further research. Third, we need to be competitive under ASEAN integration. So far, countries have competed based on resource endowments. But in the future, competition might be based on who has a better technology. That is, the one who can better utlize available resources to produce the cheapest but with the highest quality product. These need continuous R&D efforts. Fourth, we need to continue R&D so that we can continue training researchers.

ON THE IMPACT METHODOLOGY

The econometric methods of determining the impact of R&D are complicated and difficult to understand. Isolating the impact of R&D from the rest of the factors that affect farmers' income is also difficult. I appreciate more the qualitative observation of Dr. Manny Regalado on the transformation of Muñoz from a low class city into a science city. These are methodological issues that need to be addressed through R&D.

It has been proven that budget allocation on R&D is really low compared with other countries. But another question arises: if budget is available, where should we allocate the limited budget? We have basic research, development, demonstration, and deployment. If you need observable results immediately, then you might need to invest on deployment. But if you are concerned about the future of this country, you would invest it on basic research because it produces long-term benefits.

ON PRIVATE SECTOR CONCERNS

One of the concerns of the private sector is that the recommended varieties are based more on geographical or island-wide rather than location-specific or agroecology-based. This has been recognized and is now being addressed by PhilRice and the National Seed Inspection Council. At the moment, the technical working group is addressing this by revising the guidelines based on agroecology. Unfortunately, its implementation will start next year.

On seed production research, PhilRice created the Seed Technology Division to address the low seed yield of hybrid. As of the moment, seed yield has increased from 700 kg/ha to 2,000 kg/ha. This is already a big increment. However, the institute is not stopping from here. Continuous research on the factors affecting seed yield is still being conducted to further the yield.

On germplasm access, this is more difficult to address because of Intellectual Property Rights (IPR) issue involved. Although PhilRice is a public institution, staff members (especially plant breeders) also own the rights to the varieties. It is really difficult to satisfy both legal requirements and moral obligations to the people. In international community, publicly developed technologies can be sold, which is guided by the Bayh-Dole Act. In the Philippines we have the Technology Transfer Act, which is actually patterned after Bayh-Dole Act. At PhilRice, we are offering a technology licensing opportunity. If a private company wants to commercialize PhilRice-bred hybrid, then there is a procedure for this.

On the deployment, it is clear that there is a need to access financial resources for the products of research to be utilized. Resources can be in the form of cash through subsidy or bank credit. However, based on past experience, this doesn't work well because many times the cash never end up in purchasing fertilizer, but rather used for non-farm expenses.

An example of ideal in-kind service support is the one given by SL Agritech. That is, they provide material inputs like seeds and fertilizers and then buy-back the harvest. The problem is very few companies are doing such support. Another form of support is renting out of machineries, like combine harvesters. We can encourage our Overseas Filipino Workers to invest in machineries and rent it out. In this way, they can help this country at the same time earn money.

On technology demonstration, PhilRice initiated the demonstration of all hybrids from the private and public sectors about 2-3 years ago. However, there had been some problems with companies who got lower yield than the others. To solve this, we came up with another mode of collaboration and we called it Palayabangan that encouraged companies to do their own crop management practices instead of using the standard recommended cultural management practices. Technology packages are being demonstrated through this Palayabangan.

Finally, with all these concerns and issues that came up in the discussions, one thing is clear, we really must invest more on rice R&D.

SPEAKERS

DR. RAMON L. CLARETE

is a professor and the current dean of the University of the Philippines School of Economics. He teaches and does research in international economics, agriculture and food policy, and public economics.

Since the late 1980s, he has been involved in policy reform efforts in the Philippines, specifically in the fields of international trade and agriculture.

For over 20 years as an applied policy economist, he has provided technical assistance to programs of development partners, primarily of USAID/Philippines, and to the Philippine government in the areas of international trade, tax and spending policies, agriculture and rural development programs, and food policies.

In the last three (3) years, he had assisted the ASEAN Secretariat and the ASEAN Food Security Reserve Board implement the ASEAN Integrated Food Security System. He also chairs the Advisory Board of the Asian Rice Bowl Index and a member of the Advisory Board of the WTO Chairs Programme.

He obtained his PhD in Economics at the University of Hawaii.

DR. FLORDELIZA H. BORDEY

is currently the head of the Socioeconomics Division of the Philippine Rice Research Institute (PhilRice). As a Chief Science Research Specialist and Economist, she spearheads the DA-IRRI-PhilRice collaborative project titled, "Benchmarking the Philippine Rice Economy Relative to Major Rice-Producing Countries in Asia." The project aims to assess the competitiveness of the Philippine paddy production at the farm level relative to selected Asian countries.

Prior to this, she served as the program leader of the IEPRAP from 2010 to 2012. She was also heavily involved in the crafting of the Food Staples Sufficiency Roadmap for 2013-2016.

Dr. Bordey was awarded second place in 2011 NAST Talent Search for Young Scientist after presenting her paper that identified factors affecting domestic rice production in the NAST Annual Scientific Meeting.

She finished her PhD degree in Economics at the University of Illinois Urbana-Champaign with a dissertation titled, "The Impacts of Research on Philippine Rice Production."

DR. FRISCO M. MALABANAN

is the Senior Technical Consultant and Seed Technologist at SL Agritech Corporation in the Philippines. He is also the Technical Consultant on Hybrid Rice Production of the Village Gardens Limited at Gabadi, Central Province in Papua New Guinea.

Dr. Malabanan previously served as the director of the Ginintuang Masaganang Ani (GMA) Rice Program of the Department of Agriculture. He also served as NRSPC in 2000-2001.

Among his outstanding achievements are the (a) pioneering the Hybrid Rice Technology in the Philippines, (b) establishment of Rice SeedNet in the Philippines and (c) the attainment of the all-time high palay production in the Philippines through the GMA Rice Program.

He finished his PhD in Agronomy at the University of the Philippines-Los Baños in 1993.

MR. ANGELITO T. CARPIO

is a Senior Science Research Specialist at the Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (PCAARRD).

Mr. Carpio has been influential in the success of various published and unpublished technical papers as contributor, co-author, co-editor and reviewer. He is the current ISP Manager for Rice Industry Strategic S&T Plan.

He obtained his Master's degree in Management major in Rural Development Management and minor in Research Management at UP Los Baños. He also earned units in Master in Business Administration from San Pablo Colleges.

He was one of the PCAARRD's 10 Most Outstanding Technical Staff in 1997.

DR. MANUEL JOSE C. REGALADO

is the Deputy Executive Director for Research of PhilRice since 2010. He is directly involved in the planning, budgeting, overall execution and supervision, monitoring and review of all PhilRice R&D programs and projects, including collaborative R&D projects with IRRI, BAR, PCARRD, and other institutions.

For more than two decades of service at PhilRice, he has shared his knowledge, management, and provided technical assistance in several projects involved in improving agricultural productivity, profitability, and the level of rice mechanization in the Philippines.

Conferred as Scientist I in 2009, his notable professional experiences, remarkable contributions, and passion in his field of expertise made him deserving to be awarded as the 2014 Gawad Saka Outstanding Agricultural Scientist in the 26th DA-BAR National Research Symposium.

He finished his PhD in Agricultural Science at the United Graduate School of Agricultural Sciences, Iwate University in Japan.

DR. AGHAM C. CUEVAS

serves as an associate professor at the Department of Economics of the College of Economics and Management at UP Los Baños since 2000. He teaches Macroeconomics, Microeconomics, International Trade, Public Economics, and Economics of Regulation.

As an economist, Dr. Cuevas has shared numerous contributions to the analyses of the potential impacts of the Japan-Philippines Economic Partnership Agreement (JPEPA) on Japanese Official Development Assistance (ODA) to the Philippines.

He has authored and co-authored close to a hundred popular articles on basic economics and economic issues, which were published in several magazines and journals.

He also received numerous grants and awards such as the Philippine Center for Economic Development Graduate Fellowship, 2013 Metro Manila Commission Professional Chair Award, SEARCA Seed Fun for Research and Training (SFRT) Grant, and PhD Research Grant.

Dr. Cuevas obtained his PhD in Economics at the University of the Philippines Diliman.

APPENDIX A. PROGRAM OF ACTIVITIES

MORNING SESSION

8:00 - 9:00		Registration
9:01 - 9:30		Opening Program
	Invocation	**Ronell B. Malasa**
	National Anthem	Video presentation
	Welcome Remarks	**Necitas B. Malabanan** Deputy Executive Director for Administrative Services and Finance, PhilRice
9:31 -10:00	Trends in Philippines' Rice R&D Budget Allocation	**Manuel Jose C. Regalado, Ph.D.** Deputy Executive Director for Research, PhilRice
10:01 -10:15	Open Forum & Awarding of Certificate	
10:16 -10:45	Impact of Rice R&D Investments on Cost of Production	**Flordeliza H. Bordey, Ph.D.** Chief Science Research Specialist, PhilRice
10:46 -11:00	Open Forum & Awarding of Certificate	
11:01 -11:15	Snacks/Break	
11:16 -11:45	Impact of Rice R&D Investments on Economic Welfare	**Ramon L. Clarete, Ph.D.** Dean, School of Economics-UP Diliman
11:46 -12:00	Open Forum & Awarding of Certificate	
12:00 -1:00	Lunch Break	

AFTERNOON SESSION

1:01 -1:30	Private Sector's Perspective on Rice R&D Investment	**Frisco B. Malabanan, Ph.D.** Senior Consultant, SL-Agritech Corporation
1:31 -1:45	Open Forum & Awarding of Certificate	
1:46 -2:15	Ex-Ante Evaluation of the PCAARRD Industry Strategic Plan for Rice: A Cost-Benefit Analysis	**Agham C. Cuevas, Ph.D.** Project Leader, Ex-Ante Analysis of Rice ISP and Associate Professor, College of Economics and Management, UP Los Baños **Mr. Angelito T. Carpio** Rice ISP Manager and Senior Science Research Specialist, Crops Research Division, PCAARRD
2:16 -2:30	Open Forum & Awarding of Certificate	
2:31 -3:00	Synthesis & Closing Remarks	**Eufemio T. Rasco, Jr., Ph.D.** Executive Director, PhilRice
3:01 -3:15	Snacks	

Master of Ceremonies:

Ms. Rhemilyn Z. Relado

APPENDIX B. LIST OF PARTICIPANTS

No.	Name	Division/ Organization
1	Sam Perez	DA-NAFC
2	Teresita Salud	DBM
3	Lino Renomeron	House of Representatives
4	Novel Bangsal	House of Representatives
5	Prince Cal Mahot	House of Representatives
6	Paul Icamina	Malaya
7	Lenard Martin Guevarra	NEDA
8	Meliza Festeso	PCAARRD-DOST
9	Engr. Romeo Santiago	PCAARRD-DOST
10	Angelito Carpio	PCAARRD-DOST
11	Engr. Ariel Cayanan	PCAF
12	Ronnel Domingo	Philippine Daily Inquirer
13	Amelita Salvador	PhilMech
14	Engr. Genaro Tolentino	PhilMech
15	Roberto Gonzales	PhilRice
16	Abner Montecalvo	PhilRice-Agusan
17	Dr. Gerardo Estoy	PhilRice-Agusan
18	Fidela Bongat	PhilRice-Batac
19	Ranxel Almario	PhilRice-CES
20	Imelda Arida	PhilRice-CES

No.	Name	Division/ Organization
21	Chona Austria	PhilRice-CES
22	Marco Antonio Baltazar	PhilRice-CES
23	Flordeliza Bordey	PhilRice-CES
24	Alfrelyn Gregorio	PhilRice-CES
25	Racquel Ibarra	PhilRice-CES
26	Anna Liza Labay	PhilRice-CES
27	Mary Grace Lapurga	PhilRice-CES
28	Aileen Litonjua	PhilRice-CES
29	Ronell Malasa	PhilRice-CES
30	Rowena Manalili	PhilRice-CES
31	Joynabel Parahuison	PhilRice-CES
32	Suennie Jane Paran	PhilRice-CES
33	Rhemilyn Relado	PhilRice-CES
34	Danika Ezra Salvahan	PhilRice-CES
35	Jayca Siddayao,	PhilRice-CES
36	Roy Tabalno	PhilRice-CES
37	Charmaine Yusongco	PhilRice-CES
38	Dante De Luna	PhilRice-CES
39	Melquedes Coloma	PhilRice-CES
40	Arman Daguio	PhilRice-CES

APPENDIX C. POLICY RESEARCH AND ADVOCACY TEAM

Flordeliza H. Bordey, PhD • Aileen C. Litonjua • Jayca Y. Siddayao • Alfrelyn G. Gregorio

No.	Name	Division/ Organization
41	Jonathan Cunanan	PhilRice-CES
42	Michael Sanggalang	PhilRice-CES
43	Glenda Ravelo	PhilRice-CES
44	Guadalupe Miranda	PhilRice-CES
45	Jazer John Gonzales	PhilRice-CES
46	Evelyn Javier	PhilRice-CES
47	Leylani Juliano	PhilRice-CES
48	Ricardo Orge	PhilRice-CES
49	Edwin Martin	PhilRice-CES
50	Dindo King Donayre	PhilRice-CES
51	Ashlee Canilang	PhilRice-CES
52	Charisma Love Gado	PhilRice-CES
53	Nelita Tado	PhilRice-CES
54	Babylinda Reyes	PhilRice-CES
55	Loida Perez	PhilRice-CES
56	Jovino De Dios	PhilRice-CES
57	Necitas Malabanan	PhilRice-CES
58	Manuel Regalado	PhilRice-CES
59	Mary Grace Lanuza	PhilRice-CES
60	Dr. Eufemio Rasco	PhilRice-CES

No.	Name	Division/ Organization
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63	Josefina Ballesteros	PhilRice-CES
64	Eden Gagelonia	PhilRice-CES
65	Caesar Joventino Tado	PhilRice-CES
66	Ruben Miranda	PhilRice-CES
67	Aurora Corales	PhilRice-CES
68	Democrito Rebong II	PhilRice-Isabela
69	Diego Ramos	PhilRice-Los Baños
70	Sailila Abdula	PhilRice-Midsayap
71	Gina Balleras	PhilRice-Midsayap
72	Edgar Libertario	PhilRice-Negros
73	Dr. Bessie Burgos	SEARCA
74	Pilipinas Luis	SEARCA
75	Dr. Frisco Malabanan	SL Agritech
76	Dr. Ramon Clarete	UP Diliman
77	Dr. Fernando Sanchez	UPLB
78	Jayneelyn Manicad	UPLB
79	Dr. Agha Cuevas	UPLB


Angelito


Certificate of Appreciation
FLORDELIZA H. BORDEY, PhD


Certificate of Appreciation
RAMON L. CLARETE, PhD

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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 seven branch stations, coordinating with a network that includes 57 agencies and 70 seed centers strategically located nationwide.

PhilRice has the following certifications: ISO 9001 (Quality Management), ISO 14001:2004 (Environmental Management), and OHSAS 18001:2007 (Occupational Health and Safety Assessment Series).

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