Technology in Focus :

All-Season Rice Varieties for Transplanting and Direct Wet-Seeding Culture in Irrigated Lowlands (2009-2015)

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Department of Agriculture PHILRICE PHILIPPINE RICE RESEARCH INSTITUTE CLEAN | GREEN | PRACTICAL | SMART

Outline

- Introduction
- Objectives and Strategies
- Technology in Focus

Lingering Tasks Facing Mankind?

Two tasks are taking priority over everything else;

- Control of population growth
- Increase of food production.

"We know how to reduce the rate of population growth and it is possible to multiply food production. *But the problem is so enormous that all available means even if only in the short term, must be applied to the food question. "*

.

As breeders we are faced with these concerns?

- **?"Rice Varieties for the Different Agro-ecological Environments"**
- **?"Diversity for Adversity: Securing the Future Through Rice Varieties"**
- **? "Different Seeds for Different Needs: The Importance of Producing New Rice Varieties"**

Why do new rice varieties continue to be developed even when there are already hundreds to choose from?

"The environment is dynamic, if breeding slows down we will be overcome by emerging pests and other climate-related problems threatening our production system that will affect our food security. We recognized **genetic diversity** is a tool to sustain the gains made in rice production."

Moreover……

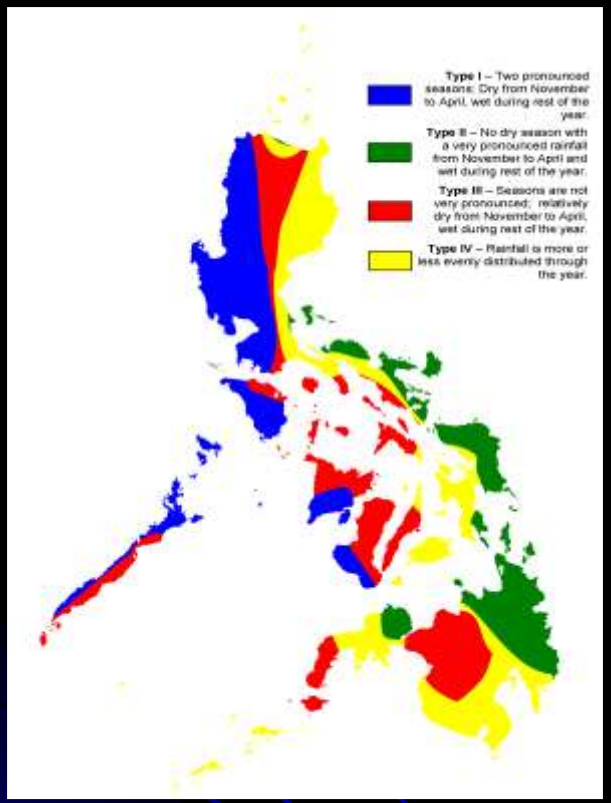
- The Philippines as an archipelago, have various types of terrain and ecosystems which are not equally suitable to rice production.

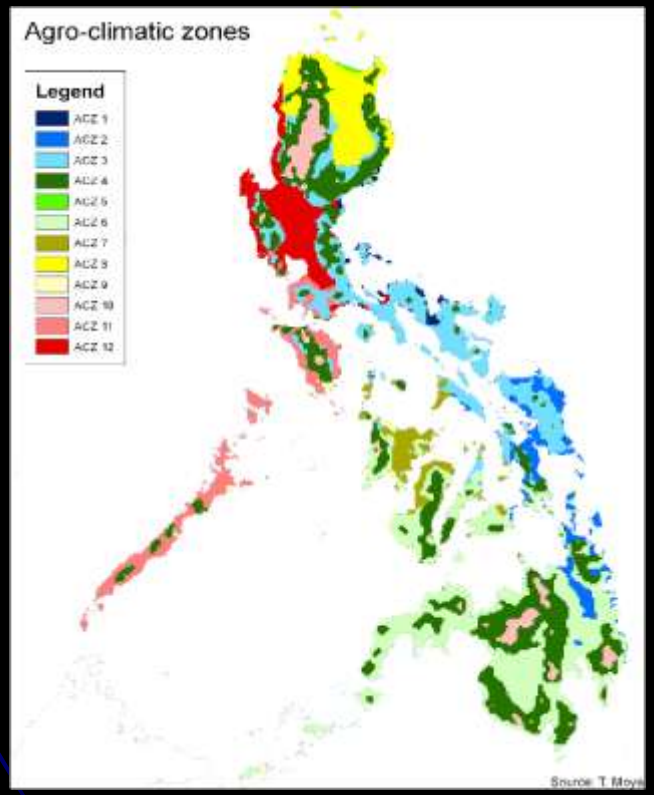
- As the population continues to grow rapidly, the pressure on resources is also increasing, and climate change poses further challenges.

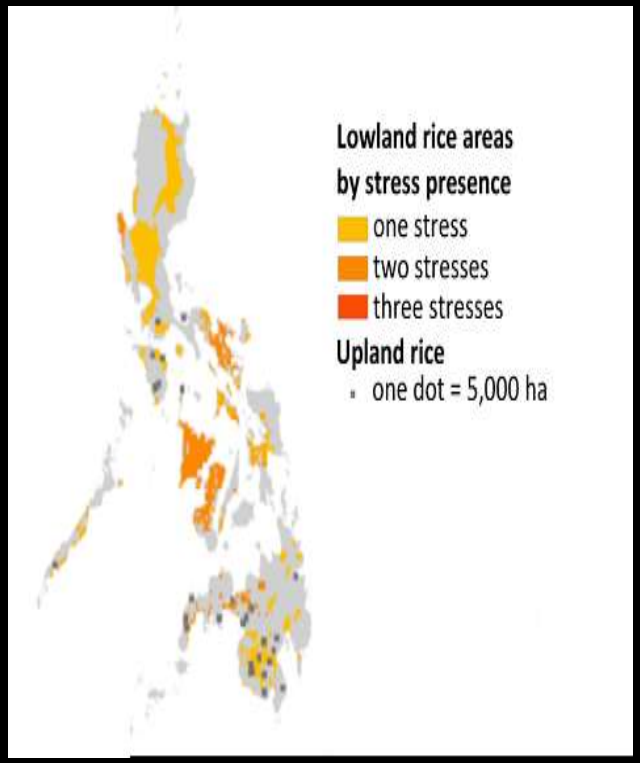
Another challenge…

- Some areas are also more prone to particular kinds of pests or diseases, so plant resistance is another quality to be kept in mind.

Diverse Rice Environments







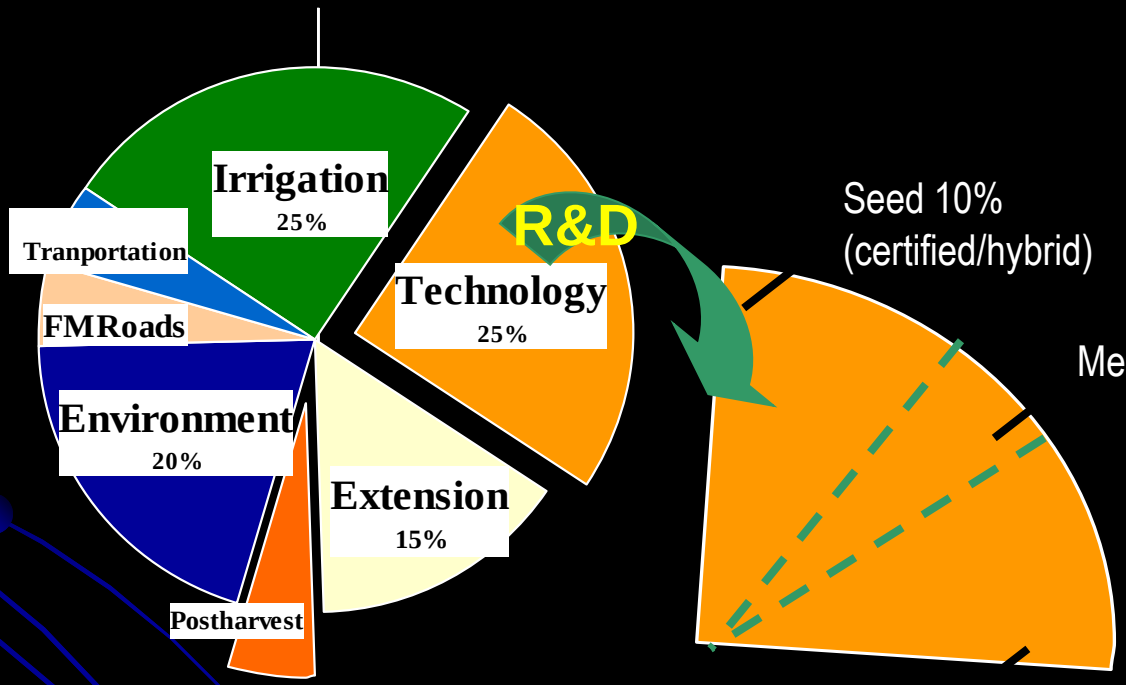
Noble tasks, but we are not alone…

Breeders aim to develop varieties that can tolerate growing in both favorable & unfavorable conditions

Slafer and Andrade, 1991; Cooper et al., 2004

"Breeding is just half of the equation for more productive and sustainable crops, the other half is agronomical management. The progress that has been achieved for grain yield has resulted from combining improved genetics with appropriate crop management strategies."

Factors to sustain rice productivity.....



Seed 10%
(certified/hybrid)

Mechanization 5%
- drum seeder,
- transplanter
- combine harvester

Integrated crop management 10%

PalayCheck and Palayamanan

OBJECTIVES AND STRATEGIES

General Objectives

Accelerate introduction & Adoption of higher yielding inbred & hybrid rice varieties with tolerance of or resistance to biotic and abiotic stress

Produce higher yields with rate >5% using : higher-yielding varieties + better irrigation + seed production and dissemination to meet country`s self-sufficiency requirements

Enhance partnership with Participating institutions and DA-RFOs for sustainability of the varietal development programs and continuous availability of newly-developed high quality seeds

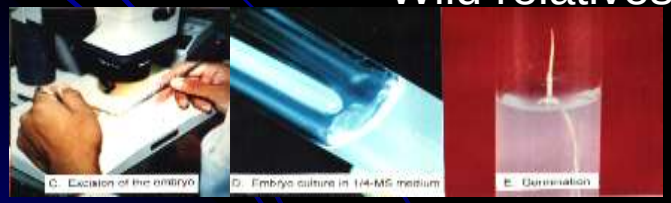
Exploiting rice itself ……

Rice has an estimated 30,000 genes

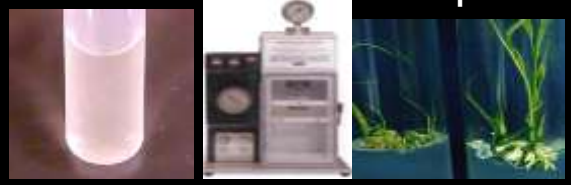
A wide genetic base is important

Traditional varieties
Modern varieties
Elite Breeding lines
Introduced varieties

Wild relatives



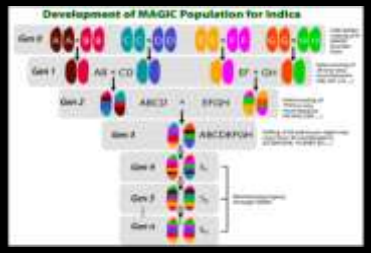
Genes from other species

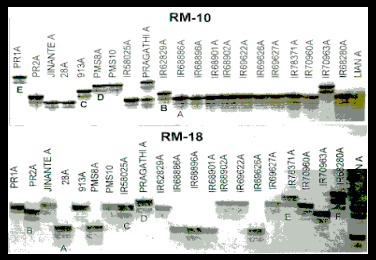


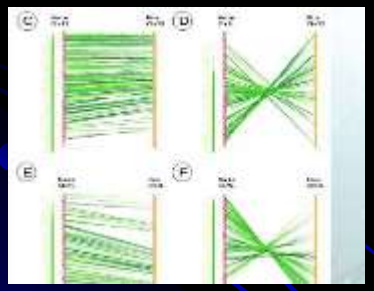
Relying on conventional hybridization

- Basic, time-tested
- To generate and utilize existing genetic variation
- Generates a wide array of combinations of the genes coming from the parent plants
- Cross-pollination followed by several cycles of selection and self-pollination → stable promising lines → candidate varieties

Applying cutting-edge technologies







Biotechnology

- ✓ increasing breeding efficiency
- ✓ improving resistance/tolerance to biotic & abiotic stresses

Molecular marker technology

- ✓ using marker-aided selection
- ✓ germplasm characterizations

Induced mutations

***In vitro* techniques**- developing lines for adverse environments

Physical & Chemical mutagenesis -

Genetic engineering

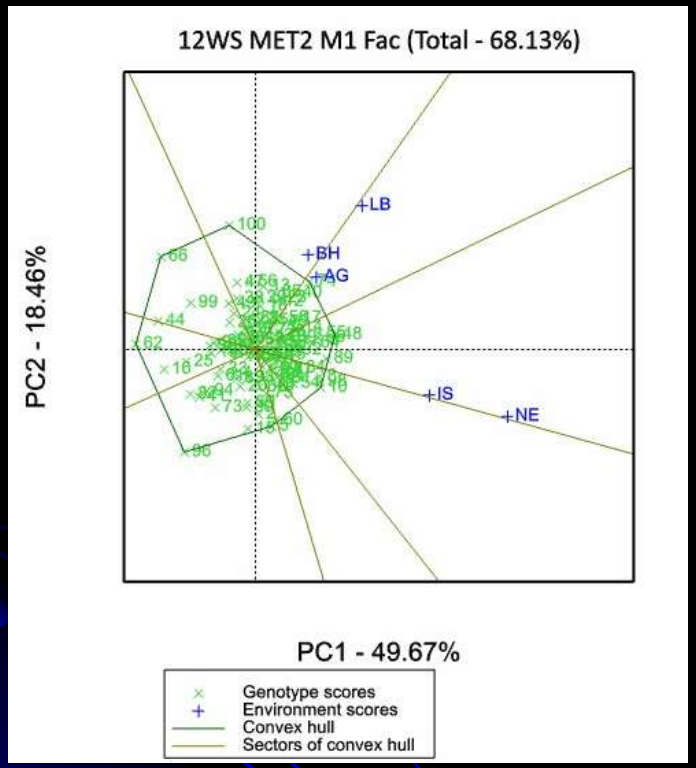
- ✓ cloning/introduction of important genes

Wide hybridization

- ✓ transferring resistance genes

Stratifying multi-environmental testing (MET) sites

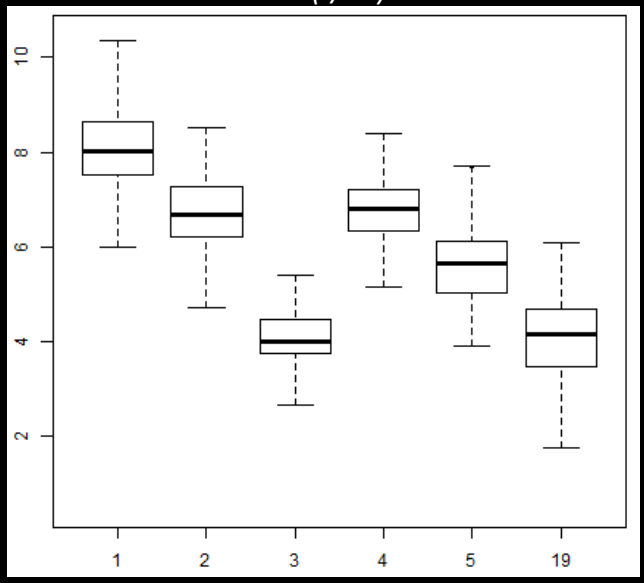
Improving computational power



Legend: 1 – Muñoz
2 - San Mateo
3 - RTR
4 - Los Baños
5 - Ubay
19 – Midsayap

14DS MET1 Medium/Late Group

Yield (t/ha)



- Top-yielding site: *Munoz* (8.06)
- Lowest yielding site: *Midsayap* (4.00)

Revising guidelines and policies in the NCT to increase gain in productivity

- A new selection may be nominated to the Technical Secretariat of the NSIC on the basis of superior yield, better agronomic and grain characteristics and higher levels of resistance to diseases and insect pests over existing dynamic varieties.

- Those with average yields of 5% or higher than the grand mean of the check are considered for approval.

- A selection not distinctly superior to the existing varieties may also be recommended for release as a variety if it carries new genes for resistance against biotic or abiotic stresses or has a different genetic background.

Current Recommendation Domains

- National recommendation – yield advantage is satisfied in 50% of the valid trials, i.e. C.V. = ≤ 20%, across all regions (Luzon, Visayas, Mindanao) in both dry and wet season.

- Seasonal recommendation – yield advantage is satisfied in 50% of the valid dry season or wet season field trials across locations-years combinations or data points, and there is clear and consistent season effect.

- Regional recommendation – yield advantage is satisfied in 50% of the valid regional field trials in Luzon, Visayas, or Mindanao across seasons-years combinations or data points, and there is clear and consistent region effect.

NCT GUIDELINES FOR VARIETY RELEASE

No.	Ecosystem/ Evaluation Component	Grain Yield Criteria	Specific Criteria	Grain Yield and Ecosystem-Specific Checks
1	**IL-TPR**	GY ≥ 5% against best performing inbred checks		TPR inbred checks, Local checks
2	**IL-DSR**			DSR inbred checks, Local checks
3	**MAT**			Maturity check, Local check

The principle of "moving target" or dynamic check shall be applied, as better check varieties become available. During transition to new sets of checks, both the old and new checks are used at the same time across WS and DS.

Number of recommended varieties by ecosystem (1968 to 2015)

Period	Irrigated lowland	Rainfed lowland	Upland	Cool elevated	Saline	TOTAL
1968-1988	**43** (29 IRRI, 4 UP, 9 BPI, 1 PAEC)	**4** (2 UPLB, 2 IRRI)	**7** 4 UPLB, 2 IRRI, 1 BPI)	**-**	**-**	**54**
1990-2010	90 (54) inbreds, 30 hybrids, 6 sp purpose	17 (3 UPLB, 8 inc 4 TRV PhilRice 6 IRRI	6 (3 IRRI, 3 inc 1 TRV PhilRice)	6 (5 IRRI, 1 PhilRice)	13 7 IRRI, 6 PhilRice	**132**
2011-2012	23 (5 inbreds, 3 special purpose, 15 hybrids)	**9** (3 UPLB, 4, IRRI, 2 PhilRice)	**1** (IRRI)	-	4 (3 PhilRice, 1 IRRI)	**37**
2013-2015	41 11 inbreds, 3 SP, 27 HR)	**10** (6 PhilRice, 3 IRRI, 1 UPLB)	**3** (IRRI)	-	**11**(4 PhilRice, 7 IRRI	**46**
TOTAL	**205**	**40**	**17**	**6**	**28**	**288**

TECHNOLOGY IN FOCUS

Irrigated Lowland Rice Varieties 2009-2015

- All-season rice varieties (National recommendation)

2009-2015 IRRIGATED LOWLAND RICE VARIETIES

NSIC Rc212	**Tubigan 15**	**IR77495-10-2-6-2**	**National TPR/DSR**
NSIC Rc214	**Tubigan 16**	**IR78566-1-2-1-2**	**National TPR/DSR**
NSIC Rc216	**Tubigan 17**	**PR34141-38-1-J2**	**National TPR/DSR**
NSIC Rc222	**Tubigan 18**	**PR31091-17-3-1**	**National TPR/DSR**
NSIC2010 Rc224	Tubigan 19	PR31091-17-3-1	National TPR
NSIC2010 Rc226	**Tubigan 20**	**PR33373-10-1-1-B**	**National TPR/DSR**
NSIC 2011 Rc238	**Tubigan 21**	**IR78555-68-3-3-3**	**National TPR**
NSIC 2011 Rc240	Tubigan 22	PR31132-B-1-1-1-3-3	National TPR/DSR
NSIC 2012 Rc298	Tubigan 23	PR34159-13-1	National DSR
NSIC 2012 Rc300	Tubigan 24	PR31379-2B-10-1-2-1-2	National TPR/DSR
NSIC 2012 Rc302	Tubigan 25	IR79643-39-2-2-3	National TPR/DSR
NSIC 2013 Rc308	Tubigan 26	PR35766-B-24-3	Mindanao (TPR/DSR); Visayas(DSR)
NSIC 2014 Rc352	Tubigan 27	IR80694-44-1-2-2	Luzon TPR
NSIC 2014 Rc354	Tubigan 28	PR37274-6-33-9-1-2 (AR)	National, TPR
NSIC 2014 Rc356	Tubigan 29	IR78585-98-2-2-1	Visayas TPR
NSIC 2014 Rc358	Tubigan 30	PR35789-B-1-1-1	Visayas TPR
NSIC 2014 Rc360	Tubigan 31	IR80894-18-2-2-3	Visayas TPR
NSIC 2015 Rc394	Tubigan 32	PR36723-B-B-3-3-3	Luzon (DSR)
NSIC 2015 Rc396	Tubigan 33	PR35766-B-24-1	Visayas (DSR)
NSIC 2015 Rc398	Tubigan 34	C8112-B-4-3-2-1-1	Luzon (DSR)
NSIC 2015 Rc400	**Tubigan 35**	**IR06A150**	**National TPR/DSR**
NSIC 2015 Rc402	Tubigan 36	PR36930-B-7-3	Luzon (DSR)

Yield and other agronomic traits

NSIC REGISTRY NO.	YIELD (t/ha)				MATURITY (DAS)		PLANT HEIGHT(cm)		TILLERS (no.)	
	TPR		DSR		TPR	DSR	TPR	DSR	TPR	DSR
	Ave	Max	Ave	Max						
NSIC Rc212	6.0	10.0	5.6	7.4	115	111	109	104	15	294
NSIC Rc214	6.0	10.2	5.5	9.2	116	110	106	103	15	290
NSIC Rc216	6.0	9.7	5.7	9.3	112	104	96	92	14	285
NSIC Rc222	6.1	10.0	5.7	7.9	114	106	101	98	14	278
NSIC Rc226	6.2	9.8	5.4	8.5	112	102	102	102	14	295
NSIC Rc240	6.4	10.6	5.8	7.6	115	108	107	104	12	259
NSIC Rc300	5.7	10.4	5.3	9.0	115	105	98	96	15	269
NSIC Rc302	5.7	10.4	5.1	9.5	115	106	100	96	15	266
NSIC Rc400	5.8	9.5	5.4	12.6	120	113	105	100	15	387

DISEASE RESISTANCE

VARIETY	Blast	BLB	SHB	RTV (I)	RTV (M)
NSIC Rc212	I	I	-	S	S
NSIC Rc214	I	I	-	S	S
NSIC Rc216	S	I	-	S	S
NSIC Rc222	I	I	-	S	I
NSIC Rc226	S	S	-	S	S
NSIC Rc240	I	I	I-S	S	S
NSIC Rc300	I	I	I	S	S
NSIC Rc302	I	I	I	S	S
NSIC Rc400	I	I	I	S	S

BLB- bacterial leaf blight; SHB- sheath blight; RTV(I)- rice tungro virus, induced; M- modified field method

I- intermediate; S- susceptible

INSECT RESISTANCE

VARIETY	BPH (I)	GLH (I)	YSB(I)	WSB(F)	YSB (F)
NSIC Rc212	MR	MR	R	-	-
NSIC Rc214	MR	MR	R	-	-
NSIC Rc216	MR	MR	MR	-	-
NSIC Rc222	MR	MR	MR	-	-
NSIC Rc226	MR	MR	I	MS	MS
NSIC Rc240	I	MS	MS	MR	I
NSIC Rc300	MR	MR	I	S	I
NSIC Rc302	I	MR	MS	S	I
NSIC Rc400	I	I	-	I	I

BPH- brown plant hopper; GLH- green leaf hopper; YSB-yellow stemborer; WSB- white stemborer
I- induced; F- field reaction
R- resistant; MR- moderate reaction; I- intermediate; MS-moderately susceptible; S- susceptible

GRAIN QUALITY

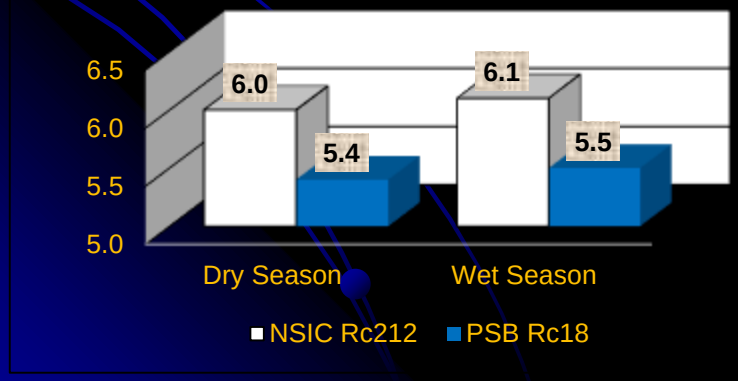
Variety	% Amylose	Protein	G.T. score	% Brown rice	% Milling recovery	% Head Rice	% Chalky	Grain Length/	Grain Shape	Cooked	Raw
NSIC Rc212	21.2 I	6.3	4.5 I/HI	78.3 F	67.6 G1	46.0 G2	19.2 aa	7.5 EL	3.4 S	83.3	80.7
NSIC Rc214	21.9 I	6.2	5.1 I/L	77.7 G1	66.6 G1	42.6 G2	18.7 aa	7.6 EL	3.5 S	83.3	83.3
NSIC Rc216	20.5 I	6.8	5.7 I/L	78.3 F	69.2 G1	50.0 G1	9.4 G2	7.4 L	3.2 S	76.5	90.5
NSIC Rc222	24.0 I	6.6	4.8 I	78.8 F	68.5 G1	44.7 G2	19.3 aa	7.2 L	3.4 S	56.7	82.4
NSIC Rc226	23.8 I	6.6	7.0 L	78.2 F	71.4 Pr	54.0 G1	10.6 G3	6.9 L	2.9 I	71.0	84.7
NSIC Rc240	23.8 I	6.6	7.0 L	78.2 F	71.4 Pr	54.0 G1	10.6 G3	6.9 L	2.9 I	71.0	84.7
NSIC Rc300	20.4 I	7.4	3.1 HI/I	78.1 F	72.2 Pr	48.9 G1	11.1 G3	6.8 L	2.9 I	82.8	90.0
NSIC Rc302	24.2 I	6.3	3.8 HI	76.9 F	68.5 G1	32.0 G3	16.9 aa	7.5 EL	3.7 S	60.0	73.3
NSIC Rc400	16.7 L	6.8	3.0 HI	76.2 F	69.3 G1	53.8 G1	4.1 G1	6.4 M	2.8 I	80.0	75.0

Tubigan 15 (NSIC Rc212)

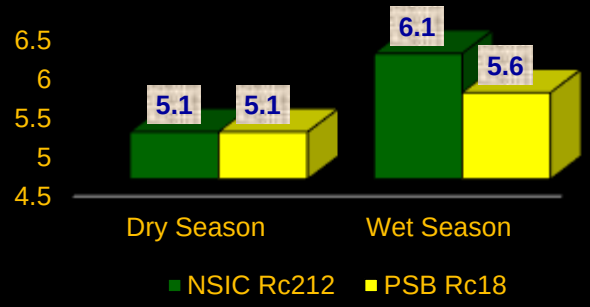
NSIC Rc212
(Tubigan 15)

- High yielding with consistent positive yield advantage over PSB Rc18
- Stable maturity at 110 to 115 days.
- Resistant to whiteheads (YSB), Moderately resistant to GLH and BPH, Intermediate reaction to blast, and BLB
- Intermediate amylose content, good milling recovery, highly acceptable and preferred both in cooked and raw forms

Transplanted Rice



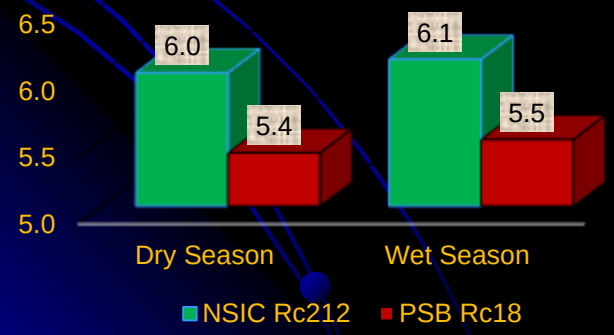
Direct Wet-seeded Rice



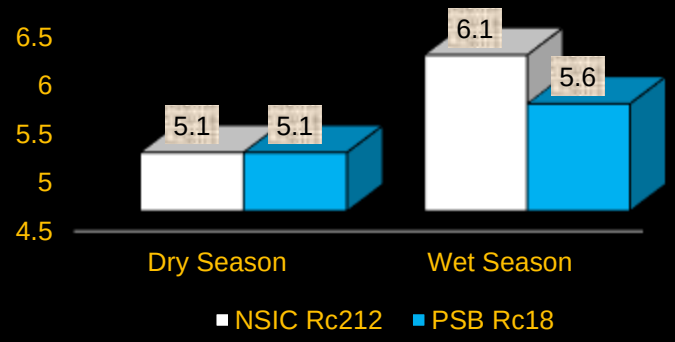
Tubigan 16 (NSIC Rc214)

- Yield advantage of 22.2% during the DS and 12.2% across season in the NCT I.
- Early maturing at 116 days as TPR and 110 days as DWSR.
- Resistant to whiteheads (YSB), Moderately resistant to GLH and BPH, Intermediate reaction to blast, BLB and SHB
- Intermediate amylose content, good milling recovery, highly acceptable and preferred both in cooked and raw forms

Transplanted Rice



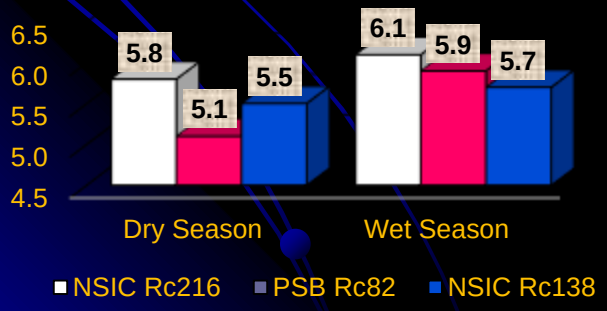
Direct Wet-seeded Rice



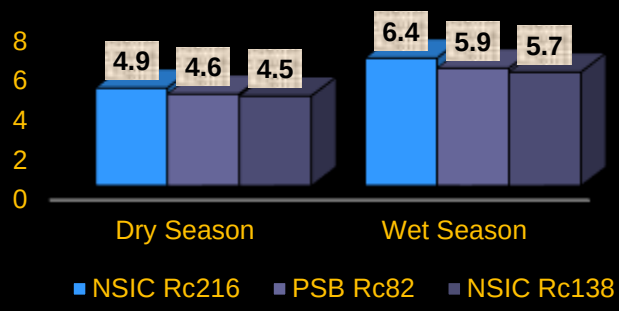
Tubigan 17 (NSIC Rc216)

- Output from the PJ Technical cooperation project developed by PhilRice from the cross PJ7/MATATAG 1
- Better yield performance across seasons in TPR and DWSR in the MAT trial
- Early maturing at 112 days as TPR and 104 days as DWSR
- Moderately resistant to Whiteheads (YSB), BPH and GLH
- Intermediate to BLB and YSB
- Intermediate amylose content with good milling and head rice recovery; Highly acceptable especially in the raw form

Transplanted Rice



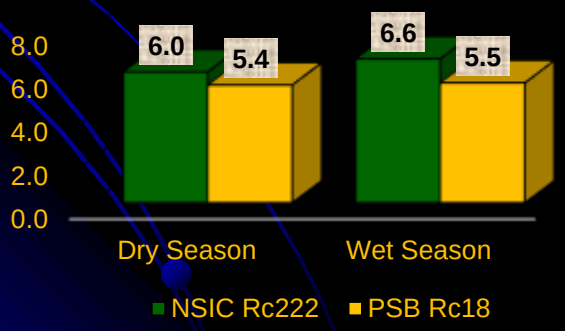
Direct Wet-seeded Rice



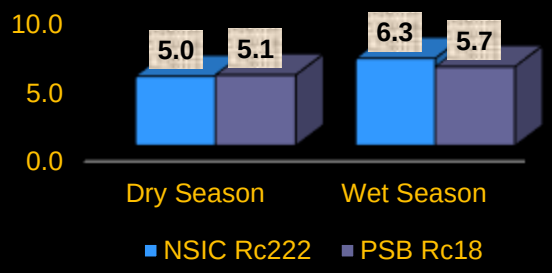
Tubigan 18 (NSIC Rc222)

- Consistently good performance across seasons
- Higher yield advantage during WS (12.1 to 13.2%)
- Early maturing variety at 114 days (TPR) and 106 days (DSR)
- Intermediate to field infection to RTV, BLB and B MR to YSB, GLH and BPH
- Intermediate amylose content, good milling and head rice recovery
- With dual adaptation in irrigated and rainfed areas

Transplanted Rice



Direct Wet-seeded Rice



ANCESTRY NSIC Rc222 (12 parents)

NSIC Rc 222 :BLB profile

Genotype: Xa4+xa5

Phenotype data

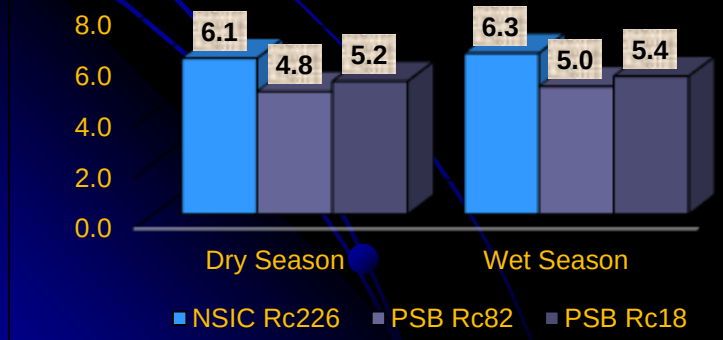
1.53 R
5.14 MR
5.74 MR
5.97 MR
5.33 MR
3.15 R
7.00 MR
1.28 R 5.48
MR 3.76 R
4.64 R
11.71 MS
3.08 R 2.36 R

- PNO NAME AND LEVEL
- 1 IR 78581
- 2 +-IR 73012-137-2-2-2
- 8 | +-IR 68064-18-1-1-2-2
- 21 | | +-IR 44962-161-2-4-4-2
- 22 | | +-IR 60824-33-2-3-2-2
- 9 | +-IR 61979-138-1-3-2-2
- 28 | +-IR 44625-139-2-2-3
- 29 | +-IR 32822-94-3-3-2-2
- 3 +-PSB RC 10 (IR 50404-57-2-2-3)
- 14 +-IR 33021-39-2-2
- 33 | +-IR 29637
- 34 | +-IR 9828-41-2-1
- 15 +-IR 50404
- 39 +-IR 19058-143-2-3
- 40 +-IR 9129-209-2-2-2-1

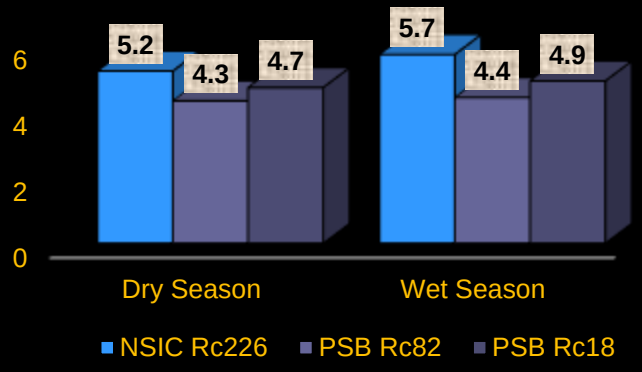
NSIC Rc226 (Tubigan 20)

- Exhibited significant yield in Palawan, Capiz, Bohol, Davao del Sur, Bukidnon, Northern Samar, and Aklan
- Comparable to PSB Rc82 in Isabela, Pangasinan, Tarlac, Cagayan, Pampanga, Ilocos Norte, Agusan, Camarines Sur and Kalinga.
- Early maturing at 112 days as TPR and 104 days as DWSR with moderate resistance to GLH, BPH and YSB and also with moderate field resistance under high incidence of tungro virus disease.
- Very good milling recovery with long and intermediate grains.

Transplanted Rice



Direct Wet-seeded Rice



ANCESTRY
NSIC Rc226
(11 parents)

NSIC Rc226 :BLB profile

Genotype: *Xa4*

Phenotype data

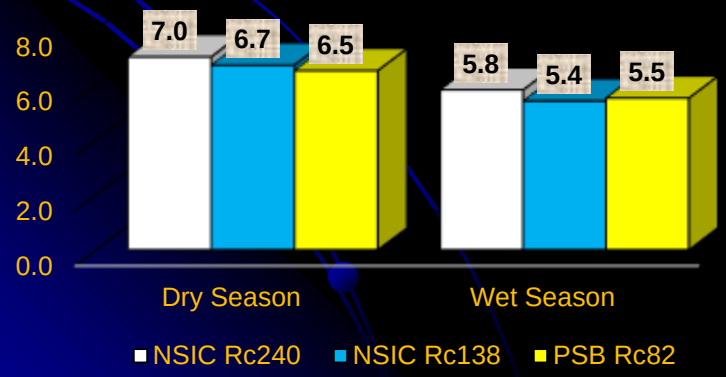
4.61 R
19.25 S
18.22 S
21.93 S
16.79 S
5.64 MR
23.53 S
4.58 R
8.31 MR
4.66 R
5.53 MR
19.25 S
18.44 S
5.62 MR

```
PNO    NAME AND LEVEL
1      PR 33373
2 +-IR 64
3      | +-IR 5657-33-2-1
18     |  | +-IR 5236
19     |  | +-IR 5338
8      |  +-IR 2061-465-1-5-5
24     |    +-IR 833-6-2-1-1
25     |    +-IR 2040
3      +-LF 31-28-1-15-1
13       +-ARC 11554/6*TN 1
26       | +-ARC 11554/5*TN 1
27| +-TAICHUNG NATIVE 1
2814       +-IR 64
7          +-IR 5657-33-2-1
8          +-IR 2061-465-1-5-5
```

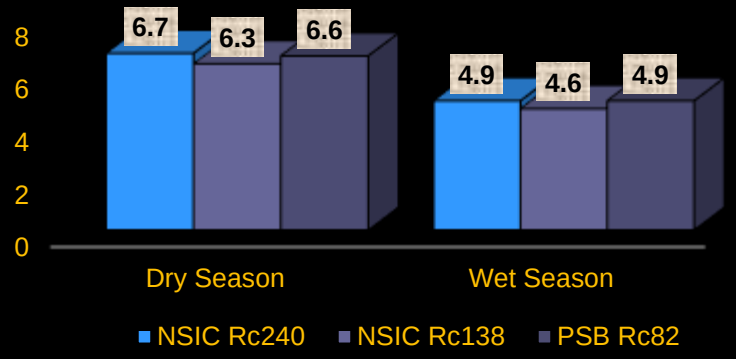
Tubigan 22 (NSIC Rc240)

- Matures from 112 to 117 days, with plant height from 91 to 101 cm, and productive tillers from 13 to 16.
- Moderate to blast, bacterial leaf blight, and sheath blight but susceptible to the tungro virus.
- Moderate to yellow stem borer, brown plant hopper and green leaf hopper but susceptible to white stem borer.
- With very good milling attributes: premium milling recovery (72.2%), Grade 1 head rice (48.9%) with long and intermediate grain size, intermediate amylose ranging from 19.8 to 20.9%.
- Sensory qualities for raw and cooked rice are comparable to IR64.

Transplanted Rice



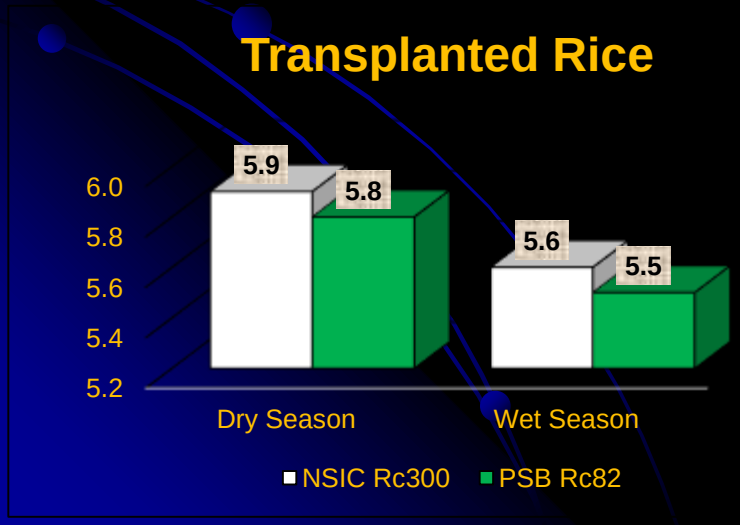
Direct Wet-seeded Rice

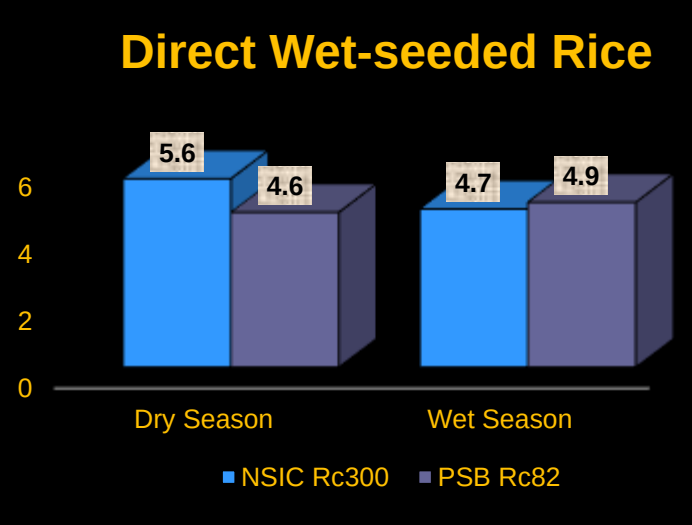


Tubigan 24 (NSIC Rc300)

- Matures in the range of 112 to 117 days, with 91 to 101 cm, height and productive tillers from 13 to 16.
- Generally moderate to blast, bacterial leaf blight, and sheath blight but susceptible to the tungro virus; also moderate to yellow stem borer, brown plant hopper and green leaf hopper but susceptible to white stem borer.

- With very good milling attributes: premium milling recovery (72.2%), Grade 1 head rice (48.9%) with long and intermediate grain size, intermediate amylose ranging from 19.8 to 20.9%. Sensory qualities for raw and cooked rice are comparable to IR64.

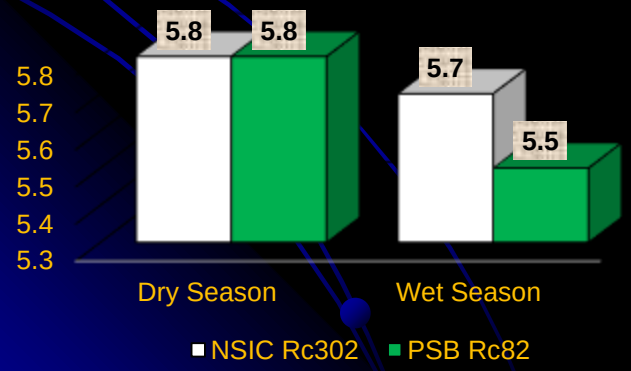




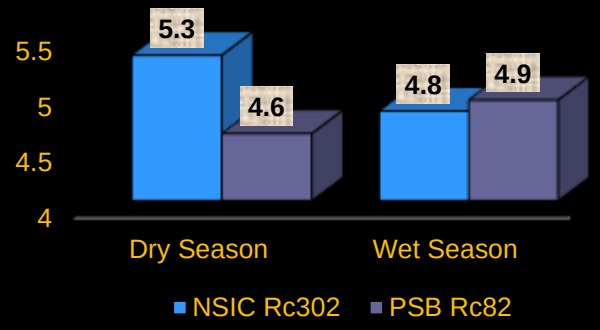
Tubigan 25 (NSIC Rc302

- Early maturing with maturity 115 days as transplanted and 106 days as direct seeded
- Showed intermediate reaction to blast, BLB, and ShB and moderate reaction to GLH and BPH in majority of the test sites in Isabela, Laguna, Leyte, Iloilo, and North Cotabato.
- Intermediate amylose content with extra long and slender grains, fair brown rice and milling recovery but with less inferior eating quality than IR64.

Transplanted Rice



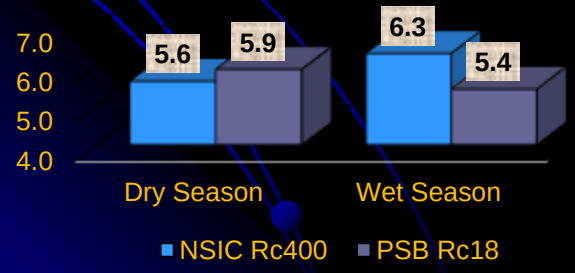
Direct Wet-seeded Rice



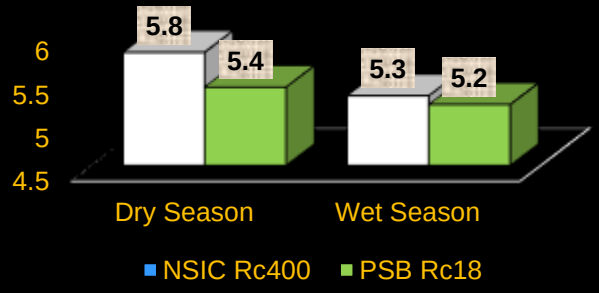
Tubigan 35 (NSIC 2015 Rc400)

- Medium maturing variety at 120 days as transplanted rice.
- Intermediate reaction to blast, bacterial leaf blight and sheath blight in majority of the test sites and YSB in PhilRice CES and to brown planthopper and green leafhopper.
- Grade 1 milling (69.3%) and headrice (53.8%) recovery. Fair brown rice (76.2%) , medium grain length (6.4mm) and intermediate (2.8mm) grain shape, slightly aromatic when cooked

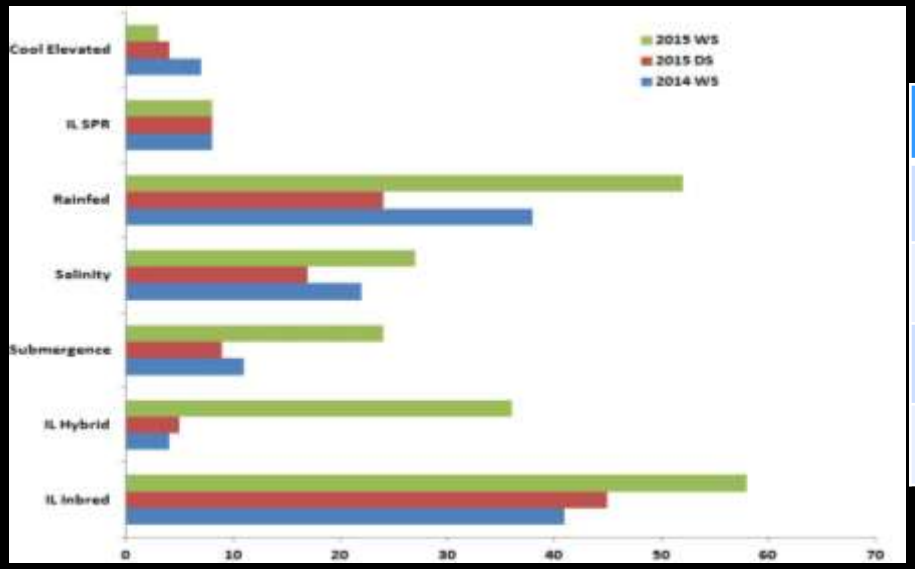
Transplanted Rice



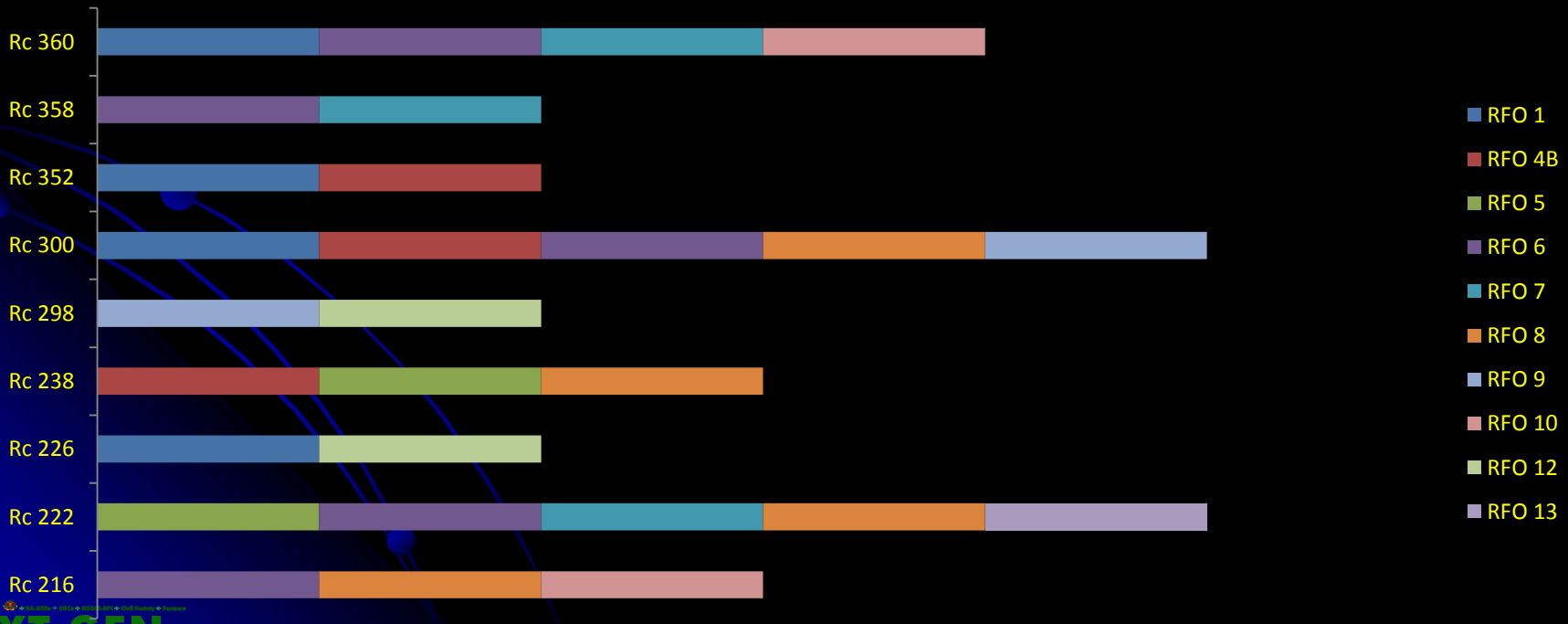
Direct Wet-seeded Rice



Participatory Variety Selection (PVS)



Cluster	2014WS	2015DS	2015WS
I	49	37	64
II	18	17	24
III	32	29	50
IV	32	29	66



NEXT-GEN

NEXT STEP

- Continue characterizing all NSIC rice varieties in terms of disease strains (blast and BLB) and insect biotypes (BPH) for appropriate variety deployment
- Integrate crop management options for increasing/sustaining yields
- Know the beneficial-health components and other traits relating to nutrition
- Assist in strengthening the seed production network from basic seeds according to the requirements in the regions

Take home message

@ ***Farmers are becoming more specific in their needs and require varieties with location-season-specific adaptation, however, there are still versatile varieties with wider adaptation and use.***

@ ***Choosing the right variety to plant is a challenge to the farmers, and how he will integrate variety use in an integrated crop management system to realize their full productivity potential***

Acknowledgement

- ✓ ***DA National Rice Program***
- ✓ ***Bureau of Agricultural Research***
- ✓ ***IRRI, PhilRice & UPLB Breeding Teams***
- ✓ ***NCT Collaborators (LGUs, SCUs)***
- ✓ ***Regional Field Offices***
- ✓ ***Bureau of Plant Industry***
- ✓ ***National Seed Industry Council***
  (RTWG/RVIG/TS/CS)
- ✓ ***National Seed Quality Control Services***

End of Presentation!

Rice Crop Manager: A comprehensive decision-support tool for increasing yields and income for farmers in the Philippines

Wilfredo B. Collado, Benedict B. Jardinero, Eufrocino V. Laureles, Rowena L. Castillo, Manuel Jose C. Regalado and Roland J. Buresh

Philippine Rice Research Institute (PhilRice)
and
International Rice Research Institute (IRRI)

What is Rice Crop Manager or RCM?

Enables extension workers to use a computer or smartphone to provide farmers with crop management recommendations matching their field condition.

Personal computer

Smartphone

http://webapps.irri.org/ph/rcm

Each farmer's field gets a unique recommendation

- **Fertilizer management**
- **Seed rate for direct seeded rice**
- **Weed management**
- **Crop health management**
- **Controlled irrigation (AWD)**

Printout before crop establishment

SMS reminders during the season

The historical development of RCM

2008 — Nutrient Manager MS Access ← SSNM

2010 — Nutrient Manager Web → Nutrient Manager Android App; NMRice Mobile IVR

2012 — Nutrient Manager HTML5

2013 — Crop Manager HTML5

2015 — RCM version 2 HTML5

http://webapps.irri.org/ph/rcm

RCM project objectives

Research – Make RCM better through good science

- **Enhance the capability of RCM to benefit rice farmers through personalized farming advice, which matches field-specific needs and conditions**
- **Implemented by PhilRice and IRRI through support of DA-BAR**

Dissemination – Ensure farmers and rice farming benefit from science

- **Ensure large numbers of rice farmers receive and benefit from field-specific rice-farming advice**
- **Implemented through DA-RFOs**

Objectives of RCM research

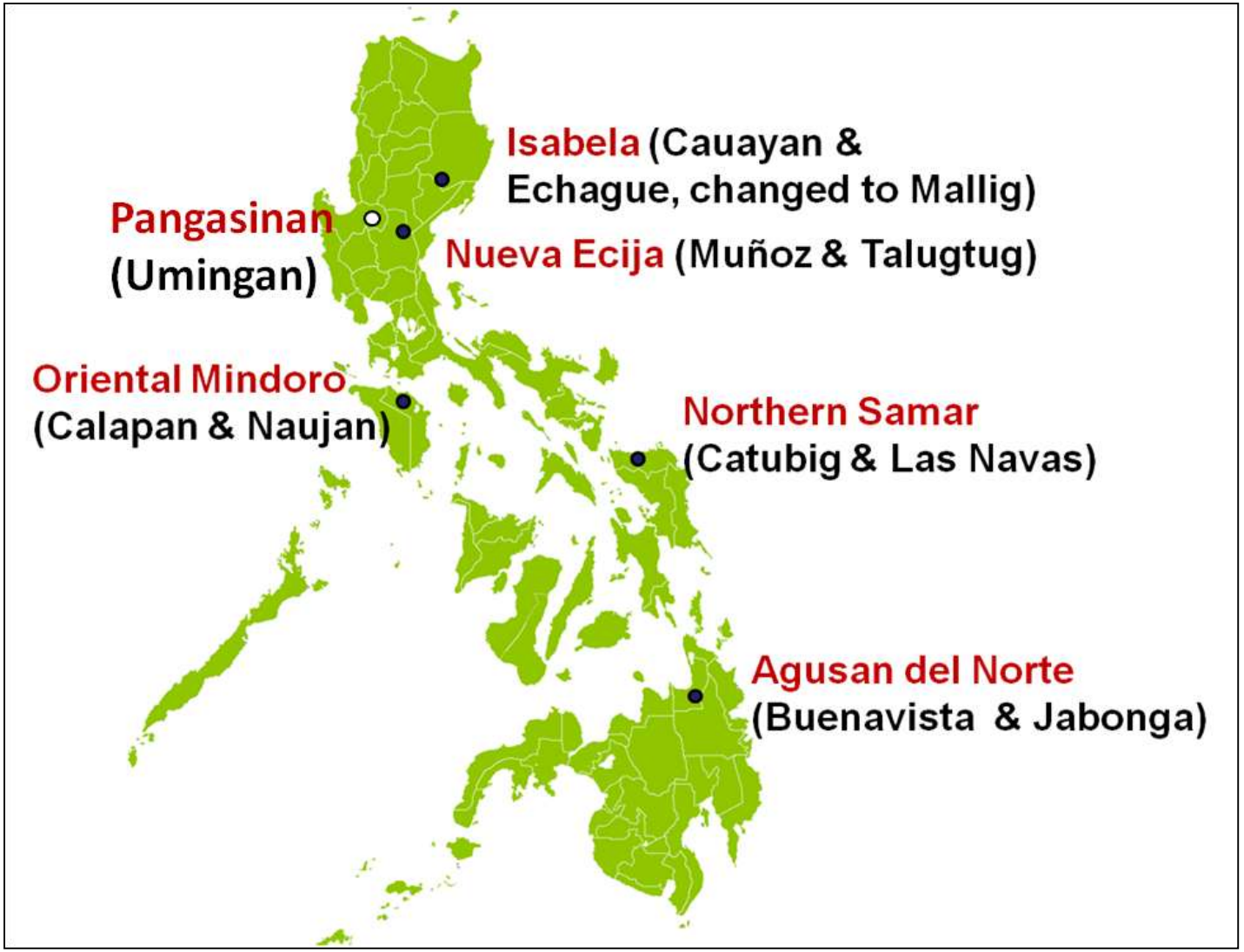
- **Conduct field trials to collect essential data for verifying and improving the performance of RCM.**
- **Compare the performance of RCM relative to farmer's practice and a modified RCM, which aims to do better than the existing RCM.**
- **Conduct additional field trials to obtain data to further refine the nutrient management component of RCM.**

Cropping seasons

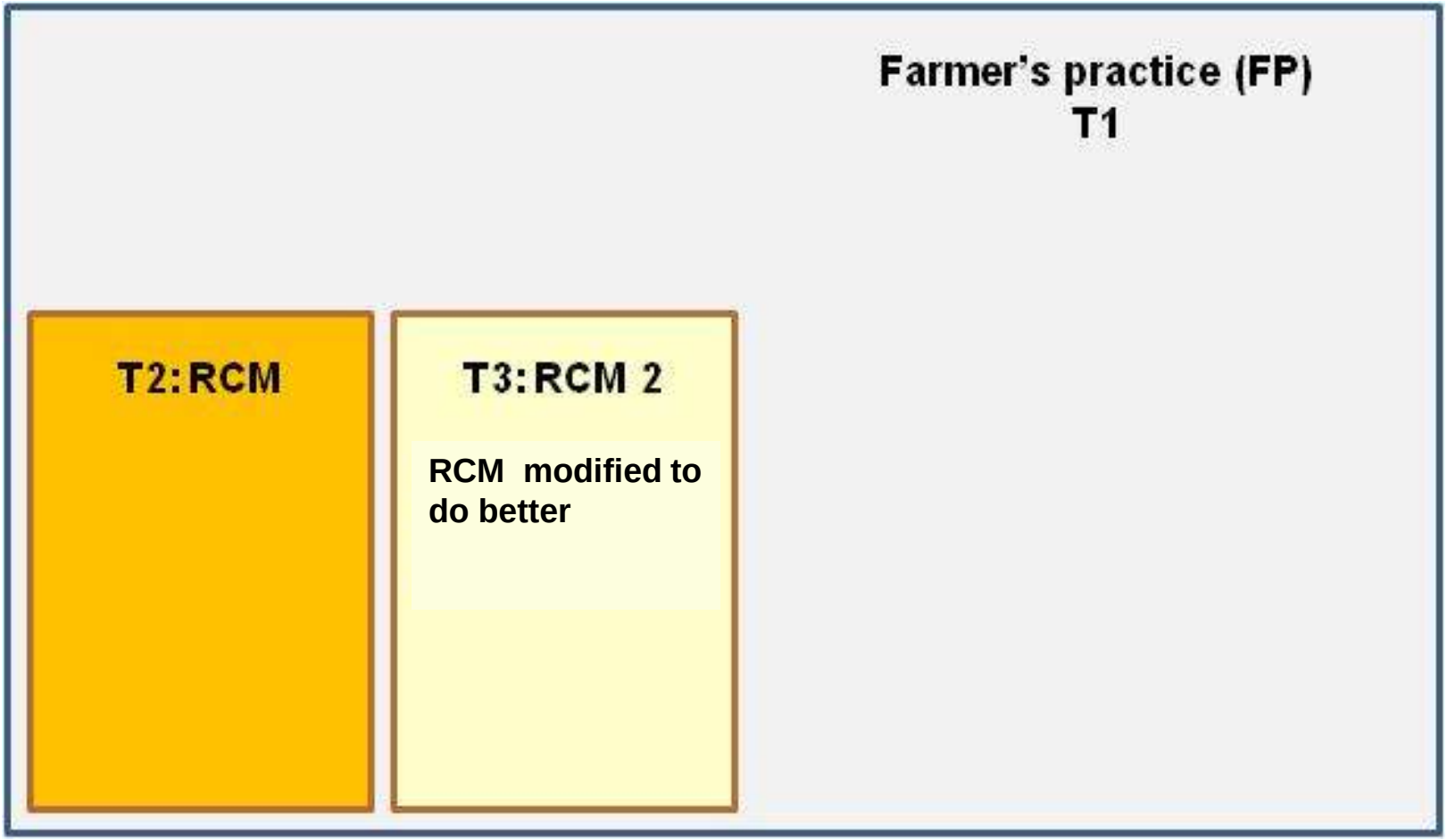
- **Season 1: 2013, June – December**
- **Season 2: 2013/14, December – July**
- **Season 3: 2014, June – December**
- **Season 4: 2014/15, December – July**
- **Season 5: 2015, June – December**

RCM research locations

Conduct research to test and improve RCM



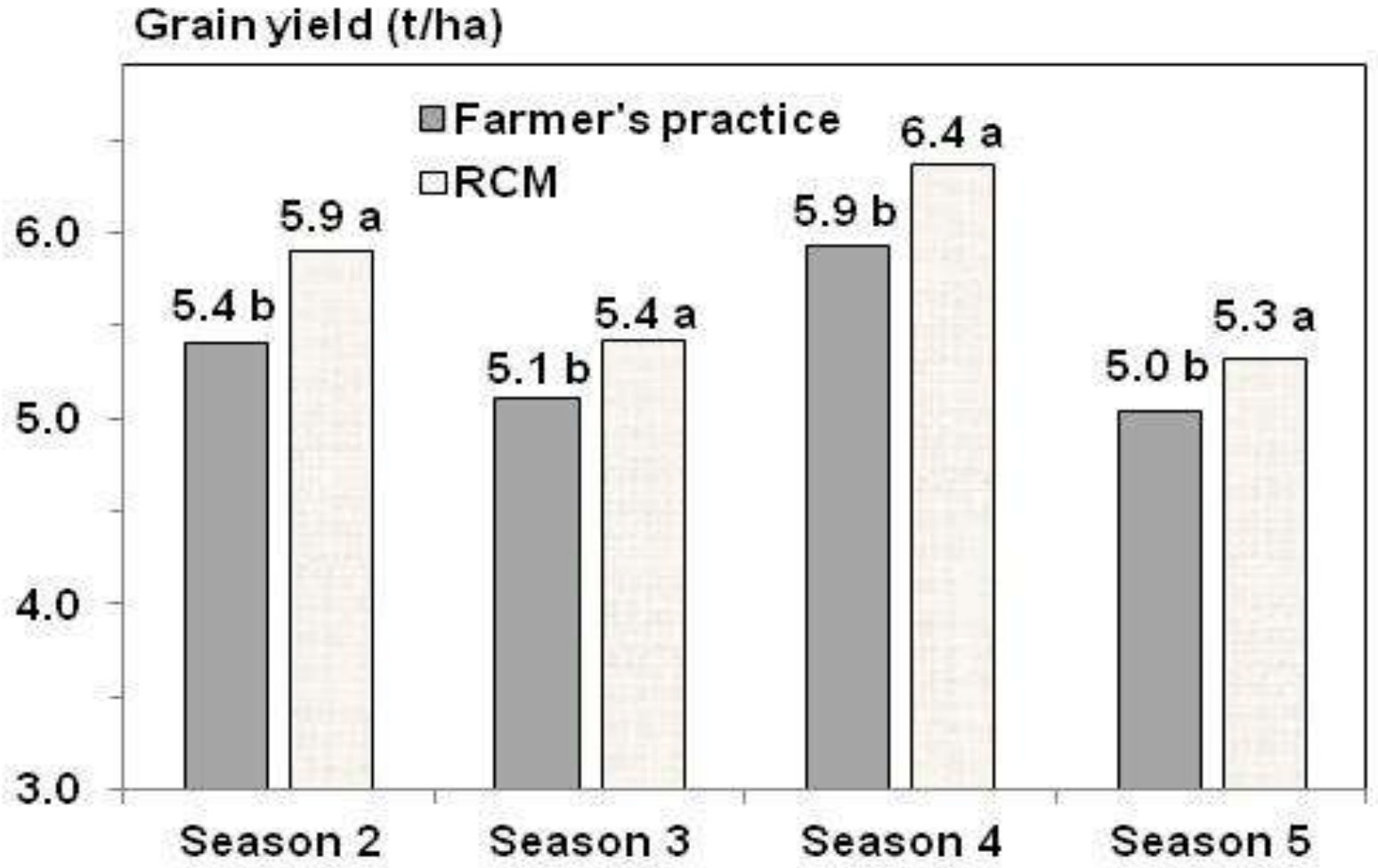
Field layout for RCM evaluation trial



Number of field trials reported in each season

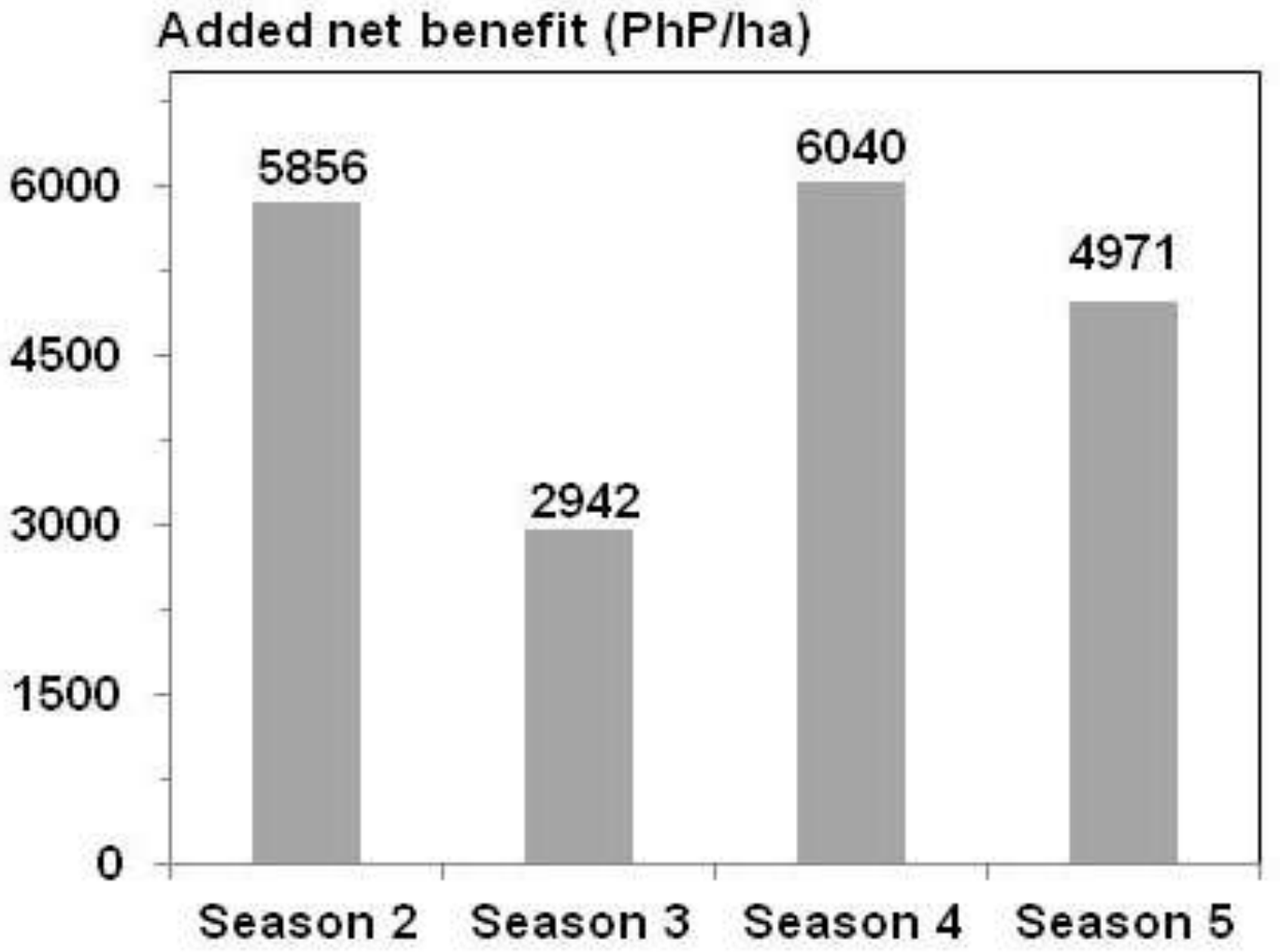
Season	Year	Season		Number of municipalities	Field trials reported
		Luzon & Mindoro	Samar & Agusan		
1	2013	Wet	Dry	9	106
2	2013-14	Dry	Wet	10	128
3	2014	Wet	Dry	8	139
4	2014-15	Dry	Wet	8	112
5	2015	Wet	Dry	9	162

Average yields for farmers' practice and RCM recommendation

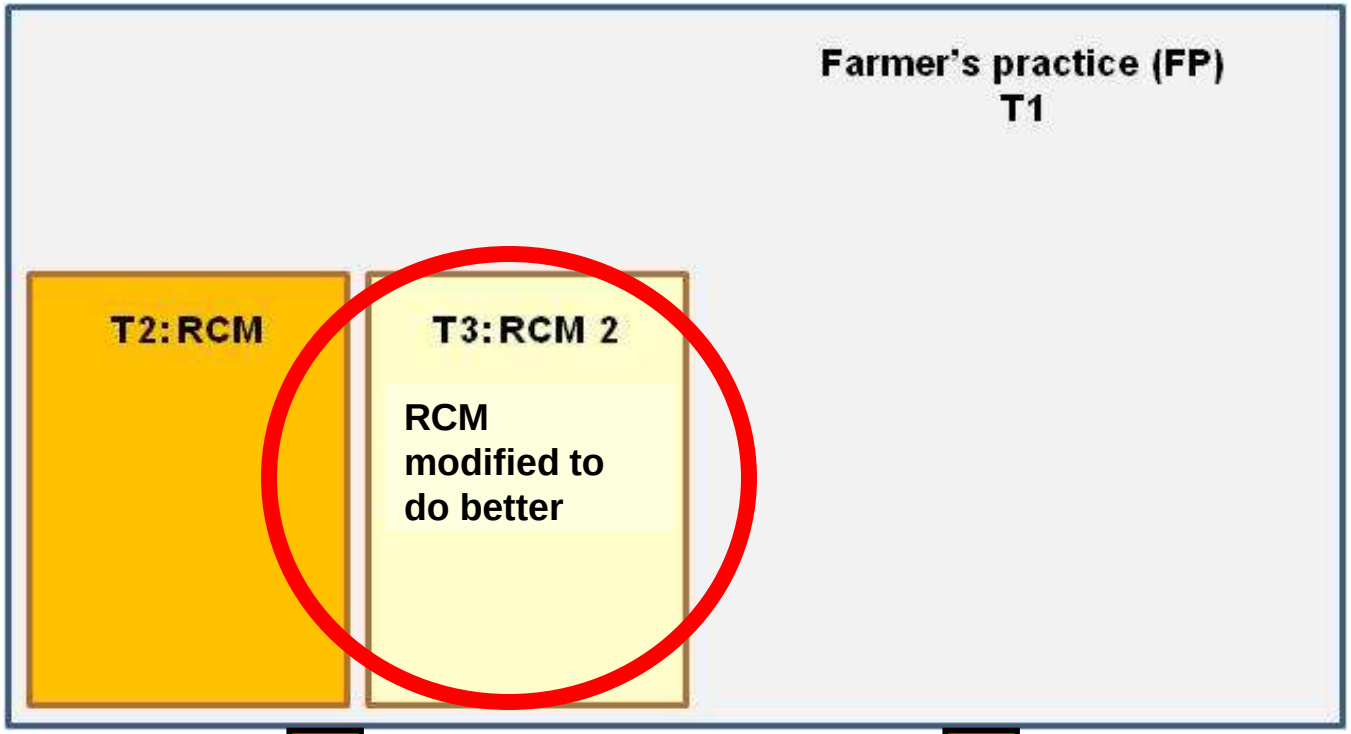


Treatments within a season followed by different letters are significantly different at *P* <0.05

Added net benefit for RCM relative to farmers' practice



An approach for making RCM better through good science



Improved setting of RCM yield target

Mid-season adjustment in N based on climate

Modified RCM treatments

Season 2 – Alternative target yield for RCM

Season 3 – Climate adjusted target yield for RCM

Season 4 –

- **RCM adjusted with additional N at panicle initiation or**
- **RCM target yield reduced by 1 t/ha (for Agusan del Norte sites only)**

Season 5 –

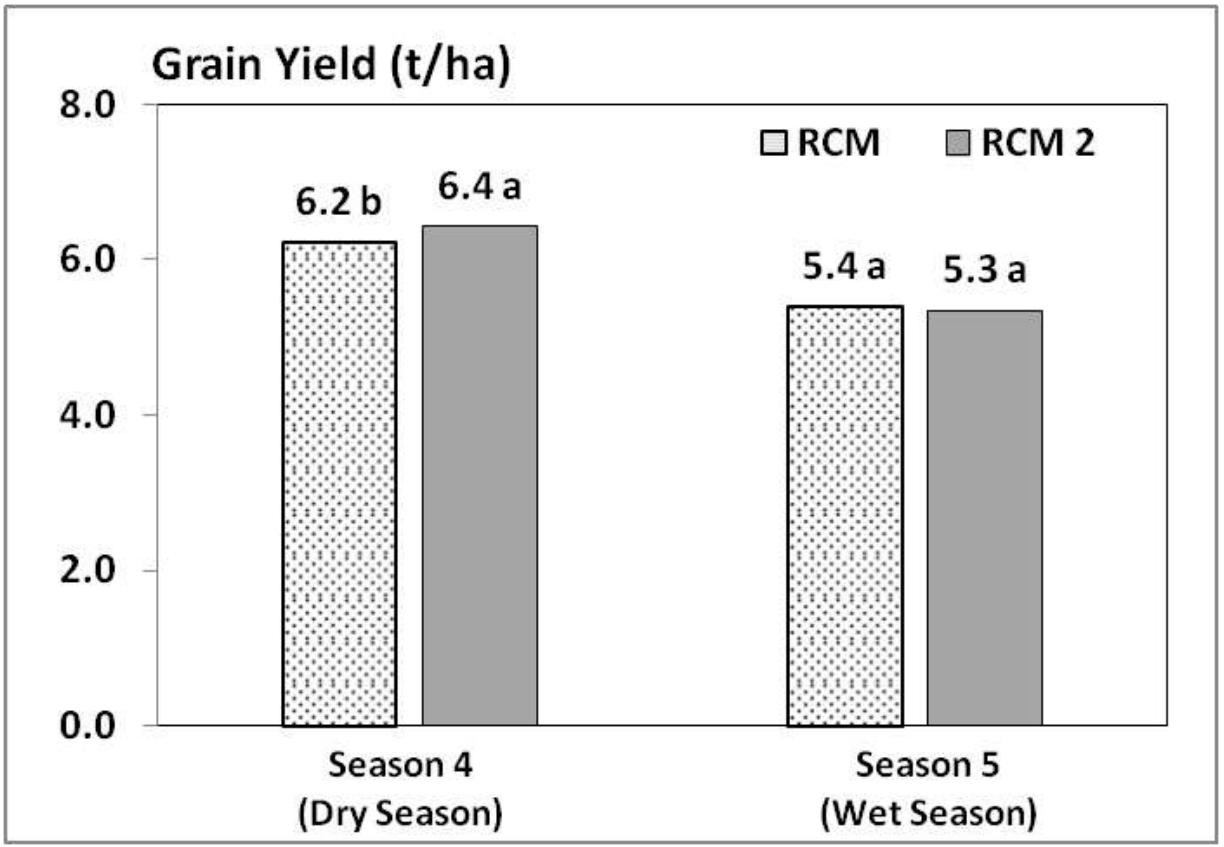
- **RCM adjusted with additional N at panicle initiation or**
- **RCM target yield adjusted up or down (for Mindoro and Agusan del Norte sites only)**

Average yields for RCM and modified RCM (RCM 2)

(RCM modification is additional 23 kg N/ha at PI)

Season 4
n = 85

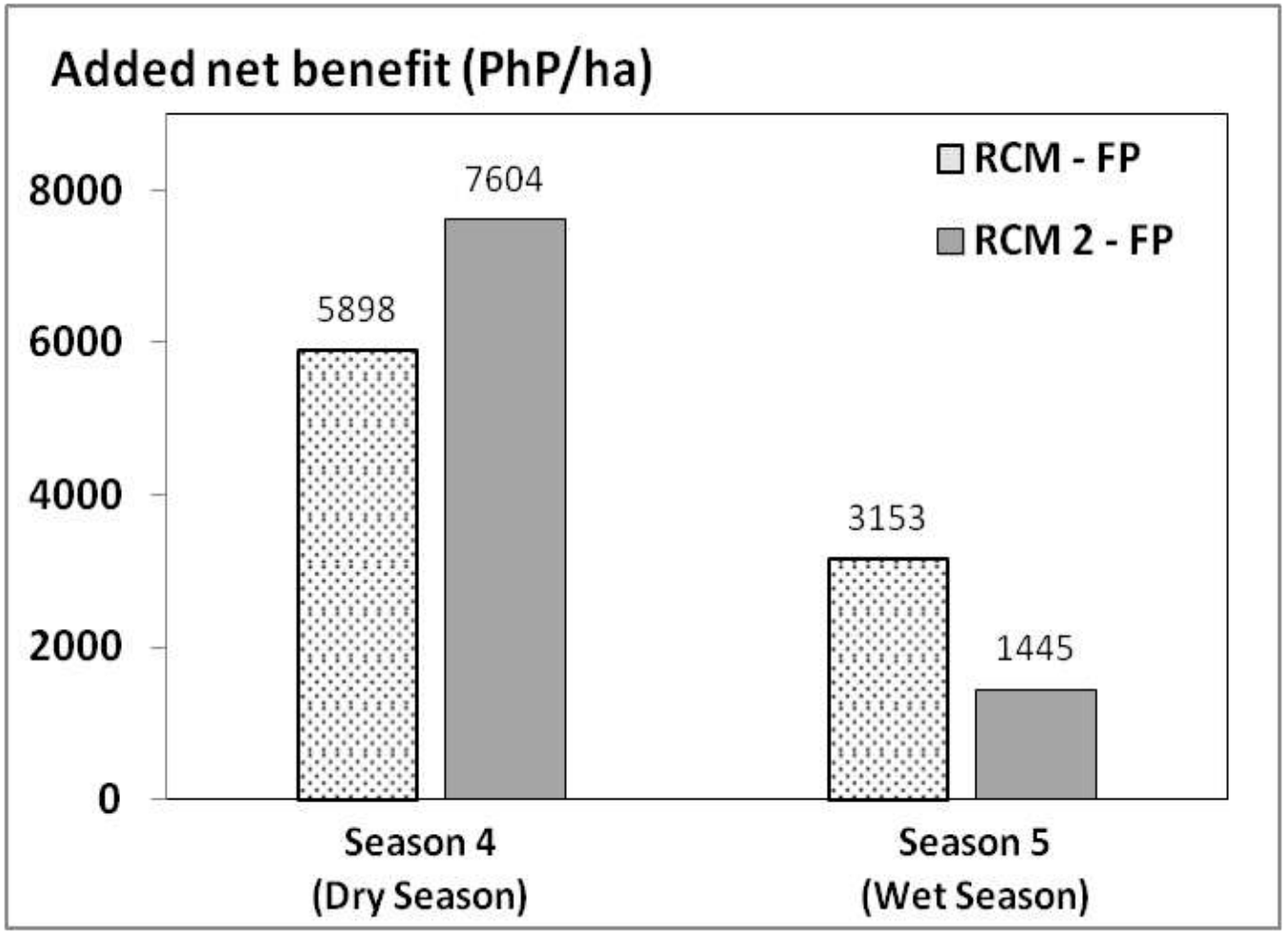
Season 5
n = 99



- **Treatments within a season followed by different letters are significantly different at P <0.05**

Added net benefit for RCM and modified RCM (RCM 2) relative to farmers' practice (FP)

(RCM modification is additional 23 kg N/ha at PI)



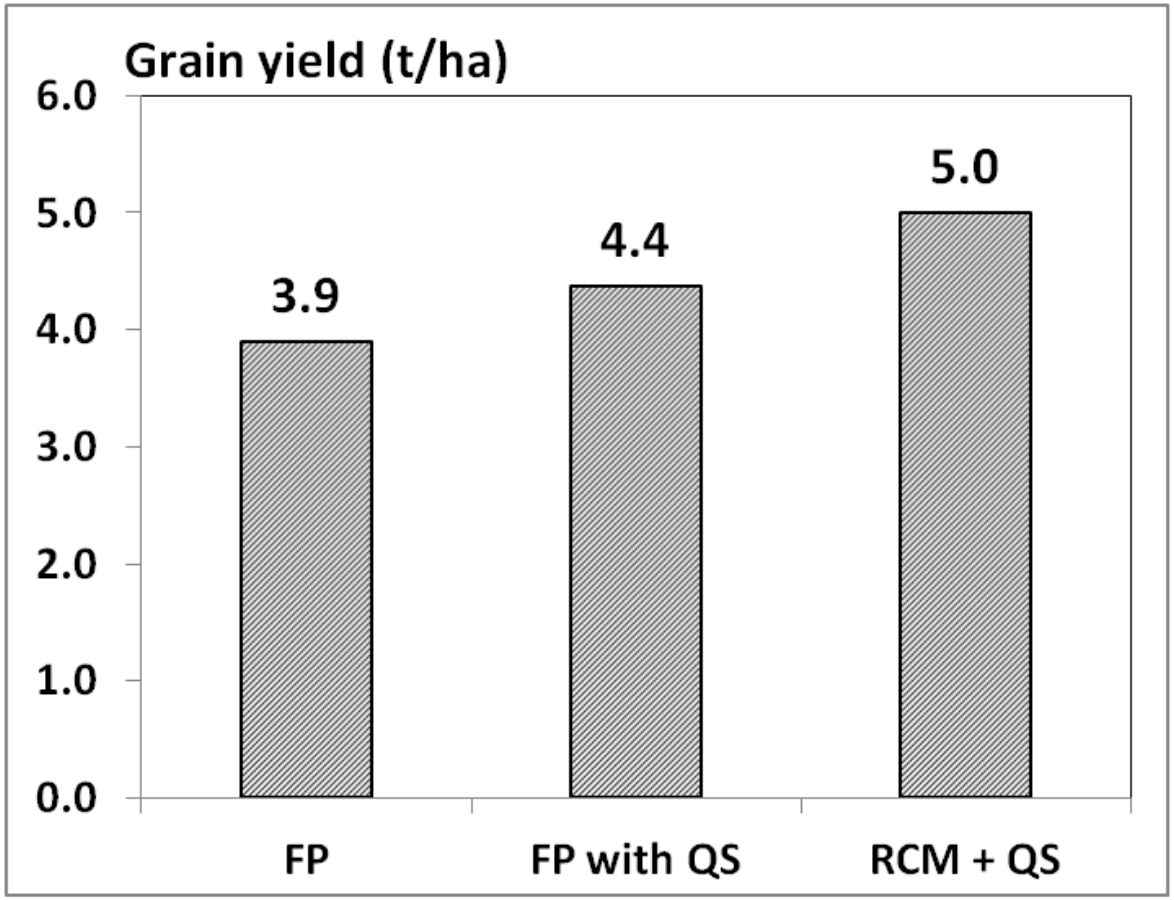
Additional trial in season 5

- **Seed quality evaluation trial in Catubig and Las Navas, Northern Samar**

- **Evaluate the benefit of using quality seeds and RCM recommendation relative to the farmer's management practice**

Effect of quality seed on yield (Catubig and Las Navas, Northern Samar)

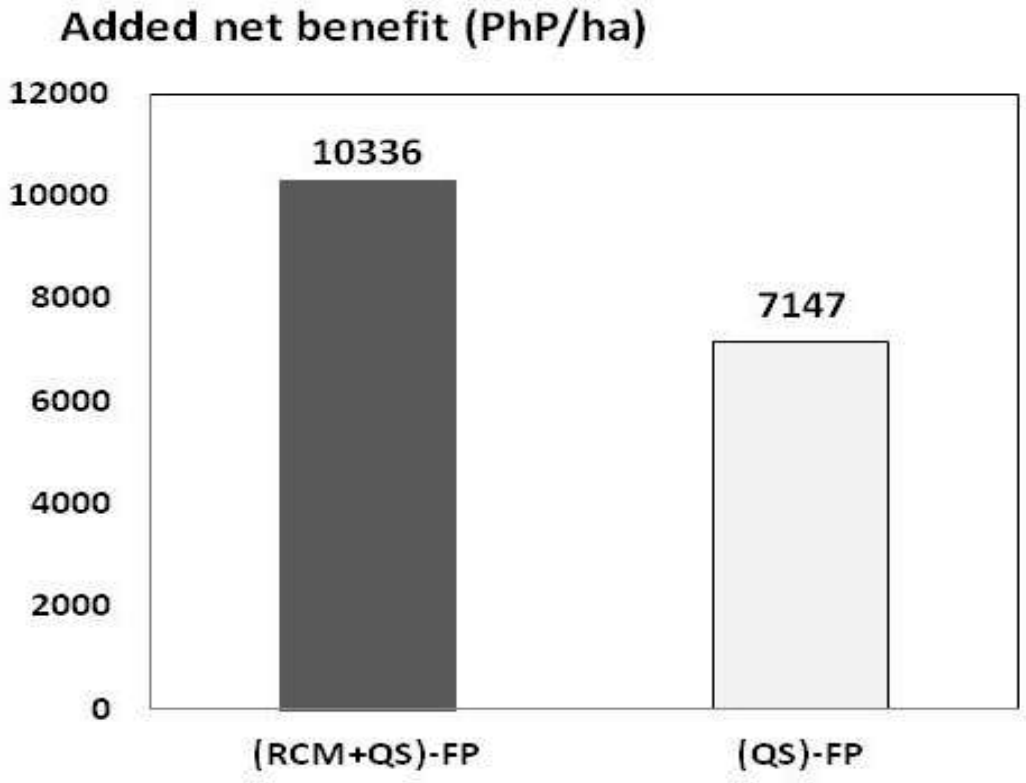
n = 28



- Use of quality seed increased yield by 0.5 t/ha
- Yield increased further by 0.6 t/ha when an RCM recommendation was used with quality seed

Effect of quality seed on added net benefit (Catubig and Las Navas, Northern Samar)

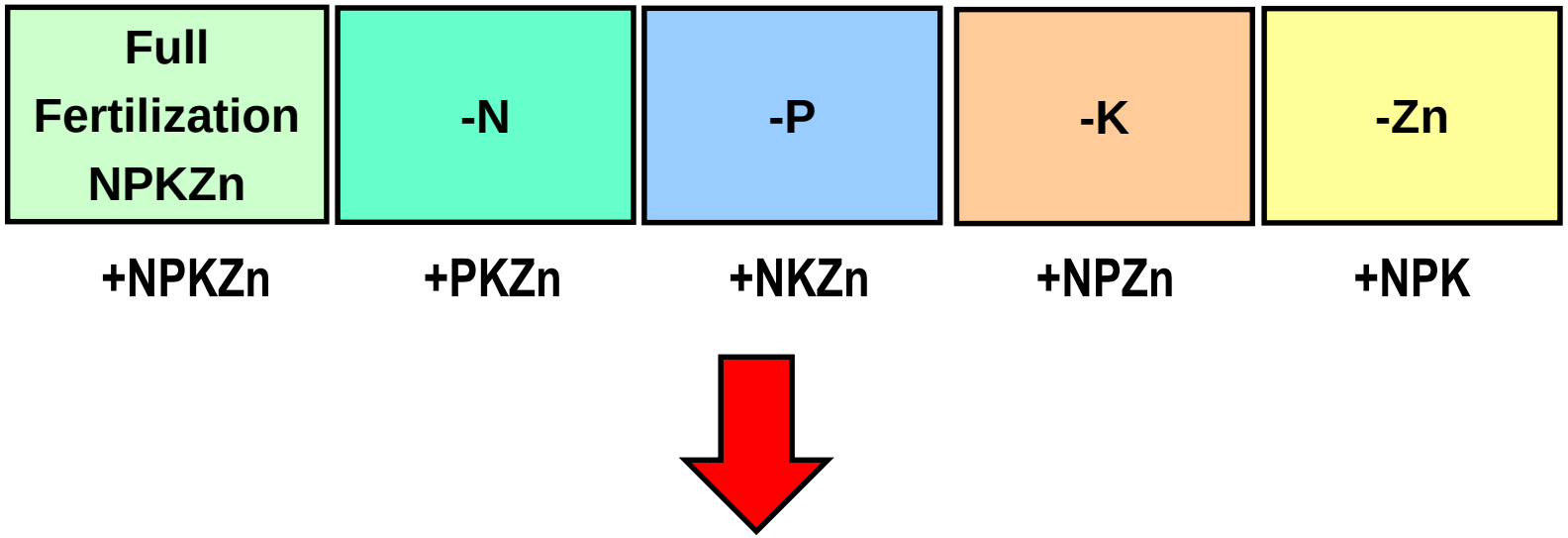
n = 28



- Use of quality seed increased added net income by Php7,147/ha
- Added net benefit increased to PhP 10,336/ha when an RCM recommendation was used with quality seed
- Findings suggest merit for enhancing RCM with use of quality seed when farmers use poor quality seed

A research approach to refine the nutrient management component of RCM

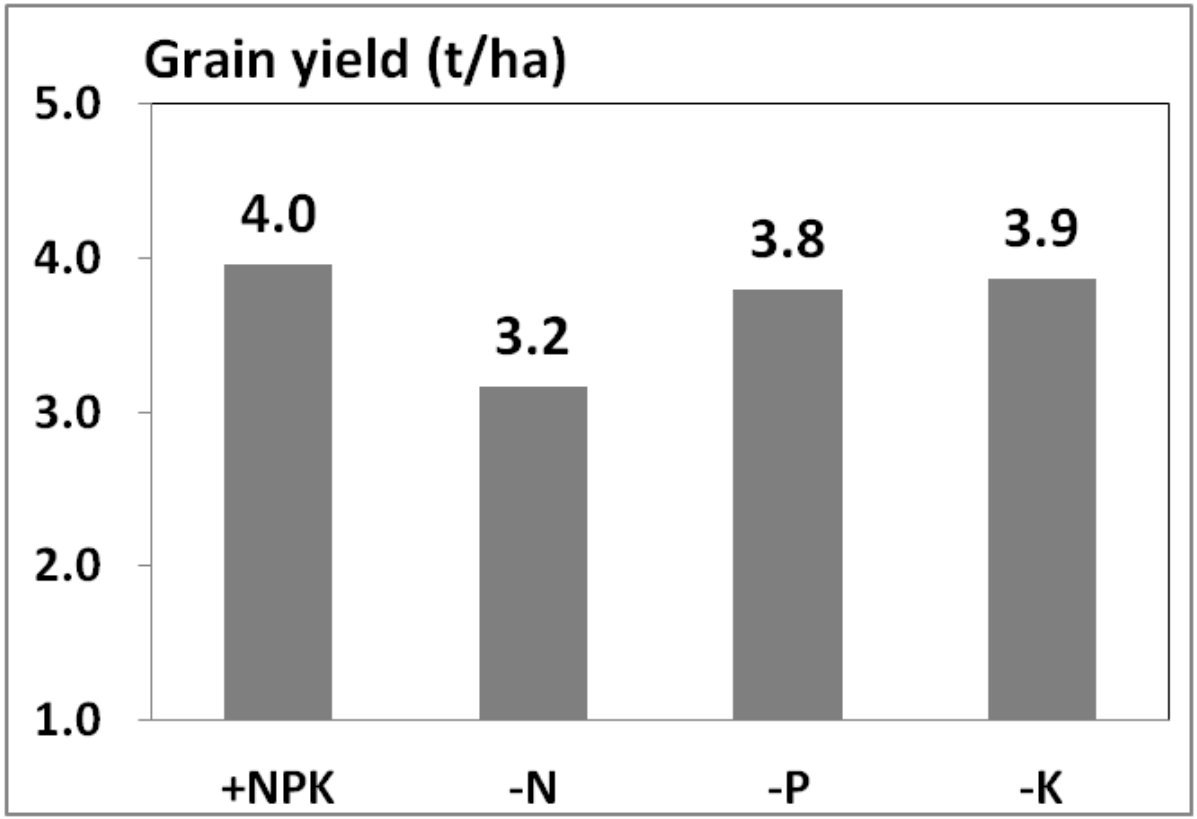
Nutrient omission plot technique (NOPT)



Predictive abilities of RCM to adjust nutrient inputs based on soil constraints or soil fertility

Average yields for rainfed rice for NOPT trials in Umingan, Pangasinan

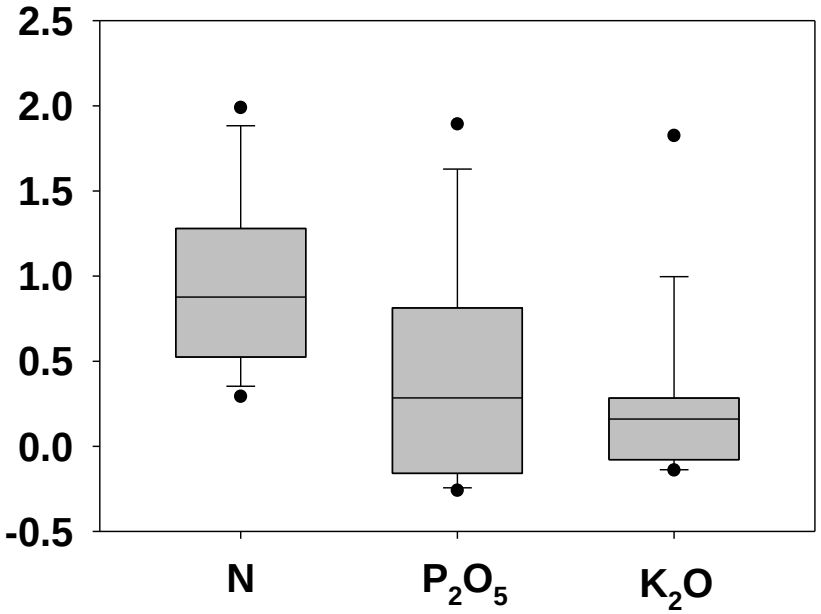
n = 16



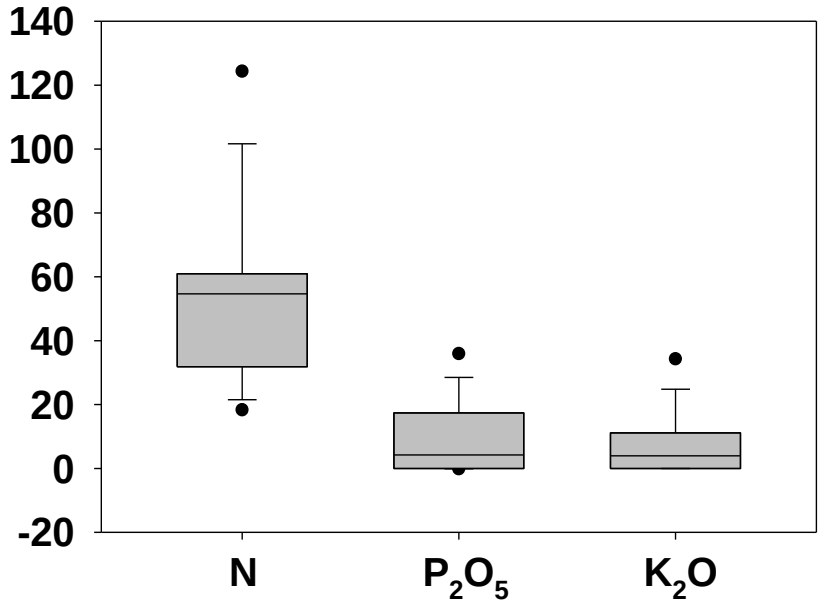
Averages reveal the loss in yield was large without added N, but small without added P or K

Average yields from NOPT trials in Umingan

Yield increase with added nutrient (t ha^{-1})



Estimated minimum need of nutrient from fertilizer (kg ha^{-1})



- **The increase in yield (response) from added nutrient varied greatly among fields**
- **The corresponding estimated minimum need of nutrient from fertilizer also varied greatly among fields**

Major updates in RCM

Date of update	RCM version	Major changes
September 2014	Version 1.1	• Adjusted P & K calculation based on rice straw management from previous season using yield indicated by farmer • Included recommendation on 'hand-weeding before fertilizer application' • Included recommendation on AWD for irrigated rice and irrigation at flowering stage for rainfed rice if pump is available
March 2015	Version 1.2	• Revised question used for prediction of zinc requirement • Revised question on the amount of organic fertilizer used in number of bags and typical weight per bag
August 2015	Version 1.2.2	• Revised question on insecticide application used for recommendation on early spraying
November 2015	Version 2.0	• Adjusted P & K calculation based on rice straw management from previous season using actual provincial average yield

Potential benefits and impacts

- **RCM as compared with the existing farmers' practice increased average grain yield by 370 kg/ha and increased added net benefit to farmers by PhP4,337/ha per season**

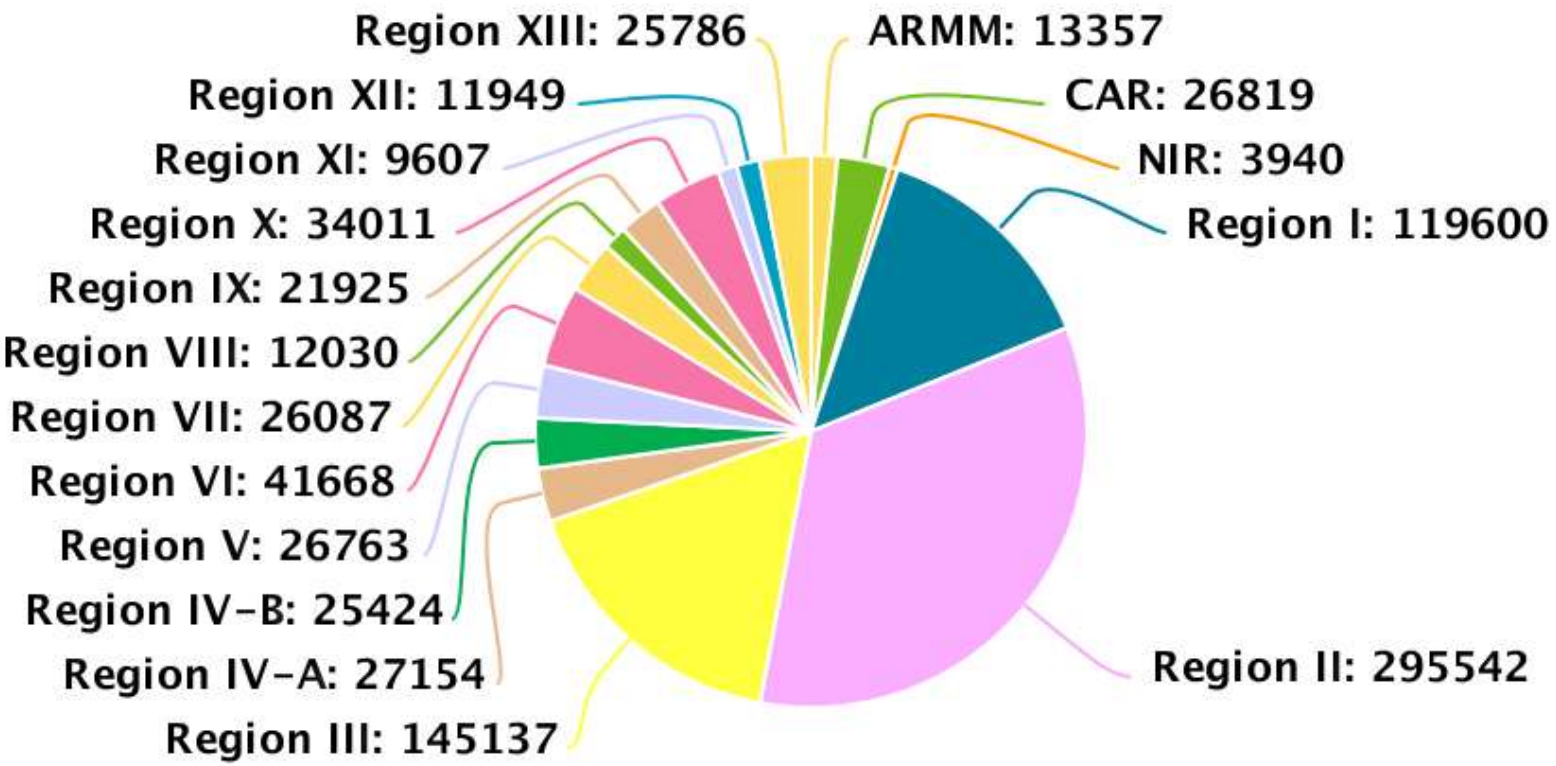
- **RCM research ensured that a well-developed and well-evaluated RCM was available for wide-scale use by extension workers in interviewing farmers**

- **RCM dissemination as another component of the project ensures farmers and rice farming benefit from the research**

Number of printed RCM recommendations provided to farmers through initiatives of DA-RFOs and DA-ATI

November 2013 to July 2016

Total = 866,799



Acknowledgement

We acknowledge the contributions of the following persons and institutions:

PhilRice-Isabela: Arlina Golonan and Macario Agustin Jr.
PhilRice-CES: Jovinia Lucas, Yumar Mercado, Elmer Viñas, and Jerrwell Quindong
PhilRice-Bicol: Danilo Mayote and Bernil Llave
PhilRice-Agusan: Caryl Agting, Marcelo Soledad Jr., and Sharen Rivas

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Calapan City-LGU: Emma Caringal, Norma Domingo and Lotis Lopez
Naujan-LGU: Rosalinda Fontanilla
Catubig-LGU: Grace Tan
Las Navas-LGU: Tito Abayon

We thank the **DA-Bureau of Agricultural Research** for the continued support of the RCM project.

Development of Training Regulations on Grains Production NCII

Bernadette N. Servaz-Audije
Technical Education and Skills Development Authority

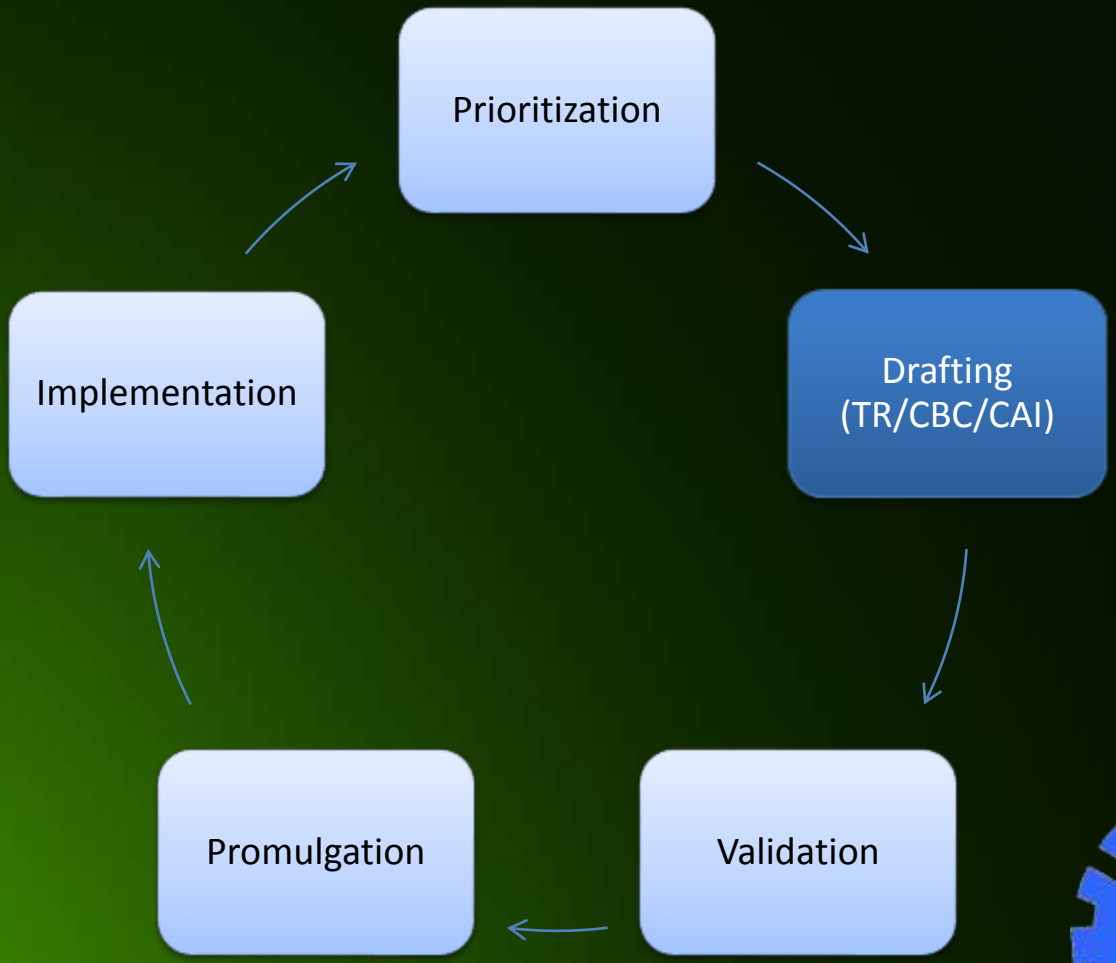
Technical Education and Skills Development Act of 1994

Section 22, “Establishment and Administration of the National Trade Skills Standards” of the RA 7796 known as the TESDA Act mandates TESDA to establish national occupational skills standards. The Authority shall develop and implement a certification and accreditation program in which private industry group and trade associations are accredited to conduct approved trade test, and the local government units to promote such trade testing activities in their respective areas in accordance with the guidelines to be set by the Authority

Criteria for Skills Standardization

- Requiring long period of education and training
- Performance of the competency affecting and endangering people's lives and limbs
- Competency involving the handling of complex equipment, tools and supplies

TR Development Cycle



What is a Qualification?

Refers to a package of competencies describing a particular function or job role existing in an economic sector, covering the work activities required to undertake a particular job.

Basis for Prioritization of Qualifications

Priority needs of the industry sector

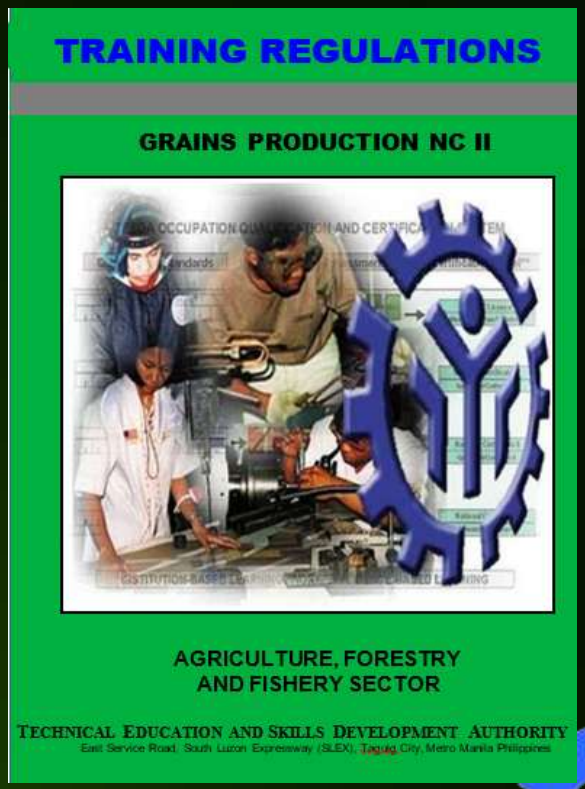
Nationwide application in terms of public interest/welfare

Employment generation and investment opportunities

Need for standardization and certification

What is a Training Regulations (TR)

Training Regulations is a promulgated document that serves as **guiding policy** for **Philippine TVET offerings** and establishment of **assessment and certification** requirements for mid-level manpower in order to earn a qualification.



Four Sections of Training Regulations

- Section 1 **Title and Description of Qualification** – refers to the TVET qualification followed by a qualification level aligned with the level descriptors of the Philippine Qualifications Framework (PQF) and a group of competencies that describes the different functions of the qualification.
- Section 2 **Competency Standards** – gives the specifications of competencies that describes the different functions of the qualifications.
- Section 3 **Training Arrangements** – contains the information and requirements in designing training program for certain Qualification. It includes curriculum design, training delivery; trainee entry requirements; tools; training facilities and trainer's qualification.
- Section 4 **Assessment and Certification Arrangements** - describe the policies governing assessment and certification procedures.

Use of TR in TVET

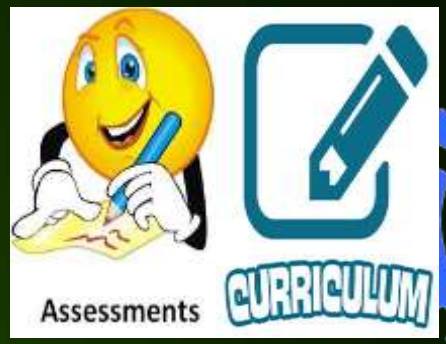
Assessment

Employment

Training

Training Regulations (TRs) serves basis for the:

- Competency assessment and certification;
- Registration and delivery of training programs; and
- Development of curriculum and assessment instrument.



Benefits of industry from TRs:

- Utilize other training providers to conduct skills training based on their requirements.
- Utilize TESDA Assessment and Certification as their first level of manpower screening.
- Establish common qualification definition within the industry sector.

Benefits of Training Institutions from TRs

- Utilize TR as reference in providing quality and suitable training programs to address industry manpower needs.
- Reference in determining the requirements for TVET program offerings as imposed by the Authority.
- Reference in determining certification requirements for trainee as defined by the labour sectors.

Benefits of Community from TRs:

- Opportunity for Government Certification in recognition to the competencies of an individual as required by the industry.
- Assurance that program offering of Private and Public TVET Training Providers are geared towards local employment.
- Better employment opportunities due to the participation of industry in the development of the Training Regulations.

GRAINS PRODUCTION NC II
(Core Competencies)

1. Conduct variety and seed selection
2. Perform land preparation
3. Carry-out crop establishment
4. Manage crop
5. Conduct harvest and post-harvest operations

Philippine Qualification Framework

The Philippine Qualifications Framework (PQF) is meant to serve as a comprehensive, nationally consistent yet flexible framework for all qualifications in Philippine educational system.

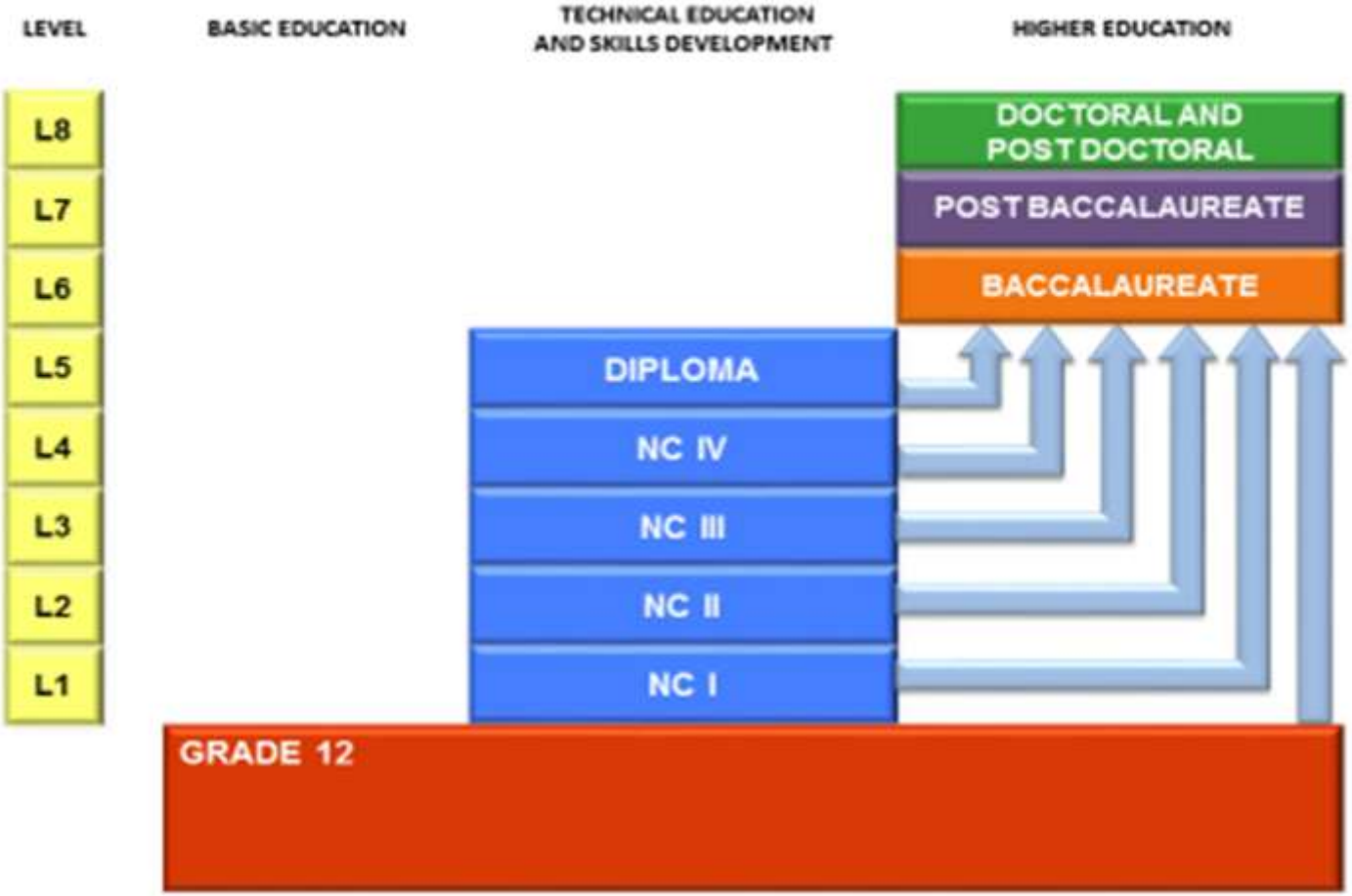
To establish national standards and levels for outcomes of education and training, skills and competencies

Objectives of the PQF

- To establish national standards and levels for outcomes of education and training, skills and competencies
- To support the development and maintenance of pathways and equivalencies which provide access to qualifications and assist people to move easily and readily between the different E & T sectors and between these sectors and the labour market
- To align the PQF with international qualifications framework to support the national and international mobility of workers thru increased recognition of the value and comparability of Philippine qualifications

as per PQF-NCC Resolution No. 2014-03 adopted on December 11, 2014

The PHL Qualifications Framework



Competency-Based TVET Framework

Mandatory Registration	Training Regulations	Mandatory Assessment
TRAINING STANDARDS	COMPETENCY STANDARDS	COMPETENCY ASSESSMENT
Curriculum	Knowledge	Assessment Tools
Trainer	Skills	Assessors
Facilities	Attitude	Assessment Centers
Tool and Equipment	Industry Standards	

What to Teach

What to Learn

How to Test

Quality Assurance

TESDA

- ISO 9001:2008 Certified Development of Training Regulations and Competency Assessment Tools (CATs)
- ISO 9001:2008 Certified Unified TVET System of Program Registration and Accreditation (UTPRAS) for TVET providers compliance with training facilities, tools/equipment, curriculum and trainers' qualifications
- ISO 9001:2008 Certified System of Assessment and Certification for students and skilled workers
- Philippine TVET Trainers Qualification Framework and TRs for Trainers Qualification
- Annual compliance Audit

THANK YOU FOR LISTENING

From Transmission to Transformation: **Reinvigorating the Rice Extension System**

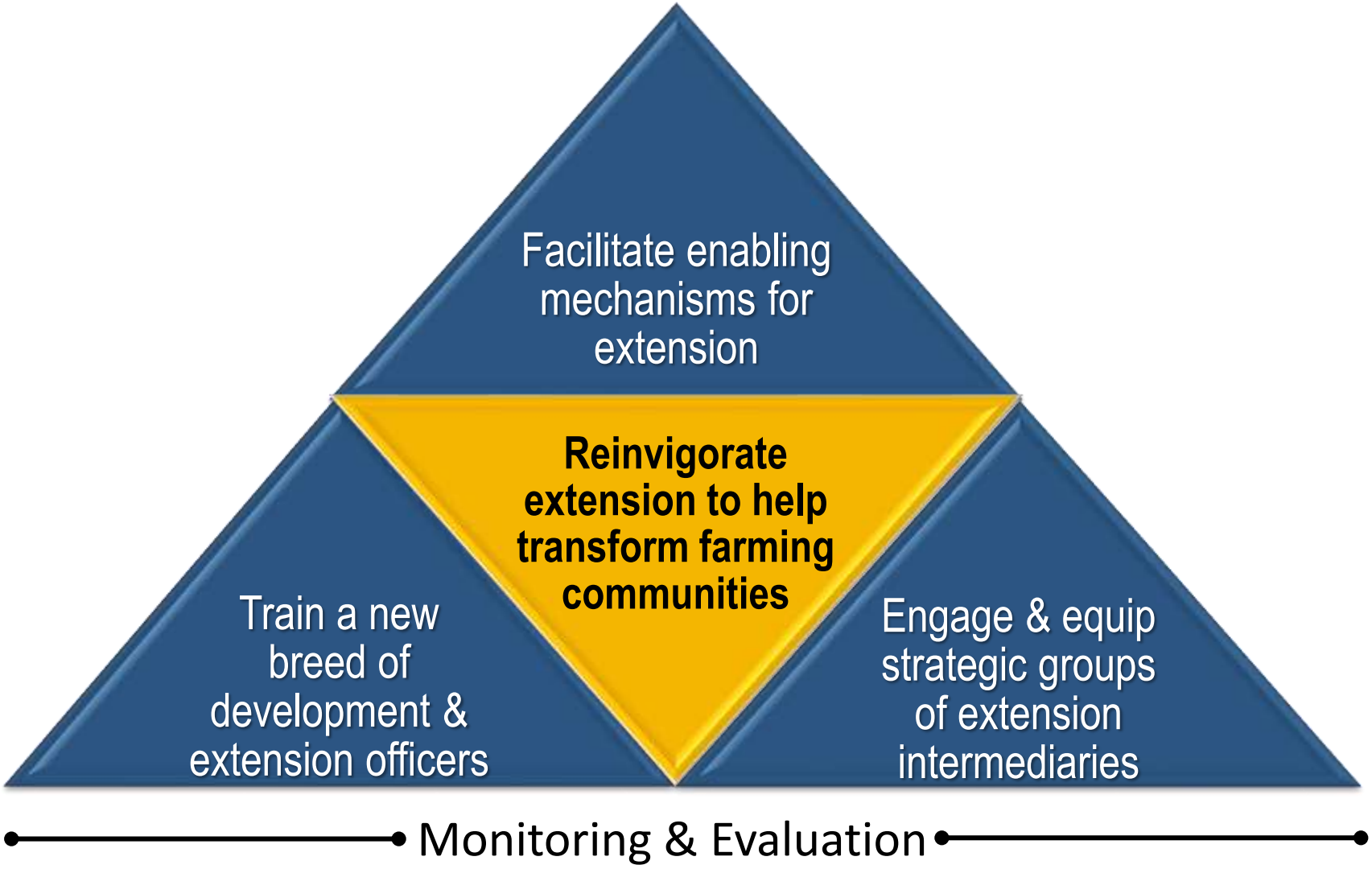
Karen Eloisa R. Tanzo-Barroga
Chief SRS, PhilRice and Project Leader, IPaD

29th National Rice R&D Conference
PhilRice, Maligaya, Science City of Munoz, Nueva Ecija
7-8 September 2016.

Challenges in agriculture
Changes in consumer needs
Complex rice production environment

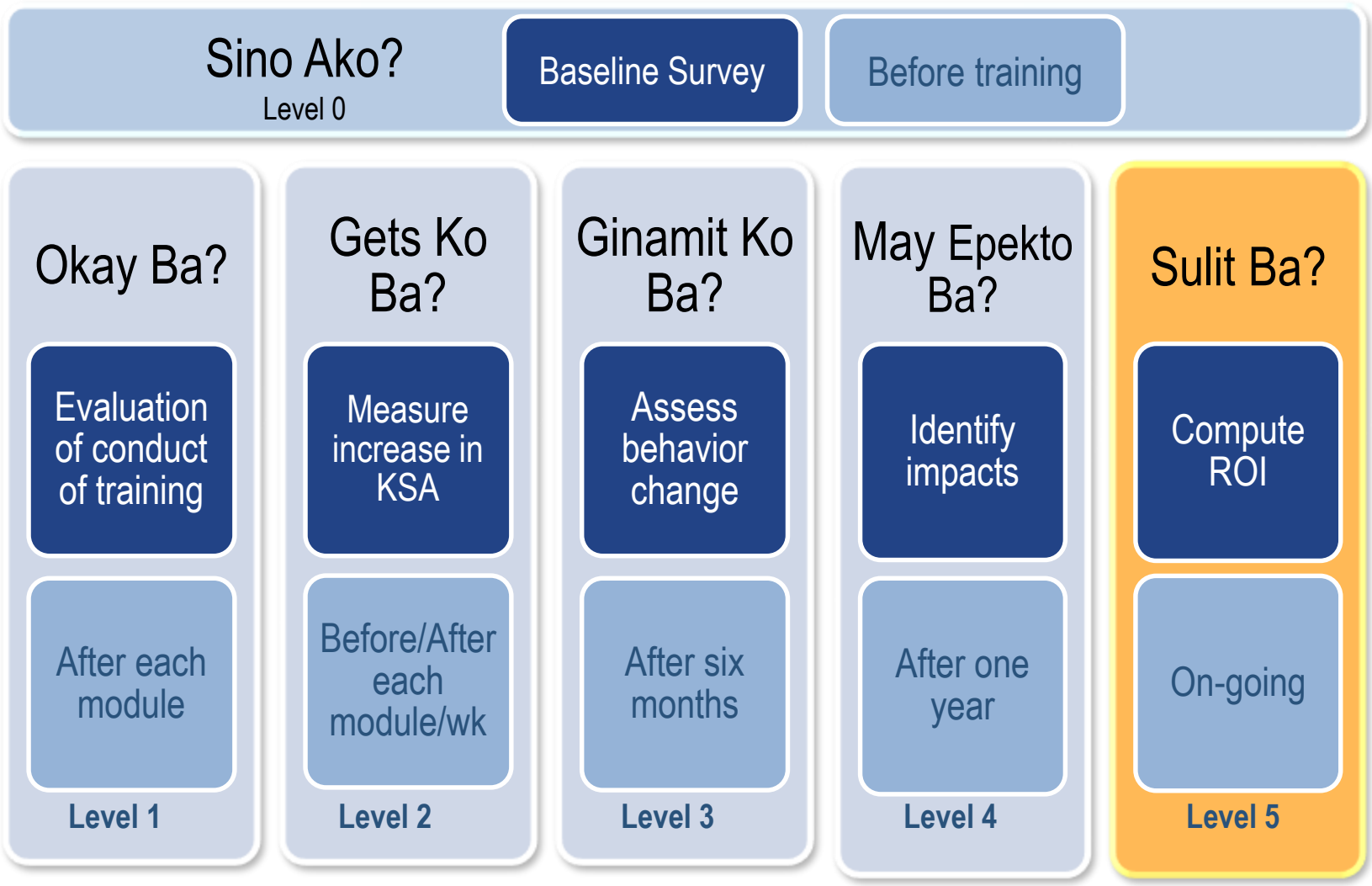
Demoralized, ageing extension workforce

Broader mandate, more active role in the agri devt process	• From technology transmission to community transformation toward competitiveness, sustainability, & resiliency
New mindset on their roles	• From farmer to farming community; rice to rice-based farming systems; farmers as producers to agripreneurs
Enhanced capability to deal w/ current & future challenges in agri	• New technologies & info, players & partners in a rice farming commty, use of ICT tools, entrep, proj proposal making, *etc*



Project IPaD

Monitoring & Evaluation



Train a new breed of devt & ext officers

Framework, definitions, & branding

AgRiDOC
Agricultural Development Officer of the Community

6-module curriculum + courseware (Be Transformed + Proj proposal)

117 AgRiDOCs

AgRiDOC BootCamp

24 members of ARRTTs

A development catalyst with a
strong sense of mission
to help transform farming communities
toward competitiveness, sustainability, and resiliency
using practical, science-based technologies
and locally appropriate, market-oriented strategies

Kredo ng AgRiDOC

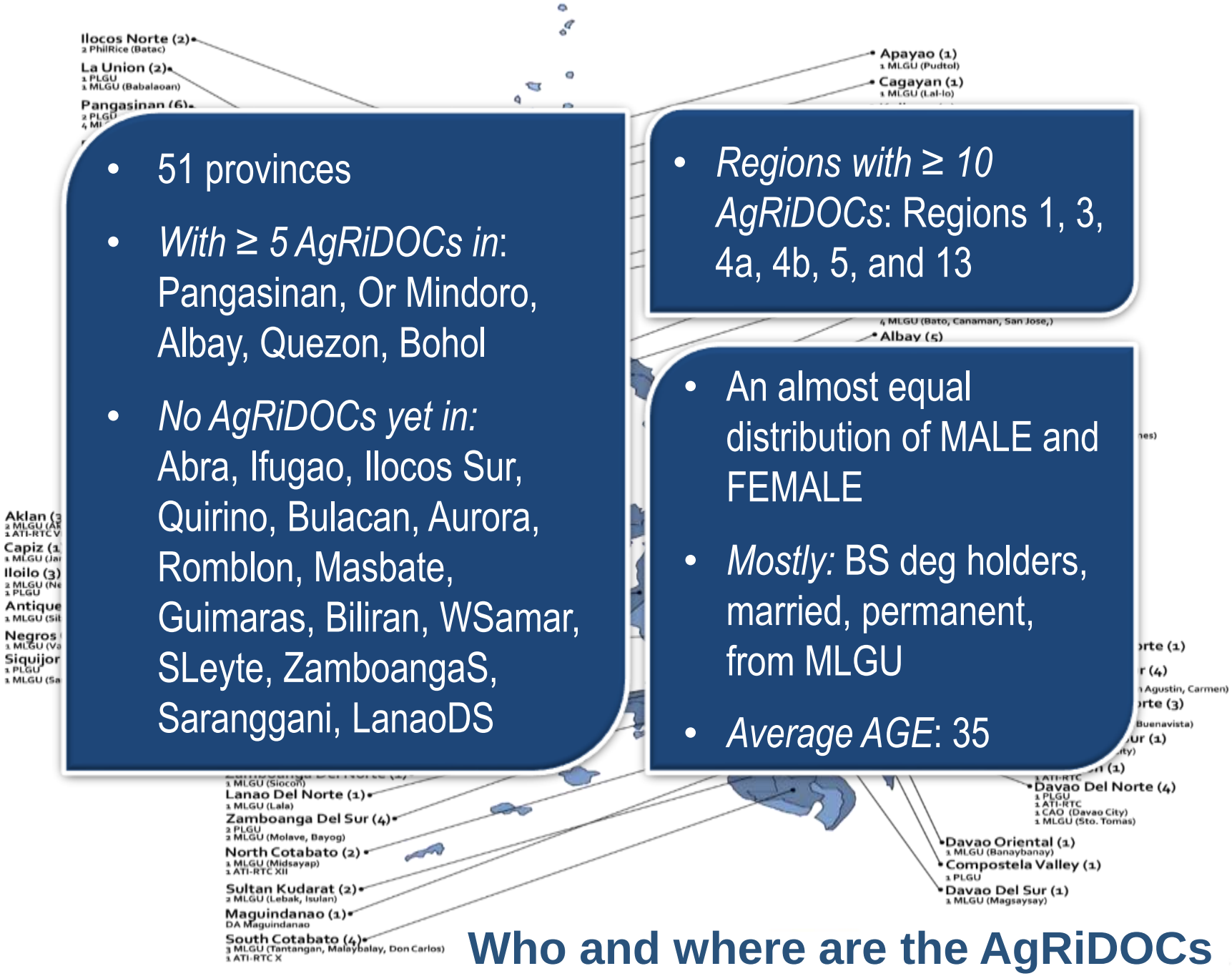
AgRiDOC ako
May pananalig sa Diyos at sa kakayahan ng Pilipino
Isinusulong at pinasisigla ang agrikultura
Para sa pag-unlad ng ating bansa

AgRiDOC ako
Progresibo't may puso ang serbisyo
Kaalaman ay subok ng agham at karanasan
Patuloy na nag-aaral, pinagbubuti ang kakayanan

Ikinararangal ko, AgRiDOC ako
Lingkod at kaibigan ng magsasakang Pilipino
Kabalikat sa pagbabago upang ani'y lumago
at produkto'y tumaas ang halaga sa merkado.

Mapunta man kung saan, ako'y maaasahan
Sa pagbahagi ng bagong kaalaman at kaisipan
Lalo na sa paggawa ng nararapat na paraan
nang guminhawa at tumatag ang buong pamayanan.

'Yan ang misyon ko, AgRiDOC ako!



- 51 provinces
- *With ≥ 5 AgRiDOCs in*: Pangasinan, Or Mindoro, Albay, Quezon, Bohol
- *No AgRiDOCs yet in:* Abra, Ifugao, Ilocos Sur, Quirino, Bulacan, Aurora, Romblon, Masbate, Guimaras, Biliran, WSamar, SLeyte, ZamboangaS, Saranggani, LanaoDS

- *Regions with ≥ 10 AgRiDOCs*: Regions 1, 3, 4a, 4b, 5, and 13

- An almost equal distribution of MALE and FEMALE
- *Mostly:* BS deg holders, married, permanent, from MLGU
- *Average AGE*: 35

Who and where are the AgRiDOCs

Toy (2nd fr L) gets a certificate for his volunteer work

AgRiDOC Toy Rutaquio (LGU-Infanta, Quezon) spends his weekends training 15-20 youth participants (9-16 yrs old) on organic vegetable production and trains his farmers on PalayCheck.

AgRiDOC Nica Licudo (LGU-Natividad, Pangasinan) taught her farmers mushroom production and are now producing & selling their own spawns. She also got funding to send her farmers to 2 AgRiTourism.

Nica (R) and her colleague during the IPaD-funded Mushroom Culture Technology training

AgRiDOC Belen Likigan (LGU-Tabuk, Kalinga) has conducted 5 Farmers Business Schools with her farmers and record-keeping and financial planning for the housewives.

AgRiDOC Rene Datinguinoo (LGU-Calapan, Min Or) has implemented his Palayamanan project proposal with funding from his office: P1.1M for 1st phase for 14 farmers in 8 bgy and P0.5M for 2nd phase for 16 farmers in 10 bgy.

AgRiDOC Eugene Dacumos (LGU-San Mauel, Isabela) has established vegetable gardens in all bgy offices in his area. He even converted his own farm into a Palayamanan showcase and invites schools and discusses Palayamanan to them.

For this project with PhilRice RTM Team, AgRiDOC Genesis Martin of DA-RFO 3 received P700K funding from his office

AgRiDOC Aileen Senorio of Iloilo is member of Rice Doctor evaluation team, RCM, PRiSM

An FB post from AgRiDOCs JunRey (ATI 12), Jaybee (LGU-Tantangan), & Nash (DAF ARMM) serving as training facilitators & applying topics & methods learned from AgRiDOC training

AgRiDOC Jo Rebato (LGU Oas, Albay) launching her AgRiDOC Project

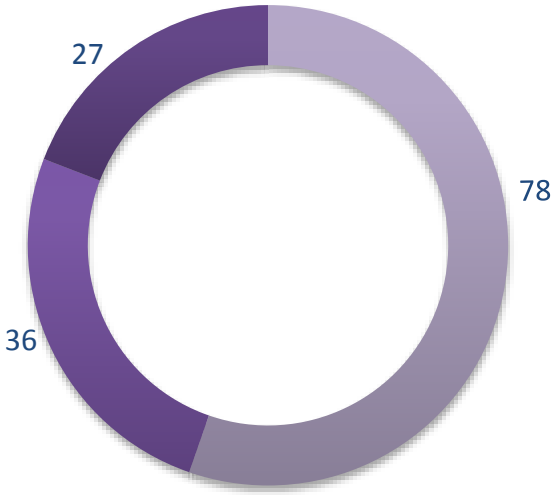
Some Preliminary Findings from M&E

- Generally, AgRiDOCs' (Batch 1) colleagues and their farmer-clients saw improvements in their work performance and on how they relate.
- Rice farming or doing Palayamanan in their own farms was becoming common among the AgRiDOCs.
- Wider use of ICT esp PhilRice Text Center, increase in use of Farmers Text Center and Rice Doctor
- AgRiDOC lessons applied in their work, own farm, schools, churches.
- Direct cost of investment: P156K/AgRiDOC for 1 season, ≈1,300/day

- AgRiDOC program at ATI
- AgRiDOC organization
- AgRiDOC concept now being shared with RDA of Korea thru PhilRAA

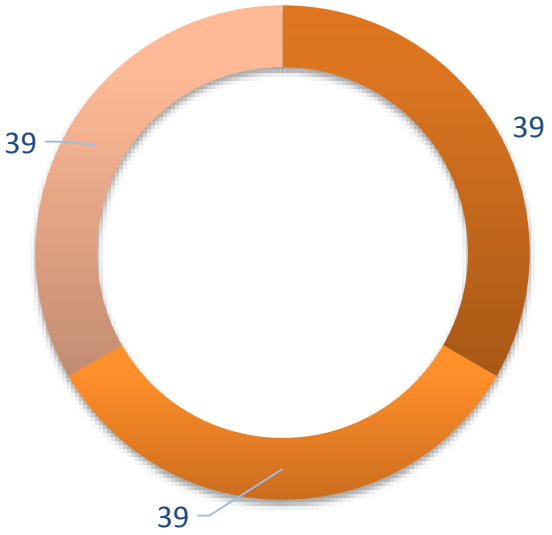
TOP 3
National Roll-out

MADE AN IMPACT



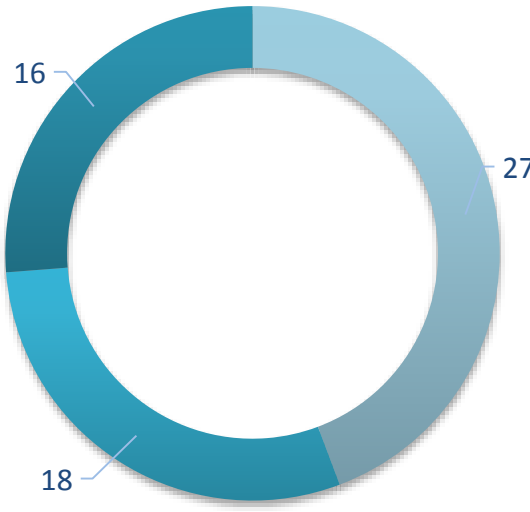
Transformational Leadership
Project Proposal Making
Homestay

NEEDS IMPROVEMENT



Resource persons
Scheduling/coordination of activities
Training/Demo site, accommodation

IMMEDIATELY APPLY



Share/Use ICT tools
Conduct Module 1 to AEWs/Farmers
Project proposal

Mod 1 (Be Transformed)
Mod 4 (PalaYcheck and PalaYamanan v2.0)
Mod 6 (Be RICEponsible)

Engage & equip strategic groups of rice extension intermediaries

Framework, definitions, & groupings

≈11,000 participants in KSL events

Linkage w/ AgRiDOCs

Promo & enhancement of ICT tools + campaigns

Sustainability mechanism started

KSL Event: Terms of engagement

+ Follow-up/sustainability mechanism

#ICTinAgri #MOETApp

"MOET (Minus-One Element Technique) App allows me to determine the precise amount and schedule of fertilizer application," said Ronie Granaderos Gonzales (L), AgRiDOC from LGU-OPA Bohol. "I no longer have to manually calculate for the fertilizer requirements -- just a few clicks of the MOET app on my tablet and I'm good to go. It's that fast and easy!"

MOET App is the complementary technology of the MOET kit, a simple and low-cost alternative technique for diagnosing nutrient deficiency. The app computes fertilizer requirement of the rice crop. Recommendations are easily saved as images on the mobile device or sent to the farmer via text message.

Download MOET app for free on your android device: https://play.google.com/store/apps/details...

Photo by: Marvin Ruam Soriano

Integrated promotion of ICT tools

Some Preliminary Findings from M&E

- Most productive extension partners: PRIVATE SECTOR (MFIs)-- reached some 8,000 farmers, friends, family and co-workers; and the ACADEME -- varied ways they can do more for our farmers, agri.
- The ICT-tools enabled REIs to do more for the farmers/agriculture.
- REIs found the KSL event relevant and videos shown helped deepen their understanding of agri situation. Impact on them is at the personal, organizational, and community levels.

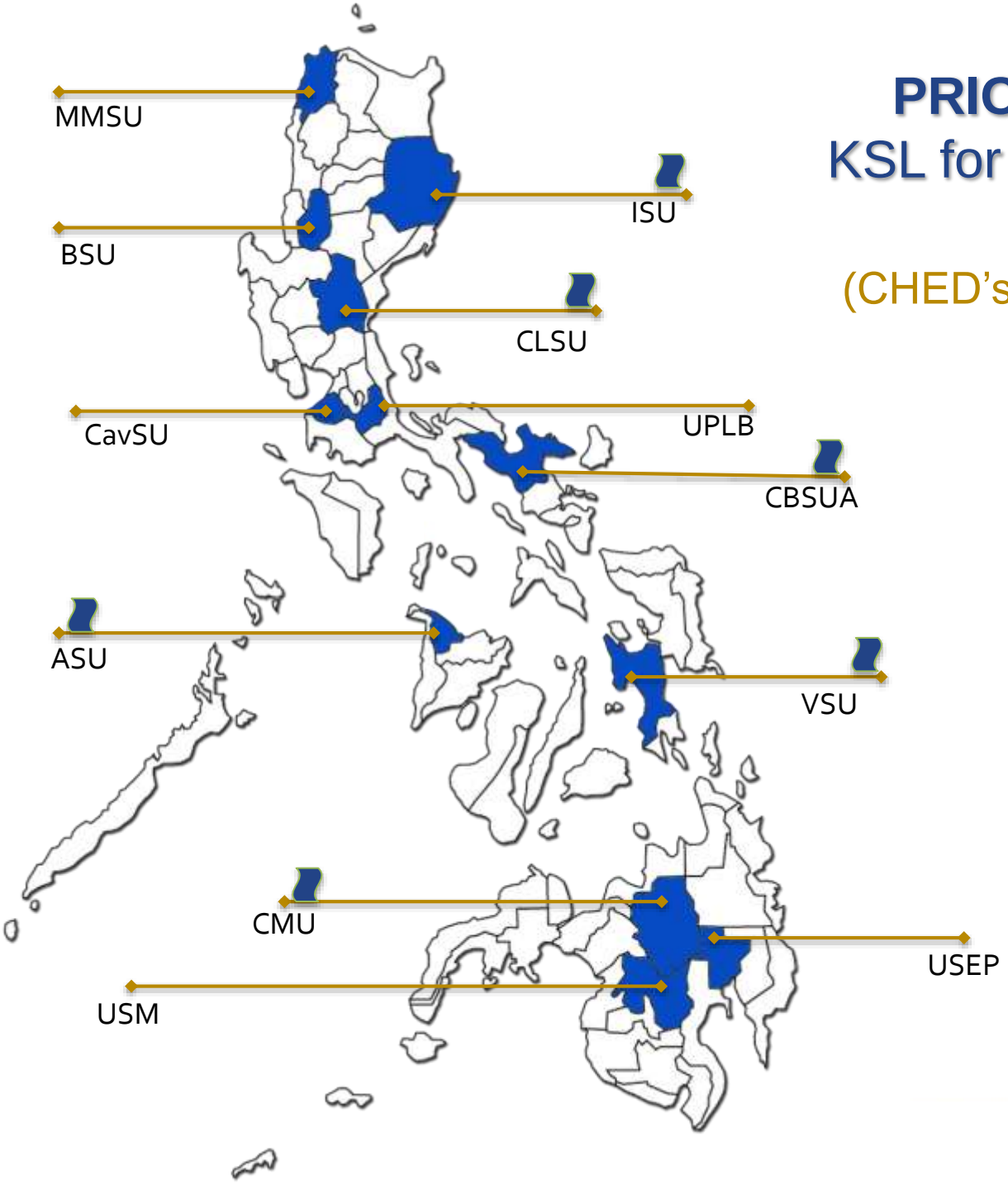
"Naging confident ako na maganda ang agriculture course" -Marc Angelo Gomez (Student, AgusanDN)

"Pagpo-photocopy ng ICT tools brochures at pagpapamahagi ng mga ito sa mga farmers na bumibili ng seeds (sa ext prog namin) at pagda-download ng Rice Doctor at pagre-require sa mga estudyante na gamitin ito." --ANaungayan, Instructor, ISPSC

"We reduced loanable amount to avoid over expenses (of the farmers) and pay immediately the(ir) debt ." -- Abundio Quililan, CEO, New Rural Bank of San Leonardo

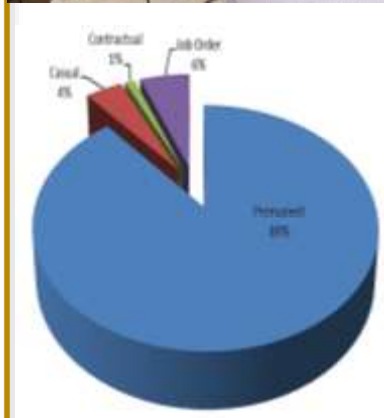
PRIORITY AREAS
KSL for ACADEME REIs

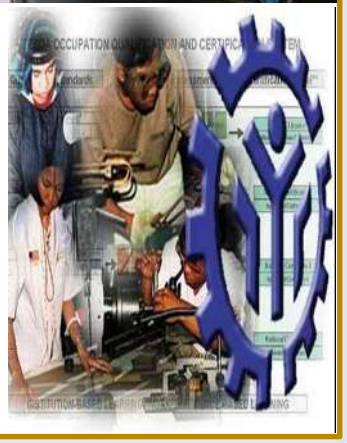
12 SCUs
(CHED's COE/COD in Agri)



Facilitate enabling mechanisms for extension

> 300 nondeg opportunities (+ ext fora)





15 policy recommend-ations

AEW profile

Nat'l TR for grains production

6 Journal dbases subscribed, 330 books purchased;

ScienceDirect

Springer

ProQuest

Start here.

Strengthening Capacities in Transforming Rice Farming Communities

Target Participants : from civil society, academe, & other extension intermediaries

Transformational: #passion4mission - (12 days) – Sep 19-30

Agripreneurial: #partnership&progress - (12 days) – Jan 9-30

Technical and other skills: #production&promotion - (Part 1: 15 days) – Oct 10-28; (Part 2: 20 days) – Nov 14-Dec 9

TRANSFORMATION
isn't about improving.
It's about
RE-THINKING.

Malcolm Gladwell

PROJECT IPaD

Implemented by PhilRice, ATI, and IRRI with funding from the DA National Rice Program through the Bureau of Agricultural Research