2020 Revised edition

PalayCheck System

FOR IRRIGATED LOWLAND RICE (transplanted/direct wet-seeded)



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Readers, especially farmers and technologists, are encouraged to give feedback on the results of following the PalayCheck System recommendations. Please send them to any PhilRice station (see back cover for the directory).

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FOR IRRIGATED LOWLAND RICE (transplanted/ direct wet-seeded)

"Learning, checking, and sharing for best farming practices."



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- 1 Foreword
- 3 Abbreviations and Acronyms
- 4 The PalayCheck System
- 12 Variety and Seed Selection
- 16 Land Preparation
- 20 Crop Establishment
- 30 Nutrient Management
- 42 Water Management
- 46 Pest Management
- 52 Harvest Management
- 56 Postharvest Management
- 62 Summary of Key Checks and Assessment, Monitoring, Analysis, and Improvement
- 70 Annexes
- 88 Appendices

Foreword

Agricultural economists maintain that for Filipino rice farmers to be at par with their counterparts from other rice-producing countries such as Vietnam and Thailand, they must increase their yield to 6t/ha and reduce their palay production cost by 30% (from P12 to P8/kg). While technologies are available to help them attain the target, they need to employ a more holistic integrated approach that can help them improve their farming practices and ensure highquality output from-seed-to-seed. After all, producing seeds involves a complex series of transformation processes.

The PalayCheck System is geared toward this concept of integration as it adapts and localizes recommendations on the best management strategies at the farm level, taking into account the interactions among practices and other factors contributing to yield, grain quality, and healthy environment. It also promotes experiential group learning where farmers are called to collaborate with their fellow farmers, and are guided by resource persons who shed more light on their understanding of production principles and management skills.

In February 2004, PhilRice and the Food and Agriculture Organization of the United Nations teamed up on a project "Strengthening the Development and Use of RICM for Food Security and Poverty Alleviation." This paved the way for the development of the PalayCheck System, the Philippine adaptation of Australia's Ricecheck System that helped increase its yield from 6t/ha in 1987 to almost 10t/ha in 2000. This localized package of technologies is a result of a series of consultations with rice experts, extension workers, and farmers. The technologies and practices recommended under the System continue to be improved.

This revised edition of the PalayCheck System booklet adopts most of the strategies that had been proven effective in the field even as it introduces some updates anchored on results of researches and actual experiences. With the expanding confluence of various factors challenging local rice production such as climate change, rice trade liberalization, and modernization, PhilRice experts convened in 2019 to come up with the revisions. One of the notable amendments is the composition of the additional Key Check 9, which focuses on Postharvest Management. It tackles proper postharvest practices, from drying to cleaning and storing. This is to accentuate the need for our farmers to produce marketable products such as high-quality seeds and commercially competitive grains. This revised edition will not only help them improve their production, but also enrich their income, which is upheld by the Department of Agriculture's 'new thinking': food-secure Philippines with prosperous farmers - "Masaganang Ani, Mataas na Kita "

PhilRice is grateful to all field and office workers who have shared their learnings to help develop and refine the PalayCheck System.

This publication is a compelling reference material for agricultural extension workers, trainors, and farmer-leaders to facilitate and guide farmers in their crop management activities. Somehow, it can also help policymakers identify solutions that they can implement for their farmer-constituents.

We hope that by using this material, the farmers, with the help of the government, can sustain a competitive rice production pursuit: productive, reliable, profitable, and environment-friendly.

JOHN C. DE LEON Executive Director, PhilRice

Abbreviations, acronyms, and symbols used:

AT	-	agricultural technologist		
cm	-	centimeter		
cav	-	cavan (usually 50kg)		
DAS/DAT	-	days after sowing/ transplanting		
DS/WS	-	dry season/ wet season		
DWSR	-	direct wet-seeded rice		
g/ kg	-	gram/ kilogram		
ha	-	hectare		
LCC	-	Leaf Color Chart		
m/ m ²	-	meter/ square meter		
MC	-	moisture content		
MOET	-	Minus-One-Element Technique		
N/ P/ K	-	Nitrogen/ Phosphorus/ Potassium		
No.	-	number		
NSQCS	-	National Seed Quality Control Services		
PI/ EPI	-	panicle initiation/ early panicle initiation		
rpm	-	revolution per minute		
S	-	sulfur		
t/ha	-	ton per hectare		
TPR	-	transplanted rice		
wk	-	week		
Zn	-	zinc		
%	-	percent		
≥	-	greater than or equal to		

The PalayCheck System

PalayCheck is a dynamic rice crop management system that presents the key technology and management practices as Key Checks; compares farmer practices with best practices; and learns from farmers' discussion groups to sustain improvement in productivity, profitability, and environment safety. PalayCheck is simply "learning, checking, and sharing for best farming practices".

PalayCheck is a Rice Integrated Crop Management (RICM) System. RICM recognizes that rice-growing is a production system consisting of factors that are interdependent and interrelated in their impact on rice growth, yield, and grain quality, and on the sustainability of the environment. It maintains that technology recommendations for yield improvement be developed and transferred to farmers as a holistic and integrated package, not by components such as integrated nutrient (INM) or pest management (IPM).

PalayCheck covers the principal areas of crop management such as seed quality, land preparation, crop establishment, and the respective management of nutrients, water, pests, harvest, and postharvest.

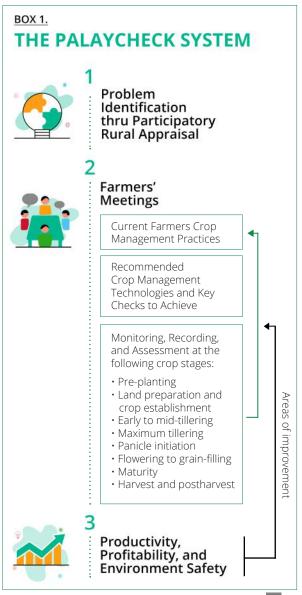
PalayCheck encourages farmers to manage their rice crop according to targets by measuring crop performance and analyzing results. It provides standards in the form of Key Checks that guide farmers on what to achieve; and how to assess and achieve the Key Checks. In such a way, PalayCheck will help farmers learn from their experiences while improving their crop management practices.

PalayCheck Strategy

Group and experiential learning through farmers' meetings and participative interactions are necessary to help farmers learn and apply the PalayCheck System by comparing farming practices, management options, and yield/quality in the technology demonstration plot with those of other farmers' fields (see Box 1).

PalayCheck employs the following strategies:

- · Packaging key technologies as Key Checks
- Working with groups of farmers to identify rice-farming problems, demonstrate the Key Checks, and help farmers learn PalayCheck by comparing the practices, management options, and yield/quality as well as profit with those of other farmers' fields
- Teaching farmers how to evaluate their current practices, and improve the management of their fields using the Key Checks
- Monitoring and recording management inputs and achievement of Key Checks per growth stage
- Helping farmers assess the Key Checks and identify the reasons for achieving or not achieving them



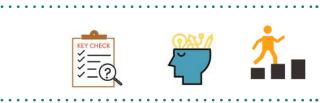
Implementing the PalayCheck System



Each site will consist of: a PalayCheck demonstration field to showcase the recommended practices; a group of rice farmers; and a facilitator or resource person. The demo field is a selected farmer's field (farmer-partner). Preferably, the field should be at least 0.5 ha located along the roadside, beside a non-technology-intervened field, and near the farmers' meeting area.

Seed and fertilizer inputs may be provided to ensure that the recommended practices are followed. The demo field will be the basis for evaluating the strengths and weaknesses of the farmers' management approach, and for discussing as well as learning the necessary adjustments to improve yield and profit. The neighboring members of the group (farmer-cooperators) may or may not adopt PalayCheck recommendations.

The participants of PalayCheck are a group of 15-25 farmers belonging to a community or neighborhood. The group will meet before, during, and after the cropping season to review the management practices, pest incidence, growth and yield results, and weather conditions; compare the PalayCheck demo field with the farmer-cooperators' fields; discuss reasons for achieving or not achieving Key Checks based on their knowledge and



experiences; plan for the next meeting's activities; and record the activities and results of the demo field and the farmer-cooperators' fields.

The management practices, achievement or nonachievement of Key Checks, and yield results will be evaluated per site. The evaluation summary will be presented during the last meeting (after harvest) to expedite the ultimate analysis and interpretation of the achievement of Key Checks and the yield results of each farmer-cooperator and farmer-partner.

Though the PalayCheck System helps farmers attain high yield through proper crop management, it is essential that the learning process be highlighted. The learning process takes place before, during, and after each planting season. Farmers can compare their actual performance and management efforts with the expected outputs (yield, quality, and environmental outcomes) as indicated by the achieved Key Checks. Due to limited resources, farmer-cooperators can not always adapt PalayCheck recommendations. Successes, problems, and failures need to be identified to ensure improvements in the next season.

Steps in using the PalayCheck System

1. Manage the rice crop using the Key Checks.

PalayCheck develops a package of technology recommendations. Emphasize to farmers that the Key Checks are the most important recommendations toward attaining high yield. Each principal area of crop management can have one or more Key Checks. Each Key Check is expressed in a structured way. Therefore, each of them has the following:

- Crop Management Area. In variety and seed selection, for example, the Key Check is "Used high-quality seeds of a recommended variety."
- Importance. This indicates why the Key Check is so necessary in achieving the field output, or growth-and-yield output of the crop. For example, high-quality seed is pure, clean, full and uniform in size, and has a germination rate of at least 85%.
- Assessment of Key Check. This is the indicator or method to determine if the Key Check has been achieved.

For example, the seed is either certified by NSQCS as evidenced by a tag on the sack, or comes from reliable sources (e.g. PhilRice, UPLB, accredited seed growers). If achieved, it is given a check (☑). If not achieved, it is given an (x).

 Recommendation to achieve Key Check. The practices required to achieve the Key Check as well as other associated practices needed to manage the crop are laid down. For example, "choose a variety with high yield potential and market demand, and tested in technology demonstration or adaptability trials". The recommended practices are the inputs, the Key Checks are the outputs.

2. Observe, measure, and record crop growth and management performance.

Encourage and guide farmers into observing the rice crop closely and regularly by walking through the plots and showing them how to measure crop growth and management performance. Use a ruler, count, or weigh. Do not guess or estimate. Record the measurements to ensure that the information is available for later use. Use the forms provided to you or a field notebook. Do not rely on your memory; write down notes.

Compare and interpret results to identify problem areas.

Guide farmers in interpreting and analyzing the relationships among management practices, measurements, and yield results to identify those areas that may have limited yields but can be improved upon. Ask them how they achieved their yields.

4. Take action to correct management problems next season.

Help farmers improve their crop management practices to overcome poor results, or repeat practices that resulted in good yields. Learn from your experiences.

BOX 2. POINTS TO REMEMBER ON THE PALAYCHECK SYSTEM



It is not simply putting a check (\checkmark) or a cross (x) on the Key Checks.

It is important for farmers to understand why a Key Check has been achieved or not achieved (output) given a crop management (input). It is not the same as the "12 Steps in Rice Production" or similar schemes.



It is not a prescription for successful rice production.

Farmers and technicians should recognize that the PalayCheck System integrates and balances crop management technologies with group learning to improve and sustain gains in rice production.



It is an advantage if farmer groups implement PalayCheck.

After close monitoring of the rice crop, farmers share experiences, discuss possible reasons for achieving or not achieving the Key Checks. Hence, farmers themselves recognize weaknesses in their crop management and ways to improve in the next cropping season.

Variety and Seed Selection



Variety & seed selectior



Key Check 1

Used high-quality seeds of a recommended variety

Importance. High-quality seeds are relatively pure, have fewer weed seeds, free from visible seed-borne diseases, full and uniform in size, and have at least 85% germination rate.

As crops from high-quality seeds grow, mature, and ripen uniformly, harvesting activities become more efficient. This results in a 10% or more increase in yield.

Recommended varieties are adapted to local conditions. They are resistant to biotic stresses (e.g. prevalent pests and diseases) in the area, have produced relatively stable and high yields, and are preferred by farmers and local consumers.

Assessment of Key Check

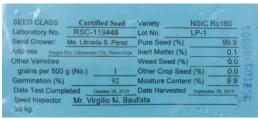
 Seeds are certified by the Bureau of Plant Industry - National Seed Quality Control Services (BPI-NSQCS).

If there are no accredited seed growers in the locality, high-quality seeds are sourced from reliable sources or own-produced.

 The variety suits the environment, addresses a prevailing local field problem, or has performed well in at least two seasons of adaptability trials.

Recommendations to Achieve Key Check 1

1. Source seeds preferably from accredited seed growers. Check if the attached NSQCS tag is valid.



Sample tag for certified seeds

If seeds are old stock or carry-over from the previous season, these should have passed the germination re-test before sowing.

If there are no accredited seed growers:

- source seeds from reliable farmers in the area (i.e. from farms that have uniform crop growth)
- produce own high-quality seeds following proper procedures, particularly in roguing or removing off-types

 ensure that farmer-produced seeds have passed a germination re-test to determine their quality, which may be done by the farmer or NSQCS

2. Choose a variety that:

 a. suits the environment (irrigated or rainfed) or planting season (DS or WS). In rainfed areas, it is best to prioritize varieties intended for the rainfed environment. During the wet season, beware of prevalent pests in the area and consider the shattering and lodging characteristics of a variety.



NSIC Rc 222 is recommended nationally, DS & WS. PSB Rc 10 is an early-maturing variety (105 days) that can fit the crop calendar before the typhoon months.

- b. addresses a prevailing local field problem. In areas that are usually affected by destructive typhoons, drought, or floods, especially during the WS, use a variety with suitable maturity that can escape potential abiotic stresses. Consider also regionally recommended varieties as these are most likely adapted in the locality.
- c. has performed well in at least two seasons of adaptability trials made by PhilRice or local DA office.
- d. has high market demand.

Land Preparation





Key Check 2

Well-leveled field

Importance. A well-leveled field is a pre-requisite to good crop growth and management. It helps achieve the following:

- efficient water management
- less weed incidence
- better snail management
- efficient nutrient utilization
- · uniform crop growth and maturity
- efficient use of farm machinery

To achieve a well-leveled field, weeds, rice straw, and stubbles must be thoroughly decomposed and land is well-puddled. A poorly prepared field could yield 5% less.

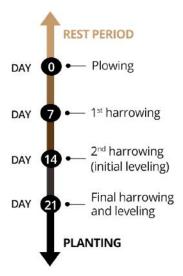
Assessment of Key Check

- No high and low soil spots after final leveling:
 - no portion has deeper than 5cm water (≈ thumb length)
 - no mound of soil can be seen above the 5cm water surface after final leveling

Recommendations to achieve Key Check 2

- 1. Clean and repair dikes and ditches.
 - Clean dikes help prevent or reduce pest infestation.
 - Compacted dikes prevent seepage.
 - Dikes maintained at 15cm high x 20cm wide discourage rat-burrowing.
 - Clean ditches ensure water efficiency and facilitate drainage.
- 2. Plow or rotovate field 21 30 days before planting to:
 - allot time for the germination of weeds and drop seeds
 - incorporate weeds, rice straw, and stubbles in the soil to allow time for decomposition
 - apply organic fertilizers to increase the population of beneficial microbials in the soil. This will help hasten the full decomposition of plant residues, otherwise the soil turns acidic and some nutrients become less available
- 3. Harrow the field every 7 days after plowing. The first harrowing is along the plowing pattern; the second or initial leveling is crosswise. This will:
 - break the clods
 - incorporate stubbles in the soil
 - allow weed seeds and drop seeds to germinate
 - help reduce initial pest population
 - maintain the soil's hard pan
- 4. Final-harrow and level the field using a wooden plank or tiller-attached leveler. Water depth must be 5cm to ease field-leveling.

Example:



- 5. For DWSR, construct small canals (25cm wide and 5cm deep) surrounding the field near the dikes and at the middle of the field to:
 - · provide path for excess water
 - facilitate collection of snails and field operations (i.e. replanting, weeding)

Crop Establishment

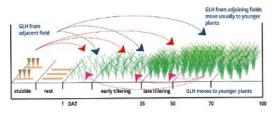




Key Check 3

Practiced synchronous planting after a rest period

Importance. Synchronous planting after a rest period enables efficient use of irrigation water and avoids overlapping incidences of insect and disease populations, thereby preventing yield loss.



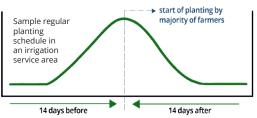
e.g. occurrence of tungro disease caused by GLH.

If farmers in an area plant synchronously, crops can be harvested almost simultaneously, leaving no food source for insect pests to survive on and multiply.

21

Assessment of Key Check

- Allowed the field to rest for at least 30 days after harvest before the next cropping season begins.
- Planted within 14 days before or 14 days after the regular planting schedule in the irrigation service area or applicable vicinity.



Recommendations to achieve Key Check 3

1. After harvesting, allow the field to rest. Do not plant the area with rice for at least 30 days.

Benefits of allowing the rest period:

- It breaks the insect pest cycle. Most insect pests have an average life cycle of 30 days. During the rest period, they will have no place to stay and most of them will starve to death.
- It destroys disease host and reduces inoculum in the field. By leaving the field idle, the source of diseases that developed during the previous cropping season will die before the start of the next season.
- *It allows good decomposition* of the rice straw and/or organic materials that can serve as fertilizer.
- 2. Follow the local planting calendar to make full use of irrigation water within the community. Practice synchronous planting at least within the applicable vicinity (e.g. turnout, division, barangay).



Key Check 4

Sufficient number of healthy seedlings

Importance. Healthy seedlings have short leaf sheaths, long and dense roots, and even height. They grow uniformly and have no pest damage.

With uniform growth, healthy seedlings produce a good canopy and every plant can avail of sufficient sunlight and soil nutrients. They can also easily recover from transplanting shock, and have higher survival rate. They produce productive tillers that translate to increased potential for higher yield.

Assessment of Key Check

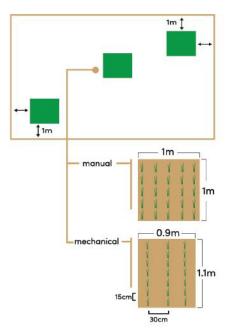
For Transplanted Rice (TPR):

Followed the recommended seeding rate of 20-40kg/ha high-quality rice seeds.

- Ensured hill density of 25 hills/m² if manually transplanted, or 21 hills/m² if mechanically transplanted.
- Ensured one healthy seedling per hill.

How to assess hill density and health status of TPR:

- 1. At 10 DAT, randomly select three sampling locations at least 1m from the dike and in a diagonal line across the field.
- 2. Count the hills from each location using a 1m x 1m quadrat for manual transplanting. For mechanical transplanting, measure a 1.1m x 0.9m quadrat.



- 3. Add the counts and divide the total by three to get the average number of hills/m².
- 4. In every parcel, randomly select 10 hills. Each hill should have at least one healthy seedling.

Manual	at least 25 hills/m² with at least one healthy seedling per hill
Mechanical	at least 21 hills/m² with at least one healthy seedling per hill

For Direct Wet-Seeded Rice (DWSR):

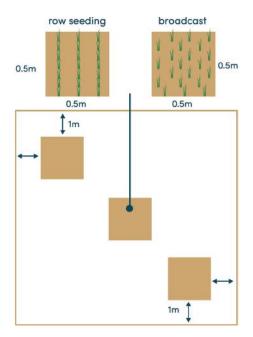
- ✓ Followed the recommended seeding rate of 40-60kg/ha for row seeding and 60-80kg/ha for broadcast seeding.
- Ensured plant density of 225 plants/m² at 60kg/ha seeding rate, or 300 plants/m² at 80kg/ha seeding rate.
- Plants in each quadrat have no pest damage and are uniform in leaf color and plant height.



Direct wet-seeded rice

How to assess plant density and health status of DWSR:

- 1. At 15-18 DAS, randomly select three sampling sites at least 1m from the dike and in a diagonal line across the field.
- 2. Use a 0.5m x 0.5m quadrat. Count the plants in each quadrat, compute the average number of plants per quadrat, then multiply by four to determine the average number of plants/m².



3. In every quadrat, visually inspect plants for uniformity in leaf color and plant height, and for pest damage.

Recommendations to achieve Key Check 4

For TPR:

1. Follow these recommendations

Method	Seeding rate	Seedbed area	**Age of seedlings (days)	No. of seedlings per hill	Planting distance (cmxcm)
Manual	20 or 40 kg/ ha	400m ²	18-21	2-3	20x20 (WS) 20x15 (DS)
Mechanical					
• Tray method	70-160 g/tray* (20- 40kg/ ha)	250-300 trays	14-18**	3-6	30x15 (WS/DS)
 Modified wet dapog method 	420- 960g/ m ² (20- 40kg/ ha)	50m ²	14-18	3-6	30x15 (WS/DS)

*Size of tray: 28cm x 58cm

**Can use 12-day-old seedlings if height is not less than 15cm

Lower seeding rate in mechanical transplanting is recommended for hybrid commercial rice production because of high price of seeds.

- Sowing the right amount of seeds results in strong and healthy seedlings.
- A 20m x 1m seedbed provides enough space for seedlings to grow.



 Apply organic materials before leveling the seedbed. Use compost or any fully decomposed material such as dried animal manure, carbonized rice hull, or rice straw. Organic materials help loosen the soil, making pulling of seedlings easier with less root damage.

Type of soil	Rate of application
Fine-textured	3-4 bags commercial organic fertilizer
Medium-textured	no need to apply organic materials

- Young seedlings are susceptible to golden apple snails. Seedlings older than 25 days will have difficulty recovering from transplanting stress and will produce less tillers.
- Close spacing results in mutual shading and less tillers. Tall plants are susceptible to lodging.
- Do not cut the leaves of seedlings before transplanting. The cut area can be an entry point for disease-causing organisms.

2. Replant missing hills within 7 DAT. Use seedlings from the same seedbed to avoid uneven maturity.

For DWSR:

- 1. Prepare the field for seeding by following the land preparation and levelling recommendations outlined in Key Check 2.
- 2. Protect pre-germinated seeds from birds, rats, snails, and weeds by following the recommended pest management practices.
- 3. Use drumseeder or broadcast pre-germinated seeds evenly onto the field.



With drumseeder

4. Sow extra 1kg pre-germinated seeds on the side of the field for replanting. Replant bald areas with a radius of more than 10cm within 7-10 DAS to ensure even maturity.

Nutrient Management





Key Check 5

Sufficient nutrients from tillering to early panicle initiation (EPI) and flowering

Importance. Nutrient inputs as fertilizers fill the gap between what the crop needs and what is currently present in the soil, water, and air. Sufficient nutrients from tillering to EPI and flowering ensure good growth and uniform panicle development of the crop. They also ensure attainment of the crop's yield potential.

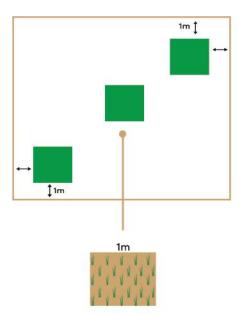
If nutrients are insufficient during these stages, there may be slow growth, less tillers and panicles, fewer seeds, and lighter grain. Excessive nutrients will cause pest damage, lodging, and soil pollution.

Assessment of Key Check

- No symptoms of nutrient deficiency or toxicity from tillering to early panicle initiation (EPI) and flowering.
- Achieved at least 300 panicles/m² (TPR) or 350 panicles/m² (DWSR) at dough stage.

How to assess the number of panicles at dough stage:

- 1. Randomly select three sampling sites (1m x 1m quadrat) at least 1m from the dike and in a diagonal line across the field.
- 2. Count the panicles in each quadrat and get the average panicles/m².



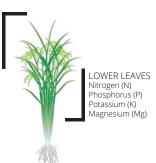
Recommendations to achieve Key Check 5

1. Know and manage the nutrient requirements of your crop based on:

a. visual observation of deficiency symptoms

Tips in proper visual diagnosis of nutrient deficiency

UPPER LEAVES Zinc (Zn) Calcium (Ca) Copper (Cu) Iron (Fe) Boron (B) Sulfur (S) Manganese (Mn)



b. results of nutrient diagnostic and decision support tools:

Diagnostic and Decision Support Tools



Leaf Color Chart (LCC)

A tool to visually assess the nitrogen status of the rice crop.



Minus-One-Element Technique (MOET) and MOET App

A pot experiment that is complemented with an ICT-based application to determine the nutrients deficient in the soil and the amounts needed for a certain target yield.



Nutrient-Omission-Plot Technique (NOPT) A means to assess indigenous nutrient supply to serve as basis of fertilizer recommendation.



Rice Crop Manager (RCM) An ICT-based platform for rapidly deploying improved nutrient and rice-farming management technologies.

- c. other available information such as data obtained from extension workers or rice specialists
- 2. Know the right element, amount, and timing of fertilizer application. Make E-A-T right.
 - E Know the right nutrient ELEMENT that the plant needs. Giving the right nutrients increases cost efficiency and attainment of target yield.
 - A Know the right AMOUNT of fertilizer to apply. Too much or too little is not good.
 - T- Know the right TIMING of fertilizer application to increase efficiency in input cost and nutrient uptake.
 - NITROGEN (N)

<u>Right element</u>. N promotes rapid growth for increased:

- plant height, tiller number, and leaf size;
- number of panicles per hill;
- number of spikelets per panicle;
- grain protein content; and,
- percentage of filled spikelets.

N deficiency results in stunted, yellowish plants; older leaves or whole plants are yellowish green.



(Right) N-deficient rice plant.

Excessive N during panicle initiation and flowering:

- makes the plant prone to lodging and pests;
- · increases unfilled spikelets;
- is costly and may contribute to environmental pollution.

<u>*Right amount.*</u> Use results of LCC, RCM, NOPT, and MOET/ MOET App as basis in properly determining the amount of N to apply.

<u>Right timing.</u>

If LCC is available:

- use LCC every 7 days from 14 DAT or 21 DAS until early flowering
- apply N if 6 or more out of 10 leaves are below 4 (TPR) or 3.5 (DWSR).

If LCC is not available:

	APPLICATION		
	1 st	2 nd	3 rd
For ≤110-day maturity	0-14 DAT or 7-10 DAS	5-7 days before panicle initiation	
For >110-day maturity	0-14DAT or 7-10 DAS	mid- tillering	5-7 days before or after panicle initiation

PHOSPHORUS (P)

<u>*Right element.*</u> P functions mainly for energy storage and transfer. In rice, it promotes vigorous root development, tillering, and early flowering and ripening.

Deficiency symptoms include:

- stunted dark green plants with narrow, short, very erect leaves and greatly reduced tillering;
- thin stems and retarded development; and,
- reduced number of leaves, panicles, and grains per panicle



(Right) P-deficient rice plant.

<u>*Right amount.*</u> Use results of MOET/ MOET App and RCM as basis in properly determining the amount of P to apply.

Right timing.

	APPLICATION
TPR	0-14 DAT
DWSR	7-10 DAS

POTASSIUM (K)

Right element. K in rice plants:

- speeds up root growth and boosts plant vigor;
- · accelerates uptake of other nutrients;
- improves tolerance of rice to adverse conditions such as pest and disease infestations, drought, lodging; and,
- increases grain size and weight, and percent filled grains

K deficiency is often not detected because its symptoms do not appear until the later growth stages, and are not as easy to recognize as those of N deficiency.



K-deficient rice plant.

K deficiency symptoms include dark green plants with yellowish brown leaf margins or dark brown necrotic spots first appearing on the tip of older leaves. Yellowing follows a " Λ " pattern and progresses downward if deficiency is not corrected.

<u>*Right amount.*</u> Use results of MOET/ MOET App and RCM as basis in properly determining the amount of K to apply.

Right timing.

	APPLICATION		
	1 st	2 nd	
TPR	0-14 DAT	5-7 days before or after panicle initiation	
DWSR	7-10 DAS	5-7 days before or after panicle initiation	

ZINC (Zn)

<u>*Right element.*</u> Zn promotes good seedling and overall growth of plants. It is essential for several biochemical pathways and structural processes in the rice plant.

Zn deficiency symptoms include dusty brown spots on upper leaves of stunted plants appearing 2-4 weeks after transplanting. In Zn-deficient soils, NPK fertilizers alone cannot provide good yield unless the deficiency is corrected.



Zn-deficient rice plant.

<u>*Right amount and timing.*</u> Use results of MOET and RCM as basis in properly determining the amount of Zn to apply.

If MOET or RCM are not available, choose only one among the following amelioration techniques:

	AMELIORATION TECHNIQUES	AMOUNT	TIMING
TPR	Seedling dip	2% ZnO solution	dip for 15- 30min
	Seedbed	apply 0.5-2kg per 400m ² seedbed or 0.5-2kg per 40kg inbred seeds	seedbed
	Broadcast	25kg ZnSO4/ ha	10-14 DAT
	Foliar spraying	2% solution spray (volume spray of 170L/ha)	14 DAT
DWSR	Seed Zn coating	1% of the dry weight of seeds	seed preparation

SULFUR (S)

Right element. S in rice plants:

- · promotes uniform growth and maturity;
- speeds up chlorophyll production, protein synthesis, and plant function and structure; and
- reduces yield if deficiency occurs at vegetative stage

Symptoms of S deficiency include yellowing of young leaves, less tillers, fewer and shorter panicles, reduced number of spikelets per panicle, and delayed maturity.



(Left) S-deficient rice plant.

<u>*Right amount.*</u> Use results of MOET test or RCM as basis in properly determining the amount of S to apply. The amount of S in 14-14-14-12S (12%S) as recommended to treat P and K deficiencies is adequate to correct usual S deficiency.

<u>Right timing.</u>

	APPLICATION
TPR	0-14 DAT
DWSR	7-10 DAS

Box 3. TIPS FOR EFFICIENT USE OF FERTILIZERS

Right technique of application of granular inorganic fertilizer



Incorporate fertilizer into the soil for better absorption of nutrients and to avoid nutrient leaching and N volatilization.

Apply only 30% of the total N requirement during the 1st application.

Apply topdress fertilizer at low water depth (2-5cm) to reduce N volatilization, and nutrient run-off.

Apply fertilizer during the cooler time of the day (particularly after 3:00PM) to avoid N losses.

Water Management





Key Check 6

Avoided stress caused by drought or excessive water that could affect the growth and yield of the crop

Importance. The right volume of water promotes better nutrient uptake, good plant vigor, better snail and weed management, uniform growth and maturity, and more efficient farm operations. Insufficient water causes drought stress that results in low fertilizer efficiency, and low yield and low grain quality. Excessive water results in higher irrigation cost, nutrient imbalance, low yield, and more greenhouse gas emissions.

Assessment of Key Check

- No symptoms of water stress due to drought during the vegetative phase, through the panicle initiation to grain-filling stages.
- No symptoms of water stress due to excessive irrigation water during the vegetative phase.

Symptoms of water stress during the vegetative phase:

<u>Drought stress</u> (deep soil-cracking for more than three days):

- · leaf-rolling and leaf tip-drying
- stunted growth

Excessive water stress (>5cm water depth for seven days or more):

- reduced tillering (<10 tillers per hill)
- smaller leaf area
- roots are dark-colored instead of reddish brown or lighter

Symptoms of water stress due to drought during the panicle initiation to grain-filling stages:

- leaf-rolling and leaf tip-drying
- many unfilled spikelets
- reduced panicle exsertion

Recommendations to achieve Key Check 6

1. Attain 2-3cm water level every irrigation time within 3-14 DAT.

Suspend irrigation for 0-14 DAS, if water is still present in the paddy, unless severe drought symptoms appear.

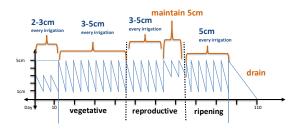


Achieve 3-5cm water level every irrigation time.



- 3. Maintain 5cm water level during the flowering stage.
- 4. Achieve 5cm water level during the ripening stage.
- 5. Drain water or stop irrigation:
 - one week before expected date of harvest for medium-textured soil or during DS
 - two weeks before expected date of harvest for fine-textured soil or during WS.

Example for TPR:



 If water is scarce, practice controlled irrigation. During crop growth, practice the Alternate Wetting and Drying (AWD) technology aided by an observation well.

Pest Management





Key Check 7

No significant yield loss due to pests

Importance. Knowing how the rice crop interacts with biotic factors and the agroecosystem, and correctly identifying pests and applying ecologically sound management strategies can help prevent significant yield loss. They can also promote high-quality grains.

Assessment of Key Check

No significant yield loss due to insect pests, diseases, weeds, rats, snails, and birds. Such loss occurs when one or more pests inflict damage.

Check Tables 1-3 (pp. 48-49) for pest damage levels; Annexes 1-2 (p. 69) for insect pest and disease identification; and Annexes 3a-3c (pp. 70-72) for practical assessment of pest damages.

Table 1. Insect pest level associated with significant yield loss (for 120-day-maturing variety).

Growth stage	Stem borer (SB)	Rice black bug (RBB)	Brown planthopper (BPH) / White- backed planthopper (WBPH)	Rice bug (RB)
Nursery/ Seedbed	> 5 egg masses/ m ²	negligible	negligible	negligible
Early tillering	≥30% deadheart	≥10 nymphs or adults/ hill; > 20% deadheart/ bugburn	≥25 all stages of insects/hill	negligible
Mid to max tillering/ Early panicle initiation (EPI)	≥1 egg mass/m2	≥20 nymphs or adults/ hill; > 30% deadheart/ bugburn	≥50 all stages of insects/hill	negligible
Flowering	≥20% whitehead	≥20 nymphs or adults/ hill; ≥20 whitehead	≥50 all stages of insects/hill	negligible
Milk	≥20% whitehead	≥20 nymphs or adults/ hill; > 20 whitehead	≥100 all stages of insects/hill	≥5 nymphs and adults/ m²
Grain- filling	≥20% whitehead	≥20 nymphs or adults/ hill; > 20 whitehead	≥100 all stages of insects/hill	≥10 nymphs and adults/ m²
Maturity	≥20% whitehead	≥20% whitehead	≥100 all stages of insects/hill	tolerable

Insect pests are monitored in the early morning (5:00-7:00AM) or late afternoon (5:00PM). Other pests are usually monitored in the late afternoon.

Table 2. Disease level associated with significant yield loss (for 120-day- maturing variety).

Growth stage	Rice blast (leaf, neck, panicle)	Sheath blight (ShB)	Bacterial leaf blight (BLB)	Rice tungro disease (RTD)
Nursery/ Seedbed	≥20% of seedbed with leaf	none to negligible	negligible	none
Early tillering	blast	negligible		≥20% of field with RTD
Mid to max tillering/ EPI	≥30% of field with leaf blast		≥30% of field with BLB and undeveloped spikelets	≥40% of field with RTD
Flowering	≥10% of field with neck blast	≥40% of field with ShB	≥30% of field with BLB on flag leaf	
Milk				
Grain- filling	≥10% of field		≥30% of field	tolerable
Maturity	with panicle blast	ShB and ≥10% unfilled grains	with BLB and undeveloped spikelets	

Table 3. Weed, rat, snail, and bird infestation level associated with significant yield loss.

	Weeds	Rats	Snails	Birds
Significant yield loss	≥5% of the area has weed cover at 0-40 DAS (DWSR), or >10% at 15-40 DAT (TPR)	≥5% of the area has damaged tillers from maximum tillering to maturity	≥10% of the area has missing or snail- damaged hills at 14 DAT or DAS	≥5% of the area has damaged panicles

Recommendations to achieve Key Check 7

1. Use varieties that are resistant to pests prevalent in the locality. This is the first line of defense against pests and is compatible with the biological control method.

Change or rotate varieties every 2-4 croppings.

- 2. Practice synchronous planting after a 30-day rest period (see Key Check 3, pp 21-22).
- 3. Conduct regular field-monitoring from the early stage of crop growth onwards to identify potential pests at their initial stage of development. Preventive disease management options can be applied before it spreads and reaches intolerable levels. For insect pests, preventive management options such as use of resistant varieties and synchronous planting are preferred. Insecticide application is a corrective measure to be deployed selectively when needed.



4. Let the many beneficial organisms thrive in the rice ecosystem. Such organisms regulate pest populations. The indiscriminate use of pesticides reduces biodiversity and disrupts the natural balance of insect pests and beneficial organisms. Conserving these organisms is economical and permanent. For example, long-horned grasshoppers feed on the egg masses of stemborers while spiders feed on the nymphs and adults of leaf and planthoppers.



Common beneficial organisms in the rice field

Pest/ disease	Management options
Insect pests and diseases	Do not spray against defoliators within 30 DAT or 40 DAS. Diagnose diseases correctly, and practice field sanitation and synchronous planting.
Weeds	 Control weeds within 0-45 DAT/DAS. Use high-quality seeds. Practice field sanitation. Practice proper land preparation and water management. Do manual and mechanical weeding. Use herbicides as the last option.
Rats	Practice timely, integrated, and sustained community- wide control. Fill rat burrows with soil and water. Practice sanitation.
Golden Apple Snails	 Keep field saturated up to 25 DAS or up to 15 DAT. Construct small canals and place attractants to facilitate snail collection. Place wire/ bamboo screen at water in/outlets to regulate snail entry.
Birds	Scaring them away is the most practical approach to managing birds.

Harvest Management





Key Check 8

Harvested the crop at the right time

Importance. Timely reaping and threshing ensures high-quality rice that leads to high market value and consumer acceptance.

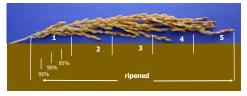
Harvesting too early results in immature grains with <1 to 1.5% harvest losses, and leads to low milling recovery of as low as 53%. Harvesting too late leads to grain-shattering with \ge 3% (if manual) harvest losses. This results in low head rice recovery as low as 32% (manual) or 38% (mechanized).

Assessment of Key Check.

- Palay is harvested when most of the grains are golden yellow:
 - 85-90% if manual harvesting
 - 90-95% if using combine harvester
- ✓ Palay is threshed not later than one day after harvest during WS or two days during DS.

Recommendations to achieve Key Check 8

- 1. Drain field 1-2 weeks before the expected date of harvesting:
 - · to attain uniform maturity and ripening
 - to prevent wetting of the grains during harvesting
 - for easy operation in the field
- 2. Harvest at the right maturity, when 85-90% (manual) or 90-95% (if using combine harvester) of the grains are golden yellow.



- 3. Harvest at the right grain moisture content (MC).
 - Use grain moisture meter when available.



18-21% (typical MC for DS)



20-25% (typical MC for WS)

- 4. After manual harvesting, thresh *palay* not later than one (WS) or two (DS) days.
 - Avoid piling the harvested crop in the field for more than a day to prevent heat buildup which leads to grain discoloration and low-quality milled rice.
 - Avoid threshing dripping-wet palay using a mechanical thresher to prevent losses from poor grain-cleaning and separation.
 - Observe the recommended threshing drum speed (800rpm for most enginedriven threshers) to prevent grain damage.
 Faster speed may increase capacity but will also incur more blower and separation losses.



Postharvest Management



Postharvest



Key Check 9

Dried, cleaned, and stored grains properly

Importance. Proper drying, cleaning, and storing maintains grain quality, and helps control postharvest losses. These also maintain the quality of *palay* suitable for milling and allow long storage.

Producing high-quality rice helps meet customers' requirement and acceptance in the market. It also achieves greater overall market value.

Assessment of Key Check

- Uniformly dried grains within 12-24 hours after harvest.
- ✓ Properly stored cleaned grains at 12-14% MC.

Recommendations to achieve Key Check 9

- 1. Dry the *palay* uniformly within 12-24 hours after harvest/threshing.
 - Use mechanical dryers at temperature not exceeding 50-70°C for 5-8 hours.
 - When drying dripping-wet *palay*, operate the dryer with unheated air during the first 1-2 hours of drying or until 18% MC (skin dry).
 - Reduce drying air temperature to 40-45°C during the last 2 hours of drying or when MC is about 15%. Dry grains to 12-14% MC.
 - When no mechanical dryer is available, sun-dry on clean concreted pavement. Stir the grains at least once every 30min for uniform drying. Avoid getting the dried *palay* drenched with rain.

incentancear arying			
Drying technique	Advantages	Disadvantages	
Sun-drying	 low maintenance cost thorough and complete drying energy-efficient kills fungi and other storage pests 	 weather- dependent requires more labor uncontrollable heating prone to contamination 	
Mechanical drying	 not weather- dependent requires less labor controlled drying air temperature easier operation kills fungi and other storage pests 	 higher drying cost uneven drying (conventional flatbed) less energy- efficient 	

Table 1. Advantages and disadvantages of	sun-drying and
mechanical drying	

2. Place dried grains on top of palettes to protect them from dampness while awaiting grain-cleaning.



- Use clean containers or sacks with plastic lining.
- Ensure that correct label is placed inside and outside the sack.
- Temporary storage of dried grains before cleaning should not be longer than three days.
- 3. Clean dried grains 2-3 days after harvest.
 - Remove impurities such as chaff or unfilled grains and straw, which have high MC that causes hot spots inside the sack.

If using a grain cleaner, regulate its speed to minimize losses. Before using the grain cleaner, ensure that it is clean and free from any grain left from previous operation.



- If not sold immediately, keep seeds in a storage area that is waterproof, with proper aeration, and free from pests such as rats, birds, and insects.
 - Never store clean, dried grains together with agricultural chemicals, fertilizers, or cement in the same storage area.
 - Check for heating by lifting the top bag and feeling the bag below.
 - Inspect the stocks at least once a week to detect pest infestation, physical damage, or staining caused by water which indicates re-wetting.
 - Keep the storage area clean and tidy inside and outside, and ensure periodic aeration to:
 - a. prevent re-entry of moisture in stored grains
 - b. protect grains from insects, rodents, and birds
 - c. facilitate loading and unloading
 - d. maximize the use of space
 - e. ease product maintenance and management
- 5. Do not drag rice sacks when transporting to prevent damages. Use sack barrows if available.



- 6. Prepare the stack layout plan before the sacks arrive.
 - Do not mix varieties in one stack or pile. Do not mix old and new stocks in the pile.
 - The pile should be built up to the edge of the palette. Bonded piles are more stable.
 - Provide air spaces in every pile for ventilation.
 - Piles should not be so high that packages at the bottom are crushed or split. Up to 6-7 bags per pile is acceptable. Height of stacks should not exceed the height of the walls.
 - Maintain one-meter space between piles, walls, and roof frames.



Summary of Key Checks and Assessment, Monitoring, Analysis, and Improvement



1. VARIETY AND SEED SELECTION Key Check 1. Used high-quality seeds of a recommended variety

Assessment of Key Check. The seeds of a recommended variety are certified by the BPI-NSQCS. The variety must suit the environment, address a prevailing local field problem, or has performed well in at least two seasons of adaptability trials.

2. LAND PREPARATION Key Check 2. Well-leveled field

Assessment of Key Check. There should be no high and low soil spots after final leveling. No portion has deeper than 5cm water and no mound of soil must be seen above the 5cm water surface.



3. CROP ESTABLISHMENT Key Check 3. Practiced synchronous planting after a rest period

Assessment of Key Check. The field must have rested for at least 30 days after harvest before the next cropping season begins. Farmers should have planted 14 days before or 14 days after the regular planting schedule in the irrigation service area or applicable vicinity.

Key Check 4. Sufficient number of healthy seedlings

Assessment of Key Check

• For Transplanted Rice (TPR). Follow the recommended seeding rate of 20-40kg/ha inbred rice seeds. Ensure hill density of 25 hills/m² if manually transplanted, or 21 hills/m² if mechanically transplanted. There should be at least one healthy seedling per hill.

• For Direct Wet-Seeded Rice (DWSR):

Follow the recommended seeding rate of 40-60kg/ha for row seeding and 60-80kg/ha for broadcast seeding. Ensure plant density of 225 plants/m² at 60kg/ha seeding rate, or 300 plants/m² at 80kg/ha seeding rate. Plants in each quadrat should have no pest damage and are uniform in leaf color and plant height.

4. NUTRIENT MANAGEMENT Key Check 5. Sufficient nutrients from tillering to early panicle initiation (EPI) and flowering

Assessment of Key Check. There should be no symptoms of nutrient deficiency or toxicity from tillering to EPI and flowering. At least 300 panicles/m² (TPR) or 350 panicles/m² (DWSR) at dough stage must be attained.

5. WATER MANAGEMENT

Key Check 6. Avoided stress caused by drought or excessive water that could affect the growth and yield of the crop

Assessment of Key Check. There should be no symptoms of water stress due to drought or excessive water during the vegetative phase, through the panicle initiation to grainfilling stages.

6. PEST MANAGEMENT

Key Check 7. No significant yield loss due to pests

Assessment of Key Check. There should be no significant yield loss due to insect pests, diseases, weeds, rats, snails, and birds. Such loss occurs when one or more pests inflict damage.

7. HARVEST MANAGEMENT Key Check 8. Harvested the crop at the right time

Assessment of Key Check. Palay must be harvested when most of the grains are golden yellow, and threshed not later than one (WS) or two (DS) days after harvest.

8. POSTHARVEST MANAGEMENT Key Check 9. Dried, cleaned, and stored grains properly

Assessment of Key Check. Grains should be dried uniformly within 12-24 hours after harvest/threshing, and properly cleaned and stored at 12-14% MC.

MONITORING, ANALYSIS, AND IMPROVEMENT IN CROP MANAGEMENT

- 1. Observe, measure, and record crop growth and management performance.
- 2. Compare and interpret results to identify problem areas.
- 3. Take action to correct management problems next season.

BOX 4. CROP MANAGEMENT AREA, DEVELOPMENT STAGE, AND KEY CHECKS IN THE PALAYCHECK SYSTEM	REPRODUCTIVE RIPENING	Maximum Tillering/ Flowering Flowering Grain-filling to Maturity	I I	I I
	VEGETATIVE	Sprouting	Das	DAT

			CROP DEVEL	CROP DEVELOPMENT STAGE					
CROP MANAGEMENT AREA	Pre-crop	Land preparation and crop establishment	Early to mid tillering	Maximum tillering to EPI	Flowering and grain filling	Maturity and harvest	After harvest		КЕҮ СНЕСК
Seed quality	*							`	 Used high-quality seeds of a recommended variety
Land preparation		*						>	Well-leveled field
Crop establishment		*						> >	Practiced synchronous planting after a rest period Sufficient number of healthy seedlings
Nutrient management				*				>	Sufficient nutrients from tillering to EPI and flowering
Water management						*		>	Avoided stress caused by drought or excessive water
Pest management						*		>	No significant yield loss due to pests
Harvest management						*		`	Harvested the crop at the right time
Postharvest management							*	`	Dried, cleaned and stored grains properly

Note: Manage, measure, record, and discuss at the shaded crop development stages

*Check assessment



ANNEXES

Annex 1. Common insect pests in the rice field.







White stem borer

Yellow stem borer

Rice black bug



Brown planthoppers



Rice bug

Annex 2. Common diseases in the rice field.



Brown spot

Blast



Bacterial leaf blight

Tungro

Annex 3a. Schematic Guide for Monitoring Key Rice Pests from Planting to Harvest (Differentiated from nutrient deficiency, e.g. Zinc - refer to Annexes 4-12, pp 72-76).

Days After Transplanting (DAT)	Refer to Annexes for photos
14-28 DAT	Yellow dead young leaves at center of tillers damaged by stem borer larvae [see deadheart (Annex 4, p. 72)]
14-40 DAT	Yellow young leaves and rusted or black dots on the lower surface of leaves (see Annex 5, p. 73)
21-45 DAT	Stunted plant with greenish to yellow top leaves. The viral disease is transmitted by green leafhoppers.
	Note: N deficiency and rice tungro disease (RTD) symptoms are similar; plants are shorter. However, N-deficient leaves of the entire plant are yellowish green, and leaf tips are chlorotic or brownish. (see Annex 6, p. 73)
	Greenish diamond-shaped lesions with yellow margin on the leaf surface. Later, lesions are fused and turn dark brown. (see Annex 7, p. 74)
	Note: Blast lesions might be confused with those caused by brown spot (BS) disease. Lesions of BS are solid, dark brown. Both diseases may occur at similar growth stages. BS is common in K-deficient soils. (see Annex 8, p. 74)
35-70 DAT	Dead tillers, lower leaves, or entire plant with burnt- like appearance. Surviving plants produce panicles with empty spikelets. (see Annex 9, p. 75)
45-90 DAT	Yellow spots along leaf margins; later they enlarge, fuse, and turn brown, and run lengthwise toward the base of the leaf (see Annex 10, p. 75)
70-90 DAT	Brown to dark brown lesions at the base of flag leaf and panicle with unfilled spikelets (see Annex 11a, p. 76)
	Note: Panicle infected with neck blast has unfilled or half-filled spikelets and straw-colored. However, whitehead caused by stemborer has completely empty spikelets and panicle appears white (see Annex 11b, p. 76)
75-100 DAT	Unfilled or half-filled spikelets; but filled seeds with damage have chalky grains. Damage is due to insect-feeding during the milking stage (see Annex 12, p. 76)

Note: To obtain the corresponding days after sowing (DAS), add the age (days) of seedlings at transplanting. For example, 14 to 28 DAT equals 35-49 DAS if the age of seedlings during transplanting is 21 days.

Annex 3b. To measure the scope of damage caused by nutrient deficiency, insect pests, and diseases in the field, visually subdivide a parcel into 4 parts, assess percent damage in each part, and get the average.

For example:

45%	35%
30%	40%

% damage per parcel = (45+35+30+40) / 4 = 37.5%

Annex 3c. Schematic Guide for Assessing Key Rice Pests from Planting to Harvest (to estimate percent damage to crop per farm parcel or *pinitak*, refer to Annex 3b).

Days After Transplanting (DAT)	Refer to Annexes for photos
14-28 DAT	Visually subdivide each parcel into 4 parts, assess the percentage of pest damage to crop in each part, and get the average
	Follow above procedure for assessing whitehead
14-40 DAT	Follow above procedure for assessing zinc deficiency
21-45 DAT	Follow above procedure for assessing rice tungro incidence but record the corresponding growth stages

	Follow the above procedure for assessing rice blast
	Follow above procedure for assessing brown spot
35-70 DAT	Follow above procedure for assessing bug burn damage
45-90 DAT	Follow the above procedure but note on the bacterial leaf blight lesion length on flag leaves
70-90 DAT	Follow the above procedure for assessing damage due to collar blast
75-100 DAT	Follow the above procedure for assessing rice bug damage
	A

Note: To obtain the corresponding days after sowing (DAS), add the age (days) of seedlings at transplanting. For example, 14 to 28 DAT equals 35-49 DAS if the age of seedlings during transplanting is 21 days.

Annex 4. Yellow to dark yellow young leaves at the center of tillers caused by feeding of stemborer larvae inside the stem of rice plant (a) and the dead panicle (b).



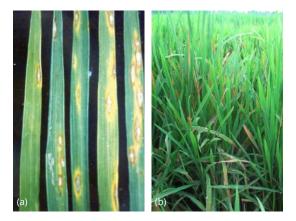
Annex 5. Zinc deficiency in the field shown by rusted and dead seedlings (a) and pale yellow leaves with brown/black-dotted lower leaves (b).



Annex 6. Plants infected with rice tungro disease show yellow top leaves (a); infected field has uneven growth (b); green leafhopper, the tungro virus vector (c).



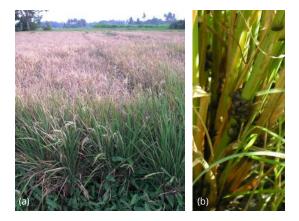
Annex 7. Diamond greenish blast lesion with yellow margin (a); infected field showing yellow and dark brown plants (b).



Annex 8. Infected plants are stunted with yellow leaves (a) and brown spots or dark brown solid lesions (b).



Annex 9. Crop burn (a) caused by feeding black bugs (b) at the base of the plants.



Annex 10. Brown lesions of bacterial leaf blight (BLB) along leaf margins fuse into bands running lengthwise toward the base of the leaf (a); and severely BLB-infected field (b).



Annex 11. Droopy panicles caused by collar blast with half-filled spikelets (a); and whitehead due to stemborer larval infestation (b) resulting in completely empty spikelets.



Annex 12. Damaged panicle with unfilled spikelets and chalky grains (a) caused by rice bug-feeding (b).



Annex 13. Field with stemborer whitehead damage



Annex 14. Zinc-deficient field





Annex 15. Field infested with rice tungro disease

Annex 16. Field infested with rice blast



Annex 17. Rice black bug infestation in the field



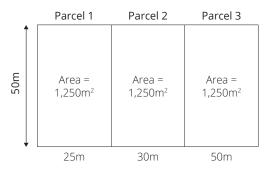
Annex 19. Rice plant infested with neck blast



Annex 23. Measurement of grain yield from a farm parcel or *pinitak*

- 1. Parcel yield will be obtained from the fields of farmer-partners (FPs) and farmer-cooperators (FCs). The site coordinator and/ or agricultural technologist should supervise the measurement, harvesting, threshing, collecting and recording data.
- 2. If there are many missing hills due to pests (i.e. rats) and diseases in each parcel, estimate the area of missing hills in percent and record.
- 3. The following should be considered:
 - a. Before harvesting/ reaping, measure the area (length and width in meters per parcel). Sample areas for 3 parcels are shown below.

Note: A farmer may have one or more parcels.



 After threshing, count and record the number of sacks of threshed palay per parcel. From each parcel, randomly select five bags. Get the weight (kg) of the grains from each bag and obtain the percent moisture content (MC) of sample grains using a Grain Moisture Meter. Follow the instructions in using the Meter.

- c. Sample data for Parcel 1:
 - (1) Parcel 1 area = 1,250m²
 - (2) Total number of sacks or bags of palay harvested from Parcel 1=13
 - (3) Average weight of one sack (average of five sacks randomly sampled) = 51.80kg/sack
 - (4) Estimated total fresh grain weight from Parcel 1 = 13 sacks x 51.8kg/sack = 673.4kg
 - (5) Average %MC (average grain MC from 5 sacks randomly sampled) = 22.3%
- d. Calculate the grain yield from fresh weight of grain sample from Parcel 1 and adjust to 14%MC using the formula below. Follow the same procedure for Parcels 2 and 3. Tabulate data and get average of yields of Parcels 1 to 3.

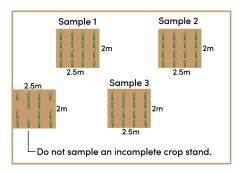
Grain yield at 14% MC (kg/ha)	 = Fresh grain weight (kg) / Parcel 1 area (m²) x 10,000 m²/ha x (100- %MC) / 86 = 673.4kg / 1, 250m² x 10,000m²/ha x (100 - 22.3%) / 86 = 5,387.3kg/ha x 0.9034 = 4,866.79kg/ha or 4.9t/ha

	,	1	,			
Parcel no.	Area (m²)	% Area with Missing	Fresh weight of grain	% Moisture Content	Grain Yield to 149	
		hills (if many)	samples per parcel (kg/m²)	(MC)	kg/ha	t/ha = (kg/ ha)/ 1,000
1	1,250		673.4	22.3	4,866.7	4.9
2	1,250		900.1	19.0	5,651.8	5.7
3	1,250		1,600.1	20.0	5,953.5	6.0
				Average	5,490.7	5.5

 Table 1. Sample grain yield data of three parcels from each farmer-partner or farmer-cooperator.

Annex 24. Measurement of "crop-cut" grain yield from a selected parcel or *pinitak*

1. If a farmer-partner (FP) or farmer-cooperator (FC) has two or more parcels, select a representative parcel. From the selected parcel, randomly measure three 5m² harvest areas (see figure below). Select areas with good crop stand, without missing hills, not damaged by pests and diseases, and without nutrient deficiency symptoms.



- 2. Harvest/reap all plants from each sample area measuring 5m² (=2mx2.5m). Thresh, clean, dry, weigh, and obtain the grain %MC using a grain moisture meter. Drying samples may be done in the oven at 70°C for 49 hours, or sun-drying for 2-3 days. Follow instructions in using the meter.
- 3. Sample data for crop-cut sample 1 from a representative farm parcel:

(a) Crop-cut sample 1 area = 5m²

(b) Grain weight for sample 1 = 2.03kg

(c) Grain moisture content = 14.1%

Calculate the grain yield from grain weight of crop-cut sample 1 and adjust to 14% MC using the formula below. Follow the same procedure for crop-cut samples 2 and 3. Tabulate and get the average yields of crop-cut samples 1 to 3.

Grain yield at 14% MC (kg/ha)	 Grain weight (kg) / Crop-cut Sample 1 area (m²) x 10,000m²/ha x (100 - %MC) / 86 2.03kg / 5m² x 10,000m²/ha x (100 - 14.1%) / 86 4,060kg/ha x 0.9988 4,055.13kg/ha or 4.1t/ha
	.,

Table 2. Sample grain yield data from 3 crop-cut samples obtained from a representative farm parcel.

Sample no.	Grain weight (kg)	Moisture content (%)	Grain	Yield
	/ 5m ²	content (70)	kg/ha	t/ha = (kg/ ha)/ 1,000
1	2.03	14.1	4,055.1	4.1
2	2.35	13.9	4,700.0	4.7
3	2.28	13.7	4,560.0	4.6
			Average	4.5

Annex 25. Measurement of yield components from 4-hill samples adjacent to crop-cut area.

Note: Do this only if resources (manpower, time, and payment) are adequate.

- 1. Select three representative 4-hill (2x2 hills) samples adjacent to the "crop-cut" area or 5m² harvest area. At 20x20cm distance between hills, 4 hills will occupy an area of 0.16m².
- 2. For each representative sample, count the panicles from each hill and total them for four hills.
- 3. Thresh the grains from all hills sampled.
- 4. Separate and count the filled and unfilled spikelets.
- 5. From the filled spikelets, separate the 1,000 grains and dry in the oven at 70°C for 49 hours.
- 6. After drying the grains and weight has stabilized, record and label the weight as the 1,000-grain weight.

Yield components:

- Panicle number/m² = (Panicle number for 4 hills at 20cm x 20 cm between hills) / 0.16m²
- Number of spikelets / panicle = (Total no. of filled and unfilled spikelets / panicle)

- % Filled spikelets = (no. of filled spikelets / panicle) / (no. of filled + unfilled spikelets) x 100
- 1,000-grain weight (g)
- Follow the same procedure for the other two 4-hill samples. Tabulate the data and get the average.

30	impie.			
Sample no.	No. of panicles/m²	No. of spikelets/ panicle	% Filled spikelets	1,000-grain weight (g)
1	500	122	76.1	22.8
2	506	88	81.8	23.9
3	575	101	81.9	25.0
Average	527	104	79.9	23.9

Table 3. Sample yield components from 4 hills (0.16m²) / sample.

Note: Yield components can be used to partly explain grain yield differences due to treatments or from farm parcels.

Grain yield (kg/ha)	 Panicle number / m² x spikelet number / panicle x % filled spikelets x 1000-grain weight (g) x 10⁻² Spikelet number / m² x % filled spikelets x 1000-grain weight (g)
	x 10 ⁻²

Notes:

- Percent filled spikelets should be in decimal form.
- Compare the yield calculated from yield components (obtained from plant hills sampled adjacent the crop-cut area) to yield obtained from a 5m² "crop-cut" sample or yield from a farm parcel.

APPENDICES

MONITORING FORM 1

Year: Season: Farm area (ha):

FARMING ACTIVITY	DATE	EXPENSES
1) Seed Quality a) Variety: b) Amount (kg):		
 2) Land Preparation a) Plowing b) Harrowing c) Land leveling 		
 3-4) Crop Establishment a) Direct wet seeding b) Pulling of seedlings c) Transplanting d) Replanting of missing hills 		
5) Fertilizer Application (type and amount) a) First: b) Second: c) Third: d) Fourth:		
6) Irrigation a) NIA/ CIS b) Water pump (crude oil)		
7) Pest Management (chemical type and volume) a) b) c) d) e)		
 8) Harvesting a) Reaping b) Threshing c) Hauling d) Percentage share 		
9) Postharvest a) Drying b) Cleaning c) Storing d) Transportation		
TOTAL COST		
HARVEST		
Paddy rice (no. of cavans)		
Weight per cavan (kg)		
Market price of paddy rice (P/kg)		
TOTAL INCOME (P)		
NET INCOME (P)		

MONITORING FORM 2

Planting Season (DS or WS):

Date:

Crop management area/ Key Check	Key (follo	Key Check followed	Observations	Changes in the current crop
	>	×		management practices
Seed Quality 1. Used certified seeds of a recommended variety				
Land Preparation 2. Well-leveled field				
Crop Establishment 3. Practiced synchronous planting after a rest period 4. Sufficient number of healthy seedlings				
Nutrient Management 5. Sufficient nutrients from tillering through EPI and flowering stages				
Water Management 6. Avoided stress caused by drought or excessive water that could affect the growth and yield of the crop				
Pest Management 7. No significant yield loss due to pests				
Harvest Management 8. Harvested the crop at the right time				
Postharvest Management 9. Dried, cleaned, and stored grains properly				

		Ave. Yield	Max.Yield	Maturity	Height	
Variety	Local name	(t/ha)	(t/ha)	(DAS)	(cm)	Number of productive tillers per hill
PSB Rc 2	Nahalin	5.1	7.1	123	66	15
PSB Rc 4	Molawin	4.6	6.1	104	81	17
PSB Rc 6	Carranglan	5.2	6.8	112	84	14
PSB Rc 8	Talavera	5.0	7.1	108	82	13
PSB Rc 10	Pagsanjan	4.8	7.5	106	77	16
PSB Rc 18	Ala	5.1	8.1	123	102	15
PSB Rc 20	Chico	4.9	7.1	111	86	16
PSB Rc 22	Liliw	5.0	7.2	129	96	15
PSB Rc 28	Agno	5.0	7.6	111	93	16
PSB Rc 30	Agus	5.0	8.0	118	88	16
PSB Rc 32	Jaro	5.2	8.8	112	94	16

2 AGRONOMIC CHARACTERISTICS OF INBRED RICE VARIETIES FOR TRANSPLANTED IRRIGATED LOWLAND

		Ave. Yield	Max.Yield	Maturity	Height	-
Variety	Local name	(t/ha)	(t/ha)	(DAS)	(cm)	Number of productive tillers per hill
PSB Rc 34	Burdagol	4.8	10.3	124	101	16
PSB Rc 52	Gandara	5.3	5.3	115	86	16
PSB Rc 54	Abra	5.0	9.9	113	91	15
PSB Rc 56	Dapitan	5.3	7.5	114	88	17
PSB Rc 58	Mayapa	4.9	7.3	124	93	14
PSB Rc 64	Kabacan	5.0	8.9	124	96	14
PSB Rc 66	Agusan	5.2	10.2	123	06	17
PSB Rc 74	Aklan	5.2	8.3	114	92	15
PSB Rc 78	Pampanga	5.0	9.5	111	94	15
PSB Rc 80	Pasig	5.0	8.7	112	92	14

% AGRONOMIC CHARACTERISTICS ... TRANSPLANTED (Continuation)

		Ave. Yield	Ave. Yield Max.Yield Maturity Height	Maturity	Height	
Variety	Local name	(t/ha)	(t/ha)	(DAS)	(cm)	Number of productive tillers per hill
PSB Rc 82	Peñaranda	5.4	12.0	110	100	15
IR69726-29-1-2-2-2	Matatag 2	4.4	7.6	116	105	13
NSIC Rc 110	Tubigan 1	4.8	6.6	113	91	14
NSIC Rc 112	Tubigan 2	4.6	7.3	111	92	14

AGRONOMIC CHARACTERISTICS OF INBRED RICE VARIETIES FOR TRANSPLANTED/ **DIRECT WET-SEEDED IRRIGATED LOWLAND**

Varietv	Local name	Recommendation	Establishment	Ave. Yield	Max. Yield	Maturity	Height	Number of productive tillers
		domain	method	(t/ha)	(t/ha)	(DAS)	(cm)	(TPR - per hill; DWSR - per m²)
NSIC Rc 118	Matatag 3		TPR	4.6	6.7	107	95	14
NSIC Rc 120	Matatag 6		TPR	4.8	6.6	109	91	15
NSIC Rc 122	Angelica		TPR	4.7	8.9	121	106	14
NSIC Rc 128	Mabango 1 (A)		TPR	5.5	6.2	118	66	14
NSIC Rc 130	Tubigan 3		TPR/ DWSR	4.9/4.8	7.6/ 7.9	108/ 104	89/87	14/ 226
NSIC Rc 134	Tubigan 4		TPR/ DWSR	5.4/ 5.4	9.8/ 9.7	107/103	90/87	14/ 236
NSIC Rc 138	Tubigan 5		TPR/ DWSR	5.4/5.5	8.0/ 8.7	111/ 106	94/92	15/ 292

Varietv	Local name	Recommendation	Establishment	Ave. Yield	Max. Yield	Maturity	Height	Number of productive tillers
		domain	method	(t/ha)	(t/ha)	(DAS)	(cm)	(TPR - per hill; DWSR - per m²)
NSIC Rc 140	Tubigan 6		TPR/ DWSR	5.7/5.5	8.7/ 6.7	110/ 104	94/92	14/ 291
NSIC Rc 142	Tubigan 7		TPR/ DWSR	5.6/ 5.6	7.8/9.2	112/ 105	88/ 85	14/ 285
NSIC Rc 144	Tubigan 8		TPR/ DWSR	5.3/5.5	7.9/8.6	107/103	94/93	14/231
NSIC Rc 146	(PJ7)		TPR/ DWSR	4.6/ 4.7	6.9/ 7	110/ 104	101/99	14/ 105
NSIC Rc 148	Mabango 2		TPR	4.6	6.0	111	91	14
NSIC Rc 150	Tubigan 9		TPR/ DWSR	5.9/ 5.9	8.5/7.2	109/ 102	96/92	14/ 303
NSIC Rc 152	Tubigan 10		TPR/ DWSR	6.0/ 5.8	8.7/ 8.0	109/ 102	97/95	15/ 345
NSIC Rc 154	Tubigan 11		TPR	5.9	8.1	110	95	14

Varietv	Local name	Recommendation	Establishment	Ave. Yield	Max. Yield	Maturity	Height	Number of productive tillers
		domain	method	(t/ha)	(t/ha)	(DAS)	(cm)	(TPR - per hill; DWSR - per m²)
NSIC Rc 156	Tubigan 12		TPR/ DWSR	5.7/5.6	8.5/9.5	111/ 104	92/88	14/ 346
NSIC Rc 158	Tubigan 13		TPR	6.0	8.1	113	94	15
NSIC Rc 160	Tubigan 14		TPR/ DWSR	6.4/ 5.6	7.3/8.2	122/ 107	-/ 96	-/314
NSIC Rc 170	MS 11		TPR	4.5	6.7	112	06	16
NSIC Rc 172	MS 13		TPR	4.6	5.9	112	78	16
NSIC Rc 212	Tubigan 15		TPR/ DWSR	6.0/ 5.6	10/ 7.4	115/111	109/ 104	15/ 294
NSIC Rc 214	Tubigan 16		TPR/ DWSR	6.0/ 5.5	10.2/ 9.2	116/ 110	106/ 103	15/ 290
NSIC Rc 216	Tubigan 17		TPR/ DWSR	6.0/ 5.7	9.7/9.3	112/ 104	96/92	14/ 285

96

Reconomic CHARACTERISTICS... TRANSPLANTED/ DIRECT WET-SEEDED (Continuation)

Varietv	Local name	Recommendation	Establishment	Ave. Yield	Max. Yield	Maturity	Height	Number of productive tillers
		domain	method	(t/ha)	(t/ha)	(DAS)	(cm)	(TPR - per hill; DWSR - per m²)
NSIC Rc 218 SR	Mabango 3		TPR	3.8	8.0	120	106	14
NSIC Rc 220 SR	Japonica 1		TPR	2.8	5.8	109	89	13
NSIC Rc 222	Tubigan 18		TPR/ DWSR	6.1/ 5.7	10/7.9	114/ 106	101/98	14 / 278
NSIC 2010 Rc 224	Tubigan 19		TPR	5.8	9.1	111	104	14
NSIC 2010 Rc 226	Tubigan 20		TPR/ DWSR	6.2/5.4	9.8/8.5	112/ 104	102/ 102	14/ 295
NSIC 2011 Rc 238	Tubigan 21	National, DS & WS	TPR	6.4	10.6	110	104	15
NSIC 2011 Rc 240	Tubigan 22	National, DS & WS	TPR/ DWSR	6.4/ 5.8	10.6/ 7.6	115/ 108	107/104	12/ 259
NSIC 2012 Rc 298	Tubigan 23	National, DS & WS	TPR/ DWSR	5.6/ 5.3	9.9/ 8.2	116/ 104	-/ 93	-/273
NSIC 2012 Rc 300	Tubigan 24	National, DS & WS	TPR/ DWSR	5.7/5.3	10.4/9	115/ 105	98/96	15/ 269

domain blackdomain blackmethod (r/ha) (r/ha) (P/ha)		Varietv	Local name	Recommendation	Establishment	Ave. Yield	Max. Yield	Maturity	Height	Number of productive tillers
NSIC 2012 Rc 302 Tubigan 25 National, DS & WS TPR/DWSR 5.7/5.1 10.4/ 115/106 NSIC 2013 Rc 308 Tubigan 26 Mindanao TPR/DWSR 5.8 10.9 111 NSIC 2013 Rc 308 Tubigan 26 Mindanao TPR/DWSR 5.8 10.9 111 NSIC 2013 Rc 308 Tubigan 27 Uisayas DWSR 5.5 8.0 1015 NSIC 2014 Rc 352 Tubigan 27 Luzon TPR 5.1 10.7 111 NSIC 2014 Rc 354 Tubigan 27 Luzon Prescond 5.4 9.0 112 NSIC 2014 Rc 356 Tubigan 29 National, DS & WS TPR 5.4 9.0 112 NSIC 2014 Rc 356 Tubigan 29 Visayas TPR 5.4 9.0 116 NSIC 2014 Rc 356 Tubigan 30 Visayas TPR 5.4 9.1 114 NSIC 2014 Rc 358 Tubigan 31 Visayas TPR 5.4 9.1 114 NSIC 2014 Rc 358 Tubigan 31 Visayas<				domain	method	(t/ha)	(t/ha)	(DAS)	(cm)	(TPR - per hill; DWSR - per m²)
NSIC 2013 Rc 308 Tubigan 26 Mindanao TPR/DWSR 5.8 10.9 111 NSIC 2013 Rc 308 TUbigan 27 Visayas DWSR 5.5 8.0 1055 1055 NSIC 2014 Rc 352 Tubigan 27 Uuzon TPR 5.1 10.7 111 111 NSIC 2014 Rc 354 Tubigan 28 National, DS & WS TPR 5.4 9.0 1125 NSIC 2014 Rc 354 Tubigan 29 National, DS & WS TPR 5.4 9.0 1145 NSIC 2014 Rc 356 Tubigan 29 Visayas TPR 5.4 9.0 1146 NSIC 2014 Rc 358 Tubigan 30 Visayas TPR 5.4 9.1 1146 NSIC 2014 Rc 358 Tubigan 31 Visayas TPR 5.2 8.2 118 NSIC 2014 Rc 350 Tubigan 31 Visayas TPR 5.4 9.1 1144 NSIC 2014 Rc 350 Tubigan 31 Visayas TPR 5.4 9.1 1146 <td></td> <td>NSIC 2012 Rc 302</td> <td>Tubigan 25</td> <td>National, DS & WS</td> <td>TPR/ DWSR</td> <td>5.7/5.1</td> <td>10.4/ 9.5</td> <td>115/ 106</td> <td>100/ 96</td> <td>15/ 266</td>		NSIC 2012 Rc 302	Tubigan 25	National, DS & WS	TPR/ DWSR	5.7/5.1	10.4/ 9.5	115/ 106	100/ 96	15/ 266
MSIC 2014 Rc 352 Uusgan 27 Uuzon DWSR 5.5 8.0 105 NSIC 2014 Rc 352 Tubigan 27 Luzon TPR 5.1 10.7 111 NSIC 2014 Rc 354 Tubigan 28 National, DS & WS TPR 5.4 9.0 112 NSIC 2014 Rc 354 Tubigan 29 Visayas TPR 5.4 9.0 116 NSIC 2014 Rc 356 Tubigan 29 Visayas TPR 5.4 9.0 116 NSIC 2014 Rc 358 Tubigan 30 Visayas TPR 5.4 9.1 114 NSIC 2014 Rc 358 Tubigan 31 Visayas TPR 5.4 9.1 114 NSIC 2014 Rc 358 Tubigan 31 Visayas TPR 5.2 8.2 118 NSIC 2014 Rc 360 Tubigan 32 Luzon TPR/DWSR 5.3/ 5.2 9.1/ 112/ 106		NSIC 2013 Rc 308	Tubigan 26	Mindanao	TPR/DWSR	5.8	10.9	111	66	15
NSIC 2014 Rc 352 Tubigan 27 Luzon TPR 5.1 10.7 111 NSIC 2014 Rc 354 Tubigan 28 National, DS & WS TPR 5.4 9.0 112 NSIC 2014 Rc 356 Tubigan 29 Visayas TPR 5.4 9.0 116 NSIC 2014 Rc 356 Tubigan 29 Visayas TPR 5.4 9.0 116 NSIC 2014 Rc 358 Tubigan 30 Visayas TPR 5.4 9.1 114 NSIC 2014 Rc 358 Tubigan 31 Visayas TPR 5.4 9.1 114 NSIC 2014 Rc 350 Tubigan 31 Visayas TPR 5.2 8.2 118 NSIC 2014 Rc 3504 Tubigan 32 Luzon TPR/DWSR 5.3/ S.2 9.1/ 112/ 106				Visayas	DWSR	5.5	8.0	105	94	294
NSIC 2014 Rc 354 Tubigan 28 National, DS & WS TPR 5.4 9.0 112 NSIC 2014 Rc 356 Tubigan 29 Visayas TPR 5.0 9.0 116 NSIC 2014 Rc 356 Tubigan 29 Visayas TPR 5.0 9.0 116 NSIC 2014 Rc 358 Tubigan 30 Visayas TPR 5.4 9.1 114 NSIC 2014 Rc 358 Tubigan 31 Visayas TPR 5.4 9.1 114 NSIC 2014 Rc 360 Tubigan 31 Visayas TPR 5.2 8.2 118 NSIC 2014 Rc 360 Tubigan 32 Luzon TPR/ DWSR 5.3/ 5.2 9.1/ 112/ 106		NSIC 2014 Rc 352	Tubigan 27	Luzon	TPR	5.1	10.7	111	104	14
NSIC 2014 Rc 356 Tubigan 29 Visayas TPR 5.0 9.0 116 NSIC 2014 Rc 358 Tubigan 30 Visayas TPR 5.4 9.1 114 NSIC 2014 Rc 350 Tubigan 31 Visayas TPR 5.2 8.2 118 NSIC 2014 Rc 360 Tubigan 31 Visayas TPR 5.2 8.2 118 NSIC 2015 Rc 394 Tubigan 32 Luzon TPR/DWSR 5.3/ S.2 9.1/ 112/ 106		NSIC 2014 Rc 354	Tubigan 28	National, DS & WS	TPR	5.4	9.0	112	95	14
NSIC 2014 Rc 358 Tubigan 30 Visayas TPR 5.4 9.1 114 NSIC 2014 Rc 360 Tubigan 31 Visayas TPR 5.2 8.2 118 NSIC 2014 Rc 360 Tubigan 31 Visayas TPR 5.2 8.2 118 NSIC 2015 Rc 394 Tubigan 32 Luzon TPR/ DWSR 5.3/ 5.2 9.1/ 112/ 106		NSIC 2014 Rc 356	Tubigan 29	Visayas	TPR	5.0	9.0	116	105	14
NSIC 2014 Rc 360 Tubigan 31 Visayas TPR 5.2 8.2 118 NSIC 2015 Rc 394 Tubigan 32 Luzon TPR/ DWSR 5.3/ 5.2 9.1/ 112/ 106		NSIC 2014 Rc 358	Tubigan 30	Visayas	TPR	5.4	9.1	114	98	14
NSIC 2015 Rc 394 Tubigan 32 Luzon TPR/ DWSR 5.3/ 5.2 9.1/ 112/ 106		NSIC 2014 Rc 360	Tubigan 31	Visayas	TPR	5.2	8.2	118	103	14
	98	NSIC 2015 Rc 394	Tubigan 32	Luzon	TPR/ DWSR	5.3/5.2	9.1/ 10.0	112/ 106	-/ 94	-/ 375

Varietv	Local name	Recommendation	Establishment	Ave. Yield	Max. Yield	Maturity	Height	Number of productive tillers
		domain	method	(t/ha)	(t/ha)	(DAS)	(cm)	(TPR - per hill; DWSR - per m²)
NSIC 2015 Rc 396	Tubigan 33	Visayas	TPR/ DWSR	4.9/5.1	9.1/ 10.3	114/ 106	-/ 63	-/ 358
NSIC 2015 Rc 398	Tubigan 34	Luzon	TPR/ DWSR	5.5/5.3	9.4/ 11.3	113/ 106	-/ 98	-/ 375
NSIC 2015 Rc 400	Tubigan 35	National	TPR/ DWSR	5.8/ 5.4	9.5/ 12.6	120/ 113	105/ 100	15/ 387
NSIC 2015 Rc 402	Tubigan 36	Luzon	TPR/ DWSR	5.5/5.5	10.0/ 14.0	114/ 107	-/ 95	-/ 395
NSIC 2016 Rc 436	Tubigan 37	Luzon and Visayas	TPR/ DWSR	5.7/5.4	10.0/ 10.2	107/101	93/ 92	14/ 301
NSIC 2016 Rc 438	Tubigan 38	Luzon and Visayas (TPR); National (DWSR)	TPR/ DWSR	5.4/5.4	10.3/ 9.6	106/ 102	95/92	13/ 306

Varietv	Local name	Recommendation	Establishment	Ave. Yield	Max. Yield	Maturity	Height	Number of productive tillers
		domain	method	(t/ha)	(t/ha)	(DAS)	(cm)	(TPR - per hill; DWSR - per m²)
NSIC 2016 Rc 440	Tubigan 39	National	TPR/ DWSR	5.5/5.3	10.8/ 9.0	109/ 102	95/91	14/ 320
NSIC 2016 Rc 442	Tubigan 40	Luzon (TPR); Mindanao (DWSR)	TPR/ DWSR	6.1/5.5	10.8/ 10.7	113/ 105	103/ 109	14/ 320
NSIC 2018 Rc 506	Tubigan 41	Visayas	TPR/ DWSR	5.9/ 5.8	10.0/ 8.7	111/ 104	96/66	13/ 277
NSIC 2018 Rc 508	Tubigan 42	Luzon	TPR/ DWSR	6.0/ 5.8	10.4/ 10.8	110/ 105	97/ 94	14/ 293
NSIC 2018 Rc 510	Tubigan 43	Visayas and Mindanao	TPR	5.7/5.4	10.3/ 9.8	110/ 104	105/ 106	13/ 275
NSIC 2018 Rc 512	Tubigan 44	National	TPR/ DWSR	5.6/ 5.6	10.2/ 10.1	113/ 105	92/93	13/ 275
NSIC 2018 Rc 514	Tubigan 45	Luzon and Visayas	TPR/ DWSR	6.0/ 5.3	9.9/ 10.9	112/ 103	95/92	13/ 273

100

NOTE.

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