Palaycheck System for Upland Rice Farming
Second Edition
1 Released Rice Varieties (1968-1994)
2 Pagpaparami at Pagpupuro ng Binhi sa Sariling Bukid
3 Paggawa ng Maligaya Rice Hull Stove
4 PhilRice Micromill
5 PhilRice Flourmill
6 PhilRice Drumseeder
7 PhilRice Rototiller
8 Rice Food Products
9 PhilRice-UAF Batch Dryer
10 Integrated Management of the Malayan Black Bug
11 SG800 Rice Stripper-Harvester
12 Dry-Seeded Rice-Based Cropping Technologies
13 Maligaya Rice Hull Stove
14 10 Steps in Compost Production
15 Rice Tungro Virus Disease
16 The Philippine Rice Seed Industry and The National Rice Seed Production Network
17 10 Hakbang sa Paggawa ng Kompost
18 10 nga Addang ti Panagaramid iti Kompost
19 Characteristics of Popular Philippine Rice Varieties
20 Rice Stem Borers in the Philippines
21 Rice Food Products (revised edition)
22 Leaf Color Chart (English)
23 Leaf Color Chart (Ilocano)
24 Leaf Color Chart (Filipino)
25 Equipment for Rice Production and Processing
26 Use of 40kg Certified Seeds per Hectare
27 Rice Wine
28 Management of Field Rats
29 Controlled Irrigation: Saving water while having good yield
30 Minus-one Element Technique: Soil Nutrition Deficiency Test Made Easy
31 Management of the Rice Black Bug
32 Management of Zinc-deficient Soils
33 Management Options for Golden Apple Snail
34 Use of Evaporation Suppressant
35 Pagpaparami ng Purong Binhi ng Palay
36 Management of Sulfur-Deficient Lowland Rice Soils
34 Use of Evaporation Suppressant
35 Pagpaparami ng Purong Binhi ng Palay
36 Management of Sulfur-Deficient Lowland Rice Soils
37 Management of Planthoppers and Leafhoppers
38 Management Options for Ricefield Weeds
39 Use of Indigo as Green Manure
40 Management of Salt-affected Soils for Rice Production
41 Wet-Seeded Rice Production
42 Matatag Lines
43 Hybrid Rice Seed Production
44 Metarhizium anisopliae: Microbial Control Agent for Rice Black Bug
45 Integrated Nutrient Management for Rice Production
46 Management of Armyworms/Cutworms
47 Carbonized Rice Hull
48 Rice-based Microbial Inoculant
49 Integrated Farm and Household Waste Management
50 Rice Postproduction Practices
51 Ecological Rice Farming
52 Modified Dry Direct Seeding Technology
53 Palayamanan: Making the Most out of Rice Farms
54 Practical Guidelines in Predicting Soil Fertility Status of Lowland Rice Soils
55 Bakanae: The Foolish Disease of Rice
56 Management of Rice Blast Disease
57 Root-knot Management in Rice-Onion Cropping System
58 Management of Yellow and White Stemborers
59 The PhilRice Dapog Technology
60 Rice Straw-Based Nutrient Management in Irrigated Lowland Rice
61 Biofertilizer Production: Vesicular Arbuscular Mycorrhizae (VAM)
62 Trichoderma: Biofungicide for vegetables
63 Barayt ng Palay handog ng PhilRice 2007-2009
64 Management of Zinc-deficient Soils (revised edition)
65 Soil Series: Improving Agricultural Productivity in Pampanga
66 Soil Series: Improving Productivity in Tarlac
67 Laboy tiller: Improving deep muddy and swampy rice lands
68 B&S Rice mini-combine harvester
69 Rice Disease Diagnostic Kit
70 Reducing Methane Emissions from Irrigated Ricefields
71 Rice Hull Gasifier Engine-Pump System
72 Kontroladong Pagpapatubig
73 Saclob: Airtight Storage for Rice Seeds
74 No Tillage Technology in Irrigated Rice Production
75 Mangement of Yellow and White Stemborer (2011)
76 Management Options for Ricefield Weeds (2011)
77 Management of Salt-Affected Soils
78 Pangangasiwa ng Dilaw at Puting Aksip
79 Metarhizium: Ang mikrobyo sa pagsugpo ng atangyang itim
80 Minus-One Element Technique (MOET): Pagsusuri ng Sustansiya sa Lupa
81 Rice Husk Gasifier Stove
82 PalayCheck System for Upland Rice Farming
83 Systemang Reduced Tillage para sa Palayang may Patubig
84 Mushroom Production
85 Postharvest Management Protocol
86 PhilRice Rototiller
87 PalayCheck System for Highland Rice Production
Upland rice farming is a community-based practice that relies mainly on local knowledge, particularly on the production aspects of traditional rice varieties. The development of the upland rice ecosystem offers an opportunity to augment the country’s rice supply and ensure food sufficiency of the upland farming communities. Hence, the Upland Rice Development Program (URDP) was crafted.

URDP targets a yield of 2-3 t/ha from the usual 1-2 t/ha. Also, the program aims to accelerate the adoption and integration of PalayCheck Upland Rice Farming technologies into the farming systems of participating communities.

PalayCheck is an integrated crop management system for rice, which provides recommendations on what to do and what to achieve based on best management practices for a particular agro-ecological condition. It seeks to integrate these recommendations at the farm-level, taking into account the interactions among management practices & other factors affecting yield, grain quality, and environment.

It is hoped that through this bulletin, the income of upland farmers could be increased and self-sufficient food communities would be established.
INTRODUCTION

The term upland rice has nothing to do with elevation. It has become associated with sloping and hilly areas because it is usually found in the uplands. Upland is usually found in sloping land with erosion problems and drought prone. Soils are typically dry, generally acidic, fragile, and less fertile. Weeds and diseases abound. The main source of water is rain.

On the other hand, upland rice can be grown in low-lying lands that are unbunded. Compared with lowland rice, upland rice has lower yield, partly because rice as a plant depends on nutrients that are dissolved in soil moisture. Upland rice usually yield from 1 to 2 t/ha.

One of the government’s missions is to help ensure the country’s security in rice. Tapping the potential of the upland rice areas could help feed communities living in the rolling and mountainous terrains of the Philippines. Hence, the Upland Rice Development Program (URDP) was crafted.

The URDP aims to harness the potential of the upland rice ecosystem as one source of the country’s rice supply; promote sustainable farming systems and practices in the upland communities thus increasing the farmers’ income; develop the upland peoples as self-sufficient food communities; and establish a seed propagation program and protocols for traditional and modern rice varieties released for cultivation in the upland ecosystem.
KEYCHECK 1: Used high quality seeds of recommended traditional and modern upland rice varieties.

Seeds that are pure, clean, full, and uniform in size and have minimum germination rate of 85% result in less weeds, healthy seedlings, stronger to pest resistance, fast and uniform growth, and 10-15% increase in yield.

**Popular traditional rice varieties**
Palaweña, Asuzena, Dinorado

**Popular modern rice varieties**
NSIC Rc9, UPL RI 5, NSIC Rc11, Rc23, Rc25, Rc27, Rc29, Rc192

**ASSESSMENT OF KEYCHECK:** Used high quality seeds of traditional and modern upland rice varieties recommended in the locality or have tested and proven resistant and high yielding (at least 2-2.5 t/ha).
### Traditional upland rice varieties

<table>
<thead>
<tr>
<th>Regions</th>
<th>Varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAR</td>
<td>Palawan, Mimis, Azucena, Pinilisa</td>
</tr>
<tr>
<td>1</td>
<td>Palawan, Kamuros, Inumay</td>
</tr>
<tr>
<td>2</td>
<td>Palawan, Mimis, Galo, Kamuros, Pinilisa</td>
</tr>
<tr>
<td>3</td>
<td>Palawan, Galo, Binernal white, Dinurado, Binundok, Kalibo, Balatinaw</td>
</tr>
<tr>
<td>4A</td>
<td>Binerhen, Kinamuros, Kinandang, Inipot-ibon, Pirurutong</td>
</tr>
<tr>
<td>4B</td>
<td>Kamuros, Inipot-ibon, Inasucena, Dinurado, Milagrosa</td>
</tr>
<tr>
<td>5</td>
<td>Dinorado, Palawan, Gios, Binerhen</td>
</tr>
<tr>
<td>6</td>
<td>Dinorado, Malido, Manumbaiay, Azucena, Palawan</td>
</tr>
<tr>
<td>7</td>
<td>Dinorado, Kamuros, Azucena,</td>
</tr>
<tr>
<td>8</td>
<td>Kalinayan, Baysilanon, Kanukot</td>
</tr>
<tr>
<td>9</td>
<td>Dinorado, Remulites, Mimis, Zambales, Azucena</td>
</tr>
<tr>
<td>10</td>
<td>Dinorado, Azucena, Dumudao, Palawanon, Mimis, Maria Gakit</td>
</tr>
<tr>
<td>11</td>
<td>Dinorado, Peria, Remulites, Azucena</td>
</tr>
<tr>
<td>12</td>
<td>Dinorado, Azucena, Hinomay, Kasagpi</td>
</tr>
<tr>
<td>13</td>
<td>Dinorado, Azucena, Mimis, Remulites</td>
</tr>
<tr>
<td>ARMM</td>
<td>Dinorado, Hinumay, Azucena, Kiraban, Kapukaw</td>
</tr>
</tbody>
</table>

### Modern upland rice varieties

<table>
<thead>
<tr>
<th>Varieties</th>
<th>Average Yield (t/ha)</th>
<th>Max. Yield (t/ha)</th>
<th>Maturity (Days after Sowing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSB Rc1 (Makiling)</td>
<td>2.4</td>
<td>3.9</td>
<td>121</td>
</tr>
<tr>
<td>PSB Rc3 (Ginilingan Puti)</td>
<td>2.9</td>
<td>6.0</td>
<td>123</td>
</tr>
<tr>
<td>PSB Rc5 (Arayat)</td>
<td>2.9</td>
<td>4.2</td>
<td>122</td>
</tr>
<tr>
<td>NSIC Rc9 (Apo)</td>
<td>2.9</td>
<td>5.5</td>
<td>119</td>
</tr>
<tr>
<td>NSIC Rc11 (Canlaon)</td>
<td>2.6</td>
<td>4.9</td>
<td>125</td>
</tr>
<tr>
<td>UPLR 1 to 7</td>
<td>2.8</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>NSIC Rc23</td>
<td>2.9</td>
<td></td>
<td>108</td>
</tr>
<tr>
<td>NSIC Rc192 (Rainfed lowland)</td>
<td>3.7</td>
<td>5.5</td>
<td>106</td>
</tr>
</tbody>
</table>
KEYCHECK 2: Fields prepared on time.

Good land preparation is important for early growth of rice and promotes vigorous seedlings and uniform plant growth.

1. Plow/rotovate the land after harvest of previous crop. For flat lands, plow once, and disc-harrow twice after the first rains to make good tilth and for better crop growth.

2. Construct furrows 30-40 cm apart, depending on weed control implement available.

3. For sloping topographies, contour-plow and disc-harrow once. Construct hedge rows across the slope using strips fodder grass or perennial plants of short stature to prevent soil erosion.
**KEYCHECK 3:** Practiced synchronous planting with upland and lowland rice areas.

Synchronous planting within one month avoids the overlapping incidence of insect and disease populations.

**ASSESSMENT OF KEYCHECK:** The field had been planted 14 days before and after the majority of the upland and lowland rice areas have been planted to prevent the spread of pest damage.
KEYCHECK 4: Sufficient number of healthy seedlings.

**Furrow seeding**
Cover the seeds by lightly sweeping soil towards the seed to cover it.

**Manual broadcasting**
Cover the seeds by lightly harrowing the field after seeding.

Healthy seedlings compete better against weeds, and have better root growth, resulting in a more efficient nutrient use.
Drill seeding

Make a hole using a pointed pole with an average distance of 25-30 cm apart. Drop 5-7 seeds per hole, and lightly cover with thin soil. Land preparation is an option.

Machine seeding

Machine seeding only needs 20-60 kg of seeds per hectare. Space between seeds should be uniform to produce vigorous seedlings.

**ASSESSMENT OF KEYCHECK:** Direct dry seeded at 30 days after seeding achieved at least 80 healthy seedlings/m² for a seeding rate of 40-60 kg/ha (5-7 seeds at 25 cm x 25 cm hill distance; 65 seedlings/m² for a furrow seeding at 25-30 cm furrow distance).

**Advantages of seeding in rows:**

- Easy weeding and application of other inputs (i.e., fertilizers and pesticides).
- Promotes good stand and higher yield.
Broadcast organic materials/fertilizer evenly after plowing.

- Apply the right amount of organic and inorganic fertilizers at appropriate growth stage.
- Fertilizer application should be based on soil analysis and or production experience.
- For organic rice cultivation of traditional rice varieties, incorporate any available animal manure (1.5 t/ha), farm biomass, biofertilizers, vermicast, green manure (legumes), trichoderma-based compost, and indigenous micro-organism.

Direct dry seeded: At ripening, panicle density should be at least 80 panicles/m² for traditional rice varieties and 150 panicles/m² for modern upland rice variety to achieve yield of 2-3 t/ha for traditional varieties and 3-4 t/ha for modern varieties.

**ASSESSMENT OF KEYCHECK:** Sufficient nutrient at tillering to panicle initiation and flowering.
KEYCHECK 6: No frequent and excessive rainfall or less rainfall resulting in water stress that could affect the growth and yield of the crop.

- Excessive rainfall results in less tiller, stunted growth, discolored, and unfilled-half-filled grains at ripening.
- Insufficient water causes drying and rolling of leaves.

ASSESSMENT OF KEYCHECK: No symptoms of stress due to excessive rainfall and drought stress.
KEYCHECK 7: No significant yield loss due to pests.

Integrated Pest Management Recommendations

- Use pest-resistant rice varieties.
- Use clean, purified, and healthy seeds.
- Observe field sanitation; remove alternate hosts, such as weeds.
- Monitor fields regularly for signs and symptoms of pest infestation, population of insect pests vs. natural enemies, damage and plant nutrition assessment.
- Use pesticides as a corrective measure during pest outbreak.

Know how the rice crop interacts with the biotic factors, agro-ecosystem, and crop management system.

Correctly identify pest and integrated crop management.

ASSESSMENT OF KEYCHECK: No significant yield loss due to insect pests, diseases, weeds, rats, snails, and birds. Significant pest damage occurs when one or more pests cause damage.
**Metarhizium anisopliae: Microbial control agent for rice black bug**

- Attacks rice black bug (RBB) with its infectious green spores that germinate once they come in contact with the RBB’s skin
- Forms extensive hyphal growths within the RBB’s body that penetrate into its blood vessels and invade its body cavity
- Produce toxins that paralyze and kill RBB

**Advantages**

- Cheaper than synthetic insecticides
- Does not leave any residue on the crops that may be harmful to humans and applicable to organic agriculture
- One preparation of *Metarhizium* contains 2.5 trillion spores. One planting season requires only two to three applications, whereas five to six applications are required for chemical pesticides.

**Directions for use**

- Use 4 sachets of *M. anisopliae* for every sprayer load.
- When mixing, partially fill the sprayer tank to half level and add 1 teaspoon detergent powder.
- Pour the entire content of four sachets into the tank with continuous stirring and agitation.
- Fill the tank to its required level (16 L/tankload) and continue to agitate.
Application

- Spray the solution on the rice paddy early in the morning or late in the afternoon and ensure contact between the fungus and the RBB.
- Use 40 sachets or 200 grams of *M. anisopliae* per hectare.

*Metarhizium* spores are like dust particles that are easily blown at the slightest movement. When adding soap or detergent solution, extra care should be given in such a way that escape of the spores could be prevented.

Disease Management

Disease Management Recommendations

- Diagnose disease correctly.
- Practice field sanitation.
- Only use pesticide as a corrective and not as a preventive measure.
- Monitor field from time to time.
- Observe one month fallow period to minimize disease occurrence.
- Avoid too much fertilizer, especially nitrogen.
CONSIDER

Disease distribution, spread, occurrence, condition of the field, presence of other organisms, toxic substances, and disease symptoms.

Weed Management

- Use weed-free seeds.
- Apply pre-emergence herbicide 1-2 days after seeding. Make sure the soil is moist when applying herbicide.
- Do follow-up application of post emergence herbicide when seeds are at 2-leaf stage or as needed.
- Spot weed when needed.
- Do inter-row cultivation plus hand weeding 14 and 28 days after emergence.
- Continue weeding until the rice canopy close in approximately 6 to 7 weeks after seed emergence.

Some recommended herbicides for upland rice:

- Oxadiazon (Ronstar) at 1 kg a.i./ha (4 L/ha)
- Pendimethalin (Herbadox) at 1-2 kg a.i./ha (3-6 L/ha) to control grasses particularly R. cochinchinensis
- 2,4-D for broadleaf and sedge control
- In areas where Imperata sp. (cogongrass) is a problem, application of glyphosate is recommended.
Mulching or ground covering with legume plants can play a very important role in improving the soil fertility and managing perennial weeds.

Other Pests

Bird Management

- Birds are abundant in rice fields during the ripening phase. They damage the panicles and eat the grains. They also eat germinating seeds.

- Scaring away is a practical solution.

- Practice synchronous planting.

Rat Management

- Sanitize fields, implement community rat hunting, or install a community trap barrier system (CTBS).

- Use acute rodenticide only during outbreaks.

- Plant crops, such as adlay and corn along the borders of the field, which will serve as trap crops.
**KEYCHECK 8:** Cut and threshed the crop at the right time.

Harvest panicles at least 85% maturity, thresh immediately, and dry at 14% moisture content for milling and 12% for planting.

<table>
<thead>
<tr>
<th>EARLY HARVESTING</th>
<th>LATE HARVESTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large percent of immature and half-filled grains</td>
<td>Grain shattering</td>
</tr>
<tr>
<td>Low milling recovery</td>
<td>Milling breakage</td>
</tr>
<tr>
<td>Low grain quality</td>
<td>Low grain quality</td>
</tr>
</tbody>
</table>

Thresh the *palay* not later than 1-2 days after harvesting, especially for modern upland varieties or keep harvested panicles in bundles for sundrying and threshing.
Hermetic Storage

- Hermetic (water and gas-tight) storage controls insects without the use of chemicals, prevents mold growth, and maintains seed germination for 6 to 8 months.

- Clean and store seeds in air-tight, cool, dry, and rat proof containers.

- Portable, needs minimal structure, and easy to install.
References

2012 Briefer, Upland Rice Development Program.


Rice Technology Bulletin on Modified Direct Dry Seeding Technology, PhilRice.

Photo Credits

International Rice Research Institute
Philippine Rice Research Institute
Local Government Unit, Arakan
Local Government Unit, Pudtol
Department of Agriculture- Upland Technology
Subject Matter Specialists
Ruben B. Miranda
Upland Rice Technologists

Managing Editor
Christina A. Frediles

Layout Artist
Jayson C. Berto

Editorial Advisers
Ronan G. Zagado, PhD
Sailila E. Abdula, PhD

First edition: 2013

Readers are encouraged to reproduce the content of this bulletin with acknowledgement.
We are a chartered government corporate entity under the Department of Agriculture. We were created through Executive Order 1061 on 5 November 1985 (as amended) to help develop high-yielding, cost-reducing, and environment-friendly technologies so farmers can produce enough rice for all Filipinos. We accomplish this mission through research and development work in our central and seven branch stations, coordinating with a network that comprises 58 agencies and 70 seed centers strategically located nationwide. To help farmers achieve holistic development, we will pursue the following goals in 2010-2020: attaining and sustaining rice self-sufficiency; reducing poverty and malnutrition; and achieving competitiveness through agricultural science and technology. We have the following certifications: ISO 9001:2008 (Quality Management), ISO 14001:2004 (Environmental Management), and OHSAS 18001:2007 (Occupational Health and Safety Assessment Series).

CONTACT US:

PHILRICE CENTRAL EXPERIMENT STATION
Science City of Muñoz, 3119 Nueva Ecija • Tel: (044) 456-0277; Direct line/Telefax: (044) 456-0112; Email: prii.mail@philrice.gov.ph

PHILRICE BATAC, MMSU Campus, Batac City, 2906 Ilocos Norte; Telefax: (077) 670-1867; 772-0654; 670-1867; Email: batac.station@philrice.gov.ph

PHILRICE ISABELA, San Mateo, 3318 Isabela; Telefax: (078) 664-2954; 664-2953; Mobile: 0908-8957796; 0915-765-210; Email: isabela.station@philrice.gov.ph

PHILRICE LOS BAÑOS, UPLB Campus, College, 4031 Laguna; Telefax: (049) 501-1917; (049) 536-8620; Mobile: 0920-911-1420; Email: losbanos.station@philrice.gov.ph

PHILRICE BICOL, Batang Ligao City, 4504 Albay; Telefax: (052) 284-4860; Mobile: 0918 946-7439; Email: bicol.station@philrice.gov.ph

PHILRICE NEGROS, Cansilayan, Murcia, 6129 Negros Occidental; Mobile: 0932-850-1531; 0915-349-0142; Email: negros.station@philrice.gov.ph

PHILRICE AGUSAN, Basilisa, RTRomualdez, 8611 Agusan del Norte; Telefax: (085) 343-0768; (085) 343-0768; Email: agusan.station@philrice.gov.ph

PHILRICE MIDSAYAP, Bual Norte, Midsayap, 9410 North Cotabato; Telefax: (064) 229-8178; (064) 229-7241 to 43; Email: midsayap.station@philrice.gov.ph

PHILRICE FIELD OFFICE, CMU Campus, Maramag, 8714 Bukidnon; Mobile: 0916-367-6086; 0909-822-9813

LIAISON OFFICE, 3rd Flor. ATI Bldg, Elliptical Road, Diliman, Quezon City; Tel/Fax: (02) 920-5129

SATELLITE STATIONS:

MINDORO SATELLITE STATION, Alacaak, Sta. Cruz, 5105 Occidental Mindoro; Mobile: 0908-104-0855

SAMAR Satellite Station, UEP Campus, Catamaran, 6400 Northern Samar; Mobile: 0948-800-5284