Rice Technology Bulletin

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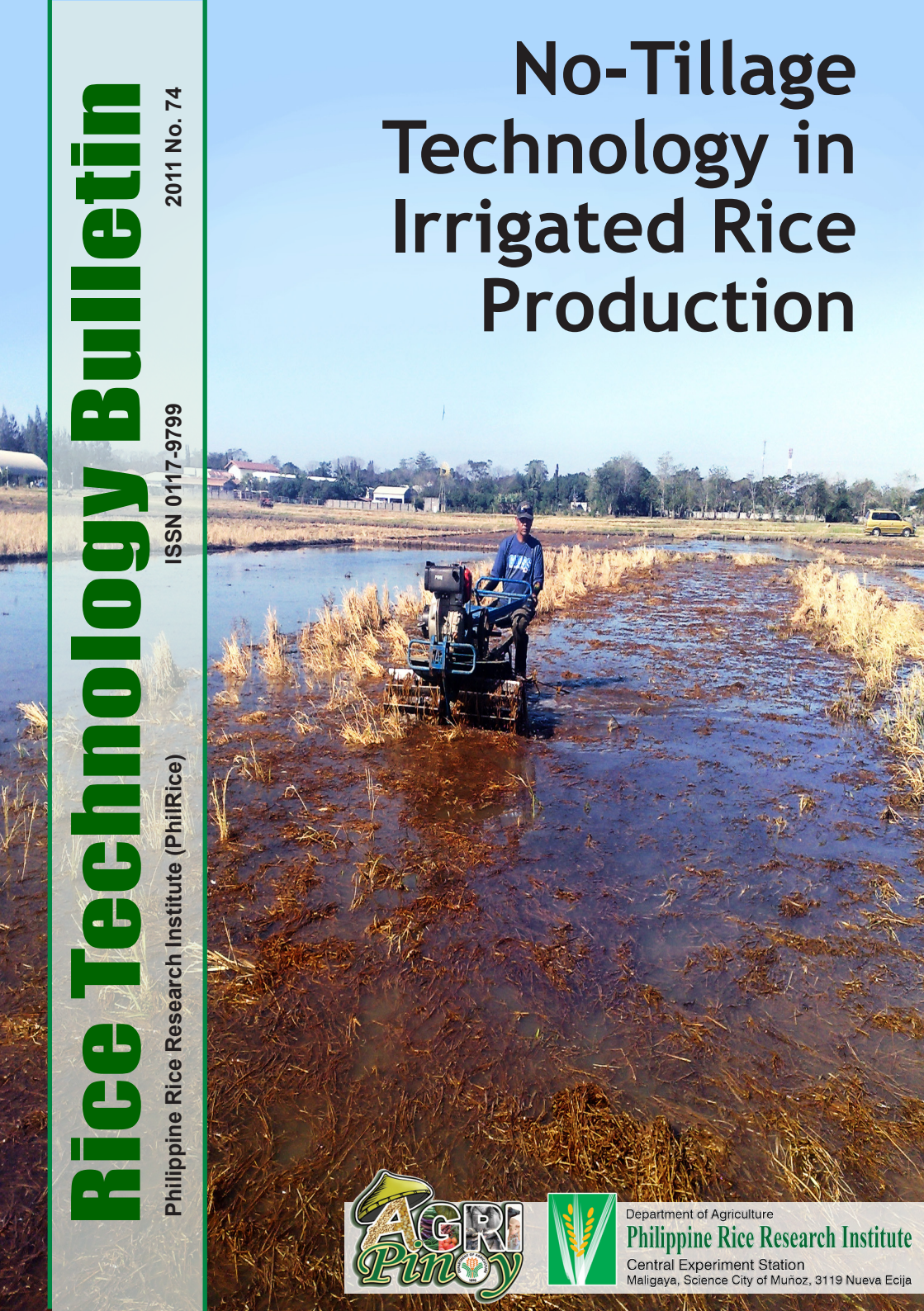
Philippine Rice Research Institute (PhilRice)

No-Tillage Technology in Irrigated Rice Production



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Maligaya, Science City of Muñoz, 3119 Nueva Ecija

Rice Technology Bulletin Series

No.

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 Barayti 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: Paraan ng Pagtitipid na Di Bumababa ang Ani
73 Saclob: Airtight Storage of Rice Seeds

Foreword

Over the past 100 years, soil resource has suffered from degradation. Much of it has lost up to one half of its native organic matter content. The major contributor to this trend in soil organic matter loss is the burning or removal of crop residue to facilitate plowing and harrowing of soil in preparing the land for seeding.

This technology bulletin promotes the use of a No-Tillage technology in preparing the rice field. The technology does not involve plowing and harrowing in contrast to conventional tillage. It also incorporates all crop residues into the soil.

Research results have shown that No-Tillage may improve soil condition over time. Availability of organic nitrogen is also higher in soil with long term use of no-tillage than in fields using conventional tillage.

Also, practicing No-Tillage shows significant labor savings.

It is hoped that with this bulletin, farmers and extension workers may be encouraged to practice and promote the No-Tillage technology. This technology will not only lessen production costs and increase farm income, but also help in mitigating or adapting to climate change.

Introduction

Traditionally, land preparation is done by plowing and harrowing using draft animal or hand tractor. With the increasing cost of labor, fuel, fertilizer, and other input costs, No-Tillage is developed as an alternative.

No-Tillage is simply preparing the rice field without using a plow or harrow. Hence, it reduces the cost of rice production and increases farmers' net income.

Moreover, recent extreme adversities in weather patterns highlighted the need to deal with climate change. Agriculture releases to the atmosphere some greenhouse gases such as carbon dioxide, methane, and nitrous oxide, which contribute to global warming.

Carbon dioxide is released largely from microbial decay or burning of plant litter and soil organic matter (Janzen, 2004). Methane is produced when organic materials decompose in oxygen-deprived conditions, notably from fermentative digestion by ruminant livestock, from stored manures, and from rice grown under flooded conditions (Mosier et al. 1998). Rice fields account for 5–20% of all global methane sources (Wassman and Alberto 2010).

No-Tillage crop production reduces soil erosion and conserves soil. It means less or no machine is used for land preparation saving fuel and less soil disturbance, thus, less carbon emission and more carbon storage in the soil. By keeping crop residues in the field, No-Tillage builds soil organic matter, thus, increases soil carbon sequestration, increases water infiltration, and reduces evaporation and run off.

Practicing No-Tillage technology not only lessens production costs and increases farm income, but also helps in mitigating or adapting to climate change especially during drought condition.

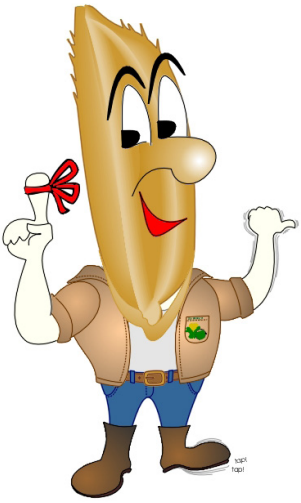
No-Tillage

A technology in which crops are grown from year to year without disturbing the soil through plowing and harrowing.

Why Use No-Tillage

- Lessens labor cost which represents 62-70% of total input costs in rice production;
- Reduces land preparation cost, increasing income from rice production;
- Mitigates or adapts to climate change;
- Provides solution to water scarcity;
- Increases nutrient supply of the soil due to non-burning of rice straw;

- Operations are carried out within a period of 15-19 days;
- Crop establishment may be done by direct seeding or transplanting;
- Usual crop care and maintenance activities such as spraying of post-emergence herbicide and molluscicide (only if necessary), fertilizer application, irrigation water management and hand-weeding are strictly observed;
- Irrigation water and drainage are controlled through construction of additional border dikes within the field. Terminal field drainage is carried out 14 days before harvest;
- Time and operations needed for land preparation is decreased reducing the amount of water used. With the usual 20-30 days of wetland preparation time, 30% of the total water needed for a crop of transplanted rice is used during land preparation (De Datta 1981);
- Burning of farm residues after harvest is prevented; and
- Energy consumption is reduced.



No-Tillage technology not only lessens production costs and increases farm income, but also helps in mitigating or adapting to climate change.

Methods of No-Tillage

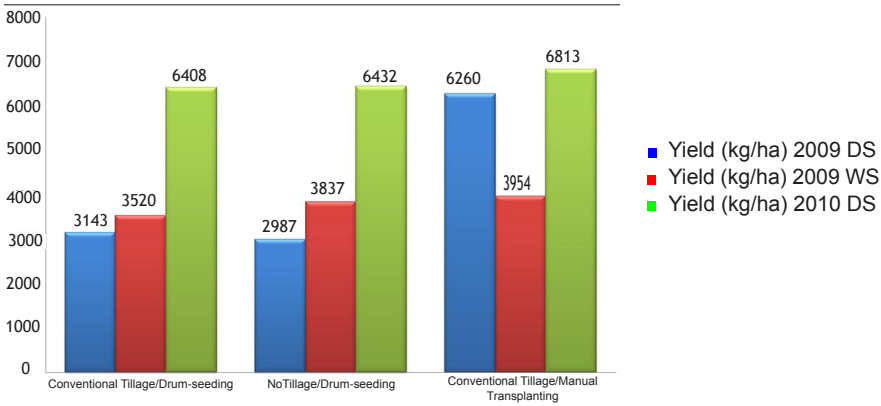
1. Irrigate the field plots to provide moisture for the germination of dropped rice and weed seeds;
2. Spray rice stubbles and weeds with herbicide (glyphosate);

3. Scatter rice straw on the field plots 1-2 days after spraying;
4. Flood the paddy field at least 2-3 cm of water 3-4 days after the herbicide spray;
5. Press the stubbles to the ground 5-6 days after flooding using animal or riding-type hand tractor leveler; and
6. Repeat pressing operation 5-6 days after the first pressing operation.

It took only 15 days to prepare the land compared with the 21 days in the conventional tillage, which includes plowing, harrowing, and leveling.

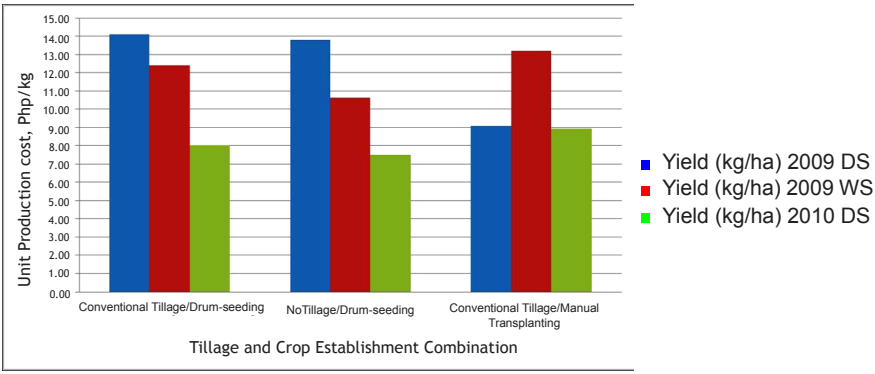
No-Tillage versus Conventional Tillage

Crop Yield



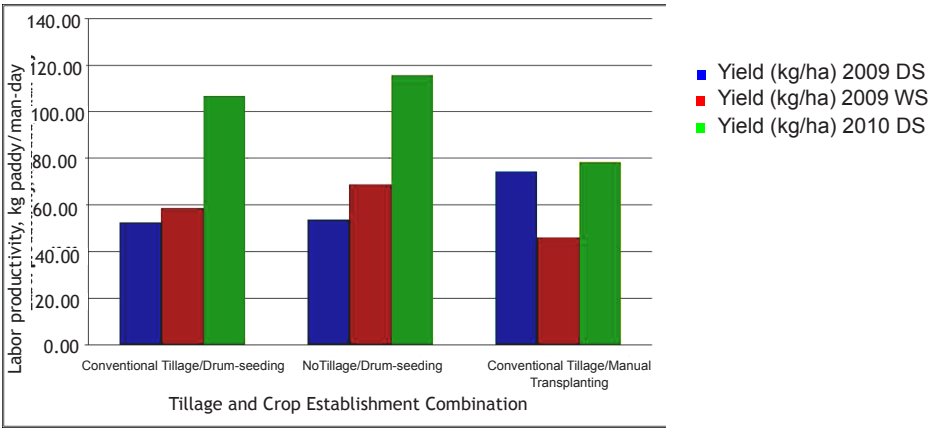
Grain yield of PSB Rc82 crops in the conventional tillage plots and No-Tillage plots were not significantly different from each other.

Production Cost



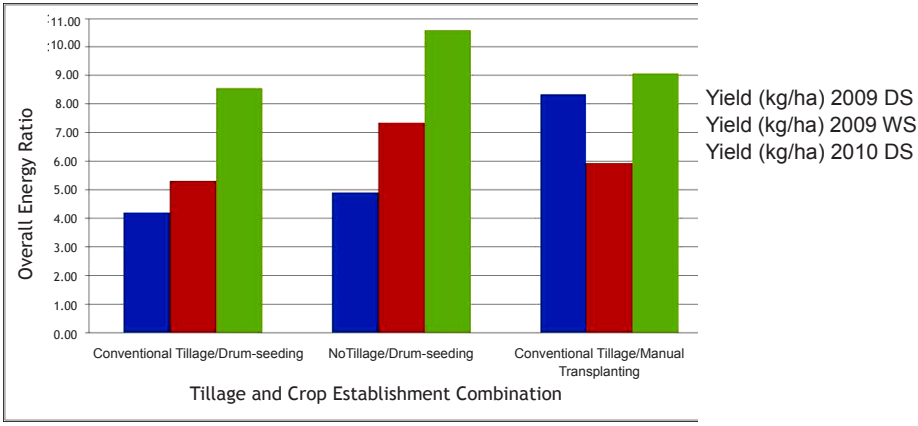
Cost of drum-seeded PSB Rc82 in No-Tillage is lower than conventional tillage.

Labor Productivity



Alternative technique of No-Tillage in combination with drum-seeding has the potential of substantially contributing to improved farm labor productivity in irrigated farms.

Energy Efficiency



Production of PSB Rc82 using No-Tillage and drum-seeding was much more energy-efficient than that of applying conventional tillage in all cropping seasons.

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Rice Science for Development

We are a government corporate entity attached to 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 57 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 in 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).

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