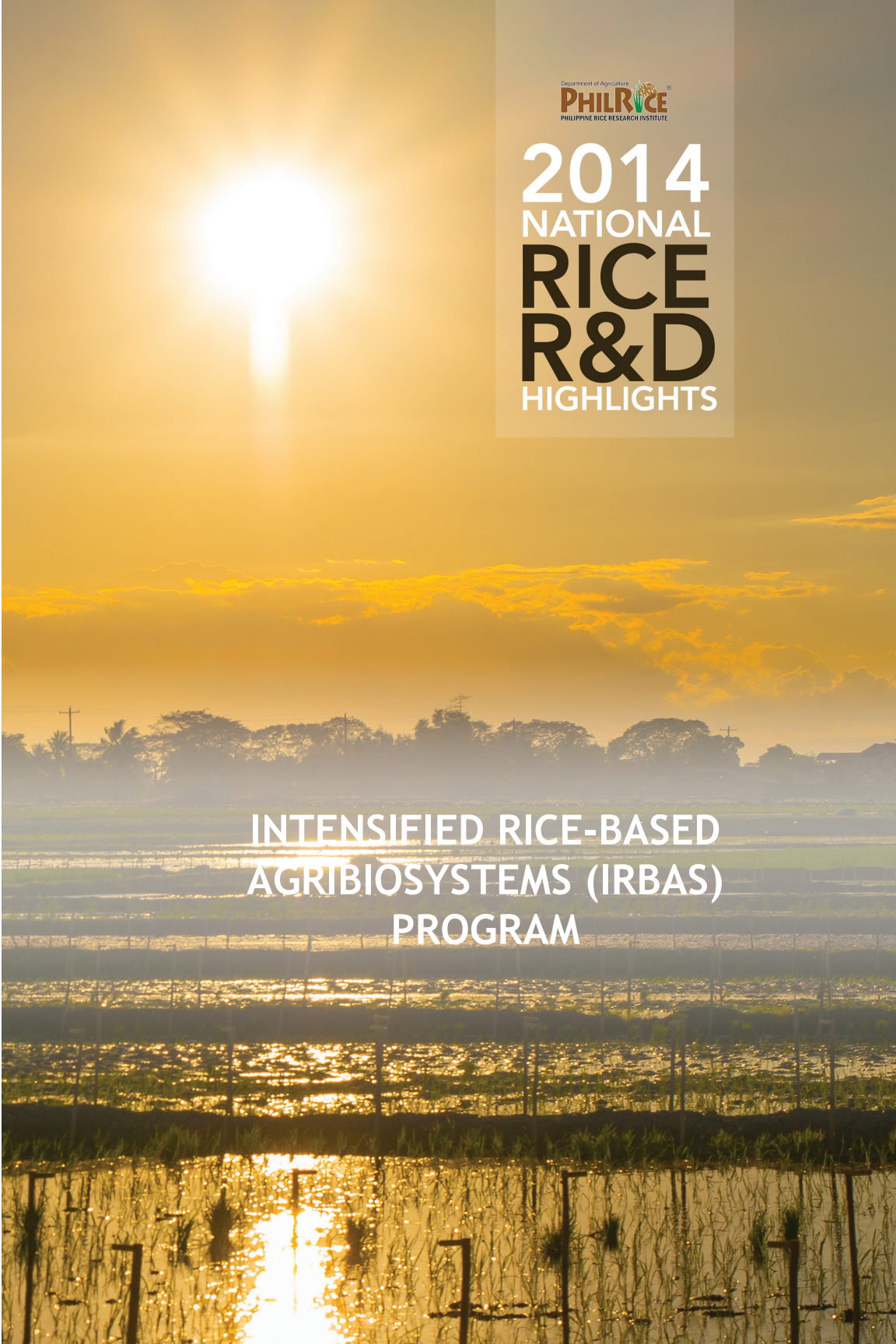
Department of Agriculture
PHILRICE
PHILIPPINE RICE RESEARCH INSTITUTE
2014
NATIONAL
RICE
R&D
HIGHLIGHTS
INTENSIFIED RICE-BASED
AGRIBIOSYSTEMS (IRBAS)
PROGRAM

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INTENSIFIED RICE-BASED AGRIBIOSYSTEMS (IRBAS) PROGRAM

Program Leader: Rizal G. Corales

Executive Summary

PhilRice has actively promoted the Palayamanan System - a diversified integrated rice-based farming system focusing on small-scale rice farming households directed towards farm diversification to increase farm productivity and address food security.

The Palayamanan System is recently upgraded into Palayamanan Plus - a farming systems model that consolidates small farm holders into a large-scale intensified rice-based agri-bio systems aiming at increasing income and profitability in the rice environments through purposive integration and diversification of certain farming components to achieve higher level of intensification and allow higher crop productivity, enhanced resource use efficiency, and value-adding.

The Palayamanan Plus model will spin-off rural agribusinesses or industries that can create employment and income-generating opportunities in the rice farming communities. This project aims to attain an average gross income of Php 1M per hectare per year.

I. Optimized production of different mushroom species using rice-based biomass

RG Corales, VT Dimaano, DJ Suba, JM Rivera

The country produced about 14.0M metric tons of rice straw and 3.0M metric tons of rice hull calculated based on the 14.0M metric tons of paddy rice production in 2004. Bulk of the rice biomass produced is still being disposed indiscriminately despite the many known benefits. Recycling rice straw as mushroom growing substrates can be economically profitable for farmers as well as in agriculture in general.

Mushroom has been part of human diet since time immemorial. It is becoming popular as culinary ingredient and as nutraceutical food because of its medical and health benefits. Mushroom can be grown anywhere as long as the conditions for their growth and cultivation are provided.

Mushroom production in the Philippines is still a backyard undertaking as compared to our neighboring countries like China, Taiwan, Vietnam, Indonesia and Thailand. The availability of abundant biomass resources like rice straw as substrates in the production of mushroom and

new technologies open up opportunities for the development of commercial scale production in the Philippines.

This study aimed to enhance the efficiency of rice-based substrates on the production of different mushroom species.

Highlights:

- In order to create a sustainable system of rice-based mushroom production, rice hull was used as fuel for pasteurization of mushroom fruiting bags using the existing PhilRice Continuous Rice Hull Carbonizer (Figure 1).

- The length of pasteurization was determined by trial. Six (6), five (5) and four (4) hours pasteurization period was tested for efficiency of pasteurization without sacrificing the quality. Fruiting bag quantity, fuel usage, by-product, date of inoculation until total ramification were listed in Table 1. Results showed that efficiency was comparable in all treatments.

- The volume of rice hull used as fuel decreased as time for pasteurization was shortened from 86.7kg at 6 hours to 55.7kg at 4 hours.

- Production constraints were documented in order to improve the system. Mushroom culture requires clean and appropriate environment thus, proper aseptic technique must be observed at all times. Figures 2 to 5 shows the encountered contaminants in mushroom production.

Figure 1. Continuous Rice Hull Carbonizer converted into mushroom pasteurizer.

Table 1. Comparison of pasteurization period of mushroom fruiting bags. March 2014.

Time (hours)	No. of Fruiting Bags	Contamination Rate (%)	Yield (Kg)
6	100	10	11.3
5	100	10	11.7
4	100	7	13.7

Figure 2. Contaminated Pure Cultures

Figure 3. Contaminated Grain Spawns

Figure 4. Contaminated Fruiting Bags

Figure 5. Malformed Fruiting bodies

II. IRBAS PhilRice Agusan

MB Amoin, BM Tabudlong, AA Ortiz, RM Naresma, CS Estacion, AT Montecalvo and GF Estoy, Jr.

The enterprise was established within the PhilRice Agusan seed production area alongside the proposed duck shed located a few meters away at the back of the Training Building. The duck shed has been strategically placed near the seed production area hence, manageably convenient and accessible.

Highlights:

- One hundred forty eight kilogram and thirty seven (148.37) oyster mushroom were harvested from June to December with Php 18,780 gross income at Php 120/kg farm gate price.
- Rice-duck production have a gross income of Php 787,410 per hectare from the sales of 16,452kg rice seeds, 238 heads ducks, 416 pcs fresh eggs, 452 pcs salted eggs and inventory price of 578 heads ducks in January to June.
- Vermiculture production (Jan-June) produced 206kg vermicast, 1,900kg vermicompost and 8kg vermin worms with Php 14,273 gross income.
- The station also engaged in swine production from September to December.

III. IRBAS PhilRice Isabela

DB Rebong II, et. al.

Highlights:

- The rice seed production component attained a gross income of Php 560,711 consisting of Foundation Seeds (Php 448 300), Registered Seeds (Php 57 800), Certified Seeds (Php 35,360), and Commercial Seeds (Php 19 251).

- Mungbean was planted as relay crop to rice to maximize land use and to make the fallow productive. The mungbean enterprises yielded 460kgs giving Php 28,852 gross income.

- Oyster mushroom production was established beside the vermicomposting facility. Separate house was constructed for this component. Fruiting bags were made dominantly from rice straw. In the initial establishment, 400 fruiting bags were made that yielded 41 kilograms mushroom. Milky mushroom is a new species introduced in the locality. The technology for the production of the said mushroom is not yet perfected. However, it is still pursued as component because of its potential to create demand.

IV. IRBAS PhilRice Midsayap

VV Casimero, S Abdulla, et. al.

In 2014, the station was able to establish the 3 enterprises as planned; the mushroom, rice-based intensification and organic fertilizer enterprises (Figure1).

Highlights:

Mushroom Enterprise

- Produced 40kg of of fresh oyster mushroom (600kg target)

- Produced 80kg of fresh paddy straw mushroom (1,080kg target)

- Produced 700 packs of spawn for oyster mushroom (600 packs target)

Vermicompost Production Enterprise

- Produced 2,800kg of vermicast (2,800kg target)

- Produced 7,200kg of vermicompost (7,200kg target)

- Produced 100kg of ANC (100kg target)

Rice Intensification Enterprise

- 18.85 tons (4.81t/ha) of registered seeds [(DS & WS), 5.86t/ha target]

Non-rice crops

- Produced 29kg of Sesame seeds (25kg target)
- Produced 555.76kg Okra (960kg target)
- Produced 269.16kg string beans (1250kg target)
- Ampalaya 177.58kg Ampalaya (19,000kg target)

Figure 6. Mushroom set-up (above); rice-based intensification (middle) and organic fertilizer production (below).

V. IRBAS PhilRice CES

RG Corales, VT Dimaano, JM Rivera, FS Seranno, IP Pineda, and HJM Orge

Rice production area in CES consist of 100 hectares for seed production and research aimed to intensify by planting short duration crops like mungbean after harvest. It aims to increase income and profitability in the rice environments through purposive integration and diversification of certain farming components to achieve higher level of intensification and allow higher crop productivity, enhanced resource use efficiency, and value-adding. The Palayamanan Plus model in CES initially started with rice and other crop production, mushroom production, rice-duck system, vermiculture and machine rental. Mushroom component established on April, vermiculture production on January while Sorjan System and livestock component like rice-duck system and chicken production started July 2014.

Highlights:

- Eight hundred seventy five (875) kilogram oyster mushroom were harvested from the 10,284 fruiting bags produced from April to December with Php 105,000 gross income at Php 120/kg farm gate price. The production cost was Php 36,561.36 giving a net income of Php 68,438.64 or 65% ROI. Pure culture of 4 mushroom species like Pleurotus florida, Ganoderma spp, Volvariella volvaceae, Calocybe indica are currently maintained at PhilRice CES Mushroom Center. The center has catered several trainings to farmers from Aurora, Bulacan and Pampanga as well as PhilRice staff and walk-in visitors.

- One hectare rice-duck system was established with 500 heads/ha mallard ducks. NSIC Rc202H, NSIC Rc240, NSIC Rc298 and Korean variety Milyang 23 were planted and yielded 4.43 t/ha. Harvested 219 heads mallard ducks at heading stage. Four hundred heads (July-258 heads and Sept-203) from IRBAS and rice-duck experiment (CCP-06-04) were stocked for egg production.

- Acquired 100 heads day old sasso chicks with 1% mortality rate and had 385 grams average live weight after 36 days (October to November).

- Established 1,235m^2 sorjan system with 8 beds measured 90 m2, 515.2m^2 pond size and 105.9m dike size planted with upland kangkong with 69kg average yield/bed; tomato, pepper and eggplant. Pond integrated with 1700 tilapia fingerlings, dike planted with bushbean and gabi at 0.3m distance along canals.

- Rice-vegetable sorjan design during wet season established with 6 beds planted with upland kangkong, pechay, kale and mustard, tomato, pepper and eggplant. Korean rice variety Dasanbyeo was used. 1000 pcs tilapia fingerlings were released and harvested 67.8%. Vegetables did not grow thus the design needs drainage to be improved.
- Seventeen hectares rice area after harvest in WS planted with 340kg mungbean for green manure. Corn planted after WS rice produced 490kg green cobs from 1000m^2.

- Vermiculture production (Jan-Dec) produced 32,672kg vermicast, 6,534kg vermicompost and 1,050kg African night crawler with Php 730,384 gross income.

- Market scanning at Science City, Munoz, San Jose City and Cabanatuan City was conducted in wet markets and supermarket for mushroom and upland kangkong. Most supermarkets needed a product demonstration.
- Partnership with Philippine Carabao Center (PCC) was established through MOA signing for carabao modules for PhilRice CES and branch stations livestock component.

- Limited resources, weather conditions, contaminations of fruiting bags, limited capacity of pasteuriser, late delivery of supplies, housing and predators, high duck mortality rate are challenges arise from first year of implementation.

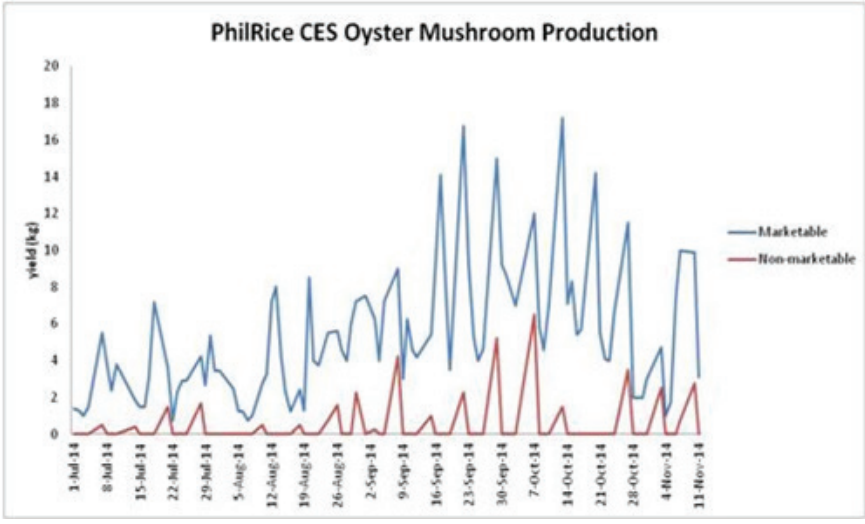

Figure 7. Mushroom production at PhilRice CES, April to November 2014.

Figure 8. Mallard ducklings in the duck house in rice-duck system (left) and sorjan system (right) PhilRice CES, 2014WS.

VI. PalayBangon for the Typhoon Stuck Communities (IRB-013)

RG Corales et. al.

- Assorted vegetable seeds and fertilizers were provided to the different communities in Samar and Leyte good for 20 hectare community food garden.

- Forty two training participants from University of Eastern Philippines (UEP and 43 participants from Visayas State University (VSU) who have not yet attended rice production training courses participated in the Training on Rice and Rice-based Technologies for Areas Affected by Typhoon Yolanda held on May 1 to 8, 2014 at the Farmers' Training Center, UEP, Catarman, Northern Samar and May 20 to 27 at VSU, Baybay City, Leyte. The training aimed to enhance the knowledge and skills of the graduates of agriculture related course on the new and relevant techniques in rice and rice-based technologies using the PalayCheck System and Palayamanan Plus.

- The topics included in the course content were presented through participatory lectures, discussions, demonstration, and actual field exercises.

- Initial talk with the Provincial Agriculturist and EVIARC was conducted for the establishment of seed multiplication and sharing for rice and vegetables in the communities.

Table 2. Resource distribution in Leyte

Province	Municipality	Barangay	Fertilizer (bags)		Chemicals (bottles)		Vegetable seeds	Community Food Garden Area	Responsible person
			Complete	Urea	Bayluscide	Machete			
Leyte	Palo	Teraza	8	4	4	4	13 kinds of vegetables	10 hectares (2 ha/site)	R. Tampil
	Sta. Fe	Baculanad	8	4	4	4			E. Mora
	Alangalang	San Vicente	8	4	4	4			M. Terora
	Mayorga	Sta. Cruz	8	4	4	4			
	Babatngon	Gov. E. Jaro	8	4	4	4			
	OPA		20	10	5	10		5 hectares	N. Sultan
Subtotal			60	30	25	30			
Samar	Basey		8	4	2	4	13 kinds of vegetables	5 hectares	A. Amascual
	Marabut		8	4	2	4			N. Embero
	Sta. Rita		4	2	1	2			D. Apura
Subtotal			20	10	5	10			
TOTAL			**80**	**40**	**35**	**40**		**20 hectares**	

Abbreviations and acronymns

ABA – Abscicic acid
Ac – anther culture
AC – amylose content
AESA – Agro-ecosystems Analysis
AEW – agricultural extension workers
AG – anaerobic germination
AIS – Agricultural Information System
ANOVA – analysis of variance
AON – advance observation nursery
AT – agricultural technologist
AYT – advanced yield trial
BCA – biological control agent
BLB – bacterial leaf blight
BLS – bacterial leaf streak
BPH – brown planthopper
Bo - boron
BR – brown rice
BSWM – Bureau of Soils and Water Management
Ca - Calcium
CARP – Comprehensive Agrarian Reform Program
cav – cavan, usually 50 kg
CBFM – community-based forestry management
CLSU – Central Luzon State University
cm – centimeter
CMS – cystoplasmic male sterile
CP – protein content
CRH – carbonized rice hull
CTRHC – continuous-type rice hull carbonizer
CT – conventional tillage
Cu – copper
DA – Department of Agriculture
DA-RFU – Department of Agriculture-Regional Field Units
DAE – days after emergence
DAS – days after seeding
DAT – days after transplanting
DBMS – database management system
DDTK – disease diagnostic tool kit
DENR – Department of Environment and Natural Resources
DH L– double haploid lines
DRR – drought recovery rate
DS – dry season
DSA - diversity and stress adaptation
DSR – direct seeded rice
DUST – distinctness, uniformity and stability trial
DWSR – direct wet-seeded rice
EGS – early generation screening
EH – early heading
EMBI – effective microorganism-based inoculant
EPI – early panicle initiation
ET – early tillering
FAO – Food and Agriculture Organization
Fe – Iron
FFA – free fatty acid
FFP – farmer's fertilizer practice
FFS – farmers' field school
FGD – focus group discussion
FI – farmer innovator
FSSP – Food Staples Self-sufficiency Plan
g – gram
GAS – golden apple snail
GC – gel consistency
GIS – geographic information system
GHG – greenhouse gas
GLH – green leafhopper
GPS – global positioning system
GQ – grain quality
GUI – graphical user interface
GWS – genomwide selection
GYT – general yield trial
h – hour
ha – hectare
HIP - high inorganic phosphate
HPL – hybrid parental line
I - intermediate
ICIS – International Crop Information System
ICT – information and communication technology
IMO – indigenous microorganism
IF – inorganic fertilizer
INGER - International Network for Genetic Evaluation of Rice
IP – insect pest
IPDTK – insect pest diagnostic tool kit
IPM – Integrated Pest Management
IRRI – International Rice Research Institute
IVC – in vitro culture
IVM – in vitro mutagenesis
IWM – integrated weed management
JICA – Japan International Cooperation Agency
K – potassium
kg – kilogram
KP – knowledge product
KSL – knowledge sharing and learning
LCC – leaf color chart
LDIS – low-cost drip irrigation system
LeD – leaf drying
LeR – leaf rolling
lpa – low phytic acid
LGU – local government unit

LSTD – location specific technology development
m – meter
MAS – marker-assisted selection
MAT – Multi-Adaption Trial
MC – moisture content
MDDST – modified dry direct seeding technique
MET – multi-environment trial
MFE – male fertile environment
MLM – mixed-effects linear model
Mg – magnesium
Mn – Manganese
MDDST – Modified Dry Direct Seeding Technique
MOET – minus one element technique
MR – moderately resistant
MRT – Mobile Rice TeknoKlinik
MSE – male-sterile environment
MT – minimum tillage
$mtha^{-1}$ - metric ton per hectare
MYT – multi-location yield trials
N – nitrogen
NAFC – National Agricultural and Fishery Council
NBS – narrow brown spot
NCT – National Cooperative Testing
NFA – National Food Authority
NGO – non-government organization
NE – natural enemies
NIL – near isogenic line
NM – Nutrient Manager
NOPT – Nutrient Omission Plot Technique
NR – new reagent
NSIC – National Seed Industry Council
NSQCS – National Seed Quality Control Services
OF – organic fertilizer
OFT – on-farm trial
OM – organic matter
ON – observational nursery
OPAg – Office of Provincial Agriculturist
OpAPA – Open Academy for Philippine Agriculture
P – phosphorus
PA – phytic acid
PCR – Polymerase chain reaction
PDW – plant dry weight
PF – participating farmer
PFS – PalayCheck field school
PhilRice – Philippine Rice Research Institute
PhilSCAT – Philippine-Sino Center for Agricultural Technology
PHilMech – Philippine Center for Postharvest Development and Mechanization
PCA – principal component analysis
PI – panicle initiation
PN – pedigree nursery
PRKB – Pinoy Rice Knowledge Bank
PTD – participatory technology development
PYT – preliminary yield trial
QTL – quantitative trait loci
R - resistant
RBB – rice black bug
RCBD – randomized complete block design
RDI – regulated deficit irrigation
RF – rainfed
RP – resource person
RPM – revolution per minute
RQCS – Rice Quality Classification Software
RS4D – Rice Science for Development
RSO – rice sufficiency officer
RFL – Rainfed lowland
RTV – rice tungro virus
RTWG – Rice Technical Working Group
S – sulfur
SACLOB – Sealed Storage Enclosure for Rice Seeds
SALT – Sloping Agricultural Land Technology
SB – sheath blight
SFR – small farm reservoir
SME – small-medium enterprise
SMS – short message service
SN – source nursery
SSNM – site-specific nutrient management
SSR – simple sequence repeat
STK – soil test kit
STR – sequence tandem repeat
SV – seedling vigor
t – ton
TCN – testcross nursery
TCP – technical cooperation project
TGMS – thermo-sensitive genetic male sterile
TN – testcross nursery
TOT – training of trainers
TPR – transplanted rice
TRV – traditional variety
TSS – total soluble solid
UEM – ultra-early maturing
UPLB – University of the Philippines Los Baños
VSU – Visayas State University
WBPH – white-backed planthopper
WEPP – water erosion prediction project
WHC – water holding capacity
WHO – World Health Organization
WS – wet season
WT – weed tolerance
YA – yield advantage
Zn – zinc
ZT – zero tillage

List of Tables

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