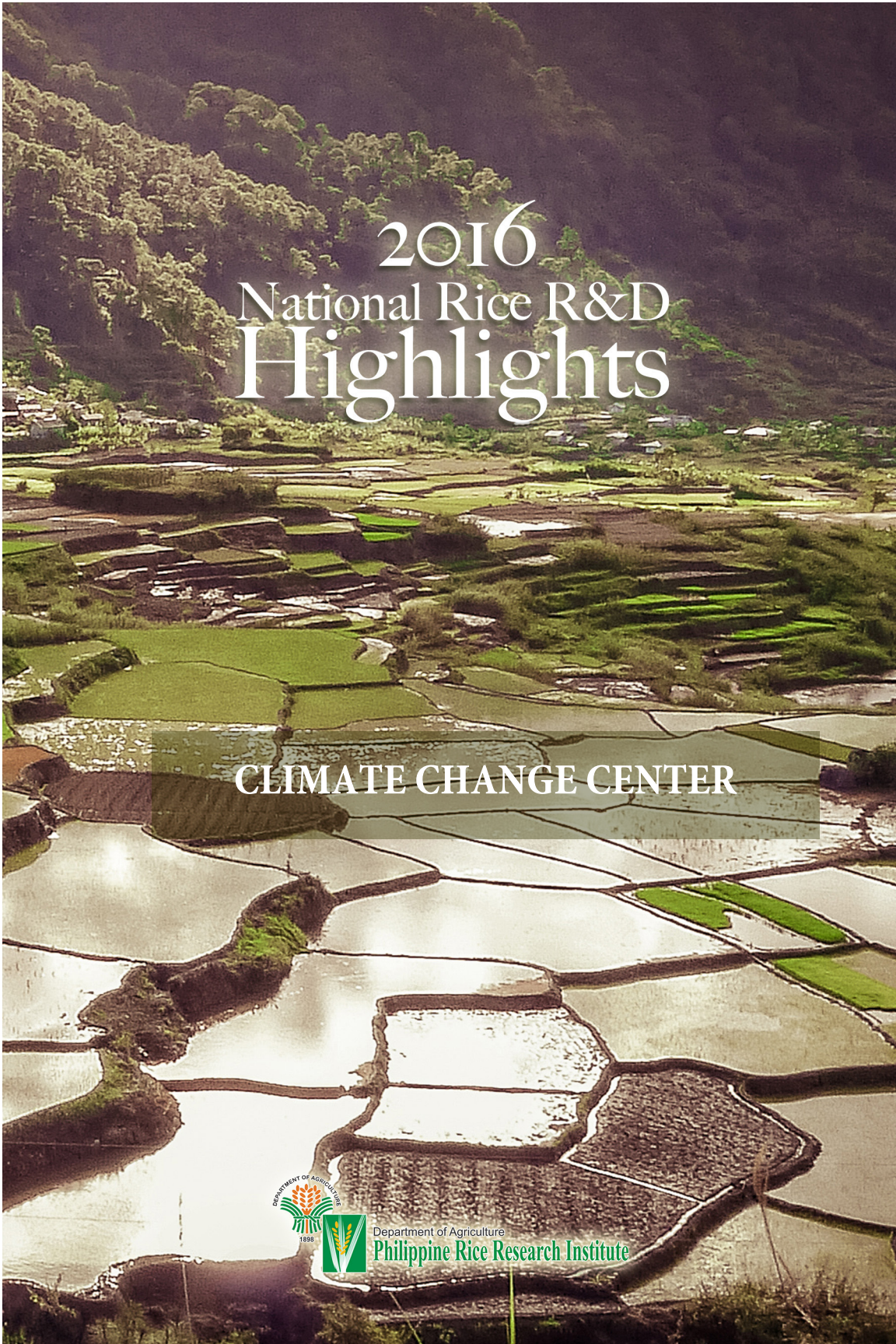

2016 National Rice R&D Highlights

CLIMATE CHANGE CENTER

Department of Agriculture
Philippine Rice Research Institute

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Climate Change Center

Center Director – Jasper G. Tallada

Executive Summary

Concerns for significant climatic changes had been fully validated by the Intergovernmental Panel on Climate Change (IPCC) in its fourth assessment report (AR4) when they overwhelmingly declared that the "warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level" and this was further confirmed in the fifth assessment report citing the great consensus of scientists. This phenomenon has been linked to the increase in carbon dioxide levels as well as the greenhouse gases arising from unprecedented anthropogenic activities since the middle of the 20th century. Envisioning a climate-risk resilient Philippine rice and rice-based farming communities, the PhilRice Climate Change Center was established to seek linkages with national and international organizations who are involved in the various aspects of climate change research and development; develop and evaluate technologies for adaptation technologies particular those with mitigation co-benefits for control the of greenhouse gases; and co-organize and participate in training activities. The center had actively participated in the Climate Outlook Forum during the onslaught of a sever El Niño and a weak La Niña. It also attended the numerous activities organized under the World Bank funded Philippine Climate Change Adaptation Project (PhilCCAP), and those activities spearheaded by the Systems Wide Climate Change Office (SWCCO) under its Adaptation and Mitigation Initiative in Agriculture (AMIA). A national workshop on Disaster Risk and Reduction Management under the DA-Operations was also participated. Farmer trainings with DA-RFO-1 and RFO-3, and NIA-Casecnan were conducted. With the limited resources endowed into the Center after a re-organization of its research activities, one major project having two studies were implemented during the first semester of 2016. Focus has been given on knowledge generation and management by developing a PhilRice automatic rain gauge based on an open source technology using a gizDuino 644 platform. It was conceived as a base-design for an automatic weather station that will electronically collect weather data and wirelessly transmit it to a central server. This will also complement the commercial instruments that are currently installed in the institute along with the ASTI supplied field monitoring stations. Information, educational and communication material had been aimed to promote domestic awareness to climate change. Additionally, no less than 30 weather data requests had been fulfilled during the year. The center also organized an institute-wide seminar on climate change.

Center Management

Project Leader: JG Tallada

The Climate Change Center provides a unique role of doing research while developmental aspects are being addressed as well to respond to the slated functions of the center. It provides administrative oversight to one research program and one development program. The center also coordinates with in-house experts and specialists in clarifying issues on the correct approaches that must be taken on mitigation and adaptation. Other agencies seek technologies for rice and rice-based system that would help the farmer adjust its cropping management to ensure his harvest despite the ill impacts of the changing climate. Thus, the center performs a multitude of functions to respond to the growing needs for information, technology and management options for different future scenarios.

I. Management of center operations, trainings and inter-agency linkages

JG Tallada

Much of the center activities are geared towards external linkages such as the active participation to DA-Systems Wide Climate Change Office program called Adaptation and Mitigation Initiatives for Agriculture or AMIA. Training activities for LGU personnel and farmers on understanding the impacts of climate change and measures for adaptation are also actively pursued through partnerships with DA-Regional Field Offices I and III. Regular attendance had been made to the national meetings such as that of DA-PCAF Sub-Committee on Climate Change, Climate Change Commission on DBM tagging of CC PAPs, and Climate Outlook Forums of PAGASA ensured adequate representation of PhilRice.

Operation and Maintenance of PhilRice Agromet System Network

MJPS Ancheta, JG Tallada, JM Maloom, JV Galapon, GC Nunez, L Dogeno, PL Sabes, JC Villarina

Activities:

- Monitoring and control of the installed automatic weather stations and manually read weather instruments at CES and at the branch stations. The instruments were maintained regularly such as checking and clean-up of dirt to keep them functioning. The enclosing areas were kept weed free.

- Calibration of the weather sensors using a reference standard sensor and protocol. Some sensors were sent to DOST-PAGASA for calibration. Capabilities to do the calibration was sought by acquiring high precision data logger and fabrication of the set-ups.

- Collection, processing and storage of weather data into a database. Data were sent-in at weekly and monthly intervals for verification, summary processing and aggregation into worksheets-database. Requests by the researchers for summary data were fulfilled.

Results:

- The automatic weather station (AWS) in PhilRice Isabela was found out not working. There was significant fault in the electronic GDAT data acquisition unit of the Field Monitoring System Unit (FMON) and was sent to DOST-ASTI for repairs and update of the firmware. However, there seemed to be difficulties in making the unit work again. The IRRI provided for the MET project was working. FMON Bicol showed signs of non-transmission of data to ASTI Server in most parts of the year. Recently, the unit was repaired on-site and data transmission had resumed except for the groundwater level and soil moisture content. All the other stations were monitored for health particularly at PhilRice Negros and Agusan.

- Highest mean temperature at CES was recorded on May 15, 2016 with 37.4 °C and the least on Nov. 19, 2016 at 19.9 °C (as of December 15, 2016). Highest rainfall data recorded was on Oct 16, 2016 with 98.8 mm of water during the onslaught of TY Karen.

- Currently, the study is catering numerous amount of Automatic Weather Station (AWS) which is located on PhilRice stations across the nation. Below are the list of Automatic Weather Station under the study:

Table 1. Status of the various automatic weather stations of PhilRice.

Name	Location	Model	Manufactured by	Status
IRRI MET AWS (CES)	PhilRice CES	Davis Vantage Pro	Davis Instruments Inc.	Working
CES1 – FMON	PhilRice CES	FMON	DOST-ASTI	Not Working
CES2 – FMON	PhilRice CES	FMON	DOST-ASTI	Working
FRP – FMON	PhilRice CES	FMON	DOST-ASTI	Working
Batac – FMON	PhilRice Batac	FMON	DOST-ASTI	Working
Isabela – FMON	PhilRice Isabela	FMON	DOST-ASTI	Working
Bicol – FMON	PhilRice Bicol	FMON	DOST-ASTI	Repaired
PhilRice AWS (Negros)	PhilRice Negros	Davis Vantage Pro	Davis Instruments Inc.	Working
PhilRice AWS(Midsayap)	PhilRice Midsayap	Davis Vantage Pro	Davis Instruments Inc.	Working
PhilRice AWS(Agusan)	PhilRice Agusan	Davis Vantage Pro	Davis Instruments Inc.	Working

Figure 1. The Field Monitoring Station provided by DOST-ASTI monitors weather in four stations at PhilRice whose data is web-accessible.

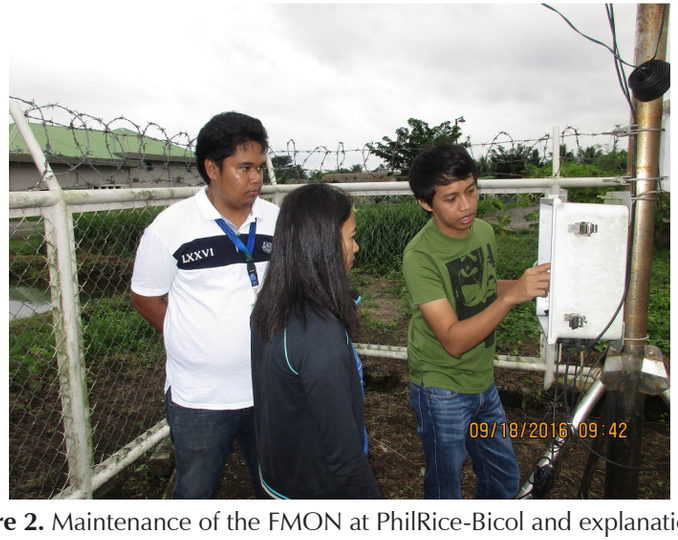

Figure 2. Maintenance of the FMON at PhilRice-Bicol and explanation of monitoring protocol.

Figure 3. The banana trees in the Easter side of the weather station at PhilRice-Negros were instructed to be removed to achieve greater accuracy in the measurements.

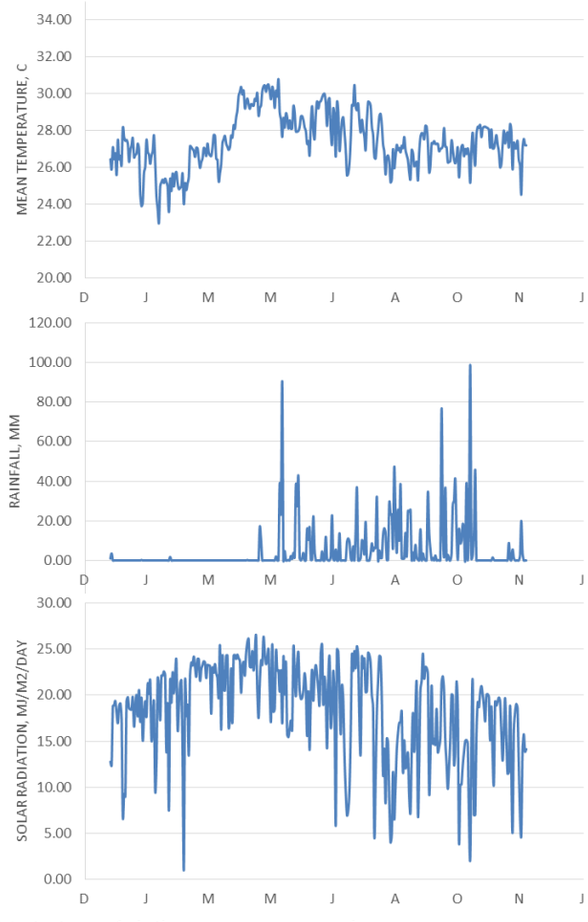

Figure 4. Variation of daily measurements for mean temperature, rainfall and solar radiation at PhilRice-CES in 2016.

II. Climate Knowledge Generation and Management

JG Tallada

Knowledge generation and management that are related to climate change are one of the key activities that are being pursued by the Climate Change Center. There are two studies under this project the first one tackles the need to develop working automatic weather station (AWS) and the second on developing literature materials. Since the availability of local climatic data to support the research acitivities of the institute, the center manages several weather stations. Davis commercial weather instrument and DOST-ASTI-supplied field monitoring stations (FMON) are the main weather source for the central experiment and branch stations. These AWS' are nearing their end-of-life cycle as evidences by increased maintenance costs and component failures. The center had initiated work on developing more cost-effective solutions by localizing some of the components of the system. Initially, an automatic rain gauge was targeted to provide a working platform for development. Consequently, other sensors such as temperature, relative humidity, soil temperature, and barometer will be added. Insufficient IEC knowledge products on climate change were found to be a major shortcoming during the conduct of trainings. Hence, the center hoped to get write some materials that will explain the concepts of climate change according to learning levels of the target farmer and technical audience. This study has been moved to the second semester for implementation because of the numerous commitments it had to make during the early part of the year.

Agro-climatic monitoring system using automatic weather stations (AWS)

P Quierra, JG Tallada, and DO Neri

Activities:

- Design, fabrication and testing of automatic weather station will enable PhilRice to develop its own system of weather monitoring instrument system. The currently employed Davis weather stations cannot meet the rigorous sensor quality requirements for research. While the ASTI designed FMON has proprietary limitations that modification and expansion of the capabilities were difficult.

- Because of unavailability of complete ensemble of sensors, an automatic rain gauge (ARG) with an in-system data logging capability was developed based on open source technology Arduino. At first, an Arduino Uno based system simply records the rainfall data. Later, a locally available gizDuino-644 microcontroller module was used for the base system that also monitors temperature and relative humidity. This now provided the base for a more complete automatic weather

station once the other sensors were procured.

- The testing of automatic rain gauge system was implemented by co-siting the instrument with the Davis and FMON. The ARG was further modified by including a GSM based wireless transmission of data.

Results:

- The ARG was successfully built and tested. The recorded rainfall data closely matches the FMON measurements.

- Further modification of the system by using a higher precision real-time clock device and a more advanced and higher capacity Mega 2560 Arduino will be developed next.

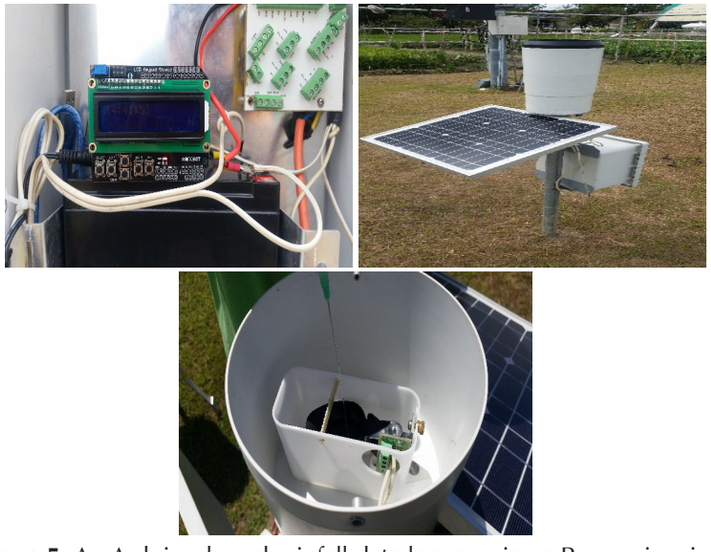

Figure 5. An Arduino-based rainfall data logger using a Pronamic rainfall tipping bucket system was designed earlier.

Figure 6. The second model used a gizDuino 644 Arduino module with added temperature and relative humidty measurements.

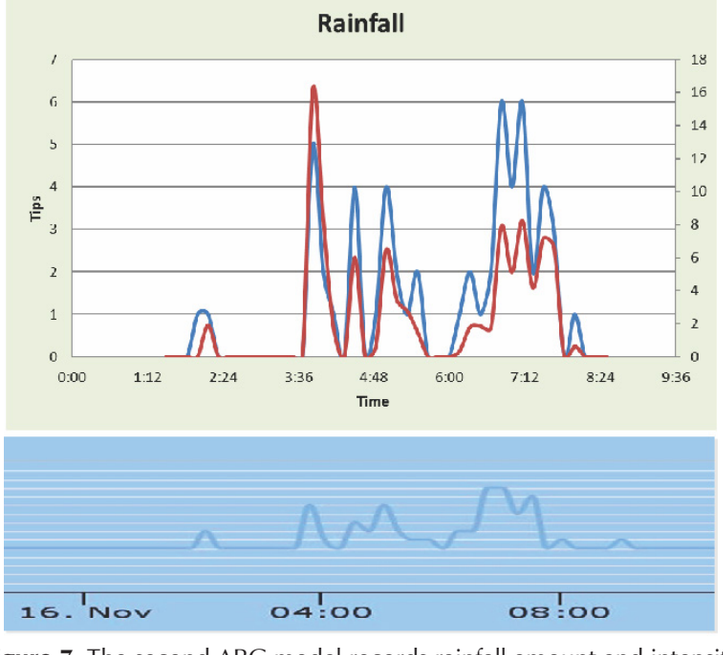

Figure 7. The second ARG model records rainfall amount and intensity (upper panel) which closely matched the measurements taken by the FMON (lower panel).

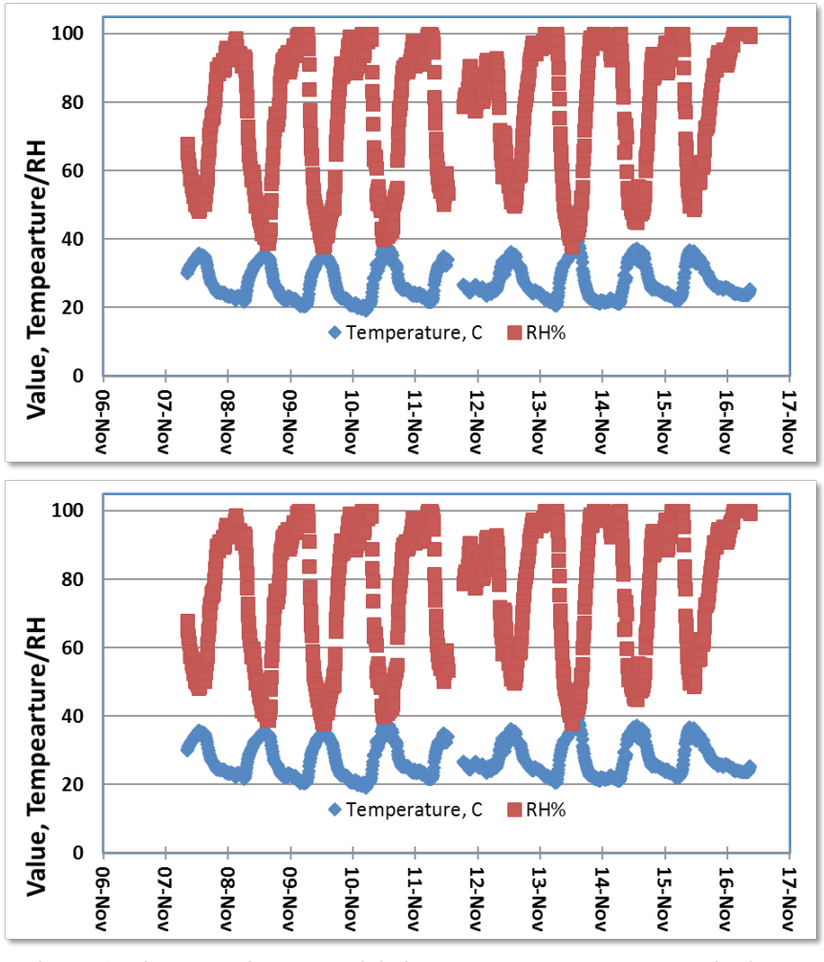

Figure 8. The second ARG model also monitors temperature and relative humidty at 10-minute intervals.

Development of IEC knowledge products for climate change adaptation and mitigation

P Quierra, JG Tallada

Activities:

- A focused group discussion was conducted at NIA-Casecnan Office during a seminar on climate change. After understanding the potential impacts of climate change on rice and agriculture, discussions on the necessary information to broaden the understanding of the issues and adaptation measures were facilitated.
- A simple questionnaire was also filled up to rank the information items that the farmers wish to see in an information material about climate change. The questionnaire response was analyzed.

Results:

- Seemingly, all the information items in the questionnaire were important but knowing where to get additional in-depth information and financial support financial support from the government were ranked the highest.
- The material written in a local dialect or Tagalog will be more welcome.

Figure 9. Conduct of FGD with the farmers of Cuyapo and filling-up of the questionnaire.

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

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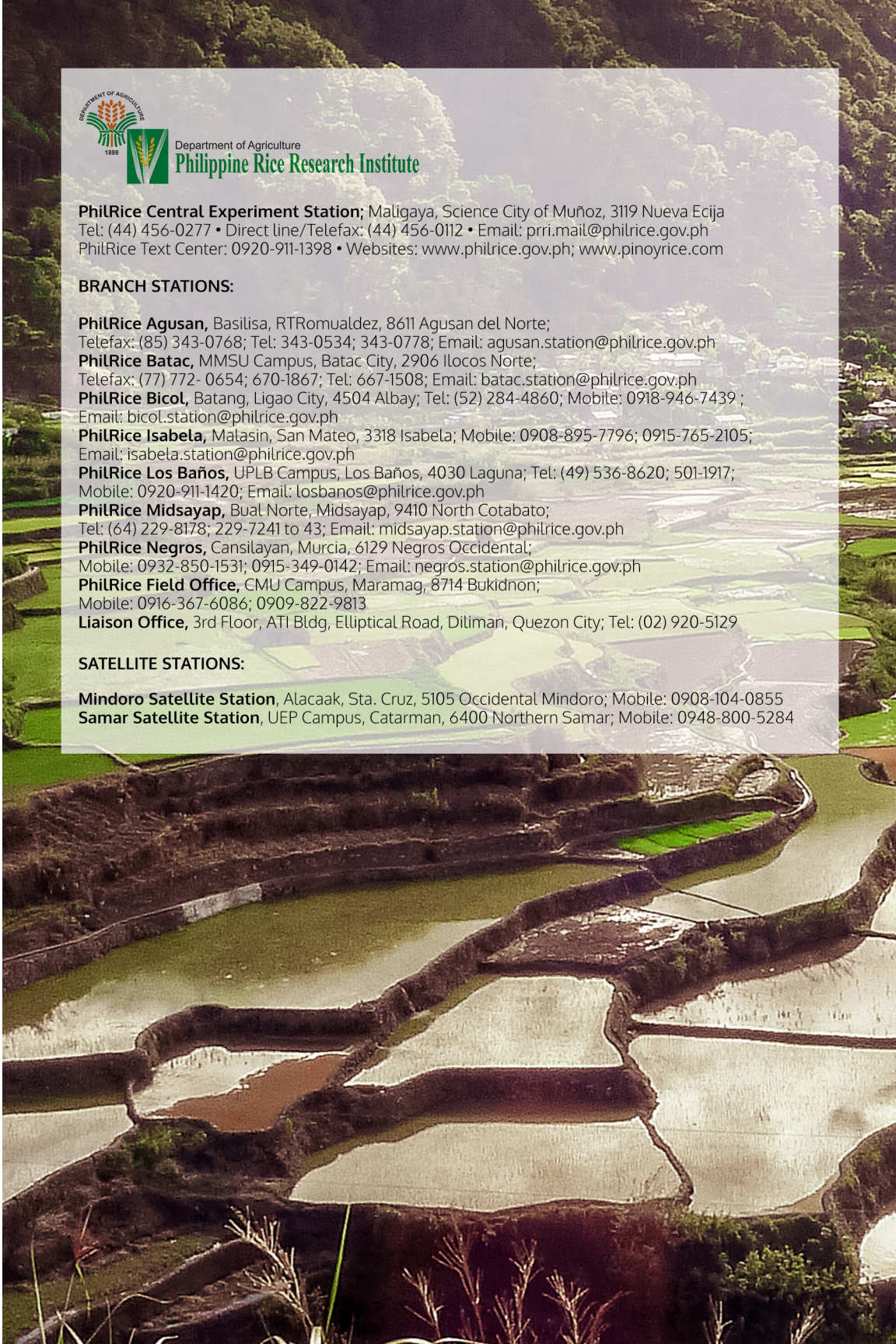

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