

2018

NATIONAL RICE R&D HIGHLIGHTS



RICE ENGINEERING AND MECHANIZATION

DIVISION



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RICE ENGINEERING AND MECHANIZATION

Division head: Arnold S. Juliano

EXECUTIVE SUMMARY

Rice Engineering and Mechanization Division (REMD) helps improve the national level of farm mechanization and modernizes rice production and postharvest operations. The division also strengthens the Institutes capacity to design, develop, manufacture, and market farm machinery for rice production and postproduction operations while considering the needs and conditions of our rice farmers. The Division aims to develop cost-efficient and environment friendly agricultural and biosystems engineering technologies that will mechanize rice and rice-based production and postproduction operations to reduce cost of operations and postharvest losses, and optimize the use of land, water, and other farm structures.

The Division has two major projects: 1) Development of REMD Farm for Modernization and Mechanization and 2) Division Operations and Custom Services Provision. For first project, a 4-ha fully mechanized farm is being developed for modernization and mechanization. The project consists of four studies: 1) land consolidation with optimum plot sizing, 2) establishment of efficient and suitable irrigation and drainage facilities, 3) identification of appropriate machines and provision of access roads, and 4) evaluation of the developed farm in terms of productivity and machine performance.

The second project has four component studies; 1) supporting RDE through shop custom service provision catering service requests on custom fabrication and related metal working activities; 2) establishing Agricultural Engineering Unit in the branch stations; 3) providing instrumentation services, which aims to assist the researchers; and 4) conducting agro-meteorology study, which aims to enhance the operation and maintenance of agro-meteorological stations at PhilRice-CES and in branch stations.

DEVELOPMENT OF REMD FARM FOR MODERNIZATION AND MECHANIZATION

AS Juliano

The project aimed to modernize and mechanize the 4-ha REMD model farm through land consolidation; improved irrigation, drainage facilities, and road and ramps, and evaluated rice production performance. The area was subdivided into 16 rectangular shape plots with about 0.24ha per plot. Four of which plots were completely laser leveled with elevation difference of ± 2 cm. One-lane graveled road (234m x 3m) and 4 units of 4-m concrete ramp were established on south and west sides of the farm. A lined canal is being established in the area and expected to cover 232 and 464 linear meter of irrigation and drainage canals, respectively. Based on the initial rice production experiment, a yield of 1.5-4/ha was obtained. This was due but not limited to the leveling employed that disturbed the organic matter layer of the farm. A guideline was drafted on developing a fully mechanized farm.

Land Consolidation with Optimum Plot Sizing for Efficiency and Leveling Effects

EG Bautista, KC Villota, and MC Mariano

This study aimed to improve plot sizes and achieve well-leveled field thru application of land consolidation. Topographic survey was conducted to determine the elevation of the area for the dry leveling and formation of bigger plots. The 4-ha REMD model farm that previously had 32 small, unleveled, and irregular shape plots was subdivided into 16 rectangular shape plots with about 0.24ha per plot. Four of the plots were completely leveled with elevation difference of ± 2 cm using a laser-guided leveling equipment attached to 4-wheel tractor.

Establishment of efficient and suitable irrigation and drainage facilities at the REMD model farm for mechanization

KS Pascual, LS Caguiat, AT Remocal, AS Juliano, and MJC Regalado

This study aimed to establish efficient irrigation and drainage system of the 4-ha REMD model farm to improve rice productivity and facilitate farm mechanization. Planning of irrigation source, irrigation and drainage facilities were conducted thru site inspection and topographic survey. The design and layout of the irrigation and drainage systems were based from the Philippine Agricultural Engineering Standards.

Four major factors were considered in the selection of the design: 1) cost, 2) maintenance, 3) operation, and 4) construction. Under each factors, four types of irrigation were identified and drainage canals were evaluated: 1) use of irrigation pipe for the lateral and tertiary canal; 2) irrigation pipe for the lateral canal; 3) concrete

lined canal for the lateral canal; and 4) earth canal. The concrete lined canal was found to be the most cost efficient, requires less maintenance, no or limited conveyance losses and easier to construct compared with the other canals. The improved irrigation and drainage systems will provide efficient irrigation delivery during crop growth and facilitate mechanization at harvest due to good drainage. It would also provide an opportunity for automation of irrigation delivery in the future suitable for a modernized model farm.

Provision of Appropriate Machines and Access Roads for Mechanization

KC Villota, AS Juliano, and MC Mariano

This study aimed to establish farm road and field ramp and identify the ideal location of these access structures at the 4-ha REMD model farm. The design and lay-out were formulated thru field inspection and in consultation with Infra Engineer and existing standards. One lane graveled road (234m x 3-4m) was established on south and west sides of the farm. Along each road, four units of 4-m concrete field ramp were constructed with entry and exit point of machine between each unit's adjacent plots. The availability of these structures is expected to improve accessibility of machines to individual field plots and reduce, if not eliminate, recurring destruction of field bunds in the farm.

Evaluation of Fully Mechanized 4-ha REMD Model Farm in Rice Production

AS Juliano, KC Villota, MC Mariano

This study aimed to determine the advantages of fully mechanized and modernized farm and to develop guidelines on mechanization and modernization. The study documented all the interventions applied in the farm including land consolidation, establishment of irrigation and drainage facilities, and access road and concrete ramp. Experiment on rice production was conducted in 2018 WS that initially evaluated the effect of leveling on area productivity. The area yielded 1.5-4t/ha, which is below the national average. This was due the late establishment (July 24, 2018) of the rice crop resulting in pest infestation (BLS, BLB, stemborer, and tungro).

DIVISION OPERATIONS AND SERVICES

JA Ramos

The project had catered to 58 requests of 38 customers who are mostly private individuals. It assessed the condition of the different equipment in four PhilRice branch stations; trained operators, technicians, and staff in the proper operation, servicing, and management of those equipment; and assigned responsible person to take care of the equipment's maintenance. The project also developed and installed three working prototypes for monitoring temperature and humidity for microclimate experiment and one working prototype for monitoring temperature and humidity for greenhouses and warehouses at FutureRice Farm Kuwebo. Testing of prototype for lysimeter module for rainfall and crop water requirement experiments for rice is ongoing. One EC and pH monitoring system for saline prone areas had been developed, installed, and maintained. The metadata of all the agro-met stations were updated. Daily weather data were also collected from the manual instruments and the AWS from January to October 2018. Calibration was already conducted at PhilRice-CES and Isabela. Monthly maintenance was done and recorded in a Repair and Maintenance Form and compiled in excel file.

Supporting R4DE through Shop Custom Service Provision

JA Ramos

This study was implemented to provide services on custom fabrication and metal works. It had served 58 services from 38 customers from different areas, most of them are walk-in customers and some had inquired through the Internet. Rice hull carbonizer is the most availed unit. The study generated an income of P1,051,744.78.

Establishment of Agricultural Engineering Unit to PhilRice Branch Stations

JEO Abon

The study aimed to establish an Agricultural Engineering Unit in the PhilRice Branch Stations. The team assessed and evaluated available farm machines and equipment in Isabela, Los Baños, Bicol, and Batac to identify the extent of repair and maintenance of the farm equipment and other facilities. Preventive maintenance checklist of farm machines such as 4-wheel tractor, transplanter, and rice combine harvester (Kubota) were prepared to ensure its optimum working condition and to help prevent unplanned downtime due to breakdowns.

Skills training course on farm machinery operation, repair and maintenance, safety, and storage were conducted. The participants were composed of agricultural engineers, operators, laborers, and selected staff from R&D sector, finance, and administration.

Instrumentation Services

MP Reselva

Instrumentation plays a vital role in achieving the measurement requirements of research. Many of the instruments are too costly or does not fulfill the specific requirements of researches. This study envisioned an initial sets of capabilities that will stimulate other researchers to explore locally developed instrumentation setups or gadgets. Specifically, the study aimed to: 1) develop monitoring system for micro climate experiments; (2) maintain the existing EC and pH monitoring system for saline prone areas study; (3) develop an environment monitoring system for the greenhouses and the seed warehouses and wirelessly transmit them to a server; (4) develop a lysimeter module for rainfall and crop water requirement experiments for rice; and (5) develop rice moisture meter.

The study had developed and installed three working prototypes for monitoring temperature and humidity for microclimate experiment and one working prototype for monitoring temperature and humidity for greenhouses and warehouses at FutureRice Farm *Kwebo*. Testing of an initial prototype for lysimeter module for rainfall and crop water requirement experiments for rice is ongoing. One EC and pH monitoring system for saline prone areas study have been developed, installed and maintained.

Operationalization of Agrometeorology Station at CES and Branch Stations

DB Fenangad

Agro-meteorological (Agro-met) stations were set-up in the different parts of the country to help in the monitoring and gathering of weather data for agricultural researches. Specifically, the study aimed to: (a) update information on existing PhilRice Agro-meteorological stations metadata; (b) create a database of daily weather data for year 2018-2019; (c) ensure the proper functionality of weather instruments; and (d) provide high quality and reliable data to researchers and other clients. Activities done were updating of the stations' metadata, periodic collection of weather data and regular calibration, repair and maintenance of weather instruments. The metadata of all the agro-met stations were successfully updated. Daily weather data were also collected from the manual instruments and the AWS from January to October 2018. Calibration was done at CES and PhilRice Isabela. Monthly maintenance was done and recorded on a Repair and Maintenance Form and compiled in an excel file as back up.

We are a government corporate entity (Classification E) under the Department of Agriculture. We were created through Executive Order 1061 on 5 November 1985 (as amended) to help develop high-yielding and cost-reducing technologies so farmers can produce enough rice for all Filipinos.

With a "Rice-Secure Philippines" vision, we want the Filipino rice farmers and the Philippine rice industry to be competitive through research for development in our central and seven branch stations, coordinating with a network that comprises 59 agencies strategically located nationwide.

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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