

**COMPREHENSIVE SEMESTRAL REPORT ON FIELD PRACTICE AT  
PHILIPPINE RICE RESEARCH INSTITUTE (PhilRice)**

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An Undergraduate Field Practice Submitted to the Faculty of the Department of  
Agricultural and Biosystems Engineering, College of Engineering, Central  
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for the Degree of

**BACHELOR OF SCIENCE IN AGRICULTURAL ENGINEERING  
(Agricultural Power, Energy and, Machinery)**

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**ACCEPTANCE SHEET**

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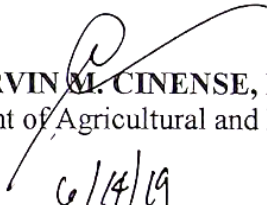
  
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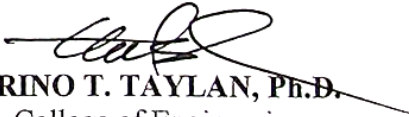
  
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## **BIOGRAPHICAL SKETCH**

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## ABSTRACT

**REYES, MARIEL BERNABE**, Department of Agricultural and Biosystems Engineering, College of Engineering, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines, June 2018. **COMPREHENSIVE SEMESTRAL REPORT ON FIELD PRACTICE AT PHILIPPINE RICE RESEARCH INSTITUTE (PhilRice)**

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This field practice was conducted to broaden the knowledge and skills of the students and to provide experiences on the activities provided by the Philippine Rice Research Institute (PhilRice) Rice Engineering and Mechanization Division (REMD) on the performance evaluation of a motor-driven brown rice machine. The general objectives of this study were to; evaluate the machine performance in terms of brown rice recovery, head rice recovery, hulling efficiency and hulling capacity; to perform cost analysis on the use of machine; and to compare the performance parameters of motor driven and manually operated brown rice machine in terms of brown rice recovery, head rice recovery, hulling efficiency, and hulling capacity.

Evaluating the performance of the machine in terms of brown rice recovery, head rice recovery, hulling efficiency and hulling capacity in different moisture content (NSIC Rc 222 variety) to determine which parameters can produce best results and computing the cost analysis on the use of machine. And comparing the best result on performance parameters of motor driven and manually operated brown rice machine in terms of brown rice recovery, head rice recovery, hulling efficiency, and hulling capacity. The study was laid out in Complete Randomized Design (CRD). Analysis of Variance (ANOVA) was

used to analyze significant difference between treatment means and Comparison Among Means (CAM) was done using LSD at 5% level of significance.

Based on the result, the paddy having 11-12% moisture content level provided the best results while 15-16% moisture content gave the lowest result on all of the parameters of the brown rice machine. The highest mean brown rice recovery, head rice recovery, hulling efficiency and hulling capacity is 66.1%, 83.41%, 75.23% and 1.94kg/hr, respectively, while the lowest were 64.7%, 82.06%, 72.88% and 1.59kg/hr, respectively. Comparing the best result on performance parameters of motor driven and manually operated brown rice machine in terms of brown rice recovery, head rice recovery, hulling efficiency, and hulling capacity proves that using manually-operated has the better performance than motor driven in all performance parameters of the machine.

## LITERATURE CITED

- AREMU, V., et al. 2014. Engineering Machine Operation. International Journal of Engineering Science Invention (ISSN). pp.10-14. Retrieved 2015-03-27
- ALIZADEH M.R., F.R. AJDADI and A. DABAGHI. 2011. Effect of final paddy moisture content on breaking force and milling properties of rice varieties. Retrieved on December 24, 2018 from <https://www.researchgate.net/publication/232957699>
- CUYANO, A., 2003. Energy Consumption Handbook. Retrived at <http://electric/energy/consumption/> retrieved on July 6, 2018
- DAUDA, S.M., and G. AGIDI. 2005. Rice post-harvest technology in Nigeria: an overview of the contribution of National Cereals Research Institute, Badeggi, Nigeria. Nigerian Journal of Agricultural Technology 13, 12-17.
- DILDAY, R.H., 1987. Influence of thresher cylinder speed and grains moisture at harvest on milling yield of rice. Arkansas Academy of science 41, 35 – 37
- DEPARTMENT OF AGRICULTURE, 2014. Comparison of Nutritive Value of Rice retrieved at <https://devcomconvergence.wordpress.com> retrieved on August 1, 2018
- GBABO, A., S.M., DAUDA, and J.C., IGBEKA. 2014. The influence of variety and various process parameters on the total milling yield of parboiled rice. African Journal of General Agriculture, 5 (3), 131-135
- GRAGASIN, 2016., Brown rice. Retrieved at <https://encyclopedia2.thefreedictionary.com/brownrice> retrieved on July 6, 2018
- HUDSON, V. AND COLLEAGUES H., 2000. Comparison of GABA, Crude Protein and Amino Acid Composition from Different Varieties of Malaysian's Brown Rice [online]. Australian Journal of Crop Science, Vol. 3, No. 4, 2009: 184-190.
- IRRI Rice Knowledge Bank. 2013. How to prepare the rice field for planting. Retrieved on August 29, 2018 from <http://www.knowledgebank.irri.org/step-by-step-production/pre-planting/land-preparation>
- JULIANO, BO., 2017. Rice Chemistry and Quality. Manila, Philippines. Nutrient composition of brown rice per 100g at 14% moisture content
- NASIRAHMADI A., B. EMADI, and M.H. ABBASPOUR-FARD 2014. Influence of Moisture Content, Variety and Parboiling on Milling Quality of Rice Grains. Department of Agricultural Machinery, Ferdowsi University of Mashhad

- PAES 214:2004 Agricultural Machinery – Rubber Roll for Rice Mill – Specifications
- PAES 215:2004 Agricultural Machinery – Rubber Roll for Rice Mill – Methods of Test
- Philippine Rice Research Institute (2017) retrieved on July 20, 2018.
- PAS, K. 2017., Statistical Analysis of Rice Production. Retrieved at <http://industry.gov.ph/industry/rice-tablea/> retrieved on July 6, 2018
- RICE TECHNOLOGY BULLETIN. 2017. Brown Rice Machine. <http://www.pinoyrice.com/?wpdmdl=3234>
- SEN, Y., 2000. Health Benefits of Brown Rice retrieved at <https://www.organicfacts.net> retrieved on August 1, 2018
- SZALAY J. 2015. Brown Rice: Health Benefits & Nutrition Facts. Retrieved on August 22, 2018 from <https://www.livescience.com/50461-brown-rice-health-benefitsnutrition-facts.html>
- SOARES, L., 2010. Fostering Innovation in Collaboration Between Community Colleges and Businesses retrieved at [www.wikipedia.com/drying](http://www.wikipedia.com/drying) retrieved on June 6, 2018
- SOHN, E., 2014."Contamination: The toxic side of rice". *Nature*. 514 (7524): S62S63. doi:10.1038/514S62a. Retrieved 2015-03-27.
- TOMI, B., 2003. Traditional Milling. retrieved at <http://www.knowledgebank.irri.org> retrieved on August 3, 2018