DETERMINATION OF OPTIMUM AND MAXIMUM POTASSIUM FERTILIZER RATE FOR HYBRID RICE PRODUCTION IN LOWLAND ECOSYSTEM

SARAH MAE J. JAVILLONAR

An Undergraduate Thesis Manuscript Submitted to the Faculty of the Department of Soil Science, College of Agriculture, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines in Partial Fulfillment of the Requirements for the Degree of

BACHELOR OF SCIENCE IN AGRICULTURE
(Soil Science)

JANUARY 2020

ACCEPTANCE SHEET

This undergraduate thesis manuscript entitled **"DETERMINATION OF OPTIMUM AND MAXIMUM POTASSIUM FERTILIZER RATE FOR HYBRID RICE PRODUCTION IN LOWLAND ECOSYSTEM"**, prepared and submitted by **SARAH MAE J. JAVILLONAR** in partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN AGRICULTURE (SOIL SCIENCE)**, is hereby accepted:

ARIEL C. MACTAL, Ph.D.
Adviser

12-10-19
Date Signed

AURORA P. WAING
Critic

12-16-19
Date Signed

MARIA LUISA T. MASON, Ph. D.
Department Research Coordinator

12-20-19
Date Signed

Accepted as partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN AGRICULTURE (SOIL SCIENCE)**:

PURISIMA P. JUICO, Ph.D.
Chair, Department of Soil Science

01-06-20
Date Signed

MARIA LUISA T. MASON, Ph.D.
College Research Coordinator

01-07-20
Date Signed

ARIEL C. MACTAL, Ph.D.
Dean, College of Agriculture

01-07-20
Date Signed

BIOGRAPHICAL SKETCH

The author, Sarah Mae J. Javillonar, was born on the 18th day of September, 1998 at Munoz, Nueva Ecija. She is currently living at Barangay Maragol, Muñoz, Nueva Ecija. She is the eldest child among two children of Mr. Benito V. Javillonar Jr. and Mrs. Cristy J. Javillonar. Her sibling is Jaylord. Their family depend on farming related business as source of income.

She took her primary education at Maragol Elementary School, while her secondary education was at Muñoz National High school, Science City of Muñoz, Nueva Ecija.

In 2015, she decided to enroll at Central Luzon State University with Bachelor of Science in Agriculture as her course, to help her father in farming related business. After she took two years studying agriculture, she decided to go on the path of being a soil scientist.

BIOGRAPHICAL SKETCH

The author, Sarah Mae J. Javillonar, was born on the 18th day of September, 1998 at Munoz, Nueva Ecija. She is currently living at Barangay Maragol, Muñoz, Nueva Ecija. She is the eldest child among two children of Mr. Benito V. Javillonar Jr. and Mrs. Cristy J. Javillonar. Her sibling is Jaylord. Their family depend on farming related business as source of income.

She took her primary education at Maragol Elementary School, while her secondary education was at Muñoz National High school, Science City of Muñoz, Nueva Ecija.

In 2015, she decided to enroll at Central Luzon State University with Bachelor of Science in Agriculture as her course, to help her father in farming related business. After she took two years studying agriculture, she decided to go on the path of being a soil scientist.

ACKNOWLEDGEMENT

The author would like to thank the following important persons who have supported her, not only during the course of her thesis but encouraged her to continue despite of the challenges she encountered.

She would like to express her gratitude towards her parents, Benito V. Javillonar Jr. and Cristy J. Javillonar for their unconditional love, support and sacrifices to provide the author with her needs in school to accomplished this study. Her loving brother Jaylord J. Javillonar, who served as her inspiration and strength to be able to finish her degree. The author would like to express her sincere thankfulness to her auntie Charito L. Penaloza and her Grandmother Felicitas J. Luno who supported her financially, physically and emotionally.

Her Adviser, Dr. Ariel G. Mactal, for his considerate assistance and continuous support, guidance and insight throughout her thesis.

Ms. Aurora P. Waing, her critic, for her words of encouragement and clarifications for the improvement of this study. All the faculty members and staff of the Department of Soil Science Kuya Bong, Ate Weng, Kuya Amang and Kuya Bulet for helping and encouraging her throughout the year.

Her fellow friends, Erica, Nika, Hazel, Warren, Roberto and Flory, her Soil Science Society family in helping her all the time for her thesis, for the motivation, happiness, endless support and advices.

Special thanks and appreciation is also extended to the persons who have willingly helped her with their abilities.

Above all, she offers this endeavor to our God Almighty for the wisdom, the strength, peace of mind and good health He has given in order to finish her research. Thank you very much.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURE

LIST OF APPENDIX TABLES

LIST OF APPENDIX FIGURES

ABSTRACT

JAVILLONAR, SARAH MAE J., Department of Soil Science, College of Agriculture, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines, **November 2019, DETERMINATION OF OPTIMUM AND MAXIMUM POTASSIUM FERTILIZER RATE FOR HYBRID RICE PRODUCTION IN LOWLAND ECOSYSTEM**

Adviser: ARIEL G. MACTAL, Ph.D.

The study attempts to determine the optimum and maximum rate of potassium fertilizer for hybrid rice production as of 2019. The optimum rate of potassium fertilizer was 2.67 kg and the maximum level of potassium was 2.68 kg this result may seem to be very low considering that the recommended rate of potassium in most hybrid rice technologies is around 60-90 kg K/ha. It was tested using Randomized Complete Block Design with three replications and five treatments. The treatments were T1 Control (150-60-0 kg N-P_2O_5-K_2O/ha), T2 (150-60-30 kg N-P_2O_5-K_2O/ha), T3 (150-60-60 kg N-P_2O_5-K_2O/ha), T4 (150-60-90 kg N-P_2O_5-K_2O/ha), T5 (150-60-120 kg N-P_2O_5-K_2O/ha).

Application of increasing rates of potassium fertilizer did not improve the height, number of tillers, percent filled grains, weight of 1000 grains, dry matter yield and grain yield of hybrid rice. Simple non-linear regression for the effect of K on rice resulted to a r^2 value of 0.7745. This demonstrates that the change in yield is accounted for by the increase in the level of K fertilizer. This further shows the closeness of the observed values with the estimated values determined in the regression line. The maximum level of K is 2.68 kg/ha which result to a yield of 7,409 kg/ha.

LITERATURE CITED

Atli, A.(2017). Rice 101: Nutrition facts and Health effects. Retrievedfromhttps://www.medicalnewstoday.com/articles/318699.php.

Bijay-Singh, Yadvinder-Singh, Imas P, Xie J (2004) .Potassium nutrition of the rice-wheat cropping system. *Advances in Agronomy 81*:203–259

David Dunn and Gene Stevens (2005). Rice potassium nutrition research progress. Better crops, 89: 15-17

De Datta SK (1981). Principles and practices of rice production. Wiley, New York

De Datta SK and Mikkelsen DS (1985) Potassium nutri- tion of rice. In Munson RD (ed.). Potassium in Agricul- ture, pp 665-699. Madison, WI: American Society of Agronomy

Dobermann A, KG Cassman, PC Sta Cruz, MAA Adviento, and MF Pampolino (1996a). Fertilizer inputs, nutrient balance, and soil nutrient-supplying power in intensive, irrigated rice systems II. Effective soil K-supplying capacity. *Nutrient Cycling Agroecosystem 46*:11–21

Dobermann A, PC StaCruz, and KG Cassman (1996b). Fertilizer inputs, nutrient balance, and soil nutrient-supplying power in intensive, irrigated rice systems. I. Potassium uptake and K balance. *Nutrient Cycling Agroecosystem 46*:1–10

Dobermann A, Fairhurst T (2000). Rice: nutritional disorders and nutrient management.Singapore: Potash and Phosphate Institute of Canada. International Rice Research Institute, Los Baños

Fageria NK, VC Baligar, RJ Wright, and JRP Carvalho (1990). Lowland rice response to potassium fertilization and its effect on N and P uptake. *Fertilizer Research 21*:157–162

Fageria NK, NA Slaton, and VC Baligar (2003). Nutrient management for improving lowland rice productivity and sustainability. *Advances in Agronomy 80*:63–152

Fairhurst TH, Dobermann A, Quijano-Guerta C, Balasubramanian V (2007). Mineral deficiencies and toxicities. In: Fairhurst TH, Witt C, Buresh RJ, Dobermann A,editors. Rice: a practical guide to nutrient management, 2nd ed. International Rice Research Institute, Los Baños; International Plant Nutrition Institute,Norcross; International Potash Institute, Berne, pp. 46–86

Faostat (2016). http://faostat3.fao.org/download/Q/QC/E. Accessed 13 Feb 2016

Hirata H (1995). Science of rice plant: Physiology. In: Matsuo T, Kumazawa K, Ishii R,

Ishihara K, Hirata H (eds) Absorption and metabolism of potassium, vol 2. Food and AgriculturalPolicy Research Center, Tokyo, pp. 383–390

Kiuchi T, and Ishizaka H (1961). Effects of nutrients on the yield constituting factors of rice. *Journal of the Science of Soil and Manures Japan 32*:198–202

Kiuchi T. and H. Ishizaka, (1961). Soil Manure, Japan 31 286

Li, H, Yang, X, and Luo, A. (2001). Ameliorating effect of potassium on iron toxicity in hybrid rice. *Journal of Plant Nutrition, 24*(12), 1849-1860.

McLean EO, and Watson ME (1985). Soil measurements of plant-available potassium.

McKenzie R. H (2013).PhD, P. Ag. Sr. Research Scientist – AgronomyResearch and Innovation Division Alberta Agriculture and Rural Development Agriculture Centre, Lethbridge.

Sekhon GS (1995). Characterization of K availability in paddy soils-present status and futurerequirements. In: Potassium in Asia-Balanced fertilization to increase and sustain agriculturalproduction. International Potash Institute, Basel, pp. 115–133

Slaton NA, CD Cartwright, Wilson and CE Jr (1995). Potassium deficiency and plant diseases observed in rice fields. *Better Crops 79*(4):12–14

Tan, P.S., Khuong, T.Q. and Hoai, N.T. 2000. Low cost technologies for rice production in the ekong delta. In: Proceedings of the Paper presented at National Workshop on September 21– 23. Ho Chi Minh City, Vietnam, pp. 14.

Tisdale, S.L, W.L Nelson, and J.D Beaton, (1985). Soil Fertility and Fertilizers (4 thedn.), Mac Millon.

Williams J, and SG Smith (2001). Correcting potassium deficiency can reduce rice stem diseases. *Better Crops 85*(1):7–9

Witt C, Dobermann A (2004) Towards a decision support system for site-specific nutrient management. In: Dobermann A, Witt C, Dawe D (eds) Increasing productivity of intensive rice systems through site-specific nutrient management. International Rice Research Institute, Los Baños,

Wells BR, BA Huey, RJ Norman, and RS Helms (1993). Rice. In: Bennett WF (ed) Nutrient deficiencies and toxicities in crop plants. The American PhytopathologicalSociety, St Paul, pp. 15–19

Yadvinder-Singh, Pannu RPS, and Bijay-Singh (2005). Leaching of K from organic manures, crop residues and inorganic fertilizer in two soils under flooded and upland moisture regimes. *Journal of Indian Society of Soil Science* 53:207–213

Yoshida S. and Y. Hayakuya, (1970). Effect of minerals on tillering of rice, *Soil Science and Plant Nutrition, 16*:5, 186-191 DOI:10.1080/00380768.1970.10432838