BALANCED-FERTILIZATION STRATEGY IN THE PRODUCTION OF HYBRID RICE VARIETY

CATALINA B. MANZANO

An Undergraduate Thesis Submitted to the Faculty of the Department of Environmental Science, College of Science, 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 ENVIRONMENTAL SCIENCE (Sustainable Agriculture)

JULY 2023

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF APPENDIX TABLES

ABSTRACT

MANZANO, CATALINA B., Department of Environmental Science, College of Science, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines, **July 2023, BALANCED-FERTILIZATION STRATEGY IN THE PRODUCTION OF HYBRID RICE VARIETY**

Adviser: FERNAN T. FIEGALAN, Ph.D.

A combination of organic and inorganic sources of nutrients for rice crops can produce high yields and ensure the production of high-quality of food. The study aimed to determine what appropriate nutrient management practices can obtain the highest yield using organic and inorganic fertilizer combinations. This experiment used five treatments with three replicates and was conducted from February to April 2023 at Barangay Cabisuculan, Science City of Muñoz, Nueva Ecija to examine the effects of IF and chicken manure on the growth and yield components of hybrid rice in a clay loam soil with low nitrogen content, low phosphorus, and deficient potassium.

The treatments evaluated were as follows; T1 - IF (100-30-60 NPK), T2 - OF (5 t/ha), T3 – ½ IF + ½ OF, T4 – 1/3 IF + ¼ OF, and T5 ¼ IF + 1/3 OF. Different levels of organic and inorganic fertilizers showed no significant effect on productive and unproductive tillers, the number of unfilled grains, and 1000-grain weight. However, there is a significant effect on plant height, number of filled grains, and grain yield in terms of using pure chicken manure. When inorganic and organic fertilizers are applied

strategically, the production of rice can be significantly boosted, but organic fertilizer alone cannot increase the yield of rice.

Results showed that applying combined fertilizers gave the highest grain yield per hectare with 4.08 t/ha. It has been shown that the use of both organic and inorganic fertilizers significantly affects rice yield.

Keywords: organic fertilizer; inorganic fertilizer; chicken manure; balanced fertilization

LITERATURE CITED

Anisuzzaman, M., Rafii, M. Y., Ramlee, S. I., Jaafar, N. M., Ikbal, M. F., & Haque, M. A. (2022). The Nutrient Content, Growth, Yield, and Yield Attribute Traits of Rice (Oryza sativa L.) Genotypes as Influenced by Organic Fertilizer in Malaysia. *Sustainability*, *14*(9), 5692.

Bargaz, A., Lyamlouli, K., Chtouki, M., Zeroual, Y., & Dhiba, D. (2018). Soil microbial resources for improving fertilizers efficiency in an integrated plant nutrient management system. *Frontiers in microbiology*, *9*, 1606.

Bhagat, R. (n.d.) *Canal Irrigation Systems*: Structures, Main System, Canal Outlets and Water Delivery Methods

Botha L. (2020). *Farmer's weekly:* Using manure as fertilizer: Mistakes to avoid. https://www.farmersweekly.co.za/farming-basics/how-to-crop/using-manure-as-fertiliser-mistakes-to-avoid/

Cayton, M. T. C., Lantin, R. S., & Neue, H. U. (1988). Chicken manure as an organic fertilizer for rice. *Supplement no. 1*.

Chang, H. S. C. (2007). Analysis of the Philippine chicken industry: Commercial versus backyard sectors. Asian Journal of Agriculture and Development, 4(1), 41-56.

Choudhury, A. T. M. A., Kennedy, I. R., Ahmed, M. F., & Kecskés, M. L. (2007). Phosphorus fertilization for rice and control of environmental pollution problems. Pakistan Journal of Biological Sciences, 10(13), 2098-2105.

Concepcion, R. N., Evangelista, P. P., & Samar, E. D. (1998). Economics of balanced fertilization in irrigated rice farms. *Taiwan): Food and Fertilizer Technology Center*.

Elstad, S. (2022). How to Use Chicken Manure as Fertilizer: *Greener Ideal*. Retrieved from https://greenerideal.com/guides/garden/chicken-manure-as-fertilizer/

Flaig, W. (1984). Soil organic matter as a source of nutrients. *IRRI, Philippines*, 73-92.

Harmon, D., (2022), What Is Inorganic Fertilizer. Retrieved from: https://www.homequestionsanswered.com/what-is-inorganic-fertilizer.htm

Haseeb, J., (2017). Canal Irrigation: *All About Civil Engineering*.

Hossaen, M. A., Shamsuddoha, A. T. M., Paul, A. K., Bhuiyan, M. S. I., & Zobaer, A. S. M. (2011). Efficacy of different organic manures and inorganic fertilizer on the

yield and yield attributes of boro rice. The Agriculturists, 9(1-2), 117-125. https://doi.org/10.3329/agric.v9i1-2.9486

Huntley, D. J., & Baril, M. R. (1997). The K content of the K-feldspars being measured in optical dating or in thermoluminescence dating. Ancient Tl, 15(1), 11-13.

Jagdish (2019). Rice Cultivation Information Guide: *Agriculture Farming,* Retrieved from: Rice Cultivation Information Guide | Agri Farming

Jiang, P., Xie, X., Huang, M., Zhou, X., Zhang, R., Chen, J., ... & Zou, Y. (2016). Potential yield increase of hybrid rice at five locations in southern China. *Rice*, *9*(1), 1-14.

Lansangan, J., Querijero, M., Reyes, R., Cuento, M., Deblois, M., & Garcia, J. (2022). Balanced Fertilization Strategy (BFS)Program. *The FPA Commitment to OneDA Approach.*

Lakshmi, C. S., Reddy, A. P. K., & Jayasree, G. (2014). Effect of organic sources and fertilizer levels on quality and grain yield of hybrid rice. *Annals of Plant and Soil Research*, *16*(2), 93-97.

Magen, H. (2008). Balanced crop nutrition: fertilizing for crop and food quality. *Turkish Journal of Agriculture and Forestry*, *32*(3), 183-193.

Mahmud, A. J., Shamsuddoha, A. T. M., & Haque, M. N. (2016). Effect of organic and inorganic fertilizer on the growth and yield of rice (Oryza sativa L.). *Nature Science*, *14*(2), 45-54. http://www.sciencepub.net/nature.

Moore, A., & Qin, R. (2022). Fertilization and Soil Fertility. Retrieved from: https://forages.oregonstate.edu/oregon/topics/forage-production/fertilization-and-soil-fertility

Moore, P. A., Daniel, T. C., Sharpley, A. N., & Wood, C. W. (1995). Poultry manure management: Environmentally sound options. *Journal of soil and water conservation*, *50*(3), 321-327.

Oagile, D., & Namasiku, M. (2010). "Chicken manure-enhanced soil fertility and productivity: Effects of application rates." ("The Testing of Chicken Manure Fertilizer Doses to Plant Physiology ...") *Journal of soil science and environmental management*, *1*(3), 46-54.

Puli, M. R., Prasad, P. R. K., Babu, P. R., Jayalakshmi, M., & Burla, S. R. (2016). Effect of organic and inorganic sources of nutrients on rice crop. *ORYZA-An International Journal on Rice*, *53*(2), 151-159.

Rahman, F., Hossain, A. T. M. S., & Islam, M. R. (2018). Integrated effects of poultry manure and chemical fertilizer on yield, nutrient balance and economics of wetland rice culture. Bangladesh Rice Journal, 22(2), 71-77.

Rowena A. (2006). *Organic and Inorganic Fertilization of Aromatic Rice (Oryza sativa L.) Grown under the System of Rice Intensification (SRI).* Central Luzon State University.

Ru, S. H., Zhang, G., Niu, J. F., Sun, S. Y., Wang, L. & Geng, N. (2018), Effects of Chicken Manure Application on Crop Yield, International Confe. Biotechnogy Engineering and Biological, 1392-1396. https://ieeexplore.ieee.org/document/6245393

Sagcal, J., (2022). FPA-recommended Fertilizers for Balanced Fertilization Strategy. Retrieved from: https://mb.com.ph/2022/05/30/fpa-recommended-fertilizers-for-balance-fertilization-strategy/

Saleque, M. A., Abedin, M. J., Bhuiyan, N. I., Zaman, S. K., & Panaullah, G. M. (2004). ("Long-term effect of fertilizer application on rice yield, potassium ...") Long-term effects of inorganic and organic fertilizer sources on yield and nutrient accumulation of lowland rice. ("(PDF) Long-term effects of inorganic and organic fertilizer sources on ...") *Field crops research*, *86*(1), 53-65.

Satyanarayana, V., Vara Prasad, P. V., Murthy, V. R. K., & Boote, K. J. (2002). Influence of integrated use of farmyard manure and inorganic fertilizers on yield and yield components of irrigated lowland rice. *Journal of plant nutrition*, *25*(10), 2081-2090.

Shrestha, J., Shah, K. K., & Timsina, K. P. (2020). Effects of different fertilizers on growth and productivity of rice (Oryza sativa L.): A review. *International Journal of Global Science Research*, *7*(1), 1291-1301.

Siavoshi, M., Nasiri, A., & Laware, S. L. (2011). Effect of organic fertilizer on growth and yield components in rice (Oryza sativa L.). Journal of Agricultural science, 3(3), 217.

Su, J. Q., Ding, L. J., Xue, K., Yao, H. Y., Quensen, J., Bai, S. J., ... & Zhu, Y. G. (2015). Long-term balanced fertilization increases the soil microbial functional diversity in a phosphorus-limited paddy soil. *Molecular ecology*, *24*(1), 136-150. https://doi.org/10.1111/mec.13010

Sutardi, Pertiwi, M. D., Praptana, R. H., Anda, M., Purwaningsih, H., Triastono, J., ... & Widodo, S. (2022). Increasing Yield and Economic Value of Upland Rice Using Inorganic Fertilizer and Poultry Manure in Dryland. *Agronomy*, *12*(11), 2829.

Telkamp, M. (2015). The Straight Poop On Using Chicken Manure as Fertilizer. Accessed on December 8, 2017.

Tiwari, D. N., Tripathi, S. R., Tripathi, M. P., Khatri, N., & Bastola, B. R. (2019). Genetic variability and correlation coefficients of major traits in early maturing rice under rainfed lowland environments of Nepal. *Advances in Agriculture*, *2019*.

Usman, M., Ullah, E., Warriach, E. A., Farooq, M., & Liaqat, A. (2003). Effect of organic and inorganic manures on growth and yield of rice variety "Basmati-2000". *Int. J. Agric. Biol*, *5*(4), 481-483.

Virmani, S. S., & Kumar, I. (2004). Development and use of hybrid rice technology to increase rice productivity in the tropics. ("Development and use of hybrid rice technology to increase rice ...") *International Rice Research Notes*, *29*(1), 10-19.

Wei, H., Meng, T., Li, C., Xu, K., Huo, Z., Wei, H., et al. (2017). Comparisons of grain yield and nutrient accumulation and translocation in high-yielding japonica/indica hybrids, indica hybrids, and japonica conventional varieties. Field Crops Res. 204, 101–109. doi:10.1016/j.fcr.2017.01.001

Wei, Z., Zhang, Y., Liu, Z., Peng, M., Wang, T., & Cao, N. (2022). Change in phosphorus requirement with increasing grain yield for rice under saline-sodic stress in Northeast China. Frontiers in Environmental Science, 1211. https://doi.org/10.3389/fenvs.2022.953579

Xie, W. X., Wang, G. H., & Zhang, Q. C. (2007). "Potential production simulation and optimal nutrient management of two hybrid rice varieties in Jinhua, Zhejiang Province, China." ("Potential production simulation and optimal nutrient management of two ...") *Journal of Zhejiang University SCIENCE B*, *8*(7), 486-492.

Xie, F., & Zhang, J. (2018). Shanyou 63: an elite mega rice hybrid in China. Rice, 11(1), 17. https://doi.org/10.1186/s12284-018-0210-9

Yoshida, S. 1983. *Rice. In Symposium on Potential Productivity of Field Crops under Different Environments.* International Rice Research Institute, Laguna, Philippines.