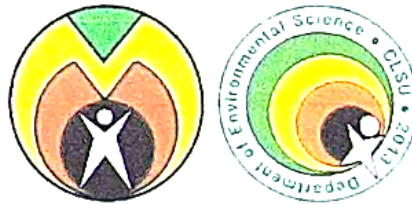


**AGROECOSYSTEM ANALYSIS OF BARANGAY TALABUTAB NORTE,
GEN. MAMERTO NATIVIDAD, NUEVA ECIJA, PHILIPPINES**

JEFFERSON M. BONILLA



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BIOGRAPHICAL SKETCH

PERSONAL INFORMATION

Name : **JEFFERSON MEDINA BONILLA**
Date of Birth : October 11, 1995
Place of Birth : Gen. Mamerto Natividad, Nueva Ecija

EDUCATIONAL BACKGROUND

Elementary : **TALABUTAB NORTE ELEMENTARY SCHOOL**
Talabutab Norte, Gen. Mamerto Natividad, Nueva Ecija
April 2008
3rd Honor

Secondary : **OUR LADY OF FATIMA ACADEMY**
Poblacion, Gen. Mamerto Natividad, Nueva Ecija
March 2012

Tertiary : **CENTRAL LUZON STATE UNIVERSITY**
Science City of Muñoz, Nueva Ecija
Bachelor of Science in Environmental Science

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AGROECOSYSTEM ANALYSIS OF BARANGAY TALABUTAB NORTE, GEN. MAMERTO NATIVIDAD, NUEVA ECIJA PHILIPPINES¹

JEFFERSON M. BONILLA

ABSTRACT

Background: The study aimed to evaluate the agroecosystem of Barangay Talabutab Norte, Gen. Mamerto Natividad, Nueva Ecija through a comprehensive agroecosystem analysis (AEA) using productivity, economic viability and ecological soundness. Specifically, the study aimed to describe the socio-demographic profile of the representative farmers, soil resource condition, land capability and crop suitability. **Methods:** The farms were categorized into three (3) groups: (1) less than 1 ha; (2) 1.1 to 2.9 ha; and (3) greater than 3 ha. For each group, twenty-five (25) farmers which comprise 20% of the population were randomly selected and interviewed for Land Utilization Types (LUTs) description. There were seventy-five (75) composite samples taken from the entire Barangay. Soil sampling was done for the determination of the major nutrients N, P, and K as well as the soil texture and color. **Results:** The nitrogen and phosphorus content of the soil in the Barangay were considered low while the potassium content was sufficient. In terms of soil pH, majority of the farms were considered medium acidity. The sustainability indices in terms of productivity, economic viability and ecological soundness revealed that the farms in the Barangay were low. **Conclusions:** The sustainability of the rice farms in terms of productivity, economic viability and ecological soundness were considered to be low according the revised Human Development Index (HDI).

Keywords: agroecosystem, agroecosystem analysis, LUTs

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- Floresca, J. P., Alcantara, A. J., Lamug, C. B., Rapera, C. L., & Adalla, C. B. (2009). Assessment of ecosystem services of lowland rice agroecosystems in Echague, Isabela, Philippines. *Journal of Environmental Science and Management*, 12(1), 25-41.
- Gastó, J., Vera, L., Vieli, L., & Montalba, R. (2009). Sustainable agriculture: unifying concepts. *Ciencia E Investigacion Agraria*, 36(1), 5–26. [http://doi.org/ 10.4067 / S0718-16202009000100001](http://doi.org/10.4067/S0718-16202009000100001)
- Harrier, L. A., & Watson, C. A. (2004). The potential role of arbuscular mycorrhizal (AM) fungi in the bioprotection of plants against soil-borne pathogens in organic and/or other sustainable farming systems. *Pest Management Science*, 60(2), 149-157. <http://doi.org/10.1002/ps.820>
- International Foundation of Organic Agriculture and Management (IFOAM). (2009). *Definition of organic agriculture*. Retrieved June 28, 2016 from [http:// www.ifoam.bio/en/organic-landmarks/definition-organic-agriculture](http://www.ifoam.bio/en/organic-landmarks/definition-organic-agriculture).
- Municipal Agricultural Office (MAO). (2016). *General masterlist of farmers in Barangay Talabutab Norte*. Gen. Mamerto Natividad, Nueva Ecija, Philippines: Author.
- Municipal Planning and Development Office (MPDO). (2016). *Comprehensive land use plan of Gen. Mamerto Natividad, Nueva Ecija, Philippines*. Gen Mamerto Natividad, Nueva Ecija, Philippines: Author.
- Nellemann, C., MacDevette, M., Manders, T., Eickhout, B., Svihus, B., Prins, A.G. and Kaltenborn, B.P. (2009). *The environmental food crisis – the environment’s role in averting future food crises*. Arendal, Norway: United Nations Environment Programme (UNEP).
- National Agriculture and Forestry Research Institute (NAFRI) (2006). *Handbook on agroecosystem analysis and agroecological zoning*. Phongsali, Laos: Lao-Swedish Upland Agriculture and Forestry Research Programme (LSUAFRP).
- Padmavathy, K., & Poyyamoli, G. (2011). Alternative farming techniques for sustainable food production. In E. Litchfouse (ed.), *Genetics, Biofuels and Local Farming Systems*, (pp. 367-424). Pondicherry, India: Springer Science+Business Media B.V.
- Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) - Department of Science and Technology (DOST). (2006). *The Philippines recommends for soil fertility management*. Los Baños, Laguna, Philippines: Author.

- Perez, F.O. (2002). *Soil pollutant susceptibility rating for rice agroecosystems*. Unpublished master's thesis, University of the Philippines Los Baños. Laguna, Philippines.
- Power, A. G. (2010). Ecosystem services and agriculture: tradeoffs and synergies. *Philosophical Transactions of the Royal Society of London B: Biological Sciences*, 365(1554), 2959-2971. <http://doi.org/10.1098/rstb.2010.0143>
- Pugliese, P. (2001). Organic farming and sustainable rural development: A multifaceted and promising convergence. *Sociologia Ruralis*, 41(1), 112-130. <http://doi.org/10.1111/1467-9523.00172>
- Rigby, D., & Cáceres, D. (2001). Organic farming and the sustainability of agricultural systems. *Agricultural Systems*, 68(1), 21-40. [http://doi.org/10.1016/S0308-521X\(00\)00060-3](http://doi.org/10.1016/S0308-521X(00)00060-3)
- Ruiz-Rosado, O. (2006). Agroecology: A discipline leading towards transdiscipline. *Interciencia*, 31(2), 140-145.
- Silici, L. (2014). *Agroecology. what it is and what it has to offer*. London, UK: International Institute for Environment and Development (IIED).
- Singh, J. S., Pandey, V. C., & Singh, D. P. (2011). Efficient soil microorganisms: a new dimension for sustainable agriculture and environmental development. *Agriculture, Ecosystems & Environment*, 140(3), 339-353. <http://doi.org/10.1016/j.agee.2011.01.017>
- Smit, B., & Smithers, J. (1993). Sustainable agriculture: interpretations, analyses and prospects. *Canadian Journal of Regional Science*, 16(3), 499-524. <http://doi.org/10.705-4580>
- United Nations (2007). *Indicators of sustainable development: guidelines and methodologies indicators of sustainable development : (Third.)*. New York, NY: United Nations.
- United States Department of Agriculture (1995). *Land capability classification*. Southwest, WA: Department of Agriculture, Soil Conservation Service.
- United Nations Development Program (UNDP). (2015). *Human development report of 2015*. New York, NY: Author. Retrieved January 16, 2017 from http://hdr.undp.org/sites/default/files/hdr2015_technical_notes.pdf.

- Wood, D., & Lenne, J. M. (1997). The conservation of agrobiodiversity on farm: Questioning the emerging paradigm. *Biodiversity and Conservation*, 6(1), 109–129. <http://doi.org/10.1023/A:1018331800939>
- Yoshida, S. (1978). *Tropical climate and its influence on rice*. Los Baños, Laguna: International Rice Research Institute (IRRI).
- Zhang, W., Ricketts, T. H., Kremen, C., Carney, K., & Swinton, S. M. (2007). Ecosystem services and dis-services to agriculture. *Ecological Economics*, 64(2), 253-260. <http://doi.org/10.1016/j.ecolecon.2007.02.024>
- Zhu, W., Wang, S., & Caldwell, C. D. (2012). Pathways of assessing agroecosystem health and agroecosystem management. *Acta Ecologica Sinica*, 32(1), 9-17. <http://doi.org/10.1016/j.chnaes.2011.11.001>