



REFERENCES

- Abdul Khaliq, S. J., Al-Busaidi, A., Ahmed, M., Al-Wardy, M., Agrama, H., and Choudri, B. S. 2017. The effect of municipal sewage sludge on the quality of soil and crops. *International Journal of Recycling of Organic Waste in Agriculture.* 6(4): 289–299.
- Almeida, D. M., Margarida Oliveira, M., and Saibo, N. J. M. 2017. Regulation of Na⁺ and K⁺ homeostasis in plants: Towards improved salt stress tolerance in crop plants. *Genetics and Molecular Biology.* 40(1): 326–345.
- Asyifah, M. N., Abd-Aziz, S., Phang, L. Y., and Azlian, M. N. 2012. Brown rice as a potential feedstuff for poultry. *Journal of Applied Poultry Research.* 21(1): 103–110.
- Ayilara, M. S., Olanrewaju, O. S., Babalola, O. O., and Odeyemi, O. 2020. Waste management through composting: Challenges and potentials. *Sustainability (Switzerland).* 12(11): 1–23.
- Bai, X., Gao, J., Wang, S., Cai, H., Chen, Z., and Zhou, J. 2020. Excessive nutrient balance surpluses in newly built solar greenhouses over five years leads to high nutrient accumulations in soil. *Agriculture. Ecosystems and Environment.* 288.
- Balai Penelitian Tanah. 2009. Analisis Kimia Tanah, Tanaman, Air, dan Pupuk. Balai Penelitian Tanah, Badan Penelitian dan Pengembangan Pertanian, Bogor.
- Barbosa, J. Z., Poggere, G. C., Dalpisol, M., Serrat, B. M., Bittencourt, S., and Motta, A. C. V. 2017. Aplicação de lodo de esgoto alcalinizado melhora a fertilidade de solos ácidos. *Ciencia e Agrotecnologia.* 41(5): 483–493.
- Benito, B., Haro, R., Amtmann, A., Cuin, T. A., and Dreyer, I. 2014. The twins K⁺ and Na⁺ in plants. *Journal of Plant Physiology.* 171(9): 723–731.
- Bian, R., Sun, Y., Li, W., Ma, Q., and Chai, X. 2017. Co-composting of municipal solid waste mixed with matured sewage sludge: The relationship between N₂O emissions and denitrifying gene abundance. *Chemosphere.* 189: 581–589.
- Burger, F., and Čelková, A. 2003. Salinity and sodicity hazard in water flow processes in the soil. *Plant, Soil and Environment.* 49(7): 314–320.
- Cai, Z., Wang, B., Xu, M., Zhang, H., He, X., Zhang, L., and Gao, S. 2015. Intensified soil acidification from chemical N fertilization and prevention by manure in an 18-year field experiment in the red soil of southern China. *Journal of Soils and Sediments.* 15(2): 260–270.
- Cao, X., Ma, L., Liang, Y., Gao, B., and Harris, W. 2011. Simultaneous immobilization of lead and atrazine in contaminated soils using dairy-manure biochar. *Environmental Science & Technology.* 45(11): 4884–4889.



Chen, S., Yan, Z., Ha, X., Qin, W., and Chen, Q. 2020. Combining application of chemical fertilizer with manure significantly increased potassium availability in an alkaline soil. Nutrient Cycling in Agroecosystems. 116(3): 285–298.

Cole, A. 1983. Nitrogen, phosphorus, potassium, calcium and copper as plant nutrients for carrots grown on wood fen peat. Irish Journal of Agricultural Research. 23(2/3): 191–199.

Conrad, R. 2020. Methane Production in Soil Environments-Anaerobic Biogeochemistry and Microbial Life between Flooding and Desiccation. Microorganisms. 8(6): 881.

Day, A. D., & Ludeke, K. L. 1993. Soil Alkalinity. Adaptations of Desert Organisms. 35–37.

Dharma-Wardana M W C. 2018. Fertilizer usage and cadmium in soils, crops and food. Environ Geochem Health. 40: 2739–2759

Dong, D. P., and Watanabe, T. 2017. Municipal Wastewater Irrigation for Rice Cultivation. INTECH

Esrinü, A., Metin, T., Adem, G., Eşitken, A., and Sambo, P. 2011. Boron application improves on yield and chemical composition of strawberry. Acta Agriculturae Scandinavica Section B: Soil and Plant Science. 61(3): 245–252.

Food and Agricultural Materials Inspection Center. 2019. Standard values of harmful substance in feed. http://www.famic.go.jp/ffis/feed/r_safety/r_feeds_safetyj22.html#metals(In Japanese)

Food and Agriculture Organization. 2000. Rice in human nutrition

GAO, S. juan, GAO, J. sheng, CAO, W. dong, ZOU, C. qin, HUANG, J., BAI, J. shun, and DOU, F. gen. 2018. Effects of long-term green manure application on the content and structure of dissolved organic matter in red paddy soil. Journal of Integrative Agriculture. 17(8): 1852–1860.

Graff, A., and Conrad, R. 2005. Impact of flooding on soil bacterial communities associated with poplar (*Populus* sp.) trees. FEMS Microbiology Ecology. 53(3): 401–415.

Gray, N. F. 2004. Biology of wastewater treatment. Biology of Wastewater Treatment, June.

Grobelak, A., Grosser, A., Kacprzak, M., and Kamizela, T. 2019. Sewage sludge processing and management in small and medium-sized municipal wastewater treatment plant-new technical solution. Journal of Environmental Management 234: 90–96.



Gusmini, Nishimura, K., Masuda, T., Adrinal, Tamai, T., and Itani, T. 2015. Nitrogen balance in forage rice (*Oryza sativa* L. cv. Tachisuzuka) cultivation in pots with animal manure application. *Plant Production Science*. 18(4): 529–534.

Hanapi, S. Z., Awad, H. M., Sarip, S. H. M., Aziz, R., Sarmidi, M. R., Ali, S. I. S. 2012. Animal Feed. *Biotechnology Development in Agriculture, Industry and Health*. 422-455

Hargreaves, J. C., Adl, M. S., and Warman, P. R. 2008. A review of the use of composted municipal solid waste in agriculture. *Agriculture, Ecosystems and Environment*. 123(1–3): 1–14.

Hazelton PA, Murphy BW. 2007. *Interpreting Soil Test Results: What Do All The Numbers Mean?*. CSIRO Publishing: Melbourne.

Hettiarachchi, H., S. Caucci, K. Schwärzel. 2018. *Organic Waste Composting through Nexus Thinking*. Springer Nature Switzerland

Iglesias-Jimenez, E., and Alvarez, C. E. 1993. Apparent availability of nitrogen in composted municipal refuse. *Biology and Fertility of Soils*. 16(4): 313–318.

Inubushi, K., Yashima, M., Hanazawa, S., Goto, A., Miyamoto, K., Tsuboi, T., and Asea, G. 2020. Long-term fertilizer management in NERICA cultivated upland affects on soil bio-chemical properties. *Soil Science and Plant Nutrition*. 66(1): 247–253.

Jayasekera, S., Mewett, J., and Hall, S. 2004. Effects of electrokinetic treatments on the properties of a salt affected soil. *Australian Geomechanics Journal*. 39(4): 33–46.

Joint Food Agriculture Organization (FAO) / World Health Organization (WHO). 2017. *Food Standards Programme Codex Committee on Contaminants in Foods*.

Jones, D. B. 1941. Factor for converting percentage of nitrogen in foods and feeds into percentage of protein. US Department of Agriculture, Washington DC, USA.

Kaboosi, K., and Esmailnezhad, R. 2018. Reclaimed wastewater quality assessment for irrigation and its mid-time reuse effects on paddy growth and yield under farmer management. *The Open Agriculture Journal*. 12(1): 64–73.

Karki, S., Rizal, G., and Quick, W. P. 2013. Improvement of photosynthesis in rice (*Oryza sativa* L.) by inserting the C4 pathway. *The Rice Journal*. 6(28): 1-15

Kehrein, P., Van Loosdrecht, M., Osseweijer, P., Garfí, M., Dewulf, J., and Posada, J. 2020. A critical review of resource recovery from municipal wastewater treatment plants-market supply potentials, technologies and bottlenecks. *Environmental Science: Water Research and Technology*. 6(4): 877–910.

Keren, R. 2000. "Handbook of Soil Science." In Salinity, edited by M. E. Summer, G-3–25. Boca Raton: CRC Press.



Kirchmann, H., Börjesson, G., Kätterer, T., and Cohen, Y. 2017. From agricultural use of sewage sludge to nutrient extraction: A soil science outlook. *Ambio.* 46(2): 143–154.

Kominko, H., Gorazda, K., and Wzorek, Z. 2019. Potentiality of sewage sludge-based organo-mineral fertilizer production in Poland considering nutrient value, heavy metal content and phytotoxicity for rapeseed crops. *Journal of Environmental Management*: 248(109283): 1-13.

Lamastra, L., Suci, N. A., and Trevisan, M. 2018. Sewage sludge for sustainable agriculture: Contaminants' contents and potential use as fertilizer. *Chemical and Biological Technologies in Agriculture*. 5(1): 1–6.

Latare, A. M., and Singh, S. K. 2013. Effect of Sewage Sludge and Fertilizers Application on Accumulation of Heavy Metals and Yield of Rice (*Oryza sativa* L.) in an Inceptisol of Varanasi. 61(3): 219–225.

Lehoczky, E., and Reisinger, P. 2003. Study on the weed-crop competition for nutrients in maize. *Communications in Agricultural and Applied Biological Sciences*. 68(4): 373–380.

Liesack, W., Schnell, S., and Revsbech, N. P. 2000. Microbiology of flooded rice paddies. *FEMS Microbiology Reviews*. 24(5): 625–645.

López-Vicente, M., Calvo-Seas, E., Álvarez, S., and Cerdà, A. 2020. Effectiveness of cover crops to reduce loss of soil organic matter in a rainfed vineyard. *Land*. 9(230): 1-16.

Luo, X., Fu, X., Yang, Y., Cai, P., Peng, S., Chen, W., and Huang, Q. 2016. Microbial communities play important roles in modulating paddy soil fertility. *Scientific Reports*. 6: 1–12.

Mahler, R. L. 2004. Nutrients Plants Require for Growth. University of Idaho Department of Plant, Soil, and Entomological Sciences. 1-4

Makabe, S., Kakuda, K. I., Sasaki, Y., Ando, T., Fujii, H., and Ando, H. 2009. Relationship between mineral composition or soil texture and available silicon in alluvial paddy soils on the Shounai Plain, Japan. *Soil Science and Plant Nutrition*. 55(2): 300–308.

Ma, Q., Sun, L., Tian, H., Rengel, Z., and Shen, J. 2021. Deep banding of phosphorus and nitrogen enhances Rosa multiflora growth and nutrient accumulation by improving root spatial distribution. *Scientia Horticulture*. 277: 1-10.

Marschner, P., Kandeler, E., and Marschner, B. 2003. Structure and function of the soil microbial community in a long-term fertilizer experiment. *Soil Biology and Biochemistry*. 35 (2003): 453–461



Martínez-Cortijo, J., and Ruiz-Canales, A. 2018. Effect of heavy metals on rice irrigated fields with waste water in high pH Mediterranean soils: The particular case of the Valencia area in Spain. Agricultural Water Management. 210:108–123.

Mehmood, T., Bibi, I., Shahid, M., Niazi, N. K., Murtaza, B., Wang, H., Ok, Y. S., Sarkar, B., Javed, M. T., and Murtaza, G. 2017. Effect of compost addition on arsenic uptake, morphological and physiological attributes of maize plants grown in contrasting soils. Journal of Geochemical Exploration. 178: 83–91.

Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan. 2015. Guidelines on Establishment of Efficient Improvement Plan of Combined Sewage System. (In Japanese).

Muhammad, H., Javeed, R., Qamar, R., Rehman, A., Ali, M., Rehman, A., Farooq, M., Zamir, S. I., Nadeem, M., Cheema, M. A., Shehzad, M., Zakir, A., and Sarwar, M. A. 2019. Improvement in Soil Characteristics of Sandy Loam Soil and Grain Quality of Spring Maize by Using Phosphorus Solubilizing Bacteria. 11(7049): 1–20.

Mylavaram, R., J. Bergeron, and N. Wilkinson. 2020. Soil pH and electrical conductivity: a county extension soil laboratory manual. Department of Soil and Water Sciences, UF/IFAS.

Nagumo, T., Tajima, S., Chikushi, S., and Yamashita, A. 2013. Phosphorus balance and soil phosphorus status in paddy rice fields with various fertilizer practices. Plant Production Science. 16(1): 69–76.

Nakano, H., Tanaka, R., Wada, H., Okami, M., Nakagomi, K., & Hakata, M. 2020. Breaking rice yield barrier with the ratooning method under changing climatic conditions: A paradigm shift in rice-cropping systems in southwestern Japan. Agronomy Journal. 112(5): 3975–3992.

Neina, D. 2019. The Role of Soil pH in Plant Nutrition and Soil Remediation. Applied and Environmental Sciences. 2019: 1-9

Nguyen, T. T., Sasaki, Y., Kakuda, K., and Fujii, H. 2020. Comparison of paddy soil fertility under conventional rice straw application versus cow dung compost application in mixed crop–livestock systems in a cold temperate region of Japan. Soil Science and Plant Nutrition. 66(1): 106-115

Jones, J. B. Jr. 2012. Plant Nutrition. Taylor and Francis Group

Jones, J.B., Jr, B. Wolf, and H.A. Mills. 1991. Plant Analysis Handbook. A practical sampling, preparation, analysis, and interpretation guide. Micro-Macro Pub, Inc.

Payman, G., Board, D., Rami, R., Pakanati, R., & Madhavi, A. 2017. Accumulation of nutrients (NPK) at different growth stages of machine transplanted rice (*Oryza sativa* L.) under different levels of nitrogen and split schedules accumulation of



nutrients (NPK) at different growth stages of machine transplanted rice. International Journal of Current Microbiology and Applied Sciences. 4: 172-181

Paz, A. M., Castanheira, N., Farzamian, M., Paz, M. C., Gonçalves, M. C., Monteiro Santos, F. A., and Triantafilis, J. 2020. Prediction of soil salinity and sodicity using electromagnetic conductivity imaging. Geoderma. 361: 1-10

Phung, L. D., Ichikawa, M., Pham, D. V., Sasaki, A., and Watanabe, T. 2020. High yield of protein-rich forage rice achieved by soil amendment with composted sewage sludge and topdressing with treated wastewater. Scientific Reports. 10(10155): 1-9

Picariello, E., Pucci, L., Carotenuto, M., Libralato, G., Lofrano, G., & Baldantoni, D. 2021. Compost and sewage sludge for the improvement of soil chemical and biological quality of mediterranean agroecosystems. Sustainability (Switzerland). 13(1): 1-17.

Pittol, M., Scully, E., Miller, D., Durso, L., Mariana Fiúza, L., and Valiati, V. H. 2018. Bacterial community of the rice floodwater using cultivation-independent approaches. International Journal of Microbiology. 2018(6280484): 1-13

Puyol, D., Batstone, D. J., Hülsen, T., Astals, S., Peces, M., and Krömer, J. O. 2017. Resource recovery from wastewater by biological technologies: opportunities, challenges, and prospects. Frontiers in Microbiology. 7: 1-23.

Qaswar, M., Jing, H., Ahmed, W., Dongchu, L., Shujun, L., Lu, Z., Cai, A., Lisheng, L., Yongmei, X., Jusheng, G., and Huimin, Z. 2020. Yield sustainability, soil organic carbon sequestration and nutrients balance under long-term combined application of manure and inorganic fertilizers in acidic paddy soil. Soil and Tillage Research. 198(104569): 1-11

Queensland Government. 2016. <https://www.qld.gov.au/environment/land>. Accessed on Februari 10th, 2020

Rani, P. S., and Latha, A. 2017. Effect of calcium, magnesium and boron on nutrient uptake and yield of rice in Kole lands of Kerala. Indian Journal of Animal Research. 51(4): 388–391.

Richards, L.A. (Ed.). 1954. Diagnosis and Improvement of Saline and Alkali Soils. Agricultural Handbook. USDA

Ritchey, Edwin L., McGrath, Joshua M., and Gehring, David. 2015. Determining Soil Texture by Feel. Agriculture and Natural Resources Publications. 139.

Rodríguez-Navarro, A., and Rubio, F. 2006. High-affinity potassium and sodium transport systems in plants. Journal of Experimental Botany. 57(5): 1149–1160.

Roig, N., Sierra, J., Martí, E., Nadal, M., Schuhmacher, M., and Domingo, J. L. 2012.



Long-term amendment of Spanish soils with sewage sludge: effects on soil functioning. *Agriculture, Ecosystems and Environment*. 158: 41–48.

Sainju, U. M. 2017. Determination of nitrogen balance in agroecosystems. 4: 199–208.

Satpathy, D., Reddy, M. V., and Dhal, S. P. 2014. Risk assessment of heavy metals contamination in paddy soil, plants, and grains (*Oryza sativa L.*) at the east coast of India. *BioMed Research International*. 2014(545473): 1-11.

Scheibler, R. B., Schafhäuser, J., Rizzo, F. A., Nörnberg, J. L., Vargas, D. P., Silva, J. L. S., Fluck, A. C., and Fioreze, V. I. 2015. Replacement of corn grain by brown rice grain in dairy cow rations: nutritional and productive effects. *Animal Feed Science and Technology*. 208: 214–219.

Scotti, R., Bonanomi, G., Scelza, R., Zoina, A., and Rao, M. A. 2015. Organic amendments as sustainable tool to recovery fertility in intensive agricultural systems. *Journal of Soil Science and Plant Nutrition*. 15(2): 333–352.

Seilsepour, M., M. Rashidi, and B. G. Khabbaz. 2009. Prediction of soil exchangeable sodium percentage based on soil sodium adsorption ratio. *American-Eurasian Journal Agriculture and Environmental Science*. IDOSI Publications. 5(1): 01-04

Shi, L. L., Shen, M. X., Lu, C. Y., Wang, H. H., Zhou, X. W., Jin, M. J., and Wu, T. D. (2015). Soil phosphorus dynamic, balance and critical P values in long-term fertilization experiment in Taihu Lake region, China. *Journal of Integrative Agriculture*. 14(12): 2446–2455.

Soetan, K. O., Olaiya, C. O., and Oyewole, O. E. 2010. The importance of mineral elements for humans, domestic animals and plants : A review. *African Journal of Food Science*. 4: 200–222.

Sultana, M., Jahiruddin, M., Rafiqul Islam, M., Mazibur Rahman, M., Abedin, M. A., and Solaiman, Z. M. 2021. Article nutrient enriched municipal solid waste compost increases yield, nutrient content and balance in rice. *Sustainability (Switzerland)*. 13(3): 1–12.

Tang, J., Zhang, L., Zhang, J., Ren, L., Zhou, Y., Zheng, Y., Luo, L., Yang, Y., Huang, H., and Chen, A. 2020. Physicochemical features, metal availability and enzyme activity in heavy metal-polluted soil remediated by biochar and compost. *Science of the Total Environment*. 701(134751): 1-9.

Tan, K.H. 2011. Principles of Soil Chemistry. 4th ed. CRC Press, Taylor & Francis group. USA.

United States Department of Agriculture (USDA). 1999. Soil Quality Test Kit Guide. Natural Resources Conservation Service. 59



United States Department of Agriculture (USDA). 2017. Sodium Adsorption Ratio. Soil Survey Staff, Natural Resources Conservation Service. 1-2

Wakeel, A. 2013. Potassium-sodium interactions in soil and plant under saline-sodic conditions. *Journal of Plant Nutrition and Soil Science*. 176(3): 344–354.

Wan, Y., Huang, Q., Wang, Q., Yu, Y., Su, D., Qiao, Y., and Li, H. 2020. Accumulation and bioavailability of heavy metals in an acid soil and their uptake by paddy rice under continuous application of chicken and swine manure. *Journal of Hazardous Materialsc*. 384(121293): 1-10.

Wang, K., Cui, K., Liu, G., Luo, X., Huang, J., Nie, L., Wei, D., and Peng, S. 2017. Low straw phosphorus concentration is beneficial for high phosphorus use efficiency for grain production in rice recombinant inbred lines. *Field Crops Research*. 203: 65–73.

Watanabe, T., Mashiko, T., Maftukhah, R., Kaku, N., Pham, D. D., and Ito, H. 2017. Nitrogen removal and power generation from treated municipal wastewater by its circulated irrigation for resource-saving rice cultivation. *Water Science and Technology*. 75(4): 898–907.

Welch, R. M. 1995. Micronutrient Nutrition of Plants. *Critical Reviews in Plant Sciences*. 14(1): 49–82

Wong, J. W. C., Li, K., Fang, K., and Su, D. C. 2001. Toxicity evaluation of sewage sludges in Hong Kong. *Environment International*. 27(5): 373–380.

Wong, J.W.C., Li, K., Fang, M., Su, D.C., 2001. Toxicity evaluation of sewage sludge in Hong Kong. *Environ. Int.* 27, 373–380.

World Health Organization (WHO). 1933. Standard maxima for metals in agricultural soil.

Xu, X., Cao, X., and Zhao, L. 2013. Comparison of rice husk- and dairy manure-derived biochars for simultaneously removing heavy metals from aqueous solutions: Role of mineral components in biochars. *Chemosphere*. 92(8). 955–961.

Yan, X., Wei, Z., Hong, Q., Lu, Z., and Wu, J. 2017. Phosphorus fractions and sorption characteristics in a subtropical paddy soil as influenced by fertilizer sources. *Geoderma*. 295: 80–85.

Yang, F., Li, G., Shi, H., and Wang, Y. 2015. Effects of phosphogypsum and superphosphate on compost maturity and gaseous emissions during kitchen waste composting. *Waste Management*. 36: 70–76.

Yoshiva, S., and Castaneda, L. 1969. Partial replacement of potassium by sodium in the rice plant under weakly saline conditions. *Soil Science and Plant Nutrition*. 15(4): 183–186.



Zhang, D., Luo, W., Li, Y., Wang, G., and Li, G. 2018. Performance of co-composting sewage sludge and organic fraction of municipal solid waste at different proportions. *Bioresource Technology*. 250: 853–859.

Zhang, Y. jie, Hua, J. jing, Li, Y. chao, Chen, Y. ying, and Yang, J. chang. 2012. Effects of phosphorus on grain quality of upland and paddy rice under different cultivation. *Rice Science*. 19(2): 135–142.