Land and Environmental Management

Editor *Hazairin Zubair*

Land and Environmental Management

Editor
Hazairin Zubair

Publisher
unhas press

Land and Environmental Management

Editor
Hazairin Zubair

Layouter & Cover Design
Muhammad Ihlasul Amal

ISBN 978-979-530-371-8
Published, I 2022

Publisher
Unhas Press

Membership
IKAPI No.: 002/SSL/01 & APPTI No.: 005.026.1.03.2018

Publisher Address
UPT Unhas Press Office, Unhas Tamalanrea Campus
Perintis Kemerdekaan KM 10 Street, Makassar, South Sulawesi
Phone/WA: +62 8229 9555 591 — Email: unhaspress@gmail.com
Website: unhaspress.unhas.ac.id

Contents

Besides increasing farmers' income, one of the positive externalities of paddy fields is reducing the surface flow rate. Terracing will reduce the length and slope of the slopes to reduce surface runoff and erosion.

4. Conclusion

The period 2010 to 2020 saw a decline in industrial forest plantations, dry land, mixed bush farming, and savanna by 126.81 ha, 339.33 ha, and 103.67 ha, respectively. In this period, there was also an increase in secondary dryland forest, rice fields, shrubs, water bodies, and open land by 58.45 ha, 285.67 ha, 109.64 ha, 92.88 ha, and 23.18 ha, respectively. To achieved the Tanralili Sub-watershed sustainability, watershed management can be carried out by a). Increasing forest area (secondary forest and industrial plantation forest) and reducing the area of dryland agriculture by combining forestry and agricultural activities on existing dryland agricultural land cover (agroforestry); b). it was managing the area of water bodies in the Tanralili sub-watershed through reforestation activities or river normalization to increase assimilative water capacity; c). Increase the area of rice fields in specific locations. Increasing rice fields' area can increase farmers' income, reduce the amount of runoff or erosion, and control landslides if done by terracing on slope land.

References

[1] E. F. Lambin et al., "The causes of land-use and land-cover change: Moving beyond the myths," *Glob. Environ. Chang.*, vol. 11, no. 4, pp. 261–269, 2001.

[2] R. Erdogan, "Stakeholder Involvement in Sustainable Watershed Management," *Adv. Landsc. Archit.*, 2013.

[3] B. Bishaw, "Deforestation and Land Degredation in the Ethiopian Highlands: A Strategy for Physical Recovery," *Northeast Afr. Stud.*, vol. 8, no. 1, pp. 7–25, 2001.

[4] Q. Wu et al., "Monitoring and predicting land use change in Beijing using remote sensing and GIS," *Landsc. Urban Plan.*, vol. 78, no. 4, pp. 322–333, 2006.

[5] N. Ramankutty and J. A. Foley, "Estimating historical changes in global land cover: Croplands from 1700 to 1992," *Global Biogeochem. Cycles*, vol. 13, no. 4, pp. 997–1027, 1999.

[6] A. O. Haris, H. Zubair, and S. A. Syaiful, "Land suitability evaluation of crops that form agroforestry in tanralili district maros regency," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 637, no. 1, 2021.

[7] R. K. Jaiswal, N. C. Ghosh, A. K. Lohani, and T. Thomas, "Fuzzy AHP Based Multi Crteria Decision Support for Watershed Prioritization," *Water Resour. Manag.*, vol. 29, no. 12, pp. 4205–4227, 2015.

[8] C. Losiri, M. Nagai, S. Ninsawat, and R. P. Shrestha, "Modeling urban expansion in Bangkok Metropolitan region using demographic-economic data through cellular Automata-Markov Chain and Multi-Layer Perceptron-Markov Chain models," *Sustain.*, vol. 8, no. 7, 2016.

[9] V. N. Mishra and P. K. Rai, "A remote sensing aided multi-layer perceptron-Markov chain analysis for land use and land cover change prediction in Patna district (Bihar), India," *Arab. J. Geosci.*, vol. 9, no. 4, 2016.

[10] C. A. Ku, "Incorporating spatial regression model into cellular automata for simulating land use change," *Appl. Geogr.*, vol. 69, pp. 1–9, 2016.

[11] H. W. Zheng, G. Q. Shen, H. Wang, and J. Hong, "Simulating land use change in urban renewal areas: A case study in Hong Kong," *Habitat Int.*, vol. 46, pp. 23–34, 2015.

[12] C. K. Yeh and S. C. Liaw, "Application of landscape metrics and a Markov chain model to assess land cover changes within a

forested watershed, Taiwan," *Hydrol. Process*., vol. 29, no. 24, pp. 5031–5043, 2015.

[13] A. Mukhopadhyay, P. Mondal, J. Barik, S. M. Chowdhury, T. Ghosh, and S. Hazra, "Changes in mangrove species assemblages and future prediction of the Bangladesh Sundarbans using Markov chain model and cellular automata," *Environ. Sci. Process. Impacts*, vol. 17, no. 6, pp. 1111–1117, 2015.

[14] Y. Huang, P. Nian, and W. Zhang, "The prediction of interregional land use differences in Beijing: a Markov model," *Environ. Earth Sci*., vol. 73, no. 8, pp. 4077–4090, 2015.

[15] Hasnawir, T. Kubota, L. Sanchez-Castillo, and A. S. Soma, "The influence of land use and rainfall on shallow landslides in tanralili sub-watershed, Indonesia," *J. Fac. Agric. Kyushu Univ*., vol. 62, no. 1, pp. 171–176, 2017.

[16] R. W. Saaty, "The analytic hierarchy process-what it is and how it is used," *Math. Model*., vol. 9, no. 3–5, pp. 161–176, 1987.

[17] G. Camorani, A. Castellarin, and A. Brath, "Effects of land-use changes on the hydrologic response of reclamation systems," *Phys. Chem. Earth*, vol. 30, no. 8–10, pp. 561–574, 2005.

[18] P. Pamukcu, N. Erdem, Y. Serengil, and T. O. Randhir, "Ecohydrologic modelling of water resources and land use for watershed conservation," *Ecol. Inform*., vol. 36, pp. 31–41, 2016.

[19] D. Rukmana, "Pertanian Berkelanjutan : Mengapa , Apa Dan Pelajaran Penting Dari," pp. 1–9, 2012.

[20] B. Arts and J. de Koning, "Community Forest Management: An Assessment and Explanation of its Performance Through QCA," *World Dev*., vol. 96, no. April, pp. 315–325, 2017.

[21] M. Achmad, S. Samsuar, and H. Mubarak, "Predicting the impact of land-use change on soil erosion rate in Ussu sub-catchment area and sedimentation yield in Malili River," *IOP Conf. Ser. Earth Environ. Sci*., vol. 486, no. 1, 2020.

Hazairin Zubair graduated with a bachelor's degree in Agricultural Engineering at the Faculty of Agricultural Sciences, Hasanuddin University in 1980. The author continued to pursue his education at the Bogor Agricultural Institute and received a Master of Science degree in Soil and Water Conservation in 1987 and a Doctorate degree in Natural Resources and Environmental Management. in 1992. The author is a lecturer at the Soil Science Study Program, Faculty of Agriculture, Hasanuddin University since 1983 and was appointed as Professor in 2008 in the field of Soil and Water Conservation.

The author teaches various courses in undergraduate programs including Soil and Water Conservation, Fundamentals of Soil Science, Land System Analysis and Integrated Watershed Management, as well as in postgraduate programs including Systems Analysis in Agriculture, Environmental Management, Natural and Social Resource Analysis Region, Regional Planning Process and Method, Environmental Impact Analysis, Environmental Modeling, and Gender and Environment.

The author has done a lot of research on soil and land, watershed management, and the environment. The author joins several professional association, including the Indonesian Soil Science Association (HITI), the Indonesian Soil and Water Conservation Society (MKTI), the All-Indonesian Association of Environmental Experts (PERTALINDO).

unhas press

Gedung UPT Unhas Press
Kampus Unhas Tamalanrea
Jln. Perintis Kemerdekaan Km. 10
Email: unhaspress@gmail.com
Makassar

ISBN 978-979-530-371-8
9 789795 303718