

THE REVIEW OF SOCIO-ECONOMIC IMPACT STUDIES IN FOREST PLANTATION

Norfaryanti Kamaruddin^{1*}, Alfred Khaw^{1*}, and Zaiton Samdin^{1,2*}

¹Institute of Tropical Forestry and Forest Products (INTROP), Universiti Putra Malaysia, 43400 UPM Serdang, Selangor

²Faculty of Economics and Management, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor

*norfaryanti@upm.edu.my, alfredkhaw@gmail.com & zaisa@upm.edu.my

Industrial forest managers and conservation scientists agreed that forest plantations play a role in conserving biodiversity and will occupy an increasing proportion of future landscapes. For example, in year 2002, 3% of the world's forests are planted which covered by 60 million hectares in the developed nations and 55 million hectares in developing nations (WRI,1998; FAO, 1999, Hartley, 2002). Forest plantations cover a major proportion of forest area, including 44% in Japan, 20% in New Zealand, and over 90% in Britain (Donald et al., 1997; FAO, 1999). Though tropical forest cover is deteriorating, tropical forest plantation area has increased dramatically, "from about 10 million hectares in 1980 to about 44million hectare in 1990" (Lugo, 1997). Demand for wood products is increasing followed as the population, and will continue to increase into the 21st century (Nambiar,1984; FAO, 1999).

As the land cover for forest plantation is increasing, the socio-economic impact of the plantation is becoming a central issue. This article is to review various methodologies to assess socio-economic impact specifically in forest plantation or agroforestry plantation. Among the socio-economic impact variables include population, non-permanent population, wage economy, employment by industry, labour force, educational attainment, and income. There are methods to assess the impacts and benefits, namely cost-benefit approaches, livelihood analysis, and others.

Table 1 shows the socio-economic impact variables related to Eucalyptus forest plantations. There 5 main variables mostly studied by the researchers. It becomes the main source of wood and energy, provides employment, generates income, develops infrastructure, and offers natural resources availability.

Table 1.0 Socio-economic impact variables

Socioeconomic Impact	References	Explanation
1. Source of Wood and Energy	Zaizhi, 2002; Mekonnen et al., 2007; Alemu, 2016	<ul style="list-style-type: none"> • Meets household subsistence need • Household energy source - Fuelwood • Construction materials, building materials, furniture
2. Employment	Zaizhi, 2002; FAO, 2011; Hamid and Abdalla, 2015; Alemu, 2016	<ul style="list-style-type: none"> • Job creation by the plantation company - especially for an unskilled worker. • It helps poor households who are jobless.
3. Income	Zaizhi, 2002; Mekonnen et al., 2007; Bekele, 2015; Alemu, 2016; Daba, 2016; Zerga & Woldetsadik, 2016;	<ul style="list-style-type: none"> • Eucalyptus increases economic income - increase in wood demand and prices make this species profitable. • Income generation through employment • Income generation through cash crop - produce timber and non-timber products not only for the household consumption but also for sale at the market.
4. Infrastructure	Zaizhi, 2002; Degnet et al., 2017; Landry & Chirwa, 2011; Pirard et al., 2017; D'Amato et al., 2017	<ul style="list-style-type: none"> • Eucalyptus plantation company provide the financial support for local infrastructure - school construction, electricity, tap water, roads, bridges and irrigation system
5. Natural Resources Availability	Tadesse & Tafere, 2017; Chanie et al., 2013; FAO, 2011; Zegeye, 2010; Chanie et al., 2013; Daba, 2016; Yitafaru et al., 2011;	<ul style="list-style-type: none"> • In terms of water availability. • Lessening in groundwater availability. • The rapid growth of the Eucalyptus with deep & solid rooted would lead to decrease and drying out of formerly functional water stores nearby in the watershed.

Table 2 provides the information on the uses of Eucalyptus plant. There are five main uses of the Eucalyptus plant; to produce wood, possess therapeutic values (medicinal and aromatherapy), provide household necessities and

ecosystem services. Wide range of applications drives the socio-economic impact values, as it shows the community could further develop the value chains into small and medium enterprises.

Table 2: The uses of Eucalyptus plant

Uses of Eucalyptus	Description
Wood Production	<ul style="list-style-type: none"> • Timber, wood for all type of construction (heavy, utilitarian, light construction) and also as floorings, building and furniture.
Medical Use	<ul style="list-style-type: none"> • The Eucalyptus oil is good to restore human health such as healing fever, cough, diabetes, respiratory system, insect bites and remedy for muscle and joint pain.
Household Consumption/ Production	<ul style="list-style-type: none"> • An important source of fuelwood in most of the rural area. This is due to its usage as household energy and cooking purpose. • Can be utilised as a household product such as soap and cleansers (antibacterial properties and refreshing properties).
Aromatic Properties	<ul style="list-style-type: none"> • The pleasant smell of Eucalyptus is useful for the aromatherapy purposes • The leaves can be used as herbal teas to comfort, make calm and even act as a cold reliever.
Ecosystem Services	<ul style="list-style-type: none"> • Lower down global warming and at the same time helps animals find natural shelter. • Good for the purpose of the windbreak, aesthetic value and landscaping.

Source: FAO, 1993, FAO, 2011; David, Gabriel and Luther, 2017; Treecoin, 2019; Dessie et al., 2019.

Forest plantations have a significant impact on the community. The method in evaluating the impacts are important, as it determines the policies link to industry development. The purpose of assessing the socio-economic impact is to inform policies. Various policies are in favour to upgrade socioeconomic status, however, the limitations in the information regarding the variables of socio-economic impacts made it difficult to assess.

We presented in Table 3.0 the studies which employed the socio-economic impact method in their studies. Cost-benefit analysis is an established method in studying the socio-economic impact and field visits and interviews are the most common method to obtain the information for the studies.

Table 3.0 Socio-economic research methodology and its scope

Author/Year	Method/Data	Study scope
Gessesse Dessie and Teklu Erkossa/ 2011	Desktop study based on reports, journal articles, and field visits to Rwanda and Ethiopia.	To provide a balanced perspective of socio-economic and environmental impacts of Eucalyptus forest plantation in East Africa.
Jennifer Landrya, Paxie W. Chirwa/ 2010	Livelihood analysis. Data collected using interviews and secondary data.	Assessment of livelihoods of rural households in greenfield forestry of Niassa province, Mozambique.
Janske van Eijck, Henny Romijn, Annelies Balkema, André Faaij / 2014	Cost-benefit analysis, processing cost, yield revenue, the value of by-products, interviews and observations based on issues (i.e, food security, local prosperity, labour working conditions, land rights).	Assessment of key economic, environmental and social issues in jatropha biofuels. To provides an overview and identify knowledge gaps.
Bill Slee/2005	Cost-benefit approaches, regional economic analysis, sustainable livelihoods, community benefits, economic welfare, landscape identity, environment and natural quality.	Highlighting methods devised to evaluate the contribution of forestry to rural development at regional or sub-regional level in the UK.
Maria Rosaria Di Nucci, Christina Spitzbart/2010	An integrated methodological framework, a set of criteria and tailored tools.	To share the results of the CONCERTO initiative. The different publications will provide information to relevant actors aiming to implement sustainability projects in cities across Europe.

A holistic and rigorous framework is needed to study the socio-economic impact of forest plantations. Reviewing the methods and the variables in the socio-economic impact of forest plantations studies is important in developing a comprehensive framework.

▶ REFERENCES

- Alemu, M. M. (2016). Eucalyptus Tree Production in Wolayita Sodo, Southern Ethiopia. *OALib*, 03(12), 1–10.
- Bekele, T. (2015). Integrated Utilization of Eucalyptus globulus grown on the Ethiopian Highlands and its Contribution to Rural Livelihood: A Case Study of Oromia, Amhara and Southern Nations Nationalities and People's Regional State Ethiopia. *International Journal of Basic and Applied Sciences*, 4(2), 80–87.
- Chaniet, T., Collick, A. S., Adgo, E., Lehmann, C. J., & Steenhuis, T. S. (2013). Eco-hydrological impacts of Eucalyptus in the semi-humid Ethiopian Highlands: The Lake Tana Plain. *Journal of Hydrology and Hydromechanics*, 61(1), 21–29.
- Chanthalath, X., Yong, L., Beckline, M., & Inthilath, S. (2017). Assessing the Socioecological Perspectives of Eucalyptus Cultivation and Plantation Expansion in Laos. *OALib*, 04(12), 1–15.
- Corrigan, D. (1992). Eucalyptus Species. In *Book: Adverse Effects of Herbal Drugs*, 125–133.
- D'Amato, D., Rekola, M., Wan, M., Cai, D., & Toppinen, A. (2017). Effects of industrial plantations on ecosystem services and livelihoods: Perspectives of rural communities in China. *Land Use Policy*, 63, 266–278.
- Daba, M. (2016). The Eucalyptus Dilemma: The Pursuit for Socio-economic Benefit versus Environmental Impacts of Eucalyptus in Ethiopia. *Journal of Natural Sciences Research*, 6(19), 127–137.
- David, E., Gabriel, O., & Luther, W. (2017). GSC Biological and Pharmaceutical Sciences Evaluation of the uses of Eucalyptus species in Makurdi Local Government Area of Benue State, Nigeria. *GSC Biological and Pharmaceutical Sciences*, 01(01), 25–34.
- Desalegn, T., Cruz, F., Kindu, M., Turrión, M. B., & Gonzalo, J. (2014). Land-use/land-cover (LULC) change and socioeconomic conditions of local community in the central highlands of Ethiopia. *International Journal of Sustainable Development and World Ecology*, 21(5), 406–413.
- Dessie, A. B., Abteu, A. A., & Koye, A. D. (2019). Determinants of the production and commercial values of Eucalyptus woodlot products in Wogera District, Northern Ethiopia. *Environmental Systems Research*, 8:4.
- Donald, P.F., Haycock, D., Fuller, R.J., 1997. Winter bird communities in forest plantations in western England and their response to vegetation, growth stage and grazing. *Bird Study* 44, 206–219.
- FAO. (1993). *The Ecological, Economic And Social Effects Of Eucalyptus*.
- FAO. (2000). *Global Forest Resources Assessment 2000*.
- FAO. (2013). *Agribusiness public-private partnerships*.
- FAO. (2015). *The economic lives of smallholder farmers*. Fao, 4(4), 1–4.
- FAO. (1996). *Proceedings of the Regional expert consultation on Eucalyptus*. Volume II, 4-8 October 1993, FAO Regional Office for Asia and the Pacific (RAP) Bangkok, Thailand, December 1996.
- Hamid, I.Y., & Abdalla, I.M.F. (2015). Benefits of Eucalyptus camaldulensis Plantations to Local Community in Kenana Sugar Cane Project, Sudan. *International Journal of Current Microbiology and Applied Science*. 4(3). 537-541.
- Jaleta, D., Mbilinyi, B., Mahoo, H., & Lemenih, M. (2016a). Eucalyptus Expansion as Relieving and Provocative Tree in Ethiopia. *Journal of Agriculture and Ecology Research International*, 6(3), 1–12.
- Jaleta, D., Mbilinyi, B., Mahoo, H., & Lemenih, M. (2016b). Evaluation of Land Use/Land Cover Changes and Eucalyptus Expansion in Meja Watershed, Ethiopia. *Journal of Geography, Environment and Earth Science International*, 7(3), 1–12.
- Hartley, M. J. (2002) 'Rationale and methods for conserving biodiversity in plantation forests', *Forest Ecology and Management*, 155(1–3), pp. 81–95. doi: 10.1016/S0378-1127(01)00549-7.
- Lugo, A.E., 1997. The apparent paradox of re-establishing species richness on degraded lands with tree monocultures. *For. Ecol. Manage.* 99, 9–19.
- Mekonnen, Z., Kassa, H., Lemenh, M., & Campbell, B. (2007). The role and management of eucalyptus in lode hetosa district, central ethiopia. *Forests Trees and Livelihoods*, 17(4), 309–323.
- Nambiar, E.K.S., 1984. Plantation forests: their scope and a perspective on plantation nutrition. In: Bowen, G.D., Nambiar, E.K.S. (Eds.), *Nutrition of Plantation Forests*. Academic Press, New York, pp. 1–15.
- Tadesse, S. A., & Tafere, S. M. (2017). Local people's knowledge on the adverse impacts and their attitudes towards growing Eucalyptus woodlot in Gudo Beret Kebele, Basona Worena district, Ethiopia. *Ecological Processes*, 6(1).
- Teketay, D. (2000). Facts and experiences on eucalypts in Ethiopia and elsewhere: ground for making wise and informed decision Facts and Experiences on Eucalypts in Ethiopia and Elsewhere: Ground for Making Wise and Informed Decision 1 Compiled by Demel Teketay, PhD Direc. Walia, 21(January), 25–46.
- Treecoin (2019). 5 Main Uses Of Eucalyptus Trees. Retrieved from <https://tree-coin.io/5-uses-of-eucalyptus-tree/>.
- Turnbull, J. W. (1999). Eucalypt plantations. *New Forests*, 17(1–3), 37–52.
- Yitaferu, B., Fisseha, G., Gebrekidan, H., Kibret, K., & Bedadi, B. (2011). Analysis of land use/land cover changes in the Debre-Mewi watershed at the upper catchment of the Blue Nile Basin, North W Analysis of land use/land cover changes in the Debre-Mewi watershed at the upper catchment of the Blue Nile Basin, Northwest Ethiopi. *Journal of Biodiversity and Environmental Sciences (JBES)*, 184(6), 184–198.
- World Resources Institute, 1998. *World Resources 1998–1999*. Oxford University Press, Oxford, 369 pp.
- Zaizhi, Z. (2002). Socio-economic Assessment of Eucalyptus Plantations in Suixi County, Southern China. *Japan Society of Forest Planning*, 8, 57–65.
- Zerga, B., & Woldetsadik, M. (2016). Contribution Of Eucalyptus Tree Farming For Rural Livelihood In Eza Wereda, Ethiopia. *PJ PALGO JOURNAL OF AGRICULTURE*, 3(1), 111–117.