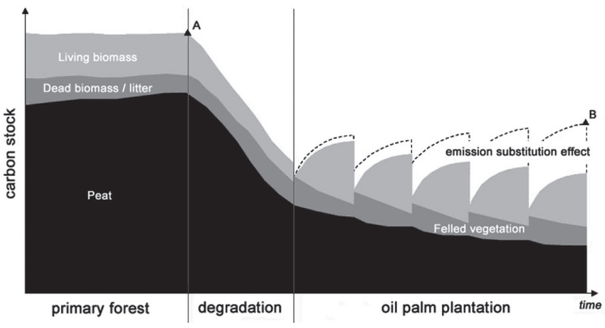
Effects of oil palm cultivation on carbon stocks and biodiversity

C.C. Verwer, P.J. van der Meer, E. Arets



Oil palm is one of the most rapidly expanding food and biofuel crops in the world. Its expansion takes place in regions with high species richness, mainly lowland rain forest and peat swamp forest (PSF) in Southeast Asia. The conversion of these forests leads to large carbon emissions and loss of tropical biodiversity. Many forests that are cleared for oil palm have been degraded and some may actually be net emitters of carbon (Melling et al. 2005).

This study aims (1) to quantify the carbon stocks of PSF during conversion to oil palm and (2) to identify effects of forest conversion to oil palm plantation on species richness.

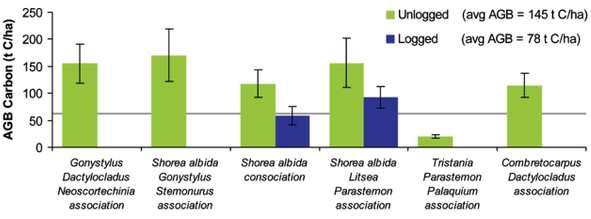


Conceptual diagram of temporal evolution of on-site carbon stocks in living biomass (pale grey), dead biomass (dark grey), peat (black) and the cumulative emission substitution effect (dashed line) during forest conversion (Verwer et al. 2008).

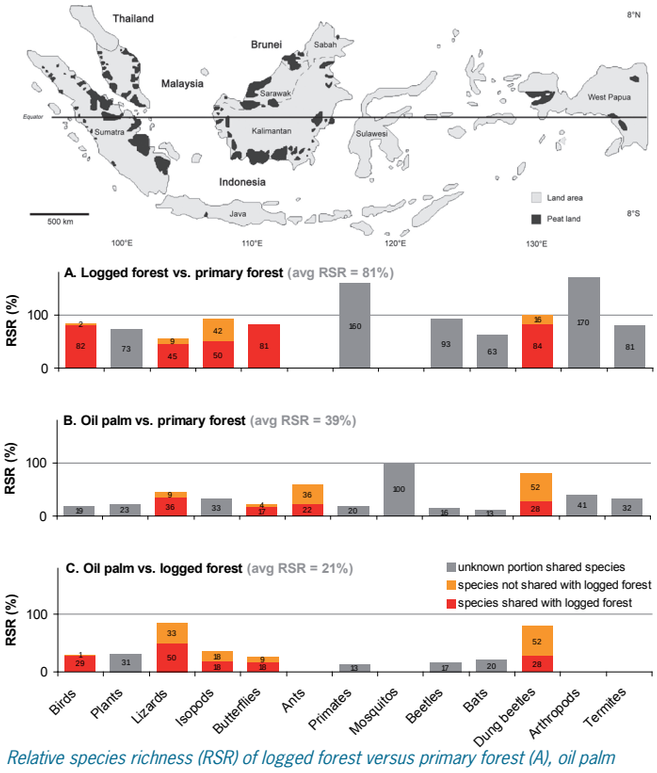
Method

Aboveground biomass (AGB) and carbon content were estimated with nine allometric models that have been verified by field measurements. Historical inventories from Sarawak and Brunei (Anderson 1961) formed a reference for unlogged PSF. Effects of forest conversion on species richness have been estimated based on data from peer reviewed publications.

Results



Carbon stock in AGB of the six phasic communities in PSF. Error bars indicate variation between allometric models used; grey line is the mature oil palm reference (69 t C/ha)



Relative species richness (RSR) of logged forest versus primary forest (A), oil palm plantation versus primary (B) and logged forest (C). Where possible the species shared and not shared have been identified.

Conclusion

Although forest conversion mainly takes place in degraded, logged-over forests with a relatively low carbon stock, the loss of aboveground biomass still plays an important role because losses are not replaced on the long term. Also carbon sequestration potential is much smaller in oil palm estates than in (logged-over) forest.

Conversion of relatively species-poor logged-over forests still results in a significant further reduction of species richness. Conserving biodiversity is best achieved by (1) increasing yields in current plantations, (2) realising new plantings only on degraded grass- or croplands and (3) safeguarding other patches of logged-over forest as high conservation value areas.

Literature

Anderson, J.A.R. 1961. The ecology and forest type of the peat swamp forests of Sarawak and Brunei in relation to their silviculture. PhD Thesis, University of Edinburg, U.K.

Melling, L., Hatano, R., Goh, K.J. 2005. Soil CO2 fluxes from three ecosystems in tropical peatland of Sarawak, Malaysia. Tellus 57b, 1-11

Verwer, C., Meer, P.v.d., Nabuurs, G-J. 2008. Review of carbon flux estimates and other greenhouse gas emissions from oil palm cultivation on tropical peatlands – Identifying the gaps in knowledge. Alterra-rapport 1731. ISSN 15667197

Alterra, Wageningen UR
P.O. Box 47
6700 AA, Wageningen, The Netherlands
Tel: +31 317 – 48 7285, Fax: +31 317 – 41 80 94
E-mail: caspar.verwer@wur.nl

This project is financed by the Dutch ministries of Housing, Spatial Planning and the Environment (VROM) and Agriculture, Nature and Food quality (LNV)

Poster A0 6691 Caspar Verwer.indd 1 25-8-2009 11:53:45