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Nature conservation in Life Cycle Assessment – new method and case study with the palm oil industry

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1. Introduction

In agriculture and forestry, an important means for mitigating impacts on biodiversity and climate change is nature conservation. However, this is seldom included in life cycle assessment (LCA) and most LCA and footprint guidelines prescribe that such off-setting shall be excluded from the system (e.g. ISO 14067; PEF guideline; ILCD guideline; PAS2050; the GHG protocol). Obviously, there are good reasons for excluding off-setting in the guidelines, however in some cases the distance between the studied product system and a mitigation option (offset) is very short, and the industry managing the product system may be the (only) one who is able to conserve high value biodiversity and carbon stock areas. This is the case of companies operating in countries where the frontier between product systems and high conservation value nature is moving.

The purpose of this paper is to describe how the most recent research within indirect land use changes (iLUC) can be used to creating a cause-effect based method for quantifying the life cycle implications of nature conservation. The application of the method is demonstrated with a case study LCA of palm oil production at United Plantations Berhad in Malaysia and Indonesia. With their recent expansion of the plantation area into Central Kalimantan Indonesia, United Plantations has voluntarily set-aside more than 8000 ha of high value conservation and high carbon stock land for permanent nature conservation. The findings are used to recommend how LCA and footprint guidelines should be revised in order to enable for the inclusion of important mitigation options.

2. Materials and methods

A detailed ISO 14044 compliant LCA was carried out in cooperation with United Plantation during March to November 2014. The study is summarised in Schmidt (2014). In the following, focus is on the nature conservation part of the study. Only GHG emissions as GWP100 are shown in this paper.

2.1. Modelling indirect land use changes in LCA

The link between land use (e.g. occupation of 1 ha during one year) to deforestation and related emissions are referred to as indirect land use changes (iLUC). This study uses a model documented in Schmidt et al. (2014) and Schmidt and Muñoz (2014). This model considers that demand for land leads to two main effects: deforestation and intensification – both effects are associated with GHG emissions. The LCA processes that are part of iLUC are illustrated in the right grey box in Figure 1.

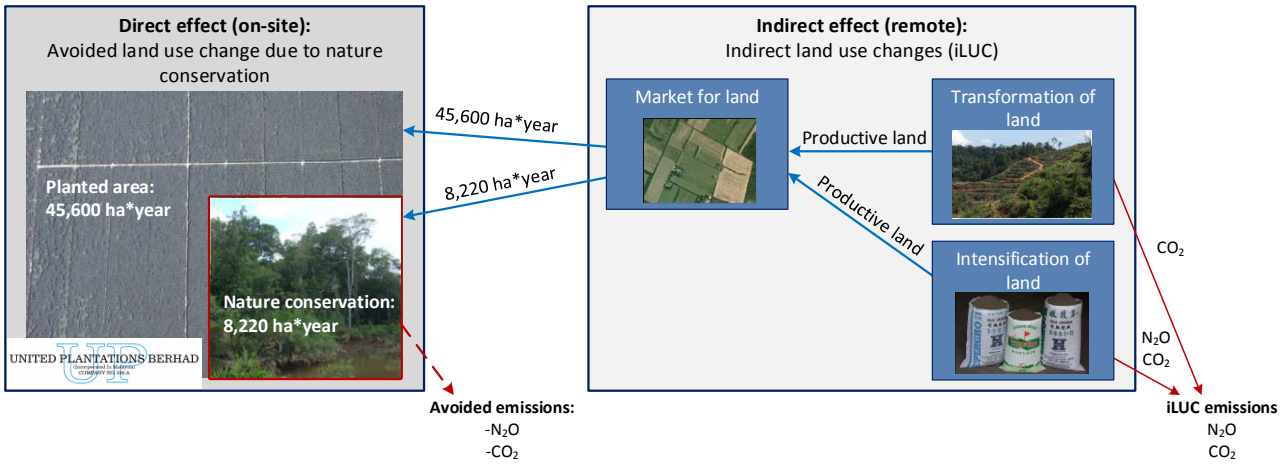

Figure 1: Direct and indirect land use effects of United Plantations' oil palm cultivation. The direct effects refer to nature conservation and the indirect effects refer to the upstream effects of using land. Pictures: fields (Google Maps), nature and transformation of land (Jannick H Schmidt), fertiliser (United Plantations picture library).

When modelling the effect on land use changes from crop cultivation, such as oil palm, the challenge is to identify the additional land use changes relating to a change in the cultivation of a given area during a given period of time. All crops are grown on already cleared land, and the choice to cultivate a plot of already cleared land cannot lead to the clearing of this particular plot of land (because it is already cleared). Therefore, when land is cultivated, it is not associated with any direct land use changes (clearing of the land) on the same plot of land – instead it contributes to the general demand for arable land, and consequently land use changes somewhere else. Land is regarded as an asset input to crop cultivation – in line with other assets, such as tractors. Indirect land use changes are then the upstream effect of this input of land.

2.2. Modelling nature conservation in LCA

The effect of nature conservation can briefly be described as redirecting where and how new land is brought into productive purposes. When preserving a specific plot of land, local specific eco-systems and carbon stocks are conserved, but the global overall demand for land can generally be assumed to not be affected. Hence, an equivalent amount of the function of the conserved land will be brought into production somewhere else. This is illustrated in Figure 1, where the direct effect (onsite) includes the avoided emissions due to nature conservation (8,220 ha), and the indirect effect (remote) refers to the emissions associated with the equivalent amount of land that will be brought into production somewhere else. The concept as lined out above means that the nature conservation is a good idea as long as the conserved land hosts a higher value, i.e. biodiversity and carbon stock, than the alternative land to be brought into production. On-site carbon (C) stocks are estimated based on matching with average strata data in [4].

3. Results and discussion

When not including nature conservation, the life cycle GHG emissions per t of refined palm oil at United Plantations Berhad are 1.85 t CO_2-eq. (of which iLUC accounts for 0.29). When including nature conservation, the GHG emissions are reduced by 0.63 to 1.22 t CO_2-eq. per tonne oil. This means that United Plantations mitigate around the double GHG emissions compared to what they induce by iLUC from their planted area. This is achieved by conserving 8,220 ha out of a total land bank at 53,820 ha, i.e. 15% is set-aside as nature conservation. The savings from nature conservation are mainly associated with the conservation of peat soils, but also the conserved above ground carbon contributes. It should be noted that the iLUC emissions and nature conservation emissions are related to uncertainties, but the overall proportions of the results are regarded as robust, and uncertainties can be reduced by better C stock data.

4. Conclusions

It was clearly demonstrated that nature conservation can significantly reduce the impact of products produced by industries that take responsibility. The benefits are so remarkable that if implemented more broadly, nature conservation may significantly help reaching current national and international goals for GHG emissions and biodiversity. It is regarded as being problematic that most current LCA and footprint guidelines do not allow for including nature conservation offsetting. Given the general strong emphasis on the implementation of Life Cycle Thinking in industry and policy making, the current scope of LCA and footprint guidelines may reflect a missed opportunity for creating incentives for securing nature conservation reserves in fast diminishing natural habitats. Therefore, it is recommended that nature conservation offsetting is included in LCA and footprint guidelines when the conservation is initiated/managed by companies operating in the frontiers of nature. Obviously, sound systems for avoiding greenwashing also need to be set-up.

5. References

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