

# **Land-Use and Livelihoods – A Malaysian Oil Palm Scheme and its Social and Ecological Impacts**

**Nico Wilms-Posen**, *University of Copenhagen*  
**Mali Boomkens**, *AgroParisTech, Montpellier*  
**Sarah d'Apollonia**, *University of Copenhagen*  
**Amanda Klarer**, *SupAgro, Montpellier*  
**Eva Maria Kraus**, *University of Copenhagen*  
**Lena Lyngholt Tynell**, *University of Copenhagen*

*University of Copenhagen, Bülowsvej 17, 1870 Frederiksberg C, Denmark*  
*AgroParisTech, 648 Rue Jean François Breton, 34090 Montpellier, France*  
*SupAgro, 2 place Pierre Viala, 34060 Montpellier, France*  
*Corresponding author: n.wilmsposen@gmail.com*

**Abstract:** *Livelihoods and land-uses in rural Malaysia have undergone a series of changes in the past 40 years affecting both livelihood security and the environment. The rapid rise of oil palm cultivation has been associated with high deforestation rates and biodiversity loss and has therefore triggered concerns regarding the long term sustainability of this land use change. On the other hand, oil palm development has stimulated the national economy and it aims at promoting socio-economic development in rural areas. This study researches pathways through which the Sarawak Land Consolidation and Rehabilitation Authority (SALCRA) oil palm scheme affects livelihood security and environmental sustainability. The study seeks to combine findings of both areas of research. It thus contributes to the evaluation of such government promoted schemes through an integrated, mixed-methods approach.*

*In terms of livelihood security, SALCRA was found to diversify income sources of households at the study site in Sarawak, Malaysia. This diversification occurs through direct and indirect ways. Notwithstanding the positive effects and the general positive perception of SALCRA at the study site, concerns about the environmental sustainability of oil palm development have been expressed regarding soil quality. An analysis of soil active carbon in different land-use types could only partly support those concerns. The amount of labile carbon is to a large extent dependent on management practices in the oil palm plantations. Incentives for soil quality conservation and the application of sound management practices in the plantation will be crucial for creating an environment in which future livelihood options are not harmed, while present generations can still benefit from increased livelihood security.*

**Keywords :** *Livelihood security, oil palm development, Sarawak, land use change, environmental sustainability*

## 1. Introduction

In the Malaysian state of Sarawak, high deforestation rates have been observed over the past decades. At the same time, land under oil palm cultivation increased from 23,000 ha in 1980 to 1.2 m ha in 2012 (Drummond & Taylor 1997; Ministry of Land Development Sarawak, 2014). Deforestation and biodiversity loss have been associated with this rapid expansion, and have triggered concerns regarding the long term sustainability of the land use changes (Sheil *et al.* 2009). Despite these concerns, the high global demand for oil palm has been vigorously promoted as a lucrative cash crop in Sarawak and its adjoining areas on Borneo. National production contributed to 3.2% of Malaysian GDP and exports have increased steadily since 2005 (NEAC 2010). In 2011, Malaysia exported \$17.5 bn worth of palm oil (FAOSTAT, 2013). The government aims to increase future production and perceives oil palm cultivation as an important means to promote socio-economic development in rural Malaysia (Cooke 2006; NEAC 2010). Oil palm development is also hoped to modernize rural areas through newly established infrastructure and reduce high urbanization rates.

To facilitate this development, the Sarawak Land Consolidation and Rehabilitation Authority (SALCRA) scheme was created in 1982-1984 (Banerjee & Bojsen 2005). SALCRA is an *in-situ* scheme that aims to convert Native Customary Right (NCR) land into productive oil palm plantations. SALCRA was originally a governmental plan to develop the rural areas of Sarawak and was driven by the belief that state intervention was necessary in order to enhance a shift in agricultural practices for the benefit of the local population (Banerjee & Bojsen 2005). Today, after being subject to growing political pressure, SALCRA is increasingly focused on profit maximization and the expansion of commercial agriculture consequently it has partly lost its initial focus on poverty reduction. Landowners sign a contract with SALCRA for the development of their unregistered parcels of NCR land. Over the contract period of 25 years, SALCRA develops and maintains large-scale oil palm plantations on the land. During this period, customary right holders transfer rights to develop the land to SALCRA which then becomes the factual owner of the land. In return, the local farmers receive several benefits through the SALCRA scheme.

They receive dividends twice a year from their leased lands, of which the amount is in correlation with the profits of the yields from their plot. Furthermore, they are able to pursue work on the SALCRA plantations and receive an official title to the land that provides secure tenure rights after the contract period (McCarthy & Cramb 2008).

Ngidang (2002) argues that SALCRA also improves livelihoods by increasing the availability of financial and physical (i.e. infrastructure) capital. Although the SALCRA scheme is able to provide direct income for rural people, the sustainability of such large-scale land acquisitions is being debated as the conversion of land into large-scale oil palm plantations can have irreversible environmental effects (Obidzinsk *et al.* 2012; Colchester & Chao 2011; Cramb 2013). With regard to the socio-economic outcomes of the scheme, Banerjee and Bojsen (2005) question the ability of all households in a community to participate equally in the scheme. Furthermore, opportunities for employment within the plantations have found to be limited due to the competition through migrant workers from Indonesia and poor working conditions (Colchester & Chao 2011).

It is thus questionable as to how far SALCRA contributed to livelihood diversification. Such diversification can be desirable for reasons of risk reduction, poverty reduction or resource accumulation depending on the local circumstances (Barrett *et al.* 2001; Ellis 1998). Livelihood diversification thus has implications for the livelihood security of rural households. Mere diversification within agricultural activities might however be detrimental to livelihood outcomes as it can constrain households from leaving the agricultural sector (Rigg 2006). Livelihood diversifications, furthermore, not only impact rural households, but also environmental sustainability. Such interrelations are often difficult to predict (Ellis 2000).

This study addressed the need for empirical interdisciplinary research regarding the long-term effects of changes in factual ownership through the oil palm scheme on livelihood security and the environment. It is unclear to which extent and through which channels SALCRA contributes to the livelihood security of the local population. Existing studies focus on either social or environmental outcomes of the scheme. The objective of the current study

is therefore to provide insights into the different pathways through which livelihood security and environmental sustainability are reduced or enhanced. The study aimed to examine the extent to which SALCRA directly and indirectly influences land-use changes and supports livelihood diversification and consequently contribute to livelihood security in the local context. It furthermore aimed to identify and test the concerns of the local community regarding the environmental sustainability of the oil palm development.

The paper is organized as follows: after describing the theoretical framework and methods that were applied in section 2, results will be presented and discussed in section 3. This third chapter is divided into a section on livelihood security, which outlines four pathways through which SALCRA influences livelihood security, while the following section on environmental sustainability discusses the implications of the scheme on land-use changes and soil quality in a case study area. The conclusion combines aspects of livelihood security and environmental sustainability.

## 2. Theoretical Framework and Methods

The research applied a mixed-method approach that was embedded in the livelihood framework of Ellis (2000).

### 2.1 Theoretical Framework

To assess the impact of the SALCRA oil palm plantation scheme on livelihood security and the environment in the study area an adapted version of Ellis (2000) livelihood framework (figure 1) was used. The framework illustrates that at the household level, actual livelihood strategies are an outcome of (A) assets owned by the household as well as (B) social relations, institutions and organisations modifying access to transform assets into productive activities and (C) trends and shocks that influence peoples' livelihood choices such as market prices, migration trends and floods. It is thus these elements that define a livelihood in this study. As this framework incorporates both environmental and social outcomes, the study follows the call for an increased focus on social outcomes of cash crop production (Hunsberger *et al.* 2014) and acknowledges the multiple facets of oil palm plantations in South East Asia (Sayer *et al.* 2012).

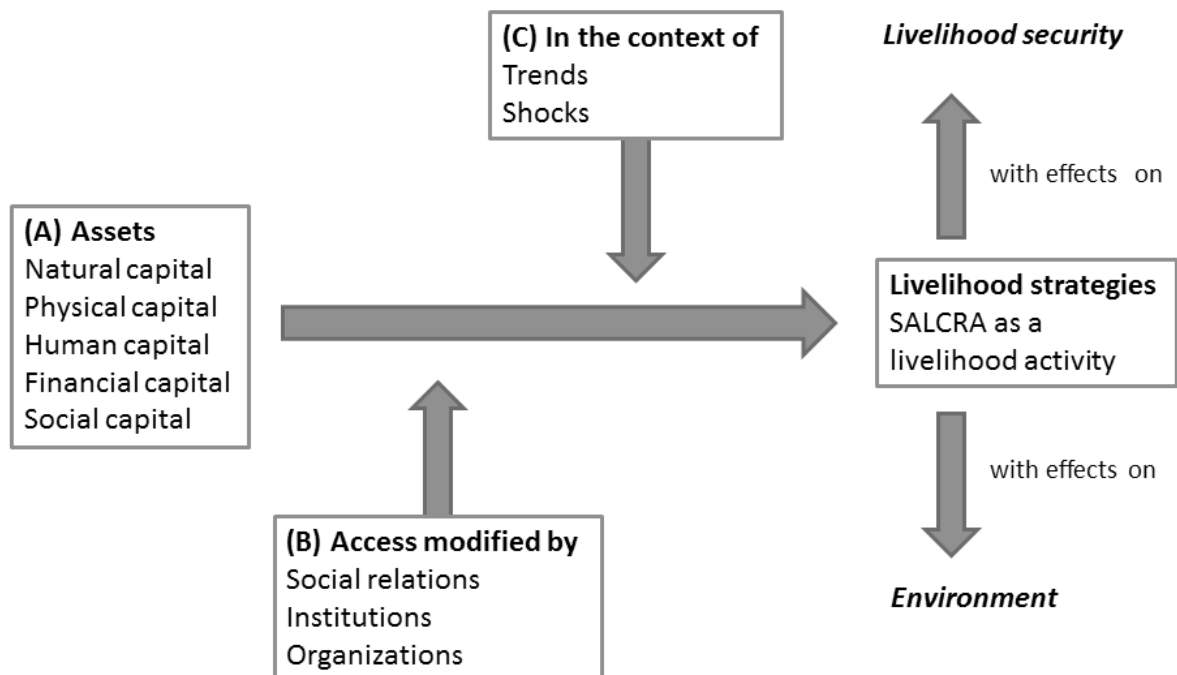


Figure 1 – Theoretical framework

The influence of SALCRA on livelihoods in the study area is variable in that SALCRA appears at various places in the framework. It can be seen as a livelihood activity, a factor impacting the asset endowment of households or as an institution that modifies the opportunities of households to transform assets into livelihood outcomes.

## 2.2 Methods

The study applied a mixed methodology approach to account for the need of an interdisciplinary assessment that covers the variety of aspects of the framework, following a sequential design. In the initial phase, qualitative data was gathered that served to modify quantitative data collection templates and justify the quantitative analysis of soil quality, as this was one of the major concerns of the local community regarding the environmental sustainability of the scheme.

Participatory rural appraisals in the form of resource maps with male and female participants, a village timeline, livelihood preference rankings, and a seasonal calendar were conducted with community members to gain an understanding of the livelihoods and resources in the study site. In addition, key informant interviews were held with representatives of SALCRA and village residents. With regard to the theoretical framework, collected qualitative information through these methods served to mainly identify institutions, trends and shocks that modify peoples' ability to transform assets into livelihood strategies. As key informants at a village level might not provide representative answers for their community, randomly sampled household members participated in a questionnaire that covered both aspects of livelihood security through SALCRA and perceptions on environmental degradation through the oil palm development. The questionnaire included an assessment of households' natural and physical capital and their involvement with SALCRA and additional land uses. Furthermore, five households which were chosen for in-depth interviews that followed the questionnaire participated in a detailed quantitative income analysis. This more detailed inquiry with a smaller sample size provided an impression of different income portfolios of different households and their financial assets.

In the second step, soil samples were collected from various sites to investigate the impact of oil palm on

soil quality to determine natural capital as an asset form on the one hand and the environmental effects of different livelihood strategies on the other hand.

Preliminary questionnaire results informed the choice of different land-use types to be sampled. For comparison among land uses that were previously dominated the land currently under oil palm cultivation, samples were taken from a 22-year-old rubber plantation, a 2-year-old terraced oil palm plantation and an upland rice field after 2 years of fallow. Volume specific soil samples of 100cm<sup>3</sup> were also taken in a 22-year-old non-terraced oil palm plantation between two palms in a plantation row (inter palm), and between the rows under the frond stacking (intra palm). Sites of similar topography were sampled to ensure the standardization of site dynamics, and thus standardizing the soil carbon levels (Bruun *et al.* 2006). At each site, samples were taken at depths of 0-5cm, 5-15cm and 15-30cm. Soil samples were analysed for active carbon, using a permanganate oxidizable carbon (POXC) test which measures changes in the labile soil carbon pool. Compared to other tests this measure is more sensitive to changes in management practices of the soil and is therefore most suitable for the purpose of this study (Culman *et al.* 2012). All data was collected by an interdisciplinary team during two weeks of fieldwork in March 2013.

## 2.3 Study Area

Mantung Birawan (1°00'25" N 101°35'11" E) is located in the Malaysian state of Sarawak. The village is located 23 km south of Serian and easily accessible through a paved road. It is separated into two parts by the Kedup River which can be crossed by a trail bridge. Mantung Birawan was established in 1972, after an amicable split from a larger village two kilometres away. The village is populated by the Bidayuh people and has a population of 240 inhabitants, living in 52 households. The demography shows a high proportion of people aged over 50 due to a trend of migration towards larger cities. Land is predominantly under NCR land designation. Around 200 ha of land have been cultivated under the SALCRA scheme since 1989 and in a second phase, initiated in 2009, this area has expanded over another 150 ha. Net proceeds from the SALCRA plantations in the study area (1480 Malaysian Ringgit (MYR)/ha and 1571 MYR/ha) have been found to be comparing averagely with

other plantations of the scheme (1458 MYR/ha) (Cramb and Ferraro, 2010).

### 3. Results and Discussion

The following sections discuss channels through which SALCRA impacts livelihood security and environmental sustainability within the context of the theoretical framework. The discussion takes into account the multiple roles that SALCRA can adopt within the framework.

#### 3.1 Livelihood Security

##### 3.1.1 Asset Enhancement

Major livelihood activities in the community of Mantung Birawan include rice cultivation, as well as livestock and fruit production for subsistence use. Cash income is generated through rubber and oil palm cultivation. Off- and non-farm activities comprise wage labour, participation in the SALCRA scheme, shop-keeping and remittances. Results from the questionnaire reveal that over 90% of the households in the village have signed an agreement with SALCRA for the development of their land. The data therefore suggests that the scheme covers a broad range of households and has no selection bias towards local elites.

The livelihood preference ranking revealed that men prefer the SALCRA scheme over other income generating activities, while women rank other activities at least of equal importance to the scheme. Results from the questionnaire confirm the optimistic perception of the scheme with 29 out of 31 households agreeing that SALCRA has an overall positive impact on their lives. SALCRA was a preferred livelihood strategy as it provided additional financial resources that are being saved, invested in the construction of houses, the education of children or used for daily expenses. Therefore, we argue that a first pathway of the contribution of SALCRA towards livelihood security is the enhancement of financial and human capital as two of the five assets described by Ellis (2000). Ellis maintains that financial capital eases “the switching between uses”, when held in the form of cash (Ellis, 2000, p.34). This principle, also referred to as “fungibility” describes the fact that savings, after being transformed into cash, are easy to be converted into productive units or units of consumption. Consequently, during difficult economic times individuals holding savings can directly use this money to buffer money shortages and maintain their

levels of consumption. This is not always the case for other assets, such as human and physical capital, where convertibility into productive units depends on external demand. Therefore, the accumulation of financial assets through SALCRA contributes to the overall livelihood security of SALCRA participants in that it can be used to stabilize income variability. Findings of this study confirm the importance of additional income resulting from SALCRA (Cooke *et al.* 2011). Households are thus not solely relying on income derived from SALCRA, but have diverse income portfolios.

##### 3.1.2 Diversification of Livelihood Activities

Besides expanding the asset endowment, a second pathway to increased livelihood security is the diversification of livelihood activities. Such diversification can occur within or between the categories of on-farm and off-farm livelihood activities. With regard to on-farm diversification, we find that the SALCRA scheme diversified the portfolio of crops grown in 67% of the interviewed households. Furthermore, data from the questionnaire reveals that although the size of the area under rice cultivation decreased due to oil palm cultivation, all but one household interviewed still cultivates rice. The amount of land used for rice was not dependent on the amount of area owned. However, a positive relationship between total land area and land leased to SALCRA was found on household level. Ngidang (2002) describes that other government interventions similar to SALCRA, have encouraged specialization of households on a single income source which led to an increased vulnerability of households after observed price drops of cash crops. This evidence underlines the importance of diversified livelihoods and maintenance of subsistence production which was observed in Mantung Birawan. Diversification of livelihoods through off-farm activities is being supported through SALCRA as the main supplier of jobs within this sector. However, as livelihood strategies mainly consist of farming different crops, these off-farm activities play only a role for some households of the village. Working conditions and salaries do not provide sufficient incentives for the majority of the community to engage in work within the plantation. Whereas plantation work is mostly carried out by workers from neighbouring Indonesia, community members of Mantung Birawan are mostly employed as security guards or drivers.

### **3.1.3 Infrastructure Development**

Through a third pathway SALCRA was found to indirectly contribute to livelihood security by facilitating livelihood diversification through infrastructure development that was induced by the scheme. Accessibility of rubber, pepper and rice paddy fields is facilitated through the development of new roads. Furthermore, the improvement of the road network and the establishment of oil palm mills can be important for households currently cultivating or planning to cultivate oil palm outside of the SALCRA scheme as it reduces transportation costs significantly. However, due to financial constraints for required investment into private cultivation outside of the SALCRA scheme, to date, only 16% of the households have started their own plantations. This represents the least prevalent on-farm activity in the village as skills and investment are major hurdles for the incorporation of private plantations in the livelihood portfolio of many households. The observed importance of road development and access to capital confirm the identified obstacles in existing studies (Cooke *et al.* 2011; Nagiah & Azmi 2012).

### **3.1.4 Secure Land Tenure**

As participants of the scheme will receive land titles after the completion of the contract duration on their NCR land, livelihood security also increases. With regard to this fourth pathway, 85% of households participating in the old SALCRA scheme (1989) had titles on their land, whereas on the new plantation that was established in 2009 only 5% claimed to have a title on the land. This proves the beneficial effect of SALCRA regarding land tenure for participants. Securing land titles are an important motive for landowners to participate in the SALCRA scheme. Twenty percent of the SALCRA participants plan to grow forest on the land area that is currently under oil palm cultivation. Since the income from this land use is likely to be low, it can be argued that for individuals receiving a land title through SALCRA is a large motivation to participate in the scheme. The motivation of securing land tenure is an important observation in light of the broader observed trend of agrarian transformation towards cash crop cultivation in Sarawak (Sim 2011).

When discussing the fact that SALCRA promotes the issuance of private titles in Mantung Birawan, one also needs to take into account the impact that

such increased tenure security has on the above described second pathway of livelihood diversification. Vien (2006) found that land titles affect livelihoods through the security of tenure, increased transferability of land and the possibility of using land as collateral. Firstly, security of tenure is in itself an important factor as the fear to lose land will be reduced. Secondly, increased transferability of land gives rural households options to diversify as land transactions are facilitated (Bowser & Nelson 2012). We found that SALCRA participants made use of the opportunity to sell their land to such an extent that the Land and Surveys Sarawak Department placed bans on selling land within the first ten years after titles were issued. Those restrictions were also found on titles of villagers of Mantung Birawan. Thirdly, land titles can serve as collateral and thus increase access to credit markets and facilitate livelihood diversification (Bowser & Nelson 2012). However, questionnaire data could not confirm this relationship between increased access to credit through private land titles.

From the perspective of the theoretical framework of the study it can be argued that increased tenure security can be conceptualized as an institution that modifies the ability of households to use their natural capital in the form of land into secure livelihoods.

## **3.2 Environment**

### **3.1.2 Land Use Changes**

Currently, oil palm is the main form of land use in the area. Based on the questionnaires, almost 70% of respondents' land is used for oil palm cultivation under SALCRA. The average size of land under SALCRA oil palm cultivation was found to be 4.4 ha per participating household. Access to land for rice cultivation is perceived to be very important, as 94 % of the sampled households cultivate rice for subsistence use. The introduction of the oil palm scheme led to a considerable reduction of area cultivated for up- and lowland rice. Before the land was used for oil palm, 82% of the area of the old SALCRA plantation was under rice cultivation. Hansen *et al.* (2014) concluded that the conversion of forest reserves into oil palm plantations is associated with high carbon emissions; whereas emissions are not as great when the converted land had been previously used for, and degraded by, rubber and rice cultivation. Greenhouse gas emissions through land use change of previously cultivated areas into oil palm

plantations are therefore of lesser concern than in previously forested areas (Hansen *et al.* 2014). The new plantation divides the village from many pepper, upland rice and rubber fields, and from the forest.

On the landscape level, diversity in land use was not reduced through the SALCRA scheme. The questionnaire asked landowners what they would like to grow on their land if leasing it to SALCRA was not an option. The hypothetical different land uses were evenly distributed between upland rice, pepper, rubber and lowland rice. In reality, 67.7% of the landowners that have a contract ending with SALCRA in 2014 want to renew their contracts if possible. However, this possibility was unclear since a decision by SALCRA to offer such an extension had not yet been made at the time of data collection. The cultivation of rice and cash crops other than oil palm were not mentioned for future land use wishes. This inconsistency between hypothetical land uses if SALCRA would not be present and future land use wishes might be explained by the concerns that were expressed by the local community over a perceived reduction in soil fertility as they would be unable

to grow certain crops on degraded soil. This aspect will therefore be further discussed in the following section.

### 3.2.2 Soil Fertility

Land use changes and livelihood improvements often come at the cost of environmental sustainability (Foley *et al.* 2005). Interviewees attributed poor water quality and low soil fertility to the oil palm plantations. Results of the soil analysis supported these claims. Data from the soil samples suggests that soils in oil palm plantations were the most degraded out of any of the land uses sampled. By applying the principle of space for time substitution, a significant difference was observed between plantations of old oil palm and the rubber (both 22 years old), of which the latter contained 170% more active carbon ( $p < 0.01$ ) (see figure 2). It should however be noted that the frond stacking rows, which occupied approximately half of the entire plantation, had significantly increased levels of active carbon quite similar to those found in the rubber plantation.

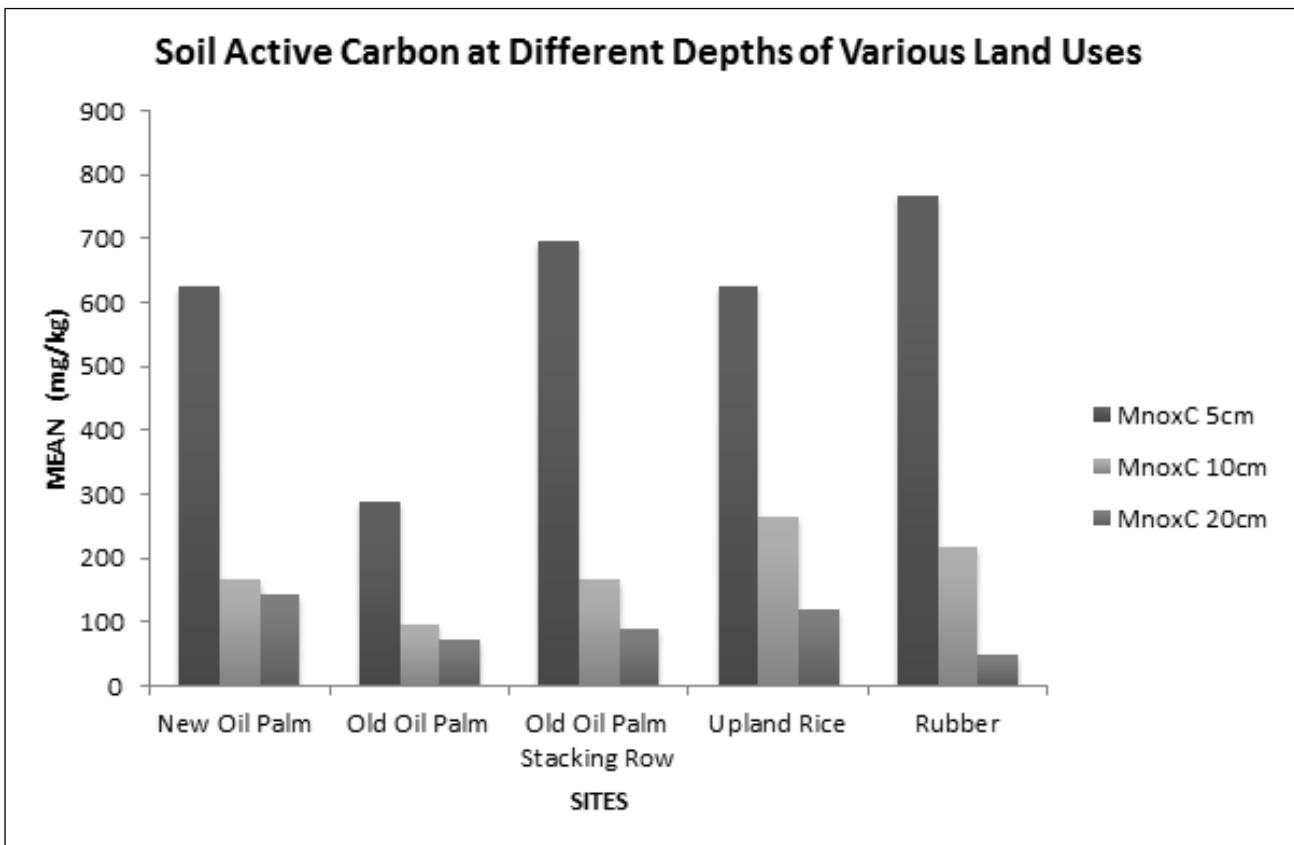


Figure 2 – Soil active carbon levels

Fronde stacking rows are used as fertilizer, as the increased ground cover increases the nutrient and water retention of the soil. This practice could potentially decrease the need and cost of inputs while contributing to the longevity of soil quality. The impact of SALCRA's oil palm cultivation had been lessened through the application of such management practices. This study was limited to lands that were already actively being used for other cash crops. Hence, it does not show the change in soil quality that would occur if the oil palm had been cultivated on lands that were previously primary forest or old fallow lands. The highest level of active carbon in the topsoil was found in the rubber plantation but similar values were also seen in the frond stacking rows. In the rubber plantation, these high values are most likely a result of the diversity of vegetation types among the rubber trees and the abundant litter layer throughout the area. Though not completely comparable to the soil in a primary forest, out of all the cash crops sampled, the soil of the rubber plantation was found to be the closest in resemblance to soil in a natural forest. Interestingly, almost the same effect on the soil active carbon can be accomplished through management practices. The layering of fronds and vegetation in the stacking rows similarly resulted in soil that contained 140% more carbon than the soil between the oil palms ( $p < 0.023$ ).

Long term effects of oil palm cultivation on soil quality are being debated in literature; some research discusses possible irreversible damage (e.g. Hamdan *et al.* 2000), whereas others report that soil quality can be maintained over time (Tanaka *et al.* 2009; Pauli *et al.*, 2014), depending on the management practices. We conclude, that the longevity of land resources can be compromised, as there are currently no incentives for SALCRA to conserve soil quality in the long run if contracts with landowners are not going to be extended. Agreements between SALCRA and landowners do not provide any rights to landowners for intervention in management practices of the plantation.

Deteriorating soil quality can limit options of future generations to use the land, according to their needs and wishes. Already today, farmers indicated that rice cultivation might be impossible after the user rights of SALCRA on the land expire. This argument is also supported through the future land use wishes

of farmers described above. Negative environmental impacts of land use changes and management practices can hinder the potential practice of certain livelihood strategies in the area and impact the livelihood security of future generations. The SALCRA scheme can have negative implications for the asset endowment of households with natural capital and thus limit livelihood security by reducing options to adopt new livelihood activities or by deteriorating the natural resource base of current ones.

#### 4. Conclusion

This study shows through which pathways livelihood security and the environment are impacted by the SALCRA oil palm scheme. The results of this study demonstrate a close relationship between livelihood diversification and security, land ownership and environmental sustainability and underline the importance of an interdisciplinary and participatory approach when studying the multiple consequences of land-use changes. We find that SALCRA has a generally positive impact on livelihood security through four different pathways. Our results suggest that the scheme benefits local livelihoods as it provides additional and stable incomes, gives way to livelihood diversification and contributes to savings and promotes infrastructure development in the area. In that way, economic vulnerability to shocks will be reduced on the household level. Accumulation of financial resources is another important motive of households in the study area to diversify their livelihoods through SALCRA. To what extent the benefits of this diversification will be outweighed by the environmental costs associated with the oil palm development cannot be assessed here.

Incentives for soil quality conservation and application of best management practices in oil palm plantations will be crucial in relation to creating an environment in which future livelihood options are not harmed, while present generations can still benefit from increased livelihood security. An additional agreement between SALCRA and landowners on the sustainable management of soil quality is recommended to improve the outcomes of the scheme.

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