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Sustainable Palm Oil Production project synthesis

Understanding and anticipating global challenges

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Key messages

- Several sustainability certification schemes have been developed for palm oil; however, the field impacts of these schemes remain highly uncertain. The Sustainable Palm Oil Production (SPOP) project, funded by the French National Research Agency (ANR), was aimed at consolidating and deepening the scientific basis of these schemes.
- SPOP field work undertaken in Indonesia and Cameroon highlighted the large variability in practices and impacts of oil palm systems. Our main results related to the uncovering of the multiplicity of growers and their trajectories, and identifying room for improvement and the need for recommendations adapted to the various grower contexts and strategies.
- The SPOP project made it explicit that visions of sustainability and global challenges vary greatly among growers and other stakeholders involved in the palm oil sector. These diverging conceptions are most likely to induce bottlenecks in the definition and implementation of good practices and should be accounted for in the refinement of sustainability criteria.
- Within the SPOP project, we investigated possible futures for oil palm using participatory prospective analyses and multi-agent based modelling work. Our research work showed that capacity development and the organizational capacity of smallholders, fair partnerships and combined forms of governance are key drivers in ensuring the uptake of good practices and sustainable development at the landscape scale.

Introduction

The palm oil value chain is facing a booming global demand, driven by rising living standards and population growth in emerging countries. Sustainable production faces economic, social and environmental challenges. Oil palm cultivation has to be integrated into agricultural development plans in producing countries, with measures to support the uptake of sustainable management practices, while guaranteeing the rights of local people and the protection of wild areas and biodiversity. In order to promote and recognize the efforts made by players in the sector to implement sustainable production, various certification schemes have been established, such as the Roundtable on Sustainable Palm Oil (RSPO) launched in 2004.

In this context, the SPOP project was aimed at consolidating and deepening the scientific basis of certification schemes: the definition of sustainability criteria and their actual impacts in the field. The project primarily focused on the first link in the value chain — the plantation — because a multiplicity of production

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Smallholder interview in Sumatra, Indonesia, within the SPOP project (Photo by Cécile Bessou, Cirad)

systems can be found, ranging from the family plot of 1–2 ha to agro-industrial estates with plantation blocks and extraction mills.

The aim of the SPOP project was to better understand the economic, ecological and social impacts of palm oil production. It combined the expertise of research teams from various backgrounds (agronomy, economics, social sciences and agro-ecology) in order to generate and validate scientific knowledge and to propose tools for the accurate assessment of sustainability in different production systems. This approach directly involved stakeholders in the innovation process at various stages of the project, through surveys, multi-agent modelling and participatory prospective analysis.

A multiplicity of growers at the heart of a diversity of production systems

While palm oil is widely perceived as a mainstream commodity mostly produced by industrial growers and some smallholders, results generated by the SPOP project showed a much more nuanced picture. In Sumatra, Indonesia, we conducted two main field surveys in 2013–2015, feeding a database with data on more than 200 individual independent and plasma oil palm growers and 300 plots. Results clearly evidenced a wide range of oil palm production systems — ranging from 2 ha to 110 ha — which were embedded in highly diverse systems of activities. Such systems were found able to generate an annual income, per 2 ha plot, of USD 800–8,000 — about 0.6–6 times the average Indonesian annual income (USD 1,416). Such heterogeneity, as found at both holding and household levels, highlights the rapid social differentiation that is associated with the spread of income originating from oil palm production. Such changes were analyzed in the light of the potential strategic behaviors of producers, which allowed us to define five different types of structural patterns at the holding level. We distinguished a variety of producers' rationales combining to different degrees 'profitability', which was associated with plasma plots (linked to scheme smallholders) and 'flexibility', which was associated with independent plots. The aims of these producers can be reached by adopting various strategic pathways (Figure 1).

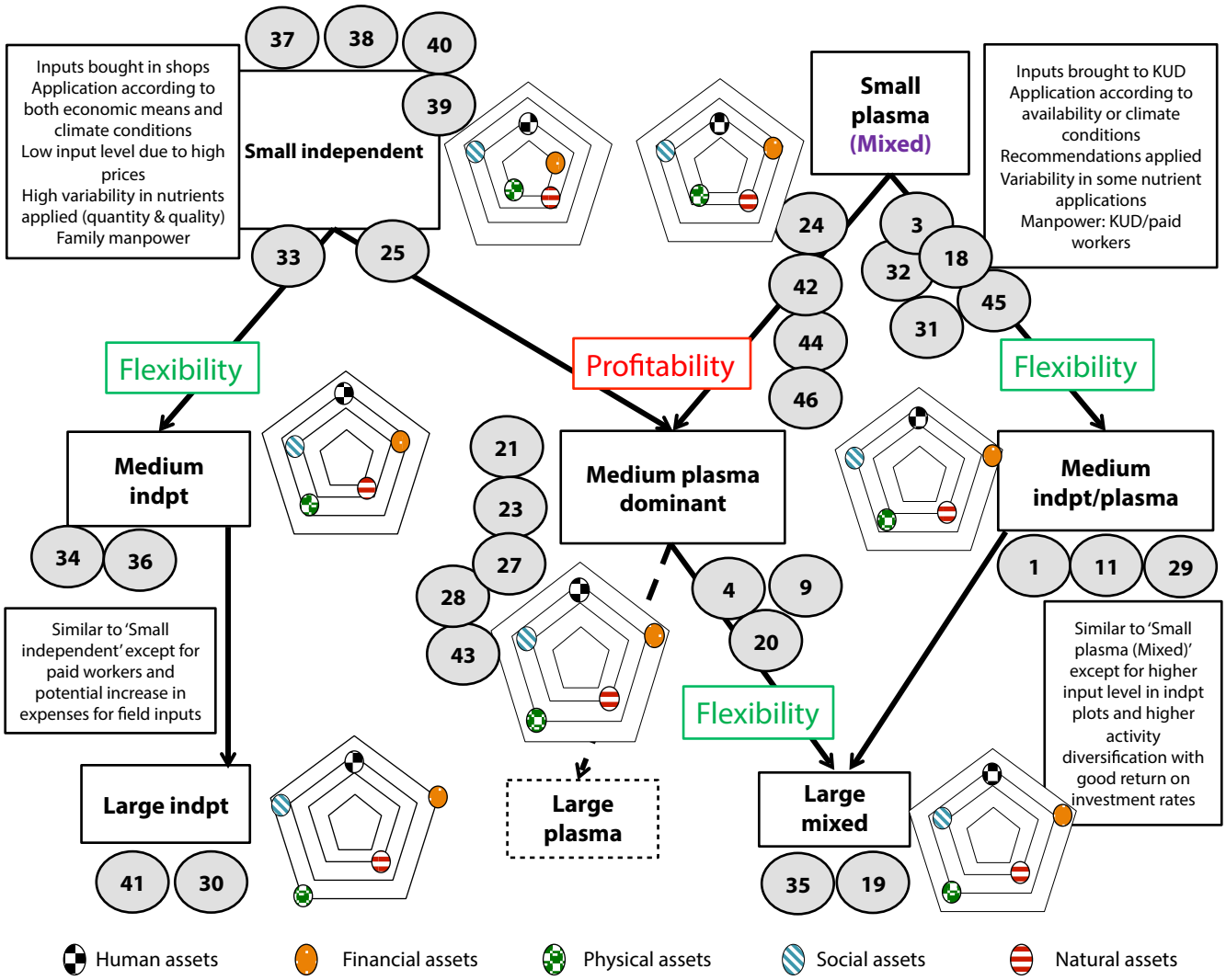

Figure 1. The potential strategic pathways taken by oil palm smallholders

indpt = independent, KUD = Koperasi Unit Desa, village cooperative system.

Notes: The pentagrams represent the level of the usual five assets defined in the Sustainable Rural Livelihoods framework; the further away from the center the mark is on the pentagram, the higher the level of the asset is. Each number represents one household/holding surveyed.

Source: Baudoin et al. (2015).

The performance of each holding type was then assessed according to the three dimensions of sustainable development (social, economic and environmental). While social and economic dimensions were estimated at household level, the environmental dimensions relied more on estimates at plot level. In particular, we focused our attention on fertilizers (nitrogen, phosphate) and herbicides (glyphosate, paraquat) management in both industrial and smallholder plots (independent and scheme) with quantified and semi-qualitative statistical analyses. Across growers' types and locations, fertilizer and herbicide rates varied by up to five times, while yields varied by 2 factor, highlighting potential room for improvement (Moulin et al. 2016). In Cameroon, our research focused on defining better partnerships between agro-industry and smallholders. The participatory prospective analysis (PPA) method proved very efficient in facilitating discussions between major stakeholders. Conflicts were rapidly put aside and stakeholders worked together in order to develop win–win partnerships and to draft more equitable contracts between agro-industry and smallholders, with local government assistance (Djouma 2014).

Fruit harvester in an oil palm plantation in Indonesia (Photo by Cécile Bessou, Cirad)

Understanding the differentiated strategies of the multiplicity of oil palm growers is crucial in order to identify the scope of improvement required in oil palm production practices and household strategies, notably in terms of financial loans. This understanding is also essential to make recommendations adapted to different growers' needs, which are more likely to be efficient in the field. Strategies, successes and impacts on household livelihood are highly dependent on the local context and on growers' rationale (Baudoin et al. 2015). This diversity in smallholder production systems should be taken into account by the main players when defining national strategies or certification schemes.

Understanding the local–global nexus toward sustainability

A cross-analysis of the perception of global changes and sustainability by macro- and micro-actors was carried out, in order to better understand the decision-making processes of oil palm growers, which affect the performance of their production systems. Our fieldwork took place in Jambi Province, Indonesia, in 2013, and included interviews with local people in various oil palm production areas. A cross-view analysis was then undertaken based on interviews with macro-actors, (i.e. actors playing a role at the global level), particularly representatives of international nongovernmental organizations (NGOs) and RSPO members.

Local perceptions of sustainability and related issues were quite diverse. In particular, the origin of the growers within a specific context of palm oil historical development (e.g. whether the grower is a transmigrant supported by a government-based development program or is independent) could affect their appraisal of sustainability issues related to natural resource management or resource distribution in general. But even more critical were the fundamentally contrasting perceptions by micro-actors, notably growers in the field who are confronted with very local issues, when compared to the perceptions of macro-actors. The concept of sustainability — that was exogenously defined by macro-actors as consisting of three pillars — is locally intrinsically integrated, that is the three dimensions do not have a segregated essence (Cheyns and Escobar 2014). The 'three bottom-lines' theory isolates the problems of the local actors, who in reality have to face them all at the same time. This makes it difficult to consider the environment apart from its economic or social connections (e.g. nature conservation is weighted by local needs and can hardly be considered as an aim by itself or disconnected from the livelihood environment) (Cheyns and Escobar 2014). The role of forests for rural communities reflected such a disconnection between local and global perceptions.

The disconnection between local and global perceptions is also illustrated by the methodology adopted for forest classification. Reacting to the rapid rate of deforestation in Southeast Asia and the intention of the Indonesian government and palm oil companies to further expand oil palm plantations on degraded forestlands Greenpeace launched a campaign against European palm oil buyers and their suppliers in 2010. Following this campaign, the targeted firms adopted a 'zero-deforestation' policy. The implementation of such a policy raised a simple, yet tricky, question: what is a forest? In order to address this question, the plantation companies, together with Greenpeace and a consultancy firm, developed a methodology for forest classification called 'High Carbon Stock'. This method relies on a threshold of carbon sequestration and a vegetation classification in order to identify the forested zones to be protected. This implicitly applies a 'land sparing' approach to conservation — maximizing agricultural productivity of so-called 'arable' lands — while maximizing the natural productivity of ecosystems in the preserved zones. Pilot implementation of this methodology in Indonesia revealed tensions generated by this model of forest classification and the forms of action and information it relies on. The use of this methodology may exlude forms of valuation supported by those actors whose practices are not oriented towards a land sparing approach (Silva-Casteneda et al. In preparation).

The SPOP project demonstrated that perceptions of sustainability and global challenges vary greatly among micro- and macro-actors and between both types of actors. Differentiation between local and global scales in defining and implementing strategies toward sustainability is also crucial in terms of time scale. Macro-actors tend to target actions in a short timeframe for immediate results, while local populations plan their actions and strategies over a lifetime. These diverging conceptions of sustainability dimensions, (i.e. regarding the inter-relationship of the three pillars and varying time scales and priorities when confronting local and global issues) influence the way good practices and potential actions may be defined and applied in the field. A lack of consideration and mediation between both points of view (i.e. local and global by micro- and macro-actors respectively) is most likely to induce bottlenecks and barriers in the definition and implementation of good practices and these perspectives should be therefore accounted for in the refinement of sustainability criteria.

Harvested oil palm fruits at the plantation edge (Photo by Cécile Bessou, Cirad)

What do possible futures tell us about solutions for the present?

We investigated possible futures for oil palm using two principal tools, namely PPA and multi-agent based modelling work. Under the SPOP framework, we organized five four-day PPA workshops in Indonesia (two villages) and in Cameroon (three villages) in 2013 and 2014–2015 respectively. They were based on open discussions between various local stakeholders about the development of oil palm cultivation and related issues or expectations. Based on these discussions, the PPA workshops delivered narratives of scenarios for oil palm development at the local scale. Recommendations and strategies for action were conceived about the ways to achieve the participants' preferred scenario.

The PPA workshops held in Indonesia questioned the participants about their views on possible developments in the palm oil sector in the coming 30 years. One of the main outcomes from the workshop was revealing participants' desire to get technical

support from public services in order to improve their production systems, and the influence of public policies up to the very local scale. Given the great variability in practices observed in the field, technical support would very likely help to reduce error margins in order to reach production and ecosystem optima. As farmers tend to be suspicious towards technical support provided by private companies, public services would definitely need to be strengthened in those areas (Djama et al. 2011).

The PPA workshops held in Cameroon were more targeted, considering as a background the National Palm Oil Sustainable Development Strategy, which was written under the coordination of the Ministry of Agriculture and Rural Development with the assistance of experts including some SPOP members, as well as representatives from NGOs such as the World Wide Fund for Nature. This strategy relies on the assessment of the potential roles of partnerships between agro-industry and smallholders — either individuals or groups — in national palm oil development. Partnership was thus considered as the framework for the scenario-building process. Over the three workshops the most important drivers — from the growers' point of view — were technical support and infrastructure, and trust and transparent partnership with the industry (Nkongho 2015; Feintrenie et al. 2016).

The overall outputs of PPA in both countries were that the organization of smallholders into associations is a prerequisite for efficient partnership with the industry, which could lead smallholders to improve their bargaining power and leverage if they were better federated. The establishment within the industry of a team mandated to ensure a smooth relationship with smallholders is also seen by all actors as key to successful partnerships. A detailed and well understood contract between the partners is essential. A specific study on 'fair partnerships' between smallholders and palm oil industries in Cameroun revealed that both parties have a different and sometimes conflicting visions of what should be recommended and what we need to further analyze in order to provide stakeholders with new strategies toward good and fair partnerships (Ndjogui et al. 2014; Nkongho 2015).

Finally, a large part of the sustainability issues regarding palm oil arises from the development of new plantations potentially replacing natural forests. Under the SPOP framework, we developed an approach based on scenario building and modelling in order to explore possible futures for oil palm development in Indonesia. The debate on landscape design integrating new oil palm plantations, conservation areas or other land uses must be based on facts, particularly on the spatial dynamics of the oil palm cropping systems. In order to integrate the diversity of oil palm systems and the influences of various stakeholders on those dynamics at the landscape level, we developed a multi-agent based model named Palm-LAB (Palm-Landscape Agent Based model). The Palm-LAB model yields 107 indicators describing land cover, land ownership and changes in oil palm agricultural practices or in the properties of the agents during the simulation cycle. Results from the first simulations, based on provisional exploratory scenarios, confirmed the ability of the Palm-LAB model to discriminate different situations in terms of land sparing policies, simulating radical or more subtle land use changes. For example, at the end of a 50-year cycle, only 33% of the peat soils were converted to oil palm in a scenario with 'environmental awareness', whereas this rate reaches 100% as early as the third simulated year for an 'unconstrained' scenario. The ability of the model to discriminate different oil palm establishment kinetics is important in order to anticipate landscape futures and the short- and long-term effects of oil palm development within a given area. The impact of oil palm cultivation — especially on complex adaptive processes such as biodiversity losses or socioeconomic changes — may differ depending on the dynamics of oil palm establishment. Indeed, we found that the faster oil palm replaces current soil covers, the higher the risk of collapse of the existing system. The fact that the kinetics of oil palm establishment can be assessed by the model is then important in order to anticipate radical land use changes and take action to limit or slow down the process. The more sophisticated the model can be, the more precise and useful its outputs.

Recommendations

Research conducted under the ANR SPOP project highlighted the need for some fresh inputs into the general debate about the different types of production systems and growers. For example, not all smallholders are 'small' or tied to agro-industry. In addition, more nuances are required in the debate about sustainability given the diverse perspectives embraced by different actors. Practices, perceptions, rationales and impacts greatly vary and the grounds for this variability need to be accounted for in designing adapted pathways towards sustainability. Certification schemes, such as the RSPO, need to be better adapted to the various actors targeted. Adaptation of current generic criteria, so that they can be fulfilled by smallholders, has proven to be inefficient because the original criteria do not account

for the very variable backgrounds and assets of the various smallholders. New criteria, specific to smallholders' constraints and opportunities should be defined together with smallholder representatives, who can feed the debate with relevant insights.

There is clearly room for improvement. Good practices need to be designed according to site-specific constraints and integrated into the whole innovation process chain — from the analysis of structural bottlenecks at the grower and household level up to the uptake of good practices in the field. Field research notably highlighted that applied rates of fertilizers and pesticides are highly variable, ranging from very low doses, which are likely to deplete soil nutrient pools, to very high doses, which are likely to lead to serious environmental pollution. Criteria on good field practices should be more directive in terms of types and rates of field inputs, according to field and grower site-specificities. Sustainability criteria regarding social issues or biodiversity conservation, for instance, should also be revisited according to local perceptions and opportunities. Useful tools, such as 'high conservation value' surveys for instance, would need to be complemented with local perception-based criteria. In order to foster the uptake of good practices, both adapted capacity development and local infrastructure development programs are needed. It is not sufficient to specify good practice criteria without making sure that growers can understand the grounds for those practices and how they can play a key role in the sustainability of the whole supply chain by making changes in the field. In the same way, improved infrastructure is needed (e.g. providers of good-quality inputs), so that good practices can actually be applied.

Moreover, it is clear that a strong smallholder organization is a prerequisite for successful partnership with the industry, especially in areas where government support remains limited. Enlightened fair partnerships based on more balanced views and powers between actors, as well as sound synergies between public and private governance, are essential to foster integrated sustainable development models at the landscape level, where several commodity chains and resource uses may compete.

Under the SPOP framework, multidisciplinary research proved very useful in generating additional understanding and accurate tools for, among others, the description of smallholder typology or the generation of prospective scenarios. The project highlighted that sustainable agricultural development — including oil palm — cannot be conceived and implemented without strong interactions between agronomy, human and social sciences. These disciplines address questions at nested scales, whose integration reveals further questions as well as potential solutions.

References

Baudoin A, Bosc PM, Moulin M, Wohlfahrt J, Marichal R, Caliman JP and Bessou. 2015. Linking the transformation of production structures to a multidimensional sustainability assessment grid of smallholders' oil palm plantations. *International Journal of Sustainable Development and World Ecology* 22(6):520–532 .

Silva-Casteneda L, Cheyns E., Aubert Pierre-Marie. *Missing the forest for the maps? Conflicting valuations of the forest and cultivable lands. To be submitted to Land Use Policy.*

Cheyns E and Escobar M. 2014. *Les ONG, entrepreneurs de la critique des entreprises: Entre marché et politisation de la durabilité. Le cas de l'huile de palme et du soja.* Conference paper presented at: Renouveler les approches institutionnalistes sur l'agriculture et l'alimentation : la 'grande transformation' 20 ans après, 16 June 2014, Montpellier, France.

Djama M, Fouilleux E and Vagneron I. 2011. Standard-setting, certifying and benchmarking: A governmentality approach to sustainability standards in the agro-food sector. *In* Ponte S, Gibbon P, Vestergaard J, eds. *Governing through standards: Origins, drivers and limitations.* Basingstoke, United Kingdom: Palgrave Macmillan. 184–209.

Djouma S. 2014. *Une analyse prospective participative des partenariats industrie-planteurs dans le secteur palmier à huile au Cameroun: Cas des regions du Centre et du Sud-Ouest* [MSc thesis]. Dschang, Cameroon: University of Dschang.

Feintrenie L., Roda J.-M., Rival A., 2016. *Industrial investments in agriculture in Central Africa. Establishing the conditions for sustainability and equity*. CIRAD, Perspective 37.

Moulin M, Wohlfahrt J, Caliman JP and Bessou C. 2016. Deciphering agricultural practices and environmental impacts in palm oil plantations in Riau and Jambi provinces, Indonesia. *International Journal of Sustainable Development and World Ecology* 0(0):1–12.

Ndjogui E, Nkongho RN, Rafflegeau S, Feintrenie L, Levang P. 2014. *Historique du secteur palmier à huile au Cameroun.* Rapport du projet SPOP, CIRAD-IRD-CIFOR-INRA. CIFOR: Document Occasionnel 109.

Nkongho R. N. 2015. *Oil palm development in Cameroon, lessons learnt from Indonesia.* Doctorat de Géographie et aménagement de l'espace, Université Paul Valéry, Montpellier III.

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