

**SMALLHOLDERS' SUSTAINABILITY PERCEPTIONS VS.
PERFORMANCE IN THE CONTEXT OF INDONESIAN PALM OIL**
**How do international sustainability criteria influence local
discourses and practices in rural Sumatra?**

Master Thesis

for attainment of the academic degree of

Master of Science

Georg-August-University of Göttingen, Germany

Faculty of Geosciences and Geography

Study programme:

Geography: Resource Analysis and Management (M.Sc.)



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PREFACE

*“Indonesia jaga hutan, kalau orang
Indonesia itu hanya disuruh menjaga hutan,
apa yang akan dimakan oleh masyarakat
ini?*

*Apa orang di Indonesia akan dimiskinkan,
di(butuh)kan seperti itu?*

*Makanya kalau sampai sekarang untuk
perubahan iklim sekarang, jauh daripada
tahun – tahun 90...”*

If the world urges Indonesians to preserve
the forest, what will the society eat?

People are impoverished intentionally,
aren't they?

That is why climate change now is far worse
than the situation in the 90s . . .

(Smallholder farmer in Mekar Jaya, Jambi Province,
Translation by Amrina)



Figure 1 – Trees burned down in Jambi Province, near the village of Gurun Mudo. Oil palm plantation in the background. Photo taken by the author (2017).

ACKNOWLEDGEMENTS

My gratitude first and foremost goes to my supervisor Professor Dr Heiko Faust for supporting me every step of the way during the process of conducting this master thesis project. His encouragement, leading questions and trust made me confident in doing field research and writing about the topic of perceptions that is so hard to capture. Furthermore, I would like to thank Dr Yvonne Kunz for her time and effort and being a source of inspiration. I thankfully acknowledge the funding of this project by the Deutsche Forschungsgesellschaft (DFG).

I am grateful to have been part of the CRC 990 subgroup C02 and the support of Jennifer Merten, Fenna Otten, Flora Hartmann and Katrin Martens. All your personal and scientific experiences got me excited about Indonesia. Further, I would like to thank our Indonesian counterpart, Dr Rosyani, for providing local knowledge and the office staff in Jambi and Bogor for their administrative support. And not to forget, a big shout out to the people of Jelutung I and II who made my stay in Jambi become everyday life.

This thesis would not have been possible without my amazing assistant and friend Amrina because of her uncountable translations, teaching me the Indonesian way of life and giving insight to the incredibly rich culture of Indonesia.

The people of Sungai Rotan, Mekar Jaya and Gurun Mudo welcomed me into their lives and homes, shared their perceptions and taught me so much about our world. Terima kasih banyak to the interviewees and village communities who contributed the core to my case study, which is the often-unheard story of smallholders in the palm oil business.

To my proof-readers, Kristina and Vicki: Thank you so much for giving it the final touch.

Personally, I am grateful for the caring and patient support by my mother and siblings, Frauke and Lars, throughout the time of my studies. Last but not least, I owe so much to Elias, thank you for everything.

ABSTRACT

The rapid expansion of agricultural plantations due to the increasing global demand for palm oil has led to large-scale land use change and destruction of rainforests in Indonesia. Environmental, economic and social impacts are not fully understood yet while showing various dependencies and trade-offs.

Based on consumer demands for certified sustainable palm oil and a perceived lack of transparency in this sector, the research endeavour at hand shifts the perspective towards the producers by inquiring their perceptions towards sustainability. Smallholders, who grow 40% of oil palm globally, still face major obstacles to sustainability certification and are not vertically integrated in the palm oil value chain. In fact, this agro-commodity network is defined by power-asymmetries and risks conflicts among stakeholders.

Therefore, the study investigates how perceptions of sustainability expressed through certification criteria from the consumer perspective influence local discourses and production processes.

The Action-in-Context approach by DE GROOT (1992) was applied as a conceptual framework to provide insight into the actors field at local scale, options and motivations, as well as the socio-cultural background of actors. Situated at the interface of social and natural science, this thesis seeks to explain links between values, norms and perceptions of the human-nature relationship and its application in performance. Special emphasis was laid on questions of scale and smallholders' roles in global value chains.

The field research followed a case study approach and applied a set of qualitative research methods. Problem-centred interviews with independent smallholders in three research villages in Jambi Province, namely Sungai Rotan, Mekar Jaya and Gurun Mudo, were conducted. Complemented by focus group discussions, expert interviews and observations, empirical data was collected. Additionally, the Sustainability Assessment of Food and Agriculture systems (SAFA), developed by the Food and Agriculture Organisation of the United Nations, allowed to gather data on performance hot spots.

As part of the joint Indonesian-German collaborative research centre "Ecological and Socioeconomic Functions of Tropical Lowland Rainforest Transformation Systems (Sumatra, Indonesia)", research was conducted during a six-week stay in Jambi Province. The landscape in the research villages, which are located across the province, is dominated by oil palm and rubber plantation land use systems, partly in close proximity to natural forests.

The findings of this master thesis contribute a case-based assessment of changes in the environment, community, and livelihoods of smallholders in the research region, the challenges they face, as well as the impacts of sustainability certification and the association in farmer groups for this purpose. These perceptions are set in context with performance indicators, derived from SAFA results and existing evidence of impacts of oil palm cultivation in literature.

Changes perceived by smallholders concern increasing incomes, education levels and infrastructure, effects on community life and shared values, as well as environmental parameters, such as declines in water quality and availability, rising temperatures, and decreased soil fertility. Challenges faced are a decrease in access to land, knowledge on good agricultural practices, ways to increase yields, the relationship to large-scale oil palm producers and the upcoming replanting phase.

Performance hotspots, detected by the SAFA framework, lie in the explicit documentation of records about harvests, earnings and fertilizer usage, the resources water and land, economic vulnerability and equity aspects in oil palm cultivation.

A gap between the supply and demand side regarding their perceptions of sustainable palm oil has been identified. The former focuses on zero-deforestation commitments and preserving habitats of flagship species, as the Orangutan and the Sumatran tiger, and the latter put emphasis on economic viability and prosperity. Certification schemes, such as the Roundtable on Sustainable Palm Oil (RSPO) have raised environmental awareness but failed to bring perceptions from both sides to a common level.

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ABBREVIATIONS

AiC	Action-in-Context
CPO	Crude Palm Oil
CSPO	Certified sustainable palm oil
CRC	Collaborative Research Centre
EFForTS	Ecological and Socio-economic Functions of Tropical Lowland Rainforest Transformation Systems
EU	European Union
DO	Delivery order (to sell harvested oil palm fruit to a mill)
FAO	Food and Agriculture Organisation of the United Nations
FFB	Fresh Fruit Bunches
Fig.	Figure
GD	Group discussion
GHG	Greenhouse Gases
ha	Hectare
HCV	High Conservation Value
HCS	High Carbon Stock
ibid.	ibidem, meaning "in the same place"
ISPO	Indonesian Sustainable Palm Oil
n/a	Not applicable
NGO	Non-governmental organisation
NSMD	Non-state market-driven
OECD	Organisation for Economic Co-operation and Development
P&C	Principle and Criteria
PiC	Problem-in-Context
PKO	Palm Kernel Oil
Rp	Rupiah (Indonesian currency, ~16,000 Rp = 1 Euro)
RSPO	Roundtable on Sustainable Palm Oil
SAFA	Sustainability Assessment of Food and Agriculture Systems
SHM	Sertifikat Hak Milik (land title)
SKT	Surat Keterangan Tanah (land title)
UNJA	Universitas Jambi
WWF	World Wide Fund for Nature

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1 Introduction

The Indonesian Trade Minister Enggartiasto Lukita called it “misguided and unfair” (MONGABAY, 2018) and Malaysia’s Plantations Minister Mah Siew Keong blamed the EU of practicing “crop apartheid” (REUTERS, 2018a), while hundreds of Malaysian oil palm farmers protested in the capital (REUTERS, 2018b) as a reaction to the vote by the European Parliament to ban palm oil biofuels by 2020 under the Renewable Energy Directive. As a snapshot of perceptions, these reactions show the controversial dispute around the palm oil topic from both consumers’ and producers’ perspectives.

Indonesia is experiencing rapid transformation of rainforests into agricultural systems, such as oil palm plantations. The palm oil value chain is facing a booming global demand, primarily in industrialised countries, driven by rising living standards and population growth in transition countries (BESSOU et al., 2017). The call for energy transition and therefore an increasing demand for biofuels fortifies this trend (ACOSTA-MICHLIK et al., 2011; MUKHERJEE AND SOVACOO, 2014). The ongoing debate about palm oil is not limited to biofuels though. Land use change, deforestation, climate change, biodiversity losses, food insecurity, depletion of ecosystem services and increasing power asymmetries are some of the described impacts of oil palm expansion (DRESCHER et al., 2016; OOSTERVEER, 2015).

The idea for this study stems from manifold scientific evidence on context sensitivity of the term sustainability (BOONS AND MENDOZA, 2010; GEIBLER, 2013; MANNING et al., 2012; NAGIAH AND AZMI, 2012; OOSTERVEER, 2015; O'TOOLE et al., 2006) and builds on findings that actors’ definitions of values and strategies in the production and consumption of palm oil leads to diverse perceptions of sustainability (BOONS AND MENDOZA, 2010). Theoretical definitions of sustainability are mostly based on the Brundtland Commission’s triangle of the dimensions of economic growth, environmental protection and social equity (BRUNDTLAND, 1991) but in reality, are rather arbitrary and subject to political discourses (HARMEN SMIT et al., 2013) or green marketing campaigns of industries (AGUIAR et al., 2017). In global, buyer-driven value chains and production networks, globalisation minimizes and increasingly ignores the considerable influence of local contexts, especially in light of transnational governance structures (BRANDI, 2017; LEVY, 2008). The local context of palm oil production in Indonesia is characterized to a great extent by smallholder farmers, whose performance in terms of yields is weaker than those of large corporations and who face compliance barriers in terms of sustainability certification (JELSMA et al., 2017; JELSMA AND SCHONEVELD, 2016).

Certification is a form of non-state market-driven governance (NSMD) (GEIBLER, 2013; RICHARDSON, 2014). In fact, the voluntary market of certified sustainable palm oil (CSPO) is controlled by non-governmental organisations (NGOs) and large multinational companies (GEIBLER, 2013). RICHARDSON (2014) claims that certification makes a market for sustainability. This commodification has emerged, to a great extent, apart from governmental steering. Even though consumers have the power to demand sustainable palm oil (IVANCIC et al., 2016), the pluralism of standards and product certifications for sustainable options creates doubt among consumers and makes them insist on traceable and transparent palm oil value chains (CHEYNS, 2011; IVANCIC et al., 2016; RIVAL et al., 2016). Consumer perspectives are expressed through NGO and activist campaigns¹, television commercials², calls for boycott³, and complaints to palm oil processing companies⁴ (AGUIAR et al., 2017; WWF, 2016; ZOLLER). A growing number of companies, such as McDonalds or Unilever have reacted by putting zero deforestation commitments in place⁵.

The objectives of this master thesis are to identify sustainability indicator and criteria definitions, inquire perceptions of Indonesian oil palm smallholders outside or beyond the ideas of sustainable development from the Global North and how far these discourses influence farmers' practices towards a more sustainable oil palm cultivation to serve both their wellbeing and the global demand of the most consumed vegetable oil against the background of the sustainable development goals (UNITED NATIONS).

1.1 Palm oil sustainability issues

Palm oil is a productive agricultural good with unique properties that is used in nutrition, biodiesel and cosmetics (AGUIAR et al., 2017). In fact, five times higher volumes of palm oil can be produced per hectare (ha) per year compared to soy (BRACK et al., 2016). The increasingly dominant producer group operates in tropical regions originally dominated by rainforests, primarily in Indonesia and Malaysia, as well as Africa and Latin America (PACHECO et al., 2017) (cf. fig. 2).

¹ Rettet den Regenwald e.V., <https://www.regenwald.org/themen/palmoel>

² Greenpeace commercial of Kitkat product, targeted at Nestlé, <https://www.youtube.com/watch?v=1BCA8dQfGi0>

³ Say NO to palm oil if it harms animals, people & our planet, <http://www.saynotopalmoil.com/index>

⁴ Pepsico, Unilever and Nestlé accused of complicity in illegal rainforest destruction, <https://www.theguardian.com/environment/2017/jul/21/pepsico-unilever-and-nestle-accused-of-complicity-in-illegal-rainforest-destruction>. THE GUARDIAN (2017a).

⁵ Companies' 'zero deforestation' pledges: everything you need to know, <https://www.theguardian.com/sustainable-business/2017/sep/29/companies-zero-deforestation-pledges-agriculture-palm-oil-environment>. THE GUARDIAN (2017b).

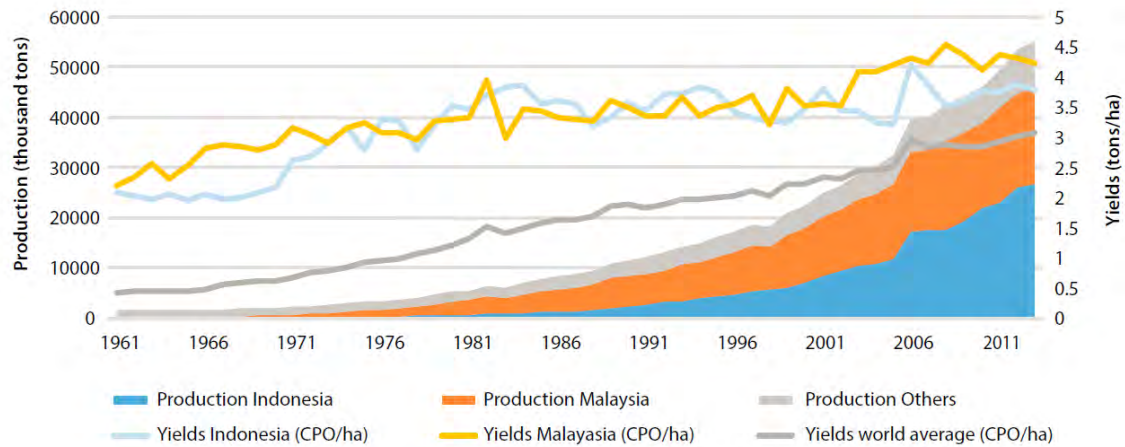


Figure 2 – Oil palm production and yields in Indonesia, Malaysia and other countries from 1961 until 2011. Data from FAO in PACHECO et al. (2017, p. 7).

Oil palm (*Elaeis guineensis*) grows in humid tropical environments and competes with HCS (high carbon stock) and HCV (high conservation value) forests (HANSEN et al., 2015). Introduced to Indonesia under the Suharto regime in the 1960s (HEIN, 2016), oil palm has been commercially grown ever since, and is experiencing a boom since the mid-2000s (EULER et al., 2016). Today, Indonesia is one of the leading palm oil producer countries in the world (cf. fig. 2). Especially Sumatra, besides other regions, such as Kalimantan (Borneo), Sulawesi or West Papua, is shaped by large oil palm plantations (GLOBAL FOREST WATCH, 2016). These are operated by both smallholders and state-owned and private companies.

Eighty percent of global palm oil is produced in Indonesia and Malaysia, 75% of which is traded internationally, with the European Union (EU) (cf. fig. 3), China and India being the dominant importers (INDEXMUNDI, 2017). With a global production of more than 60 million tons, palm oil is the most produced vegetable oil in the world (HANSEN et al., 2015). Production, consumption, imports and exports of palm oil in Indonesia and the EU is indicated in figure 3. Imports of palm oil in the EU began in 1998. In Indonesia, production rose accordingly. A rising consumption in both the producer and consumer countries can be identified. In Indonesia, domestic consumption accounts for approximately one fourth of total production. Because the greatest share of oil palm harvest is exported, concerns about food security have emerged (GEIBLER, 2013). Corn or rice growers have shifted to palm oil cultivation and other cash crops, thus making food imports necessary.

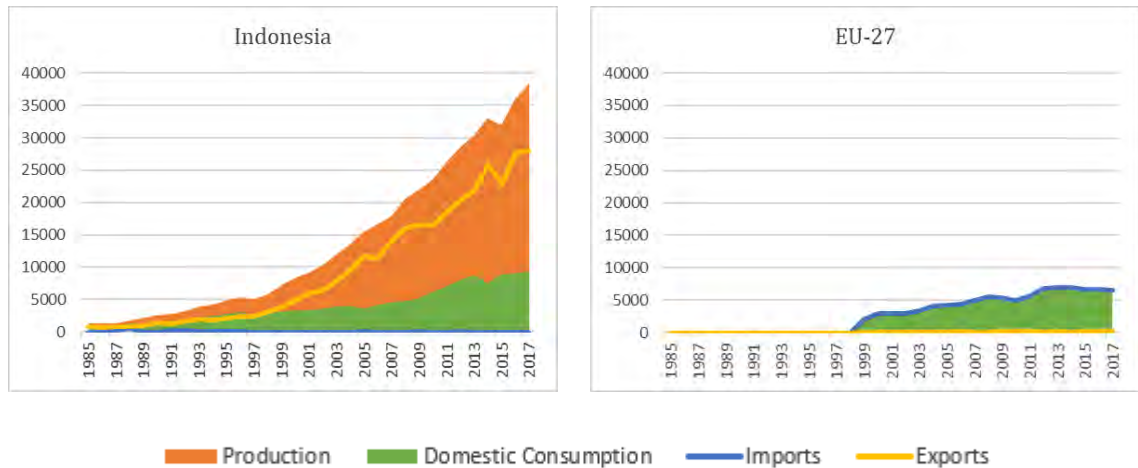


Figure 3 – Production and consumption, imports and exports of palm oil (in thousand metric tons) in Indonesia and the EU from 1985 until 2015. Own illustration, data from INDEXMUNDI (2017).

Changes in production and consumption patterns show “an increase in pace (acceleration) as well as an expansion in space (globalization)” (KUNZ, 2016, p. 1) and express themselves in economic growth and resource depletion. Catalysts for this development have been population growth and rising demand for food, consumptive goods, mobility and prosperity. The results are imminent in exploited ecosystems. Palm oil production is frequently named in context with deforestation, biodiversity loss, global warming and pollution (BESSOU et al., 2017; DRESCHER et al., 2016; HANSEN et al., 2015; IVANCIC et al., 2016). These trends have adverse effects on social systems. Land grabbing, indigenous rights, and workers’ rights have become an issue (ABRAM et al., 2017). While detrimental to the natural environment and with high social costs in rural communities (AGUIAR et al., 2017), it is debatable whether palm oil production can achieve ecological value through aiming for economic values (BOONS AND MENDOZA, 2010).

Agricultural frontier expansion in low land rainforests in Sumatra

In addition to oil palm, rubber, which was introduced to Indonesia during Dutch colonial time, belongs to the dominating agricultural systems in Sumatra (HEIN, 2016). While the expansion of oil palm in its early years was mainly led by companies, it is expected that smallholders will exceed large estates soon (SCHWARZE et al., 2015) (cf. fig. 4).

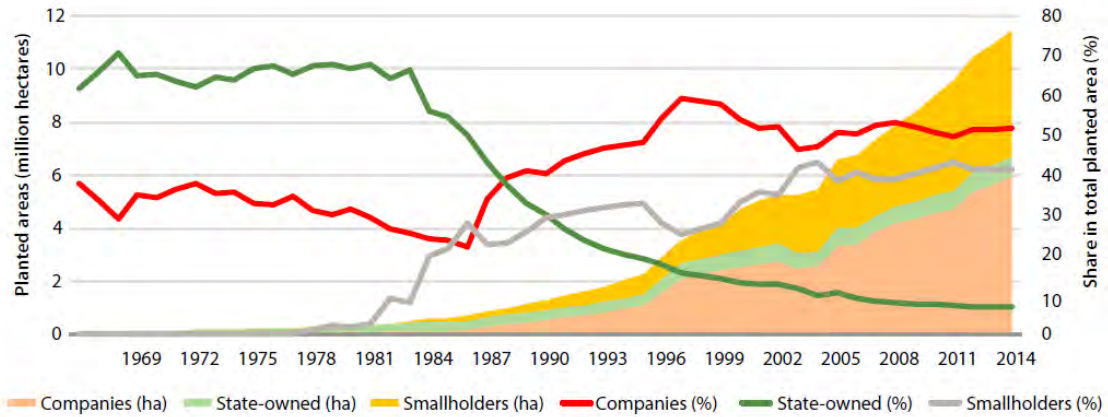


Figure 4 – Oil palm expansion in Indonesia by type of actor. Data from: Directorate General of Estate Crops, Indonesia, in PACHECO et al. (2017, p. 19).

Motivational factors that induce land use decision have found attention among researchers (EULER et al., 2016), and the pace of agricultural frontier expansion is still increasing. Two thirds of the current expansion of oil palm cultivation is based on conversion of rainforests, while one third results from the conversion of previously cultivated or barren land (GEIBLER, 2013). Between 2000 and 2010, Indonesia lost over six million ha of forest (EULER et al., 2016). The last remaining frontier areas are heavily contested spaces that are still witnessing violent conflicts on access and control of forest land” (HEIN, 2016, p. 2).



Figure 5 – Picture compilation of oil palm cultivation. Upper left: Smallholder oil palm plantation in Mekar Jaya; Upper right: Company plantations near Gurun Mudo. Young plants on the left of the road, mature ones on the right; Lower left: Truck with harvested FFB near Sungai Rotan; Lower right: Freshly-harvested FFB. Photos taken by the author (2017).

Agricultural expansion towards sustainable development that does not compromise ecosystems, communities or incomes, constitutes a great challenge that is not faced by Indonesia alone but by palm oil consuming and producing countries collectively (BRANDI, 2017). „Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs“ according to the Brundtland Commission (BRUNDTLAND, 1991) and builds on the three pillars economic, ecological, and social. This triple bottom line approach is complemented by a fourth dimension, governance, in this thesis. However, it will become clear that the threefold (or fourfold) concept that was defined by actors from a global perspective, is locally intrinsically integrated, so the three (or four) dimensions do not have a segregated character (BESSOU et al., 2017).

Though oil palm is an efficient plant, job provider, income booster, and a demanded commodity in diverse global markets (food and non-food), with higher yields per area than other vegetable oils (GEIBLER, 2013), its production is being criticised for its sustainability performance in various ways. The impacts of oil palm expansion and palm oil production are categorized into the four dimensions of sustainability below.

Environmental sustainability issues

Several environmental effects have already been named above, so this section works as a summary. The effects on ecosystems are manifold. Fertile land in tropical regions is needed for intensified oil palm monoculture plantations. Oil palm trees are up to ten times more productive than other oilseed crops, such as soybean or rapeseed (GEIBLER, 2013). In areas dominated by primary and secondary forests this results in the conversion of rainforest (land use and land cover change). The conversion leads to substantial biodiversity losses of flora and fauna (BARNES et al., 2017) and has been proven to alter microclimatic conditions (DRESCHER et al., 2016). The pollution of air and water, effects on regional and local hydrology (MERTEN et al., 2016), the degradation of productive land by soil compaction and erosion (GUILLAUME et al., 2016), long-term threats to the future production of food (GEIBLER, 2013), climate change, stratospheric ozone depletion, peatland drainage and the release of carbon stocks (HEIN et al., 2018), as well as forest fires (HARTMANN et al., 2018) and greenhouse gas (GHG) emissions alter the vulnerable ecosystems irrevocably. GHG emissions from land use change can be several times higher than GHG emissions from palm oil production itself (HANSEN et al., 2015). Some key species, such as the Sumatran tiger or the Orangutan are endangered by vast agricultural expansion and lose their rainforest habitats. It is not the crop itself that ultimately is the subject of controversies but agricultural practices and plantation management. Regarding sustainability certification, which is described in more detail in chapter 1.2, a spillover effect is

predicted if uncertified land does not meet certain sustainability criteria and thus additional forest area is cleared (GEIBLER, 2013).

Economic sustainability issues

Economic gains from oil palm cultivation are undeniable according to many researchers (KRISHNA et al., 2017; KUBITZA et al., 2018; RAYNAUD et al., 2016). However, the decentralised production network (OOSTERVEER, 2015), poses some risks with regard to inclusion of stakeholders, especially those with limited expertise and capital. Long-term economic benefits are subject to many factors, such as secure land tenure, governmental training and support, product diversification and dependencies among smallholders and companies. As a result of the price for palm oil having been relatively stable and rising until 2011 (cf. fig. 6), heavy substitution for biodiesel both in the EU and in Southeast Asia has jacked up prices for palm oil particularly for those consumers in producer countries, who use palm oil for cooking (MUKHERJEE AND SOVACOO, 2014). In 2008 and 2011 price peaks mirror international market cycles, which ultimately led to a decline in palm oil prices (yellow line in fig. 6) (PACHECO et al., 2017). The expansion of biodiesel markets since 2015, climate events causing a decrease in yields and a reduction of palm oil stocks are causing a price recovery in recent years (BRACK et al., 2016; PACHECO et al., 2017). Competing with other food crops that generate less income, conversion of agricultural land to plantations for cash crops puts food security at risk and makes palm oil a globalised agro-food commodity, comparable to soy or cocoa (GEIBLER, 2013; OOSTERVEER, 2015).

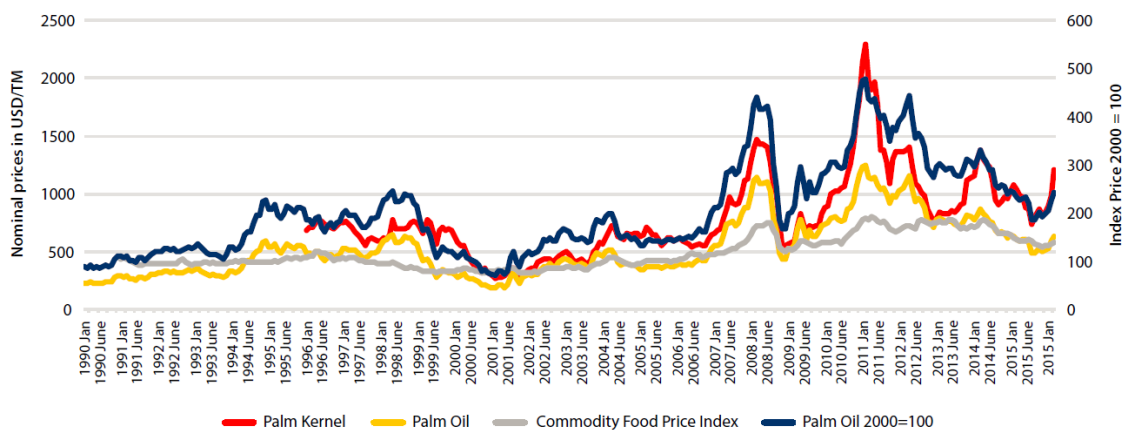


Figure 6 – Palm oil and palm kernel price (in USD/metric ton) development from 1990 until January 2015. Data from INDEXMUNDI (2017) in PACHECO et al. (2017, p. 11).

Social sustainability issues

Community development in Sumatra was highly influenced by the transmigration programme, initiated by the government under Dutch colonial rule, and later repeated under Suharto's New Order to lift some of the population pressure off Java. Thousands of transmigrants were sent to Sumatra, one of the "outer islands" (KUNZ, 2016) and were allocated land for housing, planting food crops and plantations. Today transmigrants live side-by-side with locals of Malayan origin in a mosaic of multi-cultural, multi-ethnic and multi-religious communities. This diversity has caused many conflicts (SCHOTT, 2015).

Oil palm expansion has resulted in illegal land grabbing and land conflicts due to insecure land tenure of villagers as traditional land right models are often not legitimised by national governments or certification bodies. A remaining flexibility of legitimacy in regard to land tenure further enables exploitation of the landscape and accelerates small-scale agricultural expansion in the forest frontier areas of rural Indonesia (KUNZ, 2016).

The production system varies a lot from former rubber production systems in terms of work intensity and gender aspects (MURRAY LI, 2015). The harvest of oil palm fruits is physically hard work, that is often done by male farmers, while rubber tapping could be accomplished by female workers. Poor working conditions are often associated with oil palm cultivation (AMNESTY INTERNATIONAL, 2016).

Despite social conflict over land rights, illegal logging, compulsory relocation, or displacement of indigenous peoples, oil palm cultivation has brought some benefits and enhanced socio-economic and infrastructural development. Increasing prosperity and ability to invest in education has resulted in higher social mobility, rising living standards and rising consumptive demands (KUBITZA et al., 2018).

Governance sustainability issues

A fourth dimension, governance, is added to differentiate sustainability issues further. New modes of transnational governance have emerged, such as NSMD. In the local-global nexus (BESSOU et al., 2017), the world is connected by trade but disconnected on the basis of "value judgment of consumers living in largely saturated OECD (Organisation for Economic Co-operation and Development) markets and of producers in low and middle income countries" (MOHD NOOR et al., 2017, p.1). This especially applies for local sustainability needs of smallholders who grow 40% of the world's oil palm (ibid.). Global production networks that comprise multiple dimensions of power (of which the palm oil value chain is a prominent

example) are viewed as an integrated economic, political and discursive structure (LEVY, 2008). This is not always the case in sustainability governance.

The common phenomenon of corruption and vested interests limit the accountability of stakeholders and their actions (IVANCIC et al., 2016). Palm oil production is of global concern and steered by cross-state actors. A study of perceptions of global changes and sustainability by BESSOU et al. (2017) found that performance of oil palm growers is closely linked to the perception of macro- and micro-actors. On these grounds, this thesis tries to set perceptions in contrast to performance. The same study suggests that “a lack of consideration and mediation between both points of view (i.e. local and global) 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” (ibid., p. 5). Forest classification methodology in Indonesia is a concrete example for the disconnection between local and global perceptions, since zero-deforestation policies raised the question of what forest is, how is it defined, and which kind of forest is worth preserving. Consequently, HCV forests were set as a reference in a land sparing approach to conservation by maximizing agricultural productivity on arable lands and natural productivity in preserved ecosystems (ibid.).

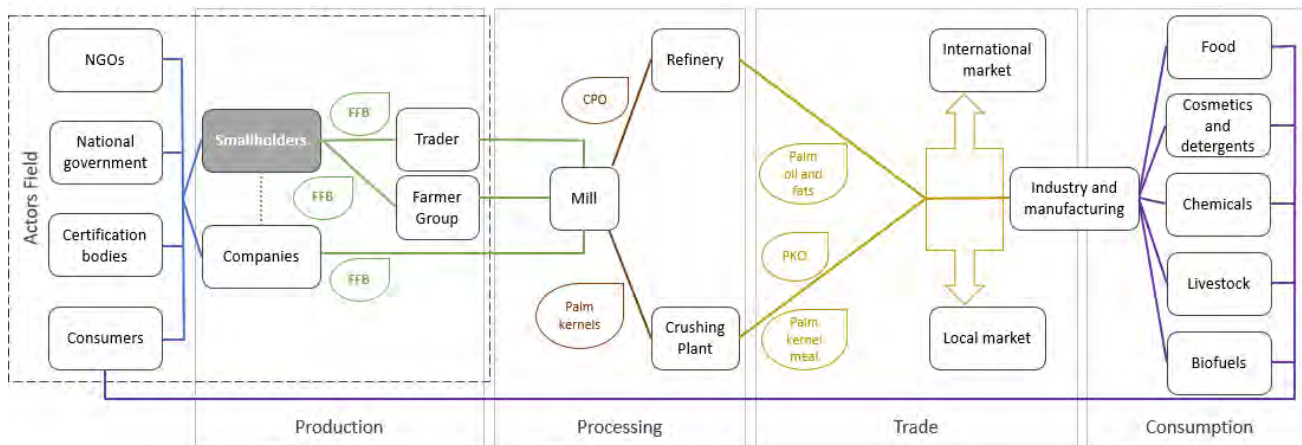


Figure 7 – “Actors field” within the palm oil value chain. Own illustration (FFB= Fresh Fruit Bunches, CPO = Crude Palm Oil, PKO = Palm Kernel Oil) adapted from BRACK et al. (2016, p. 10).

The palm oil value chain

The palm oil value chain or production network (cf. fig. 7) encompasses various actors across state lines. Global production networks are entangled with charged social and political issues and “entail the disaggregation and dispersion of economic activities to multiple geographic locations” (LEVY, 2008, p. 943 f.). Upstream suppliers, influenced by NGOs, national governments, certification bodies and ultimately, consumers and downstream buyers are

dominated by few powerful conglomerates involved in production, processing and trade (Wilmar, Musim Mas, GAR, Cargill and Asian Agri in Indonesia) (PACHECO et al., 2017). Cultivation of oil palm plantations is carried out by smallholders and large-scale companies which produce fresh fruit bunches (FFB) that are sold via traders or farmer groups (in the case of smallholders). FFB are then processed in mills (that can be part of the companies), generating crude palm oil (CPO) and palm kernels. In order to avoid denaturation, FFB need to be processed within 24 hours (RAYNAUD et al., 2016). From there, refineries process palm oil and fats from CPO, and crushing plants produce palm kernel oil (PKO) and palm kernel meal. PKO is more suitable for cosmetics and detergents because of the high amount of saturated fatty acids and palm kernel meal is often used for feed in the livestock sector (ibid.). The products are traded on domestic and international markets and are sourced by industry and manufacturing in the food, cosmetic and detergents, chemicals, livestock and biofuel sector (BRACK et al., 2016).

Consumer awareness of palm oil sustainability issues

The palm oil buyers scorecard by the World Wide Fund for Nature (WWF, 2016) gives an overview of efforts to tackle sustainability issues regarding palm oil by retailers, manufacturers, and food service companies. It benchmarks which companies have reached their commitments and which are behind. The report is in close connection to the Roundtable on Sustainable Palm Oil (RSPO) certification. Resources like these aid customers in informed decision-making when purchasing palm oil products. Palm oil is amongst the top seventeen oils and fats used for human, animal, and oleochemical industry (which is analogous to petro-chemicals usage) needs. Its versatility is expressed in the widespread use, of which 80% is for edible purposes and 20% is in the non-food section (AGUIAR et al., 2017). Its ubiquitous presence in today's consumption is attributable to various advantages for the food sector, for instance a balanced composition of saturated and unsaturated fatty acids, the high vitamin E content (RAYNAUD et al., 2016), the deep frying preparations due to it resisting oxidation at high temperatures and giving products a desirable colour, as well as the useful texture at room temperature (AGUIAR et al., 2017). The table below (cf. table 1) outlines key use areas and properties for palm oil. Many products do not contain CPO or PKO but derivatives and fractions.

Table 1 – Key use areas and properties of palm oil in the food, non-food and oleochemicals sector. Adapted from: AGUIAR et al. (2017).

Food sector	Non-food sector	Palm-based oleochemicals
<ul style="list-style-type: none"> - Bakery sector (butter, margarines, ghee) - Confectionaries (cheaper than cocoa butter, texture between liquid and solid, spreadable) - Replacement for butter fat in dairy, mayonnaise, salad dressing 	<ul style="list-style-type: none"> - Directly: polyurethanes, printing ink, engineering thermoplastics, fuels and drilling mud - Indirectly: oleochemicals in lubricants - Personal care products (cosmetics, soaps and toiletries) - Fatty acids, fatty esters, fatty alcohols, fatty nitrogen and glycerol 	<ul style="list-style-type: none"> - Agrochemicals - Surfactants used in pesticide formulations, wetting and dispersing agents - Paints (emulsifier), solvent, carrier, diluent - Biofuel - Coat for food wrapping paper

1.2 Certification schemes in the palm oil sector

This chapter gives an overview of certification schemes in the palm oil sector in general, and the RSPO standard in particular. Side by side with self-regulatory commitments and public regulation, certification seeks to “clean up the supply chain” (JELSMA et al., 2017, p. 281). In order to address the sustainability issues concerning palm oil production, global voluntary agreements have emerged due to apparent state failure (RUYSSCHAERT AND SALLES, 2014). Embedded in broader discourses of poverty reduction and economic development, certification addresses these issues collectively (PACHECO et al., 2017). In absence of inter-governmental regulation, private actors, including corporations and NGOs engage in standard setting and certification in value chains (MANNING et al., 2012), which can be interpreted as NSMD governance (GEIBLER, 2013).

RIVAL et al. (2016) provide a list of available standards for the palm oil industry, which is complemented by PACHECO et al. (2017):

- Roundtable on Sustainable Palm Oil (RSPO).
- International Sustainability and Carbon Certification (ISCC).
- Rainforest Alliance (RA)/Sustainable Agriculture Network (SAN).
- Roundtable on Sustainable Biomaterials (RSB).
- Palm Oil Innovation Group (POIG).
- Sustainable Palm Oil Manifesto (SPOM).
- Indonesian Sustainable Palm Oil (ISPO).
- Malaysian Sustainable Palm Oil (MSPO).
- The Indonesian Palm Oil Pledge (IPOP).

These standards complement the existing set of labels for agricultural products, such as Forest Stewardship Council, Fair trade or organic. In an attempt to enhance the global competitiveness of Indonesian palm oil, the Indonesian government has developed the public standard ISPO in 2011. ISPO is mandatory for all Indonesian growers. However, the original goal that all Indonesian oil palm growers should comply with the standard by 2015 was not reached because of failure to effectively sanction incompliance (JELSMA et al., 2017). Both ISPO and the Malaysian version MSPO have moved the due dates for criteria application several times. Further, commitments to transparency and ethical conduct in business are not captured under ISPO, which currently also provides the least stringent biodiversity criteria⁶ (RIVAL et al., 2016). Due to these weaknesses of the ISPO standard more attention is drawn to the RSPO as a private incentive.

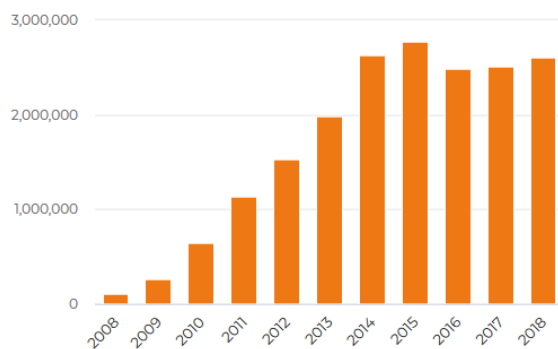


Figure 8 – Global certified sustainable palm oil production area from 2008 until 2018 (ha).
Data from RSPO (2018a).

Launched in 2004, the RSPO is a business-to-business initiative supported by the WWF and private industry actors. The first plantations were certified and the first CSPO was sold in 2008 (RIVAL et al., 2016). Currently, around 19% of palm oil is certified by the RSPO, with over 3000 members and an increasing number of retailers, manufacturers and foodservice

companies committed to getting full traceability of their supply chains and to exclusively using certified palm oil (WWF, 2016). In figure 8 the global certified oil palm production area is shown, indicating a rising trend until 2015 and reaching an estimated 2.5 million ha in 2018.

Principle and criteria by the RSPO

The RSPO standard puts forward eight **principles** that are subdivided into 39 **criteria**, which are listed in table 2. These principles and criteria (P&C) are reviewed in a harmonisation process to improve relevance and effectiveness, and national interpretation guidelines, specifically targeted at the different grower groups, are available (RSPO, 2010). The P&C focus on transparency, laws and regulations, economic and financial viability, environmental responsibility, conservation, biodiversity, workers' rights, communities, replanting and continuous improvement. Until November 2018, the next revision of the P&C will be conducted by stakeholders and representatives from various grower groups predominantly

⁶ For more differences between ISPO and RSPO, see SUHARTO et al. (2015).

from Malaysia and Indonesia, environmental and social NGOs and processors, retailers and manufacturers of the industry, as well as financial institutions (RSPO, 2018b).

In this thesis, the terms **criteria and indicator** repeatedly come up. To give a short and consistent definition, criteria are a set of aspects for evaluating sustainability, while indicators are the parameters with which these aspects are assessed, rated and valued.

Table 2 – National interpretation RSPO Principles & Criteria for independent smallholders in Indonesia. Adapted from RSPO (2010).

<p>1. Commitment to transparency</p> <p>1.1 Provision of adequate information to stakeholders</p> <p>1.2 Management documents are publicly available</p>
<p>2. Compliance with applicable laws and regulations</p> <p>2.1 compliance with all applicable ratified local, national and international laws and regulations</p> <p>2.2 Legal ownership of the land</p> <p>2.3 Oil palm land use does not diminish legal or customary rights</p>
<p>3. Commitment to long-term economic and financial viability</p> <p>3.1 Financial and economic management plan is implemented (min. 1 year, incl. replanting)</p>
<p>4. Use of appropriate best practices by plantation and mill</p> <p>4.1 Documented, implemented and monitored operating procedures according to GAP</p> <p>4.2 Practices to improve soil fertility and ensure yields</p> <p>4.3 Minimise and control erosion and soil degradation</p> <p>4.4 Maintain quality and availability of surface and ground water</p> <p>4.5 Integrated Pest Management</p> <p>4.6 Responsible use of agrochemicals</p> <p>4.7 Occupational health and safety plan documented, communicated and implemented</p> <p>4.8 All staff, workers, smallholders and contractors are appropriately trained</p>
<p>5. Environmental responsibility and conservation of natural resources and biodiversity</p> <p>5.1 Negative environmental impacts are mitigated, positive ones are promoted</p> <p>5.2 HCV</p> <p>5.3 Waste is reduced, reused, recycled, and correctly disposed off</p> <p>5.4 Energy efficiency and use of renewable sources maximised</p> <p>5.5 Use of fire for waste disposal or land preparation avoided</p> <p>5.6 Reduce pollution, emissions (incl. GHG)</p>
<p>6. Responsible consideration of employees and of individuals and communities affected by scheme smallholder</p> <p>6.1 Participatory approach to social impacts, mitigation (-) or promotion (+)</p> <p>6.2 Open and transparent communication and consultation between stakeholders</p> <p>6.3 Complaints and grievances system</p> <p>6.4 Right to negotiations and representation</p> <p>6.5 Minimum wage and at least standard working conditions</p> <p>6.6 Access to workers unions</p> <p>6.7 No child labour that interferes with education or under hazardous conditions</p> <p>6.8 No discrimination</p> <p>6.9 No sexual harassment or violence against women</p> <p>6.10 Fair and transparent treatment of business partners</p> <p>6.11 Contribution to sustainable development of the local community</p>
<p>7. Responsible development of new plantings</p> <p>7.1 Independent social and environmental impact assessment prior to replanting</p> <p>7.2 Soil survey and topographic information for site planning</p> <p>7.3 New plantings do not replace primary forest or HCV areas</p> <p>7.4 Steep terrain and/or marginal and fragile soils avoided</p> <p>7.5 No new plantings on land without the owner's consent</p> <p>7.6 Compensation for agreed land acquisition</p> <p>7.7 Use of fire for land preparation avoided</p>
<p>8. Commitment to continuous improvement in key areas of activity</p> <p>8.1 Monitor and review activities, action plans and demonstrate continuous improvement</p>



Figure 9 – RSPO label and Green Palm label for certified palm oil sourced through Book and Claim supply chains.

Source: BUNDESMINISTERIUM FÜR WIRTSCHAFTLICHE ZUSAMMENARBEIT UND ENTWICKLUNG (2018) and GREEN PALM (2016).

CSPO can be labelled with the RSPO certificate on the final product (cf. fig. 9). Depending on the supply chain options, described below, a Green Palm label indicates that the palm oil contained in the product cannot necessarily be traced back to the grower in an exclusively certified supply chain, but each tonne of palm oil or PKO is offset by the manufacturer or retailer. The

manufacturer or retailer buys Green Palm certificates on a trading platform (GREEN PALM, 2016).

Supply chain models

Traceability and transparency are important features of sustainable products and certificates. It ensures that suppliers are known and that the supply chain is visible and followable from the primary producers to final product. Transparent communication with and about suppliers and the life cycles of the products are especially important in the food industry (PACHECO et al., 2017). Within the RSPO certification scheme four different supply chain options are available, which are listed in table 3. The model Identity Preserved ensures full traceability to one supplier and the palm oil is sourced separately from uncertified palm oil along the entire supply chain. This is the strictest certification option. In segregated supply chains, certified and uncertified palm oil are kept separate too, but the supplier base can include several sources. The option Mass Balance levels out the amount of certified and uncertified palm oil by ensuring that the amount of purchased palm oil is produced on a certified plantation but this palm oil is not necessarily contained in the purchased product. Via the Book & Claim model, manufacturers and retailers can support the RSPO and standard-compliant palm oil production and communicate this effort to consumers, but the contained palm oil cannot be traced back to a certified supplier base. One example for RSPO Book & Claim supply chains can be given from Mekar Jaya, one of the research villages of this thesis, where RSPO-certified smallholders are supported by Green Palm certificates, purchased from Unilever and Johnson & Johnson because there is no certified mill to continue a fully certified supply chain (#24).

Table 3 – RSPO supply chain models for palm oil and respective traceability options. Adapted from RSPO (2018f).

Identity Preserved	Segregated	Mass Balance	Book & Claim
Sustainable palm oil from a single identifiable certified source is kept separately from ordinary palm oil throughout supply chain. Palm oil can be traced back to one certified supply base.	Sustainable palm oil from different certified sources is kept separate from ordinary palm oil throughout supply chain. Palm oil can be traced back to several certified supply bases.	Sustainable palm oil from certified sources is mixed with ordinary palm oil throughout supply chain. Palm oil is derived from mixed sources and cannot be traced back to either certified or uncertified supply bases.	The chain is not monitored for the presence of sustainable palm oil. Manufacturers and retailers can buy a credit from an RSPO-certified grower to demonstrate their support for sustainable palm production.

Smallholder typology

Members of the RSPO can be divided into growers, processors and traders, manufacturers, banks and investors, retailers and NGOs (RIVAL et al., 2016). This thesis is focused on growers, particularly smallholders. The growers' landscape is quite diverse (BAUDOIN et al., 2015). There are approximately three million small oil palm farmers worldwide (NAGIAH AND AZMI, 2012; RSPO, 2018a). Smallholders have been reported to generate lower yields than company plantations (35% less) and 40% less than state-owned plantations (NAGIAH AND AZMI, 2012) (cf. fig. 4). Smallholder productivity is presumably rising, since more recent studies have found that company yields exceed those of smallholders by only 25% (JELSMA AND SCHONEVELD, 2016)⁷. There are various and oftentimes arbitrary definitions of smallholders articulated in literature. Therefore, this section gives a smallholders and plasma or nucleus estate schemed smallholders, who have a contract with a company (JELSMA et al., 2017). In the boxes below, smallholder definitions by the RSPO (2018c) are given. short smallholder typology. Broadly, smallholders can be divided into independent

⁷ In optimum conditions, yields around 7 tons/ha are possible. Most large-scale plantations in Indonesia produce 3.5-4 tons/ha, while smallholders achieve less than 2 tons/ha (BRACK et al., 2016).

“**Smallholders** are farmers who grow oil palm, alongside with subsistence crops, where the family provides the majority of labour and the farm provides the principal source of income, and the planted oil palm area is less than 50 hectares.”

Independent smallholders are “characterised by their freedom to choose how they utilise their lands, type of crops to plant, and how they manage them (being self-organised, self-managed and self-financed). They are not contractually bound to any particular mill or association and may also receive support or extension services from government agencies.”

Schemed or associated smallholder “are structurally bound by contract, a credit agreement or planning to a particular mill. They do not choose which crop they grow, are supervised in their planting and crop management techniques, and are often organised, supervised or directly managed by the managers of the mill, estate or scheme to which they are structurally linked.”

Regarding schemed or associated smallholders land is usually divided between smallholders and companies with a 70:30 or 80:20 ratio in favour of the companies. Smallholders usually receive support from the company regarding agricultural management (planting material, inputs, advice) but in exchange are contractually bound to sell their harvest to the company.

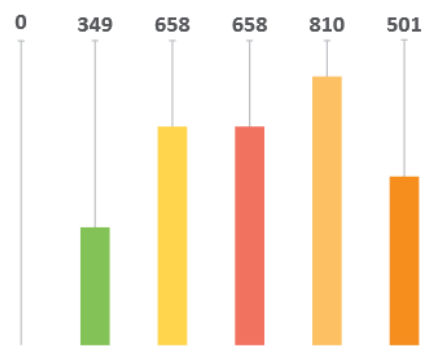


Figure 10 – Number of independent smallholders under group certification in Indonesia from 2012 until 2017 (left to right column). Data from RSPO (2017).

A result of these schemes are loss of autonomy and by dealing with a single buyer, smallholders often get below-market prices for their harvest (MUKHERJEE AND SOVACOOOL, 2014). The partnership schemes are of high complexity and variability and cannot be described here in full detail. For this thesis, independent smallholders were interviewed exclusively. Independent smallholders may be associated in cooperatives. In order to engage in RSPO certification, smallholders need to apply under farmer groups (cf. fig. 10). The impacts of these groups are described in chapter 4.4.

Benefits and barriers

Certification is said to offer a set of expected benefits (BRANDI, 2017; NAGIAH AND AZMI, 2012), but in the literature, certain barriers to certification, especially for smallholders are emphasised (BRANDI et al., 2015; CHEYNS, 2011; IISD, 2014; POYNTON, 2015).

Potential benefits include improved market access for smallholders through certification, higher incomes through higher productivity and better quality of harvests (BRANDI, 2017), as well as empowerment and representation strengthening the bargaining power and negotiation skills of small-scale growers (NAGIAH AND AZMI, 2012). By applying good agricultural practices, as a prerequisite of RSPO certification, higher yields are documented. Because smallholders are paid according to the weight of the FFB they produce, higher productivity expressed through higher weights directly translates into economic gains. It has to be noted though that there are no price premiums for CSPO in international markets (BRANDI, 2017). Regarding environmental benefits, RSPO certification does not achieve large-scale conservation effects because of implementation and control challenges, but can, in some cases, contribute to reducing impacts on a small scale: for example a reduced usage of agrochemicals (ibid.). Social benefits have not been sufficiently studied or are included in socio-economic analyses, with regards to contributions to wealth and jobs (MURRAY LI, 2015). This thesis will shed light on some major challenges in the community life induced by oil palm introduction.

Barriers to smallholder certification are primarily, the costs of certification, which account for 1.19 UD \$ - 34.66 US \$/ha (BRANDI et al., 2015). The capital-intensive certification process, which entails trainings, administrative costs, monitoring and auditing, hinders the inclusion of smallholders (CHEYNS, 2011) and is rarely seen as a long-term investment that can later be paid off by higher yields (NAGIAH AND AZMI, 2012). Compliance with RSPO P&C is limited due to a lack of agricultural skills, informality, as well as a lack of incentive (JELSMA et al., 2017). Based on the social and governance dimensions, land tenure and land conflicts, illegal operations by companies, as well as law enforcement challenge successful certification (ABRAM et al., 2017).

Sustainability certification implies significant trade-offs between sustainability dimensions. There is a possible contradiction of sustainable socio-economic development and environmental sustainability because the former encourages expansion of plantations which has a detrimental effect on the latter (BRANDI, 2017).

The shortcomings of the RSPO in the context of Indonesian oil palm smallholders can be summarised as follows: poor outcomes regarding the large-scale protection of the forest area and mitigating GHG emissions, "financial compensation too small, too much room for

interpretation” of P&C, “postponement on contentious issues, non-integration of RSPO within the socio-politico-legal Indonesian context and finally the lack of effective external control systems” (RUYSSCHAERT AND SALLES, 2014, p. 438).

Market exclusion of smallholders is contested. So far, smallholders have not experienced exclusion from markets according to (BRANDI, 2017), who names the following reason: Major palm oil importers, such as China or India, as well as the Indonesian domestic market do not demand CSPO and thus still make a market for uncertified products, although some initiatives promoting sustainability in the palm oil sector have emerged (IISD, 2014).

1.3 Research design and hypotheses

This master thesis is affiliated to the collaborative research centre (CRC) 990 at the University of Göttingen and the Indonesian partner universities. The interdisciplinary EForTS⁸ project focuses on ecological and socioeconomic functions of tropical lowland rainforest transformation systems in Jambi Province, Sumatra, Indonesia. Three research groups contribute to describing causes and effects of rainforest conversion to jungle rubber agroforests and monoculture plantations of rubber and oil palm: Environmental processes, biota and ecosystem services, and human dimensions. This thesis is conducted within group C, in subgroup 02 (Socio-cultural and institutional transformation processes in rural Jambi) and narrows the transformed landscapes down to oil palm cultivation. Currently in the second project phase (2016-2019), the EForTS project is collecting long-term data that enable the provision of support to stakeholders in informed decision-making.

Problem formulation

In the heated scientific and public debate on palm oil production and its impacts on the environment, society and economy, this case study adds to the existent body of literature and gives a small-scale insight to a topic that is often assumed to be clear. There is extensive evidence on sustainability certification, the barriers, weaknesses and strengths of these standards, but little findings on the small-scale producers’ perspective on the criteria imposed on them. While case studies are often considered self-evident, this thesis seeks to contribute to an understanding of case-based patterns that can be abstracted and generalised on a more extensive group of similar actors (LUND, 2014).

⁸ Ecological and Socio-economic Functions of Tropical Lowland Rainforest Transformation Systems (Sumatra, Indonesia), in the following referred to as CRC 990.

Short methodological overview

In a six-week research stay in Jambi Province, following an extensive literature review and short-term language course in Bahasa Indonesia, qualitative interviews were conducted in three villages. In addition to open, problem-oriented interviews and focus group discussions, a standardised sustainability assessment guideline by the Food and Agriculture Organisation of the United Nations (FAO) was used for data collection.

Hypotheses

As a starting point of this thesis, the following three hypotheses have been formed to serve as a basis for empirical work:

H1: Perceptions of sustainability are shaped by geographical context and cannot uniformly be applied on a global scale.

Criteria for certification schemes are shaped by a western view of sustainability. These criteria often do not reflect the realities faced by smallholders in the vast and extensive production network of palm oil. Local contexts do matter in a way that not only local regulations, laws, and the field of stakeholders have an impact, but more importantly that there exists a cultural divide between growers and users that manifests itself in a gap of uphold values and hierarchy of sustainability aspects.

H2: Incentives to promote sustainability in palm oil sourcing via certification transfer externalities from consumer to producer countries (i.e. Indonesia) and exclude uncertified smallholder farmers from the market.

Most of the globally produced palm oil is consumed in China, India, and the European Union (PACHECO et al., 2017). The producers are, to a major extent, located in Malaysia and Indonesia (ibid.). This creates a geographical dissociation between consumers and producers, while most of the negative externalities are generated at the production sites. If the demand for CSPO rises, producers might have to follow the consumer demands in order not be excluded from the market. The recent political decision to ban palm oil as an ingredient for biodiesel by 2020 in the EU (REUTERS, 2018a) might change the current picture significantly. Smallholders now fear that this ban will destroy their livelihoods and the entire palm oil industry (REUTERS, 2018b).

H3: Smallholder farmers aiming for sustainable business and farming practices are mainly driven by economic incentives, such as maintaining and improving their livelihoods.

The threefold approach to sustainability encompasses sufficiency, efficiency and consistency. Sufficiency marks a reduction of raw materials and energy consumption to reach a state of moderation and adequacy. It calls for a change in consumption habits (CREATIVE COMMONS, 2016). Efficiency aims at enhancing the resource productivity and improve the ratio of resources used to the results achieved. An example would be agricultural intensification (WUPPERTAL INSTITUT FÜR KLIMA, UMWELT, ENERGIE, 2016). Lastly, consistency is “about reconciling nature with technology” (CREATIVE COMMONS, 2016, p. 1). An example would be a circular economy. The term “sustainability” itself indicates that a certain condition can be uphold. This is applicable to the state of ecosystems, communities or economic wellbeing. With scarce financial resources, smallholders need to focus on increasing their income, in order to provide for their families. The boom caused by oil palm introduction has extended sustainability from the ability to sustain, to even improve the situation. In contrast to emerging countries that are focused on economic growth, many industrialised countries are aiming for a degrowth movement. Here, sustainability often refers to recovering to a former state, for example renaturation of ecosystems. In this case study, smallholders in Jambi might link sustainability solely or mainly to economic growth, while the environmental and social dimensions attract less interest or are not perceived as pressing as the economic viability.

Structure of the thesis

This thesis is divided into six chapters and unfolds as follows: The introductory chapter 1 is an overview of the issues existent in the palm oil context and presents available certification schemes in the sector. Special emphasis is placed on smallholders in the industry and their range of influence and interaction.

In chapter 2 the conceptual framework is laid out. The action-in-context approach is transferred onto the case study problem. Consequently, the actors field, motivations and options are defined, leading to the more detailed chapter on perceptions of sustainability by the predefined actors. A shift of perspective from the observer to the actors is described. To round up, relevant questions of scale are addressed.

Insights to the applied set of methods is given in chapter 3. Beginning with a description of the case study area and sampled villages, the twofold methodological approach, consisting of flexible and standardised data generation is then demonstrated.

Chapter 4 is dedicated to the results of the case study. Perceived changes and challenges on the one hand and sustainability performance hotspots detected on the other hand are contrasted and set in context with impacts of farmer groups and RSPO certification.

Closing the loop to the conceptual framework, the results are evaluated in the discussion of chapter 5. Again, the specific role of smallholders is pointed out here, apart from abstracting and generalising, of what this study is the case. Limitations and further research needs are presented.

Concluding, chapter 6 resumes the results and gives a more personal reflection on the process of conducting this thesis.

2 Conceptual Framework

The underlying conceptual framework of this thesis builds on a micro-scale approach aiming to give insights to oil palm smallholders' perceptions of sustainability. Since perceptions are in least cases straight-forward and those who hold these perceptions are often not aware of them, a theory that captures the concept of perceptions in a more subtle way is applied. Hence, as a micro-scale approach, the action-in-context approach by de Groot (1992) is introduced, followed by a more detailed chapter on perceptions towards sustainability. Presenting various questions of scale that affect perceptions completes this chapter.

2.1 Action-in-context-approach by de Groot (1992)

Any action and any actor is shaped by a normative, socio-cultural and environmental context. According to (MUHAR et al., 2017) the context sensitivity of social-cultural concepts should be given particular attention in decision-making. Activities often lead to externalities, either or both of beneficial and destructive nature. These externalities are described as an (environmental) problem in the following. Since this study looks at all dimensions of sustainability, "environment" is placed in brackets here. The original source of this approach looks at environmental problems only.

The 'Problem-in-Context' (PiC) approach was developed by DE GROOT in 1992 and aims at identifying the actors behind problems, the range of options actors may choose from and the motivations behind those. In addition to the normative and ecological contextualisation, in this case study the social contextualisation is of highest interest. The 'Action-in-Context' (AiC) fragment of the PiC approach gives insight into the problem-relevant activities and the direct actors behind them and their options and motivations (TSETSE, 2008). Furthermore, the actors and factors that influence the decision-making of actors and wider cultural and structural bases can be assessed. In applied research, this framework may support the researcher in ordering conceptual theories, as well as arranging research steps and questions at the case study level (ibid.). TSETSE (2008, p. 79) defines this approach as "progressive contextualization,

in which there is no other a priori research unit than the action to be explained from which the researcher proceeds ‘outward’”, similar to grounded theory (cf. chapter 3). Following the PiC approach, the geographical, ecological and normative context and its actors are to be defined. The (environmental) problem is situated at the top of the conceptual field of research (cf. fig. 11). Vertical chains of effects and norms are connected by “fact/value discrepancies” (DE GROOT, 1992, p. 82). Finding out how and why actors conduct activities in a certain manner and how they perceive them as problematic is a key step in analysing the problem and designing and implementing counteractive strategies that close the feedback loop to the original actor. (MUHAR et al., 2017) recognise the need to “sufficiently consider and operationalize the dynamic interactions between people’s values, attitudes and understandings of the human-nature relationship at both individual and collective levels”. According to PiC, the people-environment system comprises of the interrelation of social and physical causes, as well as impacts and norms. This thesis is focused on the problem situation analysis and explanation and excludes any solution design, although the results could assist in more informed decision-making in the future.

In the following, the visualisation in figure 11 is broken down. Under de Groot’s framework three components are studied:

1. the (environmental) problem is caused by activities for which actors are responsible;
2. the normative observer defines and analyses an (environmental) problem; and
3. a reflective observer perceives a situation and is influenced by values.

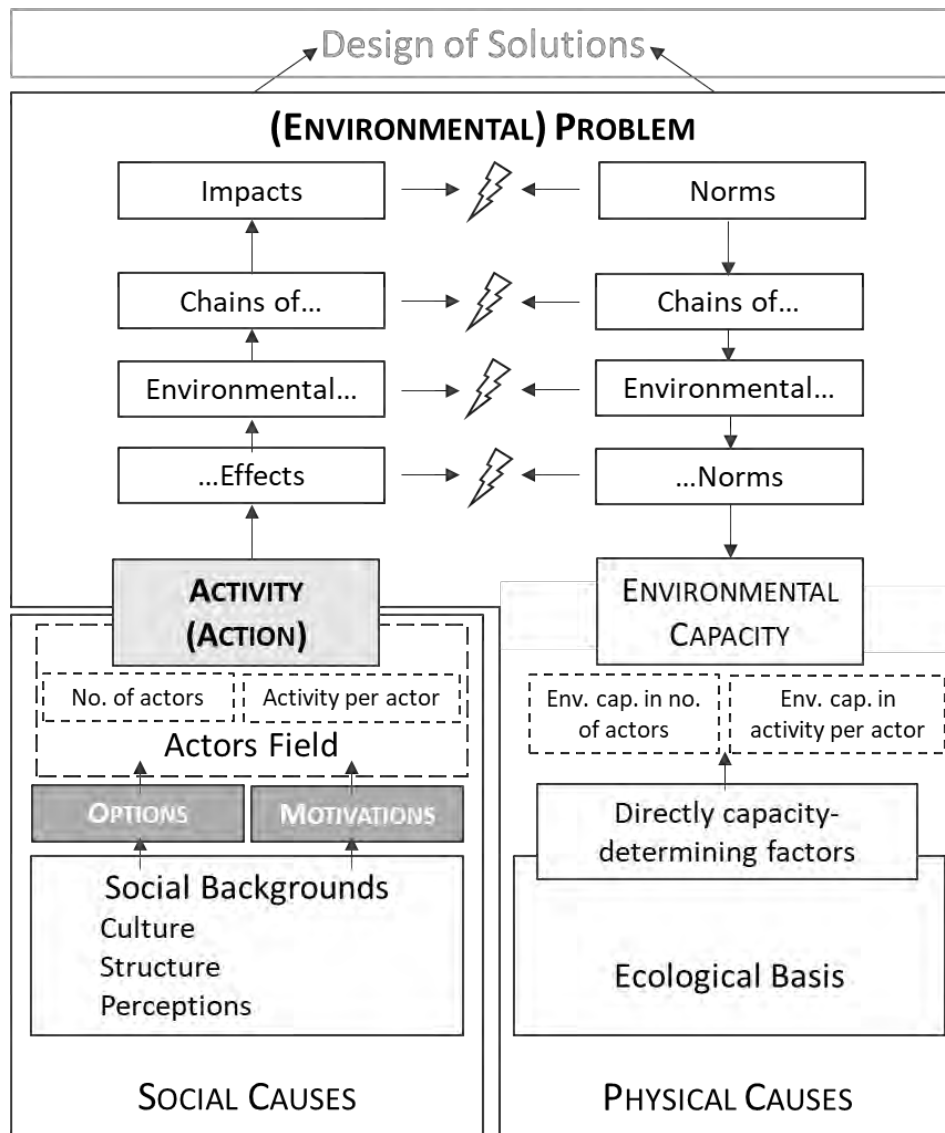
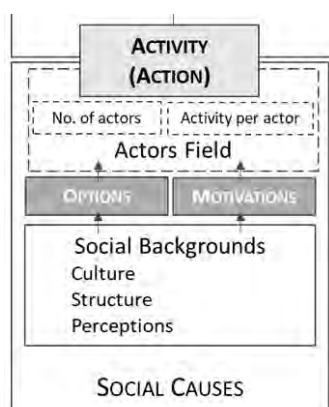


Figure 11 – Problem-in-context framework by DeGroot (1992). Own illustration, adapted from DE GROOT (1992, p. 158).

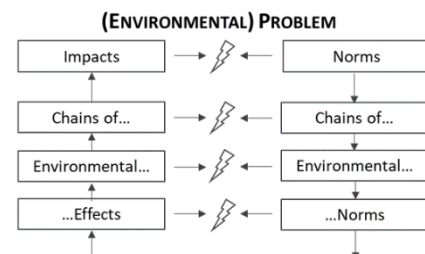


Beginning with the first component, the primary actors (decision-makers) who are influenced by secondary actors (e.g. relatives, neighbours, government, NGOs), can be further distinguished as actual (comprising the actors field) and potential actors (connected to the solution design). These properties may overlap and can have both beneficial and destructive roles (DE GROOT, 1992, p. 143). In this case study independent smallholders are the primary actors. Actors are broadly defined as “social entities that act [and] reflect and decide upon what to do” (ibid., p. 142). More precisely, individuals or collective entities decide on a basis that is assembled by the actor’s environment. Options and motivations are embedded in a social background and are formed

by the actor's environment. Influencing factors are for instance markets, power relations, technology and innovation, knowledge and world views (ibid.). The social background is not necessary a system shaped by its boundaries. (BOONS AND MENDOZA, 2010) argue that the local context in which producers and consumers operate considerably influences activities. Not solely being shaped by the international governance structure, global and national system boundaries do not exert major influence, but the micro-scale environment does. (O'TOOLE et al., 2006) refer to this as local indicators and emphasise that these may not be in line with national or global indicators.

An activity or action is everything actors do to the environment, from small-scale phenomena that result in bigger-scale activities, while complex systems are comprised of singular elements. The dose and effect relation is key to determining the magnitude of an (environmental) problem (DE GROOT, 1992, p. 151). Problems, in this case unsustainable oil palm cultivation, are often caused by a variety of actors that interact in complex manners (ibid., p. 143). This complexity makes mapping the actors field, constituted by linkages among actors, necessary (cf. fig. 7 and 11). The chains of norms and environmental effects imply why these actors carry out the "problematic activities". Before explaining the connection with options and motivations in this respect, the significance of social and physical causes is described.

The norms and effects chains (on the right) represent the various causes, effects and norms that occur within and beyond the (environmental) problem boundaries. This is why TSETSE AND GROOT (2009) vote for causal chains instead of system concepts and TSETSE (2008)

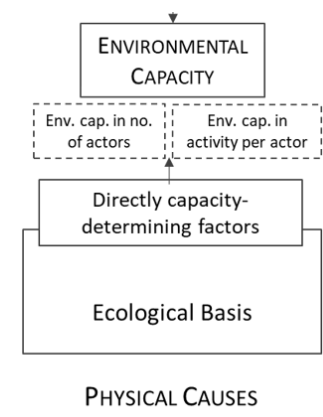


additionally points out that causal chains in fact do not have defined geographic or system boundaries. In PiC vertical arrows represent causality. Divergence on the effects-side and convergence on the norms-side are connected by fact/value discrepancies, indicated as problem flashes. The discrepancies between facts and values construct the (environmental) problem (DE GROOT, 1992, p. 152). A lack of reflection of these values and their normative context in decision-making does not only make problem solutions less successful but could also lead to conflict (MUHAR et al., 2017). The norms and effects chains could be complemented by material and non-material knowledge flows between actors. Products are distributed in one-way directions, while knowledge is exchanged both ways (OOSTERVEER, 2015).

When defining the (environmental) problem, as the second component of PiC, certain impacts (on the left) need to be considered. Impacts that do not need proof that they are good or bad (no further normative justification) are called final variables. These are impacts on health,

economy and ecology. More broadly, this is the intrinsic value of human life and the intrinsic value of nature, meaning the own right to exist, without having to contribute its functional values to humankind. Impacts on health can be further divided into health as such, and other wellbeing, both economic and cultural. Regarding the environment one can look at three levels: species, ecosystems and landscapes. This case study focuses on the landscape level and its transformation. Two factors are taken into account: diversity and naturalness (integrity and authenticity) (DE GROOT, 1992, p. 147). In addition to nature's intrinsic value, it provides functions for itself and humans, which can overlap and thus contribute to the "harmony and intensity of people-environment relations" (ibid., p.148), that are a crucial part of sustainability.

The environmental capacity is built from the environment (visualised in the lower right-hand corner of figure 11 for clarity in the visualisation, even though it appears in all components). Representing the fundamental, basic ecosystem characteristics. Every element in the problem block is determined by three types of factors: direct cause of norm, natural environmental properties, man-made environmental properties. The latter are in this research area oil palm and rubber plantations. The capacity is determined by the land use aim, objectives and allowable impact



(DE GROOT, 1992, p. 153). For instance, this could be transferred to the question of how many oil palm plantations can replace former land uses without causing irreversible environmental impacts. Another form of putting it is: How much money do people need to earn to sustain their livelihoods and how many oil palm plantations are needed for that? This is referred to as the minimum allowable income. The environmental carrying capacity is determined by certain factors and conditions. Fertilizer application is an example for human influence and soil type an example for the natural counterpart (ibid., p. 154). When applying fertilizer, the minimum input to sustain yields is typically given in developing countries, while the maximum input that prevents nitrate or phosphate pollution is typically the case in industrial countries (ibid., p. 155). Another differentiation is the capacity per number of actors, for instance deforestation/land degradation per oil palm farmer or the activity per actor. Companies appear as one actor but have a higher activity than an individual farmer. To sum up, the environmental capacity is the "allowable intensity of an activity (either by putting things into the environment, taking things out of it or directly changing the environment's structure), derived from norms in terms of sustainable health, other human well-being and intrinsic value of nature, and co-determined by human inputs and natural properties of the environment"

(ibid., p. 154). The same applies for human carrying capacity (how many people can sustainably live off the land) (ibid., p. 155). Functions and (non-intrinsic) values of the environment can be explained by the ecosystem service approach (MURADIAN et al., 2013).

The third component, the perception of the (environmental) problem by a normative observer and by the actors themselves is the focus of the following chapter.

2.2 Perceptions of sustainability-changing the perspective

“The power for change came from within, from deeply held values that had in some way been questioned or challenged” (POYNTON, 2015, p. 38).

Human-nature relationships are reflected in the PiC-framework as an overlap of the social-cultural system (society) and the bio-physical system (nature), as described in MUHAR et al. (2017)'s framework of interaction between social and natural systems.

Human-nature relationships are intertwined with general social-cultural concepts, such as beliefs, worldviews, attitudes as well as norms and values. On these grounds, visions of nature, concepts of identity and connectedness to nature come into existence. Their expression, reflection and degree are articulated in different manners, dependent on the level of society (from individual to the global community), and are not without difficulties detected (MUHAR et al., 2017).

Apart from widely used concepts of the human-nature relationship such as place attachment or connectedness to nature, the most applicable way to sketch perceptions of sustainability is given by visions of nature (MUHAR et al., 2017). The following table 4 gives an overview of these human-nature relationships which can be pluralistic, as compiled by YOSHIDA et al. (2017, p. 2). Allocating one of the below mentioned types to the actors in the field will allow drawing conclusions on their perceptions of nature, their environment or even sustainability.

Table 4 – Human-nature relationships. Adapted from YOSHIDA et al. (2017, p. 2)

Master	Steward	Partner	Participant	User
“sees humans as standing above and opposed to nature with the right to utilize and control nature for human benefit”	“similar to master in perceiving humans as separate from and hierarchically above nature, but emphasizes a responsibility to care for nature”	“equal to nature in power and importance and holds a collaborative relationship of mutual betterment”	“holds a sense of spiritual oneness with nature and considers him/herself part of and subordinate to nature”	“is based on an understanding of nature as a provider of services or benefits for human well-being”

Two levels of analysis exist. The objective/empirical and the subjective/normative. In order to explain a normative problem, a shift to the actors' perspective through empirical analysis becomes inevitable.

Perceptions are broadly defined as “how things appear to a participant in the scene [...] and how they appear to an observer” (ALASUUTARI et al., 2008, p. 215). Generally, perceptions are twofold: On the one hand, how the world is perceived to be (facts) and on the other hand how it is perceived it should be (values) (DE GROOT, 1992, p. 88). DE GROOT (1992, p. 82) attributes the normative perspective to an observer who identifies what is problematic against the background of the values he or she holds and reviews these with criteria in mind such as “efficiency, equity and sustainability”. Nonetheless “actors will continue to act through their own value perspective” (ibid., p. 88). Values reflect a person's sense of right and wrong or what 'ought to be', deeply rooted in experiences and encounters in their social and cultural setting and often definite and hard to change (O'TOOLE et al., 2006).

An actor is limited by his/her options and has certain motivations behind his actions. For example, financial or environmental resources limit a farmer in its ability to generate harvest. Regarding the three dimensions of sustainability certain trade-offs between the spheres lead to limited options for sustainable development. If economic viability is weak, the farmer will unlikely spend his income on environmental protection measures, but also would not profit from environmental protection in the long run. Motivations to act in a certain way are intertwined with values the farmer holds.

According to BOONS AND MENDOZA (2010) sustainability values are neither independently given nor objectively defined. Indicators of sustainability, expressed through standards and certification schemes, aim at objectivity but they are always connected with certain values in three ways:

1. the criteria chosen to measure the indicators
2. the methodology used to gather the data
3. the assumptions underlying the methodology (e.g. economic vs social vs environmental) (O'TOOLE et al., 2006).

Either through the eyes of a normative observer or the actor itself, a problem can be perceived in an entirely different form. Some perceptions, however, can be shared from both perspectives. Transferring this to the case of oil palm cultivation and palm oil production, this case study anticipates that sustainability and its criteria are defined by multiple actors, predominately from the buyers' side. Uncovering prevalent definitions of sustainability, the actors' surroundings that these perceptions derive from, is of high interest. The reconstruction of relevant actors and their interrelations give insight into their options, motivations and consequently, how they perceive sustainability.

KUMAR AND RAHMAN (2015) looked at the entire supply chain from the buyers' perspective and found the buyer-supplier relationship to be an important factor in sustainability adoption. Depending on the supplier's capacities and capabilities, the buyer may need to support the supplier in its efforts to contribute to sustainability. Such mechanisms are already in place for palm oil sustainability certification with the Green Palm certificate. (BOONS AND MENDOZA, 2010) argue that the focus on asymmetries of power and control over production processes and financial rewards along the supply chain have led to uncertainties about how actors shape shared values, such as criteria for sustainability. O'TOOLE et al. (2006) even go a step further by saying that development policies will not contribute to sustainability unless indicators are used that match public perceptions and values on the supplier side. They come to the conclusion that values and geography are intertwined in multiple ways, leading to various sustainability discourses that influence policy debate (ibid.). Values and attitudes towards sustainability are subject to change and a complex triangle of the social, ecological and economic dimensions.

Wrapping up, sustainability as a concept is a social construct of perceptions behind it. Sustainability criteria are established under a western worldview and seek to impose standards on local producers in predominantly developing countries (BOONS AND MENDOZA, 2010; GEIBLER, 2013). Similar to what MANNING et al. (2012) have found evident in the coffee industry, sustainability standards in the palm oil industry are being established by certain stakeholder constellations (e.g. development agencies, NGO) of non-state actors in consuming countries.

Certain criteria are valued differently depending on place and time (O'TOOLE et al., 2006). These questions of scale are addressed in the following chapter.

2.3 Questions of scale

Power and scales

“The current discourse on scale is part of an effort to make sense of the asymmetries, conflicts and confrontations of the globalising world” (PAASI, 2004, p. 536). The predominant producer countries of palm oil are in far distance from those nations consuming the majority of palm oil and its products. The globalization of supply chains has dissociated producer and consumer interests and perceptions of sustainability, while externalities are shifted from consumer to producer countries (BOONS AND MENDOZA, 2010). In this matter, FRIIS AND NIELSEN (2017, p. 2) have contributed to the ‘telecoupling’ research, which looks at these “cross-scalar, networked, and complex socioeconomic and environmental interactions between [...] distant [...] coupled human-environment systems”. The differentiated allocation of costs and benefits among actors is not sufficiently dealt with when assuming that systems are spatially discrete places. Spatiotemporal scales between social and ecological processes are often mismatched due to complexity (ibid.). HEIN (2016) explains uneven access to natural resources by power asymmetries. Political ecologists “frame power as a capacity and as based on material resources, e.g. as the ability of certain actors to accomplish certain activities” and “scales are spatial manifestations of power” (ibid., p. 26).

Geographical scale

While land as a resource is always location-bound (FRIIS AND NIELSEN, 2017), the actors influencing it appear in various contexts (MANNING et al., 2012). Concepts of sustainability are not applicable to the same extent across the globe. According to O'TOOLE et al. (2006) spatial scale is particularly challenging appropriate sustainability indicators. Palm oil value chains link countries on a global scale (BOONS AND MENDOZA, 2010), while an actor’s scope of action leads to different interpretation and impacts on local, regional and global level. MANNING et al. (2012, p. 197) state that “national economic and institutional conditions [have been] catalysts for the entire global sustainability movement”.

Value chains

As a typical example for the globalisation trend in the agro-food sector (OOSTERVEER, 2015), palm oil production presents global commodity chains that link local, often small-scale, production to transnational governance. Global agro-food networks are increasingly substituting supply systems with clear geographic boundaries, according to OOSTERVEER. Basically, two types of commodity chains exist: producer driven product chains and buyer driven product chains, while palm oil belongs to the latter (ibid.). Led by large retailers, decentralized production networks in developing countries, authority and power relations

between actors determine the allocation and flow of financial, material and human resources along the chain (BOONS AND MENDOZA, 2010).

Impacts on sustainability occur on all stages of these value chains. Another question of scope and scale is which of these stages are taken into account in an assessment. This case study only looks at a fragment of the palm oil value chain (cf. actors field in fig. 7).

Time scale

In many societies of the global south subsistence and maintaining livelihoods is of main concern. The concept of sustainability adds the time sphere. DE GROOT (1992, p. 148) gives an example: incomes should not only be sufficient today, but also not be jeopardized by slow processes such as erosion of fertile land in the future. In terms of temporal scale, when talking about sustainability, it must be clear whether the scope is one productive cycle, a year, a lifetime or even intergenerational.

Sustainability as a goal has been subject to change over time. As a reflection of an individual's socioeconomic environment, values and priorities are formed. O'TOOLE et al. (2006) speak of a time lag, when saying that values which guide an individual across a lifetime have often been coined in early adulthood. One could assume that times of economic decline lead to materialist values, while prosperity promotes post-materialist values. In fact, the abundance of wealth and resources has been found to encourage environmentally friendly behaviour patterns, minimalism and a devotion to a rather ecological than economic lifestyle (ibid.). The latter is not disregarded though. In times of economic stability, like the situation is in most industrialised countries, priorities have been resorted and societies are enabled to concentrate on ecological and social goals, while in many emerging countries, the urge to prosper and develop materialistically is more distinct or the economic situation does not allow non-materialistic views. In the long term however, a sustainable activity should benefit an individual in all dimensions.

Criteria for sustainability are in the same way as perceptions of sustainability not evenly agreed upon around the globe. One example that is judged differently on both spatial and temporal scales is named by BOONS AND MENDOZA (2010) as child labour. While it was accepted in the 19th century in Europe, it is frowned upon today, but at the same time in several developing countries family labour is still a common practice.

3 Methods

This thesis is a study of sustainability perceptions and performance of oil palm smallholders in Jambi Province, Indonesia. Empirical data collection took place during a six-week research. Qualitative methods with semi-structured interviews about perceptions and a guideline-oriented sustainability performance assessment were applied. The objective of this thesis is to fill the existing knowledge gap in assessing the sustainability of palm oil production in the light of existing certification initiatives such as the RSPO and providing reliable empirical information at local level (BAUDOIN et al., 2015).

Multiple tools have been found useful to approach this objective (ACOSTA-MICHLIK et al., 2011; RASMUSSEN et al., 2017), including life-cycle assessment (BAUDOIN et al., 2015; MANIK et al., 2013), natural and human capital accounting (RAYNAUD et al., 2016) and an ecosystem services approach (MURADIAN et al., 2013).

Exploring the research question was guided by three hypotheses, put forward in chapter 1.3. Apart from the guideline-oriented sustainability assessment, interviews and discussions focused on questions about changes, challenges, options, motivations, and values in the surroundings of oil palm smallholders. The methods used are described in the following chapters.

The three stages of the case study are outlined in the figure below (cf. fig. 12).

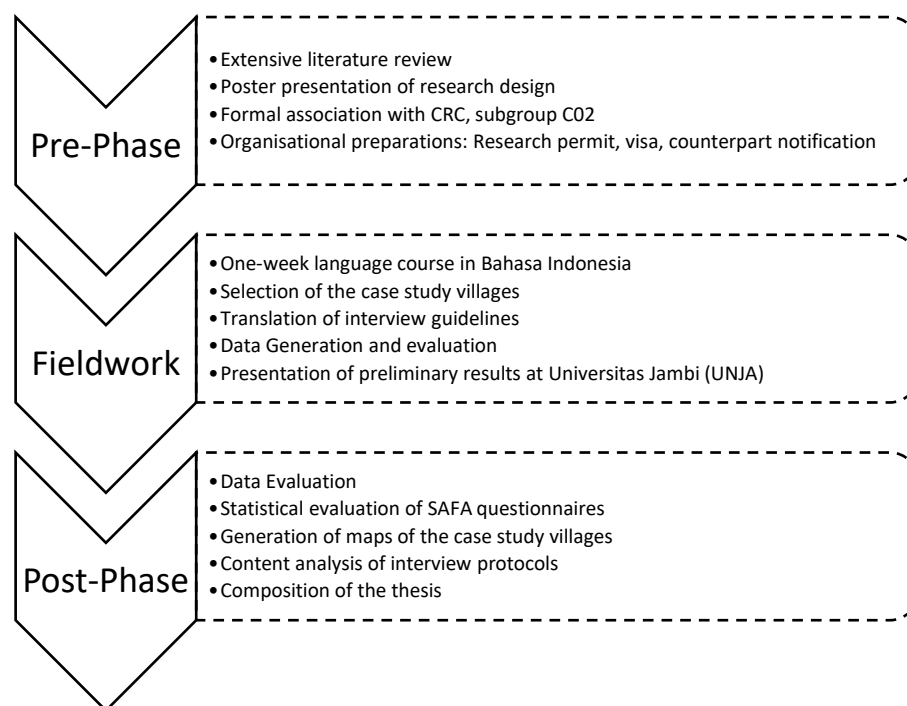


Figure 12 – Research design and case study phases. Own illustration.

In the pre-phase an extensive literature review was performed using the databases Google Scholar, Web of Science, and the publications website of the CRC 990 (2017).

The formal association with the CRC as a prerequisite for this case study went along with several organisational preparations, such as the application for a research permit and visa as well as establishing contacts with the counterparts of the C02 subgroup and the research assistant.

The fieldwork and post-phase are described in the following chapters.

3.1 Case Study Area

On Sumatra, Jambi Province, an agricultural frontier expansion area, is located in the centre of the island, on the east coast, stretching over an area of 50160 km². The western part of the province is characterized by the Barisan mountain range, whereas Jambi city and its surroundings are part of a lowland region. Apart from a relatively dry season from July to September (precipitation often below 120 mm/month), the climate is tropical humid with around 2235 mm annual rainfall and average temperatures around 27 degrees Celsius (DRESCHER et al., 2016; MERTEN et al., 2016). The long history of exploitation of Jambi's rainforests due to traditional agroforestry and the extraction of timber and other forest products has continued during colonial times, when rubber was first cultivated and since the mid-1960s, when agro-industrial plantations of oil palm were established. As of 2014, more than 590,000 ha mono-culture oil palm is planted in Jambi, resulting in a continuous decrease of rainforest cover (DRESCHER et al., 2016). Between 1985 and 2007, 1.7 million ha forest were cleared, which is an estimated 71% of the forest area in 1985 (LAUMONIER et al., 2010). In 2013, only 30% of the land in Jambi Province was rainforest, predominantly in the highlands and 55% was agricultural land (DRESCHER et al., 2016). In addition to rainforest exploitation and logging, population growth, migration patterns and governmental transmigration schemes put pressure on remaining forest areas. DRESCHER et al. identified private and public investment, federal development schemes and the national policy of resource exploitation as the main drivers of land use change in Jambi. These factors are catalysed by an increasing international demand for cash crops such as rubber or oil palm.

On the basis of other researchers' experiences and recommendations and with the help of the Indonesian counterparts at UNJA, the case study area, consisting of three villages in Jambi Province was selected. The three villages belong to three different regencies: Sungai Rotan is in Merlung regency, Mekar Jaya is in Merangin regency and Gurun Mudo lies within Sarolangun

regency. The first village was within three hours driving distance from Jambi city (approximately 150 km), the second was six hours away by car (300 km) and reaching the third village took around four hours (150 km). In each village, six days were spent for data collection. In the map below (cf. fig. 13), Jambi city and the three case study villages are shown. Dark green areas represent primary forest areas, mainly in the highlands around the volcanoes Kerinci and Masurai in the west and the Berbak national park in the east. Secondary forests, shown in light green can be found in the Bukit Tiga Puluh national park in the north and the Bukit Duabelas region in central Jambi Province, as well as in the Harapan rainforest in the south. Industrial timber plantations, in yellow-green, are mostly found in the north-east. Oil palm plantations as of 2017 are visualised in pink, with company concessions in red hachures. Other land use forms are left in white. The GIS maps were generated in the post-phase of the research process and the data was derived from various sources indicated in the map.

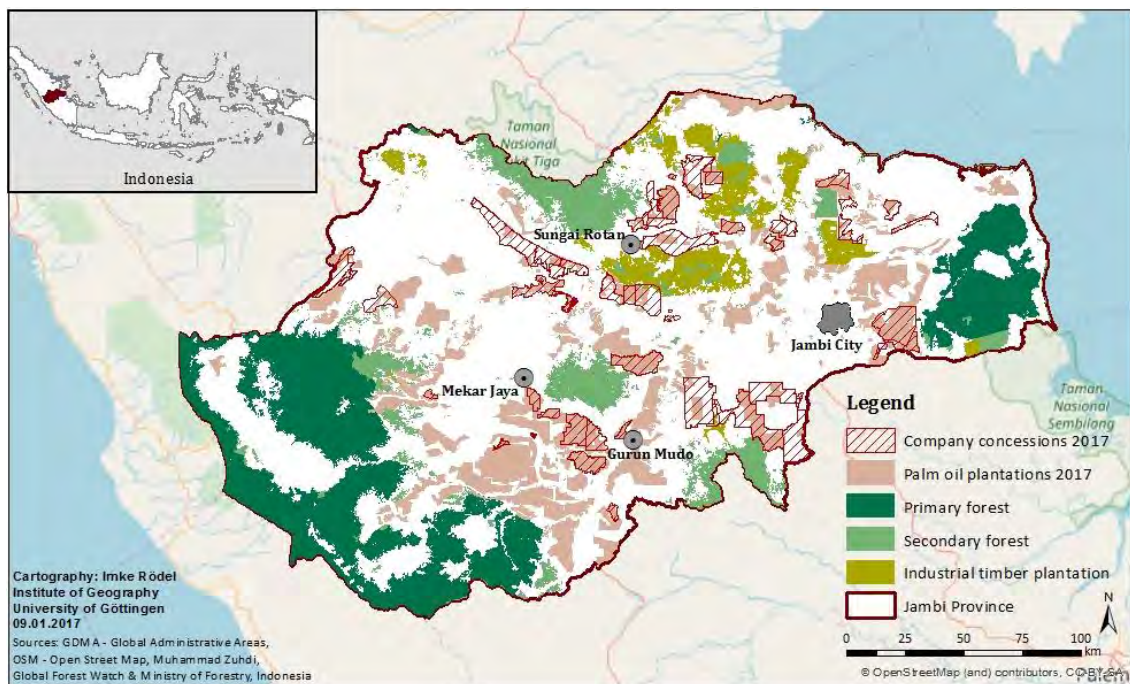


Figure 13 – Localisation of the three research villages in Jambi Province, Sumatra, Indonesia. Own illustration.

With the help of interviews with the village heads (*kepala desa, kades*) and the evaluation of the village profiles (*profil desa*), made available by them, an overview of the three villages (cf. table 5) can be given in the following. The village profile documents (DESA GURUN MUDO, 2015; DESA MEKAR JAYA, 2014; DESA SUNGAI ROTAN, 2015) were evaluated in the post-phase of the research process, translated by the research assistant.

Sungai Rotan

In 1945, the conversion of forest into jungle rubber started in Sungai Rotan, which is located close to the Bukit Tiga Puluh national park. Oil palm cultivation was introduced by companies in 1990, followed by smallholders in 2000. The original forest disappeared in 2010 according to villagers (#6; #8). Today, 779 people live in the village



Figure 14 – River Sungai Pengabuan in Sungai Rotan. Woman washing clothes in the background. Photo taken by the author (2017).

on a settlement area of 168 ha with 1237 ha of plantations. Interviewed farmers cultivate an average plantation size of six ha. Apart from farmers, people work as daily workers, traders, or civil servants. The community, which is mostly local or comes from other parts of Sumatra, has listed some key aspects as problematic in the village:

Regarding infrastructure, some streets are regularly flooded or broken, electricity is not ensured everywhere in Sungai Rotan and some buildings still need to be established or repaired, such as the local high school, the school's mosque and houses for teachers. The provision of oil palm seeds, subsidised fertilizer, organic fertilizer, as well as livestock breeding is recognized as problematic by the village government (cf. table 5) (DESA SUNGAI ROTAN, 2015). The village name Sungai Rotan means rattan river. Rattan was a non-timber forest product, used by villagers before agriculture expanded to the village. The river Pengabuan used to be the primary means of transportation and village life as well as settlements evolved around the river.

Mekar Jaya

Mekar Jaya is a transmigration settlement, also called *SPG* that stretches over an area of 1600 ha and is comprised of 625 households of which 47 are indigenous (DESA MEKAR JAYA, 2014). Transmigrants were settled there from East-Java. In the course of the transmigration program some key areas were designated by the government: Lahan usaha= LU1 for food crops and LU2 for plantations (#10). The majority of the villagers is Muslim with only two Christian households, who are newcomers from Medan (#13). Oil palm was introduced in 1990 and smallholders started cultivating it in the 2000s, when traders appeared (#13). The farmer group in Mekar Jaya, called *Tanjung Sehati*, was established in 2009 and counts 214 members (#14). Of the total plantation area of about 1353 ha (ibid.), interviewed smallholders own three

ha on average. Other than as farmers, people work in the service sector, as traders or in home-industry (cf. table 5) (ibid.). The village government does not provide a list of problems in the village profile.

Gurun Mudo

In the Bukit Duabelas region the village of Gurun Mudo was established in 1957. Of the 2248 inhabitants, most people are native and all of them are Muslims. The plantations, which cover



Figure 15 – Brick manufacturing in Gurun Mudo. Photo taken by the author (2017).

75% of the total area of 3300 ha are divided into approximately 60% rubber and 40% oil palm. Interviewed farmers cultivate seven ha on average (DESA GURUN MUDO, 2015). The smallholders in Gurun Mudo are independent, former plasma schemes have expired. However, the majority of the plantation area in the village is owned and maintained by a company (#17).

There are brick manufacturers operating near the village. The village government classifies several aspects as problematic, such as human resources for the village administration, infrastructure and technology, especially for farming purposes, lack of opportunities for the food processing industry, lack of capital for business development and poor village organisation. The location on the highway (*Jalan Sarolangun - Muara Tembesi*) brings about negative influences from outside the village according to the village profile (cf. table 5) (DESA GURUN MUDO, 2015).

Infrastructure, technology and access

All villages have primary and junior high schools, as well as mosques. Educational and economic level of villagers were quite diverse, dependent on plantation property and origin. Households usually have one or more motorbikes, but only very few own a car. Roads in Sungai Rotan have heavily-destroyed asphalt, whereas Mekar Jaya's roads are all gravel roads and Gurun Mudo's settlement is crossed by a well-paved highway.



Figure 16 – Kindergarten in Gurun Mudo. Photo taken by the author (2017).



Figure 17 - Houses in the research villages. Top: Gurun Mudo, bottom: Sungai Rotan. Photos taken by the author (2017).

Typical housing are brick houses or a few remaining wooden stilt houses. Most households have access to electricity for lighting, TVs and charging of mobile phones. Gas and fire wood are usually used for cooking. Water provision is secured by wells in Mekar Jaya and Gurun Mudo, whereas in Sungai Rotan people source their water from the nearby river.



Figure 18 – Local food market near Sungai Rotan. A woman buying bananas and jengkol. Photo taken by the author (2017).

Markets for food and daily needs are between a few minutes (in Gurun Mudo) to more than half an hour away (in Sungai Rotan) by motorbike and open once or twice a week. Community healthcare centres, *Puskesmas*, are within reach of villagers. These centres are usually operated by a nurse, with no doctor present and medical equipment and medicines are very limited. Many people believe in natural healing, offered by village healers. All interviewed farmers in the villages, are independent oil palm smallholders, while some of them also cultivate rubber or grow vegetables for personal use. Most people bought or inherited the land from their parents or were allocated land by the government in Mekar Jaya. Some farmers cleared forest land to establish plantations.

Table 5 – Main characteristics of the case study villages. Own illustration, information from village profiles (DESA GURUN MUDO, 2015; DESA MEKAR JAYA, 2014; DESA SUNGAI ROTAN, 2015), translation by Amrina.

Indicator	Sungai Rotan	Mekar Jaya	Gurun Mudo
Total Area (ha)	1365	1603	3300
Settlement Area (ha)	168	123.16	122
Plantation Area (ha)	1237	1352.68	2475
Average plantation size of interviewees (ha)	6.03	3.24	6.83
Population	779	2272 (625 households)	2248
Gender (m/f)	386/395	1174/1098	1245/1033
Employment structure (no.)	Farmer (453), daily worker (111), trader (45), civil servant (36)	Farmer (n/a), service sector (43) trader (35), home industry (13)	n/a
People's origin	Locals and migrants from Sumatra	Transmigrants from East-Java	Locals
Problems recognized by village government	<ul style="list-style-type: none"> — No village discussion forum — Flooding area on the streets — Broken street around society settlement — Electricity — Security establishment — Cows breeding — Providing oil palm seeds — Providing subsidized fertilizers — Poultry breeding — Providing organic fertilizer — High school building establishment — School mosque establishment — Teachers' housing establishment — Teachers' salary payment — School fence — Tailoring training 	n/a	<ul style="list-style-type: none"> — Society is not eager to participate in discussions — Human resources for village administration — Technology, i.e. farming technology — Infrastructure (no tarred streets) — Lack of facilities for plantation farming, education, healthcare, sports, youth activities — Food processing: no support from the government for packaging and marketing — Location near the highway, negative influence from outside the village — Poor village organisation — Lack of capital for business development

3.2 Empirical data generation

Empirical data collection was conducted during a six-week research stay (2nd phase of the research process) in Jambi Province, Sumatra, following a one-week language course in Bahasa Indonesia in Yogyakarta, Java.

Set in a particular physical and sociocultural context, this thesis can be described as a case study (MAYRING, 2002, p. 42 f.). According to ALASUUTARI et al. (2008, p. 218) three data collection methods are usually applied in case-based research: “observation, interview, and the review and analysis of site-generated or -related documents”.

The methodology applied in this case study followed a twofold approach. On the one hand, qualitative data was generated through semi-structured problem-centred interviews and focus group discussions with smallholders in the case study villages, as well as expert interviews with government officials from Dinas Perkebunan in Jambi (province level) and Sarolangun (regency level) and representatives of local NGOs (namely Setara⁹ and Warsi¹⁰).

Founded in 2006, the NGO Setara is based in Jambi and assisted in resolving land conflicts and cultural conflicts at first and extended their work to capacity building and smallholder empowerment. Today, they help rural villages that lack market access and governmental support and are located far from information flows, in forming farmer groups and guiding them in the RSPO and ISPO certification process (#2; #24). Setara is funded by the German organisation Miserior and Dutch supporters, such as Solidaridad (#24).

The NGO Warsi, established in 1991, initiated its work in 1997 by a two-year study on the socio-economic and cultural life of indigenous people, Orang Rimba, in Jambi Province. Today its work is focused on community empowerment and participation, as well as natural resource management in the four provinces West Sumatra, Jambi, Bengkulu, and South Sumatra (#9).

On the other hand, the standardised Sustainability Assessment of Food and Agriculture Systems (SAFA) framework for a sustainability assessment of smallholders was used. Additionally, participant observation and site-related document analysis contributed to data generation. In total, 27 data sets were generated, which consist of three focus group discussions, ten SAFA questionnaires, six open interviews with NGOs and governmental institutions, six open interviews with smallholder farmers and two site visits of a fertilizer storage and a protected river.

⁹ Setara Jambi. More information: <http://www.setarajambi.org/>

¹⁰ Conservation Community Indonesia, Warsi. More information: <http://www.warsi.or.id/eng/>

First described by GLASER AND STRAUSS in 1967, the practice of “continuous comparison of incoming data with emerging interpretation” (ALASUUTARI et al., 2008, p. 218), facilitating inductive concept and theory building (MAYRING, 2002, p. 103 f.), is referred to as grounded theory. This theory was followed by the researcher when attempting to build theories upon the case study findings. As described in the conceptual framework, the AiC approach was applied in this case study. Rather than finding confirmation and explanation for a priori theory or hypothesis, the researcher remained opportunistic and flexible, which shaped the following foci of interviews and their interpretation. This practice resulted in a simultaneous data generation and evaluation (ibid., p. 103 f.) (cf. fig. 19).

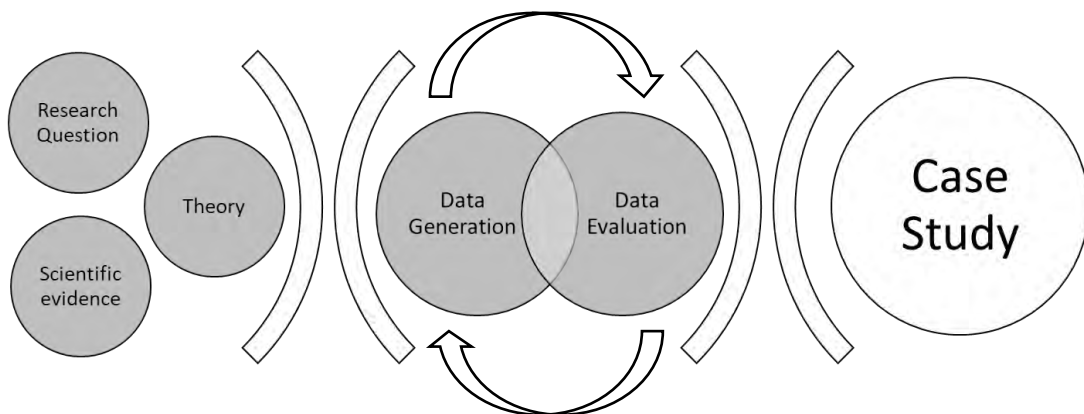


Figure 19 – Case study development and research phases under grounded theory application. Own illustration.

3.2.1 Semi-structured problem-centred interviews

For the most part, interviews were of problem-centred character. Semi-structured interviews allow “probative follow-up question and exploration of topics unanticipated by the interviewer [providing] subtle understanding of what happens in the case and why” (ALASUUTARI et al., 2008, p. 218). Where guidelines were not sufficient and even less standardised, a narrative approach was followed. The latter was for example applied in expert interviews with NGOs or government officials.

In line with MAYRING’s (2002, 67 f.) recommendations for these types of interviews, questions were formulated as open and non-biased as possible. Allowing for spontaneous adaptation, the number of questions, their order or focus could be altered. The open interviews contemplated the standardised assessment in ten cases.

The interview guidelines were formulated in stage 1 of the research process. In stage 2, guidelines were translated and explained in detail to the research assistant. This step was of high importance to sort out misunderstandings and clarify the aim of the questions, since it was the assistant’s task to ask the questions in the field.

Interviewees were selected by a method called snowball sampling. For instance, the sampling started with the host in the village and continued with his/her relatives, friends, or colleagues. From there, the sampling continued within their social surroundings and so on.

The length of interviews varied from 30 minutes to one and a half hours. The interviews setting ranged from formal character, in the office of government officials, to, most commonly, an informal atmosphere, in people's homes.

Mostly, male participants were interviewed, even though women were encouraged to participate. Often a larger group of people, for instance the entire household, neighbours, or friends joined the interviews.



Figure 20 – Interview on an oil palm plantation in Mekar Jaya during harvest. Photo taken by the author (2017).

During interviews, simultaneous translation was not always possible, since interview partner often had a limited time frame or translations would have interrupted the flow of the interview. In order to ask appropriate follow-up questions only key passages were translated by the research assistant. Upon completion of the interview, the notes of the research

assistant were the basis for extensive translations from Bahasa Indonesia to English. No transcription of the recordings was conducted, but tapes were kept by the assistant, to enable later interpretations and a few word-by-word translations in stage 3 of the research process. If, in the following chapters, direct quotations of the interviews are provided, it should be noted that these translations reflect the statements from the interviewees as correctly as possible but are not literally transcriptions.

The interview guidelines can be found in appendix II. The interviews had three foci: Apart from the farmer's background and income, the perception of human-nature balance, services, changes and challenges and thirdly, impacts of certification were enquired.

3.2.2 Focus group discussions

Since many opinions and attitudes are interconnected with social relations, a focus group discussion is a suitable tool to detect these tendencies in familiar social situations. One benefit of this approach is the momentum that is reached during a sometimes heated discussion. Participants tend to articulate ideas and insights that would be kept in one-on-one interviews

due to a formal atmosphere (MAYRING, 2002, p. 76 f.). The security and comfortability of being part of a group let certain barriers vanish and often result in honest statements. This dynamic might also entail difficulties such as the establishment of collective ideas. In this scenario, individual opinions might be discussed and reflected to such an extent that participants back off from their original opinion eventually.

After formulating a research question and forming a suitable group for the discussion, MAYRING (2002, p. 79) proposes the following approach for a group discussion led by a researcher:

- 1) Provocative introduction by the researcher
- 2) Minimal invasion by the researcher in the following discussion
- 3) Interposition of additional debatable arguments by the researcher
- 4) Metadiscussion reflecting on the discussion itself

In addition to the recording of the focus group discussion, taking note of gestures and facial expressions is recommended by MAYRING (2002, p. 78). Therefore, the focus group discussions were filmed by the researcher.

In total, three focus group discussions, one within each case study village, were held. The participants were stakeholders in the local oil palm cultivation network. Topics of the discussion, introduced by the researcher were, as in the individual interviews, changes in the smallholders'



Figure 21 – Focus group discussion in Mekar Jaya. Photo taken by the author (2017).

livelihood, community, and landscape, as well as challenges faced, and additionally values, services and benefits derived from nature. In every discussion a different focus evolved from the input by the participants and follow-up questions were adjusted accordingly. The focus group discussions had a duration from 25 minutes up to 50 minutes.

In Sungai Rotan six farmers took part. These men were selected by the farmer, the researcher stayed with. In Mekar Jaya the discussion was part of a meeting of the farmer group. In addition to ten male farmers, one female participant from the farmer group administration, as well as the counterpart researcher, Ibu Rosyani, and a student of hers were present. In Gurun Mudo twelve male farmers joined the focus group discussion, selected by the village head.

3.2.3 SAFA-Framework

The sustainability assessment of food and agriculture systems (SAFA), developed by the FAO, is a holistic global framework functioning as a sustainability assessment along crop, livestock, fisheries and forestry value chains. Targeting at four dimensions of sustainability, both ex-ante assessments to inform decision-making, as well as ex-post monitoring of impacts and progress is possible through SAFA (FAO, 2018). The overall SAFA guidelines were further expanded in its applicability for small-scale producers in 2015. Indicators that are both relevant and practical, and an online-accessible application were developed upon request by practitioners of the SAFA guidelines. Against the backdrop of insufficient time, capacity, data and knowledge, and the irrelevance of some large-scale indicators, the overall SAFA guidelines were condensed from 116 to 44 indicators to serve as a measurement tool of the most critical aspects of smallholders' sustainability (FAO, 2015). The application was tested with over 439 subsistence, semi-commercial and commercial farmers in Colombia and Kenya across various different commodities, such as coffee, chocolate, beef, soy, and maize (FAO, 2018). So far, the framework has been utilized in Indonesia, but not yet in the context of oil palm production systems, but in beef cattle systems (GAYATRI, 2016).

With the help of the SAFA Smallholders App (version 2.0.0), a mobile open-source software, explicitly designed to conduct interviews in the field or to be used by small-scale farmers as a self-assessment tool, the results of the questionnaires were documented by the researcher. The app aims at facilitating self-improvement and capacity building, by pointing out hotspots, need for improvement and good performance and collecting, evaluating and share data via a feedback mechanism. Methodological guidance is provided by a manual from the FAO (2015). The key points are described in the following.

In total, the questionnaire (cf. appendix IV) is comprised of 100 multiple and single choice questions, with a focus on the four dimensions good governance, environmental integrity, economic resilience and social well-being. Divided into 21 themes, 44 indicators are targeted in the assessment. As opposed to the SAFA guideline and tool as being performance-based, the smallholder app is rather knowledge-oriented. For example, the indicator profitability is concerned about how much smallholders know about their revenues and savings and how far they can trace the product chain upwards (FAO, 2015). Some questions are designed as trigger questions to ask whether an indicator is applicable to the farmer. These questions are not rated (neutral). If this is the case, non-relevant questions will be skipped throughout the application. One example is animal welfare. Interviewed smallholders in this case study do not participate in animal husbandry but only keep small numbers of chicken or cows for domestic

use. Thus, all questions regarding animal welfare were skipped. Whenever necessary, hints and explanations to the questions were given but preferably without attaching values to the options.

Which question is attributed to which indicator and theme, can be looked up in appendix III. A more detailed explanation of the themes can be found there, too.

3.2.4 Participant observation

A standard method in empirical research is participant observation. The observant takes an integrated role in the social context of the research (MAYRING, 2002, p. 80 ff.). Data collection happened simultaneously with everyday life in the case study villages. The great proximity to



Figure 22 – Breakfast at the canteen in front of the host's house in Sungai Rotan. Photo taken by the author (2017).

the village communities, staying with families and practicing routines and rituals with them, enabled flexible, in no way standardised, gathering of information. One experience of the researcher was that people tend to open up in a rather off-the-record-environment. For example, issues of the community life were often discussed during meals. One advantage of the family stay in the first village was that

the canteen, operated by the wife of the host, offered an extensive platform for discussion, meetings and introducing the researcher to other community members. This catalysed the snowball sampling in the way that people were aware of the researcher and got to know her on a casual basis.

3.3 Data evaluation

The third phase of the research process was dedicated to data analysis and evaluation. Generally, data recording was conducted through note-keeping and audio/video recording of all interviews, site visits and focus group discussions. Photos as record keeping during observation proved to be suitable. Raw notes were elaborated in protocols that do not only cover interviewees expressions, but also setting, location, date, time, and external factors. Data evaluation was achieved by translation and cross-checking of the interview protocols in collaboration with the research assistant. The interview and focus group discussion (GD) protocols were anonymised and chronologically numbered #1-24 and GD #1-3 respectively. The content was then scanned and coded for certain key words and categories.

As a method to source appropriate data (ALASUUTARI et al., 2008, p. 480; MAYRING, 2002, p. 46 f.) site-related documents, such as the village profiles, derived from the village officials, were evaluated in order to give a description of the case study area. Information on demographics, employment and village history and development were collected (DESA GURUN MUDO, 2015; DESA MEKAR JAYA, 2014; DESA SUNGAI ROTAN, 2015).

The evaluation of the SAFA questionnaires was conducted using Microsoft Excel because the online application (app) only generates histograms, while polygons (cf. fig. 23) are the output of the overall SAFA tool, which are normally not applicable for small-scale indicators. The SAFA manual for the smallholder app suggested three thresholds with a maximum of three points attainable. In accordance with the polygon view of the overall SAFA guidelines, the five-threshold shading was applied: good (dark green and green, >3), limited (yellow and orange, 1-3), and unacceptable (red, <1). The centre indicates that a particular theme is not applicable for a data set. Detailed results can be found in appendix V.

The majority of questions have the same weight of "1". However, a few questions are rated with a "2", according to their higher impact on sustainability. This logic applies for questions no. 9, 10, 49, 53 and 59. In many cases several questions point to a single indicator, and several indicators are merged to one theme. At the theme level, the results for the indicators are aggregated in a way that ratings are averaged, double counted when the weight is "2" and rounded. If the rating lies precisely between two numbers, the number is rounded down. All themes and dimensions have the same weight of "1".

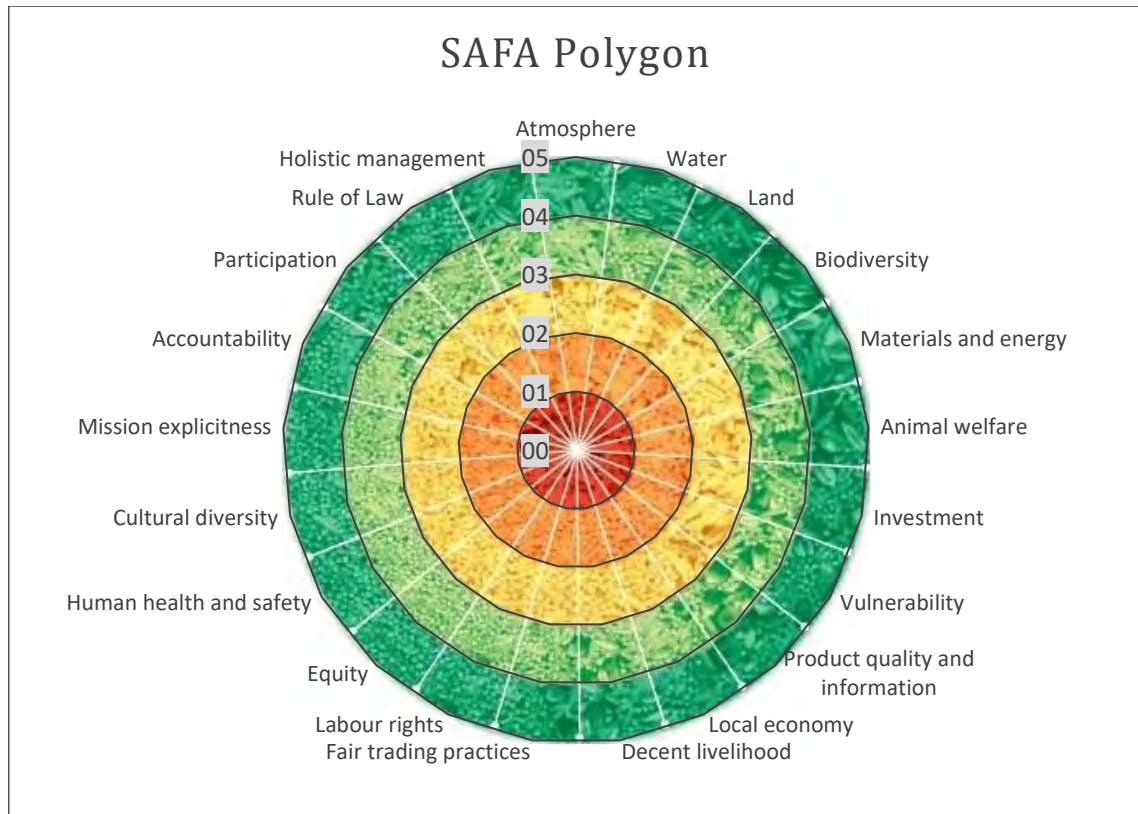


Figure 23 – Exemplary SAFA Polygon. Own illustration, polygon layout adapted from (FAO, 2015).

4 Results

Smallholders' perceptions and performances regarding oil palm cultivation and its effects on sustainability are complex and influenced by various factors. To be able to present evidence on sustainability performance the SAFA framework is a useful tool. Perceptions however, are not that obvious to capture. That is why before asking farmers about their definition of sustainability and which criteria play a role, they were asked if there is a balance between humans and the environment, which benefits and services they derive from nature and how they define their value. The replies show that sustainability mostly has economic meanings to them. From only two statements a more ecological notion can be recognised since environmental parameters were named (maintain soil fertility, reduce use of chemicals) (#14; #15). One farmer gave a social connotation:

"Nature is the source of life. I feel connected to the society in the village because we struggled together to improve the village." (#16)

Benefits derived from nature are that farmers get a lot for free, i.e. anything they plant and harvest they do not need to pay for, such as vegetables, medicinal herbs, fish, or wood as a

raw material (GD#1; GD#2; GD#3). These benefits represent an income source for farmers (GD#3). Farmers also see an imbalance between humans and the environment insofar as population growth increases the pressure on resources and land availability (GD#1). The majority of farmers believes that oil palm can sustain their living in the future. All interviewed farmers share Muslim beliefs, and some find connections between their religion and sustainability (#15).

“If people ignore or do not understand Islamic rules of good behaviour, it is the root for social disaster and problems, such as corruption.” (GD#2)

4.1 Perceived changes

Elaborating on the village history, reasons for moving to the village and recent developments revealed commonly perceived changes that can be divided into nine categories. Most farmers referred to a time before oil palm introduction and nowadays. The following results are not distinguished by village, but rather present general trends reported from farmers in all three villages.

Incomes

Rising incomes were named as the most important change due to engaging in oil palm cultivation (GD#3, #11; #13; #15). When compared to rubber oil palm is associated with less effort and higher income per ha. Even though the costs for oil palm cultivation are higher than for other commodities, such as rubber, the reduced work intensity makes oil palm worth cultivating. Additionally, the work load decreases with the trees' age. Most effort must be invested in the early stages for preparing the plantation, planting the seedlings and protecting them from pests and vegetation succession. Rubber needs a longer period (up to six years) until its productive phase than oil palm (approximately three years) (#18; GD#1).

Whereas oil palm as a perennial plant is considered a long-term investment by farmers, food crops are seen as a short-term source of income (GD#1; #11). Evidence of the improved economic situation of small-scale oil palm farmers is the ability to buy additional land (#23), afford education for children (#16) as well as set aside savings (#16) and save up for retirement (GD#2).

The economic livelihood of smallholders is associated with several dependencies. First, some of the interviewed smallholders have a history of partnerships with companies (plasma farmers). In this case farmers relied on the company for their income as workers on their plantations under contract and faced the duty to pay back operational costs to the companies

for managing the plantation. Secondly, if there is no partnership (any longer), smallholders sell their harvest to traders. This bond¹¹ allows the farmer to receive a loan from the trader and pay it back with the harvest eventually (#21). Oftentimes, tenure constraints or lack of financial liability make this the only option to request a loan. In return, traders have the control over prices and bind their suppliers by loans.

Simultaneously to rising incomes living standards have developed. Farmers subsequently need more money to cover their expenses (GD#2). The urge to increase the income remains (#4).

In the future the situation is predicted to be destabilized in the replanting phase, which requires a diversification of incomes to bridge the time gap until new oil palm trees can be harvested and big machinery to get rid of old oil palm trees and their roots (#4; #17).

In general, oil palm adoption has a positive connotation among most of the interviewed farmers and is seen to improve the current economic situation as well as sustain their living in the future (#11).

“With rubber the economic situation does not improve significantly, oil palm is new, so I have not seen improvement or decline.” (#19)

Education

In line with higher incomes and higher living standards the importance of advanced education is recognized as a means of securing future livelihoods. Overall, farmers agree that education has improved (#11; #17) and more people enjoy higher education, expressed in a higher number of children achieving university degrees because parents can afford tuition in senior high school and even university costs (#15; GD#2).



Figure 24 – Traditional stilt house near the river in Gurun Mudo. Photo taken by the author (2017).

Infrastructure

The improved financial situation of individual farmers is reflected in collective expenditures as well. In two of the three villages an expanded and improved infrastructure has been recognised (GD#2; GD#3). Road conditions, as well as public facilities and offices have advanced (GD#3). The

¹¹ Trader-smallholder relationships are usually not bound by contract, but rather an informal bond.

modernisation of technology has reached even remote villages (#17) and farmers benefit from technology (such as motorbikes for transportation). A trend to demolish traditional stilt houses and build modern brick houses can be observed (#21).

Community spirit

Oil palm expansion has proven to affect community lives in which smallholders are involved (ABRAM et al., 2017).

“Before, there were lots of emotional bonds, a sense of togetherness and everyone was family.” (GD#2)

The values expressed in the statement above can be captured under the concept of *gotong royong*, which can be described as togetherness or the duty to work together and support each other as a matter of course. BOWEN (1986, p. 546) sets the term in context with “an unquestioned characterization of villagers as engaging in agricultural and other work for each other without pay, and, more broadly, as an indigenous cultural tradition ranging over many other domains of social life.” Semantically originating from Java this mutual assistance spans over various ethnic groups and thus can be called a distinctive feature of Indonesian culture.



Figure 25 – Community celebrations on Indonesia's Independence Day, 17th of August, in Sungai Rotan. Photos taken by the author (2017).

A key mechanism for sharing community work is that one either has to actively participate or, in case one is not capable or does not want to help hands-on, to financially contribute to a project (#4). It has been observed that due to higher incomes as a result of oil palm adoption people tend to pay instead of participating (#16). The sense of *gotong royong* has declined (#16; GD#2) and competition between farmers has increased. Even though the value of team work is still apparent, people rather make a donation and thus add to '*kesenjangan sosial*', social inequality, conflict, and jealousy (GD#2). In Mekar Jaya one measure to enforce community investment is a set contribution of 20 Rp/kg of harvest from each farmer. This money contributes to building roads to access plantations (#14). On the contrary, the focus

group discussion in the farmer group came to the conclusion that within this group the “togetherness” has even increased (GD#2). Apart from gotong royong a historical value of the village carried on by ancestors is recognized by its community (#16).



Figure 26 – Women and men processing meat together from collectively sacrificed cows on Eid al-Adha, an Islamic celebration. Photos taken by the author (2017).

Quality of life

Overall living standards in rural Jambi are improving due to the expansion and market access of the oil palm commodity. This trend is recognised by experts and farmers alike (#11, #23). During transmigration periods farmers usually moved to Sumatra to pursue prosperity and to get a new life with new opportunities (#15; #18; GD#2). Most of the interviewed farmers agreed that they now experience a better quality of life compared to the previous years (#4; #5; #11; #14; #15; #16; #21; #23). While oil palm cultivation boosted farmers’ incomes (GD#2), the needs of the community have increased (GD#2) at the same time. For the future some farmers hope not to be constraint to work on the plantations themselves any longer, but to be able to hire workers to do it for them (#18). This goes along with higher education levels among the coming generations, which enables them to pursue other careers than farming.

“What do you wish on your children?” (Assistant) “Prosperity [laughing]. My children do not need to be a farmer and work in the plantation. But they can still own the field and have someone else working for them.” (#18)

Temperatures and seasons

In two out of three villages farmers reported higher temperatures in recent years (#18; #21; GD#2; GD#3) compared to cooler and more fresh weather in the past (#7; GD#2). This phenomenon goes along with a higher variability in seasons (GD#1). The duration of hot and dry seasons has increased to such an extent that high temperatures, which were usually measured only for a few months, are now apparent year around (#18). The seasons have been perceived as being more random and less predictable, which results in harvest loss (#18;

GD#2). Farmers use the term *musim trek* when referring to a season with declined harvest due to weather conditions (#5; #19; #23). Explanations by the villagers for the origin of climatic changes are manifold. Climate change is caused by deforestation and oil palm cultivation according to a group of farmers (GD#3), while another farmer does not agree that oil palm is the cause for droughts, land conversion or environmental destruction and indicates that the change in weather patterns is not significant (#15).

“It’s normal that we can’t interfere with weather. It’s controlled by god. But droughts and floods are caused by humans. Natural disasters are happening because the forest is cut down.” (#18)

Both in Mekar Jaya and Gurun Mudo farmers blame the companies for environmental damage (#16; GD#2; GD#3). Many farmers argue that changes in the environment are natural or controlled by god.

Droughts and floods



Figure 27 – Newly-built water pump in Mekar Jaya to cover water shortages. Photo taken by the author (2017).

Changing climatic conditions and land cover change influence the hydrological cycle. The climate in Jambi is perceived as becoming drier (GD#1), while at the same time oil palm is supposed to be absorbing great amounts of water according to farmers (#5; GD#2). It is clear to farmers that water availability is dependent on seasons. The contrast between times before oil palm cultivation and after oil palm was introduced is reflected in water conditions insofar as there were no long droughts before. Wells in the village are fed by groundwater and in dry season there is less water in the wells, and additionally oil palm worsens the condition according to villagers. Consequently, oil palm reduces water availability compared to forest plots according to farmers in Mekar Jaya. They remember that in the 1990s droughts were rare (maximum two weeks in duration) and nowadays droughts can last up to three months (GD#2).

“Oil palm absorbs huge amounts of water. In fact, the swamp areas turned dry because it was planted with oil palm. Oil palm cultivation is one drought factor.” (#5)

“Water availability depends on the season. In dry season we have less water. Before, there was no long drought because there were many wet lands and no oil palm. [...] Oil palm plantations worsen the condition compared to forests.” (GD#2)

“Flooding will influence the FFB. The FFB decay in these conditions. In [extremely] dry/wet season oil palm harvest is reduced, but that is natural.” (#19)

Harvest outcomes are associated both negatively and positively with water availability in the way that harvests are less in flooded areas (#19) and that fertilizers (which are linked with increasing harvests) cannot be applied on dry soils (#5). One farmer acknowledged that droughts and floods are caused by humans and that global links exist. He is certain that because forests are cut down natural disasters, such as increased floods or droughts are happening (#18). Another farmer called the effect, that too dry or too wet conditions reduce the harvest, a natural thing which can neither be prevented nor controlled (#19).

Water quality

Along with water availability concerns have been raised by farmers on water quality. As proof for water pollution farmers often name that river water used to be safe to drink from, as well as for other needs (#21; GD#3). Explanations of causes and effects of declining water quality by villagers are diverse. For instance, declining fish numbers are causally linked to population growth and overfishing (#13), pesticide usage is considered dangerous to water bodies (#3), and quicksilver pollution from gold mining and an ineffective waste management by a nearby oil palm mill (#19; GD#3) were named by villagers.



Figure 28 – Highly polluted river in Gurun Mudo and gold mining facility. Photo taken by the author (2017).

“Oil palm does not damage the environment, but the mill does because it produces lots of waste and pollution.” (#11)

Farmers remember the water to be crystal clear with many fish in it. In Sungai Rotan a water conservation area, called ‘Lubuk Larangan’, was established by the NGO Setara (#2). The fishing regulations have resulted in fish numbers increasing again. However, many farmers are not aware of the effects of farming practices on water pollution. For example, many farmers reported that they clean the pesticide equipment in waterways or clean it in the field but then discharge the wastewater to soils.

“Before we knew RSPO, we washed the pesticide equipment directly in the river because we didn’t know better.” (#14)

Soil fertility

Tropical soils are a fragile system and converting their cover from rainforests to oil palm plantations is often associated with a decrease in fertility (GUILLAUME et al., 2016). One farmer comparing the state before the conversion from former land cover (not necessarily forest) to the current state observed that the soil used to be fertile without any fertilizer so that any crop



Figure 29 – Signs of soil erosion on the edge of an oil palm plantation in Sungai Rotan. Photo taken by the author (2017).

would grow. Rubber plantations do not need any fertilizer according to farmers (#18). The time until oil palms become productive increased from three years to now four to five years and the fruit quality used to be better (#19). Another farmer agrees by stating that if he does not use fertilizer, he would get no harvest. He experienced a loss of productivity and observed that rubber and food crops, such as chili, long beans, etc. used to grow without fertilizer.

“Before, the soil fertility was sufficient without any fertilizer. I could grow other crops and even oil palm without fertilizer.” (#19)

“Back in the day, we could put any seed in the ground without any fertilizer, but now we have to apply fertilizer to make anything grow well. [...] But it’s a natural thing.” (GD#3)

One farmer reports to use urea for young oil palms complemented by natural fertilizer from goat faeces (#18). Another farmer feels he has no choice but fertilize and since natural fertilizers are less efficient he relies on chemical fertilizers (#6). Another observation is that soils became dry due to the high water demand of oil palm plantations (#13).

“The environment changes because of land degradation and deforestation and the weather becomes hotter.” (#21)

One farmer defines sustainability as maintaining soil fertility (#15), while another group of farmers do not see a causal link of the decline with oil palm cultivation but consider it “natural”

(GD#3). Due to the fact that animals repopulated the area after land cover conversion one farmer does not believe that the environmental issues are too severe (#4).

The above-described changes have been observed by farmers and other village members in the past. Concerning their every-day-life and the future several challenges are faced that are interrelated with oil palm cultivation.

4.2 Perceived challenges

From a farmer's perspective changes in the environment and community are not always perceived as challenges, too. Many changes are viewed as naturally given, controlled by God or outside of the farmers range of influence. Other issues farmers are aware of are seen as challenges and can be divided into five categories.

Access to land

Land scarcity is named as a challenge in Sungai Rotan, Mekar Jaya and Gurun Mudo. However, the land itself is not scarce, but the access to land is limited. Hitherto converted landscapes and a growing population puts pressure on the available land in rural Jambi that is increasingly dominated by oil palm plantations. Farmers see this as an imbalance between nature and humans (GD#1). More and more palm oil companies claim or buy land to establish plantations. In Sungai Rotan and Gurun Mudo people have sold a great extent of their land to companies operating in the area (GD#1; GD#3). In Gurun Mudo this has resulted in a high unemployment rate of about 30% in the agriculture-dominated village. Farmers sold their land, were hired by the company as field workers, but subsequently lost their jobs in the company and now have no source of income (#23; GD#3). Beyond that, legality of the land is not secured and as a result, farmers cannot extend their land easily. In a transmigrant village the government provided each farmer with two ha of land, which is not enough from a farmer's perspective. Declining yields on their assigned land forced some farmers to even give up their patch of land (GD#2). Another issue is the competition with food crops. An oil palm plantation is more profitable than horticulture. The more fertile land is converted to oil palm plantations, the greater becomes the limitation to grow crops for self-supply. Farmers project this issue to get more severe in the future due to population growth (#21; GD#2). The increasing population numbers are caused by migration patterns and high birth rates (DESA GURUN MUDO, 2015). Additionally, land prices for secondary forest are much lower (20 million Rp/ha) than for oil palm plantations (70 million Rp/ha). Rubber plantations are perceived as less profitable (GD#1), which is why it is seen as a smart investment to convert as much of the land to oil palm as

possible (#19). The decrease in access to land is intensified by the legal prohibition to burn the land for preparing plantations. Due to a lack of machinery for clearing the land farmers feel like no new plantation space can be created by them (GD#1).

Knowledge about oil palm cultivation

Smallholders admit that their lack of knowledge has an impact on farming practices. One farmer said he had no idea of how much fertilizer he needed to apply. Along with several other farmers he fertilizes as much as he can afford (#3; #19; #23). To overcome their insufficient expertise, they observe other farmers or company workers (#21). Farmers often complain they would like to get (more) trainings on oil palm cultivation from companies and the government (GD#1; GD#3).

Yields & prices

A distinct focus of smallholders is on their economic livelihood (#2) and the struggle of how to increase incomes, provide for their families and strive for prosperity. In Mekar Jaya the village head quoted a Javanese proverb in this respect and reversed it to demonstrate his point of view. The traditional philosophy says: *'Makan tidak makan ngumpul'* which translates to "eating or not eating, as long as we are together". The head of the village put it in his own words:

"Tidak kumpul asalkan makan [lit. do not gather as long as you eat]. I would rather go somewhere else, away from family, to make a living and have something to eat than to starve." (#13).

Generally, farmers in Sungai Rotan find that the price for oil palm is relatively stable and so high they can increase their income (GD#1). A farmer from Gurun Mudo added that overall, he is satisfied with his harvest (#21). In contrast, farmers repeatedly mentioned that rubber prices have shown high fluctuations (GD#3), which is why some farmers fear the same with regards to oil palm. Farmers in Sungai Rotan even go one step further by saying that if the government would ensure a promising price for any other crop, they would change to that (GD#1).

Harvest losses are encountered for two reasons. On the one hand, farmers experience losses during storage and transportation of FFB. A prompt delivery to mills is recommended (#19). Another factor is the period of time, called *musim trek* in Bahasa Indonesia, that is associated with decreased harvest and lower prices (#5; #19; #23). Farmers have reported that rubber trees lose their leaves due to prolonged droughts and produce less (#23).

Concerning future demand for palm oil, farmers seem quite confident and suggest that prices for FFB will even increase (#7; #11; #18; #19).

“Oil palm is sustainable because there will always be demand for palm oil products.”
(#11)

While one farmer points out that costs for oil palm cultivation are higher than for rubber (#5), another farmer emphasizes the advantage that oil palm and rubber generate the same income, but oil palm is less work-intensive (#19). Another farmer agrees by stating that the potential of oil palm will increase, and that it is easy to sell since more traders will appear, and the company will buy the smallholders' produce (#18). Beyond that, a promising factor is that palm oil cannot be reused or recycled in contrast to rubber, so farmers are certain that there will always be demand for palm oil products (GD#1). Nonetheless, farmers are aware of some risks, such as potential loss of productivity of plants, price decline (#14), unstable prices or pests (#5). Fortunately, pests have not caused serious harvest loss up until now (GD#2). The only limit farmers see at this point is the height of oil palms, which makes harvesting impossible when they are grown too high (#18).

Relations to companies¹²

Apart from smallholders, companies dominate the production stage of the palm oil value chain and sometimes go beyond mere production but incorporate plantations, mills and refineries. Smallholders and commercial as well as governmental enterprises often coexist, sometimes compete, sometimes engage in partnerships or contracts. Some discrepancies in the relation between village communities and companies exist. In Sungai Rotan farmers describe the relationship as good because the nearby company prioritizes local workers (#8).

In Mekar Jaya the relation between the community and the company is worse. One farmer argues companies would contribute more to climate change and nature destruction than farmers (#16), while another farmer claims oil palm cultivation does not damage the environment, but the mill does in terms of waste and pollution (#11).

Farmers in Gurun Mudo report a good relationship but criticise that the company is not aware of the community's needs and that local people do not benefit from the company.

“Even if we complain, there is no response from the company. We are too powerless.”
(GD#3)

¹² The names of the companies operating in the case study villages are not named due to risk for conflicts between interviewees and companies.

One example is the company's hiring strategy. Since a lot of local farmers sold their plantations to the company, they hoped to be employed. After companies switched, local workers were fired and workers from other islands or regions were hired. Daily workers did not receive any compensation upon the termination of their contracts. A former employee of



*Figure 30 – Entrance to a company mill operating in Gurun Mudo.
Photo taken by the author (2017).*

the company reported that nowadays it is only possible to work for the company through nepotism. Workers from outside the community are favoured because they receive salaries below the minimum wage, which is 80,000 Rp/day. He left the company for his personal freedom and now works on his own plantation again (#22). According to the head of the village the relationship between the community and company is good, but farmers wish that the government or company educated them on seed quality and supply them with high-quality seeds (#19). A current employee of the company operating in Gurun Mudo shared his experiences. As a permanent employee, he is free to end the contract at any time and he would get a retirement or compensation. To get the job he passed a selection process, but he mentions that this process is not always transparent and some of his colleagues got a job through a contact person. He and his family live in a house provided by the company and receive health insurance. The company wants to extend a partnership scheme because they are prohibited by law to buy more land from locals. The interviewee who has some private plantations wants to join that partnership (#23).

Replanting

Sustainability can be defined as securing livelihoods for the present and future generations. Smallholder farming is a family business in Indonesia. With a 20-30-years span of productivity and harvesting without risks, the cultivation of oil palm plantations is limited to approximately one generation of farmers. In areas where oil palm plants have reached an age of 15 to 20 years farmers are concerned about replanting strategies. First, new plants are grown as seedlings in pots before being transferred to the plantation. It takes three to five years until the plants produce harvest. In order to establish a plantation former vegetation, such as bushes, rubber trees, or old oil palms and their root system must be removed (#19). This step

requires machinery since the work is physically too hard. Because smallholders cannot afford bulldozers or other big machinery they used to burn their fields, which had been an accepted traditional agricultural practice in the past (#9). The reinforcement of a recent law from 2014, reissued in 2016 after extensive fires all over Sumatra, that caused an extreme haze, prohibits burning for agricultural purposes in Indonesia. While aiming at preserving valuable carbon stocks in peat lands, preventing harvest loss and reducing respiratory diseases from inhaled smoke, this law also puts farmers under pressure because they have no idea how to prepare their plantations once the turn-over rate is reached (#8). According to HARTMANN et al. (2018) a ban on fires for agricultural purposes does not solve the problem in its complexity.

In case smallholders have not been able to set aside enough savings to outlast the initial period until new oil palm plantations generate income, several options are discussed among farmers (GD#2). One strategy would be to diversify production and thereby generating alternative sources of income (#13; #20) or working as a daily worker for other farmers or the company (GD#1). The strategy to single out old oil palms and replace them by young ones to overcome the transition phase and still harvesting the other old oil palms has proven not to be working since small young trees do not get enough sunlight this way. In a biodiversity enrichment experiment, as part of the CRC 990, it is investigated whether an agroforestry system could enrich biodiversity in plantations and diversify existing monocultures¹³. Farmers however, are sceptical as to how effective this measure is since they tried combining trees and oil palms and experienced less harvests (#13).

Summarizing the findings from interviews about changes and challenges, sustainability is often associated with economic viability. In essence, there is a strong focus on boosting incomes, learning about efficient farming practices and optimizing yields. Some environmental awareness is apparent, albeit not necessarily articulated as challenges. Environmental deterioration is accepted as naturally-occurring and oftentimes the causal connection to farming practices is declined.

4.3 Sustainability hotspots

How an action is perceived does not necessarily reflect how the action is carried out. In the previous chapter smallholders' challenges were set in context with recent changes in their social, ecological and economic environment. This chapter presents the results of a rather standardised and objective assessment of 22 sustainability themes by the SAFA framework.

¹³ More information: <https://www.uni-goettingen.de/en/b11+-biodiversity+enrichment+experiment+in+oil+palm+plantations+%28efforts-bee%29/412084.html>

The results are divided by interviewed smallholder to enable a comparison between them on a village level. One additional polygon represents the means of smallholders' individual performances and shows a comparison of the three villages. The methodology of data collection and evaluation is described in chapter 3.2 and 3.3. In all cases the theme animal welfare was not considered or not applicable, thus explaining the sharp bend in the radar charts.

Sungai Rotan

In Sungai Rotan three smallholders agreed to participate in the sustainability assessment. The overall performance across all themes was in the yellow to green range (cf. fig. 31). The best outcome was achieved in the social dimension (decent livelihood – cultural diversity) with limited or good performance across all interviewed smallholders.

Fairly good economic results were attained by two of the three smallholders. For the remaining smallholder the field of local economy was not applicable as he does not engage in hiring workers.

In the environmental division performance in the conservation and protection of the resources atmosphere, water, and land were rated as poor, reaching values between 1.0 and 1.3. These themes include pollution prevention, mitigation, conservation, improvement and rehabilitation practices. The major sustainability hotspot here is water conservation and pollution prevention. For biodiversity, e.g. ecosystem, species and seed diversity ratings between 2.3 and 2.5 were achieved, while the theme materials and energy, comprised of the indicators nutrient balance, renewable and recycled materials, energy use as well as harvest loss and waste reduction hit a maximum of 2.5.

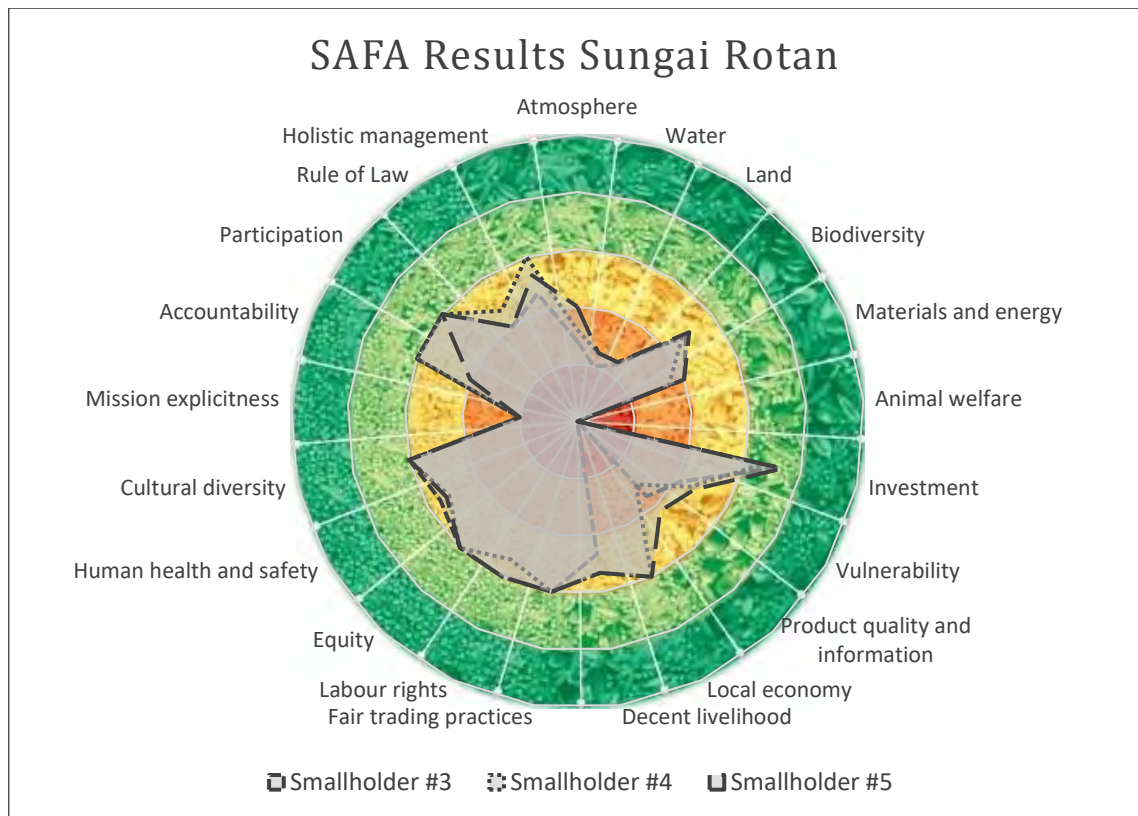


Figure 31 – SAFA Results from Sungai Rotan, showing smallholders #3, #4 and #5. Own illustration, polygon layout adapted from (FAO, 2015).

Mission explicitness as one theme of the governance dimension was assessed to be difficult for smallholders as it entails to have documented farm values. In general, record keeping, and documentation of management practices is rather done on an informal basis. This appears reasonable with regards to the size of farm businesses and the education level of smallholders. Accountability and participation however were rated as good due to the fact that the interviewed smallholders were part of a farmer group, which is covered by the respective indicators.

Complying with the rule of law is limited due to tenure insecurities. Two of the three interviewed farmers reported to have a *'sporadik'*¹⁴ as a land certificate. Other documented land titles are SKT (*Surat Keterangan Tanah*) and SHM (*Sertifikat Hak Milik*). Holistic management stands for the indicator of a sustainability management plan, its elements and success. This plan is put together by the farmer group for all members combined.

¹⁴ "Sporadic registration is the process that identifies, adjudicates and registers rights of ownership to land on an ad hoc basis [...] The term sporadic is reinterpreted on the village level and given a new meaning with a translated legitimization [...] In the case of the sporadic land titles [...] it is especially the village heads collecting a fee for issuing land titles that are no de jure titles." (KUNZ et al., 2016, p. 135; KUNZ, 2016, p. 67; 123).

Mekar Jaya

The assessment of four smallholders in Mekar Jaya shows a similar polygon to Sungai Rotan, with a few particular results to be pointed out in the following (cf. fig. 33): The village is not connected to any natural waterways, and thus there rather exists a problem with water availability than with pollution. While atmospheric and water resources are at a similar poor stage, slightly better results can be documented for soil fertility and soil management under the land theme. With a biogas facility in place and efforts to use natural fertilizer from animal faeces the results for the indicators biomass management and renewable energy source are 2.5 and 3.0 respectively. Regarding the economy dimension, a positive



Figure 32 – Combination of animal husbandry and oil palm plantation. Cow faeces is used as organic fertilizer. Photo taken by the author (2017).

spike (up to 4.2) was reached in the investment theme, namely for the indicators of community investment and profitability. While the former displays participation in community projects, the latter stands for a variety of indicators such as costs for labour, farming inputs and the knowledge and extent of farm revenues. External workforce is only applicable for one of the smallholders, who hires only workers from the local community, all others hire family or no external workers at all.

An overall good outcome can be noted for the social wellbeing in Mekar Jaya. For instance, fair trading practices imply to which extent farmers know market prices and understand the price policies of their buyers. Since, in this village, all interviewed farmers sell their produce to the farmer group, they are not in touch with traders and trust in a fair price from the farmer group. Human health and safety is in need for some improvement with regards to risk avoidance and wearing protective gear during pesticide application.

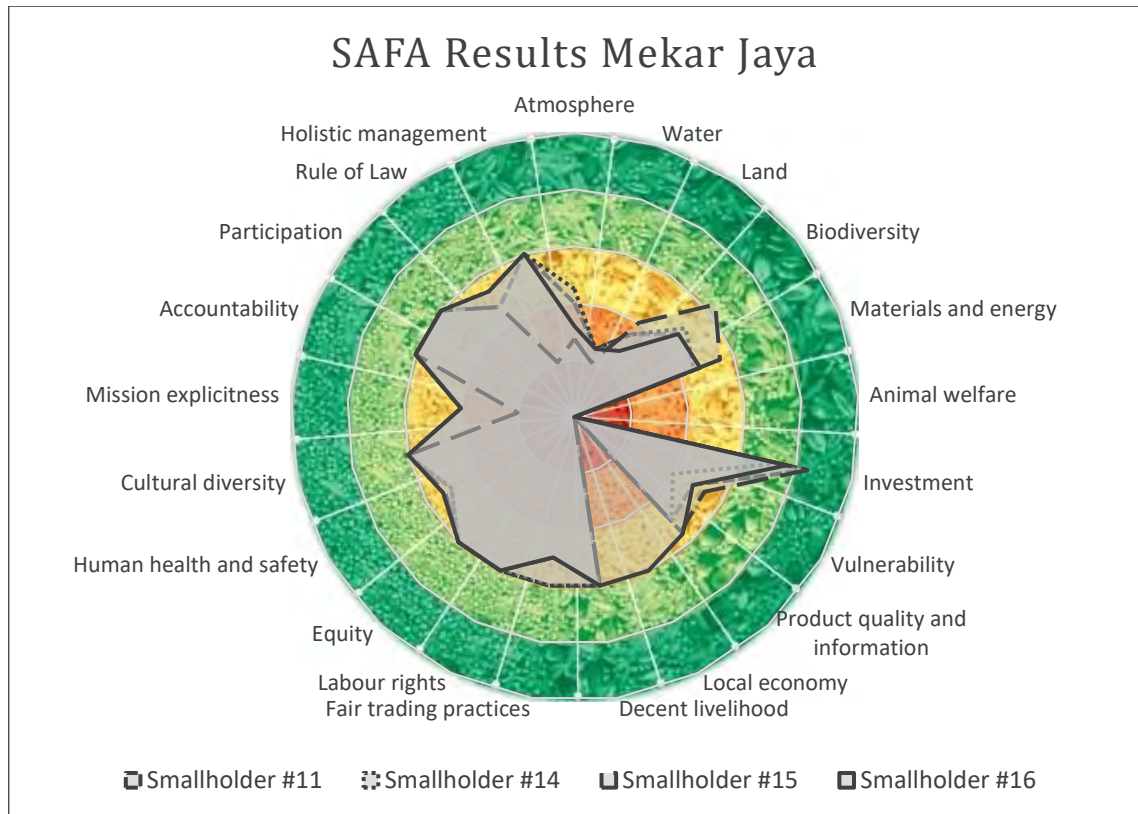


Figure 33 – SAFA Results from Mekar Jaya, showing smallholders #11, #14, #15, and #16. Own illustration, polygon layout adapted from (FAO, 2015).

Gurun Mudo

In Gurun Mudo the situation appears to be different due to several preconditions (cf. fig. 34): Firstly, Gurun Mudo has not come in contact with any certification for oil palm. Secondly, there is no support from an NGO, as there is in Sungai Rotan and Mekar Jaya. And lastly, the smallholders in the village have failed forming a farmer group once and have not managed to rebuild it. These organisational difficulties affect primarily the governance dimension. The themes mission explicitness, accountability, participation, and holistic management all rated 1.0, thus being the major sustainability hotspots in Gurun Mudo. Compliance to the rule of law with regards to land tenure reached the yellow sphere, with all three interviewed smallholders having a *sporadik*.

The environmental performance of smallholders in Gurun Mudo is comparable to the other two villages. The resource water is again a sustainability hotspot, in this case intensified by illegal gold mining activities in the river of the village.

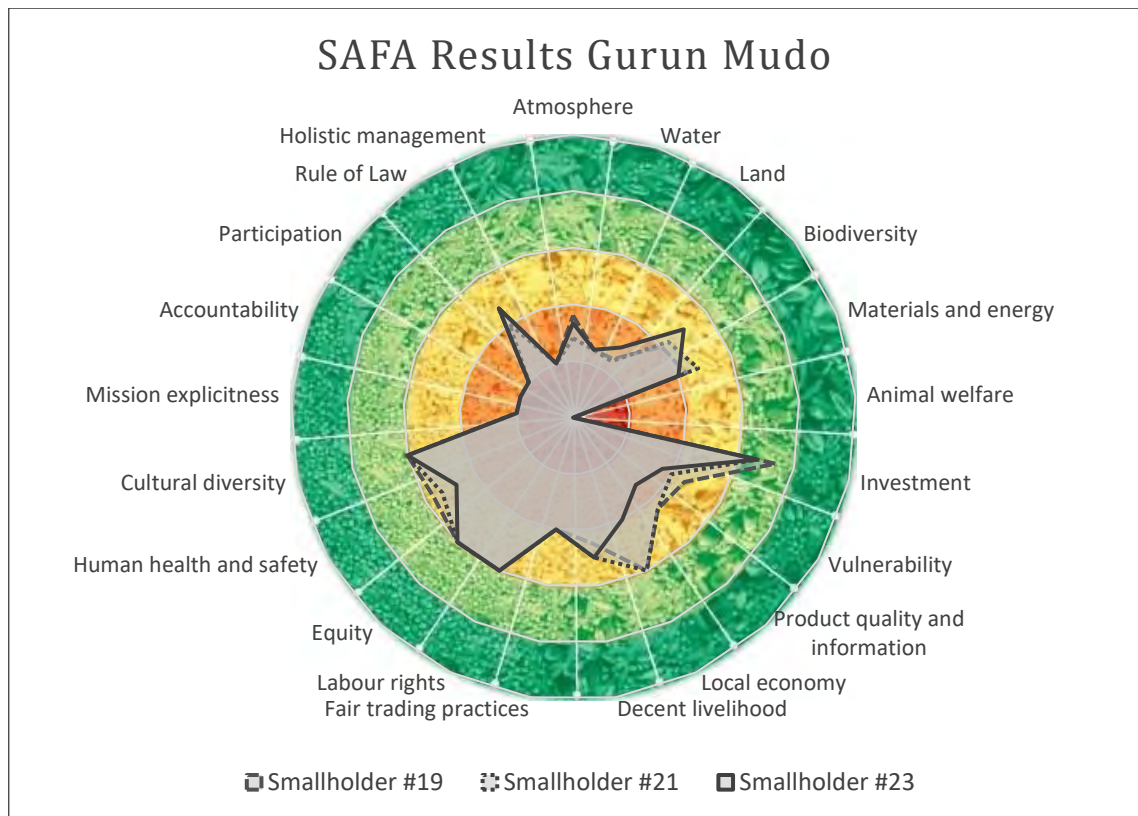


Figure 34 – SAFA Results from Gurun Mudo, showing smallholders #19, #21, and #23. Own illustration, polygon layout adapted from (FAO, 2015).

The third dimension, economic resilience, shows a relatively high vulnerability of farmers in the village. This theme is comprised of the indicators product diversification, market stability, liquidity and safety nets. One hotspot within the liquidity indicator is the variety of loan sources. In contrast to the other two villages, where farmers can borrow money from the cooperative of the farmer groups, in Gurun Mudo the options of loan sources are rather limited. Banks require a legal land certificate (*sporadik* is often not recognized (#19)) or ownership of a house to give out loans and there are no NGOs, cooperatives, farmer associations or microfinance groups existent in the village. The remaining option is to receive loans from traders that can be paid back by future harvests (#2). This creates a high dependency between grower and trader, which limits the former in his choice of where to sell FFB to. One additional factor that limits product quality and information are the missing audits which are usually conducted under the RSPO framework.

The results in the social dimension are very similar to the performance in Sungai Rotan and Mekar Jaya with two exceptions: the themes decent livelihood and fair-trading practices. The former entails the indicator training which, in the other two villages, are delivered in the process of RSPO certification. Due to the fact that smallholders in Gurun Mudo have no access to training opportunities this indicator rated down the respective theme. Fair trading practices,

too, are determined by one indicator, namely understanding buyer prices. All three interviewed smallholders reported that they never or only rarely understand how buyers calculate or establish prices. This clearly demonstrates a lack of transparency. In Gurun Mudo only one trader is operating and an interview with him showed that he is insecure himself about the price he receives from the middle man¹⁵ who then sells the FFB to the mill.

General hotspots

The figure below (cf. fig. 35) shows aggregated results of all three villages with means of the results from the interviewed smallholders of each village. In the following, four general sustainability hotspots are pointed out that are apparent across all villages, supported by farmers' statements.

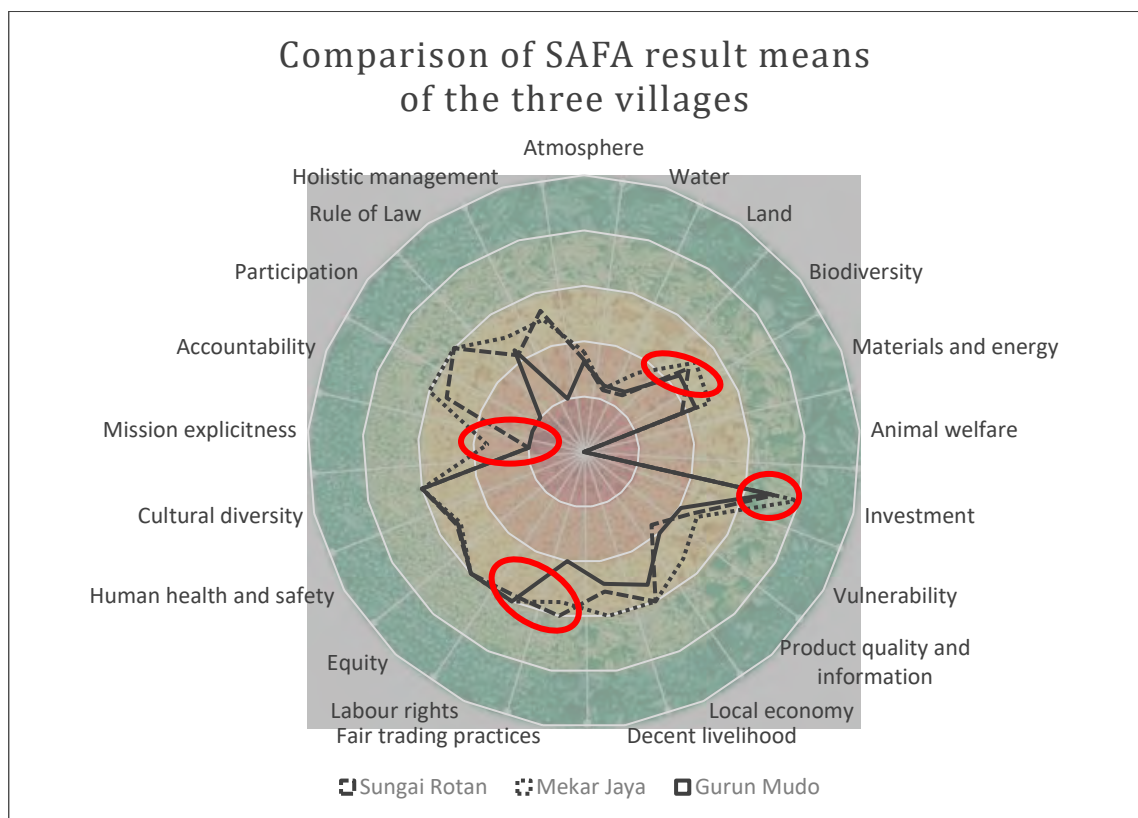


Figure 35 – Comparison of SAFA result means of the three villages, Sungai Rotan, Mekar Jaya and Gurun Mudo. Four major hotspots are indicated in red. Own illustration, polygon layout adapted from (FAO, 2015).

¹⁵ The smallholders in Gurun Mudo sell their harvest to a trader who then sells it to a supplier who has the license (DO: delivery order) to sell FFB to the mill (#19).

1. Mission explicitness

Beginning with the governance dimension, one major hotspot, detected in all three villages, is mission explicitness. This theme entails that farm goals and values are stated, understood and followed. The statement could be written down or based on “shared values that are a way of life” (FAO, 2015). On a small scale as an individual smallholder farmer such a statement exists, if at all, in an unwritten form. Even though the assessment of accuracy of records is part of the accountability indicator, documenting farming activities is highlighted here. The most challenging RSPO criterion for farmers in Sungai Rotan was in fact named as record keeping. Farmers report not to keep records but say, they would know them without written documentation (#5). Even though they have participated in trainings on this issue, they are not confident or familiar with digital data handling (GD#1). This is partly due to their educational level but more likely due to the lack of technological support (computers, software, etc.) and data availability. For example, one farmer reported that he participated in a training on calculating GHG emissions with Excel, but he immediately forgot how it worked and there is no computer available in the village (#3). Additionally, farmers do not see the benefits of record keeping because during the time spent to do it, they do not earn money (GD#1). This applies for all kinds of records, e.g. farm goals, harvest, salaries, inputs, fertilizer usage, etc.

In Mekar Jaya a marketing division of the farmer group is responsible for record keeping. This way, farmers rely on the farmer group and do not have to individually keep records of their harvest and other farm-related activities. The photo on the right (cf. fig. 36) gives an impression on paper-based records of harvest amounts and earnings. This mechanism however entails that farmers do not have any overview over their records, unless they specifically ask for inspection. Due to the same reasons as in Sungai Rotan there do not exist any digital records (#12).

SIKAP	TARIKH LAPORAN	HARGA RETANI	JUMLAH	NETTO PABRIK	HARGA PABRIK	JUMLAH	BIAYA OFF. 1 ST	UANG JALAN	LABA	BUNCI
1/7	Jabal	8706	1260	11143.680	8957	1480	15.226.760	1385.235	450.000	2478015
2/7	Bulan	7472	1280	12.124.160	8680	1480	14.526.400	1500.400	450.000	251840
3/7	Jabal	8195	1280	10.489.600	8200	1480	12.186.000	1271.000	450.000	74.600
4/7	Bulan	8293	1300	11.586.900	9285	1510	14.070.300	1499.175	450.000	544.275
5/7	Jabal				9364	1510	14.139.640		450.000	
6/7	Bulan				8270	1505	12.446.350		400.000	
		17825	1280	23.007.180	17634		26.585.990	2733.270	900.000	54430
7/7	Jabal				8957	1510			400.000	
8/7	Bulan		1390		8351	1510			450.000	
		16.999	1790	21.928.710	17308		26.136.080	2682.740	800.000	623.630
9/7	Jabal	9355	1290	12.067.350	9215	1510	13.914.650	1428.325	450.000	31.625
10/7	Bulan				8360	1505	14.086.800		450.000	
11/7	Jabal				9304	1510	14.049.040		450.000	
		18.645	1290	24.064.300	18664		28.135.840	2882.920	900.000	277.970

Figure 36 – Paper-based records of harvests and earnings in Mekar Jaya as of July 2017 (#12). Photo taken by the author (2017).

In Gurun Mudo where no organisational memberships have been established, no farm values or records have been kept at all. Oil palm cultivation is still on a rather informal level in this village.

Concerning questions about their knowledge of revenue and labour costs all farmers in the three villages replied they would know but have in most cases not written them down. Input costs for fertilizer, pesticides, seeds and plant materials were known in most cases.

2. Water and Land

With regards to the environmental dimension, the resources water and land are scarce or limited in the assessed villages due to two major factors: Pollution and access to land.

The availability is usually not perceived as limited, if villagers have access to a natural waterway. Oil palm does not require irrigation. Rather than the quantity, the quality of water resources is of concern. Both in Sungai Rotan and Gurun Mudo farmers reported a decrease in water quality due to human impact (GD#1; GD#3), including overfishing, using poison for fishing, gold mining, cleaning pesticide equipment, or simply the run-off from close by plantations that carries fertilizer and pesticides. In Mekar Jaya farmers reported similar trends of rivers in the area (GD#2) that are not directly accessible from the village.

Smallholders usually acquire their expertise in oil palm farming merely from observation. While learning from neighbours and company workers is highly practical, it can bear the possibility of inefficient farming techniques or fertilizer and pesticide mishandling. In particular, fertilizers and pesticides (including herbicides and fungicides) are used in an insufficient or excessive dose, at the wrong time, or during inadequate weather conditions. The latter can cause surface run-off, when it rains directly after application or insufficient uptake when soils are too dry (#5).

Standar Pemupukan Tanaman Menghasilkan					
Kelompok umur (tahun)	Dosis pupuk (kg/pohon/tahun)				
	Urea	SP-36	MOP	Kiserit	Jumlah
3-8	2,00	1,50	1,50	1,00	6,00
9-13	2,75	2,25	2,25	1,50	8,75
14-20	2,50	2,00	2,00	1,50	7,75
21-25	1,75	1,25	1,25	1,00	5,25

*Dosis pupuk standar TBM maupun TM perlu disesuaikan dengan kondisi tanah dan lahan

Figure 37 – Standards for fertilizing plants in the productive phase (#12), printed by Setara. SP-36 = Superphosphate (36% P₂O₅), MOP = Muriate of potash/potassium chloride, Kiserit = magnesium sulphate. Photo taken by the author (2017).

Following a fertilizer schedule (as proposed by the RSPO) is difficult for smallholders because of lack of information and scarce budgets. Such a fertilizer schedule was publicly available in Mekar Jaya at the marketing division of the farmer group (cf. fig. 37). In the other two villages fertilizing requirements were not clearly communicated or farmers were not aware of fertilizing requirements of oil palm plantations at all.

Even if farmers know required fertilizer dosages, they are often not able to follow these instructions and instead apply as much fertilizer as they can afford and during times, when they are able to afford them (#3; #14; #19; #23). Chemical substances can cause harm to

organisms in waterways and subsequently to humans, if they use these waterways as a source for drinking water or nutrition (fish or plants).

Limited land availability and quality, as well as the expansion of oil palm plantations puts pressure on soils. The resource land is scarce in several ways. A decreased soil fertility (#6; #18; #19; #21), a growing population and decreased land availability (#21; GD#1; GD#2) contribute to resource depletion. Soil management in accordance with good agricultural practices and selecting the right fertilizer type are not widespread and depict a lack of expertise. The prohibition to burn land (#8; GD#1) is considered a big challenge for smallholders as well as the competition with food security.

“If the price for rice would be under governmental control, farmers might not convert land to oil palm plantations.” (#1, Dinas Perkebunan, Plantation Department, Jambi)

3. Vulnerability

Even though oil palm cultivation brings about economic benefits, it is still difficult for smallholders to set aside savings. Income is either invested into farming expenses or into children’s education. Within the safety nets indicator, one hotspot is presented by a lack of risk management. There is no crop insurance available for oil palm in any of the three villages. Beyond that, most farmers do not have a risk management plan in place and the only risk reduction measure to reduce harvest loss is reaping the fruits at the right time.

Monocultures, such as palm oil or rubber plantations are generally vulnerable to pests and price fluctuations. Product diversification is extremely weak in all of the sampled villages. The interviewed farmers cultivated either only oil palm or a combination of oil palm and rubber, with one exception, a vegetable farmer, who converted parts of his oil palm plantation back into horticulture (cf. fig. 38).

Another factor connecting oil palm cultivation to vulnerability is that smallholders stand in the beginning of the value chain and are not connected to further steps up the chain. Apart from harvesting the fruits no value adding or processing steps are in the hands of farmers. The reliance on a single commodity poses a major risk and uncertainty on smallholders in the upcoming replanting phase. On the one hand, farmers do not see themselves capable of clearing the land without big machinery and on the other hand, they have no alternative income during the 2-3 years until new plants are productive (#8; #13; #19; GD#1; GD#2).

The following section is focused on general hotspots in the dimension of social wellbeing. As the performance is equally good in all three villages, there are just a few aspects pointed out that do not represent need for improvement but a rather commendable performance.



Figure 38 – Compilation of pictures of a horticulture farm in Mekar Jaya. Top: New seedlings; Bottom: The family supports the farmer in cassava processing and packaging; Right: Long bean cultivation. Photos taken by the author (2017).

4. Labour rights and equity aspects

Small-scale operations are usually managed by a single family. Sometimes, external workers are hired to support the farmer during harvest or plantation maintenance. These workers are usually not employed on a regular basis, but on an informal, daily basis, are often part of the extended family of the farmer or from the local community and are paid either per kg of harvest or as part of a profit share system (#5; #11; #14; #19; #21; #23). The profit share could be 50:50 or 2:1 (#11; #23).

Regarding conflicts with workers, farmers said that as long as they treated workers well, there have been no conflicts (#4; #5). All interviewed farmers agreed that children never work on their farms. This was confirmed by an interview partner, the Head of Development of Agriculture and Socialisation from *Dinas Perkebunan* (the Plantation Department), who clarified that under child labour, children under the age of 18 years, who cannot legally be employed, are considered. He is only aware of children helping their families on the

plantations by collecting fruits from the ground, but this is not physically hard work according to the official. Further, he explained that in Indonesia it is culturally expected from children to assist their parents, but these children are never entering an official working agreement nor receive salary (#1). Farmers reported that girls and boys have equal educational opportunities.

Gender-specific roles have gained importance since the introduction of oil palm cultivation. On rubber fields, women can work to the same extent as men by tapping the rubber. Oil palm harvest requires a greater physical strength as a single FFB can weigh around 20-30 kg, which generally excludes women from farm work. Easier tasks such as picking up loose fruits from the ground or cutting the grass on the plantation ground can still be done by women. However, women are not excluded from decision-making according to the interviewed farmers. All of them agreed that women and men equally make decisions regarding the farming business, and in the villages, where trainings are offered, women and men have equal opportunities to take part. One farmer explained that he and his wife discuss everything (#23), while another farmer stated that he even works together with his wife in the field (#18).



Figure 39 – Oil palm farmer not wearing protective gear while fixing his tools to harvest fruits. Motorcycle in the background for transportation of FFB. Photo taken by the author (2017).

In general, medical care is good in the research villages. Village-level health clinics, *Puskesmas*, operated by the government are available in all three villages. However, workplace health and safety (on the plantations, e.g. during pesticide application), providing and utilizing protective gear is an issue. One farmer reported an injury from pesticide application that detained him from working for

a month (#11), another man, working for the Frankfurt Zoological Society showed marks on his skin from bathing in a river (#7) and across the three villages, six out of nine interviewed farmers who use pesticides, apply them with insufficient protective gear, which should include gloves, masks, long-sleeve protective outer wear, and rubber or plastic boots.

To address the above-mentioned hotspots faced by smallholders the formation of farmer groups is the first step in entering a certification process that aims at improving production practices in a sustainable manner. In the following two chapters perceived impacts of such farmer groups and RSPO certification are outlined.

4.4 Impacts of farmer groups

Forming farmer groups (*gapoktan*) is a prerequisite for smallholder certification efforts (BRANDI, 2017). Additionally, governmental aid, such as provision of inputs (seeds, subsidised fertilizer), technical or monetary support, can only be applied for as a group with a minimum collective plantation size (#1; #20). Comparing the villages Sungai Rotan and Mekar Jaya where farmers have established groups and cooperatives, with Gurun Mudo where farmers have failed at doing so, shows the benefits of collective positioning and organisation. Among these benefits is an improved bargaining position (#1; #12) saving management costs and access to certification (GD#1; GD#2). By eliminating traders from the value chain, direct distribution to mills lowers the price for FFB (#1). In this case the farmer group has the DO.



Figure 40 – Gapoktan Tanjung Sehati in Mekar Jaya. Members of the marketing division and research team in front of two trucks the group was able to purchase for FFB distribution to the mill. Photo taken by the author (2017).

In both research villages, farmer groups were supported by the NGO Setara in their formation. Further on in the certification process, members of the farmer group benefitted from trainings delivered by the NGO Setara and were assisted in bureaucratic requirements in establishing contacts to the RSPO and governmental institutions.

The main benefits obtained by members of farmer groups in Sungai Rotan and Mekar Jaya are the following:

- Knowledge transfer about oil palm cultivation (#3; #4; #5; #11; #14; #15; #16).
- Price transparency (#10; #11; #14; #16).
- Loans from cooperative and subsidised inputs (#5; #8; #10; #11; #14; #15).

Information on farming techniques is shared among members in the farmer groups, enriched by external trainings from the NGO Setara. Farmers feel more informed about plantation management (cultivation, recognizing good seeds, herbicide and pesticide usage, work safety, record keeping, RSPO P&C, environmental management).

Farmer groups are more trusted by farmers than traders in the way that farmers gain insight into pricing policies. The role as a price control entity is acknowledged as well as an increased price stability, since traders can change prices without former notice (#16). The price, farmers can sell their produce for at the farmer group is different (#14) or better (#10) from trader prices and the farmer group covers for harvest losses (#11; #14). A joined record keeping by all members of the farmer group simplifies the process for the individual farmer (#11). As already mentioned, farmers are quite insecure about documenting harvests and earnings.



Figure 41 – Entrance to the building of the farmer group Tanjung Sehati in Mekar Jaya. Signs of appropriate protective gear and protected animals are put up in front. Photo taken by the author (2017).

Subsidised inputs primarily contain fertilizers (#5) and farmers source seeds from BPKS Medan, an official distribution centre for seeds, through the farmer group (#3; #5; #11; #14; #16; #19). Costs for inputs can be paid back with the harvest and thereby farmers do not need to expend great amounts of cash (#11). Regarding financial support, the cooperative of the farmer group is a source for loans (#5; #11; #14; #16) as well as a unit, farmers can invest their savings into (#11; #16). Every member of the farmer group who sells the harvest to the group is eligible for a loan (#16) without operational costs (typical for bank loans). When installing their savings, farmers receive a profit share (#11). Interests on loans is considered *riba* in Islam and is forbidden according to the Qur'an (#11).

Some environmental and occupational health benefits can be observed since the establishment of the farmer group in Mekar Jaya: There are more fish in the river again, farmers use chemicals more wisely, they started to use natural fertilizer, the soil has improved, chemical usage has been reduced and containers of herbicides and pesticides are not used for other purposes any longer (e.g. containers for drinking water) (#11; #13). The farmer group works together with the village government on preserving water resources (e.g. prohibition to use poison for fishing) (#16), but still have difficulties in their collaboration when it comes to land rights and the process of certifying legal ownership (#11).

Furthermore, social cohesion is promoted by joining farmer groups. In Mekar Jaya the spirit of 'gotong royong' has decreased on village level but is still functioning well within the farmer

group (#15). Two farmers added that they had found friends and contacts to other farmer groups in the course of participation (#5; #14). The mutual support in the farmer group is seen as a partnership by one farmer (#8) and another farmer shares that he believes that something that is done together can generate good outcomes (#14). One farmer simply likes to be involved in organisations (#16).

In Gurun Mudo the head of the village seeks to establish a farmer group to apply for governmental aid (#17). One farmer declares he would join the farmer group for the benefits (#21).

4.5 Impacts of RSPO certification

Certification and standard setting are viewed as essential tools to promote sustainable palm oil. Smallholders can pursue certification by the RSPO under farmer groups. In two of the research villages, farmers have undergone the certification procedure. As of September 2017, farmers in Sungai Rotan had not yet completed the official certification, and the farmer group of Mekar Jaya had been RSPO-certified since 2014. In Gurun Mudo the situation is very different, since farmers reported that there is no certification scheme accessible for them (#19) or they have simply never heard of any sustainability standards for oil palm (#18). These statements repeated themselves in the focus group discussion as farmers said they had not heard of either the RSPO or ISPO, but they expressed their interest to join the certification process but said they were afraid they could not fulfil the requirements because their farming business is focused too much on economy and would not meet the environmental criteria. The participants asked how they could establish contact to an NGO that would support them in the process.

Similar to the impacts of farmer groups, the effects of RSPO certification are viewed by smallholders as positively affecting them. Even though there is no premium price scored by certified farmers (#24), several benefits are recognized by smallholders. The positive effects can be distinguished by material and immaterial gains. The former gains are generated through subsidies on fertilizers (#1; #5) and governmental aid for certified farmers. The latter are more diverse. Higher transparency on prices and yields are mentioned and one farmer explains that certified members get updated information, such as a price list for each mill, via text message (#11). Furthermore, farmers gain market access for CSPO (#1) and with their certificate they can meet the demands of the mill regarding the quality of FFB (#8). The trainings which aim at delivering RSPO P&C and good agricultural practices are embraced by farmers (#8) and the outcomes are described as knowledge transfer (#5), improvement of

cultivation methods (#8) as well as inspiration and shared knowledge (#11). One farmer says, *“it educates people to act smart”* (#13). He remembers that farmers used to apply fertilizer and pesticides without any knowledge and discharged the wastewater into rivers (#13; #14). Due to RSPO certification and trainings farmers are more educated on good agricultural practice and thus would avoid the global conflict on oil palm because the farmers would not cut down trees or destroy the land any longer, according to the farmer. The increasing awareness on environmental issues of oil palm cultivation (#2) are reflected in farmers’ comments on RSPO-induced changes of behaviour. Farmers supposedly preserve the nature by not cutting down trees on the river banks, not burning the land and reducing the use of chemical substances by following fertilizer schedules. In addition to that, the farmers are aware of expansion limitations on conflicted areas, natural forests and timber plantations, in case they wanted to extend their land (#16). According to the NGO Setara, farmers have gained benefits from implementing good agricultural practices and have gotten better results from their plantations (#2).

Despite the benefits, not all farmers want to join the RSPO certification process mostly because they do not understand the principles and criteria or the anticipated benefits (#3).

One Muslim farmer depicts a connection of sustainability criteria by the RSPO with Islamic principles.

“Rahmatan lil alamin. Islam adalah agama yang membawa rahmat dan kesejahteraan bagi seluruh alam semesta.” (#15)

Figuratively, this means that every aspect of life has to be considered, not only taking economic advantage into account but also protecting the community and the environment, according to him (#15).

The focus group discussions were concerned about challenging RSPO criteria for smallholders and how the standard could be improved to address smallholders needs and options. In Sungai Rotan participants of the discussion expressed insecurities about the criteria on record keeping (criteria 1.1, 1.2 and 4.1, cf. Table 2).

“We are being blamed by NGOs and the news for global problems, such as GHG emissions.” (GD#1)

They fear that smallholders who do not hold a certificate might be excluded from the market (GD#1). Farmers who participated in the discussion held in Mekar Jaya argued that RSPO criteria should be adjusted to smallholders’ needs and their situation and suggested the

process of *harmonisasi* (Eng. harmonization). For them the most challenging criteria are all of those that are related to the government and the legality of the land (criteria 2.1, 2.2 and 2.3, cf. Table 2) (GD#2).

5 Discussion

The discussion of the results of this study is divided into three parts. As a starting point, the identified sustainability hotspots are taken and set in context with existing findings from research. The perceptions of certain issues and various nuances of sustainability criteria are compared to scientific evidence.

In the second part, particular attention is directed to smallholders in the global palm oil value chain. Power asymmetries and perceptions in buyer-supplier relations as identified in literature are discussed on the grounds of the findings in the case study villages.

Thirdly, the findings of the case study at hand are abstracted and generalised with the help of an analytical matrix.

5.1 Perception vs. Performance

As described in the conceptual framework (cf. chapter 2), how an actor perceives his actions is not necessarily the way the action is carried out from an external perspective. This results in conformity and nonconformity of perceptions vs. performance (MERTEN et al., 2016). The interviews show the motivations of farmers behind their actions concerning oil palm cultivation. Even though deeply-rooted values or indirect limitations cannot be detected to a full extent, the results give an idea of what kind of human-nature relationship is apparent among rural farmers in Jambi. On the basis of interview statements, it is argued that oil palm smallholders generally belong to the group of “Users” of nature (cf. Table 4). This human-nature relationship “is based on an understanding of nature as a provider of services and benefits for human well-being” (YOSHIDA et al., 2017, p. 2). When talking about services and benefits derived from nature, farmers often stated that nature gives them things for free, such as food and fibre and income from farming. This user-type is in the environmental management discourse connected to the concept of provisioning ecosystem services (ibid.).

The (environmental) problem in this case study can be defined as unsustainable cultivation of oil palm. This problem originates from actions carried out by smallholder farmers in this case. These small-scale farmers are part of a more complex actors field that consists of companies,

traders, middlemen, communities, governmental institutions and NGOs. The perceptions behind the actions are part of the social background of the actors (cf. fig. 42).

Perceptions of sustainability are shaped by geographical context and cannot uniformly be applied on a global scale (H1).

The first hypothesis above can be verified insofar as perceptions of sustainability are not shared by all actors involved with palm oil around the globe. Consumers who demand CSPO have other motivations in mind than producers who engage in sustainability certification. One aspect, where local and global perceptions clearly diverge, is child labour. While culturally expected in Indonesia that children support their parents (#1), it is accepted by the RSPO under criterion 6.7 (cf. Table 2), as long as it does not interfere with the child's education and under adult supervision on family farms. The Employment Act from 1995 states that the minimum working age is 15 in Indonesia (18 years in hazardous work) (ILO, 2003). AMNESTY INTERNATIONAL published an article in 2016 denouncing global brands, such as Unilever, Nestlé and Wilmar, of profiting from child and forced labour, calling palm oil "anything but" sustainable. It must be noted though that this report addresses violations of laws because eight-year-old children were found to be involved in plantation work.

However, sustainability perceptions are not shaped by geographical context alone. The sociocultural, local context does shape values behind actions, but especially concerning sustainability values, farmers are highly influenced by external input from certification bodies and NGOs. This becomes clear when comparing sustainability definitions from farmers in villages where RSPO trainings were held and those who have not been in contact with the RSPO. There is a much more pronounced environmental connotation to the sustainability term than without RSPO input.

Principles, criteria and indicators

A major constraint in sustainable development appears to be the selection of indicators that are both comparable and context-specific. In order to reduce trade-offs between dimensions of sustainability and avoid imposing criteria that are either not relevant, not applicable or not accomplishable on actors, the harmonisation of criteria against the background of stakeholders' options and motivations becomes of highest concern.

BUCHHOLZ et al. (2009) conducted an extensive study of sustainability in bioenergy systems and looked at which indicators are taken for the various assessments available in literature. They come to the conclusion that the ad hoc approach of the triple-bottom-line (environmental, economic, social) "leaves many questions open in terms of which factors are chosen or left out,

who chooses them, how trade-offs are addressed, what feedback loops exist amongst criteria, and how they influence decisions concerning sustainability” (ibid., p. 96). Due to the fact that sustainability initiatives are formed out of political negotiations and often ignore scientific debates criteria are often not straightforward, leave too much room for interpretation, and are ambiguous in their implementation (HARMEN SMIT et al., 2013).

In order to translate criteria of sustainability discourses into measurable indicators, criteria must be made spatially explicit in order for sustainability and economic development to coexist. RASMUSSEN et al. (2017) looked at which sustainability indicators are described in peer-reviewed articles in commodity agriculture. Apart from sorting these indicators by sustainability dimensions they tried to find out what constitutes a good indicator and suggest the following: Indicators must be both country- and commodity-specific but also common and comparable. A clear goal or objective for the indicators to measure progress ought to be identified. Additionally, indicators should be cost-effective to measure and are dependent on data availability. All twelve indicators that meet the mentioned requirements and are suggested by RASMUSSEN et al., are covered in the applied SAFA framework of this case study. However, the question remains why the indicators brought forward by the FAO in the SAFA framework better serve the purpose than RSPO P&C. From talking to smallholders in the palm oil business it becomes clear that most RSPO P&C are quite complex to understand, hard to follow or simply not applicable to small-scale farming. For example, reducing GHG emissions should be the goal of sustainable agriculture, but it must be kept in mind that smallholders lack the necessary technological equipment, skills and incentive to track GHG emissions from fertilizer application. Furthermore, recording this sort of data does not necessarily contribute to changing agricultural practices. This study shows that first of all knowledge transfer of negative impacts of farming and guidance on good practice needs to be accomplished. The limited options of farmers in economic terms, and their motivation to prosper and further their children’s education and family’s wellbeing, reflects another weighting of indicators than it is common in discourses among experts, consumers and politicians from industrialized countries. Of course, this does not mean that indicators should only serve small-scale producers’ needs but informing about trade-offs and feedbacks between sustainability dimensions and target-oriented support (such as provision of machinery for replanting oil palm trees) or extension services is still lacking.

There remains high uncertainty as to which criteria best work to achieve a holistic sustainability development. Therefore, it is argued that changing the perspective and asking the primary actors which criteria are important to them and adding those to the list of general

critical is a suitable way of approaching sustainable development. The integration of local perceptions and concerns gives credit to the embeddedness of multidimensional sustainability issues faced by stakeholders (MANNING et al., 2012; MERTEN et al., 2016; OSTROM, 2009; O'TOOLE et al., 2006).

Applying the AiC-framework

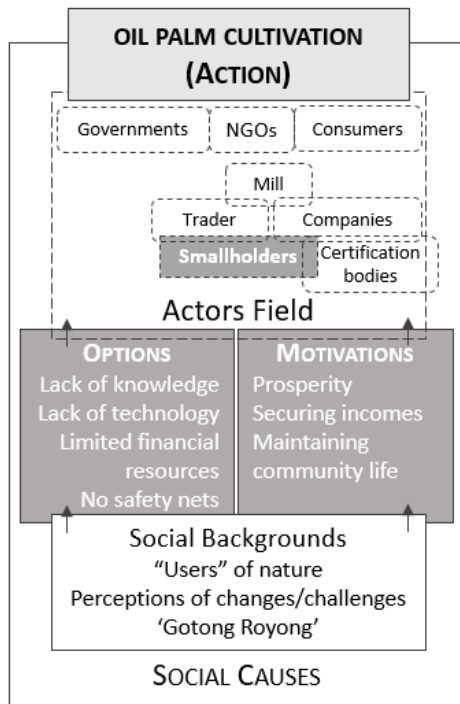


Figure 42 – Applied AiC-framework based on case study findings. Own illustration, adapted from DE GROOT (1992, p. 158).

Reaching back to the conceptual framework of this study (cf. chapter 2.1), the AiC-framework in its applied form on this case study is displayed in figure 42 on the left. The social background comprises the perceptions of changes and challenges in the smallholders' surroundings, as well as community values and the human-nature relationship, which are described further below. Motivations are dominated by economic incentives together with respect for social values, and options are rather limited due to insufficient knowledge, technology and high financial vulnerability. The actors field is rearranged and overlapping actors show interdependencies or influence. Governments, NGOs and consumers can be viewed as externally influencing actors. The several components of the AiC are described in further detail in the following sections.

Perceptions of the environmental capacity

When talking about perceptions on changes in the environment, community, or economic wellbeing, it is very important to ask for parameters which demonstrate the development. This kind of "proof" ensures that perceived changes are not exaggerated or out of context.

Interpreting farmers' statements on the ecological state it could be argued that the environmental capacity, as described by DE GROOT (1992), is almost reached. This is confirmed by scientific literature as follows. Whereas the land cover change from rainforest to plantations produces more GHG emission than existing oil palm plantations (HANSEN et al., 2015), land cover change has direct influence on land surface temperature (SABAJO et al., 2017). Compared to forests, temperatures on clear-cut land can be ten degrees higher, thus

confirming farmers perceptions of increased temperatures (ibid.). SABAJO et al. also found that regional warming effects induced by land cover change exceed those of global warming, which points out the regional impact of oil palm cultivation on the climate. Farmers have further reported a higher variability in seasons. The usual dry and rainy seasons have changed in length, intensity and starting point. As to how far the perceived change of seasons are actually caused by land conversion into oil palm plantations or whether the effects can be confirmed by climatic data, remains unclear. However, MERTEN et al. (2016) report on observations of seasonal water scarcity and prolonged dry periods by villagers, too. The same source presents evidence on droughts and floods in Jambi Province. Water shortages have occurred more often since oil palm cultivation according to villagers both in the region studied by MERTEN et al. (ibid.) and the areas in this case study. The results presented here are also in line with MERTEN et al.'s findings with regards to water consumption of oil palm plantations but link this effect more to soil properties than hydrological cycles (ibid.). Not only droughts, but floods, too, increase risks in monoculture plantations. TARIGAN (2016) have reported drastically increasing flooding frequency in Batanghari Watershed (Jambi Province) in the past 15 years in absence of extreme rainfall events and therefore identified land cover change as an impact factor. The same author presents findings in a more recent paper suggesting a minimum forest cover of at least 30% required for sustainable water flow regulation within the watershed and other ecosystem services (TARIGAN et al., 2018).

Climate change might not be the sole or primary cause of temperature changes and changing flooding patterns, but the changing land use system in its entirety, including infrastructural changes. These are apparent in an expanded road and path network, changed building properties (wooden houses vs. brick houses with roofs of corrugated sheets) and other village developments due to the oil palm boost. The effects of land use change cannot solely be explained by changes in ecosystems but are attributed to the human component in global change mechanisms, too. The temperature changes described in the results of this case study are human perceptions whose surroundings is the village with its buildings and streets. It is likely that villages are hotter than outer plantations or forests. From the three case study villages the distance to primary forests is so long that perceptions of temperatures are ascribed to surface conditions inside the village boundaries.

Even though most interviewed farmers have not experienced land conversion or deforestation of natural forest themselves, it is still a pressing issue and the effects continue occurring decades after the land cover change. Soil degradation, as one of the effects, is caused by intensive cultivation according to GUILLAUME et al. (2016). They also expect future degradation

of soils under young oil palms and conclude that almost reaching the availability of fertile land challenges sustainable agricultural intensification in Jambi province. Degradation under oil palm are expressed in compacted soils with lower carbon content and stocks, lower nitrogen content and higher bulk density than under rubber (DRESCHER et al., 2016).

Deforestation of tropical rainforest and conversion to agricultural systems lead to ecological shifts and reduce biodiversity. These effects occur among various trophic levels, from microorganisms to birds, and show both direct, indirect, and cascading patterns (BARNES et al., 2017).

Historically, growth of the palm oil sector has been delivered rather by expansion than intensification. The plantation area has been greatly expanded, while yields stagnated at around 17 tons of FFB/ha (RAYNAUD et al., 2016). According to a representative from the NGO Warsi, sustainable expansion is rather unlikely due to limited land access, which is why forests are cleared for new plantations (#9). This is prohibited by sustainability standards, such as the RSPO. However, certification on farm-scale does not generate biodiversity conservation effects as projected by certification criteria because maintenance efforts need to take place on larger landscape level (TSCHARNTKE et al., 2015). Again, this underlines the importance of scales in sustainability research as described in the conceptual framework (cf. chapter 2.3).

Economic viability traded off against environmental integrity

The major sustainability hotspot of small-scale oil palm cultivation in Jambi Province appears to be environmental integrity according to SAFA results. This finding is supported by the above-mentioned articles on ecological effects. Nonetheless, economic criteria appear to be of highest importance to farmers, which confirms the hypothesis that

smallholder farmers aiming for sustainable business and farming practices are mainly driven by economic incentives, such as maintaining and improving their livelihoods (H3).

Various interviews support this hypothesis and OSTROM (2009) points out that even though investments in sustainable resource use may create joint benefits, it still costs time and effort and could result in short-term economic losses. A representative from the NGO Setara confirmed this statement by pointing out that economic sustainability always comes first because it is important to farmers whether an action is profitable or not. Successively, environmental sustainability, soil, water, and waste issues, are of farmers' subordinate attention (#2). The SAFA assessment identified vulnerability as a hotspot in the economic dimension. Oil palm monocultures have been found to contribute to economic wellbeing of farmers because oil palm requires less labour than rubber and enables off-farm revenues or

plantation expansion, especially among those farmers who have formal land titles (KRISHNA et al., 2017; KUBITZA et al., 2018). Without these land titles, farmers are more likely to expand plantations than to intensify production of existing plantations (KUBITZA et al., 2018). Every 1% increase in area (ha) of oil palm cultivation reduces the amount of population living under poverty by 0.15 to 0.25 points (RAYNAUD et al., 2016). This puts surrounding forest land under even more pressure on the one hand but may decrease economic pressure on farmers through off-farm revenues on the other hand. Farmers welcome the economic stability since oil palm introduction but seem short-sighted when asserting that oil palm would sustain their future. Studies which have calculated economic gains often only take consumptive parameters into account and lack other aspects of socio-economic wellbeing (KUBITZA et al., 2018).

It remains open to discussion, whether these economic gains are traded off against environmental integrity through forest loss and high-intensity farming practices. Another aspect that is disregarded when praising contribution to local economies through oil palm, is the time scale. Even though short-term economic benefits are generated from farmers' perspectives, the environmental capacity will be reached at some point, endangering ecosystem productivity. The interviews and SAFA results of this case study show that oil palm might contribute to local economies but creates dependencies which make smallholders extremely vulnerable to harvest loss or price collapses.

This thesis puts forward the argument that wellbeing of small-scale farmers entails more than consumption patterns and incomes by including a socio-cultural perspective. SIBHATU AND QAIM (2016) for example, associated higher incomes from farm production diversity with a better dietary quality and diversified nutrition of farm households. VAN DEN BORN et al. (2017, p. 4) recognize three pillars linked to nature conservation: the intrinsic value of nature, an instrumental or hedonic value, expressed through consumption or economic benefit and an eudemonic value, which the authors describe as "happiness as the ultimate goal of human existence". Beyond happiness, a meaningful life can be reached by values that motivate or drive action and is shaped by people's connectedness to nature (ibid.). In this respect, nature is part of a broader concept of human wellbeing.

In order to address the economic-environmental trade-off, incentives for smallholders to promote environmental performance must be set that lead to economic gains, especially in the long-term due to increase in yields and their quality, as well as avoided destruction of natural resources that ensure future agricultural productivity.

Linkages between the governance and social dimensions

From the governance dimension, one especially relevant topic for smallholders is the rule of law, as well as tenure rights and conflicts in particular, which are associated with land cover conversion and oil palm expansion. Access to fertile land is crucial to securing incomes but is contested among rural farmers.

KUNZ et al. (2017) explain the historical roots of land tenure regulations that shape the pluralistic local land rights landscape today. KUNZ et al. (2016) recognize a gap between de jure land tenure and de facto legitimization strategies. This gap was observed during this case study, too, since many farmers reported they had *sporadik* land title, the most common proof of ownership but less binding than an official certificate (ibid.). Constraints due to insufficient land legality could be limited access to loans. Furthermore, the RSPO requires legal ownership or land-use rights in order to issue a certificate (RSPO, 2010).

Compared to jungle rubber and rubber monocultures, higher financial land productivity but lower financial labour productivity is achieved. This was found to influence crop choice by DRESCHER et al. (2016). Those farmers with limited land prefer rubber, while labour-scarce farmers prefer oil palm. Another factor influencing crop choice is generated revenue, which is lower for food crops and higher for the cash crops rubber and oil palm. An expert interview with the *Dinas Perkebunan*, Plantation Department in Jambi (#1) explained that if the price for rice would be under government control, farmers might not convert agricultural land to oil palm plantations. How far the government can and should control crop choice remains unclear. Further influence of smallholders' decision-making can be attributed to agricultural expertise, availability of seedlings, and investment costs (SCHWARZE et al., 2015).

Because of the complexity of land tenure issues and legislation JELSMA et al. (2017) votes for an actor-disaggregated approach to better address stakeholders' capabilities and capacities: Small and medium scale farmer groups would benefit from support on production practices, permits and establishing farmer groups and market access, whereas small and medium local farmers without official land titles would benefit by undergoing certification. In contrast to these smallholders who are characterized by a lack of capacity when it comes to certification, smallholders with larger plantations and those operating on peatlands show a lack of incentive for certification (ibid.).

Referring to social sustainability, performance according to the SAFA results are more positive than perceptions by the society. In an agricultural dominated region, on village-level the value of '*gotong royong*' is expressed and lived by the community (BOWEN, 1986). People engaging in

collective work without pay is typical in the observed research villages. Due to increased competition through cash crop expansion this value fades according to many villagers. Farmers explained that they miss the interaction during '*gotong royong*' activities and increasing incomes lead to people paying for communal projects, which is the alternative to participating themselves. The social life of farmers is especially impacted by the shift from labour-intensive rubber cultivation to less demanding oil palm plantation.

This land use shift implies two consequences regarding women in rural Indonesia which is defined by clear hierarchies and traditional images of females as wives and mothers. First, according to MURRAY LI (2015, p. 6) "the erosion of women's position as landholders through the registration of smallholder oil palm plots in men's names" and secondly, observed in the case study villages, the vulnerability of women in the plantation duties. The latter is due to the physically hard work required for oil palm harvesting. Women, who were capable of tapping rubber trees, are now excluded from the family farm, even though interviewees report that women and men shared the decision-making in the business and women had equal training opportunities. MURRAY LI (2015, p. 6) sees the "weak coverage of gender issues in oil palm research as symptomatic of a broad tendency in Indonesia to assume that women and men benefit equally from development schemes". The statements on equal opportunities in the interviews were exclusively by men. Observations that women are in charge of household finances are confirmed by MURRAY LI (2015).

Whether oil palm expansion offers a pathway out of poverty in the long-term remains unclear. However, an increased social mobility indicates change in this respect. Rising incomes enable farmers' children to go to university, and rising living-standards are seen as a positive development by villagers. Without going in too much detail on poverty dynamics, the question of who the future farmers will be, when almost every child has a university degree and whether the employment market satisfies all those who seek a job outside the agricultural business, arises nonetheless.

This chapter has summarized key sustainability hotspots - perceived and actually evident - of oil palm smallholders and their relevance in the scientific context. Two of the underlying hypothesis could be verified and the third one is addressed in the following chapter, concentrating on smallholders' roles in global palm oil value chains.

5.2 Smallholders' role in global value chains

Incentives to promote sustainability in palm oil sourcing via certification transfer externalities from consumer to producer countries (i.e. Indonesia) and exclude uncertified smallholder farmers from the market (H2).

Sustainable value chains are characterized by WALTHER AND SPENGLER (2010, p. 24) as “an efficient and effective coordination of material, value and information flows by all actors and activities along the product life cycle, under the consideration of economic, ecologic and social objectives to fulfil requirements from political, market and societal needs”. This study provides evidence that trade-offs between these economic, ecologic and social objectives exist, which are expressed by conservation-oriented on the one hand, and development-oriented actors on the other hand (HEIN et al., 2018).

Smallholders are a very heterogenous group. For a detailed typology of smallholders, see JELSMA AND SCHONEVELD (2016) and JELSMA et al. (2017). A short description of smallholders accounted for in this study is given in the introduction (cf. chapter 1.2) and the description of the research villages (cf. chapter 3.1). The three million smallholders growing oil palm in middle or low income countries around the world contribute to approximately 40% of global oil palm (MOHD NOOR et al., 2017). Accounting for less yields per ha than large-scale producers (JELSMA AND SCHONEVELD, 2016; NAGIAH AND AZMI, 2012) they still represent a significant stage in the value chain.

Standards for sustainability build on generally accepted criteria that in many cases ignore a divergence of practices in agriculture, which result from differences in values, traditions, financial or ecological resources. Smallholders might “fall through the cracks” of these standardized perceptions of what sustainable agriculture is supposed to look like from a western perspective. As a consequence, there is a risk of smallholder exclusion from markets for CSPO due to insufficient legal and technical support (BRANDI, 2017). It is mostly not a lack of motivation but a lack of options that smallholders face as barriers to certification. The results of this case study provide proof that the biggest obstacle to certification is access to information about the RSPO and other standards. Hence, a need has been recognized to create incentives that make the certification process accessible by smallholders (JELSMA AND SCHONEVELD, 2016). CHEYNS (2011) argues that inclusiveness of smallholders is still limited, despite efforts by the RSPO to address small-scale farmers¹⁶. In roundtables, a dichotomy of

¹⁶ For example, the RSPO Smallholders Support Fund (RSSF) (RSPO (2018e) or the RSPO Smallholder Engagement Platform RSPO (2018d).

knowledge (local and global) is expressed. Based on observations of RSPO roundtable meetings, CHEYNS states that smallholders openly disagreed with sustainability definitions put forward by NGOs and industry representatives. The RSPO as a political arena does not listen to smallholders' problems and in fact does not even question their definition of sustainability according to their observations. The NGO Setara observed similar patterns in Jambi and states that most RSPO criteria are simply not relevant to smallholders and that certification is a burden for them. It is too expensive and impossible to meet all criteria. From the NGO's point of view, the criteria focus too much on the global market, whereas farmers focus on small-scale sustainability, their personal life and direct surroundings and do not have the global market in mind. The smallholders' main goal is to improve the livelihood, preserve the land and secure future profits for their children, which they want to reach with or without sustainability certification (#2).

"Companies only have the standard, a criterion to fulfil, in mind, but have no interest in taking action to solve the actual problems." (#9, NGO Warsi, Jambi)

Conflict between large-scale producers and local villages is widespread (ABRAM et al., 2017). The often-desired support by companies is rather difficult when it comes to provision of machinery, assistance, provision of seeds, and training. As a contract-farmer the partnership scheme often means a loss of autonomy, while investors engage with smallholders simply as a means to access land and labour (MOHD NOOR et al., 2017). Based on the situation in Gurun Mudo "lack of consultation, compensation and broken promises by companies" encountered by ABRAM et al. (2017, p. 33) can be confirmed. Nonetheless, the representative from the NGO Warsi views certification as a good measure to preserve the environment but expresses doubts when certification is only used as a marketing mechanism (#9).

Flow of goods and information along the value chain

Mentioned above as the major barrier to smallholder certification, flow of information is as remarkable as non-transparent. In a globalised value chain, palm oil and its products are distributed in a one-way direction, with the exception of domestic consumption which entails that processing steps happen abroad, and producer countries then import palm oil products (OOSTERVEER, 2015). One farmer and former company employee put it this way:

"CPO is exported, Indonesia then imports oil palm products. The problem is that the processing is controlled by "some particular party", powerful people outside of Indonesia." (#22)

The statement above underlines that only the production steps of oil palm are situated in Indonesia and any profitable processing or trading is sourced out. So, how can the production phase be influenced in a way that small-scale growers still benefit from this stage in the value chain? In a study in Jambi, MANIK et al. (2013) have found that positive socio-economic development is only possible, if smallholders are insofar promoted as to work on their own plantations instead of selling their land because the development benefits will be larger. Other researchers found that contract farming leads to greater efficiency, income stability, security on the market, as well as access to capital and technology (MOHD NOOR et al., 2017). GATTO et al. (2017) differentiate between contracts signed before 1999 which proved to be more beneficial and those contracts signed afterwards. Reasons lie in better public-sector support and infrastructure investments in earlier years. In general, contracts have decreased inter-village inequality because poorer village were positively influenced by signing a contract. They vote for well-designed contracts on village level (ibid.). Due to the fact that this study focused exclusively on independent smallholders the effects on socio-economic development of contract-farming can be neither supported nor denied.

MOHD NOOR et al. (2017) look beyond sustainability criteria and principles and propose insetting of consumers' concerns. Recognizing smallholders as an important and complex segment of the global value chain, insetting seeks to bring direct benefits to smallholders. On the contrary to offsetting which is aimed at mitigating climate change effects, insetting could be achieved by companies by jointly reaching improvement of environmental outcomes in partnership with local communities. Offsetting is a financial instrument that does not connect the different parties, while insetting supports interaction of companies with local communities and farmers under contract and internalizes environmental and social impacts.

In contrast to the production steps, flow of information goes in a two-way direction. In remote villages which just have recently been connected to power and where people need to drive for one hour to reach a market for daily supplies, television and smartphones are very common, nonetheless. This technological advancement makes access to information easier. Which kind of information and through which channels information makes its way to remote smallholders is still being researched¹⁷. However, global news on palm oil critics have reached even small or remote village. This is a quite recent development, as another researcher, Yvonne Kunz, who worked in one of the villages five years ago, confirms (personal communication February 2018).

¹⁷ C02 project group within CRC: Rural-urban relations and flows and related socio-cultural transformations in rural Jambi, Indonesia <https://www.uni-goettingen.de/de/rural-urban+relations+and+flows+and+related+socio-cultural+transformations+in+rural+jambi%2C+indonesia+%28fenna+otten%29/531811.html>

The NGO Setara has recognized this obstacle and directs its support particularly to those communities who have no access to markets or extensive information and do not receive governmental support (#24).

Focus group discussions revealed that smallholders are receptive for opinions from the consumer perspective. They feel as if they are being blamed for global problems, such as GHG emissions and feel powerless to prevent global issues, such as global warming. This is why they fear, if they cannot meet criteria and do not hold a certificate for sustainable palm oil, they might be excluded from the market (GD#1). A staff member from the Frankfurt Zoological society even goes one step further by saying that smallholders have no options to change the situation because they are dependent on revenue from oil palm.

“If they [the farmers] are not allowed to earn their living by cultivating oil palm and making use of burning practices, their right to live is taken away.” (#7, Frankfurt Zoological Society)

Externalities on the producer side – is certification a solution?

The RSPO's success in catalysing a global dialogue between interest groups on both producer and consumer sites, can be measured in number of RSPO members, CSPO volumes, and number of certified supply chains, but industry-wide adoption of the standard is still missing and large consumer countries such as China and India are still not on board when it comes to sustainability concerns about palm oil (MOHD NOOR et al., 2017). This gives reason to argue, that as long as conventional markets exist uncertified smallholders will have no difficulty selling their produce and thus are not necessarily excluded from the market. However, the negative externalities from palm oil production are not experienced by consumers but are felt by producers alone. RAYNAUD et al. (2016) conducted a natural and human capital accounting and suggest an internalization of negative environmental and social externalities in prices for palm oil products via voluntary commitments, taxation or regulation that do not increase food prices for vulnerable groups of the population.

Even though oil palm cultivation may contribute to poverty reduction, it puts long-term provision of ecosystem services and socioeconomic wellbeing at risk (RAYNAUD et al., 2016). An analysis of socioeconomic development includes the distribution of power and control. In Jambi province, and presumably likewise in other producer regions, a clear top-down hierarchy is imminent. The trader controls the price, smallholders get for their FFB. Subsequently, the trader is controlled by the mill. The mill is controlled by refineries which are dependent on global markets that are under the influence of consumer demands (cf. fig 7). The results of the

SAFA assessment provide insight on hotspots in this area which include fair trading practices, accountability and vulnerability. Smallholder seem to have a decent amount of information on prices, their FFB are traded for among middlemen, mills, and companies. However, they lose track after this stage of the value chain, which is indicated by the following statements. One farmer claims to know the price of the company but not how the price is established (#19). None of the interviewed farmers sell their harvest directly to the mill, but to a trader or a middleman in possession of a delivery order (DO), adding a stage to the value chain which entails operational charges of around 300 Rp/kg FFB. Furthermore, the trader has the power to control the price because without DO, farmers are not eligible to access the market (#19). In terms of freedom to choose where to sell their harvest to, farmers report that they can choose as long as they are not indebted to a particular trader, but decided on the trader, they most trust in or offers the best price (#3; #4). Here, the advantage of forming a farmer group becomes clear. By selling FFB directly to a mill, and eliminating the trader from the value chain, higher prices can be achieved (INOBU, 2016).

Orienting on conservation, this thesis argues that environmental awareness is weak among smallholders, but certification and trainings can bring about knowledge on environmentally sound behaviour. However, since the hypothesis that smallholders focus primarily on economic outcomes is confirmed, it is clear that positive socioeconomic development is traded off against conservation of ecosystems by smallholders.

Concerning the socioeconomic and conservation effectiveness of certification, there is much doubt among researchers (BESSOU et al., 2017; BRANDI, 2017; MOHD NOOR et al., 2017; POYNTON, 2015; RIVAL et al., 2016; RUYSSCHAERT AND SALLES, 2014; TSCHARNTKE et al., 2015). Main critics of certification schemes evolve around transparency and traceability issues, lack of monitoring and external control, too much room for interpretation of P&C as well as insufficient stakeholder engagement.

But how can consumers support sustainable palm oil by their consumption choices in the certification jungle? RIVAL et al. (2016) question the reliability on existing standards and ask, whether one can build confidence from labels. They identify traceability gaps due to insufficient inclusiveness of independent smallholders. CHEYNS (2011) sees limitations to the “inclusiveness paradigm” insofar as multi-stakeholder initiatives are still characterized by unequal and asymmetric participation. This is partially caused by alternative forms of legitimacy which are not accommodated by standards. KUNZ et al. (2016) confirm this “mimicry of the legal”, particular with regards to land tenure.

Consumer awareness of palm oil critics is rising leading to a demand for transparency, traceability¹⁸, and ability to rely on accurate standards. The generally negative image of palm oil among customers, is found evident by various studies (AGUIAR et al., 2017; ZOLLER). However, knowledge and awareness about palm oil is not evenly pronounced. Many consumers are unsure about estimating their consumption due to insufficient labelling on products. Some consumers decide to ban palm oil from their diet instead of opting for CSPO to avoid negative impacts of the product. Taking consumers' inquiries on palm oil sources seriously is inevitable for palm oil processing companies, retailers and caterers to maintain their reputation (ZOLLER). Similar to how sustainability standard criteria do not necessarily reflect producers' perceptions of sustainability, general sustainability agendas do not ultimately influence consumer choices. Palm oil is perceived as a minimal ingredient and thus, consumers are unlikely to stop consuming. Sustainability, in general, is subordinate to other parameters, for instance taste, quality, cooking properties and healthiness. Negative images of unsustainable palm oil such as resource depletion, dominate positive images such as poverty reduction (AGUIAR et al., 2017).

POYNTON (2015, p. 18) makes clear that certification "cannot deliver the deep, transformational change, we require". This has been found true by this case study with certain exceptions. Oil palm cultivation can lift smallholders out of poverty, but only for a certain time frame. Long-term economic effects of smallholder oil palm cultivation have not been studied due to the fact that smallholders started cultivating palm oil independently only two decades ago. The upcoming replanting phase will constitute major challenges to the economic livelihoods of farmers. It is clear that RSPO P&C need revising and adaption to smallholders' needs and capabilities in order to address both conservation and poverty reduction goals.

At this point in time, this thesis agrees with what MOHD NOOR et al. (2017, p. 1) say:

"We argue that certification, although certainly important, will not be able to deliver expected environmental and social benefits because of (1) an uneven distribution of incentives along the value chain, (2) traceability issues, (3) difficulties associated with an expanding market, and (4) alternative low standard markets to the standard large OECD markets."

¹⁸ Several online platforms to trace palm oil and other agricultural products are available but limited to commodities produced by large-scale farming, for example: **PalmTrace** by RSPO (<https://rspo.org/palmtrace>), **SPOTT** (<https://www.spott.org/palm-oil/>) and **TRASE** (<https://trase.earth/>). The **SNV Traceability Tool** is the first tool to include smallholders (<http://www.snv.org/update/traceability-tool-empowers-independent-oil-palm-farmers-jambi-indonesia>).

Often referred to as the “golden crop” (MOHD NOOR et al., 2017), lifting people out of poverty, palm oil does not measure up to the expectations and is found not to be a very suitable crop for smallholders out of many reasons. High upfront investments and expertise requirements paired with high costs for farming input and physically hard labour demands during mature stages of plantations as well as the need of large machinery to prepare plantations for replanting make smallholder farmers struggle (ibid.). The loss of autonomy, binding unfavourable contracts with companies, mills and traders, monoculture plantation systems, and lack of legitimacy in terms of land ownership make smallholders extremely vulnerable to climate change, pests, price collapses and shifts of the market.

5.3 “Of what is this a case?”

This case study provides versatile results that can be set in context with peer-reviewed literature from social and political ecology and other social science disciplines. So, what are these results a case of? LUND (2014, p. 224) describes a case as “not natural, but a mental, or analytical, construct aimed at organizing knowledge about reality in a manageable way”. Sustainability as a three- or four-dimensional construct that presents countless and complex trade-offs, feedbacks on various scales, can neither be evenly described nor analysed. Some aspects recede into the background, so this chapter tries to highlight the main conclusions and how they are significant, explanatory and transferable.

An analytical matrix is proposed by LUND (2014) that differentiates between specific to general and concrete to abstract as two continua (cf. Table 6).

Table 6 – Analytical Matrix by LUND (2014).

	Concrete	Abstract
Specific	Observations	Concepts
General	Patterns	(Theories)

Data analysis enabled breaking complex issues into smaller parts. The conceptual framework constitutes the context of the findings. Some key virtues of natural sciences cannot be applied in social

qualitative research, such as proof, prediction or cumulative accretion of knowledge (LUND, 2014). Valuable knowledge is still produced, however often ambiguous or dependent on scale. The personal “stories” behind smallholders’ perceptions and performance is what forms this thesis. Perceptions of people towards a certain topic are always *specific* since they occur at a precise place to a precise time in history. Although some perceptions seem inexplicable, they are still *concrete* as they are influenced by concrete conditions in a particular village or socio-cultural setting. So, how can one generalize or abstract this information to form knowledge? It

is important to note that as the reflective observer (as described by DE GROOT (1992)), the researcher is led by a priori concepts formed by her own values or experiences (which in this case, is the western concept of sustainability). However, it was not intended to be completely objective, since methodology included participant observation, a conceptual framework and hypothesis were chosen, and perceptions are deeply-held notions that cannot be detected objectively from the outside.

Generalisation can be achieved empirically or analytically. The latter is referred to as abstraction by LUND (2014). Because it is impossible to collect all data from all actors in the studied group, “generalization from some observations to the group as such is inevitable” (ibid., p. 226). Describing patterns is a good way to avoid transferring a single statement to the whole of a group or to view singular events as typical. Focus group discussions proved to be a suitable tool in this regard. Statements from interviews were recapitulated, set in context, and elaborated, thus providing more general evidence, while not universalizing. For example, some interviews had revealed a rather economic focus of sustainability by farmers, and later in the focus group discussions environmental issues were merely mentioned in their impact on economic parameters, e.g. how declines in soil fertility harm future harvests.

Abstracting a case entails the choice of geographical contextualization, in this case rural Jambi Province in Indonesia. This region was selected by the CRC 990 as a frontier of agricultural expansion and thus makes perceptions towards sustainability highly relevant. The chosen conceptual framework of AiC is quite abstract to begin with. The goal of this thesis was to imbed the case study into an actors field and detect smallholders’ options and motivations. Results of this study show how primary actors (smallholders) are influenced by secondary actors (NGOs, government, consumers, certification bodies) and are driven by their social background in their options and motivations to act. How the impacts of these actions are interrelated with norms and the environmental capacity of the ecological basis is explained by scientific findings from other researchers in the same geographical location.

Table 7 – Filled in analytical matrix with data. Own illustration, adapted from LUND (2014).

	Concrete	Abstract
Specific	Observed sustainability hotspots and perceptions	Actions are influenced by social and environmental contexts (AiC)
General	Economic sustainability is prioritized, environmental awareness is weak	(Theories)

This thesis was not aiming at forming theories, which would be a combination of generalisations and abstractions (thus placed in brackets in Table 7) but seeks to contribute to bridging the practitioner-researcher divide, identified by RASMUSSEN et al. (2017) as it presents a shift of perspective from western, theoretical views of sustainability to the “stories” of smallholders that are equally or even more important to achieve sustainable development.

Limitations of the case study and its methodology

As already mentioned throughout the forgoing chapters, several limitations were encountered during data collection and evaluation. One imminent limit is the scope. As a case study, it only represents a selected number of villages and therefore results can deviate from perceptions of sustainability by other village communities in Jambi Province as well as other producer regions of palm oil. Several varying conditions, such as abundance of natural resources, land use, location, proximity to rivers, companies, or cities, as well as access to information and support from the government or NGOs might change the entire picture of small-scale sustainability for smallholders. Generalisation is only possible within the conceptual framework of this thesis. The selected research villages and interviewees are not representative, and their selection followed grounded theory and the snowball sampling method. However, qualitative data needs to ensure that statements are not set into wrong contexts in course of interpretation by the researcher. Interpretations require argumentation and evidence from peer-reviewed literature to avoid bias. Between village stays, the days spent in Jambi proved to be suitable to regain neutrality and helped to reflect on previous interviews and adjust further ways of approaching village communities.

A major obstacle affecting data generation is the language barrier between researcher and interviewees. This explains the need for a research assistant in the field. Her work facilitated acclimatisation and integration within the local communities in the research villages and elucidated intercultural difficulties. Even though her level of fluency in English was sufficient for the research context, loss of information due to translation is inevitable.

Misunderstandings between researcher and assistant happened due to the very limited language skills of the researcher in Bahasa Indonesia. Later crosschecking of interview protocols and audio files revealed such discrepancies, which decreased over time because suggestive, biased, too direct or too vague formulation of questions were avoided with increasing interviewing skills. While the work with the assistant constituted some challenges, it was invaluable at the same time. The assistant's experience with another researcher of the CO2 project within CRC 990 made her comfortable in most interview situations and had made her familiar with the broader research topic. The assistant who arranged accommodation, interview dates, and moderated meetings at the local government delivered professionalism and acceptance to the interviewees and made locals more familiar and confident. On account of misapprehensions, the assistant communicated and translated both literal information and cultural and social setting, which enabled participative observation. Acceptance of the researcher was positively influenced by former encounters of the villagers with foreign researchers of the CRC. However, the researcher being a German white woman in her 20s, made data generation and analysis somewhat biased. Religion and marital status of the researcher were always of high concern to villagers in rural Jambi.

Whether the method of focus group discussion was delivered successfully, was dependent on group composition, place, time, distraction, mood and interest of the participants. The researcher experienced a welcoming atmosphere during these group discussions and participants voluntarily joined the interview showed great interest in the topic. During the discussions, it was always the case that only few participants discussed actively, and many of them adopted opinions and statements of former speakers. This interactive method provided high-quality data but also took a lot of time and effort to prepare and follow-up.

Audio and video recording were agreed to rather sceptical by the participants but once anonymization and the aim of the study were explained, people were more confident in the situation. When selecting participants, some were insecure as to what knowledge level they would need to have to answer a question. Since the research topic was not about right or wrong answers, it was explained that the questions asked for personal opinions, experiences and perceptions. Sometimes it was inevitable to give examples when asking questions.

The standardised part of the applied methodology, the SAFA framework, constituted some particular challenges in addition to those mentioned above. Some questions from the assessment needed adjustment to the case of oil palm cultivation, others were left out or not asked directly because of topic sensitivity, such as sources of loans. Other questions were not relevant at all, namely questions about access to drinking water or basic nutrition since this

was ensured in all research villages. For some questions, technical terms needed to be simplified, for example when asking about agricultural practices. Albeit thorough checking, the calculation of sustainability hotspots as indicated in the polygon illustration could be affected by mathematical error.

The OECD predefines some key attributes of sustainability assessments, the ex-ante and ex-post examination which assess the “positive and negative, primary and secondary long-term effects [...], directly or indirectly, intended or unintended” (2002, p. 24). These attributes are constricted by GEIBLER (2013), insofar as not all effects can be considered with a sustainability assessment and he states that assessments should collect as many relevant aspects as possible regarding sustainable development. This guidance was followed when conducting SAFA interviews with the fact in mind that sustainability assessments need to be flexible for different spatial and temporal scales in order to be successful and need to be applied to each case independently (BUCHHOLZ et al., 2009).

Further research needs and outlook

This thesis aimed at building knowledge of local perceptions of sustainability. Further research should focus on how these local perceptions could be integrated in policy making, how standard criteria could be adjusted to be receptive for small-scale capabilities and capacities and if alternatives, such as the Macaúba palm (CÉSAR et al., 2015; PLATH et al., 2016), could release some of the pressure on the producer regions of palm oil and their resources. Indirect effects of oil palm expansion should attract more attention in research, such as developments in the community life, gender aspects and livelihood diversification strategies. In the near future, most interestingly will be accomplishing the replanting phase of those plantations which are no longer safe to harvest or have become less productive.

6 Final conclusions

Sustainability criteria expressed through standards by the consumer countries are highly dissociated from the reality of smallholders in the producer countries. A gap exists between the supply and demand sides in their perceptions of sustainable palm oil. It has become clear that the question is not who to blame, but how to integrate perceptions and challenges of various stakeholders to build a differentiated approach to sustainable development in the palm oil sector. In order to minimize trade-offs between sustainability dimensions the mediation between scales, both geographical and temporal, is of high importance. Intergenerational justice, as put forward since the earliest sustainability definitions have arisen, receives little attention among rural villagers. Instead, an increasing social mobility is pursued by being able to afford education for children and hoping for a better future for them outside of the farming business.

Two major challenges appear to influence the fate of smallholders' oil palm production: environmentally sound practices and vertical integration of smallholders in the value chain. If the power asymmetrically exerted by one group continues to control another group of stakeholders, who contributes more than a third to the global production area, fair socio-economic development seems unlikely.

In this bottom-up case study, the focus was laid on the primary producers and their notions of sustainability. Economic stability and prosperity are at the top of the list to ensure viability of households and the people living in it. Nature is seen as a provider of food, building materials, and as an energy source. This economic connotation is certainly influenced by international certification criteria. The incentives to join certification are often-promised economic gains, while in the course of the certification process and its trainings, farmers increasingly recognize the environmental impacts of oil palm cultivation. However, environmental awareness alone does not stimulate environmentally friendly behaviour. To give an example: On the one hand, farmers have learnt not to wash fertilizer equipment directly in the river because it can cause water pollution. Instead, they wash it on the plantation, where the soil might take up residues. On the other hand, a fertilizer schedule is recommended to meet the soils' needs and avoid inappropriate dosage, but farmers continue to apply fertilizer based on budget. Ecological sound behaviour, such as the usage of natural fertilizer, is often associated with economic losses through declining yields.

In general, increased consumption is a sign of an economic boost, experienced by smallholders, but it is a matter of time, how long these economic gains will endure, when natural resources

are continued to be exploited at such an alarming pace, especially when oil palm expansion proceeds in the forest frontier.

Emphasis was also put on community life by the villagers, who have experienced growing competition and social value erosion in their communities. Many farmers argue that changes in the environment, such as pollution, waste, soil degradation or changes in precipitation and temperature are natural or controlled by god, the companies, or the mills. This could be a justification to refuse responsibility and causal links, that connect farming activities with climate change. Climate change is seen as a global problem and outside of local people's reach.

In fact, people are seemingly always expecting the government to "do something" about the problems they face and reactive instead of proactive mitigation measures are favoured. An example is the installation of a water pump in one village to cover prolonged droughts, while farmers often refuse to acknowledge that changes in the hydrological systems could be induced by oil palm expansion.

Continuous harmony between sustainability dimensions and the diverse incentives along the value chain is unlikely to be achieved. However, a fairly clear understanding of the sustainability issues and many of their interrelations has been reached through scientific debates and studies. Hence, what is now needed, is political will to change habits (HARMEN SMIT et al., 2013), and the industry to have long-term goals to protect Indonesian natural resources and communities, and not only short-term profits or a standard to fulfil in mind. Because oil palm is a productive plant that needs less land than other oil seed crops, adaption of cultivation practices is necessary instead of boycotting a commodity without sustainable alternatives.

Personal reflections

In the course of researching, conducting this case study and writing this thesis I have learnt a lot about why achieving sustainability is so difficult. I realised how arrogant we are when we expect rural communities to keep up with our sustainability demands. And how ignorant we are, when we say, these communities should not focus on the economic gains at the expense of the Orangutan, the Sumatran tiger and the tropical rainforests.

We, as an industrialised country, have gone through the mistakes of environmental destruction and our rivers were not safe to drink from at some point and are still polluted, too. Our surroundings consist of large fields for corn, grains, vegetables and oilseeds, too. We have eliminated forests to plant food and cash crops, too.

So, how can we expect Indonesians not do the same mistakes? Or, how can scientific knowledge contribute to improving the situation, without just imposing sustainability criteria onto local communities? And is there really an alternative to intensified agricultural production that does not compromise ecosystem services? Our world's population grows, the middle classes are on the rise, we want more things, more food and more energy and we want them cheaper and easily accessible at all times. And we want to put labels on things to clear our conscience.

Of course, Indonesians tell you that palm oil is the golden crop. It has created jobs, income, and development in rural areas. POYNTON (2015, p. 61) asks "What about a government which is supposed to help people out of poverty – how does it trade off the desire to protect forests with the development of poor communities?". Now, who is able to answer that? I am not.

Qualitative research has its perks because it unravels answers to questions that no experiment, model or calculation could give. My goal was to write about perceptions of small-scale oil palm farmers. Leaving my own comfort zone and going to Indonesia was a big adventure. It has taught me more than I can put into a short paragraph. Listening to and telling you, my readers, the people's stories is my pleasure.

So, coming back to the introductory paragraph of this master thesis, I am still asking myself who is right, or who is entitled to be heard more.

References

- ABRAM, N. K., MEIJAARD, E., WILSON, K. A., DAVIS, J. T., WELLS, J. A., ANCRENAZ, M., BUDIHARTA, S., DURRANT, A. AND FAKHRUZZI, A., et al. (2017) 'Oil palm–community conflict mapping in Indonesia: A case for better community liaison in planning for development initiatives', *Applied Geography*, vol. 78, pp. 33–44.
- ACOSTA-MICHLIK, L., LUCHT, W., BONDEAU, A. AND BERINGER, T. (2011) 'Integrated assessment of sustainability trade-offs and pathways for global bioenergy production: Framing a novel hybrid approach', *Renewable and Sustainable Energy Reviews*, vol. 15, no. 6, pp. 2791–2809.
- AGUIAR, L. K., MARTINEZ, D. C. AND CALEMAN, S. M. Q. (2017) 'Consumer Awareness of Palm Oil as an Ingredient in Food and Non-Food Products', *Journal of Food Products Marketing*, vol. 16, no. 1, pp. 1–14.
- ALASUUTARI, P., BICKMAN, L. and BRANNEN, J. (2008) *The SAGE handbook of social research methods*, Los Angeles, CA, SAGE.
- AMNESTY INTERNATIONAL (2016) *Palm Oil: Global brands profiting from child and forced labour* [Online]. Available at <https://www.amnesty.org/en/latest/news/2016/11/palm-oil-global-brands-profiting-from-child-and-forced-labour/> (Accessed 13 March 2018).
- BARNES, A. D., ALLEN, K., KREFT, H., CORRE, M. D., JOCHUM, M., VELDKAMP, E., CLOUGH, Y., DANIEL, R. AND DARRAS, K., et al. (2017) 'Direct and cascading impacts of tropical land-use change on multi-trophic biodiversity', *Nature ecology & evolution*, vol. 1, no. 10, pp. 1511–1519.
- BAUDOIN, A., BOSCH, P.-M., MOULIN, M., WOHLFAHRT, J., MARICHAL, R., CALIMAN, J.-P. AND BESSOU, C. (2015) 'Linking the transformation of production structures to a multidimensional sustainability assessment grid of smallholders' oil palm plantations', *International Journal of Sustainable Development & World Ecology*, vol. 22, no. 6, pp. 520–532.
- BESSOU, C., RIVAL, A., LEVANG, P., FEINTRENIE, L., BOSCH, P.-M., CHEYNS, E., DJAMA, M., WOHLFAHRT, J. and MARICHAL, R., et al. (2017) *Sustainable Palm Oil Production project synthesis: Understanding and anticipating global challenges*, Center for International Forestry Research (CIFOR).
- BOONS, F. AND MENDOZA, A. (2010) 'Constructing sustainable palm oil: How actors define sustainability', *Journal of Cleaner Production*, vol. 18, 16-17, pp. 1686–1695.
- BOWEN, J. R. (1986) 'On the Political Construction of Tradition: Gotong Royong in Indonesia', *The Journal of Asian Studies*, vol. 45, no. 3, p. 545.

- BRACK, D., GLOVER, A. AND WELLESLEY (2016) *Agricultural Commodity Supply Chains: Trade, Consumption and Deforestation* [Online], Chatham House. The Royal Institute of International Affairs. Available at <https://www.chathamhouse.org/sites/files/chathamhouse/publications/research/2016-01-28-agricultural-commodities-brack-glover-wellesley.pdf> (Accessed 30 March 2018).
- BRANDI, C. A. (2017) 'Sustainability Standards and Sustainable Development - Synergies and Trade-Offs of Transnational Governance', *Sustainable Development*, vol. 25, no. 1, pp. 25–34.
- BRANDI, C. A., CABANI, T., HOSANG, C., SCHIRMBECK, S., WESTERMANN, L. AND WIESE, H. (2015) 'Sustainability Standards for Palm Oil: Challenges for Smallholder Certification Under the RSPO', *The Journal of Environment & Development*, 24 (3), pp. 292–314.
- BRUNDTLAND, G. H. (1991) *Our common future*, 13th edn, Oxford, Univ. Press.
- BUCHHOLZ, T., LUZADIS, V. A. AND VOLK, T. A. (2009) 'Sustainability criteria for bioenergy systems: Results from an expert survey', *Journal of Cleaner Production*, vol. 17, pp. S86-S98.
- BUNDESMINISTERIUM FÜR WIRTSCHAFTLICHE ZUSAMMENARBEIT UND ENTWICKLUNG (2018) *Siegelklarheit: Roundtable on Sustainable Palm Oil* [Online]. Available at <https://www.siegelklarheit.de/RSPO-c31> (Accessed 4 March 2018).
- CÉSAR, A. D. S., ALMEIDA, F. D. A., SOUZA, R. P. de, SILVA, G. C. AND ATABANI, A. E. (2015) 'The prospects of using *Acrocomia aculeata* (macaúba) a non-edible biodiesel feedstock in Brazil', *Renewable and Sustainable Energy Reviews*, vol. 49, pp. 1213–1220.
- CHEYNS, E. (2011) 'Multi-stakeholder Initiatives for Sustainable Agriculture: Limits of the 'Inclusiveness' Paradigm', in Ponte, S., Gibbon, P. and Vestergaard, J. (eds) *Governing through standards: Origins, drivers and limitations*, Basingstoke, Palgrave Macmillan, pp. 318–354.
- CRC 990 (2017) *Publications* [Online]. Available at <https://www.uni-goettingen.de/de/publications/412214.html> (Accessed 8 January 2018).
- CREATIVE COMMONS (2016) *Three strategies towards sustainability: Identifying examples of efficiency, consistency and sufficiency* [Online]. Available at <https://www.endlich-wachstum.de/kapitel/materials-in-english/methode/three-strategies-towards-sustainability/> (Accessed 11 March 2018).
- DE GROOT, W. T. (1992) *Environmental Science Theory: Concepts and Methods in a One-World, Problem-Oriented Paradigm*, Amsterdam, Elsevier.
- DESA GURUN MUDO (2015) *RPJM Desa Gurun Mudo (2016-2021)*.

- DESA MEKAR JAYA (2014) *LPPDES Desa Mekar Jaya Tahun Anggaran*.
- DESA SUNGAI ROTAN (2015) *Peraturan Desa: Tentang. Rencana Pembangunan Jangka Menengah Desa (RPJMDes) Tahum 2015-2019*.
- DRESCHER, J., REMBOLD, K., ALLEN, K., BECKSCHÄFER, P., BUCHORI, D., CLOUGH, Y., FAUST, H., FAUZI, A. M. AND GUNAWAN, D., et al. (2016) 'Ecological and socio-economic functions across tropical land use systems after rainforest conversion', *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*, vol. 371, no. 1694.
- EULER, M., SCHWARZE, S., SIREGAR, H. AND QAIM, M. (2016) 'Oil Palm Expansion among Smallholder Farmers in Sumatra, Indonesia', *Journal of Agricultural Economics*, vol. 67, no. 3, pp. 658–676.
- FAO (2015) 'SAFA Smallholders App: User Manual Version 2.0.0'.
- FAO (2018) *Sustainability Pathways: SAFA APP* [Online]. Available at <http://www.fao.org/nr/sustainability/sustainability-assessments-safa/safa-app/en/> (Accessed 3 January 2018).
- FRIIS, C. AND NIELSEN, J. (2017) 'On the System. Boundary Choices, Implications, and Solutions in Telecoupling Land Use Change Research', *Sustainability*, vol. 9, no. 6, p. 974.
- GATTO, M., WOLLNI, M., ASNAWI, R. AND QAIM, M. (2017) 'Oil Palm Boom, Contract Farming, and Rural Economic Development: Village-Level Evidence from Indonesia', *World Development*, vol. 95, pp. 127–140.
- GAYATRI, S. (2016) *Aspects of sustainability of smallholder beef cattle farming in Semarang Regency, Central Java Province, Indonesia*, Tjele, Department of Science and Technology, Aarhus University.
- GEIBLER, J. von (2013) 'Market-based governance for sustainability in value chains: Conditions for successful standard setting in the palm oil sector', *Journal of Cleaner Production*, vol. 56, pp. 39–53.
- GLASER, B. G. and STRAUSS, A. L. (2008) *The discovery of grounded theory: Strategies for qualitative research*, Princeton, NJ, Recording for the Blind & Dyslexic.
- GLOBAL FOREST WATCH (2016) *Protecting forests & peatlands in Indonesia* [Online]. Available at <http://www.greenpeace.org/seasia/id/Global/seasia/Indonesia/Code/Forest-Map/en/index.html> (Accessed 11 January 2018).
- GREEN PALM (2016) *GreenPalm: Supporting certified sustainable palm oil* [Online]. Available at <http://www.greenpalm.org/> (Accessed 4 March 2018).

- GUILLAUME, T., HOLTkamp, A. M., DAMRIS, M., BRÜMMER, B. AND KUZYAKOV, Y. (2016) 'Soil degradation in oil palm and rubber plantations under land resource scarcity', *Agriculture, Ecosystems & Environment*, vol. 232, pp. 110–118.
- HANSEN, S. B., PADFIELD, R., SYAYUTI, K., EVERS, S., ZAKARIAH, Z. AND MASTURA, S. (2015) 'Trends in global palm oil sustainability research', *Journal of Cleaner Production*, vol. 100, pp. 140–149.
- HARMEN SMIT, H., MEIJAARD, E., VAN DER LAAN, C., MANTEL, S., BUDIMAN, A. AND VERWEIJ, P. (2013) 'Breaking the link between environmental degradation and oil palm expansion: a method for enabling sustainable oil palm expansion', *PLoS one*, vol. 8, no. 9, pp. e68610.
- HARTMANN, F., MERTEN, J., FINK, M. AND FAUST, H. (2018) 'Indonesia's Fire Crisis 2015: A Twofold Perturbation on the Ground', *Pacific Geographies*, no. 49, pp. 4–11 [Online]. Available at http://pacific-geographies.org/wp-content/uploads/2018/02/PG49_FHartmann_et_al.pdf (Accessed 11 March 2018).
- HEIN, J. (2016) *Rescaling conflictive access and property relations in the context of REDD+ in Jambi, Indonesia* [Online]. Available at <http://hdl.handle.net/11858/00-1735-0000-0028-8778-6>.
- HEIN, J., FAUST, H., KUNZ, Y. AND MARDIANA, R. (2018) 'The Transnationalisation of Competing State Projects: Carbon Offsetting and Development in Sumatra's Coastal Peat Swamps', *Antipode*, vol. 45, no. 1, p. 188.
- IISD (2014) *The state of sustainability initiatives review 2014: Standards and the green economy*, Winnipeg, Manitoba, London [England], Beaconsfield, Quebec, International Institute for Sustainable Development; International Institute for Environment and Development; Canadian Electronic Library.
- ILO (2003) *Indonesian Labour Law - Act 13 of 2003* [Online]. Available at <http://www.ilo.org/dyn/travail/docs/760/Indonesian%20Labour%20Law%20-%20Act%2013%20of%202003.pdf> (Accessed 13 March 2018).
- INDEXMUNDI (2017) *Country Facts* [Online]. Available at <https://www.indexmundi.com/> (Accessed 30 March 2018).
- INOBU (2016) *A Profile of Small-scale Oil Palm Farmers and The Challenges of Farming Independently: The Case of Seruyan and Kotawaringin Barat Districts in Central Kalimantan, Indonesia* [Online]. Available at http://newsite.inobu.org/wp-content/uploads/2016/11/INOBU_Smallholders_Final.pdf.
- IVANCIC, H., KOH, L. P. AND WICH, S. (2016) 'Evolution of sustainable palm oil policy in Southeast Asia', *Cogent Environmental Science*, vol. 2, no. 1, p. 562.

- JELSMA, I. and SCHONEVELD, G. C. (2016) *Towards more sustainable and productive independent oil palm smallholders in Indonesia: Insights from the development of a smallholder typology*, Center for International Forestry Research (CIFOR).
- JELSMA, I., SCHONEVELD, G. C., ZOOMERS, A. AND VAN WESTEN, A.C.M. (2017) 'Unpacking Indonesia's independent oil palm smallholders: An actor-disaggregated approach to identifying environmental and social performance challenges', *Land Use Policy*, vol. 69, pp. 281–297.
- KRISHNA, V., EULER, M., SIREGAR, H. AND QAIM, M. (2017) 'Differential livelihood impacts of oil palm expansion in Indonesia', *Agricultural Economics*, vol. 48, no. 5, pp. 639–653.
- KUBITZA, C., KRISHNA, V. V., ALAMSYAH, Z. AND QAIM, M. (2018) 'The Economics Behind an Ecological Crisis: Livelihood Effects of Oil Palm Expansion in Sumatra, Indonesia', *Human Ecology*, vol. 8, no. 1, p. 58.
- KUMAR, D. AND RAHMAN, Z. (2015) 'Sustainability adoption through buyer supplier relationship across supply chain: A literature review and conceptual framework', *International Strategic Management Review*, vol. 3, 1-2, pp. 110–127.
- KUNZ, Y. (2016) *Landscape transformation in Jambi province, Sumatra - An analysis of land tenure regulations under translational dynamics* (Dissertation, University of Göttingen) [Online]. Available at <http://hdl.handle.net/11858/00-1735-0000-0028-875A-A>.
- KUNZ, Y., HEIN, J., MARDIANA, R. AND FAUST, H. (2016) 'Mimicry of the Legal: Translating de jure Land Formalization Processes Into de facto Local Action in Jambi province, Sumatra', *ASEAS - Österreichische Zeitschrift für Südostasienwissenschaften*, 9 (1), pp. 127–145.
- KUNZ, Y., STEINEBACH, S., DITTRICH, C., HAUSER-SCHÄUBLIN, B., ROSYANI, I., SOETARTO, E. AND FAUST, H. (2017) 'The fridge in the forest': Historical trajectories of land tenure regulations fostering landscape transformation in Jambi Province, Sumatra, Indonesia', *Forest Policy and Economics*, vol. 81, pp. 1–9.
- LAUMONIER, Y., URYU, Y., STÜWE, M., BUDIMAN, A., SETIABUDI, B. AND HADIAN, O. (2010) 'Eco-floristic sectors and deforestation threats in Sumatra: Identifying new conservation area network priorities for ecosystem-based land use planning', *Biodiversity and Conservation*, vol. 19, no. 4, pp. 1153–1174.
- LEVY, D. L. (2008) 'Political Contestation in Global Production Networks', *Academy of Management Review*, vol. 33, no. 4, pp. 943–963.
- LUND, C. (2014) 'Of What is This a Case?: Analytical Movements in Qualitative Social Science Research', *Human Organization*, vol. 73, no. 3, pp. 224–234.

- MANIK, Y., LEAHY, J. AND HALOG, A. (2013) 'Social life cycle assessment of palm oil biodiesel: A case study in Jambi Province of Indonesia', *The International Journal of Life Cycle Assessment*, vol. 18, no. 7, pp. 1386–1392.
- MANNING, S., BOONS, F., HAGEN, O. von and REINECKE, J. (2012) 'National contexts matter: The co-evolution of sustainability standards in global value chains', *Ecological Economics*, vol. 83, pp. 197–209.
- MAYRING, P. (2002) *Einführung in die qualitative Sozialforschung: Eine Anleitung zu qualitativem Denken*, 5th edn, Weinheim, Beltz.
- MERTEN, J., RÖLL, A., GUILLAUME, T., MEIJIDE, A., TARIGAN, S., AGUSTA, H., DISLICH, C., DITTRICH, C. AND FAUST, H., et al. (2016) 'Water scarcity and oil palm expansion: Social views and environmental processes', *Ecology and Society*, vol. 21, no. 2.
- MOHD NOOR, F. M., GASSNER, A., TERHEGGEN, A. AND DOBIE, P. (2017) 'Beyond sustainability criteria and principles in palm oil production: Addressing consumer concerns through inseting', *Ecology and Society*, vol. 22, no. 2.
- MONGABAY (2018) *Outrage and conspiracy claims as Indonesia, Malaysia react to EU ban on palm oil in biofuels* [Online]. Available at <https://news.mongabay.com/2018/01/outrage-and-conspiracy-claims-as-indonesia-malaysia-react-to-eu-ban-on-palm-oil-in-biofuels/> (Accessed 2 March 2018).
- MUHAR, A., RAYMOND, C. M., VAN DEN BORN, R. J.G., BAUER, N., BÖCK, K., BRAITO, M., BUIJS, A., FLINT, C. AND GROOT, W. T. de, et al. (2017) 'A model integrating social-cultural concepts of nature into frameworks of interaction between social and natural systems', *Journal of Environmental Planning and Management*, vol. 31, no. 3, pp. 1–22.
- MUKHERJEE, I. AND SOVACOO, B. K. (2014) 'Palm oil-based biofuels and sustainability in southeast ASIA: A review of Indonesia, Malaysia, and Thailand', *Renewable and Sustainable Energy Reviews*, vol. 37, pp. 1–12.
- MURADIAN, R., ARSEL, M., PELLEGRINI, L., ADAMAN, F., AGUILAR, B., AGARWAL, B., CORBERA, E., EZZINE DE BLAS, D. AND FARLEY, J., et al. (2013) 'Payments for ecosystem services and the fatal attraction of win-win solutions', *Conservation Letters*, vol. 6, no. 4, pp. 274–279.
- MURRAY LI, T. (2015) *Social impacts of oil palm in Indonesia: A gendered perspective from West Kalimantan*, Center for International Forestry Research (CIFOR).
- NAGIAH, C. AND AZMI, R. (2012) 'A Review of Smallholder Oil Palm Production: Challenges and Opportunities for Enhancing Sustainability- A Malaysian Perspective', *Journal of Oil Palm and the Environment*, vol. 3, no. 12, pp. 114–120.

- OECD (2002) *Glossary of key terms in evaluation and results based management: Glossaire des principaux termes relatifs à l'évaluation et la gestion axée sur les résultats = Glosario de los principales términos sobre evaluación y gestión basada en resultados*, Paris, OECD/DAC Working Party on Aid Evaluation.
- OOSTERVEER, P. (2015) 'Promoting sustainable palm oil: Viewed from a global networks and flows perspective', *Journal of Cleaner Production*, vol. 107, pp. 146–153.
- OSTROM, E. (2009) 'A general framework for analyzing sustainability of social-ecological systems', *Science (New York, N.Y.)*, vol. 325, no. 5939, pp. 419–422.
- O'TOOLE, K., WALLIS, A. AND MITCHELL, B. (2006) 'Local perceptions of sustainability indicators: issues of scale and implications for management', *Rural Society*, 16(1), pp. 25–46.
- PAASI, A. (2004) 'Place and region: Looking through the prism of scale', *Progress in Human Geography*, vol. 28, no. 4, pp. 536–546.
- PACHECO, P., GNYCH, S., DERMAWAN, A., KOMARUDIN, H. and OKARDA, B. (2017) *The palm oil global value chain: Implications for economic growth and social and environmental sustainability*, Center for International Forestry Research (CIFOR).
- PLATH, M., MOSER, C., BAILIS, R., BRANDT, P., HIRSCH, H., KLEIN, A.-M., WALMSLEY, D. AND WEHRDEN, H. von (2016) 'A novel bioenergy feedstock in Latin America? Cultivation potential of *Acrocomia aculeata* under current and future climate conditions', *Biomass and Bioenergy*, vol. 91, pp. 186–195.
- POYNTON, S. (2015) *Beyond certification*, Oxford, UK, Dō Sustainability.
- RASMUSSEN, L. V., BIERBAUM, R., OLDEKOP, J. A. AND AGRAWAL, A. (2017) 'Bridging the practitioner-researcher divide: Indicators to track environmental, economic, and sociocultural sustainability of agricultural commodity production', *Global Environmental Change*, vol. 42, pp. 33–46.
- RAYNAUD, J., FOBELETS, V., GEORGIEVA, A., JOSHI, S., KRISTANTO, L., GROOT RUIZ, A. de, BULLOCK, S. AND HARDWICKE, R. (2016) *Improving Business Decision Making: Valuing the Hidden Costs of Production in the Palm Oil Sector.: A study for The Economics of Ecosystems and Biodiversity for Agriculture and Food (TEEBAgriFood) Program*. [Online]. Available at http://trueprice.org/wp-content/uploads/2017/03/TEEBAgriFood_PalmOil_Report.pdf.
- REUTERS (2018a) *European move to ban palm oil from biofuels is 'crop apartheid' -Malaysia* [Online]. Available at <https://www.reuters.com/article/malaysia-palmoil-eu/european-move-to-ban-palm-oil-from-biofuels-is-crop-apartheid-malaysia-idUSL3N1PD1NJ> (Accessed 2 March 2018).

- REUTERS (2018b) *Malaysian farmers protest Europe's push to curb palm oil imports* [Online]. Available at <https://www.reuters.com/article/malaysia-palmoil-protests/malaysian-farmers-protest-europes-push-to-curb-palm-oil-imports-idUSL3N1PB1G5> (Accessed 2 March 2018).
- RICHARDSON, B. (2014) 'Making a Market for Sustainability: The Commodification of Certified Palm Oil', *New Political Economy*, vol. 20, no. 4, pp. 545–568.
- RIVAL, A., MONTET, D. AND PIOCH, D. (2016) 'Certification, labelling and traceability of palm oil: Can we build confidence from trustworthy standards?', *OCL*, vol. 23, no. 6, pp. D609.
- RSPO (2010) 'National Interpretation RSPO Principles & Criteria for Sustainable Palm Oil Production: For Independent Smallholders Republic of Indonesia'.
- RSPO (2017) 'Impact Update 2017' [Online]. Available at https://www.rspo.org/toc/RSPO-Impact-Update-Report-2017_221117.pdf (Accessed 10 March 2018).
- RSPO (2018a) *Impacts. Certification in numbers* [Online]. Available at <https://rspo.org/about/impacts> (Accessed 10 March 2018).
- RSPO (2018b) *Principles & Criteria review* [Online]. Available at <https://rspo.org/principles-and-criteria-review> (Accessed 26 March 2018).
- RSPO (2018c) *RSPO Smallholders Definition* [Online]. Available at <https://rspo.org/smallholders/rspo-smallholders-definition> (Accessed 12 March 2018).
- RSPO (2018d) *RSPO Smallholders Engagement Platform - Home* [Online]. Available at <https://www.rsep.rspo.org/> (Accessed 4 March 2018).
- RSPO (2018e) *RSPO Smallholders Support Fund (RSSF)* [Online]. Available at <https://rspo.org/smallholders/rspo-smallholders-support-fund> (Accessed 4 March 2018).
- RSPO (2018f) *RSPO supply chains* [Online]. Available at <https://rspo.org/certification/supply-chains> (Accessed 9 February 2018).
- RUYSSCHAERT, D. AND SALLES, D. (2014) 'Towards global voluntary standards: Questioning the effectiveness in attaining conservation goals', *Ecological Economics*, vol. 107, pp. 438–446.
- SABAJO, C. R., LE MAIRE, G., JUNE, T., MEIJIDE, A., ROUPSARD, O. AND KNOHL, A. (2017) 'Expansion of oil palm and other cash crops causes an increase of the land surface temperature in the Jambi province in Indonesia', *Biogeosciences*, vol. 14, no. 20, pp. 4619–4635.
- SCHOTT, C. (2015) *Indonesien: Ein Länderporträt*, Bonn, Bundeszentrale für politische Bildung.
- SCHWARZE, S., EULER, M., GATTO, M., HEIN, J., HETTIG, E., HOLTkamp, A. M., IZHAR, L., KUNZ, Y. AND LAY, J., et al. (2015) 'Rubber vs. oil palm: an analysis of factors influencing smallholders' crop choice in Jambi, Indonesia', *EFForTS discussion paper series*, no. 11.

- SIBHATU, K. T. AND QAIM, M. (2016) 'Farm production diversity and dietary quality: Linkages and measurement issues', *GlobalFood Discussion Papers*, no. 80 [Online]. Available at <https://www.econstor.eu/bitstream/10419/129099/1/848837703.pdf>.
- SUHARTO, R., HUSEIN K., SARTONO, KUSUMADEWI, D., DARUSSAMIN, A., NEDYASARI, D., RIKSANTO, D., HARIYADI AND RAHMAN A., et al. (2015) *Joint Study on the Similarities and Differences of the ISPO and the RSPO Certification Systems* [Online], Jakarta. Available at <http://www.id.undp.org/>.
- TARIGAN, S., WIEGAND, K. AND SLAMET, B. (2018) 'Minimum forest cover required for sustainable water flow regulation of a watershed: A case study in Jambi Province, Indonesia', *Hydrology and Earth System Sciences*, vol. 22, no. 1, pp. 581–594.
- TARIGAN, S. D. (2016) 'Land Cover Change and its Impact on Flooding Frequency of Batanghari Watershed, Jambi Province, Indonesia', *Procedia Environmental Sciences*, vol. 33, pp. 386–392.
- THE GUARDIAN (21.07.2017a) 'Pepsico, Unilever and Nestlé accused of complicity in illegal rainforest destruction', 21 July [Online]. Available at <https://www.theguardian.com/environment/2017/jul/21/pepsico-unilever-and-nestle-accused-of-complicity-in-illegal-rainforest-destruction> (Accessed 12 March 2018).
- THE GUARDIAN (29.09.2017b) 'Companies' 'zero deforestation' pledges: everything you need to know', 29 September [Online]. Available at <https://www.theguardian.com/sustainable-business/2017/sep/29/companies-zero-deforestation-pledges-agriculture-palm-oil-environment> (Accessed 12 March 2018).
- TSCHARNITKE, T., MILDER, J. C., SCHROTH, G., CLOUGH, Y., DECLERCK, F., WALDRON, A., RICE, R. AND GHAZOU, J. (2015) 'Conserving Biodiversity Through Certification of Tropical Agroforestry Crops at Local and Landscape Scales', *Conservation Letters*, vol. 8, no. 1, pp. 14–23.
- TSETSE, D. (2008) *Opportunity and Problem in Context (OPiC): A framework for environmental management in developing countries* (Dissertation, Universiteit Leiden).
- TSETSE, D. AND GROOT, W. T. de (2009) 'Opportunity and Problem in Context (OPiC): A Framework for Environmental Management', *Sustainability*, vol. 1, no. 1, pp. 19–34.
- UNITED NATIONS *Sustainable Development Goals: Sustainable Development Knowledge Platform* [Online]. Available at <https://sustainabledevelopment.un.org/?menu=1300> (Accessed 27 March 2018).
- VAN DEN BORN, R. J.G., ARTS, B., ADMIRAAL, J., BERINGER, A., KNIGHTS, P., MOLINARIO, E., HORVAT, K. P., PORRAS-GOMEZ, C. AND SMREKAR, A., et al. (2017) 'The missing pillar: Eudemonic values in

- the justification of nature conservation', *Journal of Environmental Planning and Management*, vol. 5, no. 5, pp. 1–16.
- WALTHER, G. and SPENGLER, T. S. (2010) *Nachhaltige Wertschöpfungsnetzwerke: Überbetriebliche Planung und Steuerung von Stoffströmen entlang des Produktlebenszyklus*, Wiesbaden, Gabler.
- WUPPERTAL INSTITUT FÜR KLIMA, UMWELT, ENERGIE (2016) *Sufficiency* [Online]. Available at <https://wupperinst.org/en/topics/well-being/sufficiency/> (Accessed 11 March 2018).
- WWF (2016) 'Palm Oil Buyers Scorecard: Measuring the Progress of Palm Oil Buyers'.
- YOSHIDA, Y., FLINT, C. G. AND DOLAN, M. K. (2017) 'Farming between love and money: US Midwestern farmers' human–nature relationships and impacts on watershed conservation', *Journal of Environmental Planning and Management*, vol. 59, no. 5, pp. 1–18.
- ZOLLER, N. *How do different stakeholders perceive palm oil in food and its impact on the environment?: Master Thesis at the Department of Environmental Systems Science, ETH Zurich* [Online]. Available at http://www.opal-project.org/uploads/5/0/1/3/50138087/20160707_stakeholder_perception_of_palm_oil_eth_master_thesis_norazoller.pdf.

APPENDIX

I. Key attributes of interviews

# Respondent	City/Village	(Trans-) Migrant	Position/ Occupation	Interview SAFA/ open	RSPO-certified	Commodities
1	Jambi		Dinas Perkebunan Officer	Open		
2	Jambi		NGO Setara	Open		
3	Sungai Rotan	no	Smallholder Farmer	SAFA	in process	Oil palm
4	Sungai Rotan	no	Smallholder Farmer, Shop Owner	SAFA	in process	Oil palm, rubber
5	Sungai Rotan	no	Smallholder Farmer	SAFA	in process	Oil palm, rubber
6	Sungai Rotan		Fertilizer Storage	Open		
7	Sungai Rotan		Staff Frankfurt Zoological Society	Open		
8	Sungai Rotan	no	Smallholder Farmer, Kepala Desa	Open	in process	Oil palm
9	Jambi		NGO Warsi	Open		
10	Mekar Jaya		Village Tour	Open		
11	Mekar Jaya	yes	Smallholder Farmer, Kepala Dusun/ Bungo Salam	SAFA	yes	Oil palm, rubber
12	Mekar Jaya		Marketing Division Gapoktan	Open		
13	Mekar Jaya	yes	Kepala Desa	Open		
14	Mekar Jaya	yes	Smallholder Farmer, Head of gapoktan	SAFA	yes	Oil palm
15	Mekar Jaya	yes	Smallholder Farmer	SAFA	yes	Oil palm, rubber, vegetables
16	Mekar Jaya	yes	Smallholder Farmer	SAFA	partly	Oil palm, rubber

17	Gurun Mudo	no	Smallholder Farmer, Kepala Desa	Open	no	Oil palm, rubber
18	Gurun Mudo	no	Smallholder Farmer	Open	no	Oil palm, rubber
19	Gurun Mudo	no	Smallholder Farmer, Trader	SAFA	no	Oil palm, rubber
20	Sarolangun		Dinas Perkebunan Officer and Secretary	Open		
21	Gurun Mudo	no	Smallholder Farmer, Gold Miner	SAFA	no	Oil palm, rubber
22	Gurun Mudo	no	Ketua BPD, Smallholder Farmer, Former employee of Bakri Group	Open	no	Rubber
23	Gurun Mudo	no	Security Officer at PT Sinar Mas, Smallholder Farmer	SAFA	no	Oil palm, rubber
24	Jambi		NGO Setara	Open		

II. Final Interview Guideline

Introduction

Good afternoon/morning Mr./Mrs. Thank you very much for taking your time to discuss some questions with us. I am a Master student from Germany, the city of Göttingen and she is from Jambi University. My name is Imke and hers is Amrina.

Our Universities are cooperating with the IPB in Bogor, Tadulaco University in Sulawesi and in a research project which tries to understand current land use change in Jambi.

All information you give will be kept anonymously, that means your name will not be named within my report. Please be aware, that all information you give happens voluntarily, if you don't want to answer to questions just give a note. Also, the gained information will be used for scientific purposes only.

Do you have any questions so far?

We would like to record (and film the group discussion) the interview in case I have to listen to it later again for my report. Is that ok for you?

Individual Interview

a. Farmer's background

1. How many people live in this household how old are they?
2. Were you born in name of village?
3. Do you have a special position in the village?
4. Is the palm oil business your main occupation?

b. Household's income

1. Which income sources do the people living in this household have?
2. How much land do you own?
3. What do you cultivate? Since when?
4. Do you have a contract with a company?
5. How much (%) of your financial capital is invested in your farming business?

c. Criteria

1. Do you think there is a balance between the environment and humans? Why? Why not?
2. Which kind of services do you derive from nature? How do you define their value? (in terms of yields, spiritual benefits etc.)

3. Have you observed any changes on your farm, in your community? Which? And how can you indicate the change?
4. Which kind of risks/challenges exist threatening your livelihood? (E.g. Climate change, extreme events, dependencies from large corporations, food insecurity, standards and certification...)

d. Impacts of certification

1. What was the motivation to join Gapoktan/RSPO?
2. How do you understand the term sustainability?

Is there anything else you would like to share with me? Do you have remaining questions?

Group Discussion

- Please introduce yourself quickly (name, age, occupation, position in the group)
- Or: short introduction by the group leader

a. Perceptions

1. Have you observed any changes on your farm, in your community? Which? And how can you indicate the change?
2. Which kind of developments/challenges exist that influence your livelihood, business, community? (E.g. Climate change, extreme events, dependencies from large corporations, food insecurity, standards and certification...)
3. Do you think there is a balance between the environment and humans? Why? Why not?
4. Which kind of benefits/services do you derive from nature? How do you define their value? (In terms of yields, spiritual benefits etc.)
5. Why and when have you started cultivating oil palm in this community?
6. If RSPO-certified: What is the most challenging RSPO-criteria?
7. If not RSPO-certified: Have you heard about RSPO?
8. How do you understand the term "sustainability"?

b. Outlook

1. Would you agree, that the current state of the environment, economy, community should recover to a former state, stay the same (ability to sustain) or be improved for future generations (beyond sustainability)?
2. What could be done to improve the village's situation?
3. What would your prediction for the future of oil palm be?

III. Explanation of the 22 themes of the SAFA framework

Theme	Details
Atmosphere	It is not practical to accurately calculate the GHG emissions of smallholders. Instead, these questions focus on the most important practices for smallholders to reduce their GHG emissions. This indicator also looks at practices to decrease both indoor and outdoor air pollution :
Water	Some types of irrigation systems are more efficient than others: <ul style="list-style-type: none"> ○ Drip irrigation – most efficient; ○ Manual irrigation (hand watering) – somewhat efficient, but requires a substantial amount of labour; ○ Surface irrigation – least efficient. Many agricultural activities can cause water pollution (e.g. due to runoff) if they are not properly managed: <ul style="list-style-type: none"> ○ Cultivating crops and/or pasturing animals directly next to natural water bodies; ○ Using synthetic pesticides or cleaning pesticide application equipment in natural water bodies; ○ Discharging untreated domestic or processing water into natural water bodies.
Land	Soil improvement practices (e.g. natural fertilizer) and land conservation and rehabilitation practices (e.g. planted soil cover or erosion control through terracing).
Biodiversity	Natural ecosystems (e.g. forest) are rich in biodiversity and provide many services that benefit people and the environment (e.g. pest control, pollination, climate regulation). Biodiversity includes the variety of different ecosystems, species and genes . Local sources of seeds/breeds (e.g. saving seeds, from neighbours, seed banks or breeding programmes) have advantages over external sources, as they are adapted to local conditions.
Materials and energy	The application of synthetic or natural fertilizers should be based on a careful assessment of soil and crop needs. Recycling/reusing materials contributes to a more efficient use of natural resources. If wood and charcoal are used for energy, it is important that these come from sustainable sources. As it can be difficult for smallholders to calculate energy use rates, this indicator focuses on efforts to reduce energy consumption instead. Harvest losses are also considered here.
Animal welfare	Not applicable in this case study.
Investment	By contributing to the sustainable development of the local community , enterprises also help to secure their own sustainability. The indicator covers whether the smallholder produces crops/products for sale or trade , knowledge of his/her farm revenues and significant costs , and the use of that knowledge to determine whether the farm has been operating at a profit or loss during the last five years.
Vulnerability	Product diversification to face economic and environmental risks, level of product processing to generate added value of a product, market stability (i.e. number of buyers and quality of relationship to them), liquidity (access and amount of loans), as well as safety nets are taken into account here.
Product	Safe and controlled use of pesticides , high quality standards , technical quality

quality and information	assessments and product certification can contribute to product quality.
Local economy	In rural areas, farming contributes substantially to local economies by creating jobs. If the producer hires labour , this indicator examines whether the producer is contributing to the local economy by hiring from the local community instead of relying on external sources of labour, such as migrant workers.
Decent livelihood	The perceived quality of life of the producer, to which extent incomes support a living wage , and capacity building through training and education are assessed here.
Fair trading practices	This indicator focuses on the extent to which the producer understands how his/her buyer(s) establish/calculate prices paid to the producer and the types of market information the producer reports knowing.
Labour rights	Employment relations, freedom of association and right to bargaining, forced labour and child labour are indicators here.
Equity	Non-discrimination and gender equality in decision-making and employment and access to resources are of concern.
Human health and safety	A safe, hygienic and healthy workplace meets the following standards: <ul style="list-style-type: none"> ○ Medical care is within a reachable distance if it is needed; ○ Medical care is affordable to household members and workers; ○ Access is available to water considered safe for drinking, hygiene and cooking; ○ There are restrictions on who may apply pesticides; ○ Protective gear is used for pesticide application; ○ There are few serious injuries on the farm.
Cultural diversity	Food sovereignty involves the producer's right to produce the crops/products that he/she wants to produce. It includes access to adequate nutrition that is culturally appropriate and satisfying each day. This indicator also recognizes and valorises traditional and cultural knowledge .
Mission explicitness	The mission statement expresses a farm's goals and values. It guides the way the farm is managed. The mission statement can be formally written down. It could also be unwritten, based on shared values that are a way of life (e.g., community, traditional or cultural values that are part of everyday customs).
Accountability	Accountable producers provide stakeholders (e.g. customers, producer organizations) with information about their products and production processes , so that customers can make informed choices about what they are buying. This is achieved by keeping accurate production records .
Participation	Participation asks if producers are involved in an agriculturally focused organization and how much value they have received from the organization. Participation is important for conflict resolution . Talking and listening to stakeholder groups can help producers to peacefully resolve any conflicts.
Rule of law	Tenure rights involve the producer's perceived security of the right to occupy and farm the area where he/she currently farms. It also includes whether tenure constraints affect the ability of the producer to implement practices or make investments toward the sustainability of the operation. Legitimacy refers to compliance with all applicable laws, regulations, and standards voluntarily entered into by the producer.
Holistic Management	This indicator establishes whether the producer is working on or carrying-out a sustainability management plan and how successful the plan has been. Plans will ideally be written but may be oral or pictorial. The plan should cover each of the environmental, social and economic dimensions of sustainability.

Own illustration, details taken from (FAO, 2015)

IV. SAFA Smallholders Survey

Basic Information

1. Name of assessor:
2. Assessing organization:
3. Date of assessment:
4. Name of person being interviewed:
5. Gender of person being interviewed:
 - Female
 - Male
6. Is this person the farm owner?
 - Yes
 - No
7. Name of farm:
8. Village of farm:
9. Country of farm:
10. Does the interview take place on or close to the farm?
 - Yes
 - No
11. If you do know the GPS coordinates of your farm, please type them here:
12. OR Collect the GPS coordinates of the interview (function in the app)
13. Phone number of interviewee:
14. E-Mail of interviewee (if any):
15. What are the main crops and products that you produce?

Main product 1:	Main product 6:
Main product 2:	Main product 7:
Main product 3:	Main product 8:
Main product 4:	Main product 9:
Main product 5:	Main product 10:
16. Which best describes your level of commercialization? (check all that apply)
 - I am a subsistence farmer
 - I sell mostly to local markets/customers
 - I am a fully commercialized farmer (sell goods mostly for export) I am a contract farmer (with a company or a public-private partnership)
17. Do you produce any livestock on your farm?
 - Yes
 - No
18. What is the size of the farm (local units and preferably, in hectares)?

Mission Explicitness

1. Do you have a statement about the farm's goals and values that you follow and that everyone on your farm understands? [weight: 1]
 - Yes (green)
 - Partially (yellow)
 - No (red)

Accountability

2. Do you keep accurate records of your production processes (e.g., planting and harvesting information, input use) so they can be made available to producer organizations, customers or suppliers when required? [weight: 1]
 - Always or often (green)
 - Sometimes (yellow)
 - Never or rarely (red)

Participation

3. Do you belong to a producer organization (or another agriculturally focused organization)? [weight: 1]
 - a. Yes (green)
 - b. No (red)
4. How much value do you feel the farm receives from being a part of the organization? [weight: 1]
 - a. Significant value (green)
 - b. Some value (yellow) Little or no value (red)

Conflict Resolution

5. How often have you been able to peacefully and successfully resolve any problems or conflicts that you have experienced with your suppliers, workers, producer' organization or buyers? [weight: 1]
 - Always or often (green)
 - Sometimes (yellow)
 - Never or rarely (red)
 - There have not been any problems or conflicts with other stakeholders (neutral)

Sustainability Management Plan

6. Do you have a farm management plan that provides for the success of your production in the long run? [weight: 1]
 - Yes (green)
 - No (red)
7. How successful has this plan been? [weight: 1]
 - Very successful (green)
 - Somewhat successful (yellow)
 - Not at all or limited success (red)
8. Which elements are part of your plan? [weight: 1]
(green for 3 choices or more, yellow for 2 choices, red for 1 choice or less)

- | | | |
|--|--|---|
| <input type="checkbox"/> Finances | <input type="checkbox"/> Expansion/Staff | <input type="checkbox"/> Quality |
| <input type="checkbox"/> Soil fertility management | <input type="checkbox"/> Health and Safety | <input type="checkbox"/> Processing or adding value |
| <input type="checkbox"/> Environmental management | <input type="checkbox"/> Marketing | <input type="checkbox"/> Other |

Profitability

9. Do you produce crops, animals, or agricultural products for sale or trade? [weight: 2]
- Yes (green)
 - No (red) – no go
10. Do you know your farm revenue for the last production year? [weight: 2]
- Yes (green)
 - No (red)
11. Do you know your paid labour costs for the last production year? [weight: 1]
- Yes (green)
 - No (red)
 - Not applicable (neutral)
12. Do you know your fertilizer, pesticide and seeds/plant material costs for the last production year? [weight: 1]
- Yes (green)
 - No (red)
 - Not applicable (neutral)
13. Do you know your animal feed, veterinary care and juvenile stock costs for the last production year? [weight: 1]
- Yes (green)
 - No (red)
 - Not applicable (neutral)
14. During the last five years, how often were farm revenues greater than costs? [weight: 1]
- All or most of the time (green)
 - Some of the time (yellow)
 - Rarely/Never (red) – no go
 - I don't know (yellow)

Product Diversification

15. How many significant crops, products, or services are offered for sale? [weight: 1]
- Three or more significant crops, products, or services (green)
 - Two significant crops, products, or services (yellow)
 - One significant crop or product (red)
16. Do you do any processing or value adding in order to increase revenue from services or the sale price of your crops or agricultural products (e.g., tourism, butchered meat, drying coffee or fruit, processing jam)? [weight: 1]
- Yes (green)
 - No (yellow)

Stability of Market

17. How many buyers do you have for your significant crops or products? [weight: 1]
- I usually have multiple people or places to sell my product(s) to (green)
 - I usually have one or two people or places to sell my product(s) to (yellow)
 - I do not have a regular person or place to sell to (red)
18. How is your relationship with your most important buyer? [weight: 1]
- Very reliable and consistent (green)
 - Somewhat reliable and consistent (yellow)
 - Unreliable (red) – no go
19. Do you feel that you have a choice in where to sell your products? [weight: 1]
- Yes (green)
 - No (red)

Fair pricing and transparent contracts

20. Do you understand how buyer(s) calculate or establish prices paid? [weight: 1]
- Always or often (green)
 - Sometimes (yellow)
 - Never or rarely (red)
21. What type of market information did you know during the last production year? [weight: 1] Check all that apply (any of the first three answers gets a green score for the question):
- Prices paid by different buyers throughout the region for the same product
 - Price my buyer received for the product
 - Retail price of the product
 - None (red)

Liquidity

22. Check the sources from which you could realistically get a loan if you needed one: [weight: 1]
- (two or more of the first four answers is green, one is red)
- Informal sources such as friends, relatives, or religious groups
 - Banks, government lending institutions
 - Directly from buyers (exporter, importer, roaster, trader)
 - NGOs, cooperatives, farmer associations or microfinance group
 - My only option would be to ask a loan shark (red) – no go
23. If you requested a loan during the last year, how much did you receive compared to the amount that you requested? [weight: 1]
- All or most (green) Some (yellow)
 - None (red) – no go
 - I did not request a loan during the last year (neutral)
24. Have you set aside savings? [weight: 1]
- Yes (green)
 - No (red)

Safety Nets

25. Do you have crop related insurance? [weight: 1]
- Yes (green)
 - No (red)
 - It is not available (yellow)
26. Do you have a risk management plan that accounts for minimum costs or support in case of harvest loss (e.g., community supported schemes, agreements with cooperatives)? [weight: 1]
- Yes (green) No (red)
27. Have you implemented on-farm measures to reduce risk from variability in natural conditions and inputs (e.g. building a water tank)? [weight: 1]
- Yes (green)
 - Some (yellow)
 - No (red)

Food Quality

28. Do you take actions to maintain high quality in your crops and products (e.g. hygienic processing, proper storing and packaging, grading)? [weight: 1]
- Yes (green) No (red)
29. During the last two years, have you had a technical quality assessment of any of your main crops or products? [weight: 1]
- Yes (green)
 - No (red)

Certified Products

30. Do you produce any crops, animals or products that meet, or are certified, to a standard? [weight: 1]
- Yes (green)
 - No (yellow)
 - I had a certification, but it was rescinded/taken away (red) – no go
31. How much of your main products or crops are sold as certified? [weight: 1]
- All or most (more than 80%) (green)
 - Some (40%-80%) (yellow)
 - Not much or none (less than 40%) (red)

Legitimacy

32. How do you ensure legal and regulatory compliance in general, including also any standard voluntarily entered into? [weight: 1]
(green for 2 choices, yellow for 1 choice, red no choice)
- I use board agendas, other official records or notes of rights and compliances
 - I keep licences and permits, if required by law
 - I regularly report on compliance to auditors

GHG Mitigation Practices

33. Which statement best describes the current area covered by trees on your farm? [weight: 1]

- About half or more of my farm is covered by trees (green)
- Less than half of my farm is covered by trees (yellow)
- I do not have any trees on my farm (red)

34./35. During the last production year was there any change to the number of trees on your farm? [weight: 1]

- Increase (include planting new trees from cuttings or from seed) (green)
- Decrease (removing focus crop trees, shade trees, natural forest trees, or other crop trees) (yellow)
- No change (green)

36. What is your main tillage method? [weight: 1 for both GHG and Land]

- Conventional (red)
- Reduced (yellow)
- No-till (green)

37. Does your farm consist mostly of ruminant production (e.g. cattle, goats, sheep)? [weight: 1]

- Yes (red)
- No (green)

38. What is the main type of manure management system used on the farm? [weight: 1]

- Open-air lagoon or discharged into water bodies (red)
- Compost or biodigestion (green)
- Direct use (collected and spread on cropping area, left on pasture) (yellow)

Air Pollution Prevention Practices

39. Do you use a smokeless fuel or chimney to vent smoke when cooking? [weight: 1]

- Yes (green)
- No (red)

40. Do you ever burn your fields? [weight: 1 for both Air pollution and Species conservation]

- Yes (red)
- No (green)

Soil Improvement Practices

41. What is the main type of fertilizer used on the farm? [weight: 1 for GHG and Soil]

- Natural fertilizers applied according to crop and soil needs (green for GHG and Soil)
- Natural fertilizers applied without knowledge of crop or soil needs (yellow for GHG and green for Soil)
- A combination of natural and synthetic fertilizers (yellow for GHG and Soil)
- Synthetic fertilizers applied according to crop and soil needs (yellow for GHG and Soil)
- Synthetic fertilizers applied without knowledge of crop or soil needs (red for GHG and yellow for Soil)
- None (green for GHG and red for Soil)

42. Which of the following are used to improve soil fertility on the farm? [weight: 1]
two or more of the first four answers is green, one is yellow

- Cover crops
- Nitrogen fixing annual or perennial plants
- Intercropping
- Crop rotation for maintaining soil health
- None (red)

Nutrient Balance

43. How do you determine how much fertilizer (synthetic or natural) to apply to your crop(s)? [weight: 1]

- We apply fertilizer based on a careful assessment of our soil and crops (including farmer observation, professional tests, or analyses) (green)
- We apply fertilizer based on general advice for the region or for our crop(s) (yellow)
- We are not able to fertilize (red)
- We do not use enough fertilizer, but we apply as much as we can afford (yellow)

Land Conservation and Rehabilitation Practices

44. Which of the following are ways that you manage your soil? [weight: 1]
(two or more of the first three answers is green, one is yellow)

- Maintain a permanent soil cover through mulch, planted soil cover, etc.
- Terracing or contour planting on areas of significant slope
- Hedgerows (e.g., trees and shrubs)
- Soils are often bare between cropping cycles (red)

Hazardous Pesticides

45. Do you use any synthetic (chemical) pesticides on your farm? [weight: 1 for Pesticides and Water pollution]

- Yes (red)
- Only occasionally (yellow)
- No (green)

46. Do any of the synthetic pesticides used on your farm have a red band around the container or on the label? [weight: 1]

- Yes (red) – no go
- No (neutral)

47. Do the pesticides used on your farm have labels that you understand? [weight: 1]

- Yes, they all have labels with instructions on dosage, safety, etc. that I understand (green)
- Some do not have readable labels (or are unlabelled) (red) – no go

48. Do you ever mix pesticides? [weight: 1]

- Yes (red) – no go
- No (green)

Ecosystem Diversity

- 49.** Did you convert any natural land (prairie, forest, or savannah) to production land during the last five years? [weight: 2 for Ecosystem diversity and weight: 1 for Land]
- Yes (red)
 - No, there is no natural land on the farm (neutral)
 - No, natural land on the farm was left as is (green)

Species Conservation Practices

- 50.** Do you have any of the following on your farm to preserve or restore natural species? [weight: 1]
(two or more of the first three answers is green, one is yellow)
- Permanent set-aside (land taken out of production to create a habitat for biodiversity)
 - Rehabilitated or restored natural areas
 - Hedgerows or buffer zones
 - None (red)
- 51.** Check all of the pest and disease management practices used for the main crop(s) during the last production year: [weight: 1 for both Species conservation and Hazardous pesticides] (All four first choices should be marked for green, yellow if only some are marked)
- Conduct regular visual examinations of plants to detect pests or disease
 - Use traps, repellents (including repellent species), and natural pesticides
 - Create or preserve places (including plant species) for beneficial predators of pests to live
 - Maintain written record of pest infestation, treatments, and results
 - I use synthetic pesticides specific to the crop and/or pest at the proper dosage and timing (yellow)
 - I apply synthetic pesticides preventatively (e.g., on a regular schedule regardless of whether a pest or disease threat currently exists) (red)
- 52.** Which statement best describes the diversity of your farming system? [weight: 1]
- I produce multiple (4+) types of crops and/or livestock in the same area (green)
 - I produce 2-3 types of crops and/or livestock in the same area (yellow)
 - The majority of my farm is used to produce a single crop or one type of livestock (red)

Saving Seeds and Breeds

- 53.** For the main crops and livestock produced on the farm, do you use any locally adapted varieties of seeds or breeds? [weight: 2]
- Yes (green)
 - No (red)
- 54.** What is the main source of your seeds or breeds? [weight: 1]
- Saved by the farmer, obtained from neighbours, or from a local seed bank (or breeding program for livestock) (green)
 - A combination of local and non-local sources (yellow)
 - Completely reliant on external non-local sources (red)

Water Conservation Practices

55. Do you use water conservation practices on the farm? [weight: 1]
- Yes (green)
 - No (red)
 - Sometimes (yellow)
56. Do you irrigate your crops? [weight: 1]
- Yes (neutral)
 - No (green)
57. What form of irrigation do you use? [weight: 1]
- Manual irrigation (hand watering) (yellow)
 - Surface irrigation (red)
 - Drip irrigation (green)

Water Pollution Prevention Practices

58. Which of the following statements apply to your farm? [weight: 1]
- The land I use for cultivating crops and/or for pasturing animals is directly next to natural waterways (red)
 - Pesticide application equipment is cleaned in natural water bodies (red)
 - Untreated domestic or processing water is discharged into natural water bodies (red) ..
None (green)

Renewable and Recycled Materials

59. How do you manage crop residues, processing residues, and organic matter? [weight: 2]
- Reused (e.g., through compost, as a soil cover, animal feed, biofuel or other uses) (green)
 - Burned or discharged into waterways (red)
 - Left in piles or taken off farm (yellow)
60. Do you recycle or reuse metal, plastic containers or bags (with the exception of agrochemical containers), paper or cardboard? [weight: 1]
- Yes (green)
 - No (red)
 - Not applicable (neutral)

Energy Use/Energy consumption/Renewable energy

61. If you use electricity, charcoal, wood, or fuel sources of energy, are you improving your efficiency? [weight: 1]
- I can demonstrate that I reduce energy use (e.g., through fuel efficient stoves, solar drying, well-maintained machinery, switching from wood to gas) (green)
 - I have made some efforts to reduce energy, but I have not applied them to most of my farm (yellow) | I do not make any attempts to reduce energy (red)
62. If you used wood or charcoal for energy during the last production year, what was the main source? [weight: 1]
- Purchased, I don't know (yellow)
 - Managed natural forest with limited extraction (green)
 - Unlimited forest use (red)

- Managed plantations or planted woodlots (green)
 - Tree pruning (green)
 - Not applicable, I do not use wood or charcoal energy (neutral)
63. Do you use any of the following renewable energy sources for a significant portion of your energy needs? [weight: 1] (any green answer gets a green for the indicator)
- Solar (green)
 - Hydropower or geothermal (green)
 - Wind (green)
 - Biofuel from farm or household waste (green)
 - None of the above (yellow)

Food Loss and Waste Reduction

64. Which of the following best describes your pre- and post-harvest losses (i.e., the amount of crop lost during production, storage, and transport) during the last production year? [weight: 1]
- Minimal (less than 10%) (green)
 - Some (10-30%) (yellow)
 - Substantial (more than 30%) (red)
65. Do you take active steps to reduce pre- and post-harvest losses on your farm (through improving storage and transport methods, pest/disease management, harvesting at the appropriate time, etc.) [weight: 1]
- Yes (green)
 - No (red)

Animal Health and Welfare

66. Do you have access to veterinary care for the livestock on your farm? [weight: 1]
- I do not have access (red)
 - I have access, but it is problematic (unqualified personnel, too costly, too distant, or it is inhumane) (yellow)
 - I have access to veterinary services that are of good quality, affordable, and nearby (green)
67. Which statement best describes the way livestock diseases are managed on the farm? [weight: 1]
- I give animals medication routinely to prevent them from becoming sick (red)
 - I follow my veterinarian or a local expert's recommendation for the treatment of diagnosed diseases (green)
 - I do not consult professionals or experts about animal diseases (yellow)
 - I do not provide my livestock with any veterinary care (red)

68. Which of the following most accurately reflects the general state of well-being and living conditions of animals on the farm? [weight: 1]
- I practice animal husbandry that provides animals with adequate space, shelter that is kept clean and does not crowd animals, a sufficient and balanced diet, and I prevent unnecessary distress (green)
 - Animals have adequate living conditions, sufficient feed, and I try to prevent unnecessary distress, but there is room for improvement (yellow)
 - Animals are kept in unsanitary or inadequate shelter conditions, are limited in expressing natural behaviours, do not have access to adequate feed, or measures are not taken to keep animals from experiencing unnecessary distress (red) – no go

Safety of Workplace, Operations and Facilities

69. How long must you travel to reach medical care (nurse, doctor, or clinic) using the most common transportation method? [weight: 1]
- Treatment at farm or under 1 hour (green)
 - 1 to 3 hours (yellow)
 - More than 3 hours (red) – no go
70. How affordable is the nearest medical care for the farm's household members and workers? [weight: 1]
- Treatment is free, or costs are low and do not cause difficulty (green)
 - Costs are difficult, but not so high as to keep household members and workers from obtaining treatment when needed (yellow)
 - Costs are so high that household members or workers avoid treatment even for very serious conditions (red)
– no go
71. How long must people on the farm travel to reach water they consider safe to drink? [weight: 1]
- Water is available on site, or is 5 minutes or less away (green)
 - More than 5 minutes, but less than 20 (yellow)
 - More than 20 minutes (red) – no go
72. Do members of your household and others who live on your farm have consistent access to sufficient and adequate water for human use (i.e., for water intake, hygiene, and cooking needs)? (As a reference point, 15 litres per person per day is generally considered adequate) [weight: 1]
- Yes (green)
 - Most of the time (yellow)
 - No (red)
73. Do any of the following apply pesticides on the farm? [weight: 1]
- Pregnant women (red)
 - People under 18 (red)
 - People untrained in pesticide application (red)
 - None of these groups apply pesticides on the farm (green)

74. What protective equipment is used when synthetic pesticides are applied? [weight: 1]
(All 4 answers must be marked for green, yellow for some)
- Plastic or rubber gloves
 - Breathing masks (not just handkerchiefs)
 - Protective outer clothing (should cover body with impermeable material)
 - Protective foot gear (rubber or plastic boots)
 - None (red) – no go
75. Did you have more than one serious injury on your farm during the last year (enough to require medical attention)? [weight: 1]
- Yes (red)
 - No (green)
76. How well are you prepared to avoid risks on the farm and to handle emergencies? [weight: 1]
(All 3 answers must be marked for green, yellow for two, red for one or none)
- I have first aid kits on the farm (e.g. bandages, antiseptics)
 - I warn my employees of potential hazards on the farm and how to handle them (e.g. snake bites)
 - I properly store dangerous tools and well maintain machinery

Capacity Development

77. What type of training(s) did you attend during the last year? (Training is considered to be a half-day or more)
[weight: 1]
(three or more types of training is green, one or two is yellow)
- Improving farming operations (agricultural practices or processing practices)
 - Improving record keeping (on farming operations traceability and book keeping)
 - Marketing support (information and education about topics such as prices, market contacts)
 - Health and safety issues
 - Environmental issues
 - Adult literacy
 - Managing the farm's business or finances
 - Other
 - I did not participate in training (red)

Paid Labour

78. Do you hire paid labor? [trigger question, not rated]
- Yes
 - No

Employment relations

- 79.** Would you be willing to hire workers of different social groups (e.g. ethnic/religious minorities) at the same wage rate of a local man of the dominant ethnicity and religion? [weight: 1]
- Always or often (green)
 - Sometimes (yellow)
 - Never or rarely (red) – no go
 - Not applicable (neutral)

Freedom of Association and Right to Bargaining

- 80.** Are hired workers free to associate with colleagues or unions and do they have the right to bargain their employment conditions? [weight: 1]
- Definitely do (green)
 - Sometimes (yellow)
 - Definitely don't (red)

Forced Labour

- 81.** Are hired workers free to leave their employment at any time, with reasonable notice and in accordance with working agreement (formal or informal)? [weight: 1]
- Yes (green)
 - At a price (e.g. penalty, non-payment of wage, loss of privileges) (red)

Child labour

- 82.** Which of the following statements apply to children younger than 16 years working on the farm (whether or not they are paid)? [weight: 1]
- Children work on the farm with family in a way that allows them to attend school (work less than 20 hours a week) (green)
 - Children work on the farm instead of going to school (work more than 20 hours a week) (red) ; Children do not work on the farm (green)

Non-discrimination

- 83.** In case of harassment or discrimination amongst your employees (e.g. sexual harassment of women), how would you respond? [weight: 1]
- I am comfortable implementing a procedure to protect vulnerable groups (green)
 - I do not have a plan or procedure, but I would take action (yellow)
 - I would not personally take action (red)

Gender equality

- 84.** Are both men and women active on the farm? [trigger question, not rated]
- Yes (neutral) ; No (neutral)
- 85.** What portion of the decisions about the farm's significant crops/products are made by men on the farm? [weight: 1]
- All or most (red)
 - About half (green) ; Few or none (red)

86. What portion of the decisions about the farm's significant crops/products are made by women on the farm? [weight: 1]
- All or most (red)
 - About half (green)
 - Few or none (red)
87. Do girls and boys on the farm have the same educational opportunities? [weight: 1]
- Yes (green)
 - No (red)
 - Not applicable, there are no children on the farm (neutral)
88. Do men and women on the farm have the same training opportunities? [weight: 1]
- Yes (green)
 - No (red)

Regional workforce

89. If you hire labour, what is the main source of your workers? [weight: 1]
- I hire mostly workers from the local community (green)
 - I hire mostly migrant workers or workers from outside my local community (red)
 - I hire workers from the local community and also migrants or those outside of my community (yellow)
 - I tried to hire local workers but was unable to do so, due to circumstances that did not depend on me (yellow) | Not applicable (neutral)

Food Sovereignty

90. How much do you agree with the following statement: I have the option to choose to produce the crops and products that I want to on my farm? [weight: 1]
- Agree (green)
 - Neither agree or disagree (yellow)
 - Disagree (red)
91. Do all members of the household have access, every day, to adequate nutrition in a culturally appropriate and satisfying way? [weight: 1]
- Yes (green)
 - No (neutral)
92. How many days during the last production year did any member of the family cut the size of meals or skip meals because there wasn't enough food? [weight: 1]
- 1-9 days (yellow)
 - 10-29 days (red)
 - 30 or more days (red) – no go

Indigenous knowledge

93. Do you consider that your product has a higher value-added thanks to traditional/indigenous knowledge? [trigger question, not rated]
- Yes (neutral) | No (neutral)

94. Do you have a connection with the community where the traditional/indigenous knowledge has originated from?

[weight: 1]

- I am a part of the community myself (green)
- Formal link with sharing of benefits (e.g. royalties or sharing profits) (green)
- Informal link to ensure the preservation of knowledge (yellow)
- No link established (red)

Tenure rights

95. Do you feel secure with your tenure? [weight: 1]

- Yes (green)
- Somewhat (yellow)
- No (red)

96. Are there practices or investments you would like to implement on your farm but cannot because of tenure constraints? [weight: 1]

- Yes (green)
- Possibly (yellow)
- No (red)

Community Investment

97. Do you participate in any community welfare projects (e.g., building community facilities, roads, schools, clinics, water works; organizing youth activities; or donating food or produce to community events), or do you undertake activities that have direct benefits for your community (e.g., managing a shared forest, building ponds for water management)? [weight: 1]

- Yes, I regularly participate in or organize projects that benefit my community (green)
- I am aware of projects like these in my community, and I participate in them occasionally (yellow) ; I do not participate in community welfare projects (red)

Quality of Life

98. What is your opinion of the overall quality of life (e.g. in terms of time, money and lifestyle) on the farm compared to the previous year? [weight: 1]

- Good (green)
- Not good, not bad (yellow)
- Bad (red)

Wage level

- 99.** Which of the following can you afford comfortably based on your income, without compromising time for weekly rest and holidays? [weight: 1]
(green for all selected, yellow for 5 to 8 choices, red for 4 choices or less)
- Three meals a day for myself and my family that include fruits and vegetables, and meat if I choose to eat it
 - Appropriate clothing for myself and my family including shoes, clean clothes for school or work, warm clothes in winter, etc
 - Medical care, including visits to doctors for myself and my family, and prescriptions or medications
 - Educational expenses for children including school fees, uniforms, books and transportation
 - Sufficient clean drinking water in my home
 - Access to safe means of transportation
 - Housing that is safe and protects from the weather
 - Energy expenses that allow light and adequate heating or cooling (such as fans or heaters), when necessary
 - Savings of at least 10% of my income to set aside for cultural or recreational activities and other expenses
- 100.** Which of the following can your employees afford comfortably, based on the wage rate that you pay them, without having to have a second source of income? [weight: 1] (green for all selected, yellow for 5 to 8 choices, red for 4 choices or less)
- Three meals a day for themselves and their family that include fruits and vegetables, and meat if they choose to eat it
 - Appropriate clothing for themselves and their families including shoes, clean clothes for school or work, warm clothes in winter, etc
 - Medical care, including visits to doctors for themselves and their families, and prescriptions or medications
 - Educational expenses for children including school fees, uniforms, books and transportation
 - Sufficient clean drinking water in their homes
 - Access to safe means of transportation
 - Housing that is safe and protects from the weather
 - Energy expenses that allow light and adequate heating or cooling (such as fans or heaters), when necessary
 - Savings of at least 10% of their income to set aside for cultural or recreational activities and other expenses

Legend

- multiple answer options
- only one answer option per question

Economic resilience																	
Investment				3,6	3,3	3,7	3,5	4,2	3,7	4,2	3,8	4,0	3,7	3,3	3,3	3,4	
97	Community investment	Participation in community projects	1,0	1,0	2,0	1,0	1,3	3,0	3,0	3,0	3,0	3,0	3,0	1,0	1,0	1,0	1,0
9	Profitability	Commercial production	2,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0
10		Knowledge of farm revenue	2,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0
11		Labour costs	1,0		3,0	3,0	3,0					3,0	3,0	3,0	3,0	3,0	3,0
12		Fertilizers, pesticides and seeds and plant materials costs	1,0	3,0	1,0	3,0	2,3	3,0	3,0	3,0	3,0	3,0	3,0	3,0	1,0	1,0	1,0
13		Animal feed, veterinary and juvenile stock costs	1,0							1,0			1,0				
14		Positive farm revenues	1,0	2,0	2,0	3,0	2,3	3,0	3,0	3,0	2,0	2,8	3,0	3,0	3,0	3,0	3,0
	Vulnerability			2,1	2,3	2,4	2,2	2,4	2,0	2,6	2,4	2,4	2,3	2,0	1,8	2,0	
15	Product diversification	Products and services on sale	1,0	1,0	2,0	2,0	1,7	2,0	1,0	3,0	2,0	2,0	2,0	2,0	1,0	1,0	
16		Value addition	1,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	
17	Stability of market	Diversity of buyers	1,0	2,0	2,0	3,0	2,3	2,0	2,0	3,0	2,0	2,3	2,0	2,0	2,0	2,0	
18		Relationship with buyer(s)	1,0	2,0	3,0	3,0	2,7	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	
19		Choice of market	1,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	
22	Liquidity	Loan source	1,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	1,0	1,0	1,0	
23		Loan received	1,0	3,0	3,0	3,0	3,0		3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	
24		Savings	1,0	3,0	3,0	3,0	3,0	3,0	1,0	3,0		2,3	3,0	1,0	1,0	1,0	
25	Safety nets	Crop insurance	1,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	
26		Risk management plan	1,0	1,0	1,0	1,0	1,0	3,0	1,0	1,0	3,0	2,0	1,0	1,0	1,0	1,0	
27		On-farm measures	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	3,0	1,0	1,5	1,0	2,0	1,0	
	Product quality and information			1,8	1,5	2,1	1,8	2,5	2,5	2,8	2,8	2,6	2,2	2,2	1,6	2,0	
51	Hazardous pesticides	Crop disease management	1,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0		2,0	2,0	2,0	2,0	2,0	
45		Hazardous pesticides	1,0	1,0	1,0	1,0	1,0	1,0	1,0	2,0	2,0	3,0	2,0	3,0	3,0	1,0	
46		Pesticides red band	1,0	1,0			1,0										
47		Pesticides label	1,0	3,0	1,0	3,0	2,3	3,0	3,0	3,0		3,0			3,0	3,0	
48		Pesticides mixing	1,0	1,0	1,0	1,0	1,0	3,0	3,0	3,0		3,0			1,0	1,0	
28	Food quality	Products quality	1,0	1,0	1,0	3,0	1,7	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	
29		Quality assessment	1,0	1,0	1,0	1,0	1,0	3,0	1,0	3,0	3,0	2,5	1,0	1,0	1,0	1,0	
30	Certified products	Certified production	1,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	2,0	2,0	2,0	2,0	
31		Ratio of certified products	1,0	3,0	2,0	3,0	2,7	2,0	3,0	3,0	2,0	2,5					
	Local economy			3,0	3,0	3,0					3,0	3,0	3,0	3,0	2,0	2,7	
89	Regional workforce	Regional workforce	1,0		3,0	3,0	3,0				3,0	3,0	3,0	3,0	2,0	2,7	

Good governance																		
	Mission explicitness					1,0	1,0	1,0	1,0	2,0	2,0	1,0	2,0	1,8	1,0	1,0	1,0	1,0
1	Mission explicitness	Farm values	1,0	1,0	1,0	1,0	1,0	2,0	2,0	1,0	2,0	1,8	1,0	1,0	1,0	1,0	1,0	1,0
	Accountability					3,0	3,0	2,0	2,7	3,0	3,0	3,0	3,0	3,0	1,0	1,0	1,0	1,0
2	Accountability	Accuracy of records	1,0	3,0	3,0	2,0	2,7	3,0	3,0	3,0	3,0	3,0	3,0	1,0	1,0	1,0	1,0	1,0
	Participation					3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	1,0	1,0	1,0	1,0	1,0
3	Participation	Organizational membership	1,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	1,0	1,0	1,0	1,0	1,0
4		Value of membership	1,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0					
5	Conflict Resolution	Conflict Resolution	1,0			3,0	3,0											
	Rule of Law					2,0	2,3	2,0	2,1	2,3	2,7	2,3	2,7	2,5	2,3	2,0	2,3	2,2
95	Tenure rights	Tenure security	1,0	2,0	3,0	2,0	2,3	2,0	3,0	3,0	3,0	2,8	2,0	2,0	3,0	3,0	2,3	2,3
96		Tenure constraints	1,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0	3,0	3,0	2,0	2,7
32	Legitimacy	Compliance	1,0	2,0	2,0	2,0	2,0	3,0	3,0	2,0	3,0	2,8	2,0	1,0	2,0	2,0	1,7	1,7
	Holistic management					2,3	3,0	2,7	2,7	3,0	3,0	1,0	3,0	2,5	1,0	1,0	1,0	1,0
6	Sustainability Management Plan	Management plan	1,0	3,0	3,0	3,0	3,0	3,0	3,0	1,0	3,0	2,5	1,0	1,0	1,0	1,0	1,0	1,0
7		Plan success	1,0	1,0	3,0	2,0	2,0	3,0	3,0		3,0	3,0						
8		Elements of plan	1,0	3,0	3,0	3,0	3,0	3,0	3,0		3,0	3,0						

STATUTORY DECLARATION

I, Imke Rödel, herewith declare that I am the sole author of the enclosed master thesis with the title *“Smallholders’ sustainability perceptions vs. performance in the context of Indonesian palm oil. How do international sustainability criteria influence local discourses and practices in rural Sumatra?”*. All references and data sources that were used in the thesis have been appropriately acknowledged. Any thoughts from others or literal quotations are marked. Furthermore, the enclosed master thesis in this or any other form has not been submitted to achieve an academic degree at any other university or institution and has not been published.

Göttingen, April 4th, 2018

(Imke Rödel)