Assessment of Sustainability Standards Among Smallholder Oil Palm Farmers in Indonesia

Von der Wirtschaftswissenschaftlichen Fakultät der
Gottfried Wilhelm Leibniz Universität Hannover
zur Erlangung des akademischen Grades

Doktorin der Wirtschaftswissenschaften
- Doctor rerum politicarum -

genehmigte Dissertation
von

M.Sc. Ernah

geboren am 03.01.1977 in UjungPandang, Indonesien

2015

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Tag der Promotion: November 17, 2015

Acknowledgements

I would like to thank my great supervisor Prof. Dr. Hermann Waibel for support, guidance, suggestions, and giving me opportunity to come to Germany and be part of Institute of Development and Agricultural Economics, Leibniz Universität Hannover.

I would also like to thank Prof. Dr. Ulrike Grote as my second supervisor for valuable comments, suggestions and examining my thesis.

I am grateful to express my sincere gratitude and appreciation to Economy and Environment Program for Southeast Asia (EEPSEA)-WorldFish for entrusting their financial support to me. I would like to thank Dr. Herminia Francisco, EEPSEA Director and Dr. Pham Khanh Nam, EEPSEA senior economist. I am also grateful to Dr. David James and Dr. Arief Anshori Yusuf for valuable comments and advice. I want to mention Dr. Eko Ruddy Cahyadi, who had done the initial field work on which this work is based.

I am also indebted to the Directorate General of Higher Education at the Ministry of Education and Culture, Republic of Indonesia, for providing me a scholarship for my PhD program at the Leibniz Universität Hannover, Germany. I also want to express my deep gratitude for the support of my home institution, the Padjadjaran University at Bandung Indonesia and Dr. Bayu Krisnamurthi, chair of Indonesian Society of Agricultural Economics (PERHEPI).

I am also very grateful to the Faculty of Agriculture of Jambi University, Prof Zulkifli Alamsyah, Dr. Saad Murdi and Dr. Ernawati Hamid for their cooperation; my field enumerators; and the respondents, who are smallholder oil palm farmers in the study sites stakeholders and key informant for their collaboration during the survey and for providing the required information for this study; and *Pak* Zein, *Pak* Mizun, *Pak* Saladin and *Pak* Sujud for their accommodation in the villages.

Last but not least, I want to thank all my colleagues at Institute of Development and Agricultural Economics and Institute of Environmental Economics and World Trade for their support and advice. In particularly, I thank to Dr. Priyanka Parvathi for sharing experiences, great discussions and proof reading my thesis. I also thank Dr. Sabine Liebenehm and Ms Christina Grundstedt for helping to translate the abstract into the german version. I am also grateful to Mr Florian Heinrichs for making the layout and formatting the thesis. To Pham Huong Dien and Shi Min, I thank for nice friendship. I want also to thank Abraham for writing consultation. Most importantly, I want to thank my parents, my parents-in–law, my brothers, my sisters, my husband and my children for their love, patience, prayers and support.

Zusammenfassung

Indonesien ist der größte Palmölproduzent auf dem Weltmarkt und selbst mit diesem Status expandieren Indonesiens Plantagen weiterhin. Dies hat einige negative Auswirkungen für die Umwelt und Standards müssen eingeführt werden. Um sicherzustellen, dass Indonesien seinen Status als größter Palmölproduzent beibehalten kann, hat man angefangen, nachhaltige Ansätze für die Palmölproduktion zu fördern. 2011 wurde der sogenannte " Indonesia Sustainable Palm Oil" (ISPO) Standard als ein obligatorischer Standard für große Palmölproduzenten eingeführt. Für Kleinbauern ist der Standard bisher freiwillig. Neben diesem Pflicht-Standard gibt es auf der internationalen Ebene noch weitere freiwillige internationale Standards, zum Beispiel den "Roundtable Sustainable Palm Oil" (RSPO) Standard und den " International Sustainability and Carbon Certification" (ISCC) Standard.

Ziel dieser Dissertation ist es, die Nachhaltigkeitsstandards in der Palmölproduktion in Indonesien zu untersuchen. Die Arbeit hat drei spezifische Forschungsziele. Erstens sollen die Ansichten, Meinungen und Bewertungen bezüglich des ISPO Standards von Interessenvertretern der Palmölindustrie und diese mit den realen Bedingungen von Kleinproduzenten abgeglichen werden. Zweitens wird untersucht in wie weit Kleinbauern Anbaupraktiken anwenden, die dem ISPO Standard nahe kommen und schließlich wird im Rahmen einer Kosten-Nutzen-Analyse geprüft, welche Beratungsstrategien ökonomisch effizient und aus gesamtwirtschaftlicher Sicht vertretbar wären. Schließlich soll die Anwendung des Standards von der Seite der Kleinproduzenten analysiert werden.

Diese Studie greift auf vier Primärdatenquellen zurück: Die erste besteht aus einem Paneldatensatz, basierend auf 245 Ölpalm-Kleinproduzenten im Distrikt „Merangin", in der Provinz Jambi, in Sumatra aus den Jahren 2010, 2012 und 2013. Der Paneldatensatz umfasst Informationen zu Haushaltscharakteristika, landwirtschaftliche Details und ökonomische Daten aus den jeweiligen Vorjahren 2009, 2011 und 2012. Zweitens wurde 2013 eine Umfrage mit 25 Interessenvertretern aus verschiedenen Gruppen der Palmölindustrie in Jambi-Stadt durchgeführt. Drittens wurde in jedem Dorf eine Fokus-Gruppen-Diskussion mit ca. 7-12 Teilnehmern durchgeführt. Die vierte Primärdatenquelle beinhaltet Interviews mit den jeweiligen Dorfvorstehern, die in 2013 durchgeführt wurden.

Diese Arbeit bewertet die verschiedenen Ansichten des nachhaltigen Standards in der Palmölindustrie in Indonesien aus Sicht der Interessengruppen und Kleinproduzenten. Mithilfe von deskriptiven Statistiken und nicht-parametrischen Tests wurden die Interessenvertreter-Interviews analysiert. Die Fokus-Gruppen-Diskussionen wurden genutzt, um die realen Erfahrungen der Kleinproduzenten zu untersuchen. Eine Gegenüberstellung der beiden Gruppen zeigt, dass die Ansichten der Interessenvertreter signifikant von den Erfahrungsberichten der Kleinproduzenten hinsichtlich der praktischen und ökonomischen Machbarkeit den ISPO Standard zu implementieren, abweicht. Auf der anderen Seite betonten die Kleinproduzenten, dass der Standard Vorteile hätte, aber auch Kosten beinhaltet.

Um die Anwendung des ISPO-Standards von Seiten der Kleinproduzenten zu untersuchen, wurde ein "Seemingly Unrelated and Recursive Bivariate Probitmodell" und ein "Endogenous Switching Poisson Modell" an dem Paneldatensatz und den Dorfvorsteherdaten angewandt. Die Spezifizierung eines Kleinproduzenten als Anwender von Praktiken die dem ISPO Standards entsprechen erfolgte über die Definition von drei aufeinanderfolgenden Anwendungsschwellen und die Identifikation einer bestimmten Anzahl von Praktiken. Die Ergebnisse zeigen, dass das wahrgenommene Risiko der sinkenden Palmölproduktion ein wichtiger Faktor ist, der Kleinproduzenten dazu bewegt, Praktiken anzuwenden die dem ISPO Standard nahe kommen.

Im Rahmen einer Kosten-Nutzen-Analyse wird die Einführung des ISPO-Standards über Beratungsstrategien in der kleinbäuerlichen Palmölproduktion in der Provinz Jambi auf Sumatra untersucht. Es werden zwei Beratungsstrategien zur Einführung des ISPO-Standards untersucht, nämlich Bauern-Feld-Schulen und eine standardmäßige Beratungskampagne. Die Ergebnisse zeigen, dass die Bauern-Feld-Schule unter den getroffenen Annahmen ökonomisch effektiv und attraktiv sein kann, um den Standard einzuführen.

Diese Dissertation kommt zu dem Schluss, dass die Spezifikation von Regeln und eine klare Strategie notwendig sind, den ISPO Standard zu implementieren. Deshalb sollte die Indonesische Regierung Investitionen in Angriff nehmen, die die Einführung des ISPO Standard in der Kleinproduktion im größeren Umfang ermöglicht. In Bezug auf zukünftige Forschung wird eine Kosten-Nutzen-Analyse des ISPO Standards auf Unternehmensebene empfohlen, die Verarbeitung und Fertigstellung berücksichtigt.

Stichworte: ISPO Standards, Palmöl, Kleinproduzenten, Interessenvertreter, Adoption, Kosten-Nutzen-Analyse

Abstract

Indonesia is the largest producer of oil palm in the global market. Even with the status, Indonesia continues to expand its plantations. This causes some environmental issues and as a result, standards have to be implemented. To ensure the country maintains its status, it embarks on promoting sustainable approaches to its oil palm production. In 2011 is the so-called Indonesia Sustainable Palm Oil (ISPO) standard was launched, which is a mandatory standard for all large-scale oil palm growers, but voluntary for smallholder farmers in Indonesia. However, other international voluntary standards were already known, namely Roundtable Sustainable Palm Oil (RSPO) and International Sustainability and Carbon Certification (ISCC).

In generally, this thesis aims to investigate the sustainable standards on oil palm production in Indonesia. There are three specific research objectives in this thesis. First, it aims to compare the views between and among smallholders and stakeholders of the ISPO standards. Second, it also analyzes the adoption of the ISPO standards by smallholder oil palm farmers. Finally, the thesis assesses the cost benefit analysis of introducing the ISPO standards.

This study used four sources of primary data: the first consisted of a panel data set which was collected from 245 smallholder oil palm farmers in Merangin district, Jambi province Sumatra Indonesia during 2010, 2012 and 2013. In this survey, data pertaining to the household characteristics, agricultural details and economic data from previous production years 2009 , 2011 and 2012 were obtained; Second, a stakeholders survey was collected during 2013 from 25 respondents of various groups in the oil palm industry of Jambi City; Third, a Focus Group Discussion (FGD) with around 7-12 participants was carried out in each village; the final source of data included an interview with the village leaders which was conducted in each village in 2013.

This thesis reveals the assessment of different stakeholder groups and smallholder farmers' views of the sustainable standards in oil palm production in Indonesia. Descriptive statistics and non-parametric tests were used to elaborate the stakeholders' interviews. In addition, the Focus Group Discussion was employed to explore the real experiences of smallholder oil palm farmers in three villages in Merangin district, Jambi province. By confronting the stakeholder's views and the reality experiences of smallholder farmers, this study found stakeholder views differ significantly regarding the practicality and economic feasibility of ISPO standards to be implemented on smallholder farmers. On the other hand, smallholder farmers highlighted that the standards could provide benefits but would also include costs.

To investigate the adoption of ISPO practices among smallholder farmers, a seemingly unrelated and recursive bivariate probit models and an endogenous switching Poisson model on household panel data and information from village head interviews were applied. In this work, adoption is specified by defining three sequential adoption thresholds and identifying concrete number of practices. The result shows that the perception of risk of the decline in oil palm production encourages the smallholders to adopt the standards.

This thesis presents a cost-benefit analysis of the introduction of ISPO standards on oil palm farmers in Jambi province, Sumatra. In this work, adopters and non-adopters are defined by using a panel household data set in Merangin district Jambi. In term of cost benefit analysis, two extension strategies for the introduction of ISPO were explored; Farmer Field School (FFS) and conventional extension campaign. The results show that, given the assumptions, FFS can be economically effective and attractive to promote the standards.

This thesis concludes that the specification of guidelines and a clear strategy is needed to implement the ISPO standards. Therefore, government of Indonesia should undertake considerable efforts and investments if ISPO standards are to be implemented on large scale of oil palm growers particularly smallholder farmers. For the future research, it is recommended to conduct cost benefit analysis study of ISPO standards on oil palm company level involving processing and manufacturing.

Keywords: ISPO standards, oil palm, smallholders, stakeholders, adoption, cost benefit analysis

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List of abbreviations

CBA	Cost Benefit Analysis
CBR	Cost Benefit Ratio
CPO	Crude Palm Oil
DIE	German Development Institute / Deutsches Institut für Entwicklungspolitik
EIRR	Economic Internal Rate of Return
EURED	European Union Renewable Energy Directive
FFB	Fresh Fruit Bunch
FFS	Farmer Field School
GAPs	Good Agricultural Practices
GHG	Greenhouse Gas
IDR	Indonesian Rupiah
IPCM	Integrated Pest and Crop Management
IPM	Integrated Pest Management
IRR	Internal Rate of Return
ISCC	International Sustainability and Carbon Certification
ISPO	Indonesian Sustainable Palm Oil
kg	Kilogram
NBM	Natural Resource Management
NPV	Net Present value
RSPO	Roundtable on Sustainable Palm Oil
USD	United States Dollar

Chapter 1: Introduction

1.1 Background

Indonesia is the largest producer of palm oil in the world. The development of oil palm plantations has contributed to economic growth and the reduction of rural poverty. On the other hand, this development has led to a number negative externalities e.g. deforestation, water pollution, carbon emission, and social conflicts between oil palm companies and indigenous communities which has led to a negative image of the oil palm industry on a global scale. To counter this problem, similar to the development of many agricultural commodites, e.g. coffee (Giovannuci and Ponte; 2005 Kilian et al., 2006), forest products (Holvoet and Muys, 2004), soy bean (Schouten et al., 2012) sustainability standards have also been developed for the oil palm industry (Hospes, 2014). Meanwhile, there are three sustainability standards in oil palm, (a) International Sustainability and Carbon Certification (ISCC), which is a voluntary and international standard related with bio fuel production under the European Union's Renewable Energy Directive (EU-RED), (b) the Roundtable Sustainable Palm Oil (RSPO), which is a voluntary international standard initiated by multiple stakeholders established in 2003, and (c) Indonesia Sustainable Palm Oil (ISPO), a mandatory sustainable standard for oil palm companies in Indonesia launched in early 2011. The ISPO aims to promote an environmental friendly and sustainable development of the oil palm industry trough certification. However, so far it has not yet been recognized by the international markets for palm oil. Furthermore, ISPO is mandatory only for large scale oil palm plantations, but is a voluntary standard for smallholders.

Although numerous studies on the economics of oil palm have been carried out, only few studies of sustainability standards in small holder oil palm production have been undertaken so far. Several recent studies have emphasized RSPO as a internationally recognized standard in global private governance (Nikoloyuk et al., 2009; Shouten and Pieter, 2011; Köhne, 2014; Oosterveer, 2014). Studies on ISPO (Harsono et al., 2012; Mc Carthy, 2012; Hospes, 2014) pointed out, that while being an obligatory standard in Indonesia's oil palm industry, no evidence exists regarding the degree of implementation. Also, there are no visible enforcement mechanisms in place to assure that the standards are being followed.

Against this background, it is the aim of this research to improve the understanding about Indonesian oil palm farmer's knowledge of good management practices and how these relate to sustainability standards formulated by the oil palm industry. In particularly, this thesis addresses the views of stakeholders of ISPO and how these might fit into the small holder farming environment. It also asks the question of adoption of crop management practices and how close these are to ISPO standards. Finally, the question is investigated, how efficient investment in extension strategies that aim at introducing ISPO standards to smallholders would be. Hence, this study contributes to fill a major gap in the literature by focusing on smallholder oil palm farming in Indonesia. The study location is in the province of Jambi in Sumatra, one of the major oil palm plantation areas in Indonesia. The study uses several sources of data including household panel data, a stakeholder survey, Focus Group Discussion in three small holder oil palm villages and interviews with village heads.

1.2 Research objectives

The overall objective of this thesis is to improve the understanding of the feasibility and actual use of sustainability standards in oil palm farming by smallholders in Indonesia. The research has three specific objectives:

1) To assess the views of different stakeholders in the oil palm value chain and compare these with the reality of smallholder farmers and their experiences in three villages in the province Jambi, Sumatra, in order to conclude about the opportunities and constraints to implement ISPO standards among small holder oil palm famers.

2) To assess the degree of adoption of crop management practices based on ISPO standards by smallholder oil palm farmers, and to better understand the factors driving adoption of such practices.

3) To assess the efficiency of investment in two extension strategies to implement ISPO standards to small holder farmers namely a Farmer Field School approach and a conventional extension campaign by means of a cost benefit analysis applied to the conditions of Jambi, Sumatra.

1.3 Organization of the thesis

The thesis is organized in six chapters. Chapter 2 provides information study area and data collection. This chapter illustrates the location of the study area, the data collection procedures including survey instruments and sampling.

Chapter 3 analyzes stakeholders view and a village case study on ISPO. In this chapter, the principles and criteria of ISPO as obligatory standard for large scale oil palm growers and a voluntary standard for small holder farmers in Indonesia were described. The data were collected by interviewing with a structured questionnaire administered among stakeholders and by conducting Focus Group Discussions with small holder oil palm farmers in three villages in Merangin district of Jambi province. Descriptive statistics and non-parametric tests are used to identify differences among stakeholder views. Confronting stakeholders views with farmers opinions revealed during Focus Group Discussions were carried out to discover compatibility and differences on the sustainable palm oil standards. The title of this paper is "The Indonesian Sustainable Palm Oil: stakeholder sssessments and smallholder farmer views". An earlier version of the paper in chapter 3 was presented at the International Conference on Research on Food Security, Natural Resources Management and Rural Development (Tropentag), September 17-19 2014, Czech University of Life Sciences Prague, Czech Republic.

Chapter 4 investigates the actual adoption practices of ISPO on smallholder oil palm farmer's level in Merangin district, Jambi province, Sumatra, Indonesia. In this study, the adoption is measured based on survey data of crop management practices carried out in 2013. Defining and testing adoption thresholds and identifying the drivers of practices, which can be equated with ISPO standards, are the core in this paper. A seemingly unrelated and recursive bivariate probit model and a switching regression Poisson model are applied, to assess the drivers of adoption ISPO practices. The title of this paper is "Adoption of ISPO practices by smallholder oil palm farmers in Indonesia". The paper will be submitted to an agricultural or environmental economics journal.

Chapter five provides cost benefit analysis of the introduction of the ISPO standards to smallholder oil palm farmers in Jambi province through two alternative extension strategies. It uses a panel data set of 185 oil palm smallholders, which are collected during survey in 2010, 2012 and 2013 to distinguish between adopters and non-adopters. To introduce of ISPO standards, two basic strategies namely a conventional extension campaign and Farmer Field School were explored in the analysis. In addition, the option of achieving international certification of ISPO standards by means of a more costly certification scheme is also discussed. Simulation scenarios for both strategies and international certification were developed. The title paper in this chapter is "Cost benefit analysis of the introduction of the Indonesia sustainable palm oil standards in Jambi province, Sumatra, Indonesia", published and printed online at Economy and Environment Program for Southeast Asia (EEPSEA)-WorldFish website. This paper was presented at 21st Annual Conference of the European Association of Environmental and Resource Economists (EAERE) June 24-27 2015, in Helsinki, Finland.

Chapter 6 submits a synthesis of this research which involves summarizing the results, drawing conclusions and giving recommendations for the future research.

Chapter 2: Study area and data collection

2.1 Study area

This study was carried out in the Jambi Province, Sumatra, which is one of the major oil palm producing provinces in Indonesia. The area of this province is around 53000 km^2 and consists of nine districts and two cities, namely Sungai Penuh and Jambi. Jambi has a population of around 3.3 million people with most of them working in agricultural sector. Generally, smallholdings are the largest plantations in Jambi with rubber as the main crops followed by oil palm and coconut. Hence, data was collected from Jambi province from the city of Jambi and Merangin district (see Figure 2.1).

Figure 2.1: Study area

Source: Jambi in figures, 2014

2.2 Sampling

A multi-stage sampling approach was used in the study conducted in Jambi city for stakeholder survey and in Merangin district for the smallholder household survey. Jambi city is selected for variety of actors in oil palm supply chain. Merangin district has a large area of around 7000 km^2 or 15.31% of total Jambi province area. It also has oil palm plantations at different growth stages (Cahyadi, 2013). As the growth stage of oil palm influences its productivity, we conducted a smallholder household survey in Merangin district to capture the different growth stages of oil palm. Three villages, namely Rawa Jaya, Mentawak Baru and Dusun Baru were selected from this district based on the following three reasons: first, the cooperation of the village head; second, located at varying distances around oil palm mills and third, these villages have both, migrant and indigenous population.

The first village, Rawa Jaya is located in the sub-district of Tabir Selatan, around 10 km away from the oil palm mill with a total number of 3000 inhabitants. Dusun Baru is located in the sub-district of Tabir Lintas, around 20 km from the oil palm mill. It has around 6000 people, mostly belonging to indigenous tribes. The last village is Mentawak Baru which is located in the sub-district of Air Hitam. The distance to oil palm mill is further in comparison to the other villages and is around 50 km. The number of inhabitants in this village is less than the first village and has around 2000 people. Both, Rawa Jaya and Mentawak Baru have predominantly migrant population.

This thesis work includes four data collection sources. First, this study used a three years panel household survey from Meranging district wherein data from 245 smallholder oil palm farmers were randomly collected in 2010, 2012 and 2013. The distributions of respondents are 120 in Rawa Jaya, 90 in Mentawak Baru and 35 in Dusun Baru. Second, 25 stakeholders from various groups in the palm oil industry were interviewed based on disproportionate stratified random sampling. The stakeholder groups include 10 representatives from governmental agencies, 4 from non-governmental agencies, 3 belonging to a farmer association, 5 representing oil palm companies and 3 researchers. Also 20 villagers were selected using random sampling for Focus Group Discussion (FGD) in 2013. Village head interviews were also conducted in 2013 to understand facilities in the village, like access to good infrastructure systems, roads and access to good quality water.

2.3 Survey instruments

The household survey data were collected using structured questionnaires. In 2010 and 2012, household questionnaire included information on household characteristics, shocks and risks, agricultural activities, household income, loan and lending, investment and future plan. In 2013, the questions related to sustainable oil palm crop management practices were added. The household surveys were conducted in January and February in 2010 and in July and August in 2012 and 2013. The data collected in 2010, 2012 and 2013 pertains to production years 2009, 2011 and 2012, respectively.

Household characteristics consists of information on household age, gender, occupation, health and education. It also includes shocks experienced by the household in the last 5 years, impact of such events on the household and coping strategies implemented. Also attitude towards risk and their expectation of similar future shocks were collected.

Agricultural activities pertain to information about land and crops, production and sales of oil palm and crop inputs. To assess household income, data were collected from farm and non-farm activities, livestock, wage employment and natural resource extraction.

In 2013, the respondents were asked about their implementation of sustainable oil palm crop management practices such as keeping record of inputs used, applying integrated pest management (IPM) practices, following the technical guidelines for crop maintenance and for harvesting Fresh Fruit Bunches (FFB) as prescribed under Indonesian Sustainable Palm oil (ISPO) practices.

The stakeholder questionnaire captures information on principles and criteria of sustainable standards of oil palm production in Indonesia (ISPO) (see Appendix C) from different stakeholder groups. This includes information on licensing, environmental management of oil palm processing, labor, social and community responsibility as well as economic empowerment.

Licensing section pertain to information relating to license cost, and its benefit to smallholders and society. Technical standards for oil palm production and transportation include guidelines on land clearing, land management, water resources and use of seeds, soil fertility, pest management, harvesting and transportation. The financial feasibility of the guidelines for smallholders was also investigated.

In environmental management of oil palm processing plants and oil palm plantation, the stakeholders were questioned on the effectiveness of ISPO standards to minimize damage, management of water wastage, prevention of fires, and conservation of biodiversity and transparency. Labor section pertains to information relating to implementation of effective labor standards. Major measures to increase welfare of laborers were also investigated.

In the social and community responsibility and economic empowerment section, the stakeholders responded on the effectiveness of ISPO standards to guide oil palm companies to support small scale enterprises and to commit to local communities. The last section, sustainable business improvement pertains to information on how the oil palm growers can improve the local community through the implementation of ISPO standards.

Third, Focus Group Discussions (FGD) was carried out with randomly chosen 20 participants per village. Major discussion points were the costs and benefits of the ISPO criteria from the point of view of the farmers. The discussion used open questions to capture information of socio-economic and environmental aspects of village, farmers' knowledge of ISPO practices and villagers' expectation of the village and oil palm production in the future.

Additionally, the village head interviews in 2013 concentrated on the following information: village demographics, village infrastructure, employment, agriculture, economic and environment conditions of the village.

Village demographics include data on number of households, number of inhabitants, number of villagers working, etc. In village infrastructure section, village head was asked about the location of village, the main type of road and village's facility. Employment includes information relating to the main occupation of villagers as well as major agricultural activities. In the last section, village heads were asked to comment on the changes in the economic and the environmental conditions of village during the past 10 years.

In addition, secondary statistics and related literatures were used to complement the information collected through the different surveys.

2.4 Implementation of data collection

The data was collected in the following steps. First, enumerators were selected and recruited from Jambi University. Training was conducted for selected enumerators in 3 parts: 1) the first part was conducted to explain survey objective and questionnaire content. The researcher explained the objective of every question and discussed appropriate probes for every question; 2) the second part was designed for the interviewers to practice reading and pointing the assigned show card. Then a discussion session was held to understand possible difficulties and, 3) the last part was role plays, wherein the interviewers, researcher and field supervisors acted as respondents for the surveyors.

As a second step, pre-testing of questionnaires was conducted by interviewing smallholder oil palm farmers in the field study area. This procedure aims to improve the quality of questionnaire and make the interviews effective.

In the third step, stakeholder workshops were conducted to explore participant's information and interpretation of the ISPO criteria. This survey was also carried out in line with the household survey wherein select enumerators were trained, and a pre-test of the stakeholder questionnaire was also implemented.

In the next step, Focus Group Discussions (FGD) were conducted in all villages to establish information on knowledge, adoption costs and expected benefits of measures related to ISPO criteria. The FGD was lead by the author as a moderator. The moderator introduced the topic to the villagers and stimulated a discussion, which was documented by two assistants.

2.5 Summary

This chapter describes the data collection procedure used in this study, wherein data were collected from two locations in Jambi province, namely Jambi city and Merangin district. This study employs four primary data sources. These include a smallholder household three years panel survey data, stakeholder survey, Focus Group Discussion and village head survey.

Data from stakeholder interview and the reality experiences of farmers through Focus Group Discussion in three villages are used to assess the view of the various stakeholder group and smallholder farmers toward sustainable oil palm production standards in Indonesia in chapter 3.

Chapter 4 applies data on household characteristics, shocks and risks, agricultural activities, household income, loan and lending from a household panel data and the village head information to analyze factors, that influence adoption of ISPO practices by smallholder oil palm farmers.

In chapter 5, data from household panel data set from three years on agricultural activities and data on sustainable oil palm management practices are used to estimate a cost benefit analysis of introducing ISPO standards among smallholder oil palm farmers.

Chapter 3: The Indonesian sustainable palm oil: Stakeholder assessments and smallholder farmer views

This chapter is based on a joint paper by Ernah and H. Waibel, presented at the International Conference on Research on Food Security, Natural Resources Management and Rural Development (Tropentag), September 17-19, 2014, Czech University of Life Sciences Prague, Czech Republic.

3.1 Background and objectives

As a response to the growing global demand of palm oil, Indonesia has hugely expanded its oil palm plantation areas. To date, Indonesia is the largest producer of palm oil with about half of the world's palm oil production. The oil palm industry in Indonesia has contributed to economic growth and helped to reduce poverty in rural areas (Manurung, 2001; Susila, 2004; World Bank, 2010; Cahyadi and Waibel, 2013). However there are also downsides of this development such as water pollution, soil erosion and the threatening of plant and animal species as a result of deforestation (Koh and Wilcove, 2008; Tan et al,. 2009; Obidzinski et al., 2012; Orsato et al., 2013; Schrier-Uijl, 2013). Also indigenous communities living in forest areas in many cases have been constrained in their livelihood and also competition over land use has caused social conflicts (Vermeulen and Goad 2006; Marti 2008; Rist et al. 2010).

There are three types of oil palm plantations in Indonesia, namely: (1) private plantations; (2) state plantations and (3) smallholders. Almost 50 % of the oil palm plantation areas are owned by private corporations, 40 % by smallholders, and the remainder are state farms. Smallholder oil palm farmers are defined as those with a land holding up to 50 hectares (RSPO, 2013). As a result of government promotions the oil palm area managed by smallholders has grown from just 8500 hectares in 1982 to more than 4 million hectares in 2012 (Statistics Indonesia, 2015). Likewise the smallholder oil palm production has grown from less than 3000 tons to some 9 million tons in 2012 indicating that yields have increased remarkably over the last forty years (Statistics Indonesia, 2015).

In an attempt to align the oil palm industry with the paradigm of sustainable development, in 2009 Government of Indonesia (GoI) has introduced a mandatory standard, called the Indonesia Sustainable Palm Oil (ISPO). With ISPO, GoI has been taking a different route from the international oil palm industry which had established the Roundtable of Sustainable Palm Oil (RSPO). RSPO is a voluntary but internationally recognized standard that requires certification and offers a price premium in the European and US markets. However while ISPO is not yet recognized in the international markets it nevertheless is promoting sustainable palm oil production. Under ISPO a set of seven principles have been defined which are further specified by corresponding criteria for different aspects of oil palm production basically prescribing actions that are expected by the stakeholders in the oil palm value chain. A particular challenge is the adoption of ISPO standards by smallholder farmers. GoI has declared the ISPO principles and criteria as mandatory. However there is no obvious enforcement mechanism in place and especially the smallholder oil palm farmers may lack the necessary technical means and the knowledge to put the required standards into practice.

Against this background, this study explores the views of different stakeholder representatives as regards the technical and economic feasibility of the ISPO guidelines. It will be in order to identify similarities and differences. Such comparison can help to clarify opportunities and constraints of ISPO implementation. Furthermore confronting stakeholder views with the results of stakeholder discussions with smallholder oil palm farmers will reveal information on how realistic is a mandatory system of sustainable oil palm farming.

The paper proceeds as follows. In the next section the principles and criteria of the Indonesia Sustainable Palm Oil are described in more detail. Thereafter (section 3.3) the methodology of data collection and analysis is presented. Section 3.4 reports and discusses the results and chapter 3.5 summarizes and concludes.

3.2 Description of the Indonesia Sustainable Palm Oil (ISPO) standards

To introduce ISPO the Ministry of Agriculture has established an appraisal commission as an authoritative body to assess the compliance of stakeholders in the oil palm value chain with ISPO standards. The goal of GoI has been that by 2014 all oil palm would be under ISPO, which however was not the case. Several studies found problems with the actual implementation of the standards especially at the producer level (e.g. McCarthy, 2012; Hospes, 2014; Ootserveer, 2014). Brandi et al., (2013) emphasized the lack of monitoring capacity and enforcement mechanisms. To date little is known about the actual degree of adoption of ISPO standards and how far GoI has reached with its goal of implementing these standards that would finally lead to a fully operational and internationally recognized certification system.

The ISPO aim is to define standards on the establishment and management of oil palm plantations including transportation, processing and marketing. These standards are formulated trough principles and criteria and are meant to be legal guidelines for sustainable oil palm production.

The seven ISPO principles and the total of 38 corresponding criteria are published by the Ministry of Agriculture (see http://www.ispo-org.or.id/images/Persyaratan_ISPO-Plasma-revisi_23_Januari_2013.1.pdf).

In Table 3.1 the ISPO principles and criteria are translated from the original document which contained principles, corresponding criteria, indicators and guidelines for implementation. Unfortunately, not all principles are substantiated by concrete criteria; some of them are not clearly formulated and seem to lack practical relevance. Hence, in Table 3.1 we have included those criteria that allow interpretation and operationalization.

The first principle addresses the issue of land intended to be used for oil palm farming. The six criteria under this principle are aimed at reducing land conflicts which in the past have been a major problem. Principle 2 has 10 criteria which provide a prescription for the management of plantations starting from the clearing of land, seed selection and plantation till harvesting procedures. Principle 3 again is addressing the special case of the use of peat land and primary forest and imposes a temporary halt (moratorium) on the use of such land where in the past oil palm plantation have encroached and have caused problems. The fourth principle is focused on environment and demands environmental impact assessment as well as special measures for fire protection, one of the major problems in many of the oil palm areas in Sumatra. Its third criteria are addressing biodiversity conservation. Principle five talks about standards to address occupational health problems in connection with the management of oil palm plantation for example in connection with the use of pesticides. Principle six is directed towards community development by promoting social responsibility and empowerment among oil palm farmers. Finally, principle seven talks about sustainable business development regarding the social, economic and environment in oil palm areas especially the villages where laborers and small scale oil palm farmers reside.

Table 3.1: ISPO principles and their major corresponding criteria

No	Principle	Description	Criteria
1	Plantation management and licensing	Regulation of land use for oil palm plantations including procedures for land disputes, coexistence with the mining industry and provision of information to third parties	1) Legality of land use through proof of ownership 2) Suitable Land 3) Land Disputes to be resolved by negotiation 4) Group Farming 5) Coexistence with mining activities 6) Transparency and Confidentiality
2	Technical guidelines for oil palm cultivation and transport.	Prescription for oil palm plantation management from plantation establishment to harvesting fresh oil palm fruits and marketing them	1) Land clearing 2) Protection of water resources 3) Seeds and Planting Material 4) Soil preparation for planting 5) Planting on peat land 6) Plant Management 7) Pest Management 8) Harvesting 9) Transporting Fruits 10) Marketing and Pricing
3	Moratorium on the issuance of concessions for plantations in primary forest and peat land.	This principle puts a temporary stop on the issuance of permits for the use of peat land and primary forest for establishing oil palm plantations	
4	Environmental management and monitoring	Environmental assessment prior to oil palm plantation establishment	1) Obtain environmental clearance 2) Fire prevention and suppression 3) Maintain and preserve biodiversity
5	Health and safety of laborers and farmers	Promotion of Safety Procedures in oil palm farming	Training on health and records of implementation of safety procedures
6	Community development	Economic empowerment through promoting cooperation	Formation of cooperatives and farmer groups
7	Empowerment and business development	Collective action program to maintain and improve technical infrastructure and the environment	Continuously improve performance with regards to social, economic and environmental

Source: Based on Ministry of Agriculture (2015): Peraturan Menteri Pertanian Republik Indonesia Nomor 1/Permentan /OT.140/3 /2015

A special feature of the ISPO guidelines is that much of the implementation is dependent on plantation managers (plasma manager). The Government main strategy is by trying to introduce ISPO via the oil palm companies. The problem with this approach is on the one hand the lack of clarity and precision of the ISPO criteria which leaves much room for interpretation. On the other hand the Government's capacity of monitoring and enforcement is weak and although sanctions can be in principle imposed for non-compliance with the standards in reality this is difficult to realize.

In addition to the technical standards, the aim of ISPO guidelines is to introduce certification, first to private companies and later for smallholder farmers. For private companies the target is full certification by the end of 2015. However, no evidence is available how much certification has been achieved to date and if this target can be reached. For smallholders implementation of ISPO standards is still voluntary and no target for certification has been set (Ministry of Agriculture 2015). Furthermore it is not clear what strategy the government has in place to introduce ISPO standards and to implement certification schemes for smallholders.

Based on the analysis of the content and the feasibility of implementing ISPO guidelines it can be expected that stakeholders in the oil palm industry in Indonesia may differ in their assessment regarding the technical and economic feasibility of ISPO. Furthermore it will be interesting to compare the stakeholder views with the perspective of smallholder farmers who will carry the major costs of ISPO while still uncertain about their benefits.

3.3 Data and methodology

This study has two sources of primary data. The first is a survey among stakeholders who are connected to the oil palm industry in Jambi province during July 2013. In total there were 25 respondents who could be attributed to five stakeholder groups namely Government agencies including the Ministries of Agriculture, Forestry, Trade and Environment, the oil palm companies, farmer association, NGOs and researchers (see Table 3.2). The largest number of respondents was from government agencies, only three respondents came from farmer association and researchers respectively. The questionnaire was short and focused. It was structured around the seven ISPO principles complemented by questions on general knowledge of sustainability standards in the oil palm industry. Selection of respondents was by suggestion of the respective agencies. The face to face interviews have been carried out by trained enumerators.

The survey instrument was structured around the seven ISPO principles as indicated in Table 3.1 above[1]. After a few introductory knowledge questions, the opinions of stakeholder representatives regarding various criteria formulated for the seven ISPO principles were asked. Most of the questions were simple yes – no questions (e.g. *"do you think that the ISPO standards for environmental management of oil palm processing plants are effective to minimize damage to the surrounding environment"* ?). Some questions had been pre-coded but respondents were not prompted for a specific answer but were always asked for specification. In addition a few questions were open-ended.

Table 3.2: Respondents of the stakeholder survey

No	Name of Groups	Respondents
1	Government Agencies	10
2	Oil palm companies	5
3	Farmer Association	3
4	NGOs	4
5	Researchers	3
Total		25

Source: Stakeholders survey, 2013

To add the perspective of smallholder farmers' Focus Group Discussions were carried out in three oil palm villages all located in Merangin District in the western part of Jambi province. Focus Group Discussions are essentially group interviews to generate data through the opinions expressed by participants. The method is used to identify differences and similarities in assessing problems and opportunities which are of the concern of participants and allow them to build up their ideas to gather additional information (Kaplowitz and Hoehn, 2001).

[1] The numbering of ISPO principles in the questionnaire was following the older version of ISPO guidelines; In the paper we re-interpreted them following the 2015 guidelines.

A panel of households had been surveyed in 2010 and 2012. The group discussions aimed to explore knowledge and perceptions of oil palm farmers towards the practices connected with the ISPO criteria. About 7-12 have participated in the discussion. The meetings were moderated by the author. Leading questions were introduced and the participants were invited to present their opinions. Discussion points were: (1) history of oil palm development in the village; (2) oil palm management practices and environmental conditions, and (3) future prospects of oil palm farming in the village. A discussion point was finished when some degree of consensus was reached although difference in opinions remained which were shown in the results. Discussions had been taped with the consent of the participants.

The analysis of the data proceeds as follows. First the stakeholder views are analyzed by comparing the answers among stakeholder groups. Weighted non-parametric Chi square and Fisher's exact tests are applied to test for significant differences in stakeholder views. Second, the answers to the leading questions in the village level group discussions are analyzed by means of tabulations using key words. Further explanations and selected examples are given in the text.

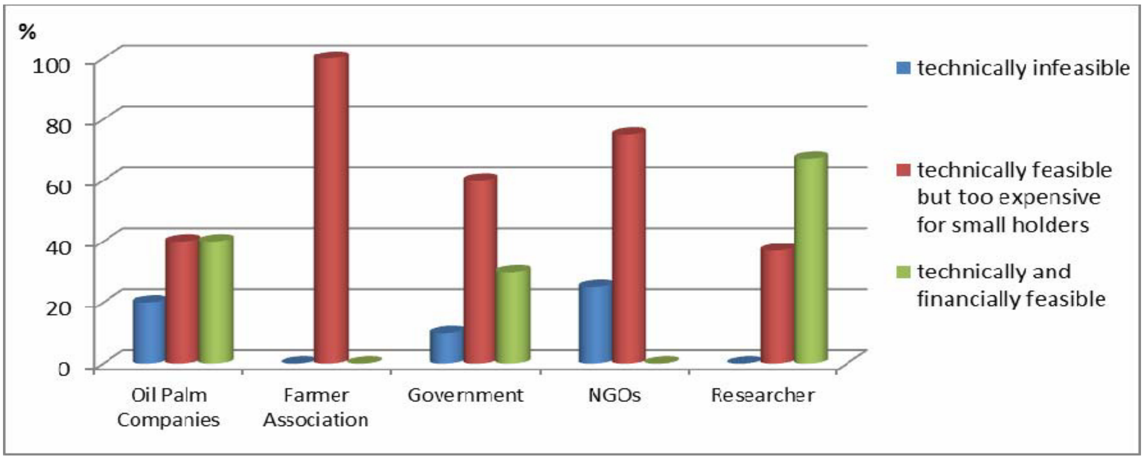
3.4 Results

The results are presented in two steps. First the stakeholder analysis is performed including the conduct of non-parametric tests and second a description of the village Focus Group Discussion is presented. In as much as possible references are made from the views of the smallholder farmers to those of the stakeholders.

Stakeholder analysis

ISPO has established guidelines for smallholders that map out the kind of practices that the ISPO promoters want them to pursue. Stakeholder representatives thus were asked how they would assess the feasibility for the smallholders to implement these guidelines in their plantations. Three answer categories were given: a) guidelines are technically and financially feasible b) guidelines are technically feasible but not financially (i.e. too expensive for the smallholders) and c) guidelines are infeasible, i.e. even from a technical perspective it's not possible for smallholders to implement them.

As shown in Figure 3.1 there is quite a divergence in opinion among the five stakeholder groups. Most prominently representatives of the farmers unanimously agree that the guidelines are just too expensive to implement. An even more negative assessment is given by NGO representatives where one out of four representatives also doubted the technical feasibility of the guidelines. On the other hand researchers demonstrate a more optimistic view where two out of three representatives consider the guideline technical and financially feasible. This is perhaps not surprising as presumably researchers had participated in the formulation of the guidelines and economic consideration are often left out when agricultural researchers make recommendations. Interestingly company representatives were quite mixed in their assessment with equal judgment about financial and technical feasibility while one representative also questioned the technical feasibility.



Source: Stakeholder survey 2013

Figure 3.1: Assessment of feasibility of ISPO Guidelines for smallholders by stakeholders representatives (in percent)

In Table 3.3 selected indicators of the expected outcome from implementing ISPO standards among smallholder farmers is presented. In total 13 indicators are selected which can be attributed to the different principles and criteria as outlined in Table 3.1.

The first row shows majority stakeholders positive with requiring for licensing by. The second two outcomes (rows 2 and 3) deal with the land which is a major source of unsustainability of current oil palm production. ISPO is providing rules on which land can be used for oil palm plantations. Overall the majority of stakeholders agree that the ISPO guidelines are a sufficient tool to reduce the risk of land misuse although there is more ambiguity about peat lands where the agreement is just over 50 %.

Not surprisingly NGO representatives are most critical about the land issues, however also the oil palm company representatives only have 3:2 votes on the issue while farmers and researchers are unanimously positive. Government representatives are dominantly positive on the effect for general land use but are rather divided on the peat land issue.

For environmental aspects in general (row 4) as well as water resources (row 5) and soil fertility (row 6) the overall assessment is positive although for soil fertility the positive assessment is more narrow with about 40 % disagreement. Especially for the latter indicator stakeholder views differ significantly. Representatives of government agencies and NGOs dominantly consider the guidelines to be insufficient to maintain soil fertility while company representatives and farmers give a positive assessment.

Little doubt however exists on the effectiveness of the guidelines for protection of laborers working in oil palm plantations. The promotion of safety measures and reduced pesticide use is almost unanimously viewed as effective by stakeholder groups. Only NGO representatives are divided in their views. Complete consensus exists among all stakeholders that the guidelines will be effective in improving the quality of fresh fruit bunch and consequently the palm oil yield. This is consistent with scientific studies on the financial impact of sustainability standards in large plantations (Levin et al., 2012). This assessment tends to be consistent with the effect on minimizing transportation losses although farmer associations are skeptical about it with 2 out of 3 representatives considering the guidelines as insufficient. Considerable divergence exists about the effect of the guidelines on the price. 40 % of the stakeholder representatives consider the guidelines to be insufficient to improve price fairness for smallholders. Surprisingly farmer representatives consistently see the guidelines as an effective means to give a fair price for smallholders. However the price generally is a major controversy due to the lack of transparency in the existing price determination system. Maryadi and Mulyana (2004) found that the price of strongly depends on price setting system of the nucleus firm's price setting team.

The last three outcome indicators (rows 11 to 13) refer to the measures to be undertaken by oil palm plantations for improving the socio-economic conditions of oil palm smallholder villages. The results of the stakeholder assessment show that respondents have a dominantly negative view on the effectiveness of the guidelines. Especially representatives of Government agencies question the adequacy of the guidelines for respective development activities to be performed by companies and even company representatives are not entirely convinced about that.

Overall the results show that the assessment among stakeholder groups differs significantly for all outcome indicators (except harvest quality). Fisher exact tests show a high level of significance for all outcome indicators presented in Table 3.3. Chi square test across all indicators confirms these results.

In Figure 3.2 stakeholder views on the impact of ISPO guidelines on some major environmental issues that have emerged from oil palm plantations are presented. Four environmental issues have been asked, namely wastewater discharge, fire prevention, biodiversity conservation and environmental transparency in relation to the documentation prepared by oil palm companies.

For the wastewater issue ISPO guidelines specify that Local Governments can give permission to oil palm companies for wastewater discharge into surrounding water bodies or into the sea. Stakeholders were asked if they think that this is an appropriate measure. Results show that overall stakeholders are not very convinced about this. However, 80 % of the representatives of Government agencies are positive higher than company representatives where 60 % agreed. The remaining three groups had zero or low agreement.

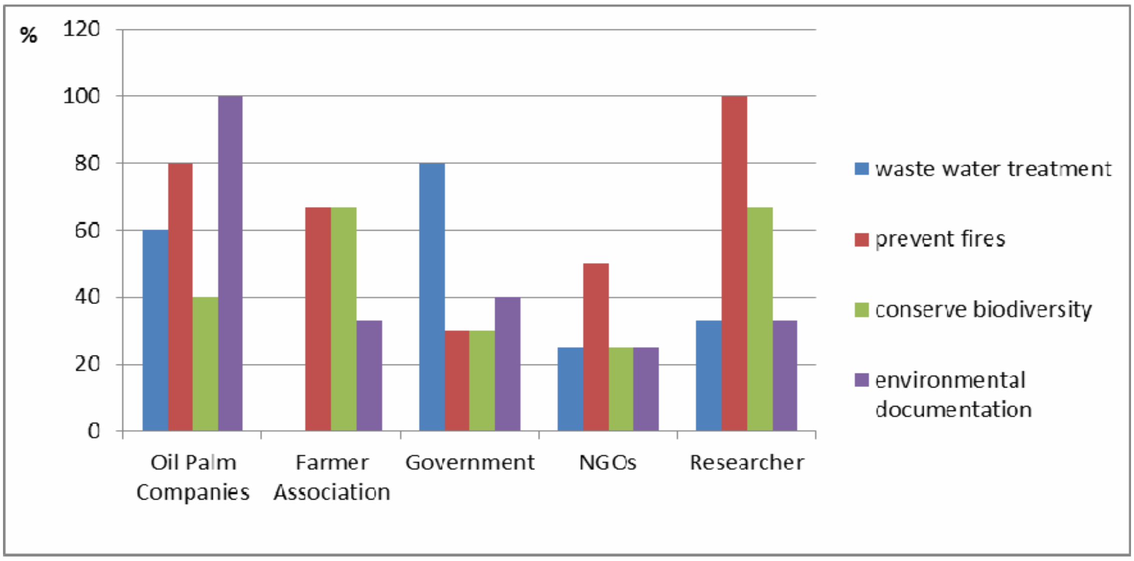
For the fire prevention effect, results are quite different. Here researchers are most positive followed by companies, farmer representatives and NGOs. Government representatives, however, disapprove by 70 %, i.e. most of the respondents do not believe that measures to prevent forest fire which frequently occur after clearing land and which oil palm companies are required to do according to ISPO standards are effective. For measures to conserve biodiversity stakeholder views are moderately positive on the whole with farmer representatives and researchers having approval of over 50 % while representatives of the three other groups mostly disagree, with government being the lowest. Since biodiversity is a public good, government is responsible for monitoring respective outcomes and therefore it is remarkable that government representatives are critical about the effectiveness of the guidelines in this regard. Finally, the transparency question: “do you believe that the documentation provided by oil palm companies is sufficient” was answered negatively by four out of five stakeholder groups except the company representatives.

Table 3.3: Assessment of sufficiency of the expected outcome of ISPO guidelines by different stakeholder groups in percent

No	ISPO Principle No.	Outcome	Oil Palm Companies		Farmers Association		Government Agencies		NGOs		Researchers	
			yes	no	yes	no	yes	no	yes	no	yes	no
1.	1	Require for licensing	100	0	100	0	80	20	50	50	67	33
2.	2	Minimize the risk of land misuse	60	40	100	0	80	20	25	75	100	0
3	3	Maintain functioning of peat lands	60	40	33	67	50	50	25	75	100	0
4	4	Environmental management and monitoring effective	80	20	100	0	80	20	50	50	67	33
5	2	Maintain water resources	80	20	67	33	60	40	100	0	67	33
6	2	Maintain soil fertility	100	0	100	0	30	70	25	75	67	33
7	5	Protection of laborers	100	0	100	0	90	10	50	50	100	0
8	2	Improve harvest quality	100	0	100	0	100	0	100	0	100	0
9	2	Minimize transportation losses	80	20	33	67	80	20	100	0	67	33
10	2	Fair price for FFB to smallholders	60	40	100	0	50	50	50	50	67	33
11	6	Oil palm companies effectively promote community development	60	40	33	67	30	70	25	75	0	100
12	6	Plantation managers support small scale business development	60	40	100	0	40	60	50	50	0	100
13	7	Plantation managers are doing enough to assess the progress in the development of the local communities	80	20	33	67	40	60	50	50	33	67

Note: Chi-square and Fisher's exact test show significant differences between stakeholder groups for all criteria (see Appendix A1).
Source: Stakeholder survey, 2013

In summary it is fair to say that as regards the environmental effects of the ISPO guidelines, views differ among the stakeholder groups and between the environmental issues. Chi-square and Fisher tests show significant differences for all four environmental issues asked.



Note: Chi-square and Fisher's exact test show significant differences among stakeholder groups for all criteria (see Appendix A)

Source: Stakeholder survey 2013

Figure 3.2: Assessment of environmental effectiveness of ISPO guidelines by stakeholder group

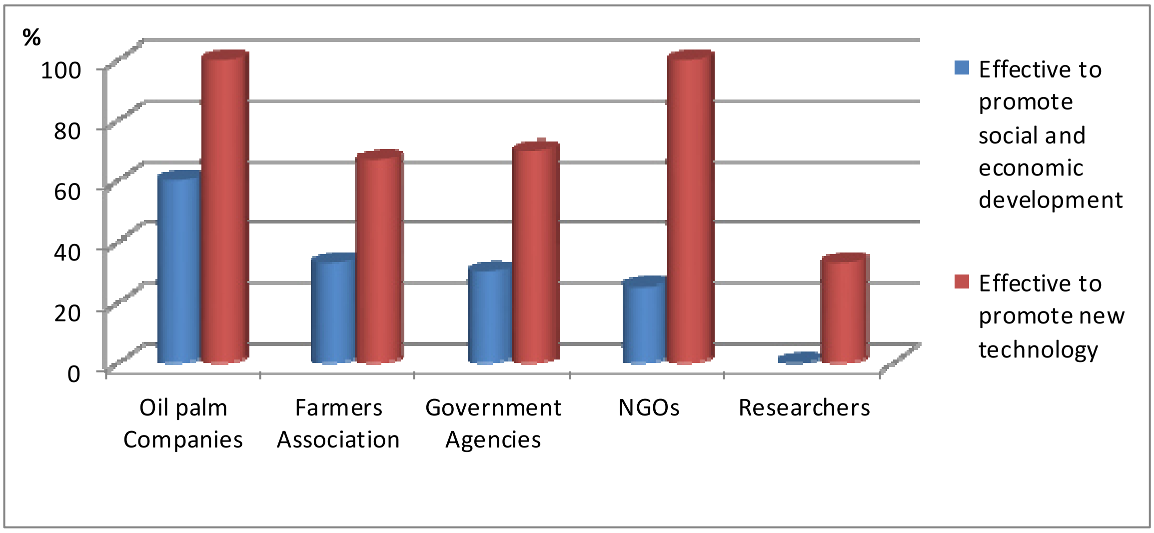
One of the social standards promoted by the ISPO guidelines is worker standards for people employed in the oil palm industry. This mainly concerns wage laborers of the companies but is also relevant for smallholder households whose family members may sometimes work part time in the oil palm industry. Hence stakeholders were asked if they thought that the ISPO standards were effective for protection of laborers rights including occupational safeguards. In general the results on this aspect are positive with at least 50 % agreement among all the stakeholder groups. As expected, representatives of the companies had the highest rate of agreement. Second were farmer associations at par with researchers while representatives of Government Agencies and NGOs were uncertain about this.

Table 3.4: Assessment of ISPO guidelines to meet labor standards

Group	Percentage	
	Yes	**No**
Oil palm companies	80	20
Farmers association	67	33
Government agencies	50	50
NGOs	50	50
Researchers	67	33
chi2 = 28.2001*** Fisher's exact = 0.000***		

Source: Stakeholder survey 2013; *** = Significant at the 1% level

One element related to the companies' promotional activities is that according to the ISPO guidelines plantation managers should improve technologies for better plantation (and plant processing) management aimed at improving environmental conditions in the oil palm areas. Positive technology spillovers to smallholder farmers could be expected from such measures. Here the results are opposite to the previous topic. Most stakeholder groups by majority believe that plant managers could be effective as technology transfer agents (Figure 3.3). Surprisingly NGOs are fully in line with company representatives. However researcher representatives are skeptical on this. It is nevertheless plausible to a assume that such requirements are in the interest of plantation manager as these could be win-win situations as companies benefit from more efficient technologies and there are no additional costs for technological spillovers to smallholder farmers.



Groups differ significantly at the 1% level using Chi-Square and Fisher's Exact Test

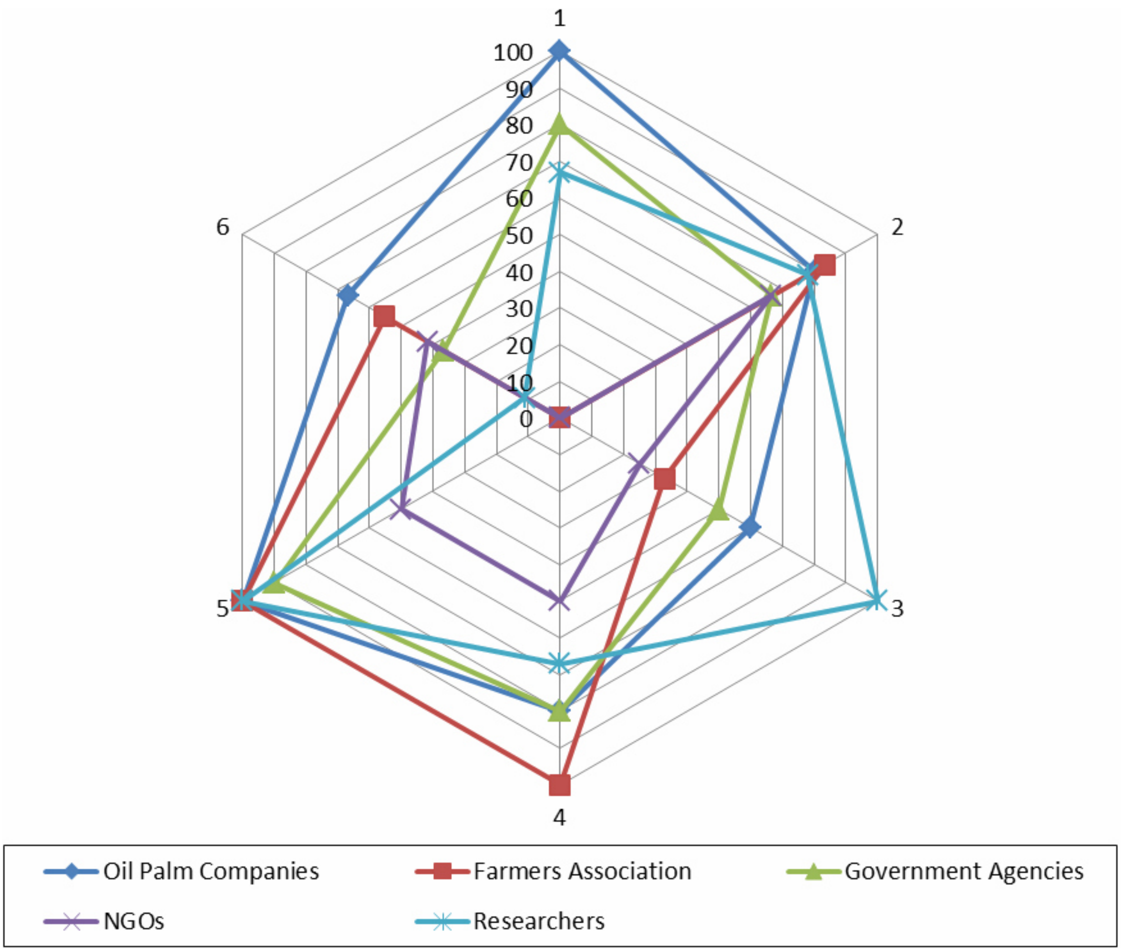
Source: Stakeholder survey 2013

Figure 3.3: Assessment of ISPO guidelines to induce oil palm companies to promote social and economic development and new technology in oil palm villages

Concluding the findings from the stakeholder survey results are summarized by grouping them according to the ISPO principles (see Table 3.1) using the results of Table 3.3. This is summary is presented in a kite graph as shown in Figure 3.4. Each axis of the kite represents an ISPO principle. For ease of presentation principles 6 and 7 have been joined together since they are also closely related. The axes represent the per cent agreement to the intended effects of the ISPO guidelines by stakeholder. Each stakeholder group can be identified as a "kite". The larger the kite the stronger is the agreement of a stakeholder group with the principle. The closer the kites overlap the more similar the assessments among the stakeholder groups are. The corners of the kite indicate full agreement of all respondents of a stakeholders group. For all principle where we had more than one criterion we took the average.

The graph shows that overall the highest level of agreement relating to the effectiveness of ISPO guidelines is expressed by oil palm company representatives. Their agreement is highest with at least two principles, i.e. principle 1 (licensing) and principle 5 (labor standards). The lowest overall degree of agreement is found from the respondents from research organizations who disagree with the effectiveness of ISPO guidelines for principles 6. A critical assessment was given also given by representatives of government agencies, NGOs and the farmer association are rather ambivalent on principle 3 (avoiding the misuse of forest and peat land). On the other hand government representatives show the highest level of inconsistency since, for example, they are in total agreement with companies on principle 4 but disagree on others. The results from government stakeholders underline the divergence in views among the different government agencies (i.e. agriculture, forestry and environment). Maximum agreement exists on principle 2 (plantation management) which is perhaps the most important one as far as adoption of ISPO standards by smallholder farmers are concerned. The second highest overall agreement is on principle 4, followed by principle 5.

Summarizing the results of the stakeholder survey it becomes clear that on the one hand the introduction of ISPO standards in the oil palm value chain in Indonesia generally is supported by stakeholders. On the other hand there is quite some disagreement on what would work and what not, both within a stakeholder group but more so among them. Since not only oil palm companies but also smallholders are a target group of the ISPO guidelines it will be useful to compare the stakeholder views with those of farmers. To achieve this objective village level Focus Group Discussions with smallholder oil palm farmers have been carried out. The results are presented in the in the next section.



Source: Stakeholders survey 2013

Figure 3.4: Summary of stakeholder assessments of the effectiveness of ISPO guidelines by ISPO principle

Village Focus Group Discussions

The three villages where Focus Group Discussions (FGD) were carried out are in the district of Merangin in the Western part of Jambi province. All three villages are located in the vicinity of an oil palm processing plant albeit at different distances ranging from 10 to 50 km. The first village, we call it "RJ" is located closest to the oil palm processing plant. There the FGD took place on 21 August 2013 with 10 participants. The second village, "MB", is located furthest from the processing plant and the FGD was conducted on 25 August 2013 with 7 participants. Finally, village number 3, "DB", where the FGD was conducted with 12 participants on 29 August 2013 is located 20 km from the processing plant. On average about 50 % of the farmers invited actually participated in the FGD.

The discussions with some smallholder farmers (including the village chief) per village were moderated by the author. The moderator started the meeting with the introduction of the purpose. The discussion was then organized around the ISPO principles with the moderator asking questions that were subsequently discussed. Hence, the first question was whether the villagers had heard about ISPO. Since the answer was unanimously "no", i.e. none of the villagers had heard about ISPO, the moderator explained the regulations endorsed by the government. Subsequently farmers were asked for specific conditions in their village as these relate to the ISPO principles but the latter were not highlighted any more in order not to bias the discussion. There were three main discussion points covered by the FGD, namely (1) history of oil palm establishment and current environmental conditions, (2) measures undertaken by villagers to counter negative environmental and health effects from oil palm and (3) expected future problems and fears as well as suggestions to improve oil palm village conditions.

The discussion was then continued with a review of the oil palm establishment and the suitability of the location for oil palm production including the current environmental conditions after oil palm establishment. Results are presented in Table 3.5 using key words.

While the results in Table 3.5 must be interpreted with care it nevertheless becomes clear that the process of land selection and clearing as well as the establishment of oil palm plantations did not go smoothly in all the three cases. In village 2 for example there was considerable dissatisfaction with the land clearing process organized by the oil palm company. Recalling this period the participants reported the occurrence of strong social conflicts with company representatives which made them "to block the road". Obviously in this village, ISPO principles 1 and 3 have not been met. Furthermore, all three villages gave indication of deteriorating environmental conditions after oil palms had been planted in their village. For example, village 1 emphasized problems with water, village 2 with the effects of changing weather conditions and village 3 indicated soil fertility problems. However, there was no complete consensus on this point with some respondents strongly emphasizing the problem while others were more relaxed. It also becomes apparent from the FGD discussion points that the oil palm companies do indeed have a major influence on the extent to which sustainability criteria are implemented and therefore their role in introducing the ISPO guidelines is important.

Table 3.5: History and conditions of oil palm in three villages, Merangin District, Jambi province

Discussion points	**Village 1 (RJ)** (10 km)	**Village 2 (MB)** (50 km)	**Village 3 (DB)** (20km)
History of land selection	Allocation by raffle, through company	Allocation by raffle, through company; process perceived as unfair	Settled in vacant land; villagers could not participate in the selection
Suitability of land	Very suitable	Moderately suitable	Suitable
Process of land clearing/ preparation prior to establishment of oil palm	No problems, company prepared the land	Land was cleared by the company but process (demarcation and allocation of plots unclear) was unsatisfactory	Clearing of forest land by villagers, no company input
Process of seedling provision and planting	Company provided seeds and carried out the planting	Company provided seeds and carried out the planting	Villagers acquired seeds and planted themselves
Current environmental conditions	Water shortage problems, but no unanimous opinion	Weather risks increasing with negative effects on oil palm productivity	Indication of soil fertility problems

Source: Focus Group Discussions transcripts 2013

In Table 3.6 the results for the second major discussion point namely how the respondents perceive the impacts on health and environment of the management practices in oil palm plantations and especially what measures they are undertaking to mitigate these problems are examined. The discussion centered on soil fertility, water conservation, fire protection, wildlife protection and occupational health. Results show that village 2 really seems to have a problem. It is the village where the land selection process was inappropriate with the use of peat land. On all five issues villagers have measures in place (Table 3.6). For example, the respondents had a clear idea on forest and peat land fire prevention which is quite in line with the spirit of the ISPO guidelines although they did not know about it. In village 1 the soil fertility and occupational health problem was recognized and respective measures were carried out. In village 3 no measures were undertaken (Table 3.6) although villagers had indicated that there are soil fertility problems (Table 3.5). Perhaps these were not serious enough to undertake measures or there was not enough knowledge regarding action to be taken as found in the case of occupational health problems (e.g. spraying of pesticides). Generally, the discussion on sustainable practices indicates that there is generally room for improvement.

Table 3.6: Measures undertaken to mitigate negative health and environmental effects

Discussion points	Village 1 (RW)	Village 2 (MB)	Village 3 (DB)
Soil fertility	Use empty fruit bunches, mineral fertilizer, and animal dung	Agricultural lime (calcium) needed to produce on peat land	No concrete measures reported
Water conservation	none	Ditch and dike system in peat land	none
Fire protection	none	No land clearing during dry season	none
Wildlife protection	none	Do not kill birds and protect pollinators; use owls for rat control	none
Occupation health	Use boots and gloves	Use boots and gloves	Nothing, because do not know how

Source: Focus Group Discussions transcripts 2013

The third discussion point focused on future problems, fears and major suggestions how to improve the conditions of the oil palm villages (see Table 3.7). When focusing the discussion on the major problems there are again differences and similarities between the villages. In village 1 the water problem was emphasized which is consistent with the discussion on environmental conditions (see Table 3.5). In addition the lack of feed was pointed out which has led to a decline in livestock as a direct source of protein-rich food. In village 2 problems seem most severe consistent with the results reported in the tables (3.5 and 3.6) above. Apparently farmers still struggle with the effects of inappropriate/unfair land allocation as they point out the lack of clear field boundaries. In village 3, declining soil fertility and the lack of transparency in oil palm price is reported. Oil palm prices are determined by a provincial price committee but the quality of fresh fruit bunches play a major role which is subject to debate between farmers and traders or oil palm processing plants (Maryadi and Mulyana, 2004). This problem was also reported in village 2 and it is expressed as a fear in village 1. In general all three villages expressed concern about the future of oil palm in their village. Village 1 is most optimistic but they see constraints for further expansion because of lack of available land. The most remarkable suggestions for future development were made by participants from "MB village" who proposed that when oil palm reaches their replanting stage it should be replaced by pineapple.

In summary, the problems, fears and suggestions expressed by the participants of the FGD emphasize that while oil palm may have brought economic progress to the villages (as confirmed in earlier studies, e.g. Cahyadi and Waibel 2013) there is a strong feeling of uncertainty. It also becomes clear that there may be some path dependency caused by the introduction of oil palm because of the strong influence of the oil palm companies that make a system change very costly for small holder farmers. As shown in the case of village 2, an inappropriate selection and allocation of land leads to follow-up problems that perhaps cannot be corrected anymore and may cause future investment in oil palm to become unprofitable. Overall the FGD has demonstrated the need for sustainability standards to be implemented in oil palm farming.

Table 3.7: Problems, fears and suggestions

Problems/Fears/ Suggestions	Village 1 (RW)	Village 2 (MB)	Village 3 (DB)
Problems	1) Water scarcity 2) Less feed for livestock	1) No clear field boundaries 2) Declining soil fertility 3) No transparency in oil palm price	1) Declining soil fertility 2) In transparency in oil palm price
Fears	1) Price uncertainty 2) In transparency of oil palm price 3) Lack of area for expansion	1) When oil palms reach replanting age 2) Infrastructure not improved	1) In transparency of oil palm price 2) Seed Quality for replanting uncertain
Suggestions	1) Do not burn for clearing land 2) Waste management	1) Change land use from oil palm to other crops, e.g. pineapple	None

Source: Focus Group Discussion transcripts 2013

3.5 Summary and conclusions

Summarizing the findings of this descriptive analysis on the constraints and opportunities for introducing sustainability standards to smallholders in the oil palm industry in Indonesia, we must emphasize that results must be treated with care since the sample size is small and essentially we are dealing with case studies. Nevertheless we believe that some important messages emerge from this exercise and that a good link can be established between the views of the stakeholders and the reality of smallholder oil palm farming.

The first message is that there really is a need for sustainability criteria in the oil palm industry in Indonesia and the decision of the government to make the ISPO standards mandatory can be supported in principle. As shown by the village case studies there are problems with oil palm development which could be traced to lack of clear regulation in the past.

The second message is that there exists considerable variation, both in the stakeholders' assessment of the effectiveness of the principles and criteria as specified in the ISPO guidelines and in the real world experiences of smallholder oil palm living in villages dominated by oil palm and influenced by the decision and procedures of large oil palm companies. It is remarkable and also encouraging that the Indonesian researchers who participated in the stakeholder survey were critical demonstrating their independence to some extent. This can also be said for representatives of government agencies whose views demonstrate that they are quite realistic about the limitations that ISPO guidelines have against the background of small scale farming and the interaction between oil palm companies and smallholders. The cases reported in the FGD have demonstrated this clearly at least in the case of village 2. Naturally the views expressed by the stakeholder groups like NGOs, farmer association and oil palm companies are a reflection of the interest pursued by these groups. This is especially the case for the companies but this not only demonstrates constraint but opportunities as well. For example the need for better and environmentally sound technologies is obvious and is in the interest of both the companies and the smallholders.

The third message is that there are indications of problems with environment and long term productivity in smallholder oil palm farming. Furthermore there is quite some uncertainty about the future and this underlines the need for alternatives as revealed in the village case studies particularly in the case of village 2. These cases have two questions, Firstly, What is the mechanism to ensure that the standards set out in the guidelines are really implemented? It can be doubted based on our results whether just to declare the guidelines as mandatory by the government and leave the implementation with the oil palm companies will be sufficient. Secondly, it must be asked whether ISPO guidelines are sufficient to address the full breadth of the sustainability problem in currently oil palm dominated rural areas in Sumatra and other regions of Indonesia. It appears that ISPO guidelines need to be effectively incorporated or linked with a rural development strategy that adheres to the sustainability paradigm.

In conclusion we submit that the ISPO guidelines are a step in the right direction but what is needed is a concrete implementation plan based on a well-designed extension strategy. Such a plan does not come without costs but the potential benefits may make this a highly profitable and socially justifiable investment.

Chapter 4: Adoption of ISPO practices by smallholder oil palm farmers in Indonesia

This chapter is based on a joint working paper with Priyanka Parvathi and Hermann Waibel.

4.1 Introduction

Oil palm is the most important commodity in terms of export earnings and jobs in the agricultural sector in Indonesia. Despite its importance to Indonesia, the oil palm crop is faced with a number of challenges. Several studies found that oil palm production is detrimental to environment and can lead to soil erosion, water pollution, and reduced biodiversity mainly due to deforestation caused by oil palm expansion (Koh and Wilcove, 2008; Obidzinski et al., 2012; Rival and Levang, 2014). Furthermore, smallholder oil palm farmers continue to remain vulnerable to poverty including those that are under contractual arrangements with the oil palm companies (Cahyadi and Waibel, 2015). To address these challenges, adoption of alternative sustainable oil palm production standards are required.

Several initiatives have been started to better align oil palm production with the principles of sustainable development. The oil palm industries in 2003 initiated the Roundtable on Sustainable Palm Oil (RSPO) that promoted a voluntary international standard for the production, processing and marketing of palm oil. In 2011, Government of Indonesia (GoI) has introduced its own standard, called the Indonesia Sustainable Palm Oil (ISPO). Contrary to the international standard, ISPO is a mandatory certification scheme that requires large plantation companies to observe a set of seven principles further specified by some 35 criteria that pertain to the establishment and management of plantations as well as the processing of palm oil. For smallholder oil palm farmers these standards are still voluntary but Government of Indonesia has undertaken first steps to introduce sustainability principles to smallholder farmers as well although no time horizon has been set (Ministry of Agriculture 2015).

The ISPO principles prescribe the rules with regards to land use for oil palm plantations and their ecological and human environments including environmental and labor standards. It also includes crop management recommendations that aim at minimizing negative externalities for environment and human health. The latter standards are mainly relevant for smallholder oil palm farmers. For them the ISPO standards basically mean that they should follow good crop management practices which include, for example, keeping records of input use, to follow the principles of integrated pest management, to apply good technical standards in tree maintenance and in harvesting of the oil palm fruits. However since the specification of ISPO principles and criteria are not always precise it is difficult to judge whether and to what extent ISPO has actually been adopted by oil palm producers. This weakness has been pointed out in the literature with studies that have especially analyzed conditions at the grower level (e.g. McCarthy, 2012; Brandi et al., 2013; Hospes, 2014). Nevertheless it can be argued that some smallholders may be closer to the ISPO standards than others simply with regard to their management practices. These farmers may have experienced that such practice is consistent with sustainability criteria are also beneficial from a private perspective and thus present a win-win situation.

In this paper we dealt with this problem in such a way that we identified a range of practices and made a technical judgment whether or not these qualify for ISPO. In a next step we define adoption thresholds that pertain to a certain minimum number of practices adopted. We do that based on a three-year panel data set of 233 smallholder farmers from three villages in the district of Merangin in the province of Jambi, Sumatra.

We apply two adoption models that allow controlling for endogeneity. Firstly we use bivariate probit models (Chirwa, 2005) for the adoption of a defined minimum number of ISPO practices. This model allows us to understand the factors driving adoption of a defined number of minimum practices designated as adoption thresholds. But the model is inadequate to examine the determinants of further practices that are adopted by an increasingly smaller number of farmers. Therefore we use a second model, i.e. a switching regression Poisson model based on full information maximum likelihood (FIML) method (Miranda, 2004) to examine the drivers of all ISPO practices by smallholder farmers. However both models show that household characteristics, economic shocks and the perceived risk of a decline in oil palm productivity are the major drivers of ISPO adoption.

The rest of the paper is organized as follows. The next section presents a review of literature of economic studies in oil palm, followed by a description of the study area and data which are discussed in section 4.3. Section 4.4 elaborates on the empirical strategy followed in this study and the results are presented in section 4.5. Section 4.6 concludes the paper and submits policy recommendations.

4.2 Literature review

Literature on oil palm has been growing in the last decade. Oil palm has become an important source of renewable energy (e.g. Yusoff, 2006; Sumati et al., 2008; Kelly-Yong et al., 2007). Although oil palm has positive impact for economic development and poverty reduction (e.g. Susila, 2004; Cahyadi and Waibel, 2013), its expansion has led to detrimental environmental impacts. Several literatures have pointed out the negative impact of oil palm expansion on environmental issues such as deforestation, carbon emissions, loss of biodiversity and water pollution. The current expansion of oil palm mostly takes place on fallow and rubber land. In addition oil palm growth occurs in locations with ongoing logging activities suggesting an indirect relationship between deforestation and oil palm expansion (Gatto et al., 2015). Studies show that the conversion of forest into oil palm plantations released not only carbon emission (Germer and Sauerborn, 2008; Reijnders and Huijbregts, 2008; Sayer et al., 2012) but also reduced number of orangutans (Nantha and Tisdell, 2009; Ruysschaert and Salles, 2014) and is therefore a threat to biodiversity (Fitzherbert et al., 2008; Corley, 2009). Orsato et al. (2013) reveals water pollution has increased the use of more inputs such as herbicides and pesticides in oil palm plantations.

The increasing concerns about the downsides of an indiscriminate expansion of oil palm with negative effects for environment, human health and social coherence has led to the local population stakeholders of the oil palm value chain starting to promote the concept of sustainable oil palm plantations and are also introducing standards in oil palm production and processing. At the international level, the Roundtable of Sustainable Palm Oil (RSPO) had been set up in 2004 as voluntary standard which is developed by multi-stakeholders initiative (Schouten et al., 2012; McCarthy, 2012; von Geibler, 2013). The RSPO vision is to transform the markets by making sustainable palm oil the norm through certification of the production and processing process. Until to date RSPO organization claims that 20 % of palm oil production is certified. This is equivalent to approximately 2.6 million ha in which about 10 % of the certified plantations are smallholders (see http://www.rspo.org).

Indonesia being the biggest producer of palm oil in the world has introduced its own standard, the ISPO in 2011 (Hospes, 2014; Ootserveer, 2014). While the principles practically do not differ from RSPO, the main difference is that ISPO is a mandatory standard for large scale plantations but so far is voluntary for smallholder farmers (Ministry of Agriculture, 2015). Furthermore, ISPO certification does not meet the requirements of RSPO certification which prevents the Indonesian producers from selling certified palm oil in the international market. Both the standards however are multi-dimensional and include legal, economic, environment and social aspects.

The main question as regards ISPO is whether and to what extent smallholder oil palm farmers are likely to adopt these standards voluntarily. There are two reasons why adoption may take place. First for contract smallholders, oil palm companies are expected to undertake efforts to make their farmers follow the standards. Second, some farmers may already undertake crop management practices which may be close or equivalent with some of the recommended practices under ISPO. As indicated by some literatures oil palm farmers in Indonesia are already experiencing problems with soil erosion, and declining water resources and poor water quality (e.g. Schrier-Uijl, 2013; Obidzinski et al., 2013). Hence, in this study we investigate the extent of ISPO adoption among small holders in the province of Jambi and we identify the drivers of ISPO adoption of ISPO by smallholder oil palm farmers.

4.3 Study area and data

Majority of oil palm plantations take place in Sumatra that includes the province of Jambi where this study was carried out. This province is ranked 6th in terms of oil palm production in Indonesia (Statistivs Indonesia, 2015). Among 11 districts of Jambi province, the district of Merangin has the largest oil palm area. In this district, three villages which were located at different distances to a large oil palm mill owned by a private oil palm company were randomly selected for this study.

A household panel survey was conducted in 2010, 2012 and 2013 among 233 smallholder oil palm farmers in these villages using a multistage sampling procedure. The survey instrument included the usual living standard measures comprising information on household member characteristics, a detailed module on oil palm crop management including inputs and yield in terms of fresh fruit bunches (FFB) and subjective shock experience and risk expectations. In the 2013 survey, not all modules of the previous surveys were included although income modules were retained and detailed questions on management practices related to ISPO were included (see Table 4.1). In addition, some information about the village condition from village head interviews was applied.

Interviews have been carried out as face to face by using a modularly structured questionnaire. All information asked in the interview refers to the reference period of 1 January to 31 December, 2013.

Table 4.1: ISPO Practices

Categories	Number of Practices
Keeping specific records of fertilizer application	1
Keeping records of other general material inputs	3
Using protective clothing while applying pesticides	1
Safety measures for pesticides application	5
Applying mechanical Integrated Pest Management (IPM) practices	1
Applying other general IPM practices	4
Individual oil palm crop maintenance	1
Other plantation maintenance practices accordingly to technical guidelines	6
Harvesting Fresh Fruit Bunch (FFB) base on maturity	1
Other harvesting practices accordingly to technical guidelines	4
Total	27

Source: Own survey

It was revealed in the 2013 survey that farmers have very limited knowledge regarding ISPO standards. Nevertheless farmers were applying practices that corresponded with some of the principles and criteria stipulated by ISPO. Therefore, based on the data collected in the 2013 survey we were able to identify practices that could be equated with those formulated in the ISPO guidelines. However since we only collected this information in 2013 we made the assumption that they were also applied in the previous 2010 and 2012 reference periods.

Figure 4.1 presents the number of crop management practices that are considered as being ISPO practices followed by farmers in the study region. We see that 90% of households at least follow two crop management practices that can be termed as ISPO. But as we increase the threshold based on the number of ISPO practices followed, the share of households declines rapidly. About 60 % of the farmers follow 4 practices but only 5 out of 233 farmers apply ten out of the 27 possible practices (see Figure 4.1 below and Table 4.1 above).

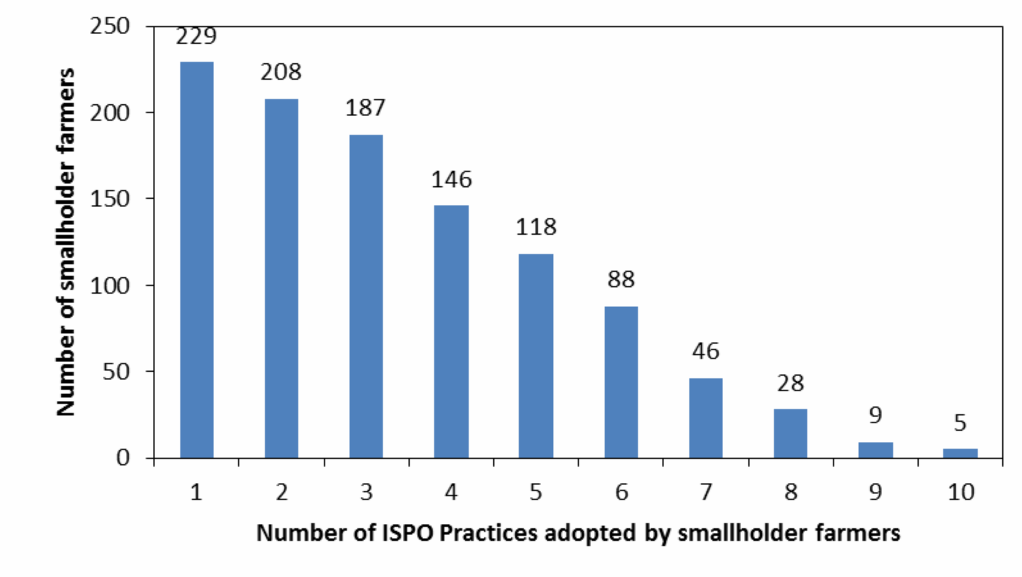


Figure 4.1: Distribution of ISPO practices adopted by smallholder oil palm farmers

Source: Own data

Considering the pattern of adoption we decided to define a minimum of four practices as ISPO adoption threshold. This leaves us with 146 adopters and 94 non-adopters. Alternatively we raise the threshold to 5 and 6 which lowers the percentage of adoption to about 40 % and 25 % respectively. We also assume that households that were using a certain number of ISPO practices in 2013 had already applied them in the previous survey years. For the threshold of 4 practices, therefore, the number of adopters is 438 households and the number of non-adopters 261 households pooling the three panel waves.

With the data at hand we are able to identify the factors of adoption for the defined adoption threshold. In addition we can decipher the drivers of all 10 ISPO crop management practices currently observed in the sample but we are unable to say something about the remaining 17 ISPO practices where up to date no adoption has taken place in the study region.

4.4 Empirical strategy

The literature on development and agriculture has many technology adoption models (e.g. Dimara and Skuras, 2003; Feder and Slade, 1984; Ghadim and Pannell, 1999; Kondylis et al., 2015; Shiferaw et al., 2015). A number of studies (e.g., Chirwa, 2005; D'Souza et al., 1993; Ramirez and Shultz, 2000; Rahelizatovo and Gillespie, 2004) have applied econometric models to assess the causality between the adoption decision and underlying drivers. Generally, binary models like probit or logit models are applied as a common approach to identify factors influencing farmers' decision to adopt a specific technology (Kassie et al., 2009; Mariano et al., 2012) like improved germ plasm or external inputs. However when we want to measure intensity of adoption such as crop management practices binary model is inappropriate. Hence, some studies (e.g. Garming, 2008; Isgin et al., 2008) use Poisson models to assess adoption of technologies involving count data.

In this study, we use both binary and count models to identify the drivers of ISPO adoption. We use binary models to examine the determinants of adoption based on a threshold of a defined minimum number of practices and use Poisson models to identify factors that would enable adoption of all observed ISPO practices.

4.4.1 Threshold adoption models

We define adoption thresholds based on a minimum number of ISPO practices already being followed by the farm households. While the maximum number of observed ISPO practices is 10, we categorize those farm households implementing at least 4, 5 or 6 as "minimum adopters" of ISPO. Hence, we run 3 adoption models based on these thresholds.

One of our major hypothesis for adoption of ISPO practices is that adopters respond to the emerging problems of declining productivity of oil palm plantation which has been found by recent literature (Obidzinski et al., 2013). The authors attributed the decline in productivity due to lack of access to adequate fertilizers and also due to excessive and untimely herbicide usage. Hence, we assume that farmers who perceive the risk of decline in oil palm productivity in the future may be more likely to implement practices corresponding with the ISPO criteria.

Risk perceptions and assessments are commonly used to explain the behaviour of individuals to protect themselves against the risks. However, subjective assessments of respondents can be endogenous and correlated with unobserved heterogeneities in adoption decisions (Bontemps and Nauges, 2014). The respondents were asked whether they perceived a risk of diminishing oil palm productivity in the next 5 years and if their answer was in the affirmative. We incorporated this response in a dummy variable as equivalent to 1 if positive and 0 otherwise. We capture this subjective context from the household panel data set by applying a seemingly unrelated and recursive bivariate probit model. This allows us to estimate the two regressions even if they may have the same set of regressors.

The general form of seemingly unrelated bivariate probit models adoption models is expressed as follows:

$$Y_1 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e \quad (4.1)$$

$$Y_2 = \alpha_0 + \alpha_0 X_1 + \alpha_0 X_3 + \varepsilon \quad (4.2)$$

Hence following this we use the below variables to estimate our model.

ISPO adoption = f(*age, gender, education, hhsize, have off farm, have debt, risk taking, have contract, oil palm age, oil palm area, rubber area, other crops area, have livestock, natural disaster, economics shocks, infrastructure, water safety, dummy2011, dummy2012*) (4.3)

Perceived risk of diminishing productivity = f(*age, gender, education, oil palm age, oil palm area, natural disaster, infrastructure, water safety, dummy2011, dummy2012*) (4.4)

Recursive Bivariate Probit Models

The general form of recursive bivariate probit adoption models is expressed following Greene (1998) as follows:

Decision to adopt an ISPO Threshold:

$$Y_1^* = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 Y_2 + e \qquad Y_1 = \begin{cases} 1, \text{if } Y_1^* > 0, \\ 0 \text{ otherwise} \end{cases} \tag{4.5}$$

Perceived risk of diminishing productivity:

$$Y_2^* = \alpha_0 + \alpha_0 X_1 + \alpha_0 X_3 + \varepsilon \qquad Y_2 = \begin{cases} 1, \text{if } Y_2^* > 0, \\ 0 \text{ otherwise} \end{cases} \tag{4.6}$$

This implies that the perceived risk of diminishing oil palm productivity can influence farmers to adopt ISPO but the decision to adopt ISPO will not change the risk perception of diminishing productivity.

Hence, we modify equation (4.3) as per (4.5) and add perceived risk of diminishing productivity as an explanatory variable in the recursive bivariate probit regression. Thereby this model allows for correlation between the decision to adopt a defined minimum practice of ISPO and the subjective assessment of respondent´s perception of a risk of diminishing productivity of oil palm.

4.4.2 Complete adoption model

To estimate complete adoption of observed ISPO practices we use a Poisson model (Hausmaan et al., 1984; Greene, 1997; Kozumi, 2002; Oya, 2005). We further account for endogeneity due to the respondent's perceived risk of diminishing oil palm productivity by implementing an endogenous switching Poisson model (Terza, 1998; Kozumi, 2002; Miranda, 2004; Oya, 2005; and Assaf et al., 2013).

The dependent variable is the number of ISPO practices adopted by smallholder farmers. The poisson model assumes that endogenous variable $ISPO_i$, given explanatory variables V_i , is independent with the conditional function of c (Assaf et al., 2013).

$$\Pr(c;\Omega) = \frac{\mu^{-\Omega}\,\Omega^{c}}{c!} \qquad \text{for } ISPO_i = 0,1,2\ldots \tag{4.7}$$

Where c is the number of occurrences of ISPO practices followed and whose probability is the Poisson mass function $c!$ and Ω is the parameter that indicates the average number of ISPO practices followed in a given time interval as well as it indicates its variance.

To account for the problems of over and under dispersion of the Poisson regression, we follow Miranda (2004) and implement an endogenous switching Poisson model. This model has a conditional Poisson distribution and a switching variable s_i. The conditional probability function of c_i is as expressed in equation (4.8) and the conditional mean function as:

$$\Omega_i = \exp\{\, V_i'\gamma + s_i\,\delta + \theta_i\} \tag{4.8}$$

where V is a vector of explanatory variables. The switching variable s_i is a dummy variable expressed as:

$$s_i = \begin{cases} 1, \text{ if } s_i^{*} = \omega_i\,\lambda + \psi_i \geq 0, \\ 0, \text{ otherwise} \end{cases}$$

s_i^{*} is a latent random variable and ψ_i is an error term. ωi is a vector of explanatory variables and λ is their unknown coefficient parameter. The potential endogeneity of s_i is represented using a correlation coefficient ρ between two error terms θ_i and ψ_i The joint distribution of these error terms are assumed to be normal with mean zero and variance covariance matrix as below:

$$\begin{bmatrix} \sigma_2 \; \sigma_\rho \\ \sigma_\rho \; 1 \end{bmatrix} \tag{4.9}$$

The variance of ψ_i is normalized to 1 as the switching equation only identifies λ up to a scale factor (Winkelmann, 2008 and Assaf et al., 2013).

The general form of endogenous and exogenous adoption models are expressed as follows:

$ISPO_i$ = f(*age, gender, education, hhsize, have offfarm, have debt, risk taking, have contract, oil palm age, oil palm area, rubber area, other crops* *area, have livestock, natural disaster, economic shocks, perceived risk, infrastructure, water safety, dummy2011, dummy2012*) ED (Perceivedrisk [*age, gender, education, oil palm age, oil palm area, natural disaster, infrastructure, water safety, dummy2011, dummy2012*]) (4.10)

The explanatory variables used in this study to investigate adoption of ISPO practices include household characteristics, farm characteristics, shocks and village condition (see table 4.2). Number of ISPO practices is a dependent variable that indicates the number of these practices implemented by the farm household. The variable "household age" indicates the age of the household head and is expected to be negatively correlated with adoption decision because younger farmers may be more inclined to adopt new technologies as found in literature (e.g. Rahelizatovo and Gillespies, 2004; Parvathi and Waibel, 2015). Variable gender (gend) is a dummy variable representing one for male household head and zero otherwise. More educated oil palm farmers and a larger household size are expected to positively influence the adoption decision. A larger household may be more secure as a source of intensive labor for new technology (Mariano et al., 2012). Having an off-farm income may enable farmers to venture into new agricultural technology adoption. It is also expected that smallholder oil palm farmers with a higher willingness to take risk are more likely to be ISPO adopters. Similarly being a part of contract oil palm farming may enable farmers to be better aware of ISPO practices because in their nucleus companies ISPO is mandatory. In terms of farm characteristics, oil palm age, oil palm area, rubber area and other crops areas are expected to influence the adoption decision. Furthermore, farmers who have experienced shocks such as a natural disaster or economics shocks like rise in input prices or fall in output prices may be more likely to have changed their crop management practices in line with ISPO. We include time dummies for 2011 and 2012 with base year being 2009. We also use village level control variables like access to safe water and good infrastructure like good roads.

4.5 Results

The definition of variables of regression models is shown in Table 4.2 and the comparison of the ameans of household characteristics between adopters and non-adopters and the different threshold levels is presented in the Table 4.3.

Table 4.2: Definition of variables used in regression models

Variables	Description
Dependent Variables	
Adoption of ISPO (TH4)	1 If the household adopts four of the ISPO practices; 0 otherwise
Adoption of ISPO (TH5)	1 If the household adopt five of the ISPO practices; 0 otherwise
Adoption of ISPO (TH6)	1 If the household adopt six of the ISPO practices; 0 otherwise
Adoption of total number of ISPO Practices	1 If the household adopt ten of the ISPO practices; 0 otherwise
Perceived risk of diminishing productivity	1 if the household head perceive of diminishing productivity in the future is a risk; 0 otherwise
Independent Variables	
Household Characteristics	
Age	age of the household head in years
Gender	1 if the household head is male; 0 otherwise
Education	number of years of schooling by household head
Household size	numbers of member in the household
Have off farm	1 if the household head has off farm income; 0 otherwise
Have debt	1 if the household head has debt; 0 otherwise
Risk taking	1 if the household head takes risk above and equal 5; 0 otherwise
Have contract	1 if the household has contract farming; 0 otherwise
Farm Characteristics	
Oil palm age	1 oil palm age is between the productive years of 7 and 18 and 0 otherwise
Oil palm area	oil palm area in hectare
Rubber area	rubber area in hectare
Others crops area	other crops area in hectare
Have livestock	1 if the household head has livestock; 0 otherwise
Shocks	
Natural disaster	1 if the household head have experience of the natural disaster; 0 otherwise
Economic shocks	1 if the household head have experience of other economic shocks; 0 otherwise
Village Condition	
Infrastructure	1 if infrastructure in village has good roads and 0 otherwise
Water safety	1 if the village has access to good quality water and 0 otherwise
Dummy 2011	1 if the year is 2011; 0 otherwise
Dummy 2012	1 if the year is 2012; 0 otherwise

Source: Own data

Table 4.3 presents the t-test comparisons of the means between adopters and non-adopters for the three threshold levels. The results show the characteristics of household such as household head age, gender, education, household size, have off farm, have debt, risk taking and have contract farming vary significantly between adopters and non-adopters across threshold levels. On average, smallholder farmers who adopt ISPO practices are male and around 50 years old. They also have six years of formal education and a relatively small household size. On the other side, non-adopters have more debt, take more risks and are part of contract farming. Oil palm area is almost the same for adopters and non-adopters group but adopters have more oil palm within its productive age of 7 and 18 years. Also adopters have larger rubber area and livestock. On the other hand, they also vary significantly with non-adopters in terms of economics shocks. Adopters perceive a higher risk of diminishing oil palm productivity in the future. Moreover, villages of adopters have a better access to good roads along with access to good quality water.

Table 4.3: Comparison of means of household characteristics between adopters and non-adopters for the difference threshold levels

Variables	TH4				TH5				TH6			
	Adopters	Non-Adopters	Diff		Adopters	Non-Adopters	Diff		Adopters	Non-Adopters	Diff	
Household Characteristics												
Age	49.545	51.505	-1.960	**	50.053	50.507	-0.453		49.503	50.747	-1.244	
Gender	0.977	0.919	0.058	***	0.974	0.936	0.038	**	0.984	0.937	0.047	***
Education	6.187	5.827	0.360		6.163	5.939	0.224		6.106	6.020	0.086	
Hhsize	4.301	4.260	0.041		4.322	4.249	0.073		4.473	4.172	0.301	**
Have off farm	0.646	0.666	-0.020		0.661	0.646	0.015		0.681	0.636	0.045	
Have debt	0.534	0.613	-0.078	**	0.508	0.620	-0.112	***	0.526	0.586	-0.060	
Risk taking	0.538	0.647	-0.109	***	0.545	0.614	-0.069	*	0.553	0.595	-0.042	
Have contract	0.280	0.344	-0.064	*	0.262	0.347	-0.085	**	0.284	0.317	-0.033	
Farm Characteristics												
Oil palm age	0.559	0.478	0.081	**	0.584	0.472	0.112	***	0.579	0.498	0.081	**
Oil palm area	2.848	2.725	0.123		2.841	2.761	0.080		2.760	2.827	-0.067	
Rubber area	0.693	0.573	0.120		0.832	0.459	0.373	***	0.866	0.516	0.350	**
Others crops area	0.074	0.178	-0.104	*	0.075	0.152	-0.077		0.076	0.135	-0.059	
Have livestock	0.618	0.601	0.017		0.618	0.605	0.013		0.029	0.023	0.006	
Shocks												
Natural disaster	0.394	0.421	-0.027		0.378	0.431	-0.053		0.405	0.404	0.001	
Economics shocks	0.289	0.210	0.079	**	0.302	0.217	0.085	**	0.318	0.225	0.093	***

Perception												
Perceived risk of diminishing productivity	0.662	0.521	0.141	***	0.686	0.530	0.156	***	0.700	0.554	0.146	***
Village Condition												
Infrastructure	0.143	0.149	-0.006		0.177	0.113	0.064	**	0.170	0.131	0.039	
Water safety	0.500	0.436	0.064		0.423	0.530	-0.107	***	0.477	0.475	0.002	
Number of Observations	438	261			354	345			264	435		

Note: TH= Threshold. *Significant at the 10% level; **Significant at the 5% level; ***Significant at the 1% level.

Source: Own calculations.

4.5.1 Determinants of threshold models

The results of the seemingly unrelated and recursive bivariate probit models for thresholds 4, 5 and 6 are presented in Tables 4.4 and Appendix A 2. This model allows us to account for correlation of unobserved heterogeneities with regards to the decision to adopt ISPO practices. Appendix A 2 shows the rho test equal to zero for the seemingly unrelated bivariate probit model for all the threshold models. This implies that the unobserved heterogeneities of the decisions to adopt ISPO practices and the perception of risk of diminishing productivity are correlated. But this does not necessarily indicate that the decision to adopt ISPO and the subjective risk perception of declining oil palm productivity are jointly made. Hence we estimate a recursive bivariate probit as shown table 4.4. The Rho test for threshold 4 and 6 suggest that farmers who perceive higher risk of diminishing oil palm productivity in the future are more likely to adopt at least a minimum number of ISPO practices.

Regarding other determinants of adoption, age, gender, household size, having debt, willingness to take risk and participating in contract farming significantly affect adoption of at least a thresholds of practicing 4 ISPO practices. As expected, the younger smallholders are more probable to adopt ISPO practices than their older counterparts. This result is consistent with Chirwa (2005) that there is a negative relationship between older farmers and adoption of new agricultural technologies. Farmers who have less debt are likely to adopt ISPO practices. This could be because as pointed out by Kebede et al. (1990) farmers having less debt may be more willing to use a new technology whose benefits are uncertain than farmers who have a high debt and maybe less inclined to venture into risky agricultural alternatives. It is interesting to note that risk averse farmers are more likely to implement at least 4 ISPO practices. This indicates that farmers with a lower willingness to take risk are more inclined to follow sustainable practices of oil palm production. It is also remarkable that farmers under contract schemes are less likely to adopt ISPO practices. This suggests that oil palm companies are actually discouraging ISPO practices among their contract farmers as they may prefer higher use of external inputs to assure high oil palm outputs. Anecdotic evidence suggests that although ISPO is a mandatory standard for them only a small proportion of companies have become certified. With regard to farm characteristics, those farmers who have oil palm plants in their productive age are more likely to adopt ISPO practices. Smallholders who have experienced economic shocks like job loss in agricultural or non-agricultural employment are more disposed to implement some ISPO practices. At the village level, smallholders in villages having access to good quality water and infrastructure like roads are more likely to adopt at least a minimum of 4 ISPO practices.

With regard threshold 5 and 6, more or less the same factors are likely to influence ISPO adoption. However the magnitude as well as coefficients of some of the variables like household size becomes significant in threshold 6 while having debt and practicing contract farming becomes insignificant. This is because the number of adopters falls from 146 in threshold 4 to 88 in threshold 6. The factors that strongly drive ISPO adoption across all the threshold models are village level characteristics and the perceived risk of diminishing oil palm productivity in the future.

Table 4.4: Estimated coefficient of recursive bivariate probit model

	Threshold 4	Perceived risk of diminishing productivity	Threshold 5	Perceived risk of diminishing productivity	Threshold 6	Perceived risk of diminishing productivity
Household Characteristics						
Age	-0.007 *	0.004	-0.002	0.002	-0.005	0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Gender	0.551 ***	0.065	0.414 **	0.054	0.792 ***	0.092
	(0.212)	(0.273)	(0.184)	(0.244)	(0.285)	(0.283)
Education	0.025	-0.009	0.016	-0.016	0.000	-0.012
	(0.017)	(0.019)	(0.017)	(0.019)	(0.019)	(0.020)
Hhsize	0.000		-0.004		0.060 *	
	(0.027)		(0.024)		(0.031)	
Have off farm	-0.086		0.078		0.135	
	(0.120)		(0.090)		(0.123)	
Have debt	-0.199 **		-0.216 ***		-0.146	
	(0.091)		(0.081)		(0.100)	
Risk taking	-0.218 **		-0.072		-0.058	
	(0.106)		(0.077)		(0.100)	
Have contract	-0.187 *		-0.221 **		-0.133	
	(0.096)		(0.088)		(0.110)	
Farm Characteristics						
Oil palm age	0.012	0.268 **	0.028	0.272 ***	0.068	0.299 ***
	(0.101)	(0.108)	(0.090)	(0.102)	(0.108)	(0.107)
Oil palm area	-0.014	0.067 ***	-0.013	0.068 ***	-0.023	0.067 ***
	(0.022)	(0.023)	(0.022)	(0.024)	(0.026)	(0.025)
Rubber area	0.016		0.016		0.045	
	(0.024)		(0.021)		(0.031)	
Others crops area	-0.056		-0.078		-0.067	

	(0.050)		(0.052)		(0.070)	
Have livestock	-0.075		-0.038		-0.062	
	(0.093)		(0.083)		(0.107)	
Shocks						
Natural disaster	-0.170	0.234 *	-0.211 **	0.215 *	-0.086	0.169
	(0.105)	(0.130)	(0.104)	(0.121)	(0.114)	(0.123)
Economics shocks	0.255 **		0.243 **		0.320 ***	
	(0.104)		(0.097)		(0.121)	
Perception						
Perceived risk of diminishing productivity	1.798 ***		1.867 ***		1.198 ***	
	(0.165)		(0.080)		(0.328)	
Village Condition						
Infrastructure	0.477 ***	-0.733 ***	0.682 ***	-0.725 ***	0.406 **	-0.731 ***
	(0.178)	(0.159)	(0.164)	(0.155)	(0.206)	(0.166)
Water safety	0.338 ***	-0.208 *	0.038	-0.185	0.179	-0.212 *
	(0.103)	(0.121)	(0.101)	(0.114)	(0.112)	(0.120)
Dummy 2011	0.347 ***	-0.533 ***	0.311 **	-0.577 ***	0.164	-0.513 ***
	(0.124)	(0.130)	(0.123)	(0.135)	(0.138)	(0.1370
Dummy 2012	1.028 ***	-1.571 ***	1.106 ***	-1.582 ***	0.817 ***	-1.576 ***
	(0.167)	(0.138)	(0.128)	(0.137)	(0.224)	(0.140)
_Cons	-1.371 ***	0.609	-1.829 ***	0.805 **	-2.189 ***	0.686
	(0.397)	(0.391)	(0.349)	(0.385)	(0.459)	(0.418)
Number of observation		699		699		699
Log pseudolikelihood		-792.6		-809.96		-802.22
rho		-0.891 **		-0.999		-0.416 *

Note: Robust standard errors in parenthesis. ***, ** and * significance at 1%, 5% and 10% respectively
Source: Own calculations based on household survey 2010, 2012 and 2013

4.5.2 Determinants of complete ISPO adoption

The results of the Poisson regression including time dummies are presented in table 4.5. The sigma in the exogenous model is not significant indicating that there is no convincing evidence of the presence of unobserved heterogeneity. However, when we run the endogenous model considering the endogeneity of perceived risk of diminishing oil palm productivity in the future, the rho is significant showing presence of unobserved heterogeneity in the adoption decision and accounting for the same. Although there are no sign changes as well significance between the exogenous and endogenous models, important differences in the magnitude of coefficients are found. The endogenous model presents a stronger association between the explanatory and the dependent variable. Also, we did an Akaike information criterion to examine which model is better. The exogenous model had an AIC of 3866 while it was 3859 for the endogenous model. Hence based on the lower AIC of the endogenous Poisson regression, we used the latter.

In line with the threshold 4 model, we find household characteristics like male headed households, having less debt, being risk averse and not participating in contract farming are more likely to influence adoption of all ISPO crop management practices. In addition, more educated farmers are expected to be ISPO adopters as found in studies like Garming (2008) and Abdulai and Huffman (2014) wherein educated farmers were more prone to adopt new innovations in agriculture.

Again as found in threshold 4 model, farmers who have experienced economic shocks in the past 5 years are more inclined to be ISPO adopters. Also those farmers in villages with good infrastructure and access to good quality water are likely to implement all practices stipulated under ISPO more readily.

To sum up, these results indicate that the same factors that influence adoption of a minimum threholds of 4 as well as adoption of 10 ISPO practices. Hence, factors driving adoption are largely independent of the number of ISPO practices followed. Household characteristics, experience of an economic shock in the past and a perceived risk of low oil palm productivity in the future are the main drivers.

Table 4.5: Results of endogenous and exogenous switching Poisson model on count practices of ISPO standards

Variables	Exogenous Switching Poisson			Endogenous Switching Poisson		
	Coef		S.E	Coef		S.E
Dependent Variable						
Total number of ISPO practices adopted						
Independent Variables						
Household Characteristics						
Age	-0.001		0.001	-0.001		0.001
Gender	0.322	***	0.106	0.317	***	0.108
Education	0.016	**	0.007	0.017	**	0.007
Hhsize	0.021	*	0.011	0.021	*	0.012
Have offfarm	0.016		0.047	0.015		0.048
Have debt	-0.083	**	0.038	-0.084	**	0.039
Risk taking	-0.089	**	0.038	-0.090	**	0.038
Have contract	-0.152	***	0.043	-0.152	***	0.043
Farm Characteristics						
Oil palm age	0.036		0.037	0.018		0.039
Oil palm area	0.001		0.008	-0.002		0.009
Rubber area	0.013		0.011	0.012		0.011
Other crops area	-0.042		0.029	-0.042		0.029
Have livestock	-0.053		0.041	-0.052		0.041
Shocks						
Natural disaster	-0.053		0.041	-0.062		0.042
Economics shocks	0.114	**	0.044	0.114	**	0.045
Perception						
Perceived risk of diminishing productivity	0.222	***	0.043	0.426	***	0.135
Village Condition						
Infrastructure	-0.010		0.074	0.037		0.081
Watersafety	0.073	*	0.041	0.085	**	0.043
Dummy 2011	0.059		0.048	0.087	*	0.052
Dummy 2012	0.162	***	0.056	0.271	***	0.089
_Cons	0.955	***	0.167	0.804	***	0.197

Switching					
Perceive of risk diminishing productivity					
Household Characteristics					
Age	0.003		0.004	0.003		0.004
Gender	0.098		0.251	0.100		0.249
Education	-0.012		0.020	-0.012		0.020
Farm Characteristics						
Oil palm age	0.299	***	0.107	0.295	***	0.107
Oil palm area	0.067	***	0.025	0.068	***	0.025
Shocks						
Naturaldisaster	0.162		0.120	0.176		0.121
Village Condition						
Infrastructure	-0.726	***	0.164	-0.728	***	0.164
Watersafety	-0.212	*	0.120	-0.218	*	0.120
Dummy 2011	-0.499	***	0.138	-0.512	***	0.139
Dummy 2012	-1,573	***	0.141	-1,577	***	0.142
_Cons	0.651		0.402	0.660		0.402
Number of observation	699			699		
Log likelihood =	-1900.25			-1899.73		
Sigma	0.085			0.136	*	
Rho				-0.887	***	

Note: Robust standard errors in parenthesis. ***, ** and * significance at 1%, 5% and 10% respectively
Source: Own calculations based on household survey 2010, 2012 and 2013

4.6 Conclusions

This study examines the extent of ISPO adoption among smallholder oil palm farmers in Indonesia. Using three years panel data set of 233 smallholder oil palm farmers; we define adoption thresholds based on a minimum number of practices followed and implement a bivariate probit model. To investigate if factors that affect complete adoption of all ISPO practices are different or same with threshold model, we further estimate an endogenous switching Poisson regression.

A key outcome is that ISPO practices are not well known to farmers and its adoption is limited in the study area. When we consider a minimum threshold of at least following 4 ISPO practices, 60% of the observed farmers can be considered as adopters. However when the threshold is raised to 6, the adopters are less than 40% of the sample. This indicates that a large part of the smallholder farmers are not yet aware of ISPO crop management practices.

Another major finding is that farmers who perceive a high risk of declining oil palm productivity in the future due to environmental degradation leading to soil erosion and pest problems are more likely to readily venture into ISPO. Also the factors that influence adopting at least a minimum of 4 ISPO practices like household characteristics and farmers who experienced economic shocks in the past also drive the adoption of all ISPO crop management practices. This suggests that those farmers who have adopted at least a minimum number of ISPO practices are more likely to be early adopters of all ISPO crop management practices with time.

The results of this study allow us to submit that the Government of Indonesia should set up extension strategies to disseminate information regarding Indonesia Sustainable Palm Oil crop management practices to its smallholder farmers. The Government should establish training facilities like farmer field schools or conventional campaigns to communicate clearly and precisely the principle and practices of ISPO. This will encourage its large scale adoption by smallholders in Indonesia.

Chapter 5: Cost-benefit analysis of the introduction of the Indonesia sustainable palm oil standards: A case study in Jambi province, Sumatra, Indonesia

This chapter is based on a paper presented at 21st Annual Conference of the European Association of Environmental and Resource Economists (EAERE), June 24-27, 2015, in Helsinki, Finland. It is published at Economy and Environment Program for Southeast Asia (EEPSEA).

5.1 Introduction

5.1.1 Background

Indonesia has dramatically increased its planting of oil palm driven by the increasing global demand for palm oil during the last three decades. To date, the oil palm area planted is over 25 times of what it was in the 1980s; it now accounts for approximately half of the world's palm oil production. The oil palm industry is an important economic sector of Indonesia. It contributes almost 5% to the country's GDP, generates export earnings of over USD 10 billion, and employs over 3 million workers in the country (USDA 2010). Some studies have found that the expansion of oil palm production has helped to reduce poverty in rural areas of Indonesia (World Bank 2010; Susila 2004). To date, almost half of the plantations in Indonesia have not yet reached their productive stage; hence, the share of Indonesian oil palm in global production may further increase in the years to come.

There are three types of oil palm plantations in Indonesia, namely, (1) private plantations, which comprise about 50% of Indonesia's oil palm production area, (2) smallholder farmers with around 40%, and (3) production under state control with just 10%. The Government of Indonesia has actively promoted the participation of smallholder farmers in oil palm plantations in order to achieve more inclusive growth and poverty reduction in rural areas.

There are two types of smallholder production and marketing schemes. The first type involves independent smallholders who are free to market their produce, but must rely on official government extension services for technical support. The second group is the smallholders who are under contractual arrangements with large private oil palm companies. Large companies require these small contractors to supply them with oil palm fruits through the company's facilities. The company, in turn, provides financial and technical services to these contractual smallholders.

Sumatra is the primary location of oil palm production in the country, comprising about 80% of national production. In recent years, however, oil palm has also expanded to include Kalimantan, Sulawesi, and Papua.

The rapid expansion of oil palm plantation areas has profound socioeconomic and environmental implications. Most oil palm plantations are established in forested areas, where indigenous communities, who are dependent on the forest, have lived for centuries. Although establishing oil palm plantations offers new sources of income, converting natural forests into plantations can threaten the well-being of indigenous communities who rely on natural resources for their livelihoods (Sheil et al., 2006; Belcher et al., 2004). Several studies also pointed out the negative impacts of oil palm projects on rural communities, including incidents of human rights violation, land grabbing, and ecosystem destruction (Marti, 2008; Colchester et al., 2013). Although oil palm development may have contributed to poverty reduction, these effects were found to be greater for districts where poor households are engaged in agriculture (World Bank, 2010).

Many smallholders have benefited from the high net revenues derived from oil palm production. However, Rist et al., (2010) cited some of the potential conflicts that frequently emerge from oil palm plantation development, namely, weak local government, lack of clarity of the contracts signed between companies and smallholders, failure of the companies to meet either contractual or perceived obligations, and lack of clarity over land tenure. For example, Vermeulen and Goad (2006) reported that in 2000, every oil palm company in Sumatra had land disputes with local communities.

There is also a trade-off between the economic benefits generated from the oil palm industry and its negative environmental consequences, such as loss of food and natural resources for forest dependent communities, loss of biodiversity, and carbon emissions (Manurung 2001; Koh and Wilcove 2008; Tan et al. 2009; Wilcove and Koh 2010; World Bank 2010; Obidzinski et al. 2012; Schrier-Uijl et al. 2013). Obidzinski et al.

(2012), for example, named oil palm development as one of the causes of deforestation, air and water pollution, and soil erosion.

In summary, similar to other changes caused by economic development, the expansion of oil palm production in Indonesia has caused externalities that deserve government intervention. The Government of Indonesia has responded to this challenge by developing standards that aim to make oil palm production more compatible with the paradigm of sustainable development. Several initiatives have been undertaken to introduce standards in the oil palm industry. The most well-known are the (1) Roundtable on Sustainable Palm Oil (RSPO), a multi-stakeholder voluntary international standard; (2) International Sustainability and Carbon Certification, which is a voluntary international standard related to the sustainable production of biomass for bio fuels under the European Union Renewable Energy Directive; and (3) Indonesian Sustainable Palm Oil (ISPO), a mandatory government-led certification scheme.

ISPO is an obligatory government standard introduced in late 2009 that enables Indonesia to reduce greenhouse gas emissions while sustainably increasing oil palm production. The objective was to make this standard mandatory for all oil palm growers in Indonesia by 2014. A pilot ISPO study conducted in March 2011 classified oil palm plantations into five categories, following Decree No. 7/2009 of the Minister of Agriculture I: (1) Category I (very good), (2) Category II (good), (3) Category III (moderate), (4) Category IV (poor) and (5) Category V (very poor). Only plantations from Categories I, II, and III were considered for introducing ISPO. However, plantations that employ slash-and-burn methods were not considered as these are against the sustainability paradigm in the Indonesian palm oil sector. Moreover, plantations have to conform to all the guidelines prescribed by the Ministry of Agriculture, the Ministry of Environment, and the National Land Agency of Indonesia.

The ISPO Appraisal Commission is the authoritative body that decides and regulates conformity to ISPO. A study by the Deutsche Institut für Entwicklungspolitik (DIE, German Development Institute) pointed out that ISPO's credibility is problematic due to the lack of progress monitoring of the initiative (Brandi et al. 2013). In addition, as it is an obligatory standard, there is no membership fee, which, in principle, should make it attractive for growers. Notwithstanding the lack of an obvious enforcement mechanism, ISPO has the potential to make Indonesia internationally competitive, and hence is a better strategy than RSPO.

To date, little is known about the most appropriate mechanism that would encourage oil palm farmers to adopt ISPO. It is reasonable to assume that its declaration as a legal requirement will not automatically lead to producers adopting the standard, especially in the absence of effective enforcement mechanisms. Not surprisingly, Brandi et al. (2013) observed that “the certification process has not advanced on a broad scale since the standard’s introduction” (p. 55). The report also recommended for the Government of Indonesia to scale-up its extension services in investment, content, quality, and frequency. In particular, Brandi et al. (2013) recommended the following actions:

1. Provide a high number and frequency of well-planned trainings.
2. Conduct practical training sessions in small groups and through demonstration plots.
3. Teach well-tailored content that emphasizes the ecological dimension of sustainability, covers a broad array of topics, including standards and their requirements, good agricultural practices and effective smallholder organization, and the benefits of certification.
4. Plan training schedules meticulously, i.e., convey content that is thematically focused on one topic, maintain high frequency of training modules with repetitions, and coordinate different topical modules of the training program.
5. Target effective scope of audience—focus training sessions on plot owners but also include hired workers.
6. Establish a system of famer-to-farmer knowledge transfer in order to scale up adoption of ISPO.

Accordingly, this study focused on the introduction of ISPO principles as a set of oil palm management practices to smallholder oil palm farmers by means of publicly supported extension strategies.

5.1.2 Research objectives

This study generally aimed to assess the costs and benefits of implementing ISPO criteria to smallholder oil palm farmers in Jambi, Sumatra in the context of a case study. Specifically, this study aimed:

1. To analyze oil palm smallholders’ management practices and compare them with ISPO standards;

2. To conduct a cost-benefit analysis of the measures that facilitate the implementation of the ISPO criteria in oil palm production; and
3. To derive policy recommendations for designing strategies that could introduce ISPO standards among smallholders in Indonesia.

The remainder of this report is organized as follows. The next section discusses the methodology used for the cost-benefit analysis (CBA) of sustainability standards, including its general principles, and the study approach. Section 5.3 presents the data collection procedure, followed by the assumptions used in this analysis in Section 5.4. Section 5.5 discusses the results, and Section 5.6 concludes this report with some policy recommendations and outlook.

5.2 Methodology

5.2.1 General principles

This study used the CBA method to analyze the adoption of Indonesian smallholders of the ISPO standards. Following the principle of natural resource management discussed by Zilberman and Waibel (2007), adopting ISPO standards, in theory, would lead to several benefits. The first would be market benefits (MB_t), which can be divided into three components as follows: consumers' surplus (CS_t), farmers' surplus (FS_t), and manufacturers' surplus (MS_t). These rents accrue in time *t* and must be measured over a defined period of time, practically the expected life span of technology associated with ISPO standards. The sum of this measure is MB_t, where

$$MB_t = CS_t + FS_t + MS_t. \tag{5.1}$$

The second type of benefit of ISPO introduction would be the nonmarket benefits (NMB_t), which include benefits in the form of positive human health effects from less pesticide use (NH_t), benefits from natural resources conservation like better soil management practices (NR_t), and environmental benefits such as species conservation (EB_t). Some of these benefits may be internalized by the adopters of the technology. For instance, improved farmer health from the reduced toxic chemicals is considered to be part of their willingness to pay for the technology; it is, therefore, included in FS_t. The nonmarket benefits (NMB_t) can be

$$NMB_t = NH_t + NR_t + EB_t. \tag{5.2}$$

To quantify nonmarket benefits, cost accounting techniques of monetization (e.g., damage and replacement cost approaches) can be used; however, such techniques are time consuming. Alternatively, aggregate measures for externalities from literature can be used as proxies. Consequently, the sum of market and nonmarket benefits at time t (TB_t) can be expressed as

$$TB_t = MB_t + NMB_t . \tag{5.3}$$

The benefits must be compared with the costs of ISPO development and implementation. The full costs (TC_t) of ISPO are difficult to measure because attributing the development costs is difficult; however, it is reasonable to assume that there are specific research costs (RC_t) that can represent the costs of adopting the ISPO criteria for local conditions (DC_t). These costs will also be difficult to assess and attribute to a specific instance of ISPO introduction. Other costs include ISPO criteria diffusion through extension efforts of informing producers (EC_t). Thus, the total cost of developing and introducing ISPO criteria at time t can be expressed as

$$TC_t = RC_t + DC_t + EC_t . \tag{5.4}$$

Considering the timeframe of an ISPO project, the discount rate r must be introduced. Hence, the present value of the net benefits can be calculated as

$$NPV = \sum_{t=0}^{t=T} TB_t/(1+r)^t - \sum_{t=0}^{t=T} TC_t/(1+r)^t \tag{5.5}$$

The internal rate of return (IRR) is the discount rate resulting in 0 net present value (NPV), which can be expressed as

$$NPV = \sum_{t=0}^{t=T} (TB_t - TC_t)/(1+IRR)^t = 0 \tag{5.6}$$

Following Pearce and Turner (1990), the IRR of aggregate investments in the development and introduction of ISPO criteria can be compared to the social opportunity costs of capital or the social rate of time preference. In addition, there may be other, albeit less tangible, factors that can affect the IRR such as network externalities; social capital; prior knowledge; institutional arrangements; and social, cultural, and policy conditions. These factors may be reflected in the adoption rates of measures related to the ISPO criteria implemented by oil palm smallholders.

At the aggregate level, the increased productivity effects that can be expected from introducing improved oil palm management practices following ISPO criteria would shift the supply curves for both fresh palm fruits and crude palm oil (CPO). In addition, relative to conventional oil palm production, ISPO can generate positive nonmarket benefits that can accrue from the adoption of more environmentally benign management practices such as integrated pest management that uses lower amounts of and less toxic pesticides. In this sense, ISPO practices can create a win-win situation for smallholders and society at large.

Figure 5.1 illustrates the ISPO impacts from a theoretical point of view. The diagram has an upper and a lower panel. The upper panel illustrates the usual market model with a downward sloping demand curve D and the upward sloping supply curve S, where P is price and Q is quantity of fresh palm oil fruits. S_1 is the conventional oil palm management technology. S_2 is the improved technology following ISPO adoption, and leads to a downward shift of the aggregate supply curve. This ultimately results in increased supply and lower prices, considering that Indonesia is a major supplier on the world market.

The lower panel of Figure 5.1 defines the environmental damage associated with oil palm production. A straight line is assumed from the origin and goes downwards. This shows the increase in environmental costs with increasing oil palm quantity, denoting this damage curve as E_1. Introducing ISPO standards shifts the damage curve to E_2; thus, demonstrating a win-win situation with increasing productivity (shift from S_1 to S_2) accompanied by decreasing environmental damage. In other words, even at a higher level of palm oil production, the environmental damage would be lower when smallholders (and companies) follow the ISPO technology regime.

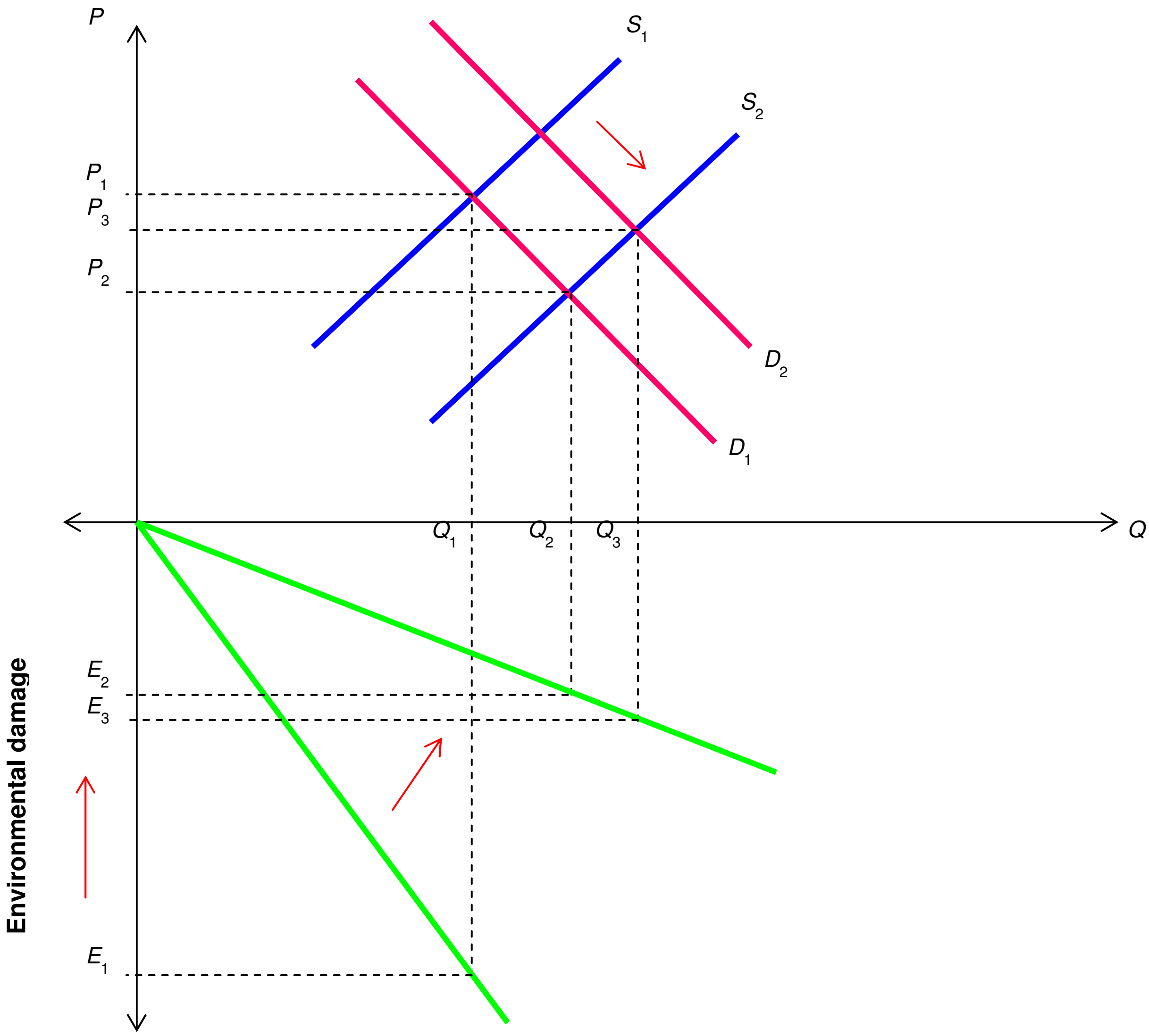


Figure 5.1: Theoretical effect of ISPO (with and without certification) on market and environment

Source: Own illustration

The next step would be to introduce oil palm certification that is recognized by the international market. This would then result in a shift of the demand curve from D_1 to D_2. For simplicity, assume that this would not lead to further environmental benefits, although one could argue that the much stricter monitoring results under a certification scheme may justify a further upward shift in the damage curve in the lower panel of Figure 5.1.

In this study, the principles outlined above were followed in the CBA. Since this study primarily focused on the smallholders, the analysis concentrated on the farmer level and excluded the manufacturing (processing) level. However, the externalities were included in the quantification of the costs and benefits and in the estimation of the NPV, IRR, and benefit-cost ratio (BCR) under the various scenarios of ISPO introduction to oil palm smallholders. The whole analysis was done under the context of a hypothetical (albeit real-world) situation in the project target area in Jambi province, Sumatra, Indonesia.

5.2.2 Study Approach

This section outlines the approach taken by the author in order to conduct a CBA of introducing ISPO standards to smallholder farmers in Jambi, Indonesia. The study assumed a hypothetical project, in which ISPO standards are introduced to smallholder oil palm farmers in a hypothetical project area by means of alternative extension approaches. The project target area is a district with smallholder oil palm plantations in Jambi, Sumatra.

Two scenarios were assumed in introducing ISPO to smallholder farming. The first scenario involved a standard extension campaign with an initial five-day intensive classroom-cum-field demonstration type of training for farmers, a follow-up training in Year 2 of the project, and some low-intensity extension activities until Year 5. The second scenario involved a Farmer Field School (FFS) type of training (Feder et al., 2003), with season-long participatory practical and theoretical field-based training. Follow-up trainings or follow-up extension activities were not included in this scenario; the FFS approach usually relies on reciprocal farmer-to-farmer information exchange, which does not have additional costs.

Although ISPO is a mandatory standard, adoption is the choice of the individual smallholder since there is no enforcement mechanism. Therefore, this study assumed an adoption curve with the usual sigmoid shape. Arguably, the two extension approaches would lead to different adoption curves, with the intensive method leading to faster and higher degrees of adoption.

A project horizon of 15 years was assumed in the analysis; thereafter, the effect of the campaign would have vanished or alternative means would have become relevant. These would be subject to a separate further analysis.

The benefits of ISPO adoption consist of economic and environmental benefits. Economic benefits are defined as the difference in the yield of smallholder farmers whose crop management practices fulfill a minimum set of criteria defined in ISPO and of those who did not follow such practices. This study defined smallholder adopters as those with a threshold of more than four crop management practices; those with fewer than four practices were defined as non-adopters. The empirical base for this comparison was the three-year panel data that had been obtained from three villages in Merangin district, Jambi province (see Section 5.3). To obtain the gross benefits, the author multiplied the average yield difference over the three-year period between the two groups of farmers by the export parity price of crude palm oil at farm gate that had been converted into Fresh Fruit Bunch (FFB) equivalents. The net economic benefits per hectare were then derived by deducting the difference in variable cost of production from the gross benefits, assuming that adopters have higher costs corresponding with their higher yields.

Likewise, this study defined environmental benefits based on the approach suggested by Levin et al. (2012). Specifically, Levin et al. (2012) observed that adopters of the voluntary international standards based on the RSPO had followed IPM practices, which led to their lower use of pesticides and herbicides. Accordingly, assuming that there is no difference between the management practices of ISPO and that of RSPO, the present study considered in the calculation the difference in the value of herbicides and pesticides between farmers who use at least two IPM practices and those who do not. Likewise, the author used a factor of 2:1 to account for the effect of externalities of pesticide use, such that one unit of pesticide reduction results in two units of environmental (and health) benefits. This value is based on the study of Rola and Pingali (1993) on the external effects of pesticide use in the Philippines.

This study included in the sample only those smallholders whose plantations were in the productive stage (i.e., at least seven years), with a similar tree age distribution between adopters and non-adopters. The NPV and BCR were then calculated using a discount rate equal to the interest rates for medium-term loans in Indonesia. The IRR was also calculated (i.e., economic internal rate of return [EIRR]), which was then used to analyze the different scenarios that would determine the optimal strategy for introducing ISPO into smallholder farming.

5.3 Data collection

The province of Jambi is a major oil palm-producing area in Indonesia. It was selected as the study area due to the contribution of its oil palm industry to the provincial economy and to the province's labor market since the industry provides major employment in the province. In 2009, a total of 168,140 households in Jambi cultivated oil palm, and 55% of these households were engaged in contractual arrangements with oil palm companies (BoA 2010).

The researchers conducted a household survey in January and February 2010. In total, the survey involved 245 oil palm smallholders, which were spread across three villages surrounded by a nucleus company. A total of 126 farmers were contract smallholders, whereas 119 were noncontract smallholders.

The research team employed a multistage sampling procedure in the survey. First, an oil palm nucleus company covering 15,441 hectares (ha) in Merangin district was selected as the study area because it represented several stages of oil palm growth. Second, three villages were selected based on the distance criteria of the oil palm mill to the production sites. The distance was accordingly categorized into three, namely (1) near (10 km), (2) medium (20 km), and (3) far (50 km). Third, households were sampled randomly, with probabilities proportional to the number of oil palm growers in each village.

Interviews were carried out by using a modularly structured questionnaire. The main modules involved household characteristics, shocks, crops, livestock, natural extraction, off-farm, household expenditures, and oil palm production. The section on oil palm inquired about the details of the farmers' production and inputs.

The researchers conducted the baseline survey in 2010, in which all of the information asked in the survey referred to the reference period of 1 January, 2009 to 31 December, 2009. The second part of the survey was implemented in 2012, which basically collected the same information as that in 2010, but also covered an additional module on environment and natural resources. The researchers conducted a follow-up survey in 2013, which retained the basic sections of the first questionnaire (i.e., 2010 survey questionnaire) but with additional questions on management practices related to ISPO. The survey was complemented by interviews with stakeholders (i.e., village leaders and representatives of oil palm companies). Focus group discussions were also conducted in all three villages to better understand the current socioeconomic conditions as well as the opportunities and constraints in introducing sustainable oil palm production regimes.

The analysis included only those farmers whose plantations had reached productive age (i.e., 7 years old). None of the plantations had reached old age; thus, the total number of households included in the three-year panel was 185.

5.4 Assumptions

This section specifies the assumptions used in the CBA. First, the economic and environmental benefits assumed to be attributable to the management of oil palm practices under the ISPO regime are quantified in this section. The analysis subsequently specifies the costs of the hypothetical project to introduce ISPO standards to smallholder oil palm farmers. This section also presents the assumptions made for the adoption curves of both the economic and environmental benefits based on plausibility considerations, and provides the reason for the choice of the discount rate. The calculations were performed in several scenarios, which were reflected in the assumptions on costs, benefits, and adoption rate.

5.4.1 Benefits

Economic benefits

The research team selected 185 households engaged in oil palm plantations from the sample of 295 households in four villages in Jambi province. As explained in Section 5.3, the selected households are located at the three villages in Merangin district and had plantations in productive age. The 2013 household survey included questions regarding management practices. These practices were compared with the ISPO standards in order to define the number of farmers that meet a minimum number of ISPO criteria.

Table 5.1 shows that nearly 90% of the farmers in the study meet at least two ISPO criteria, although this percentage declines rapidly as the threshold increases. The author chose a threshold of four criteria, and defined ISPO adopters as those households that follow almost half of the maximum number of criteria. A higher threshold number could be argued, but this would have left fewer households among adopters and less variation among management practices. By choosing a threshold of four criteria, the study was able to include 115 adopters and 70 non-adopters.

Table 5.1: Threshold chosen for adopting ISPO criteria in percentage (n = 185)

No. of ISPO Criteria	Frequency	% of Total Households Interviewed
2	165	89.19
3	147	79.46
4	115	62.16
5	90	48.65
6	64	34.59
7	32	17.30
8	16	8.65
9	5	2.70

Source: Household survey (2013)

The author took the average yield values across the three-year panel data set, and compared the fresh fruit yield between adopters and non-adopters. As shown in Table 5.2 the mean difference between the two groups is 1,278 kg/ha. This is equivalent to a yield increase of 10% on average, albeit with considerable variation over the three years. In 2010, yields between adopters and non-adopters were almost equal; in 2013, adopters enjoyed an increase of well over 15%. Generally, the observed yield difference is a conservative estimate. For example, Levin et al. (2012) reported an increase of up to 180%, which the author considered to be a very optimistic estimate. Levin et al. (2012) noted, however, that the yields of smallholders ranged from 14 to 17 t/ha of palm oil, which is equivalent to about 3–3.5 t/ha of CPO. These values were reported to be quite comparable with the yields observed in other studies, and therefore indicate that smallholder oil palm farmers may be no less productive than the other plantations.

Table 5.2: Yields of fresh fruit palm of adopters and non-adopters of ISPO standards

Year	FFB yield (in kg/ha)				
	Adopters (n = 115)	Non-Adopters (n = 70)	Difference	t-stat	p-values
2010	14,853.03	14,938.91	–85.88	0.120	0.905
2012	16,106.04	14,403.83	1,702.21	–1.106	0.270
2013	17,057.02	14,838.04	2,218.98	–1.002	0.318
Mean	16,005.36	14,726.93	1,278.43	–1.378	0.169

Source: Household survey (2010, 2012, 2013)

The author did not use the observed average price of FFB as paid to oil palm smallholders in the sample to estimate the economic benefits of oil palm farming. This price is a financial price; thus, it is not consistent with the requirements of a CBA. Instead, the author derived the export parity price of FFB at farm gate from the world market price of CPO, considering real resource use for processing, loading, transportation, and retribution costs (Table 5.3). Taxes were eliminated as transfer payments that do not affect real resource use of the economy. Table 5.3 summarizes the assumptions used in the calculation of the export parity price used in the study. These assumptions include a processing factor of 21% for palm oil and 3.5% for palm kernel. Hence, an export parity price of IDR 1,261.77/kg of FFB was derived. This was then multiplied by the observed yield difference between adopters and non-adopters from Table 5.2. As the ISPO regime has not yet gained recognition by the international markets for CPO, the study excluded price benefits and produced an identical output price for both adopters and non-adopters.

Table 5.3: Calculation of export parity price at farm gate for FFB (in IDR/kg)

Item	Value (IDR/kg)	Conversion Factor (%)	Value per Kilogram of Fresh Fruit (IDR/kg)
Value			
Crude Palm Oil (FOB)	6,218.80	21.00	1305.95
Palm Kernel	2,627.00	3.50	91.95
Costs			
Processing CPO	400.00	21.00	84.00
Processing Kernel	400.00	3.50	14.00
Retribution CPO	10.00	21.00	2.10
Retribution Kernel	2.00	3.50	0.07
Transportation	150.00	21.00	31.50
Others CPO	20.00	21.00	4.20
Others Kernel	7.50	3.50	0.26
Sum of Conversion Cost			136.13
Export parity price for FFB at farm gate (IDR/kg)			1,261.77

Source: Own survey data and data from Bureau of Estate Crops (2009)

Notes: (1) 1USD = 10,000 IDR; (2) FOB = Free on Board

To calculate the net benefits of ISPO adoption, the author took into further account the observed differences in variable cost of production between adopters and non-adopters. The study was based on the premise that ISPO adopters would apply farm inputs more judiciously and as a function of need. Consequently, farm inputs would approach optimum levels and be more highly variable over time. Table 5.4 shows that, on average over the three years of the panel data, the difference is small—just about IDR 170,000/ha. However, in 2013, adopters had lower variable costs and yet achieved higher yields (see Table 5.2), which indicates higher efficiency.

Table 5.4: Variable cost of oil palm production for adopters and non-adopters of ISPO standards

Year	Costs (in '000 IDR/ha)				
	Adopter (n = 115)	Non-adopters (n = 70)	Difference	t-stat	p-values
2010	7,250.76	6,392.45	858.31	–0.603	0.547
2012	9,297.72	8,240.13	1,057.59	–0.806	0.421
2013	2,354.42	3,738.95	–1,384.53	1.982	0.050*
Mean	6,300.97	6,122.56	178.41	–0.250	0.802

Source: Household survey (2010, 2012, 2013)

Note: * is significant at 10% level

Environmental benefits

Full adoption of ISPO standards may also result in environmental and health benefits. Using potentially harmful external inputs (e.g., chemical fertilizer and chemical pesticides) more judiciously and following science-based technical recommendations will not only result in higher productivity but can also reduce harm to the environment and people. For example, correct application of fertilizers would minimize the danger of polluting groundwater resources in rural villages, where public and private wells are often the sources of drinking water. Applications of fewer, less frequent, and less toxic pesticide and herbicide compounds would reduce the risks to occupational health and decrease the potential for water contamination. Measuring the environmental effects of improved input management is difficult without detailed studies, such as groundwater quality monitoring, and can therefore hardly be based on assumptions derived from the quantity of use.

In this case, farmers were asked about their use of the IPM concept based on a number of specific practices, such as identifying weeds or pests before applying pesticides and observing specific safety rules. Similar to the procedure for determining the economic benefits, the study analyzed environmental (human health) benefits by defining an adoption threshold of two IPM practices. The costs of pesticides were subsequently compared between adopters and non-adopters of IPM practices (Table 5.5).

Table 5.5: Cost of pesticides for adopters and non-adopters of IPM

Year	Costs ('000 IDR/ha)				
	Adopter (n = 29)	Non-adopters (n = 156)	Difference	t-stat	p-values
2010	471.65	541.37	69.72	0.264	0.792
2012	487.85	438.97	–48.88	–0.322	0.749
2013	288.70	419.83	131.13	1.402	0.164
Mean	416.07	466.72	50.65	0.478	0.632

Source : Household survey (2010, 2012, 2013)

On average over the three observed years, adopters spent approximately IDR 50,000/ha less on pesticides than the non-adopters did. Variations were nevertheless observed over the years, as in year 2012 when adopters had used more pesticides than the non-adopters did; whereas in year 2013, some adopters had used considerably less. The author argues that this variation is reasonable because ISPO standards would make farmers more efficient with their pesticide application. To account for external costs, the study attributed a factor of 2, based on the study of Rola and Pingali (1993) on pesticide use in the Philippines. The observed mean difference was therefore multiplied by 2 to estimate the unitary environmental benefits of ISPO adoption.

With the information displayed in Tables 5.2–5.5, the author was able to calculate the unit net benefits for a minimum rate of adoption of ISPO standards, with the addition of environmental benefits as explained above. Net benefits are composed of the economic benefits, and these were calculated in this study as the difference in yield multiplied by the export parity price less the difference in variable costs. The author calculated this on a per-hectare basis in order to make the numbers comparable with the cost assumptions.

5.4.2 Costs and adoption rates

The discussion for the costs of introducing ISPO standards to smallholder farming are based on two different strategies. The first strategy analyzed in this study was that of a conventional extension campaign that included traditional training and communication approaches. The second strategy was the introduction of ISPO by an intensive method (i.e., FFS). The FFS concept, which started in Indonesia in the early 1980s with initially great success, has been applied in numerous extension projects around the world for complex technologies (Braun and Duveskog 2008).

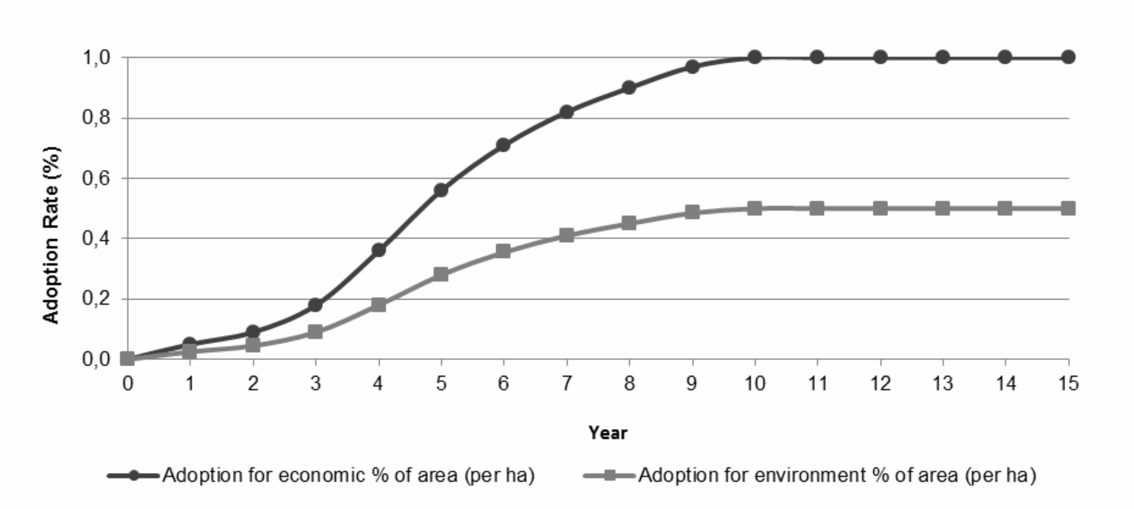
Conventional campaign

The assumptions incorporated in the conventional extension approach were based on the study of Levin et al. (2012), in which the authors analyzed the incremental financial costs and benefits of the international RSPO standards. In their study, the costs at smallholder level, including training and monitoring costs, were given a range of USD 2.82–11.51 per hectare (equivalent to IDR 28,200–115,100 at USD 1 ≈ IDR 10,000). In this study, this figure was considered as the direct costs of introducing ISPO standards, without the costs of land assessment and environmental and social impact assessment otherwise incurred by oil palm companies during RSPO certification. It could be argued that despite the difference between RSPO and ISPO, farmer training and monitoring costs would be similar. Nevertheless, certification costs were ignored, as the researcher assumed higher initial prices resulting from non recognition of the ISPO standards by the international market.

The study assumed three levels of intensity associated with the conventional extension strategy. This strategy defined an initial campaign cost of IDR 20,000/ha, and the same amount in Year 2 for a follow-up activity. Succeeding years would incur monitoring and extension costs of IDR 10,000/ha until Year 5 of the project, at which point no additional external extension activities would take place.

The study assumed a very low rate of adoption for the first-intensity level (Figure 5.2). This is in consideration of the complexity of the technology and the fact that despite being a mandatory standard, the Government of Indonesia has virtually no enforcement mechanism in place to make farmers follow ISPO practices. Hence, as the technology is knowledge-intensive, adoption would depend on the degree of investment in providing information and training to farmers.

In the low-level intensity extension campaign, the author assumed that 10 years after the campaign, only 1% of the target area would have converted to ISPO practices and only 0.5% would have adopted IPM. It was further assumed that beyond Year 10, no further adoption would occur, although no dis-adoption would take place either. The author believed that these conservative adoption rates are realistic for NRM technologies, in contrast to other technologies related to seeds, fertilizers, or pesticides.

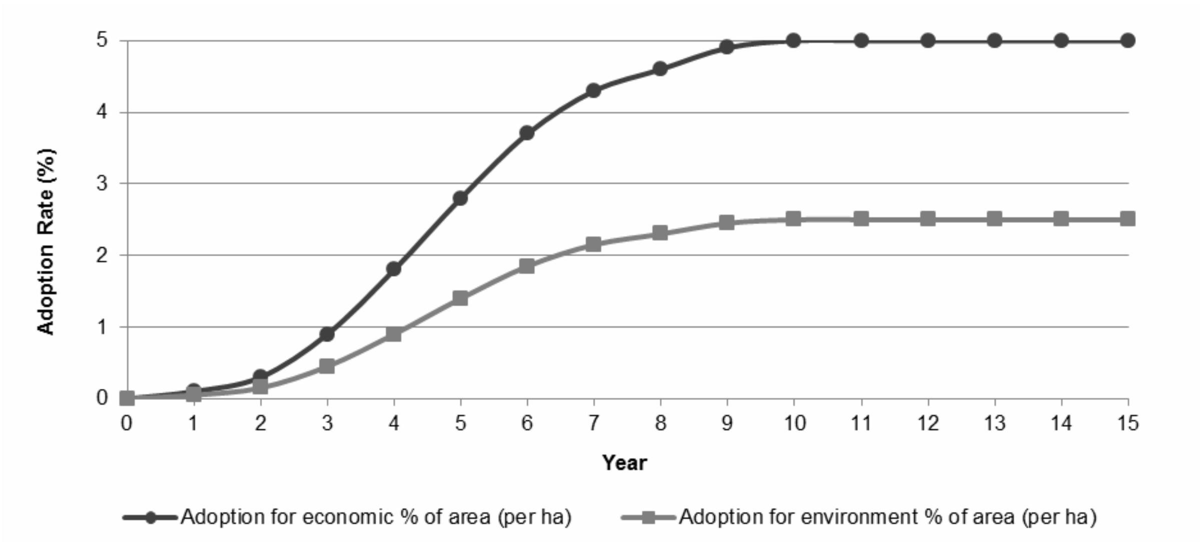


Note: The figure represents the without certification scenario, with adoption rates for campaign cost amounting to IDR 20,000

Source: Own assumptions based on plausibility considerations

Figure 5.2: ISPO adoption with low-intensity extension campaign

The second variant of the conventional extension strategy assumed that the initial campaign costs would amount to IDR 50,000/ha at Year 0, which would be repeated at Year 2 with the same level of intensity. Monitoring and extension costs would be IDR 10,000/ha until Year 5. These costs are the same as those under the low-intensity scenario. In fact, these would mirror the additional costs for a regular extension worker to address ISPO issues in his/her regular work. In this scenario, the adoption rate was set at a maximum of 5% after 10 years without dis-adoption. In addition, in order to realize environmental benefits, the smallholders were assumed to adopt IPM practices at a rate half that assumed for adoption due to economic benefits (Figure 5.3).

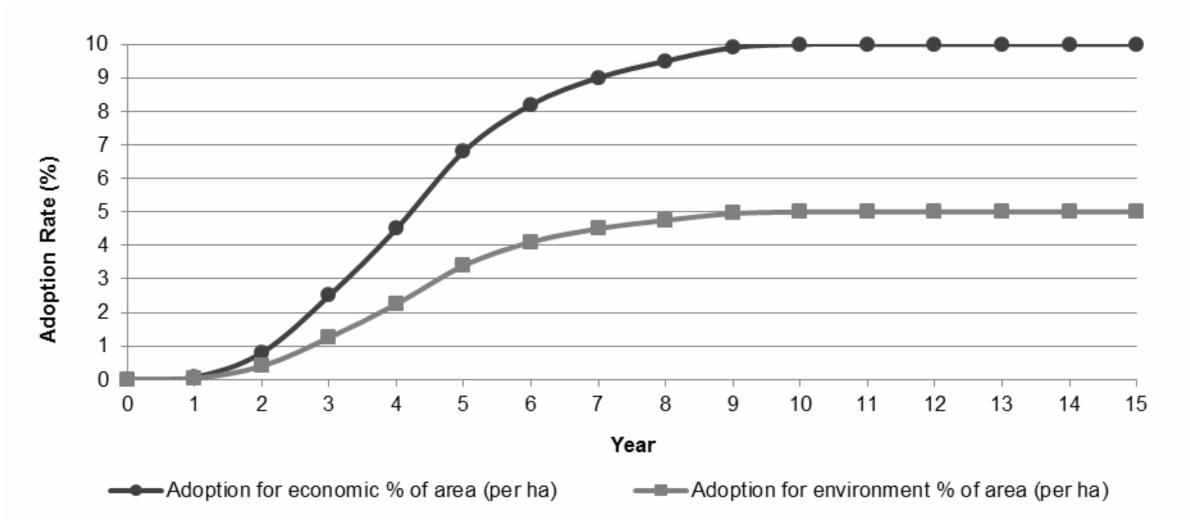


Note: The figure represents the without certification scenario, with adoption rates for campaign cost amounting to IDR 50,000

Source: Own assumptions based on plausibility considerations

Figure 5.3: ISPO adoption with medium-intensity extension campaign

Finally, the study assumed a more sophisticated extension campaign in the third-intensity level. Initial campaign costs in this scenario would incur about IDR 100,000/ha in Years 0 and 2; it would otherwise have the same conditions as the two other variants (i.e., additional costs for regular extension attributable to ISPO at IDR 10,000/ha). The third level assumed a maximum adoption rate of 10% by Year 10; IPM adoption was again assumed to be at half of this at 5%. Both rates were assumed to remain at maximum after Year 10 (i.e., no dis-adoption will take place), and are expected to experience the usual sigmoid increase between Years 1 and 10.



Note: The figure represents the without certification scenario, with adoption rates for campaign cost amounting to IDR 100,000

Source: Own assumptions based on plausibility considerations

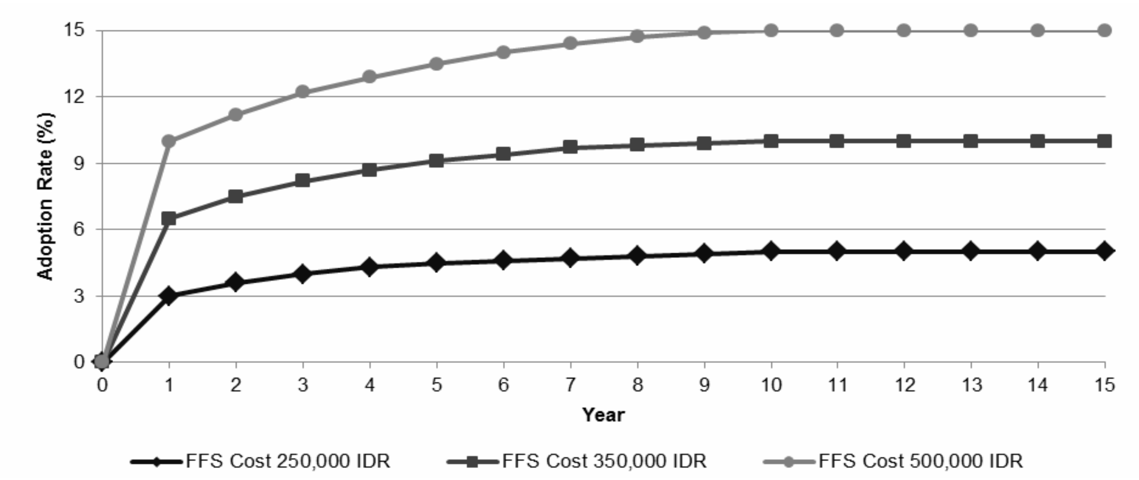
Figure 5.4: ISPO adoption with high-intensity extension campaign

Farmer Field Schools

The Farmer Field School approach was designed originally as a way to introduce knowledge on IPM to irrigated rice farmers in Asia. The first country that successfully implemented an FFS was Indonesia. Subsequently, FFS activities have been implemented in many developing countries, although only a few operate FFS as a nationwide system. The World Bank has incorporated FFS in some of its agricultural projects. At present, a typical FFS educates farmer participants on agro-ecosystems analysis, or what is generally described as integrated pest and crop management. This management system includes practical aspects of "...plant health, water management, weather, weed density, disease surveillance, plus observation and collection of insect pests and beneficial" (Indonesian National IPM Program Secretariat 1991, p. 5). The FFS approach relies on participatory training methods to convey knowledge to field school participants to make them into "…confident pest experts, self-teaching experimenters, and effective trainers of other farmers" (Wiebers 1993, p. 20). An FFS usually entails 8–12 half-day sessions of hands-on, farmer experimentation, and non formal training to a group of 20–25 farmers during a cropping season.

Well-educated, professional trainers implement training programs that focus on problem solving approaches in pest and crop management. Through group interactions, attendees sharpen their decision-making abilities and are empowered by learning leadership, communication, and management skills (Fliert, 1993).

The FFS approach is a relatively effective, albeit expensive, method of introducing complex technologies to small-scale farmers. When implemented with high standards, FFS costs can reach around USD 50 (i.e., IDR 500,000) per farmer (Feder et al., 2004). The author therefore assumed three FFS scenarios with costs starting from approximately IDR 250,000/ha, a medium-level point that costs IDR 350,000/ha, and a high-quality FFS with costs of IDR 500,000/ha. Figure 5.5 illustrates the corresponding adoption curves with maximum values of 5%, 10%, and 15 % after 10 years, and without decline thereafter. Since FFS is particularly effective for IPM, identical adoption rates for IPM and other ISPO technology components were assumed.



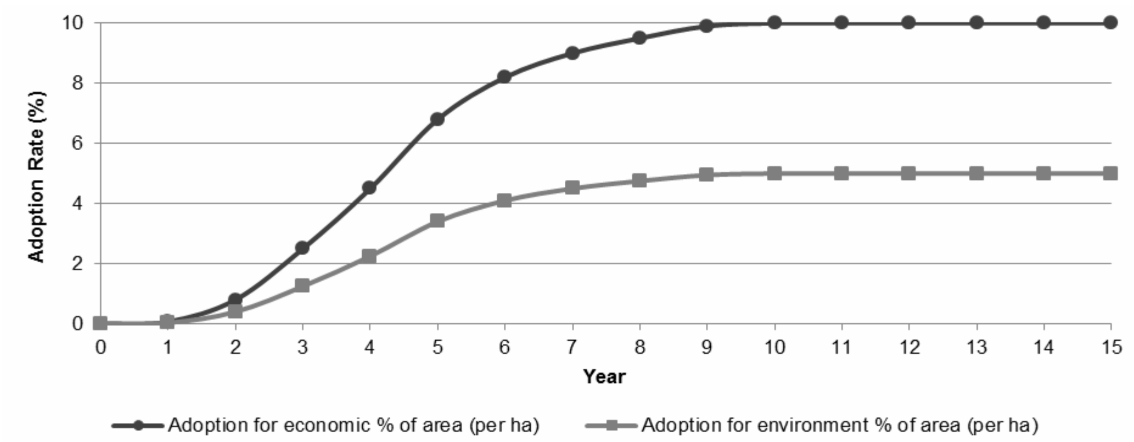
Source: Own assumptions based on plausibility considerations

Figure 5.5: ISPO Adoption rates under three levels of FFS introduction

5.4.3 Certification

The ultimate goal of ISPO is to be acknowledged by the international market and to receive the same recognition as RSPO. Such recognition would then result in a price benefit for smallholder ISPO adopters. In the certification scenario, the author hypothesized ISPO introduction via a campaign strategy, but at a higher level of intensity. The certification scenario assumed initial campaign costs of IDR 250,000/ha, a follow-up with the same level of intensity in Year 2, plus regular marginal extension costs of IDR 10,000 per annum until Year 5. Following the information obtained from the study of Levin et al. (2012), certification results in initial costs of approximately

IDR 35,000/ha; corrective costs in Year 2 of approximately IDR 400,000/ha; and maintenance and monitoring costs of IDR 130,000/ha. These high costs of certification have often been cited in literature as a constraint to adoption. This study calculated a benefit equivalent of IDR 1,577/kg FFB to the certification scenario by assuming the same difference in yield, but accounting for a price benefit of 25%. Figure 5.6 presents the adoption curves for the certification scenario.



Source: Own assumptions based on plausibility considerations

Figure 5.6: Rates for ISPO adoption with certification

5.4.4 Discount rate

In social CBA, the discount rate—referred to as the social rate of time preference—is assumed to reflect the preferences of society (Pearce and Turner 1990). This social rate of time preference could be argued to be lower than the private discount rate partly because private investors carry higher risks than society does. Promoting and introducing sustainability standards could therefore be considered as being in the public interest and would yield benefits that accrue to society at large, and not only to a specific group of people with business interests. On the other hand, the empirical analysis undertaken in this study has shown that under the prevailing conditions of ISPO, the majority of benefits would be market benefits and only a minor share would be attributed to environmental effects.

Consequently, this study used the medium-term lending rate in Indonesia as a five-year average. This rate corresponds to about 13% per annum (World Bank 2012). Hence, all hypothetical future cost and benefit values were discounted by 13%.

5.5 Results and discussion

5.5.1 Extension campaign

The study assumed that the most plausible scenario for introducing ISPO criteria in Indonesia was through an extension campaign using traditional methods of farmer training. The previous section specified the basic assumptions for this scenario. Based on plausibility considerations, a relationship was assumed to exist between the intensity of the investment campaign and the rate of ISPO adoption; a significantly higher adoption would result when more money (in actual terms, not on paper) is spent for the campaign. The results of this calculation are shown in Table 5.6.

Table 5.6: Investment efficiency of ISPO introduction, by campaign strategy, by level of intensity

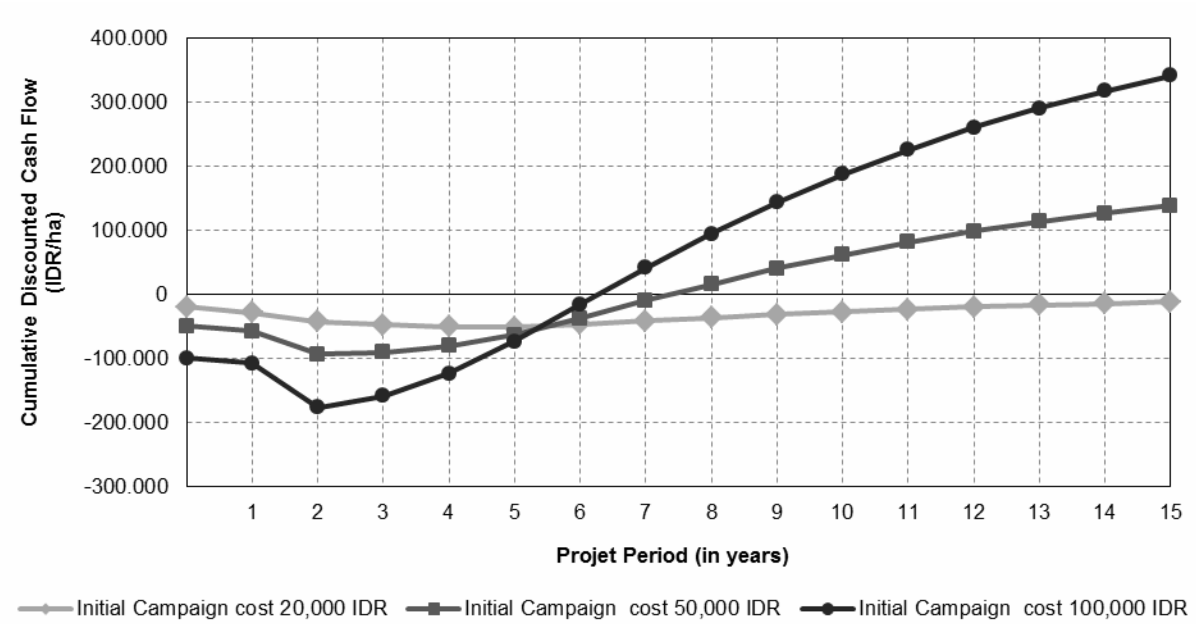
Campaign Strategy	Campaign Cost (IDR)	NPV (IDR)	BCR	EIRR (%)
Low-Intensity	20,000	–11,820	0.81	10
Medium-Intensity	50,000	138,843	2.19	27
High-Intensity	100,000	341,126	2.66	32

Source: Own calculations

Introducing ISPO standards by means of a low-intensity campaign would not be economical. At a 13% discount rate, the NPV is expected to become negative. Correspondingly, the BCR would be below 1, while the economic internal rate of return (EIRR) would be lower than the discount rate. These values associated with the low-intensity campaign are projected to render the investment inefficient. However, results would change dramatically when campaign efforts are intensified and investments are increased by a factor of 2.5. Under this high-investment strategy, the NPV would turn highly positive and a decent BCR of 2.19 and an EIRR of 27% would be achieved. These medium-intensity values would make the project an attractive investment. It is worth noting that public investment in ISPO introduction at this latter level of intensity would be efficient even if only 5% of the target smallholders would adopt the specified minimum number of ISPO practices.

Although effective spending of more money on the campaign would improve the investment outcome, doubling the investment amount as compared to the medium-intensity level does not seem to be justified. The EIRR is expected to increase by just a 5% point and, while the BCR would go up to 2.66, it would still be below the ratio of 3 often demanded by investors.

Further insights can be derived from Figure 5.7, which shows the cash flows of the three campaign scenarios. Logically, the cash flow of the low-intensity campaign would stay negative while the medium- and high-level intensity yields would have a pay-off period of seven and six years, respectively. In other words, the breakeven point for the investment would be reached after a reasonable period of time, and below the respective maximum level of adoption. This would suggest that, even at lower levels of adoption, it would be reasonable for the Government of Indonesia to spend public money for introducing ISPO standards to smallholder oil palm farmers.



Source: Own presentation

Figure 5.7: Cash flow for ISPO introduction using three intensity levels of the campaign strategy

Figure 5.7 suggests that the high-intensity campaign would be the most desirable from an economic point of view. However, using the area between the curve and the x-axis as a measure, this would only be true if absolute measures are applied. Since the adoption rates of ISPO standards would be highest under this strategy, political considerations may also make this strategy attractive for the Government of Indonesia. However, considerable budget would have to be provided and a high degree of quality control would have to be exercised in order to achieve the expected results.

5.5.2 Farmer Field School strategy

Numerous studies have been published about the economics of the FFS approach in agriculture (e.g., Feder et al., 2004; Witt et al., 2008; Praneetvatakul et al., 2007; Praneetvatakul and Waibel, 2007). Many of these studies acknowledged the high quality of the FFS approach; but at the same time, these studies pointed out that it may be too expensive and unsustainable from a fiscal perspective. On the other hand, this extension and training method would be suitable and economically justifiable if complex and knowledge intensive technologies must be introduced, as in the case with ISPO standards. The FFS strategy was therefore considered to be a feasible option. As compared to the extension campaign strategy, the FFS would be advantageous such that costs would occur only once, at the beginning of the project. Thereafter, due to strong institution-building effects among members of the field school, no follow-up extension activities would be required; farmer-to-farmer reciprocal information service would emerge from the network activities promoted as part of the school.

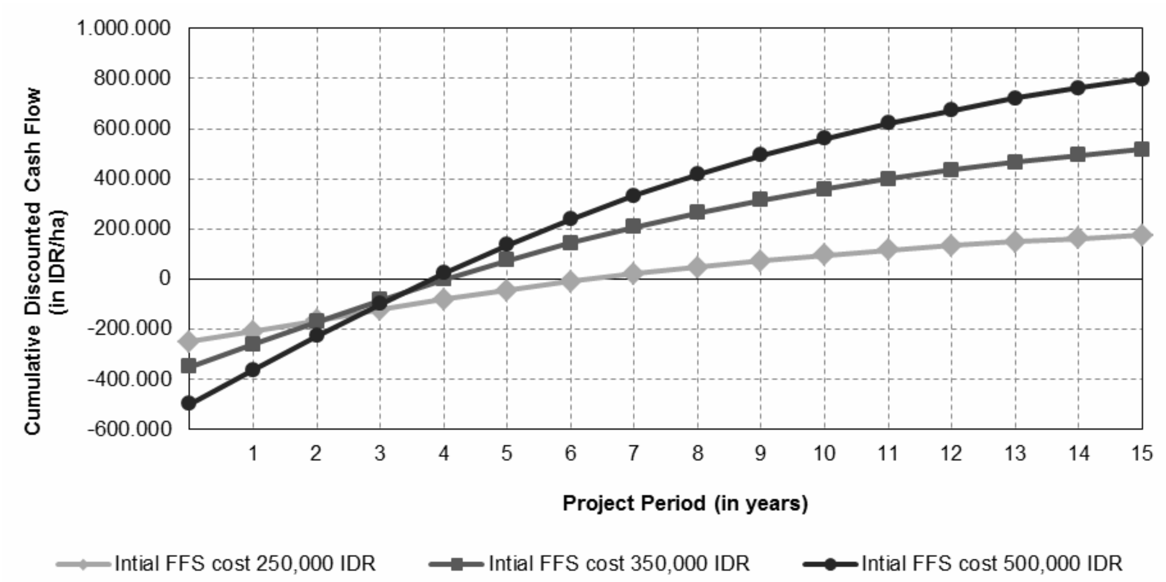
Table 5.7 shows that even a low-cost FFS would already be economical. The low-intensity FFS level, which assumes the initial cost of IDR 250,000/ha and a pessimistic adoption rate of only 5%, would result in a decent EIRR of 24%. This EIRR is well above the discount rate of 13%. The medium-intensity level would incur IDR 350,000/ha, which is a mere IDR 100,000 more expensive than the low-investment intensity campaign strategy. This would yield very good investment parameters, with an EIRR of 35% and a BCR of 2.48. The latter is lower than the 2.66 BCR of the extension campaign because for FFS, all costs would occur in year zero. The full cost FFS would result in a further increase in EIRR, BCR, and NPV. However, the marginal improvement in outcome may not justify the full cost variant.

Table 5.7: NPV, BCR, and EIRR of three levels of FFS strategy to introduce ISPO

FFS Strategy	Cost (IDR)	NPV (IDR)	BCR	EIRR (%)
Low-Intensity	250,000	174,292	1.70	24
Medium-Intensity	350,000	517,996	2.48	35
High-Intensity	500,000	799,600	2.60	37

Source: Own calculations

As shown in Figure 5.8, the advantage of adopting the FFS strategy would be its low pay-off period, which is between three and four years for the medium and costly FFS version, and seven years for the cheap version. This positive result is due to the fact that no further investment costs would occur, other than the initial season-long training in Year 0. Again, the lesson from the FFS scenario is that already moderate adoption rates of 5% would render public investment to be efficient, and the adoption of the ISPO standards by 10% of target smallholders makes the project a safe investment. A further increase in initial investment would enhance the profitability of the project in absolute terms. However, as this improvement would be small, it may be more efficient for the government to focus its efforts on increasing the number of FFS rather than on achieving their highest quality. After all, the FFS diffusion mechanism would offer the possibility that selected FFS graduates may implement further field schools in their village and carry out follow up activities.



Source: Own presentations

Figure 5.8 Cash flow of ISPO introduction for three intensity levels of the FFS strategy

5.5.3 Certification scenario

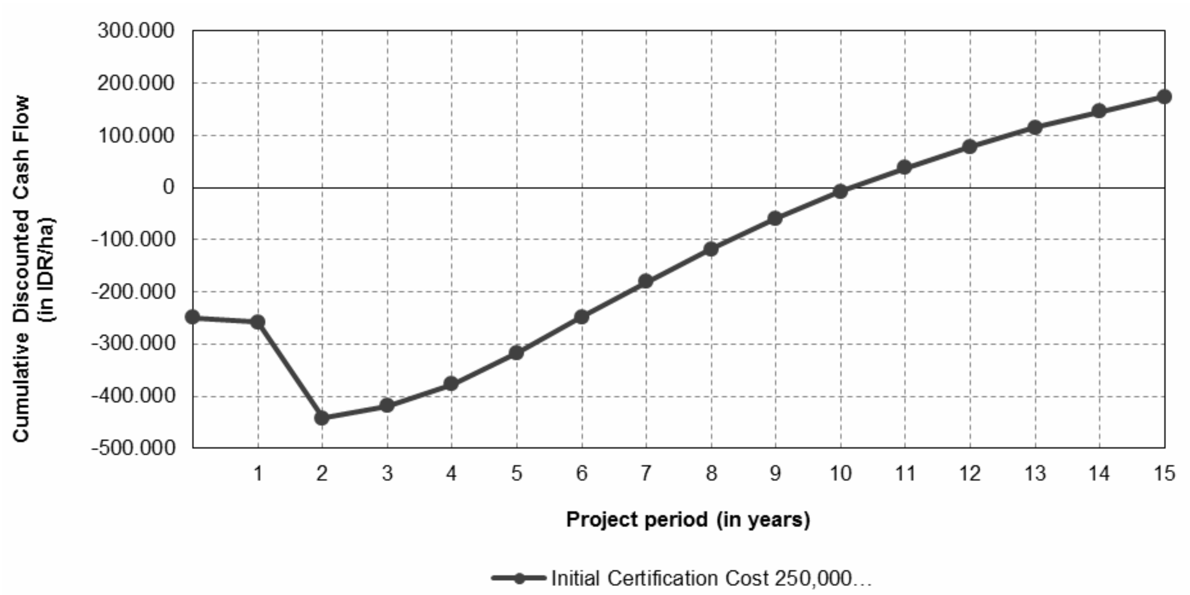
Although certification is part of ISPO, it is not yet recognized as an international standard that meets the sustainability criteria. However, it may be regarded as a step toward reaching international recognition in the same stature as that of RSPO (Brandi et al. 2013). Therefore, the author developed an additional scenario that includes certifications, with equivalent costs and benefits as described above. Table 5.8 defines this scenario, and includes a positive NPV, a greater than 1 BCR, and an EIRR of 18%. While the assumptions used may be debated, the study notes that under current gains in productivity from ISPO adoption (as observed in our sample), the path toward international recognition may be a difficult one for Indonesia. Government subsidies on certification may attract adoption by smallholders, but the efficiency of public investment would remain unchanged.

Table 5.8: Certification scenario

Parameter	Estimate
Investment cost (IDR/ha)	250,000
Initial certification cost (IDR/ha)	35,000
Correction cost (IDR/ha)	400,000
Annual maintenance and monitoring costs (IDR/ha)	130,000
Adoption rate for economic benefits	10%
Adoption rate for environmental benefits	5%
NPV	174,083
BCR	1.33
EIRR	18%

Source: Own assumptions and calculations

As shown in Figure 5.9, the cash flow only turns positive after almost 11 years, which is attributable to the high certification costs. From a public choice perspective, this would not seem justifiable, as the benefits of certification would mainly accrue to oil palm producers and be purely economic. As compared to the ISPO introduction without international certification, the environmental, and possibly social, benefits would remain unchanged. This would suggest that ISPO introduction without certification, as shown in the previous simulation, may be the better choice. Hence, the Government of Indonesia may be well-advised to strengthen ISPO adoption by designing effective extension campaigns or FFS training in order to improve productivity, reduce negative environmental externalities, and reduce human health hazards in smallholder oil palm farming.



Source: Own presentation

Figure 5.9: Cash Flow of ISPO introduction for the certification scenario

5.6 Summary, conclusions, and recommendations

In the palm oil industry, different initiatives for setting sustainability standards have evolved during the past years. The most well-known of these is the RSPO, which is a voluntary, internationally recognized standard for the production and marketing of palm oil. In 2011, the Indonesian government introduced ISPO, which is a mandatory certification scheme that aims to certify all oil palm producers in Indonesia by 2014. ISPO is less strict than the international RSPO, and only has basic requirements for compliance with Indonesian laws and regulations. Introducing ISPO to smallholders is expected to raise productivity and enable compatibility of oil palm management with the sustainability paradigm.

On the other hand, oil palm farmers are not familiar with the mechanisms for the adoption of ISPO. It is reasonable to assume that its declaration as a legal requirement would not automatically lead to adoption by producers, especially in the absence of effective enforcement mechanisms. Not surprisingly, Brandi et al. (2013, p. 55) observed that “the certification process has not advanced on a broad scale since the standard’s introduction.” The authors then recommended for the Government of Indonesia to scale-up its extension services in terms of investment, content, quality, and frequency.

Against this background, this study presented a CBA for the introduction of ISPO standards to small oil palm farmers in Indonesia. In the absence of information on a well-designed extension strategy by the Government of Indonesia in introducing ISPO standards, a hypothetical project was defined that focused on smallholder oil palm farmers in Jambi province in Sumatra. Two extension strategies were defined. The first strategy was a conventional extension campaign, in principle following the recommendations of Brandi et al. (2013). The second strategy was the FFS approach that aims to establish a farmer-to-farmer knowledge-transfer system. Both strategies target the improvement of crop management practices toward the need-based and judicious use of external inputs and promote practices that are compatible with sustainability goals. However, these strategies do not imply international certification that would provide additional price benefits. The latter has been included in an additional scenario calculation where both certification costs and output price benefits were accounted for.

The benefits of ISPO were defined as both economic and environmental. The economic benefits were defined as the difference in yield observed from a panel data set collected from approximately 245 smallholder farmers in three villages in Merangin district in Jambi, Sumatra. The results of a survey of crop management practices enabled the distinction between farmers closer to ISPO standards and those who were not, which defined the adoption threshold. The positive difference in FFB yields was then multiplied by the export parity price of FFB at farm gate, which itself was derived from the FOB price for CPO. Similarly, the environmental benefits of ISPO adoption were derived from a threshold for IPM and by using the difference in pesticide costs between adopters and non-adopters. The cost difference was multiplied by a factor to reflect externalities.

The results of the scenario analysis can be summarized as follows:

1. Low-investment and poor-quality extension campaigns would result in poor investment performance and would not justify public funds.
2. A medium-level intensity extension campaign could already provide a decent EIRR even at a moderate adoption level of just 5% by Year 10.
3. A high-investment extension campaign would increase investment performance only moderately, but may be attractive from a political point of view as the ISPO

4. An FFS strategy to introduce ISPO would be economically justifiable even for a low-cost FFS regime. The low-cost variant with an adoption rate of only 5% would achieve an EIRR of 24%, which is well above the discount rate of 13%. The USD 35/ha variant gives a good investment EIRR of 35%, and the full cost FFS would result in a further increase in investment performance. The FFS strategy is also expected to be attractive because of its low pay-off period. It would also have the potential to generate additional ISPO projects by farmer-to-famer transfer, with lower costs of additional FFS implemented by farmer trainers.
5. The international certification scenario with an assumed price benefit of 25% would not yield very attractive investment performance; the certification costs would be prohibitive relative to the economic benefits.

There are at least two important conclusions from these simulation exercises. First, the Indonesian Government would be well-advised to provide adequate investment for extension services to enable the introduction of ISPO standards among smallholders. This could be done by implementing sufficient number of well-designed and well-targeted, small-scale extension projects. Second, it appears that the current strategy of the Government of Indonesia to use the national ISPO regime as a step toward international certification would be a reasonable strategy. Jumping straight into RSPO level may only be justifiable from a welfare economics point of view if the economic and environmental benefits from ISPO standards can be increased. Having the political will to strengthen the extension capacities in oil palm areas would increase the benefits to be realized from ISPO, considering the existing and observable variation in crop management practices among smallholder oil palm farmers, which would support the apparent willingness to adopt IPM, and therefore ISPO, practices.

It cannot be denied that the study has some limitations. First, some debatable assumptions had to be made in the absence of practical ISPO adoption criteria and due to the lack of scientific studies on the environmental and natural resources effects of sustainability in oil palm production. Second, the study is limited to the smallholder plantation level and excluded the estate or oil palm industry production and processing levels. Nevertheless, the author believes that the study allows some recommendations to be proposed to the Government of Indonesia with regard to how it can make "the dream of sustainable palm oil" a reality within a foreseeable period of time.

In particular, the following measures are recommended:

1. Draw up a national extension strategy for introducing ISPO standards. As shown by numerous adoptions studies of agricultural technologies and as economic theory suggests, farmers will only adopt such practices if the economic benefits are obvious and the technology is comprehensible. Hence, there needs to be a national plan with targets, time frame, and sufficient resources to introduce ISPO crop management practices to smallholders.
2. Design a location-specific crop management set of practices by incorporating existing farmer knowledge. As shown by the survey, there is a great deal of variation in crop management practices. In addition, farmers have probably used their own experiences to experiment with various alternative methods, especially as smallholder farmers are aware of the changes that have come with large-scale oil palm implementation. Hence, the study suggests taking account of spatial variation in oil palm plantation management and incorporating farmer knowledge and experience in the implementation of ISPO. This would increase the likelihood of adoption and raise the economic and environmental benefits from ISPO.
3. Design appropriate policy incentives and specify a time frame to achieve international certification after a sufficient level of ISPO adoption has been achieved. The idea of using ISPO as an intermediate step before going to the more stringent RSPO standards has some merit, and the Government of Indonesia is correct in taking this stepwise approach. On the other hand, there needs to be a clearly formulated vision and strategy on how the smallholders can level up to international standards, achieve international recognition for their fully certified plantations, and realize not only productivity benefits but also premium price effects for certified products and processes.

Finally, this study suggests for independent research organizations to conduct more cost-benefit studies, including at the company level; these studies should incorporate processing and marketing. This requires some effort by the Government to urge companies to be cooperative and to provide data for such undertakings.

Chapter 6: Synthesis

6.1 Summary

To counter the negative externalities of oil palm, Indonesia, the largest global producer of palm oil, has introduced sustainable standards to promote environmental friendly production of oil palm. These standards are voluntary for smallholder farmers in Indonesia although it is mandatory for oil palm companies. Hence, the objective of this thesis is to understand the views of stakeholders involved in the Indonesian Sustainable Palm Oil (ISPO) standards in terms of how it can be useful to smallholder farmers. Moreover, this work also examines the drivers of ISPO adoption as well as it estimates the costs and benefits of such an adoption by smallholder farmers in Indonesia. This study consists of three papers which were presented in chapters 3, 4 and 5 respectively. The core of those papers is to examine, whether ISPO standards are beneficial for smallholder oil palm famers. Thereby, this thesis focusses in depth on smallholder oil palm farming in Indonesia.

Chapter 3 explores the views of five stakeholder groups in the oil palm industry in Indonesia regarding ISPO. It compares these views with the ground reality in villages using Focus Group Discussion with village heads.

Chapter 4 studies the factors that influence smallholder farmers to adopt ISPO in Indonesia. It employs two sets of adoption models. The first set is based on a defined minimum number of ISPO practices specified as thresholds. It explores three sequential adoption thresholds of 4, 5 and 6 ISPO practices using bivariate probit models. Second, an endogenous switching regression Poisson model is applied to identify the determinants of adoption of all ISPO crop management practices.

Chapter 5 presents a cost-benefit analysis to implement ISPO practices and encourage its adoption among smallholder farmers in Indonesia. It predominately examines two strategies of ISPO introduction namely (a) Conventional campaign and (b) Farmer Field Schools.

This chapter provides a synthesis of the three main chapters of the thesis. It presents the key findings, overall conclusions, relevant recommendations and policy implications.

6.2 Key findings

The first specific objective of this thesis is to explore the views of different stakeholder groups in the oil palm industry as well as to incorporate village case studies on ISPO criteria as described in chapter 3. To meet this objective data from stakeholder interviews and village Focus Group Discussion were used. The differences in stakeholder views are identified by using descriptive statistics and non-parametric tests. The results show that there are both, compatibility and differences by confronting stakeholder and farmer views. Stakeholder views differ significantly regarding the practicality and economic feasibility of ISPO standard to be implemented by small holder oil palm farmers. Representatives from the oil palm industry are most optimistic about the feasibility of ISPO standards, while researchers tend to be most critical. On the other hand, using a qualitative analysis from data based on Focus Group Discussions reveal, that farmers recognize the benefits of ISPO standards and its costs.

The second specific objective of this thesis was to assess the determinants of ISPO adoption by smallholder oil palm farmers as detailed in chapter 4. This chapter uses a three years panel data set of 233 smallholder oil palm farmers to define adoption thresholds based on a specified minimum number of practices followed. It implements a bivariate probit model for threshold adoption and an endogenous switching Poisson to identify the drivers of all observed ISPO practices. The main finding reveals, that adoption of ISPO practices is limited in the study area. The empirical findings show that farmers, who perceive a high risk of diminishing oil palm productivity in the future and who have experienced economic shocks in the past, are more likely to adopt ISPO practices.

The third specific objective of this thesis was to evaluate a cost benefit analysis of the adoption of ISPO standards by smallholder farmers and is addressed in chapter 5. This chapter examines two extension strategies, a conventional extension campaign and a farmer field schools. However, these strategies do not imply international certification that would result in price benefits. Hence, an additional certification strategy is also examined. A three year panel dataset of 185 households from three villages in Merangin district in Jambi was used to define economic and environmental benefits of ISPO. Results show that Farmer Field Schools (FFS) is the best strategy to introduce ISPO and encourage its adoption among smallholder farmers in Indonesia with least costs and maximum benefits.

6.3 Conclusions and recommendations

The results of this study allow drawing conclusions and submitting recommendations, which are important to policy makers, concerned with implementing ISPO standards among smallholder oil palm farmers in Indonesia. First, chapter 3 provides evidence of differences and similarities among the views of the stakeholders group as well as the smallholder oil palm farmers‘ experience of ISPO standard. This study found, that although there are costs constraints to implement ISPO practices among smallholder farmers, they will benefit them.

Chapter 4 indicates that adoption of ISPO practices is still limited among smallholder farmers in Indonesia. Hence, The Government of Indonesia has to set up schemes to disseminate more information regarding ISPO particularly in crop management practices to its smallholder farmers, such as establishing training facilities to promote large scale adoption of these practices. Also to achieve international certification, policy incentives and a specific time frame should be set.

Chapter 5 identifies FFS as an effective strategy to implement ISPO practices. Therefore, The Government of Indonesia needs to undertake not only high investments, but also efforts to implement this standard through Farmer Field Schools as an extension strategy.

To sum up, this thesis submits, that Indonesian Sustainable Palm Oil (ISPO) criteria are beneficial for smallholder farmers, although it involves efforts by the government in terms of investment and training to ensure its widespread adoption. There are always remaining gaps, and further research can also incorporate gender aspects of smallholder farming in Indonesia. Also, the cost benefit analysis used in this thesis work can be extended to large oil palm companies, involved in processing and manufacturing, especially in the context of international recognition of ISPO practices, particularly in terms of certification.

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Appendices

Appendix A1: Details of Chi-square and Fisher Exact Tests

Principle 1. Plantation management and licensing

Table 1. Licensing

Group	Question	Answer (%)	
	Do you think current licensing requirement for oil palm plantation under ISPO is an effective means for sustainable oil palm development?	**Yes**	**No**
Oil Palm Companies		100	0
Farmers Association		100	0
Government Agencies		80	20
NGOs		50	50
Researchers		67	33
Pearson chi2(4) = 114.1571 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation, n=25

Principle 2 Technical guidelines cultivation and transport

Table 2. Using Land

Group	Question	Answer (%)	
	Do you think the guidelines are sufficient to assure misuse of land and minimize the risk of using the land?	**Yes**	**No**
Oil Palm Companies		60	40
Farmers Association		100	0
Government Agencies		80	20
NGOs		25	75
Researchers		100	0
Pearson chi2(4) = 201.9280 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation, n=25

Table 3. Soil Fertility

Group	Question	Answer (%)	
	Do you think the guidelines are sufficient to assure maintenance of soil fertility?	**Yes**	**No**
Oil Palm Companies		100	0
Farmers Association		100	0
Government Agencies		30	70
NGOs		25	75
Researchers		67	33
Pearson chi2(4) = 230.1801 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation,. n=25

Table 4. Water Resources

Group	Question	Answer (%)	
	Do you think the guidelines are sufficient to assure maintenance of water resources?	Yes	No
Oil Palm Companies		80	20
Farmers Association		67	33
Government Agencies		60	40
NGOs		100	0
Researchers		67	33
Pearson chi2(4) = 53.2001 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation, n=25

Table 5. Harvesting

Group	Question	Answer (%)	
	Do you think the guidelines are sufficient to assure harvesting of fresh fruits for good quality of palm oil?	Yes	No
Oil Palm Companies		100	0
Farmers Association		100	0
Government Agencies		100	0
NGOs		100	0
Researchers		100	0
-			

Source: own calculation, n=25

Table 6. Transportation

Group	Question	Answer (%)	
	Do you think the guidelines are sufficient to assure transportation of fresh fruits to minimize post-harvest losses?	Yes	No
Oil Palm Companies		80	20
Farmers Association		33	67
Government Agencies		80	20
NGOs		100	0
Researchers		67	33
Pearson chi2(4) = 121.9246 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation, n=25

Table 7. Pricing

Group	Question	Answer (%)	
	Do you think the guidelines are sufficient to assure formation of fair pricing system smallholders oil palm farmers?	Yes	No
Oil Palm Companies		60	40
Farmers Association		100	0
Government Agencies		50	50
NGOs		50	50
Researchers		67	33
Pearson chi2(4) = 75.2682 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation, n=25

Principle 3. Moratorium on the issuance of concessions for plantations in primary forest and peat land

Table 8. Ecological of Peat Lands

Group	Question	Answer (%)	
	Do you think the guidelines are sufficient to assure maintenance of the ecological sensitive peat lands?	**Yes**	**No**
Oil Palm Companies		60	40
Farmers Association		33	67
Government Agencies		50	50
NGOs		25	75
Researchers		100	0
Pearson chi2(4) = 138.6870 Pr = 0.000 Fisher's exact = 0.000			

Principle 4. Environmental management and monitoring

Table 9. Minimize Damage

Group	Question	Answer (%)	
	Do you think that the ISPO standards for environmental management of oil palm processing plants are effective to minimize damage to the surrounding environment?	**Yes**	**No**
Oil Palm Companies		80	20
Farmers Association		100	0
Government Agencies		80	20
NGOs		50	50
Researchers		67	33
Pearson chi2(4) = 73.4942 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation, n=25

Table 10. Waste Water

Group	Question	Answer (%)	
	Do you think it is appropriate that Local Governments allow oil palm companies to disposal of waste water to around water bodies or sea	**Yes**	**No**
Oil Palm Companies		60	40
Farmers Association		0	100
Government Agencies		80	20
NGOs		25	75
Researchers		33	67
Pearson chi2(4) = 161.9339 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation, n=25

Table 11. Prevent Fires

Group	Question	Answer (%)	
	Do you believe that the measures oil palm companies are required to do by ISPO standards to prevent fires after clearing land are effective?	**Yes**	**No**
Oil Palm Companies		80	20
Farmers Association		67	33
Government Agencies		30	70
NGOs		50	50
Researchers		100	0
Pearson chi2(4) = 128.2990 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation, n=25

Table 12. Biodiversity

Group	Question	Answer (%)	
	Do you believe that the measures oil palm companies are required to do by ISPO standards to conserve biodiversity after establishing plantations are effective?	**Yes**	**No**
Oil Palm Companies		40	60
Farmers Association		67	33
Government Agencies		30	70
NGOs		25	75
Researchers		67	33
Pearson chi2(4) = 65.0510 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation, n=25

Table 13.Environmental Documentation

Group	Question	Answer (%)	
	Do you believe that the transparency (documentation) provided by oil palm plantations and processing plants are sufficient?	**Yes**	**No**
Oil Palm Companies		100	0
Farmers Association		33	67
Government Agencies		40	60
NGOs		25	75
Researchers		33	67
Pearson chi2(4) = 150.0990 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation, n=25

Principle 5. Health and safety of laborers and farmers

Table 14. Protection Labor

Group	Question	Answer (%)	
	Do you think that the ISPO standards for protection of laborers in oil palm processing plants are effective?	Yes	No
Oil Palm Companies		100	0
Farmers Association		100	0
Government Agencies		90	1
NGOs		50	50
Researchers		100	0
Pearson chi2(4) = 178.0303 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation, n=25

Principle 6. Community development

Table 15. Community Commitment

Group	Question	Answer (%)	
	Do you think that oil palm companies are effectively exercising their community commitment as required by ISPO standards?	Yes	No
Oil Palm Companies		60	40
Farmers Association		33	67
Government Agencies		30	70
NGOs		25	75
Researchers		0	100
Pearson chi2(4) = 87.9722 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation, n=25.

Table 16. Small Scale Enterprise

Group	Question	Answer (%)	
	Do you think that plantation managers are doing enough to support small scale enterprise in the local communities (e.g. giving contracts to local entrepreneurs and purchase local goods and services?	Yes	No
Oil Palm Companies		60	40
Farmers Association		100	0
Government Agencies		40	60
NGOs		50	50
Researchers		0	100
Pearson chi2(4) = 208.0000 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation, n=25

Principle 7. Empowerment and business development

Table 17. Development Local Community

Group	Question	Answer (%)	
	Do you think that plantation managers are doing enough to assess the progress in the development of the local communities?	**Yes**	**No**
Oil Palm Companies		80	20
Farmers Association		33	67
Government Agencies		40	60
NGOs		50	50
Researchers		33	67
Pearson chi2(4) = 61.7456 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation, n=25

Table 18. Applied New Technologies

Group	Question	Answer (%)	
	Do you think that plantation managers are giving enough consideration to the use of new technologies for better plantation and plant management?	**Yes**	**No**
Oil Palm Companies		100	0
Farmers Association		67	33
Government Agencies		70	30
NGOs		100	0
Researchers		33	67
Pearson chi2(4) = 161.0187 Pr = 0.000 Fisher's exact = 0.000			

Source: own calculation, n=25

Appendix A2: Estimated coefficients of seemingly unrelated bivariate probit model

Variables	Threshold 4		Perceived risk of diminishing productivity		Threshold 5		Perceived risk of diminishing productivity		Threshold 6		Perceived risk of diminishing productivity	
Household characteristics												
Age	-0.008	*	0.002		-0.001		0.003		-0.004		0.003	
	(0.004)		(0.004)		(0.004)		(0.004)		(0.004)		(0.004)	
Gender	0.775	***	0.089		0.655	**	0.089		0.845	***	0.095	
	(0.260)		(0.286)		(0.253)		(0.288)		(0.309)		(0.284)	
Education	0.025		-0.013		0.015		-0.012		-0.003		-0.012	
	(0.019)		(0.020)		(0.018)		(0.020)		(0.019)		(0.020)	
Hhsize	0.006				0.002				0.060	*		
	(0.033)				(0.032)				(0.031)			
Have off farm	-0.137				0.055				0.146			
	(0.128)				(0.124)				(0.126)			
Have debt	-0.239	**			-0.278	***			-0.148			
	(0.107)				(0.103)				(0.103)			
Risk taking	-0.299	***			-0.114				-0.058			
	(0.107)				(0.102)				(0.103)			
Have contract	-0.253	**			-0.299	***			-0.135			
	(0.114)				(0.112)				(0.112)			
Farm characteristics												
Oil palm age	0.222	**	0.301	***	0.268	***	0.299	***	0.178	*	0.296	***
	(0.102)		(0.108)		(0.100)		(0.108)		(0.102)		(0.108)	
Oil palm area	0.022		0.067	**	0.028		0.066	**	-0.000		0.067	**
	(0.023)		(0.026)		(0.023)		(0.026)		(0.024)		(0.026)	
Rubber area	0.022				0.028				0.046			
	(0.033)				(0.033)				(0.031)			
Others crops area	-0.073				-0.092				-0.068			

	(0.060)				(0.065)				(0.072)			
Have livestock	-0.115				-0.060				-0.066			
	(0.111)				(0.109)				(0.109)			
Shocks												
Natural disaster	-0.109		0.153		-0.153		0.154		-0.031		0.155	
	(0.112)		(0.122)		(0.110)		(0.122)		(0.112)		(0.123)	
Economics shocks	0.306	**			0.331	***			0.325	***		
	(0.126)				(0.123)				(0.122)			
Village condition												
Infrastructure	0.072		-0.722	***	0.285		-0.723	***	0.138		-0.718	***
	(0.198)		(0.170)		(0.196)		(0.170)		(0.193)		(0.170)	
Water safety	0.281	**	-0.205	*	-0.111		-0.208	*	0.105		-0.211	*
	(0.114)		(0.120)		(0.111)		(0.120)		(0.112)		(0.120)	
Dummy 2011	0.161		-0.486	***	0.072		-0.477	***	0.001		-0.487	***
	(0.131)		(0.136)		(0.129)		(0.135)		(0.131)		(0.136)	
Dummy 2012	0.065		-1.568	***	0.065		-1.564	***	0.180		-1.568	***
	(0.145)		(0.139)		(0.141)		(0.139)		(0.142)		(0.139)	
_Cons	-0.052		0.667		-0.605		0.636		-1.346	***	0.639	
	(0.423)		(0.421)		(0.412)		(0.423)		(0.448)		(0.421)	
Number of observation	699				699				699			
Log pseudolikelihood	-795.47				-814.06				-803.49			
rho	0.276	***			0.314	***			0.286	***		

Note: Robust standard errors in parenthesis. ***, ** and * significance at 1%, 5% and 10% respectively
Source: Own calculations based on household survey 2010, 2012 and 2013

Appendix B

Transcript of Focus Group Discussion (FGD)

(in Bahasa)

1. Rawa Jaya.

Sejak pertama datang ke Jambi tepatnya di tahun 1991, petani sudah medapatkan lahan untuk ¼ hektare untuk rumah dan 2 hektare kebun sawit dari pemerintah. Lahan sawit sudah ditentukan sama pemerintah. Jadi lahan yang tadinya sudah dibagikan ke petani kemudian disatukan dan ditarik serta dikelola oleh perusahaan sampai tanaman tersebut berproduksi, baru diundi kembali. Hasil undian tersebut menentukan luas lahan yang diperoleh oleh petani dimana luas tersebut berbeda dengan yang disertifikat. Untuk pembibitan tergantung pada perusahaan. Petani hanya tahu berproduksi. Keberadaan kelapa sawit memiliki fungsi pokok sebagai sarana peningkatan taraf hidup masyarakat desa Rawa Jaya. Secara ekonomi sudah sesuai secara ekonomi walaupun daerahnya gambut, menurut perusahaan sebaiknya ditanami sawit.

Lingkungan: kuantitas air berkurang tetapi secara kualitas berubah, tergantung lokasinya. Ada yang awalnya berwarna merah mungkin karena pengaruh keasaman sekarang sedikit lebih baik (jernih). Tetapi dilokasi lain, airnya menjadi lebih buruk (keruh). Untuk cuaca, saat ini sudah tidak bisa diprediksi terutama curah hujan. Sedangkan kualitas tanah semakin menurun kesuburannya dibandingkan waktu dulu. Peningkatan kualitas tanah dengan menggunakan tankos, kotoran hewan, pupuk cair. Tidak ada *maintenance* khusus untuk air. Jika musim kemarau sulit mendapatkan air bersih. Dikarenakan belum ada pabrik pengolahan didesa, maka petani menjual dalam bentuk buah kelapa sawit atau tandan buah segar. Dengan adanya pembukaan kebun kelapa sawit, hama sangat meningkat jumlahnya contoh monyet dan babi hutan. Untuk di kebun, petani sudah menggunakan *boot* dan sarung tangan.

Masalah utama kebun kelapa sawit dan masyarakat: banyak sapi liar dikebun sawit masyarakat, kadang-kadang mengganggu tanaman sawit mereka. Adanya kelangkaan pupuk, sehingga menyebabkan beberapa tanaman sawit hanya dipupuk dengan kotoran hewan atau pupuk organik. Saran: sistem pengadaan pupuk perlu dibenahi, sebaiknya ada sarana yang bisa membuat pakan ternak dengan menggunakan sumber daya yang ada di desa Rawa Jaya. Dibutuhkan tehknologi untuk pengolahan limbah sawit (pelepah sawit) menjadi pakan ternak dan pupuk, dan bagaimana memanfaatkan kotoran sapi sebagai pupuk sawit dapat di optimalkan. Untuk sawit berkelanjutan/ ramah lingkungan: tidak membuka lahan dengan cara membakar lahan, penggunaan bibit yang bagus, mengurangi penggunaan zat kimia (pestisida dan pupuk yg alami). Pemerintah sebaiknya memfasilitasi pengadaan pupuk.

ISPO standard bisa diterapkan apabila memudahkan masyarakat baik dalam finansial maupun manfaatnya. Harga harapan masyarakat 1600/kg, beberapa permasalahan harga menyebabkan masyarakat untuk sepakat bagaimana menanggapi perubahan-perubahan harga yang ditetapkan oleh pihak perusahaan. Untuk kedepannya, dibutuhkan subsidi untuk *replanting* atau peremajaan tanaman kelapa sawit petani.

2. Mentawak Baru.

Secara umum lokasi desa Mentawak Baru sesuai untuk perkebunan kelapa sawit. Masyarakat merasa diuntungkan secara ekonomi dengan adanya perkebunan kelapa sawit. Akhir-akhir ini cuaca tidak menentu sehingga menyebabkan produksi kelapa sawit menurun. Penanaman mulai dibuka pada tahun 1990 dimana 30% daratan sisanya merupakan lahan gambut. Perusahan membantu petani untuk membuka lahan tersebut. Lahan kelapa sawit untuk petani dipilihkan oleh perusahaan dengan cara diundi pada saat tanaman sudah tumbuh 50%. Tetapi pada umur tersebut, perusahaan belum juga mengundi dan akhirnya petani pun memblokir jalan dan meminta untuk segera diberikan lahan. Lahan yang diperoleh tidak sesuai dengan disertifikat dimana seharusnya petani mendapatkan 2 hektare, tetapi kenyataannya kurang dari dua hektare. Untuk pembibitan semua dilakukan oleh perusahaan.

Menurut *participant*, kelapa sawit tidak mengganggu kesehatan. Petani sudah mengikuti prosedur untuk penyemprotan pestisida contohnya menggunakan sarung tangan dan juga menggunakan *boot* untuk menghindari gigitan ular. Salah satu cara untuk menjaga kualitas tanah adalah dengan beternak sapi karena kotorannya bisa sebagai pupuk organik dan menggemburkan tanah. Cara lain yaitu tanah gambut tersebut diberikan kapur (dolomit) dua kali setahun. Fungsi kapur disini adalah untuk mendinginkan tanah gambut. Untuk menghindari kebakaran sebaiknya tidak melakukan penyemprotan dan melakukan kebersihan pada saat menjelang musim kemarau. Selama ini belum terjadi kebakaran diperkebunan kami. Untuk hewan dikebun, kangkrang dipelihara karena membantu perkawinan buah kelapa sawit, burung hantu juga membantu untuk memakan tikus. Kalau babi hutan diberantas. Didesa belum ada laboratorium yang dapat memeriksa jenis hama atau penyakit pada tanaman kelapa sawit sehingga bisa dengan mudah dan cepat dilakukan penanganannya, sedangkan kalau diperusahaan akan cepat mendeteksi jenis penyakit tanaman sawit karena mereka sudah mempunyai laboratorium untuk itu. Mereka berharap ada laboratorium didesa. Petani juga menginginkan diberikan banyak infomasi tentang pemberian pupuk dan pemberantasan hama penyakit. Mereka sadar kalau tanah gambut tidak bagus untuk sawit tetapi mereka tidak ada pilihan. Harga sawit sudah ditentukan dari perusahaan. Jika memungkinkan mereka ingin juga menanam tanaman lain diperkebunan sawit mereka contohnya nenas.

Mereka tidak mengetahui tentang ISPO. Mereka mau mengadopsi dan mengeluarkan biaya jika ISPO menguntungkan mereka. Petani berharap sebelum diimplementasikan ada sosialisasi dan training tentang ISPO. Harapan kedepannya tanaman sawit bisa lebih baik (dalam hal kulitas, produksi dan harga), tetapi saat ini sulit untuk menambah lahan sawit. Padahal sebagian besar tanaman sawit sudah mendekati masa peremajaan (replanting), jadi sebaiknya sudah mulai menanam tanaman yang baru. Mereka inginkan pada saat replanting tetap mendapatkan pedapatan walupun itu dalam bentuk utang. Saran untuk pemerintah agar memperbaiki jalan-jalan produksi dikebun sawit dan mengusahakan pupuk terutama pupuk subsidi. Walaupun petani sudah berkoordinasi dengan perusahaan tetap saja sulit untuk mendapatkan pupuk bersubsidi.

3. Dusun Baru

Untuk masyarakat Dusun Baru, sawit merupakan komoditi pertanian yg dianggap baru karena pada umumnya adalah petani karet. Sejak tahun 2005 masyarakat mulai bertani sawit dan masih bersifat pribadi dengan lahan masih berpencar-pencar dengan luas bervariasi. Pada saat itu petani sedang demam sawit, tetapi karena rendahnya pengetahuan mengenai sawit disamping itu kelembagaannya juga belum ada, hanya ikut-ikutan sehingga bibit yang digunakan belum bagus (diperoleh dari bawah batang sawit). Tapi seiringnya waktu, saat ini penggunaan bibit mulai yang bagus dan membeli-nya didesa Margoyoso pembibitan (Dinas Perkebunan). Kelembagaan kelompok tani sawit belum ada, yang ada baru kelompok petani sawah. Peserta berharap dari diskusi ini mendapat pencerahan tentang kelembagaan dan penyaluran pembibitan. Petani kelapa sawit masih menjual sama tengkulak, jika dipabrik bisa dapat harga Rp1500,- dan sama tengkulak bisa Rp1000,- tetapi bisa jadi karena kualitas Tandan Buah Segar (TBS) petani yang masih rendah.

Lokasi untuk perkebunan kelapa sawit pada umumnya tergantung dari letak tanahnya di mana dan untuk desa Dusun Baru masih terpencar-pencar. Secara teknis tanahnya belum begitu bagus kualitasnya, jika menanam sawit hanya ditanam begitu saja dan hanya sebagian saja yang mengikuti mulai dari pemilihan bibitnya. Pada umumnya tanahnya didesa ini adalah bekas belukar atau bekas tanaman karet, sebagian lagi adalah gambut. Pada umumnya secara ekonomi lahannya sesuai untuk ditanami sawit. Khusus untuk tanaman sawit di lahan daratan tinggi, untuk pemeliharaannya menggunakan tanaman penutup tanah seperti kacang-kacangan. Untuk pertumbuhan kelapa sawit tergantung masyarakat yang mengolahnya mulai dari pemilihan bibit dan pemupukan kualitas baik dan bersubsidi. Petani kurang memahami jenis tanaman sawit yang bagus, mereka tahunya pelepah pendek atau pelepah panjang (8x9), tapi disarankan jenis bibit marihat yaitu pelepah pendek dengan jarak tanam 8X8.

Musim kemarau penghasilan lebih banyak dari musim hujan karena sawit akan lebih cepat masak. Lahan kelapa sawit tidak dipilih, kalau ada lahan ya mereka bersihkan dan tanami sawit. Pengetahuan masyarakat kurang memahami mengenai perlindungan kesehatan dalam proses produksi kelapa sawit contohnya penggunaan masker serta rendahnya penyuluhan dari pemerintah mengenai pemupukan, penyemprotan dan pembibitan, penyiapan lahan dan pemeliharaan tanaman. Seharusnya ada kelembagaan petani untuk memberikan pengetahuan kepetani. Untuk kedepannya masyarakat petani sawit belum memikirkan bagaimana merawat dari kualitas tanahnya. Tidak ada tindakan yang diambil untuk melindungi kesehatan petani ketika mereka bekerja diperkebunan kelapa sawit karena kurangnya informasi akan pentingnya kesehatan tersebut. Tidak ada langkah-langkah khusus yang diambil untuk melindungi sumber daya air karena kurang melakukan penyiraman. Tidak ada tindakan yang diambil untuk melindungi perkebunan kelapa sawit dari kebakaran dan juga untuk untuk melindungi satwa liar.

Masalah utama: pemilihan pupuk yang belum diketahui oleh masyarakat baik itu pupuk subsidi atau tidak nonsubsidi dan pupuk tersebut sulit diperoleh. Belum adanya penyuluhan atau kelembagaan tentang kelapa sawit. Sulit memperoleh bibit kelapa sawit. Bibit dibeli Rp 25000/ batang dan biasanya dibutuhkan 25-200 batang untuk lahan 2 hektare. Juga kurang tersedianya informasi harga yang menjadi acuan baik dari perusahaan maupun pemerintah.

Informasi harga tersebut dibutuhkan mereka untuk mengetahui harga sebenarnya yang berlaku pada saat itu. Disamping itu, petani juga membutuhkan pengetahuan tentang pengelolaan perkebunan seperti cara penggunaan bibit yang baik dan pemupukan yang efisien. Tidak ada saran untuk produksi kelapa sawit yang ramah lingkungan dan berkelanjutan dalam perkebunan sawit.

Peserta belum pernah mendengar tentang ISPO tetapi mereka berpendapat bahwa desa mereka dapat memenuhi kriteria ISPO standard dan mereka akan mendukung kalau itu menguntungkan. Masa depan kelapa sawit untuk desa Dusun Baru tergantung harga, kalau harga naik masa depan sawit semakin baik dan bisa diperluas sedangkan jika harga turun maka masa depan tanaman sawit rendah. Untuk biaya tidak terlalu sulit jika berkelompok tetapi kalau perorangan lebih sulit, jika bisa biayanya dibawah satu juta rupiah.

Permasalahan adalah ketersediaan pupuk, informasi harga dan ketersediaan bibit yang baik. Petani mengharapkan bibit yang baik dimana setiap pelepah mengeluarkan buah. Diharapkan kepada pemerintah adanya kelembagaan petani dengan cara mendorong petani untuk membentuk kelompok tani untuk *access* informasi terkait dengan penanaman kelapa sawit dan mengaktifkan penyuluh untuk memantau setiap petani sawit terutama didalam hal pengetahuan pruning yang biasanya harus menggunakan pelepah songgo dua (dua pelepah dibawah buah) dan juga perusahaan mengaktifkan program CSR-nya untuk memberikan pengetahuan kepada petani.

Appendix C

Stakeholder questionnaire Jambi, July-August 2013

Stakeholder Group (Code A):

Name of respondent: ____

Position:

Field of Expertise:

Address: ____

Telephone:________________________email:__________________________________

Date of interview: ____

Time started :__________Time end:________

Name Enumerator: ____

Introductory statement (interviewer please read out)

This questionnaire is part of the research study on **"Cost-Benefit Analysis of Sustainability Standards in Smallholder Oil Palm farming in Sumatra, Indonesia"**. The Economy and Environment Program for South East Asia (EEPSEA) and Leibniz University Hannover (LUH) are jointly funding this project. The aim is to assess costs and benefits of implementing ISPO criteria from the view point of small holder oil palm farmers in Jambi, Sumatra. An important part of the research is to collate information from the various stakeholders in the oil palm industry in order to get a clearer picture on the opportunities and constraints of achieving sustainable oil palm development in Indonesia. The objective of this questionnaire is to get your opinion on various aspects of the principles and criteria of the ISPO (Indonesian Sustainable Palm Oil). We therefore kindly ask for your cooperation. The questionnaire is only a few pages and may not take much more than about an hour. We thank you for your cooperation and willingness to participate in our survey. We can assure you that all information you give during the interview is kept strictly confidential and will be used for research purposes only. The report of the survey result we will send to you before the of year for your information and reference. The questionnaire contains seven sections each section referring to a different ISPO principle.

Code A

(1) Ministries of Agriculture, Plantation, Trade and Planning; (2) Ministries of Environment and Trade; (3) Oil Palm Plantations, Processors and Retailers; (4) Small holder Oil Palm Farmer Association; (5) Non-Governmental Organizations; (6) Academia.

Introductory Questions

1. Please give your interpretation of the ISPO standards

____

____

2. Can you describe the differences between ISPO and RSPO standards

____

____

3. Please describe the three major benefits of ISPO standards for the Indonesian Economy.

____

____

4. Please describe the three major constrains/obstacles/problems for the implementation of ISPO standards in the oil palm industry in Indonesia.

____

____

Principle 1: Licensing

1. Do you think current licensing requirements for oil palm plantations under ISPO is an effective means for sustainable oil palm development?

    __/ Y __/ N, if N, why not? ____

2. What is the major benefits of licensing for smallholders?

a) Reduce land conflicts: __/

b) Minimize pollution in villages:__/
c) Assure legal security:__/
d) Improve productivity of oil palm: __/
e) Improve transparency:__/

f) Others, pls specify:____

3. What is the major benefits for society?

a) increase competitiveness of the oil palm industry__/

b) improve the image of Indonesia in global markets__/

c) minimize pollution effects __/

d) others, please specify __/

4.Do you believe the costs for licensing are appropriate ?

__/ Y __/ N ….if N, why not? ___________________________________

5.Do you have any suggestion for improving the effectiveness of licensing? ______________________________________
____

Principle 2: Technical Standards for Oil Palm Production , Transportation and Marketing (these standards refer to technical guidelines on land clearing, land management, protection of water resources, use of seeds, soil fertility and pest management, harvesting and marketing).

1. Do you think the technical standards for Production, Transportation and Marketing under ISPO are an effective means for sustainable oil palm development?
_Y __/ N, if N why not? ____

2. Do you think the guidelines are sufficient to avoid misuse of land and minimize the risk of using land that is not suitable for oil palm cultivation?

__/ Y __/ N, if N why not? ____

__/ Y __/ N, if N why not? ____

3. Do you think the guidelines are sufficient to assure the maintenance of soil fertility in oil palm cultivation?

__/ Y __/ N, if N why not? ____

4. Do you think the guidelines are sufficient to assure the maintenance of water resources in oil palm cultivation?

__/ Y __/ N, if N why not? ____

5. Do you think the guidelines are sufficient to assure the maintenance of the ecologically sensitive peat lands in oil palm cultivation?

__/ Y __/ N if N why not? _______________ ______________________________

6. Do you think the guidelines are sufficient to assure the proper harvesting of fresh fruits for good quality of palm oil?

__/ Y __/ N if N why not? ____

7. Do you think the guidelines are sufficient to assure the proper transportation of fresh fruits to minimize post-harvest losses ?

__/ Y __/ N if N why not? ____

8. Do you think the guidelines are sufficient to assure the formation of fair pricing system small holder oil palm farmers?

__/ Y __/ N if N why not? ____

9. How do you assess the financial and technical feasibility of the guidelines for small holder farmers?

__/ technically infeasible

__/ technically feasible but too expensive for small holders

__/ technically and financially feasible

10. Do you have any suggestion regarding the improvement of the effectiveness of the technical guidelines for production, transportation and marketing?____

Principle 3: Environmental Management of Oil Palm Processing Plants and Oil Palm Plantations

1. Do you think that the ISPO standards for environmental management of oil palm processing plants are effective to minimize damage to the surrounding environment ?

   __/ Y __/ N, if N what do think is missing (what the problem is)?____

2. Do you think it is appropriate that Local Governments can give permission to oil palm companies for wastewater discharge into surrounding water bodies or the sea?

   __/ Y __/ N, if N, can you describe the problem?____

____

____

3. Do you believe that the measures oil palm companies are required to do by ISPO standards to prevent fires after clearing land are effective?

   __/ Y __/N, if N why not?____

4. Do you believe that the measures oil palm companies are required to do by ISPO standards to conserve biodiversity after establishing plantations are effective?
   __/ Y __/N, if N why not?____

5. Do you believe that the transparency (documentation) provided by oil palm plantations and processing plants are sufficient?

   __/ Y __/N if N why not?____

6. Do you have a suggestion how to improve the Environmental Management of Oil Palm Processing Plants and Oil Palm Plantations ?____
   ____

Principle 4: Protect Laborers in Oil palm companies and promote Labor Welfare

1. Do you think that the ISPO standards for protection of laborers in oil palm processing plants are effective?

   __/ Y __N if N where do you see the problem? ____

2. Do you think that oil palm companies are doing enough to promote labor welfare and labor rights (e.g. formation of labor unions) ?

__/ Y __/ N, if N what should they do more?____
____

3. What is the major measure that should be implemented to increase welfare of laborers working in oil palm processing plants or oil palm plantations?

   __/ higher wage

   __/ better training

   __/ better safety procedures

   __/ more trade unions

__/ more social benefits

__/ nothing

__/ others, please specify

Principle 5: Social Responsibility and Community

(Oil Palm Companies must exercise social commitment towards the communities which are affected by plantation development and /or the oil palm processing plantation. Oil Palm companies are especially required to support the development of indigenous communities in the jurisdiction of plantation areas)

1. Do you think that oil palm companies are effectively exercising their community commitment as required by ISPO standards?

__/ Y __/ N; if N, why not? ____

2. If Y what is the major benefits of such activities for local communities

a) Better education facilities: __/

b) Better sanitation:__/

c) Better religious facilities:__/

d) Improvement of Water Supply: __/

e) Improve transparency in village decision making:__/

f) Others, please specify:____

g) I don’t know

3. Do you think the amount spend by oil palm companies for such activities is appropriate?

4. Do you have any further suggestions how to improve the effectiveness of the social responsibility activities of oil palm companies.____
____
____

Principle 6: Economic Empowerment Community Activities

Local Business Development
Prioritize planters provide opportunities for purchase / procurement of goods and services to the community in the surrounding plantations

1. Do you think that plantation managers are doing enough to support small scale enterprise in the local communities (e.g. giving contracts to local entrepreneurs and purchase local goods and services?
   __/ Y __/ N; if N, why not? _____________________________________
2. Do you have suggestion how the plant managers could help to developed the economy of local communities?

   ____

Principle 7: Sustainable Business Improvement

Planters and plant performance should continue to improve (social, economic and environmental) to develop and implement action plans that support the increase in production sustainable.

1. Do you think that plantation managers are doing enough to assess the progress in the development of the local communities?
   __/ Y __/ N; if N, why not? _____________________________________

2. Do you think that plantation managers are doing enough to correct any short comings in the development of the local communities?

__/ Y __/ N; if N, why not? ______________________________

3. Do you think that plantation managers are giving enough consideration to the use of new technologies for better plantation and plant management?
   __/ Y __/ N; if N, why not? ______________________________

4. Do you have any suggestion for implementing sustainable business management and there surrounding?
   ____

Last Question

Do you want to make any final comment on ISPO standards or development of oil palm industry in Indonesia?

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