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Sustainability and Social-Ecological Systems

Navigating Oil Palm Cultivation and Sustainable Livelihoods

A Case Study in Karaket Sub-District, Nakhon Si Thammarat Province, Thailand

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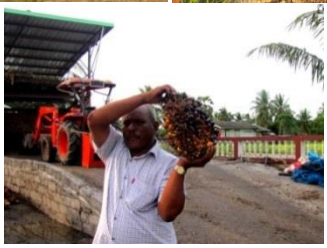

Abstract

This study reports on the results of research undertaken to assess the role of oil palm cultivation for local livelihoods in the sub-district of Karaket in Thailand. Oil palm cultivation has become a product of heated debate within the international community and various stakeholders have raised serious concerns over its environmental and social sustainability. Karaket has recently experienced substantial uptake of oil palms by independently operating smallholder farmers. As such, it served as interesting case to explore the main outcomes of oil palm cultivation for local livelihoods; regarded to operate in a system at interface with the social and the ecological. Through placing such system outcomes in the context of economic, social and environmental sustainability, implications for sustainable local livelihoods were unveiled. The study was guided by its own conceptual model and relied on interpretive, qualitative case study evidence that put local stakeholders at the centre of investigation. Evidence showed that oil palm cultivation has created high social and economic value for sustainable livelihoods without seriously undermining the natural resource base in the immediate term. Such social and economic outcomes may be secured in the medium term; the ecological value, however, runs the risk of being subverted particularly by inadequate water management practices. Data revealed that multiple interrelations between the contextual, governance, resource, and resource user system have created such values, and if beneficial system interrelations are strengthened, sustainability may be secured.

Key Words: Sustainability, complexity, sustainable livelihoods, social-ecological systems, oil palm cultivation, Thailand, Karaket

Word Count: 14941

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List of Acronyms and Abbreviations

BAAC	Bank of Agricultural and Cooperatives
CPO	Crude Palm Oil
DoAE	Department of Agricultural Extension
DoLA	Department of Local Administration
FFB	Fresh Fruit Bunch
Ha	Hectare
Kg	Kilogram
LDD	Land Development Department
Mm	Millimetre
MoAC	Ministry of Agriculture and Cooperatives
MoE	Ministry of Energy
OAE	Office of Agricultural Economics
RIG	Royal Irrigation Department
RSPO	Roundtable for Sustainable Palm Oil
SES	Social-Ecological System
SESF	Social-Ecological System Framework
SLF	Sustainable Livelihoods Framework
TAO	Tambon Administrative Organization

Conversion

6.25 rai = 1 ha

Contents

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1 Introduction

The present study is concerned with the sustainability of livelihoods embedded in a complex social-ecological system at a local level. The purpose here is to clarify the role of various interlinking components that underlie the sustainability of such a system for local livelihoods. The specific focus is the particular resource system of oil palm cultivation, a development construct that has created harsh controversy among the international community (Sheil et al. 2009). The oil palm is one of the fastest expanding crops in the tropical hemisphere and one of the most widely produced edible oils in the world. It has, however, increasingly come under fire in recent years, particularly from environmentalists, as it has been condemned for major drawbacks such as deforestation, and biodiversity loss (Colchester et al. 2011). On the other hand, the palm oil sector is said to have played a decisive role in poverty alleviation around the world. The high-yielding and lucrative oil palm crop is considered an important source for local people's livelihoods and their economy. Yet, the palm oil sector also brings with it social implications which often concern the fairness of current systems and create acute constraints for small plantation farmers (Chaichee 2007; Feintrenie, Chong & Levang 2010). Oil palm cultivation and its producer countries have been in the limelight of global discussions around sustainability, but Thailand as the third-largest global producer has attracted considerably little attention (Nathapol & Deunden 2011). The Thai palm oil sector is led by smallholders who account for about 80% of all growers nationwide (Osbeck et al. 2013, forthcoming; RSPO 2012). This fact differentiates Thailand from many other key producers where the majority is produced on large commercial plantations.

In the sub-district of Karaket in Nakhon Si Thammarat Province in Southern Thailand, the growing of oil palm has evolved as a major livelihood activity during the past decade. The sub-district serves as the geographical focus of the present study, and is located in the Pak Panang River Basin and the Pa Phru Kuan Kreng peat swamps highly complex eco-systems that are characterized by strong human interaction (Osbeck et al. 2013, forthcoming). Within this context of complex social and ecological spheres, the study's focus is to assess the role of oil palm cultivation for local livelihoods; it is guided by its own conceptual framework that brings together the concept of social-ecological systems and sustainable livelihoods. These are taken to operate in a system of different components that relate to the particular resource system and the resource users while interfering with the governance sphere and operating in a context of vulnerability.

The entry point of examination for the purpose of this study is the particular resource system of the local palm oil cultivation. The study seeks to explore the main outcomes of the local oil palm cultivation for livelihoods to date and tries to place it in the context of sustainability along the lines of Carney's definition (1998: 4): "A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base", and recognizing the economic, social and environmental spheres. The research moreover assumes that sustainability in the present case thus must not be limited to single-discipline aspects but be recognized as a struggle for diversity in all its dimensions that are contingent on the congruence of multiple factors at interface with different system levels.

Precisely, the study aims to clarify the role of oil palm cultivation for local livelihoods in Karaket, and place it in the context of economic, social and environmental sustainability.

It focuses on the following two research questions:

1. What are the major outcomes of oil palm cultivation for local livelihoods in Karaket and how can these be explained?
2. How can the outcomes be placed in the context of economic, social and environmental sustainability?

In this way, the study seeks to facilitate the long-term goal of sustainability science in the sense that it helps to recognize which components and their combinations tend to lead to comparatively sustainable system outcomes and which ones to rather unsustainable ones, and thus to added value or costs for people at a local scale.

The study is structured into five main parts. The following section will provide a background to crop characteristics as well as global and domestic oil palm development. Subsequently, the methodology and methods employed will be presented, followed by the theoretical and conceptual framework to the study. The next step will be the presentation of the results, rounding off with the conclusion section.

2 Background

2.1 The Oil Palm

The oil palm (Elaeis guineensis) is an ancient tropical plant that originates from West Africa; it grows in tropical climates within 10° of the equator where rainfall is abundant (minimum

1.600 mm/year). The oil palm tree can grow up to 20 metres tall, and its fronds may be up to 5 metres long. The oil palm is a perennial tree crop which bears clusters or bunches of fruit throughout the entire year. Each ripe bunch is commonly known as Fresh Fruit Bunch (FFB), each of which weighing between 10 and 50 kg when fully matured, and with 1000 to 3000 single fruitlets per bunch. The oil palm begins to bear fruits approximately after 30 months of field planting with a productivity cycle of about 20 to 30 years. Each fruitlet consists of a hard seed (kernel) enclosed in a shell (endocarp) surrounded by pulp (a fleshy mesocarp). The pulp can be processed into oil which is generally traded as crude palm oil (CPO). CPO is an agro-industrial product which may be used for several purposes in both the food and non-food industry; it is used as cooking oil, as a component for processed food such as margarine or cereals and for detergents; it is also one of the main substrates for biodiesel. With an estimated 74%, however, palm oil is mainly used for food products; only 26% are used for industrial purposes (FAO 2002; Green Palm 2013; USDA 2010). Palm oil is considered the most important vegetable oil in the world in terms of production, trade and its versatility of uses. Moreover, it has the lowest requirement for inputs of fuel, fertilizers and pesticides per ton of production (Green Palm 2013).

2.2 Production and Cultivation Areas

The palm oil sector is one of the longest-established agro-industry sectors for vegetable oil. It has a long history of cultivation and production. Today, 17 countries worldwide produce palm oil, of which Indonesia and Malaysia account for 90% of global production. With 2.9% of global production, Thailand ranks number 3 in the list of the top world palm oil producer countries (Colchester et al. 2011; GIZ 2012).

Oil palm fruits are considered one of the most lucrative and profitable crops in the world and have driven extensive land use changes in producer countries. The world market price for palm oil has generally developed favourably for market sellers during the past decade, and CPO prices have been on the rise (although with temporal variations), mostly driven by persistent demand for the oil (Basiron, Balu & Chandramohan 2004; Peck & ZhiDong 2012; UNCTAD 2013). Due to its versatility in use, low prices of production and its growing popularity as biodiesel substrate to follow international climate change mitigation policies and endeavours to tackle fossil fuel dependency, global demand has grown steadily in recent decades and palm oil production has expanded rapidly to meet that demand (Dallinger 2011). The

production of palm oil has increased by an average of 9% from 0.5 million tons in 1998 to 1.3 million tons in 2008 (FAO 2011a).

2.3 The Thai Palm Oil Sector

As the world's third top producer of palm oil, Thailand produced an estimated 1.54 million tons in 2011, 2.9% of global production (Agriculture Corner 2012; Dallinger 2011); Thailand supplied about 480.000 tons of its production to the global palm oil market in 2012 (World Bank 2012); it is mostly produced for the domestic market as an important contributor to the national economy. Domestic demand is very high, and palm oil dominates the local edible oil market. Since the government has initiated alternative energy plans, palm oil has increasingly been used to fuel the domestic biodiesel demand. Although oil palm cultivation has increased substantially in the previous decades, just over 2% of all agricultural land in Thailand is dedicated to palm oil cultivation and its area under cultivation has increased from 2.9 million rai in 2006 to 4.3 million rai in 2012 (FAO 2012).

Thailand's oil palm sector is largely smallholder-dominated: small-scale farmers constitute 78% of all growers nationwide (over 128.000 smallholder farmers) and control more than 70% of the total production by volume with a total cultivation area of 4.3 million rai in 2012 (Thapa & Gaiha 2010; GIZ 2009). This sets Thailand apart from other key producers such as Indonesia and Malaysia, where the majority of CPO is produced on large commercial plantations with hired labour as plantation workers. It is estimated that there are around 3 million small oil palm farmers (20%) worldwide, producing approximately 4 million tons of palm oil and around 9% of total global production (Vermeulen & Goad 2006).

2.4 Governance

Thailand has protected its domestic palm oil industry and controls the trade of palm oil through its Public Warehouse Organization. The government has imposed import restrictions and recently also export surcharges on CPO.[1] Thailand is prone to shortfall of palm oil in the domestic market; supply stocks are low, often necessitating the import of palm oil from Malaysia or Indonesia (Matrade 2011; USDA 2012). The Thai government has aimed to address this problem through policies that promote domestic supply such as increasing cultivation areas and restructuring the national palm oil management system to intensify production.

[1] It moreover restricts the import and export of any biodiesel products by not issuing import/export permits for biodiesel.

Primarily, in order to promote the domestic rural economy and to tackle the dependency on fossil fuels, the Thai government has launched determined programs under the 15-Year Renewable Energy Development Plan (2008–2022). To achieve its goals, palm oil was identified as a major substrate for biodiesel, and the Thai government has sought to expand oil palm plantations nationwide (MoE 2009). In accordance with Thai land use planning, the expansion of oil palm cultivation is intended to take place mainly on waste land, degraded land, acid soils as well as land formerly used for rubber and paddy cultivation. The government has set up a soft loan scheme to support its policy. Currently, the government plans further regulation of the palm oil industry through the development of a regulatory framework. The impact of this government initiative cannot yet be foreseen but it is expected to include sustainability among the issues addressed.

Thailand has a very efficient and transparent land tenure system that is said to provide a model for many countries. It has issued title deeds to large portions of the country's population, thus contributing to tenure security and developing a robust land market. Beginning in the 1970s, the government has made several legislative and programmatic efforts to address high levels of tenancy, landlessness and tenure insecurity. The government has imposed ceilings on private landholdings and implemented land-allocation programs. In the 1975–2003 period the state has allocated 3.7 million ha of public land to 1.5 million beneficiaries, who received either freehold title or use-rights recognized by formal law (Giné 2004; Childress 2004).

3 Methods and Selection

3.1 Case Study Selection: Oil Palm Cultivation in Karaket

A qualitative case study methodology was chosen for the present study which followed an explorative research design. In qualitative research people as the focal point of social science attribute meaning to their environment. An appropriate methodology for studying people would then "express a commitment to viewing events and the social world through the eyes of the people being studied" (Bryman 2008: 385). Yet, the distinctive essentiality for case studies emerges from the aspiration to understand complex social phenomena. In particular, the case study design helps to retain the holistic picture of the present research and the characteristics of such 'real-life' events as practices related to the cultivation of oil palm trees. Robson (1993: 52) defines it as "an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence". Furthermore, case studies are

analyses which may embrace multiple perspectives, relying not solely on the perspectives of the persons directly concerned, but also on relevant groups of persons impacted, institutions, and the interactions between these (Bryman 2008; Feagin, Orum & Sjoberg 1991; Yin 2009). In contrast to quantitative research that deals with frequencies and seeks to produce generalized accounts of reality to dictate rules for action, qualitative case study research is more valuable to promote learning that appreciates the contextual responsibility of such rules (Bryman 2008).

The case selected is the palm oil cultivation in Karaket sub-district, Nakhon Si Thammarat Province, Thailand which has experienced extensive uptake of oil palm by smallholder farmers recently. The study does not claim that Karaket is representative of oil palm cultivation in the entire country. The present case is not as such regarded as a physical configuration, but is intended to serve as an opportunity to generate a new and improved understanding of the complex situation on the ground and a learning platform which can be used for further research. The comparatively limited timeframe of the research did not allow to gaining full understanding of all complex processes involved nor was this within the scope of the study.

3.2 Data Generation

The primary data in this study were derived from 19 days of fieldwork conducted in December 2012 through interviews, informal discussions, transect walks, participatory observations and group discussions. A full list of informants coded according to type of institution[2] can be found in appendix 8.1. Conversations were held in Thai, with translations, or in English. Consultations followed a semi-structured as well as, open-ended interview format which followed a certain structure, but also allowed participants to guide the direction of the consultation. An overview of the guidelines can be found in appendix 8.2. These data were supplemented by direct observations and secondary documentation such as studies conducted by civil society or government organisations and the wider literature concerned. To ensure validity of the data continuous critical evaluation of the information obtained provided for data triangulation to also account for potential biases by the sources as well as the translator (Bryman 2008; Creswell 2009).

[2] Government, Non-profit Organisations, Private Sector and Smallholder Farmers.

The study was informed by local gate keepers[3] who facilitated access to study participants. Data triangulation here accounted for potential biases. Concerning the holistic nature of the present research, it was central to select participants purposefully to the study as a means to filter the large area under study into a relatively small sample size (May 2002). Participants were selected according to their livelihood activities (oil palm farmers as well as rice farmers to gain insight into the larger picture surrounding oil palm cultivation), years of experience in oil palm farming and to geographical location in the study site. Through stratifying the sample by sex and trying to keep a balance between female and male participants, the study moreover gained insights into potentially less visible aspects. Such a variation further serves as a tool of triangulation to ensuring validity as suggested by e.g. Bryman (2008). As in line with general suggestions for data reliability (Bryman 2008; Creswell 2009), the research ensured reliability through procedures that embrace of data triangulation, a rich description of findings, a discussion of contrary findings, extensive peer reviewing, external auditing, and an investigation in natural settings through actively taking part in daily activities and staying with the local community.

3.3 Data Analysis

Data analysis followed the inductive approach of the study which represents the development from data to themes to the point of concepts or theory (Bryman 2008; Creswell 2009; Mikkelsen 2005). As an approach to analysing the data a thematic analysis was conducted (Bryman 2008). The MAXQDA software program was used as a strategy for conducting such analysis. The program helped ordering and synthesizing the large amount of data and was expected to provide a framework for the data analysis and a way of thinking about how to manage the data and the themes in a way that facilitates the analysis. As a springboard for the core themes, the analysis was guided by the conceptual model of the study and also the author's own awareness of recurring ideas and topics in the data.

4 Theoretical Framework

The present research focuses on the status quo of a local ecosystem and the 'life' within it, which is regarded as a complex resource system that ties together the social and ecological

[3] an oil palm smallholder household the author stayed with during field work, a local NGO and a local government official.

spheres. It explores the main outcomes and its ingredients that are reflected in the concept of sustainability as regarded and tailored to the study.

The following sections aim to clarify the concept of sustainability and the relevance of its underlying disciplines to answer research questions one and two.

4.1 Sustainability

Sustainability has become a prominent but contested concept on the global agenda since the publication of the final report of the World Commission of Environment and Development, *Our Common Future,* in 1987. The report stressed three fundamental concepts to sustainable development: environmental protection, economic growth and social equity (WCED 1987). The report defined it as a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED A/42/427 Chapter 2 1987).

It highlighted the need to find strategies that promote economic and social advancement in ways that avoid environmental degradation, overexploitation or pollution. Today, few seem to question the goal that, ultimately, all human live on our earth must be sustainable; a precise definition and a common viewpoint of the different dimensions of sustainability, however, remains open and often under sharp disagreement among scholars. This triggers the need for a framework that better facilitates our understanding of sustainability and thus operationalizes the concept – if the concept of sustainability is expected to have a deeper meaning. Yet, sustainability is a social construct (Webster 1999), and a common and precise measurement may be beyond the bounds of possibility as it is a dynamic and site-specific concept (Ikerd 1993). It thus calls for distinctive approaches that depend on and reflect the perspective of the particular examiner.

The question of sustainability as it arises within this study is one of a resource system that lies at the intersection between human utilization and ecology. It belongs to one of the most central aspects of human society, agriculture. Both long-term ecological and economic viability of such systems are essential for future generations. The sustainability of such a system is complex, however, and above and beyond the biophysical system aspects quest to account for the various interactions that exist with the social sciences. Talking about sustainability in the present study thus also refers to the human side of such a system and how dynamic and inter-

acting environmental and human aspects in the wider system may contribute to shaping livelihoods that are sustainable (Armitage et al. 2009; Perry et al. 2010).

All this is regarded to take place within the webs of so-called social-ecological systems.

4.2 Social-Ecological Systems

Our world is characterized by many rapid changes through human and bio-physical processes and interactions. The concept of social-ecological systems is based on the long-established recognition of the integrated character of environmental and natural resource systems, in which ecosystems and human systems interact in complex ways; however, it has widely been recognized and gained popularity particularly over the past decade only (Berkes & Folke 1998; Chapin et al. 2006).

The concept of social-ecological systems is somewhat in line with the human ecology literature that was stressed by Park (1936) and onwards. In human ecology, the interaction among human beings and natural and social environment such as technology, population, organization and culture are in focus (Shimkin 1974). The ecological economics literature stresses the sustainable use of natural capital[4] through using economic incentives and other tools. It is significant to note, however, that scientific concepts of ecosystems are deficient in analysing and describing such interrelated human and natural systems, and there is no universally accepted way of formulating the relation among such systems. It appears that ecosystems as regarded in previous studies were mostly seen as single, detached systems and human systems as external to ecosystems (Likens 1992). The focus here is on biological ecology, a solely ecosystem-based view (Odum 1989).

The systems approach as a holistic instrument that underlies the concept of social-ecological systems may facilitate our understanding of the different components that come together in such a system and the interrelations among those components. The concept may thus be regarded as a mechanism that serves to integrate ecosystems, social systems and also governance systems as sub-components of the social system in order to recognize the various linkages that exist within such system (Berkes & Folke 1998; Ollson, Folke & Berkes 2004).

The social-ecological systems view facilitates our ability to integrative system thinking that reflects the reality in which humans live and interact with both social and ecological systems.

[4] Natural resources and ecosystem services that are generated and sustained by an ecosystem and its biodiversity.

It highlights the importance of thinking holistically and brings together the two key components of the present study: livelihoods (social) and oil palm cultivation (ecological).

The necessity of an interdisciplinary framework to assess the status of such system at different levels is thus reinforced. Acknowledging this, the study consults a conceptual framework that has been developed by Ostrom (2007) to analyse interactions and outcomes of linked social-ecological systems.

The framework counteracts the presumption that scholars have the tools to make simple models of linked social and ecological systems that enable us to deduce simple conclusions. As mentioned above, many scholars who have studied components of social-ecological systems have focused on single systems, thus neglecting the wider environment within which this system is located. The framework presented below instead acknowledges and facilitates the study of complex and cross-scale social-ecological systems.

The social-ecological systems framework (SESF) helps to clarify the structure of a social-ecological system and the various niches involved.

Figure 2 presents the general framework as developed by Ostrom (2007):

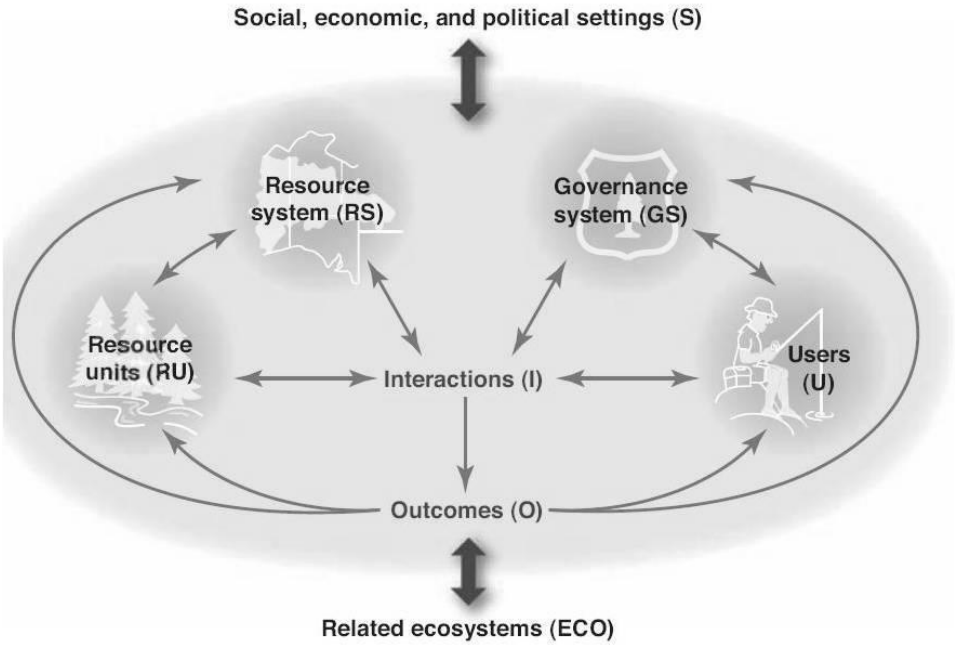

Figure 1: The Social-Ecological System Framework (Ostrom 2009: 420)

The framework regards the broader social-ecological system and shows how the four core sub-systems interrelate with each other and with external social, economic and political fac-

tors and related ecosystems. Each of the core sub-systems can be broken down into further units which can again be broken down into further sub-units. The framework can stimulate our thinking and help identify those units that are pertinent for a particular study yet requires case-specific adaptation.

As the present research looks at the sustainability of oil palm cultivation for local livelihoods, as reflected in the overall research aim, the above framework may provide for a model frame. Both are concerned with the ecological system through exploring oil palm cultivation, and with the social system through exploring local livelihoods. The present study views the two systems as interlinked and any delineation as arbitrary. The term ecological system here is used in the traditional ecological sense as the natural environment. The social system then of course refers to the aspects of livelihoods.

The next section deals with this social system of sustainable livelihoods, thus reflecting the thinking on what constitutes a social system in the present study.

4.3 Sustainable Livelihoods

Sustainable livelihoods is a term that has entered the development glossary in the 1970s. Terms and concepts of employment, jobs, workplace and income used to dominate development thinking at that time, followed by food security, vulnerability, education and health. Sustainable livelihoods proposed to offset the rather urban-industrial and need-driven biases to include the multifarious activities and aspects of poverty to emphasize the human and capacity-driven side of development thinking (Chambers & Conway 1992; Thomson 2000). It links the concepts of capability, equity and sustainability, each being regarded as both a good in itself and means to an end (Chambers & Conway 1992). It conceptualizes the many dimensions of what a sustainable livelihood comprises and may encompass elements of all the above aspects, but emphasizes people and their capacities rather than their needs, and their assets rather than their weaknesses and constraints (Thomson 2000). Drawing on the work of Chambers and Conway (1992), Carney (1998: 4) defines a livelihood as sustainable "when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base".

The term sustainable livelihoods was adopted and developed as a concept by the World Commission on Environment and Development (WCED), and in 1992, the paper "Sustainable rural livelihoods: practical concepts for the 21st century" was published (Chambers & Con-

way 1992). It has then developed into a practical concept that has guided many poverty reduction and rural development interventions of development organisations. The theory of sustainable livelihoods, however, was rather indistinct at that time, and employment thinking remained strong for several years to come.

The most influential elaboration and definition of the various dimensions, categories and connections of sustainable livelihoods was that of the ecologist Ian Scoones in his 1998 work "Sustainable Rural Livelihoods: a Framework for Analysis". The Scoones diagram with its five categories has, with minor modifications, been widely adopted and adapted by various scholars. The most universal version has been that of DFID:

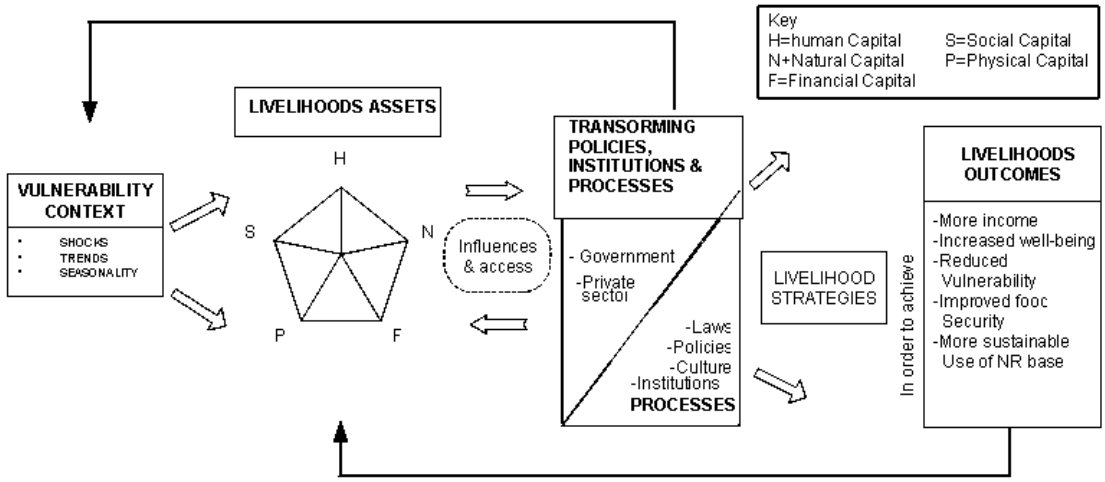

Figure 2: Sustainable Livelihoods Framework (DFID 1999)

Since then, the framework has probably been well known for its identification of the five "assets or capitals" as livelihood resources – natural capital, physical capital, financial capital, human capital and social capital. In brief, the *human asset* comprises various household members and their skills and knowledge as well as their health and physical status. The *physical asset* consists of infrastructure, equipment, and further physical assets people, households or communities make use of. The *natural asset* includes natural resource stocks such as land, water, forests and the services related to it. The *financial asset* comprises economic assets such as savings, credit, inflows from government transfers, remittances, and cash. The *social asset* includes the set of relationships and networks that support strategies for sustainable livelihoods (Carney 1998; Schall 2010).

The framework builds upon the range of these assets and may help to explore how people accumulate such assets, and more notably, how they make use of these assets. It further made explicit the importance of influence, access, structures and processes which function at multiple scales and through public and private sectors. Put simply, the framework regards people as acting in a context of vulnerability. Within this context, they have access to the above assets or factors that build the 'motor' for people's livelihoods. The governance context, which is the existing social, institutional, and organisational factors, influences the meaning and value of these assets. This context then has influence on the livelihood strategies – the way people combine and use their assets – to seek to fulfil their own livelihood objectives and meet beneficial livelihood outcomes for themselves. Along these broad lines, the sustainable livelihoods framework provides a model for gaining new valuable insights into the livelihoods of people (Carney 1998; Schall 2010).

The sustainable livelihoods framework (SLF) exemplifies the understanding that the sustainability of livelihoods is not limited to conventional modes and conservative concepts of development thinking such as exclusively employment- or poverty line-oriented thinking (Chambers & Conway 1992), but often more determined by the significance of macro-micro links that become apparent also in agriculture-based systems and value chains and the way policies, institutions and different levels of government, civil society organizations, and the private sector influence people's lives. Through taking such a broader and better informed perspective of the interactions that symbolize people's lives, it extends the 'menu' from an e.g. solely income-oriented view of livelihood sustainability (Schall 2010).

The various concepts and dimensions that are inherently represented in sustainable livelihoods have since been investigated by numerous scholars, and research on sustainable livelihoods has been multifaceted in its application and adopted in relation to various subjects. The most common and relevant insights, however, that have strongly reinforced the concept have come from social anthropological research.

4.4 Conceptual Framework

The underlying assumption of the present study is that the sustainability of resource systems for local livelihoods must be recognized as comprising multiple dimensions, and a holistic way of thinking needs to be employed that incorporates the dimensions and concepts of sustainable livelihoods and resource systems that are identified in participatory assessments. In this sense, the present study regards sustainability as being approached not simply as a single

category but as an integrated frame that links the concepts of livelihood theory and social-ecological systems within which the way humans and ecology coexist can be explored.

As there is no unified approach how to use either the SLF or the SESF, it requires an adaptation to case-specific needs. For the present purpose, both frameworks are rather used as a heuristic instrument to trigger an understanding of the implications of oil palm cultivation, whether seen as a sustainable or unsustainable living. An adapted version serves as an overarching tool for analysis and conceptionalization that shall explicitly facilitate our capability of thinking interdisciplinary and particularly address those factors that may influence the sustainability of local livelihoods and the resource system of oil palm cultivations. Thus, an adapted framework combines the advantages of both frameworks and the people-centeredness and comprehensiveness of the SLF that can principally be adapted to any discipline. Besides the acknowledgment of people's own modes of thinking and valuing, the study appreciates the space it provides for investigating people's livelihood strategies and the fact that it allows for an exploration of various livelihood outcomes outside conventional 'boxes'. The SESF, on the other hand, does provide for a more specific frame when it comes to bio-physical factors of the resource system that are rather difficult to operationalize with the SLF, as its inherently social character and its comprehensiveness and broad applicability may lose way to specify the complexities it accounts for. To avoid such disadvantage, it appears beneficial to add to it aspects of the SESF when wanting to combine one specific natural resource system with specific biophysical characters and livelihood components. Although combining the two frameworks may account for an even greater sphere of complexity, this can yet be seen in a positive way, as it allows for a more specific theoretical concept that can guide the analysis and understanding of both ecological and social aspects without compromising its high interdisciplinarity.

Yet, also an adapted framework does not attempt to provide a precise account of reality. Instead, it seeks to enable a way of thinking about the present resource system and local people's livelihoods that stimulates the case-specific reflections. In the following, the adapted framework is shown, a conceptual map that reflects how the two frameworks have been combined to serve as the analytical backbone at the broadest conceptual level.

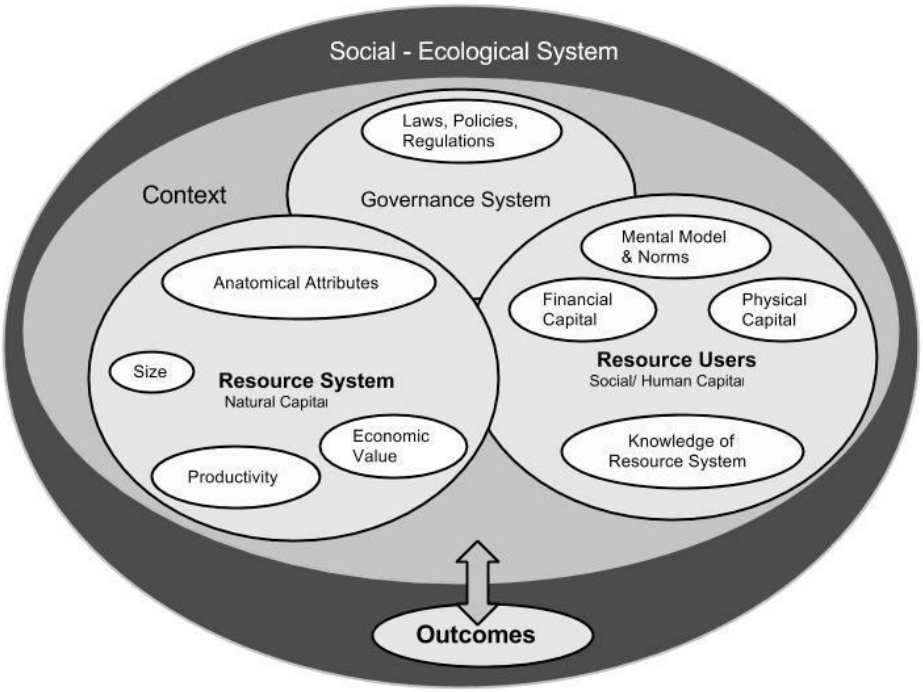

Figure 3: Conceptual model to analyse the outcomes of oil palm cultivation for local livelihoods in Karaket (design by the author)

In particular, to answer research question one and thus build an understanding of the major outcomes of such system interaction for local livelihoods in this particular case, this conceptual map facilitates the assessment of the functions of the social-ecological system in diverse settings by beginning with exploring the outcomes, both on the social and ecological side, as mainly perceived by the actors themselves, and thus acknowledging the capacity-driven approach of the SLF.

As such, the study is concerned with the ecological attribute of oil palm cultivation and the social attribute of livelihoods which operate in the overall frame of a social-ecological system. The conceptual model thus sets out to zoom into these two key system components which are reflected in the sub-systems of *Context*, *Resource System*, *Resource User* and *Governance*. Taken as interrelating, the factors within these systems and sub-systems create system outcomes that are located within the wider social-ecological system. Seen in view of the SLF, the study regards natural and human/social capital as the dominant assets to investigate; these two are thus central to create system outcomes. *Resource System* and *Resource User* as such 'soak in' these assets[5] and build a frame for further subsystems. The *Resource System* comprises of factors that relate to anatomical attributes of oil palms, the size of the system, and their 'capacity' to create economic value. The *Resource Users* comprise factors that relate to

[5] and create a system that could as well be regarded as natural and human/social capital.

knowledge of the resource system and the mental models that guide them in their actions and practices; meaning how they make use of the knowledge they possess to achieve their own goals and what they believe is most pertinent in their lives. ´This sub-system may moreover integrate norms such as trustworthiness and reciprocity they have developed with those with whom they have close interaction. As such, the model makes reference to both the SLF and SES. The *Resources User* system furthermore comprises of two other assets taken from the SLF: financial and physical capital. Although the model acknowledges that asset characteristics highlighted in the SLF (e.g. cash, credit, infrastructure, equipment, level of education) are highly influential for overall outcomes, the study does not take these into account but emphasizes access to assets such as land (which as natural capital would be represented in Resource System).

The system of *Context* integrates *Governance, Resource System* and *Resource User* and regards them as operating in vulnerability: shocks and trends, regarded on both an environmental and socio-economic perspective. In this sense, it integrates factors such as ecological disturbances and biophysical aspects, for instance, floods, droughts, hurricanes or fragile ecosystems with problematic biophysical characteristics. Socio-economic factors may consist of market imbalances, price trends or political influences at various scales. The context thus integrates factors that are outside of the range of influence of local people, and as such is defined here as vulnerability context.

The model also takes into consideration governance factors and integrates what it calls *Governance System*. Governance is difficult to define and may mean multiple things at an interface with state authority, regulations, spending or decision-making processes and structures (Carney 2003). For the present purpose, and to serve well at an interface between ecology and the social, the *Governance System* is mostly concerned with policy, rules and regulations and may highlight such aspects as national legislation, public policies, the types of subsidies provided, monitoring and sanctioning schemes and land tenure. It thus operates in the sphere of policies, institutions and transforming structures and processes as viewed by the SLF, and emphasizes its function at multiple levels and through public, private and civil society spheres.

The model is regarded as a decomposable system and requires being ‘unpacked’ first to be merged again to link the more specific concepts with the more general ones to create system outcomes.

In order to answer research question two and to place the outcomes in the context of sustainability, the study takes the following approach:

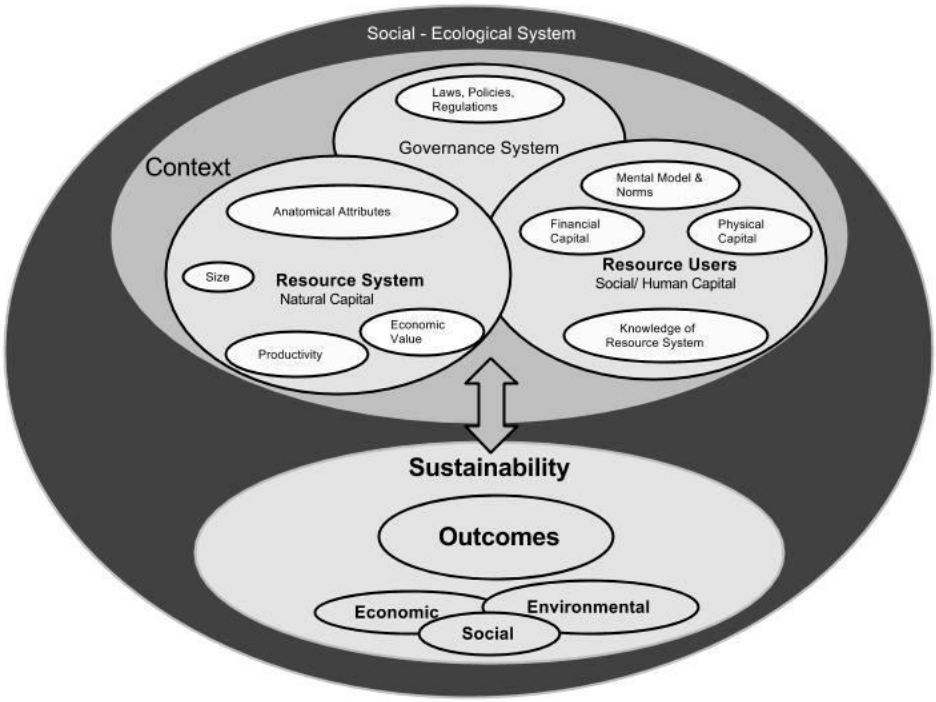

Figure 4 Conceptual model to analyse the sustainability of system outcomes for local livelihoods (design by the author)

Sustainability is here regarded in a social sense, as the study seeks to assess the system outcomes for local livelihoods. A social sense is nevertheless viewed in the way of integrating the economic, social, and environmental spheres; thus, following its holistic and interdisciplinary character, the study approaches it not simply as a single category but as an integrated frame that links various concepts. Moreover, the interdependency of the above main system components and how they link together as guided by the conceptual model in the specific case to create outcomes are taken to suggest accounts of sustainability.

Based on these, and again drawing on the work of Chambers and Conway (1992), sustainability is assessed according to what Carney (1998: 4) defines a sustainable livelihood: "it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base". This way, the study assesses the outcomes along the lines of the social, economic and environmental, yet taking into account feedback mechanisms between the outcomes and the assets and relates back to the model.

5 Synthesis of Results

This section illustrates the primary data from the fieldwork. It is organized in two major parts: Outcomes and Sustainability. The first part is a narrative of the outcomes of oil palm cultivation at the local study site as communicated by the local stakeholders themselves and reflects research question number one. It illustrates those findings from the field which were found to have considerably influenced outcomes for local livelihoods and as such does not set out to reveal a 'complete' picture of the truth but a selection of what was found to be most pertinent by the participating actors themselves. The text reflects the conceptual structure of the study through organising the findings along the line of the various system components outlined in the conceptual framework. The second part is a narrative which sets out to answer research question two and to shed light on the context of sustainability in economic, social and environmental terms. It reflects a natural flow and extends the discussion from part one. As such, it reveals the journey of investigation from local to global, commencing with the field visit and continuing upwards through the system by linking the local-level outcomes with upper system levels at national and global scale. As such, it uncovers interrelations between different system levels.

5.1 Outcomes

This section illustrates the main findings at a local level. Given the structure of the conceptual model, the following sections are organised in the subsystems of *Context*, *Governance*, *Resource System* and *Resource User*.

5.1.1 Context

The predominantly rural study site of Karaket is located in the District of Chian Yai in Nakhon Si Thammarat Province in Southern Thailand (see fig. 4 below) on the eastern side of the Malay Peninsula that borders with the Gulf of Thailand (Osbeck et al. 2013, forthcoming).

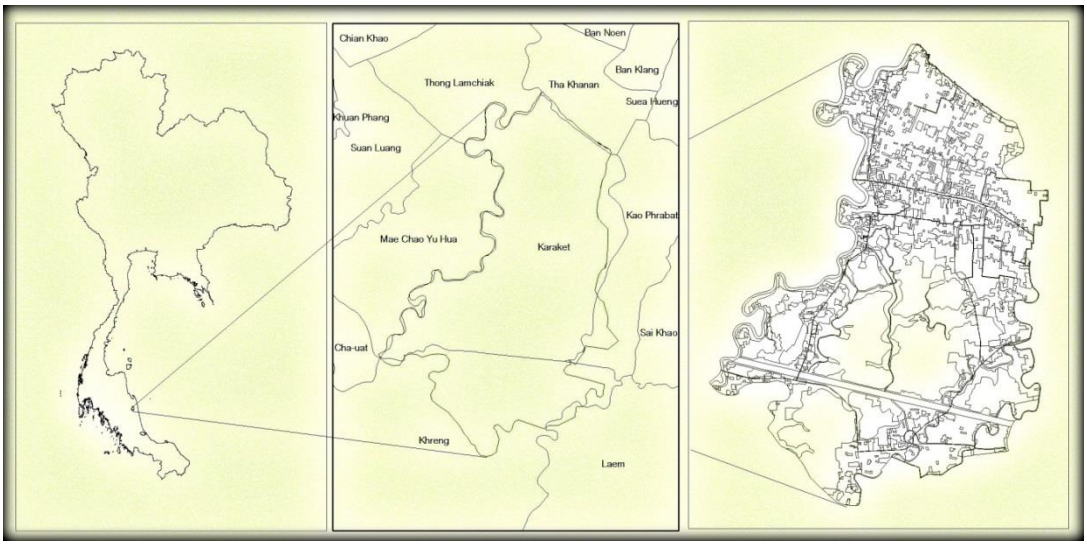

Figure 5: The study site of Karaket sub-district, Chian Yai district, Nakhon Si Thammarat Province, Thailand (SEI 2013)

It covers an area of 60.28 km² or 37.675.58 rai, and consists of 12 villages with an estimated population of 1.024 (GO3[6]; TAO 2012) of which 4 have developed to major oil palm cultivating villages in Karaket today[7]. It belongs to one of Chian Yai's 10 sub-districts, and forms, along with the neighbouring Pak Panang and Hua Sai Districts, part of the Pak Panang River Basin.

Livelihoods in Karaket have always been agriculture-led and operated on a small-scale basis where farms usually did not exceed a size of 2 ha. Livelihood activities here have been dominated by rice paddy cultivation, and for many decades, Karaket used to be known as one of the leading rice granaries of southern Thailand (GO3; SFO1-13; SFR1-5).

Geographically, the ecological factors of hydrology and land are the two most important 'resource' factors that can be taken to affect local livelihoods. Karaket is flat low land terrain and comprises two major soil types: alluvial and acid sulphate. The alluvial soils, a fine-grained fertile soil rich in minerals (Gaur et al. 1971) generally govern the northern area of Karaket. The acid sulphate soils can be found in the southern area of Karaket and belong to the Pa Phru Kuan Kreng peat swamps, a highly vulnerable and fragile ecosystem and one of South East Asia's largest peat land areas (DNP 2013). In tropical lowland peat lands, such as Pa Phru Kuan Kreng, the principal natural vegetation is peat swamp forest, a permanently waterlogged soil formation (WI 2010). The peat land units in Karaket are characterized by deep layers of peat soil and highly acidic toxicity levels (pH<4) in their waters and associated ecological

[6] Coding system can be accessed in appendix 8.1.
[7] Village number 2,3,7,12. Note: Villages in Karaket are numbered instead of named. The numbers thus refer to official names.

aspects[8] (GO5). As common with lowland peat swamps (DNP 2013), some of the peat land in Karaket is permanently flooded; most of it, however, is flooded during the peak rainy season in November and December (GO5).

Aside from soil types, Karaket is characterized by seasonal variations in water flow, and combined with varying precipitation rates and tidal fluctuations – owing to its close proximity to the coast – this creates a highly diverse agro-ecological zone that has long built the base for vulnerable 'resource-based' livelihoods. Farmers have to cope with differences in water quantity and quality according to season and space that are affected by processes within and upstream of the river basin (NPO2). Seasonal variations in water availability and the hydrologically complex peat swamp ecosystem mean that farmers in the southern area have to deal with permanent flooding in some areas and higher floods in the wet season, while farmers in the northern area face water scarcity in the dry season (SFO1-13; SFR1-5).

Rice paddy cultivation and livestock herding used to be the predominant livelihoods of farmers in the southern flood plains ecosystem. Along with rice, livestock, vegetable and rubber cultivation, farmers in the northern area of Karaket used to also rely on shrimp farming that was suited for its brackish water ecosystems. As a consequence of such environmentally destructive shrimp farming system as it was practiced in Karaket, the northern mineral soil area saw soil fertility constraints resulting in severe degradation (GO1-5; SFO1,3,6).

Moreover, an increasing number of natural disasters and climatic variations have afflicted the area; farmers reported uncommonly severe droughts and floods during the previous decade (SFO1-13; SFR1,3,5). Farmers moreover reported other ecological disturbances such as the brown plant hopper or the mealy bug that have seriously invaded on their rice crops and seeds (SFO2-6; SFR1-5).

Considering such context, it does not come as a surprise that farmers (SFO1-13; SFR1-5) shared that they seriously struggled to sustain their livelihoods owing to continued very poor harvests[9] and total losses of crops, and Karaket has been considered one of the lowest-income areas of Nakhon Si Thammarat[10] (GO3-5; NPO2). In this context oil palm cultivation began to gain ground, and developed into what is today one of the major livelihood activities in Kar-

[8] Sulphide in mangrove mud and water restricted bacterial activity. Along with organic matter from plant litter this has led to high acidity levels (WI 2010).
[9] Shrimp cultivation in Karaket was abandoned almost entirely during the 1990s mostly as a result of collapsing global prices for shrimp (McQuaid 1996; SFO1-13).
[10] In 2011, poverty rates for Nakhon Si Thammarat revolved at around 8.0%, above the average of Southern Thailand with 6.6% (TAO 2012a).

aket. According to local stakeholder estimations (GO1-3; SFO1,8,12), oil palm plantations now occupy about one third of the total cultivated area in Karaket.

Owing to a complex of site-specific biophysical factors and ecological disturbances, farmers face considerable hardship as they are strongly dependent on the natural resource base for their livelihoods. In this sense, they operate in a context of vulnerability which according to Carney (2003) includes factors that are outside the sphere of influence of people. As such the vulnerability context is an important contributor to shaping the lives of people, and favourable outcomes highly depend on how people adapt to and cope with such vulnerable context (Carney 2003; Hossain et al. 2006). The following sections will shed light on the contribution of the oil palm to assist local farmers in coping with their external environment.

5.1.2 Governance

5.1.2.1 Policy Support

Major constraints to palm oil smallholder production generally include difficulties in securing capital to meet upfront expenses, and smallholders often lack the necessary collateral for bank financing and access to good technical advice and market information (Vermeulen & Goad 2006). On the national level, the Thai government has introduced mechanisms that stabilize domestic palm oil prices and allow smallholder farmers access to short-term credit without land title as collateral (Klein et al. 1999). As a response to the considerable challenges farmers have faced in context of Karaket's highly complex ecosystem over the past years, the 'Royal Pak Panang Basin Development Project for Improving People's Livelihoods' has been established in which various government organisations[11] in Nakhon Si Thammarat under the Ministry of Agriculture and Cooperatives (MoAC) and its line departments have collaborated in order to fulfil the shared mission of improving local people's livelihoods (GO2-4). As such, they have offered farmers incentive schemes to take up oil palm cultivation on degraded and problematic soils as in line with national targets; these comprise of the degraded lands in the northern alluvial soil area and the problematic peat soil in the southern peat swamp area.

Many smallholder farmers, particularly in the southern peat swamp area, are financially deprived with few alternative off-farm income sources (SFO1-13). The costs of establishment for oil palm plantations are high and thus generally constitute a considerable entry barrier for many smallholders interested in changing their land to oil palm (Papenfus 2002). Recognizing

[11] Office of Agricultural Economic (OAE), Department of Agricultural Extension (DoAE), Royal Irrigation Department (RID), Cooperative Promotion Department (CPD) and Land Development Department (LDD).

that investments of this type are not easy to accomplish, the provincial and local[12] government has provided financial incentives to farmers in order to combat the high involved in establishing and managing oil palm plantations (GO1-5). These do not comprise direct subsidies in terms of cash but extension services such as land clearing and field preparation and the provision of seedlings, dolomite[13] and mineral fertilizer inputs which are comparably cost-intense and difficult to afford without financial support (GO1-5; Papenfus 2002). Aside from agricultural inputs and land preparation services, farmers have access to low-interest loans for smallholders by the Agricultural Cooperative Bank of Thailand (BAAC) and micro-credit schemes channelled through the Department of Local Administration (DoLA) and the Tambon Administrative Organisation (TAO); they moreover have access to a wide range of extension services in form of different kind of trainings and farmer information centres by various governmental organisations[14]. Trainings provided by the various government organisations aim to promote intensified palm oil production and equip farmers with specific information about sustainable plantation management[15] (GO4,5).

This is particularly important in Karaket in consideration of the vulnerability context. As a result of policies that promote oil palm plantings on such soil, most of the existing plantings are located on degraded lands and fragile peat lands which have lower yield potential and higher production costs per unit yield and require specific management knowledge and care (GO4-5). Institutional support does also come from the civil society and private sectors, however, up to date, their roles are rather limited.

5.1.2.2 Land Tenure and Ownership

Land rights arise as a component that has greatly undermined beneficial livelihood outcomes from oil palm cultivation around the globe. Tensions and disputes have often appeared as a result of land acquisitions, and uncertainties and disagreements over land tenure are common (Vermeulen & Goad 2006). As outlined in chapter 2, Thailand has strict land governance; in Karaket, land rights are clear and acquisitions seem hardly possible. In this regard, the Karaket case sets itself greatly apart; farmers in the northern area have full legal ownership of their land (SPR1-5; SPO1-13), and farmers in the southern peat swamp area have certificates of

[12] Local refers to district, sub-district and local levels.
[13] Dolomite is a lime (calcium-magnesium carbonate) to raise the pH level of the soil, thus reducing the high acidity levels to increase the availability of mineral nutrients for crops (GO5; Perry 2003).
[14] LDD, DoAE, ALRO, and TAO through village head.
[15] Courses take place regularly between 4-5 times per year at local, district, sub-district and provincial level, and information can actively be sought all year.

right to farm[16] that were granted to them during land allocations by the government in order to legally utilize declared zones of fragile lands in the Pa Phru Kuan Kreng peat swamps. Therefore, farmers in Karaket are independently operating agents characterized by their freedom to choose how to use their lands, which crops to plant and how to manage them. Such a freedom is often regarded as crucial to achieve sustainable livelihoods (Carney 2003; Hossain et al, 2006; Scoones 1998).

This section has shown that the public sector has exerted an influential role in promoting oil palm development in the study site, and has recognized that people may require support in order to strengthen their asset base and achieve beneficial livelihood outcomes. This statement of an oil palm farmer in the south exemplifies the constraints farmers can face when wishing to convert to oil palm: "If the government had not supported me financially at first place, especially with the seedlings, I would not have been able to change to cultivating oil palms" (SFO11).

As moreover suggested by a variety of scholars such as Carney (2003), Hossain et al. (2006) and Scoones (1998) this statement exemplifies well what profound influence policy support can have on people's livelihoods. Responsive public support has certainly helped here lowering the vulnerability effect created by the complex ecological factors intervening with people's lives. It can be said that through such incentives and strict land regulation the government has facilitated a process of transformation that may substantially contribute to beneficial outcomes for local livelihoods and build resilient lives. As moreover suggested by Scoones (1998), vulnerability to external stresses and shocks may have a negative feedback mechanism towards the livelihood assets. Through adaptation farmers have here lowered their risk of losing income, for instance. A decrease in one asset may potentially open up a vicious circle that influences other assets and livelihood outcomes negatively. Lend tenure security and a generally enabling policy environment may also be seen as asset which creates economic security.

When referring to the social-ecological system literature (Berkes et al. 2003; Gunderson & Holling 2002) resilience can moreover be regarded from the perspective of the 'capacity for renewal' as such that disturbance provides the base for new opportunities and development. Through a supportive governance system, as regarded in the present study, farmers in Karaket

16 The official name is SPK 4-01. Here, the right to transfer the certificates is limited to inheritance, and farmers are not allowed to sell the land but can use it for any purpose (GO3; SPO1-13).

have clearly shown such capacity for renewal and have taken the opportunity to develop in a context of vulnerability.

5.1.3 Resource System

Karaket is located in naturally preferable climatic conditions close to the equator where annual rainfall rates, temperatures and topography are generally suitable for growing oil palms, thus providing a favourable context for achieving high yields (FAO 2012; GO3-5). Moreover, the LDD has undertaken local soil suitability measures and identified the area as one of the most suitable for expansion of oil palm plantations in the entire country (GO5; Osbeck et al. 2013, forthcoming).

Moreover, oil palm trees belong to the perennial species of permanent oil-bearing crops. In contrast to many other temporary crops such as tubers or cereals that grow as annual crops, oil palm trees are planted once and continue producing crops during a 25-year life cycle. They grow comparatively fast and show high harvesting replacement rates. Therefore, FFBs can continuously be harvested as they ripen (FAO 2011). This provides the base for a continuous and stable income base for farmers throughout the entire year. The tree crops are harvested on a 15-20 day basis. As such, farmers can rely on financial inflows about every 2 weeks.

Oil palms are characterized by a shallow rooting system that is considered very suitable for growing on peat soils. Principally, in their natural condition peat soils are considered less suitable for the cultivation of agricultural crops such as oil palms when compared to mineral soils; they comprise very wet organic matter that needs to be prepared if to be used productively for agriculture. This is where the contradiction of low versus high suitability comes in: when drained, augmented by minor elements, and properly fertilized, peat breaks down into an excellent soil that is highly suitable for oil palms (Stephens & Speir 1969).

The oil palm belongs to the riparian species and can survive in generally high water tables and in flood conditions; they are hardy trees and are able to prevail in floods as long as they are not fully submerged in water for several weeks. Prolonged extensive flooding can, however, have adverse effects on yields (GO5; CSO1; Jaafar & Ibrahim 2012). Moreover, oil palms can survive well in long dry periods as they are drought-tolerant species. This will have little effects, although yield reductions occur when water stress is substantial (Carr 2012; Kallarackal 1996).

When taking into account the above factors of the resource system, it becomes evident that the oil palm must be a highly suitable tree for the context-specific characteristics in Karaket. It integrates well into the local context of vulnerable livelihoods and prevents what has led to crop losses and destroyed harvests previously. Considering this match between anatomical attributes of the resource system and the ecosystem within which it operates and the interaction with a generally favourable policy framework that supports and enables uptake of the tree crop, the beneficial outcomes oil palm can create for local livelihoods become apparent. Research suggests that the ability of a system, whether social or ecological, to sustain itself via adaptation and occasional transformation creates resilience (Magis 2010). Regarded as a form of adaptation to system requirements, it seems that oil palm potentially builds resilient lives as it lowers the risk to vulnerability and helps people to adapt to and cope with their environment. This is emphasized when considering its economic value through continuous harvesting possibilities. The anatomical attributes moreover seem to build a good base for high yields, thus directly affecting economic returns positively which have the potential to feed back into people's asset base (Carney 2003; Scoones 1998). As suggested by Ostrom (2009), the resource system in this considerably influences the outcomes of systems within the spheres of the social and the ecological.

5.1.4 Resource Users

5.1.4.1 Knowledge of Resource System

The oil palm is not an indigenous tree to Karaket (GO2). Therefore, farmers cannot make use of any traditional knowledge of how to cultivate the tree crop. Cultivating oil palms successfully is not a straightforward and simple practice; it requires substantial knowledge, particularly during the juvenile years and on problematic soils (Kallarackal 1996). Data suggests that farmers seek information on production principles from information meetings and training courses provided by the government and that farmers have trust in the services they receive from government officials. Moreover, kinship and neighbours with experience in oil palm farming have evolved as playing a substantial role in farmer's plantation practicing methods. Relationships of trust influence here how plantations are managed (SFO1-13).

Although potentially harmful for the environment and the health of people, agrochemicals can be a useful tool for efficient development of oil palm trees. Early detection of diseases, weed, and pests and prompt action in terms of their elimination is essential not only for productive yields, but also for the overall survival of the palm trees (RSPO 2012). Farmers showed a

high awareness of the potentially negative effects of agro-chemicals in general, and each one explained that they do not use pesticides or any other chemicals[17] prophylactically, but only when infestations are detected and elimination is needed. Pest control is usually done in an environmentally-friendly way, and farmers who, for instance, reported to have faced rat infestations, only used IPM[18] measures such as traps (SFO1-13).

Oil palms require a significant amount of fertilizer in order to yield efficiently (Thongrak, Kiatpathomchai & Kaewrak 2011). Yet, suggested amounts and compositions vary between different types of soil, drainage characteristics, rainfall, maturity stage and also return of composted materials into the soil (Ade Oluwa & Adeoye 2008). It became clear during the study that all farmers in Karaket applied mineral fertilizer on a fairly regular basis. Constraints due to high fertilizer input costs were reported (SFO1-13), however, and farmers seem to apply amounts that are below what is generally recommended by international and national standards for sustainable oil palm cultivation (MoAC 2008; RSPO 2012; SAN 2010). Moreover, according to experts (GO3-4; Thongrak, Kiatpathomchai, and Kaewrak (2011), soil and leaf analysis is necessary for correct fertilizer application and yield maximization. Farmers in Karaket have, as of now, generally not made use of such analysis, although provided by the LDD (GO5; SFO1-13).

Such low fertilizer inputs may create negative feedback mechanisms for economic returns, and can be regarded as a factor potentially affecting economic returns unfavourably.

It suggests, however, a way of managing nutrients that is not considerably environmentally destructive and stands opposed to the high fertilization rates of large monoculture plantations in other major oil palm cultivating countries (Norwana, et al. 2011; Yangdee 2007).

The study found that farmers utilize empty fruit bunches and chipped oil palm fronds that they arrange around the palm tree trunks to as compost for the trees; moreover, farmers reported to use the residues from intercropped plants and dung from livestock to serve as organic fertilization (SFO1-13).

Intercropping in fact appeared to be a common activity among farmers in Karaket. Farmers explained that according to type of soil they intercrop legumes such as chili, pepper, pumpkin and groundnuts that do not compete with the palm trees in nutrients, light and water, and in addition, provide fodder for livestock (SFO1-13). Legume cover is in fact said to serve to de-

[17] Aside from mineral fertilizer.
[18] Integrated Pest Management.

velop the soil structure and improve palm root development; it has nitrogen fixation potential and prevents soil erosion and surface run-off (Lim et al. 2012; Uexküll & Fairhurst 1999).

Intercropping is not restricted to legumes, however, and farmers also grow banana and coconut trees around the plantations, intercrop with livestock herding or have fish ponds inside the plantations that concurrently serve as water trenches to keep soil moist (SFO1-13). Smallholder farmers in Thailand are known for having practiced intercropping for many decades (Vargas-Lundius 2009). Data in Karaket confirms this and suggests mental links to tradition and culture in order to reduce risk, meet nutritional needs and maintain soil fertility.

Farmers shared that such an organic way of adding nutrients to the soil reduced the amount of fertilizer requirements substantially, and they could save costs as well as protect the environment. Moreover, they stated, adding organic material keeps weed infestation low and they do not require any form of agrochemicals against weed (SFO1,7-13). As such, farmers can be regarded as environmentally considerable stewards of their land and have shown high interest in protecting their natural resource base and health.

In this way, farmers showed substantial knowledge of nutrition management, which serves as an economically considerable way of achieving outputs. It may also be argued that such small-scale plantation mode which uses little amounts of chemical input is an environmentally friendly way of cultivation as compared to common large-scale productions in other producer countries which uses extensive amounts of chemicals in order to achieve full maximization of yields. Moreover did previous land uses require higher fertilization amounts as oil palm does when considering the specific biophysical context in Karaket (GO4,5; SFO1-13).

When referring back to the conceptual model, the current nutrient management practices can be regarded as strengthening farmer's financial asset base to produce beneficial economic outcomes and feed into building a resilient natural resource base. In interaction with the above system components, governance in particular, this has contributed to building outcomes for the natural resource base that do not seem to adversely affect the environment and stand in contrast to common mono-cropped large-scale plantations that use extensive amounts of chemicals (e.g Yangdee 2007).

Effective water management is essential for obtaining high oil palm yields. Oil palms above an age of three years require as much as 200-250 litres of water per palm per day which may rise up to 300-350 litres per day during dry periods and when trees mature. Water deficiency limits oil palm growth and production considerably as oil palms take up nutrients from soil

solutions, and low soil moisture limits such uptake. Therefore, the trees require adequate irrigation (Mite, Carillo & Espinosa 1999; Nabard 2007).

Observations during field work and interviews revealed that most plantations in Karaket are rain-fed, and water trenches in plantations store rain to keep soil moist. Farmers in the northern area explained that during the hot summer months,[19] their oil palm trees receive too little water and yields usually decline to some extent (SFO1,2,4,5,7,13). This is although the Royal Irrigation Department has set up an extensive irrigation system in the entire Pak Panang River Basin that aimed to provide local farmers with water during drought-afflicted periods. Farmers are, however, either limited in accessing the irrigation system or face constraints during hot summer months when the RID now keeps water gates closed owing to Pak Panang River water levels that are below sea level (NPO2).

How water is managed here does not seem to influence the natural resource base unfavourably. It can be argued that through pumping high amounts of water from the irrigation canals, farmer's practices may have had effects on the low water levels in the Pak Panang River since oil palms require substantial water input, as mentioned earlier. Data that would confirm such assumption and directly link oil palm to low water levels does, however, does not exist.

As explained above, a bulk of oil palm plantations is located in the fragile ecosystem of the Pa Phru Kuan Kreng peat swamp area. Peat soils have site-specific chemical and physical properties and require specific technical and financial capacity if peat soils are to be utilized in an environmentally acceptable way that provides for productive economic returns (Lim et al. 2012; Schrier-Uijl et al. 2013). Proper water management in the sense of drainage and water control systems is necessary to adapt peat land to the requirements of oil palms[20] and is crucial to prevent unnecessary moisture suffering of the oil palms to achieve good yields and facilitate a prolonged economic lifecycle. It is moreover crucial to keep severe environmental effects such as peat subsidence and imbalances to the hydrological cycle to a minimum (Lim et al. 2012).

Farmers in Karaket were in fact aware of such specific requirements that peat land needs for proper utilization (SFO3,6,8-11,13). They receive support through the LDD to be able to afford the associated initial costs of specific land preparation and the establishment of drainage

[19] Usually between December and January.

[20] Depending on the specific ecosystem conditions, water levels should here be maintained at about 40-60 cm below surface using control structures to retain the closed ecosystem and maintain its hydrological balance.

canals. Operational management costs, however, are borne by the farmers themselves who often do not have the financial means to do so, lack the specific knowledge required to manage such systems or seem to be indifferent towards the situation (GO5; SFO3,6,8-11,13). The following statement of one oil palm farmer exemplifies this (SFO6): "I do not control the water levels. I do not see why. It is complicated, expensive and my palms are growing and yielding well now". Therefore, and considering the extent to which oil palm development in the peat soil area has taken place in Karaket, it may be assumed that the hydrological cycle of the peat swamps has been disturbed considerably. Farmers moreover reported that they know of drainage practices from some farmers that reach unsustainably deep levels and blame occasional disturbances in water availability to these (SFO6,8).

Water management in the peat land area appears to be a factor that unfavourably influences outcomes for the natural resource base. It shows well how the different subsystems laid out in the conceptual model interrelate and depend on each other and can also produce harm to the system. The governance system here interferes through supporting initial resource modifications to make possible oil palm cultivation on peat only; however, then it lacks in additional support and regulating negative practices for such development. Monitoring schemes are absent. When relating this sphere to farmer's mental constructs of what they consider important and sufficient in their lives, it combines to result in outcomes that are inhibiting to a healthy ecosystem.

In general, water management in both the alluvial and peat soil area as is practised now does not set out to achieve maximum outputs in terms of financial returns either. Possibilities for improvement, however, are strongly related to financial assets of farmers; and so it can be assumed that the northern alluvial soil area, for instance, would yield significantly higher if proper irrigation systems would be constructed. These are however costly, and according to farmers' own accounts not in the financial range of possibilities at this point (SFO1,2,4,5,7,13). Financial support for these from the public side may not be expected, however, as the RID is concerned about the low water levels in the river basin and have reported not to be willing to support oil palm development through irrigation facilities (NPO2). As laid out by the conceptual model, this is yet another example for the complex interrelation between the different system components to produce favourable outcomes. Through two-way relations, the governance system here directly influences favourable and unfavourable outcomes and feeds back into people's assets (Scoones 1998).

5.1.4.2 Diversified Livelihood Activities

Oil palm farmers who participated in the study all source their main income from growing palm. All farmers share, however, one thing: diversified livelihoods (SFO1-13; SFR2,3). This stands opposed to various other oil palm cultivating countries as studied by e.g. Rist and Levan 2010) where farmers often rely on oil palms as a single livelihood activity. Farmers in Karaket are free to decide how to use their land, can operate in a highly flexible manner and pursue livelihood activities that they themselves regard as beneficial options. As such, people are engaged in multiple occupations and farming activities. Oil palm farmers practice inter-cropping, as mentioned above, and also cultivate rice, fish, vegetables of different kinds, raise livestock or engage in non-farm activities and own small stores; some also work in public civil service (SFO1-13). Therefore, none of the farmers are over-dependent on the oil palm crop, they have not totally lost their self-sufficiency and can access other sources of income in case needed. One farmer from the northern area says: "During hot summer months, when my income from oil palm is a little less, I still have the earnings from rice" (SFO7).

This again builds a strong case for resilient livelihoods. As also stressed by Carney (2003) and Scoones (1998), diversified livelihood activities help local farmers to become more resilient to external shocks and stresses and strengthen their ability to capitalise on beneficial aspects in life. In the present case, oil palm cultivation has contributed to reducing risk and vulnerability through diversified farming systems and livelihoods.

5.1.5 Main Outcomes

Building on the above underlying factors of the main system components presented in the conceptual model of the study and to answer research question one, three major outcome classifications for local livelihoods can be derived: Income, Resilience and the Natural Resource Base.

5.1.5.1 Income

The study has shown that cultivating oil palm has created substantial economic value for smallholder farmers in Karaket. Growing the tree crop has contributed significantly to increased income levels as compared to alternative livelihood activities undertaken previously and produces better returns for farmers than some of the key crops currently under cultivation such as rice. Various studies previously undertaken by Deininger and Byerlee (2011), Belcher et al. (2004), and Sheil et al. (2009), for instance, confirm such outcome for other palm oil producer countries. The following statement by an oil palm farmer in the northern area under-

lines the gratitude for the financial benefits the oil palm has created: “Since growing oil palms, my life has changed a lot – in a positive way because the income now is a lot higher than before from rice” (SFO4).

5.1.5.2 Resilience

The study has revealed that oil palm cultivation has contributed to stability in a context of uncertainty and change in which local farmers have faced an increasingly difficult environment from complex ecosystem characteristics to ecological stresses of droughts and floods. An oil palm farmer from the peat swamp area explains: “We live in flood plains. I used to grow rice and the floods have destroyed my harvests. Oil palms are very suitable for these conditions and it is a stable and reliable source of income” (SPO8). It provides financial stability and reduces risk through diversification. When asked about the benefits of cultivating oil palm, farmers explicitly referred to the stable income the crop provides. To quote one of them (SFO2): “When I used to grow rice, I only got revenues once per year. I have a regular income now and can plan my life better.”

5.1.5.3 Natural Resource Base

The study furthermore showed that oil palm cultivation in the northern alluvial soil area of Karaket may not have caused any immediate detrimental effects to the environment and as such has not undermined its environmental value. Cultivation practices seem to be comparatively environmentally-friendly, and as of now, famers themselves did not perceive any negative environmental effects of oil palm cultivation (e.g. SPO2): “The environment is not negatively influenced by the oil palms, I think. The water quality is good, and I can see more animals than before in the shrimp and rice farms.” Oil palm cultivation in the peat soil area in southern Karaket, however, may have caused disturbances to the hydrological cycle of the peat ecosystem through improper water management practices. Moreover, the Pak Panang River Basin shows critical water levels, particularly in the dry season, and oil palm may have negatively affected these levels.

5.2 Sustainability

This section sets out to answer research question two. It is organized in three parts that operate along the lines of the main outcomes of income, resilience, and natural resource base. It seeks to contextualize the outcomes in terms of sustainability that is operationalized along the

economic, social and environmental sphere and addresses local livelihoods, particularly following Carney's (1998:4) definition of sustainable livelihoods.

5.2.1 Income

Economic sustainability here is regarded as increased income that can be maintained over time[21]. Moreover, following Carney (2003), Krantz (2001) and Scoones (1998), it shall have the potential to build up people's assets, and positively feed back into other livelihood outcomes - in this case resilience and the natural resource base. In this sense, it also follows Carney's (1998:4) definition of sustainable livelihoods in which sustainability is achieved when a livelihood can adapt to stresses and shocks, maintain or enhance its assets and does not undermine the natural resource base.

The study has shown that farmers have invested their additional earned cash from palm oil in strengthening their own assets, and also have explained the benefits their increased financial asset base has created for health. Farmers shared that they can visit doctors more often and buy higher-quality food. Moreover, they invested in other's social and human capital, mostly through in education, particularly of kinship. They shared they have paid for tuition fees at schools and higher education institutions (SFO1,5-7,10,13). Regarded in a broader sense, farmers have invested also in the wider community, for instance through hiring labour from their villages for harvesting activities (SFO1,3,5,7,9). In this way, oil palm cultivation has also contributed to strengthening the financial asset base of community members and achieved wider income effects.

Increased income has the potential to affect the resource system and thus positive outcomes achieved for the natural resource base (Carney 2003; Krantz 2001; Scoones 1998). Data has revealed that owing to higher incomes, farmers have been dissuaded from environmentally destructive practices such as illegal logging. One oil palm farmer (SPO8) in the south explained: "With the income from rice my family and I could not survive. I went to the conservation area to log the malaleuca tree and sell it. It was dangerous because it is illegal. But now I don't have to do this anymore because from oil palm we earn enough money". This exemplifies well the feedback mechanism between the different assets and the system components to create beneficial outcomes.

[21] Over time, for this purpose, is defined as the near-term future.

In immediate terms, oil palm cultivation has proven to be highly beneficial for livelihoods in Karaket. Regarded in a near-future perspective, however, the study found one aspect that can be deemed particular important.

As outlined in the background section, Thailand has been protective towards its domestic palm oil industry and towards smallholder development. Under the liberalization agreement with the ASEAN Free Trade Area (AFTA) which has taken full effect in 2011, Thailand had to curb its import tariffs on palm oil to zero (ASEAN 2011). The ASEAN Economic Community (AEC) will, however, take full effect in 2015, which means that Thailand has to open its borders for palm oil imports and allow full flow of exports (Matrade 2011). The Thai palm oil sector will then have to compete with the highly efficient palm oil sectors from Malaysia and Indonesia. This may have detrimental effects for local oil palm farmers. It can be assumed that yields are considerably below what would be required when having to compete with the long-established producer countries of Indonesia and Malaysia. Thailand in general seems disadvantaged when compared to its major competitors. Certainly various factors play a role here, however, the mode of production appears to be an essential one. Mostly, plantations in the rival countries are run as large-scale mono-cropped estate or private lands, which makes it easier to produce according to technical principles (Yangdee 2007). Although specific data on yield outputs are not available for Karaket, studies by Thongrak, Kiatpathomchai and Kaewrak (2011) illustrate the relatively low yield outputs of smallholder farmers in neighbouring oil palm growing provinces. Studies suggest that independent oil palm smallholders are often less productive than large plantation companies. Here the identified inefficiencies comprise, inter alia, aspects of plantation management such as insufficient amounts of fertilizer application, improper water management, harvesting of unripe FFBs or yield loss as a consequence of ecological disturbances (Thongrak, Kiatpathomchai & Kaewrak 2011; Vermeulen & Goad 2006). Findings suggest that some of these also apply for Karaket, and a maximization of efficiency has undoubtedly not been achieved. Although farmers live in a context of vulnerability which is to its largest extent outside their direct sphere of influence, raising local productivity levels through improved plantation management practices seems attainable. As regards this, the study found that extension services could be further strengthened to facilitate yield maximization through improved farm and plantation management. There is certainly room for improvement concerning farmers' capacity in managing their farm. Farmers have shown to lack specific technical knowledge in keeping farm records and calculating their input needs, for instance (SPO1-13). Also, information networks currently seem not to work efficiently and may further be strengthened to improve practices. Such networks could then help to transfer

knowledge about existing services that would facilitate yield improvements to beneficiaries. Currently, existing support mechanisms such as the soil and leaf analysis that is available through LDD are generally not made use of by farmers (GO5; SPO1-13). Through the building of producer groups and associations such information exchange may further be strengthened.

At the time of research, farmers were highly satisfied with the productivity level they reached and the income it generates (SFO1-13). In strong consideration of people's own perceptions and views on what is regarded 'sufficient' to lead a happy life, the present study acknowledges that yield or income maximization may not be the guiding principle in everyone's world. When moreover considering the bottom-up approach of the present study and the strong emphasis it seeks to put on local perceptions and meanings, it seems appropriate to then consider the outcome of current incomes as economically sustainable – in the immediate frame. The challenge arises when considering the above contextual factors, and yield maximization then appears as a prerequisite for continued high income earnings which local farmers currently regard 'sufficient' to lead a happy life .

The fact that farmers explained that they regard the technical knowledge they possess as sufficient (SFO1-13) seems to arise as a particular challenge because they may not be willing to make use of services offered to them that address yield maximization. Over the past decade, the Thai government has put a strong focus on promoting responsible intensified oil palm cultivation in the domestic palm oil sector, and enforcement mechanisms in Karaket appear to have generally worked well and farmers welcomed such support up to a level of perceived sufficiency (SFO1-13). Considering the changing context regarding the ASEAN market integration and the opening to the global market linked to this, the government[22] has commenced to promote the integration of its smallholder farmers in the global oil palm value chain. A pilot project was successfully implemented in Thailand's major palm oil producer provinces which promoted sustainable palm oil production standards through RSPO[23] certification (NPO3). The beneficial economic outcomes oil palm cultivation has generated for local livelihoods so far may be at risk through the context that exemplifies well farmers' dependence on global markets. If farmers are not to lose market share through inefficient production prac-

[22] Commissioned by the German Federal Ministry of Environment, Nature Conservation and Nuclear Safety (BMU) under the International Climate Initiative (ICI); implemented by GIZ in cooperation with the Thai Ministry of Agriculture and Cooperatives (MoAC) and the Office of Agricultural Economics (OAE) (NPO3).

[23] The RSPO is an international multi-stakeholder organization that brings together the key players in the palm oil supply chain 'to advance the production, procurement and use of sustainable oil palm products through the development, implementation and verification of credible global standards and the engagement of stakeholders along the supply chain' (RSPO 2012a)

tices, raising productivity levels seems to arise then as a prerequisite for achieving longer-term economic sustainability in Karaket. Unfavourable future financial outputs may potentially trigger spill-over effects for other assets and livelihood outcomes, here resilience and the natural resource base. Taking into consideration the generally protective policy and regulatory framework of Thailand, and with efforts to raise productivity levels under way, it may be speculated that economic sustainability may be achieved.

To sum it up, and considering positive developments, oil palm cultivation in Karaket fulfils the 'requirements' for economic sustainability as through feedback structures between high financial returns and the asset base it helps to maintain and enhance people's capabilities and assets, and feeds back into other system outcomes.

5.2.2 Resilience

Although acknowledging that it may not be the only indicator, social sustainability in this study is reflected in the concept of resilience (Magis 2010).

Following resilience definitions by e.g. Adger (2000), Davidson-Hunt and Berkes (2003) or Folke (2006), oil palm cultivation in Karaket shall contribute to shaping farmers' capacity to absorb shocks and persist in difficult environments now and in the future[24]. As such, it follows again Carney's (1998:4) definition of sustainable livelihoods in which sustainability is achieved when a livelihood "…can adapt to stresses and shocks,…"

Adaptation to stresses and shocks as regards the vulnerable biophysical environment in Karaket can be regarded fulfilled on base of favourable system interrelations between the resource, the governance and to some extent also the resource user systems. According to Carney (2003), Krantz (2001) and Scoones (1998), improved income levels can moreover be regarded as lowering people's vulnerability to such shocks and stresses. Data has shown that the increased income farmers have earned has given them the opportunity to invest in other activities to diversify their livelihoods and build resilience through a strengthened financial asset base. For instance, some farmers are now engaged in petty trade as they could utilize earnings from oil palm as investment capital (e.g. SFO7,9). This makes them more risk-averse and appears particularly important when considering uncertainty in the future. Through livelihood diversification, as widely practiced currently, farmers can better manage such risk and ensure certain future income security. If farmers are to suffer financial losses, however, resilience in

[24] In the future is here defined to mean the near-future.

this sense may then be at risk of decreasing as well; implying certain risks for unfavourable spill-over effects on other assets.

Considering its financial attractiveness for farmers, it comes unsurprisingly that an increasing amount of people wants to take part in the good palm oil fortune. Conversations and interviews with farmers revealed that some are planning to convert their crops in the near future, in particular rice, to oil palm cultivations (SPO1-13; SPR1-5). This underlines once more the popularity of the oil palm tree among farmers in Karaket; whether with those who have been engaged in the 'boom' for some time already or with those who still practice subsistence farming and have been dazzled by the beneficial outcomes such an entering into the cash economy can provide. This finding bears attention for resilience as it relates to food security. In this way, future land use change away from subsidence farming may have implications for food access. As long as incomes earned from oil palm are high and people can purchase food, local food security is generally not affected (Vargas-Lundius 2009). Oil palm cultivation is however often regarded as impeding local-level food security as it limits the ability of local farmers to produce food they have previously cultivated (Colchester et al. 2011). Often, oil palm smallholder farmers elsewhere are known to not practice integrated farming and often give up other livelihood activities to dedicate themselves fully to grow the palms (Yangdee 2007). Oil palm cultivation in Karaket makes another case as data has shown that farmers practice intercropping and have fully diversified livelihoods.

Implications for food security in the near future then seem to depend highly on the livelihood strategies farmers decide to choose, and diversification will play an important role. Yet, when considering farmer's mental models in the sense of that they have traditionally practiced intercropping and diversified livelihood activities, and linking them with enabling public policies that promote diversified livelihoods (GO4,5) it may be assumed that farmers will continue attaching importance to diversification.

Even if earnings from oil palm may decrease in the future, through diversified livelihood strategies resilience may still be maintained, and create positive spill-over effects for other assets and livelihood outcomes.

Assuming favourable system interrelations and to sum it up, the study finds that oil palm cultivation in Karaket is socially sustainable for local livelihoods; again following Carney's (1998:4) definition, such sustainability is constructed through being able to cope with and

adapt to stresses and shocks which is fulfilled via linkages with economic sustainability and the asset base.

5.2.3 Natural Resource Base

Environmental sustainability in this study is regarded in the traditional ecological sense and shall protect the natural resource base now and in the future[25]. As such, it again follows Carney's (1998:4) definition of sustainable livelihoods in which sustainability is achieved when a livelihood can "…, while not undermining the natural resource base".

What concerns the natural resource base, land use has been clarified by the government and policies that guide the development of oil palm plantations on degraded and problematic lands physically suitable for oil palm are in place in Karaket. What is considered 'problematic' by the government here, however, is regarded a highly critical issue by various actors from the international community and the civil society sector: the development of oil palm plantations on peat lands (WWI 2013). As explained previously, impacts on peat land ecosystems and external ecological systems such as the climate can be detrimental if not managed properly, and also seem to have caused some unfavourable effects already in Karaket. With reference to what is seen to constitute sustainability in this study, there is a need to regard the system holistically and consider the social sphere as well. Within the local context of vulnerability and difficult ecological conditions, people in Karaket have struggled severely to make a living. Certainly, the negative implications oil palm development on peat land can bring for the environment must not be underestimated. Yet, improving people's livelihoods and help them build resilient lives cannot be ignored either. As such, there is a need to find a balance between ecological and social outcomes in order to achieve sustainability for both.

With its smallholder policy perspective, the government has thus decided to develop some parts of the peat swamp area in Karaket and established land use policies that confer the right to farm. On this base, peat land has been developed for oil palm cultivations to promote sustainable livelihoods (CSO1; GO4,5).

Livelihoods, however, may only be sustainable if the natural resource base is not undermined now and in the future, and the difficulties with such socially considerate thinking seem to arise in the realization of what is necessary for managing peat sustainably. Peat soil is highly suitable for oil palm if drained, and environmentally considerate drainage seems feasible at

[25] In the future is definded to mean near-trm future.

first sight. When peat subsidence and oxidation have started, however, it can hardly be detained. Drainage must be kept at levels that match the rate of subsidence. Implementing such water management satisfactorily is technically complex and financially burdening (Schrier-Uijl 2013; Stephens & Speir 1969).

As data has shown, negative implications may be assumed for the vulnerable peat ecosystem in Karaket. Improper water management practices and a lack of monitoring mechanisms to ensure peat swamp protection have shown to be the major drivers. The future sustainability of the peat swamp area is thus highly questionable even if effective management will be enforced. Finding a balance between social and environmental needs may have come at high costs for the environment.

Regarding the northern alluvial soil area, land use policies for oil palm development have aimed to convert only degraded lands. As independently operating agents, farmers in Karaket however cannot be hindered to take up oil palm to pursue what they themselves regard a beneficial option as stressed by Chambers and Conway (1992), for instance, and so they will also independently convert lands that are not included in the government's policy intentions.[26] Such extensification as such cannot be regarded as creating generally unfavourable outcomes for the natural resource base as compared to other current land uses, if it was not for the water shortage in the river basin; particularly when considering that oil palm cultivation may then take away water that is also needed for paddy rice cultivation that, with about two thirds of all cultivation activities, is still the most important livelihood activity in the study site (GO1-5). Proper water management schemes seem necessary to regulate the allocation of water in the area sustainably.

In summary, oil palm cultivation in Karaket requires to be 'deconstructed' systemically to divide it into north and south when talking about sustainability. It may be speculated that the northern area seems comparatively environmentally sustainable, again following Carney's (1998:4) definition to mean 'not undermining the natural resource base', if proper regulation mechanisms are enforced. The southern area of Karaket seems more to take the lead in comparatively unsustainable outcomes for the environment as it can be speculated that the highly fragile peat land ecosystem may seriously have suffered from disturbance and is at risk. The future does not point otherwise. When bringing the two different 'results' from the northern

[26] Although farmers who decide to convert farmland that is not classified as such will generally not be able to participate in the incentive schemes provided by the government.

and the southern area together, it may be argued that the natural resource base may be called 'not seriously undermined'.

6 Conclusion

The present study has provided an assessment of the value of oil palm cultivation for local livelihoods in Karaket Sub-District in Southern Thailand. It has regarded oil palm cultivation and livelihoods as parts of a social-ecological system that produces outcomes for sustainability. As such, the research aimed to explore the main outcomes of such a system and place them in a context of sustainability. Sustainability was operationalized in a social sense, as focusing on outcomes for livelihoods, but through following a holistic line that integrates social, economic and environmental values.

The case of oil palm cultivation in Karaket has served as a model example for the high interdependency of various factors within the social and ecological sphere that has shaped a picture of sustainability with social and economic value for local livelihoods without seriously undermining the natural resource base. The economic, social and environmental value that oil palm cultivation has created in Karaket is a result of a number of aspects very specific to the resource site that cannot easily be deconstructed along the lines of single system views and put into simple economic, social, and environmental boxes. As such, it stands against the general disrepute that oil palm cultivation has earned on a global scale particularly with civil society and advocacy organizations that often depart from an environmental single system view. While highly welcoming criticism of the severe environmental destruction oil palm has created in major producer countries, environmental implications thus strongly depend on where oil palms are planted. Sustainability is a social construct and must always be site-specific, and as the present case has shown, comparatively favourable outcomes are possible. Based on the findings, it may also be argued that such smallholder-dominated oil palm cultivation may set a good example and serve as an initial learning platform for how palm oil can be cultivated in a way that contributes to beneficial livelihood outcomes.

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Figures

SEI (2013): The study site of Karaket sub-district, Chian Yai district, Nakhon Si Thammarat Province, Thailand. Bangkoh: SEI.

8 Appendices

8.1 Primary Data Coding

Government					
Organisation	**Level**	**Place**	**Code**	**Form of Data Generation**	**Amount of Data Generated**
Village Head	Local	Village 2[27]	GO1	Semi-structured Interview Conversation	1 1
Tambon Administrative Organisation	Sub-District	Karaket Village	GO2	Conversation	1
Tambon Administrative Organisation	Sub-District	Karaket Village	GO3	Conversation	5
Agriculture Extension Office	District	Chian Yai Town	GO4	Semi-structured Interview	1
Land Development Department	Province	Nakhon Si Thammarat City	GO5	Semi-structured Interview	1
Office of Agricultural Economics	National	Bangkok	GO6	Conversation	1

Non-Profit Sector					
Organisation	**Level**	**Place**	**Code**	**Form of Data Generation**	**Amount of Data Generated**
Supanimit Foundation (World Vision Thailand)	Sub-District	Karaket Village	NPO1	Semi-structured Interview	1
CORIN-Asia (Asian Coastal Resources Institute	Province	Pak Panang; Village 2	NPO2	Open-ended Interview	5

[27] Villages in Karaket are numbered instead of named. Village 2 thus refers to an official name.

Foundation)	National	Bangkok		Conversation	1
GIZ Thailand	National	Bangkok	NPO3	Conversation	1

Private Sector					
Organisation	**Level**	**Place**	**Code**	**Form of Data Generation**	**Amount of Data Generated**
Palm Oil Middleman	Local	Village 5	MM1	Semi-structured Interview	1
Palm Oil Middleman	District	Chian Yai	MM2	Semi-structured Interview	1

Smallholder Farmers							
Type	**Code**	**Village No.**[28]	**Form of Data Generation**	**Amount of Data Generated**	**Geographical Location in Karaket**	**Village No.**	**Sex**
Oil Palm							
Oil Palm Farmer	SFO1	2	Conversation	6	North	5	F
Oil Palm Farmer	SFO2	2	Semi-structured Interview	1	North	12	F
Oil Palm Farmer	SFO3	7	Semi-structured Interview	1	South	6	M
Oil Palm Farmer	SFO4	2	Semi-structured Interview	1	North	2	M
Oil Palm Farmer	SFO5	2	Semi-structured Interview	1	North	8	F
Oil Palm Farmer	SFO6	7	Semi-structured Interview	1	South	3	M
Oil Palm	SFO7	2	Semi-structured	1	North	5	M

[28] Villages in Karaket are numbered instead of named. Village 2 thus refers to an official name.

Farmer			Interview				
Oil Palm Farmer	SFO8	12	Semi-structured Interview	1	South	7	F
Oil Palm Farmer	SFO9	7	Semi-structured Interview	1	South	3	F
Oil Palm Farmer	SFO10	12	Semi-structured Interview	1	South	2	M
Oil Palm Farmer	SFO11	12	Semi-structured Interview	1	South	6	M
Oil Palm Farmer	SFO12	7	Semi-structured Interview	1	South	13	F
Oil Palm Farmer	SFO13	2	Semi-structured Interview	1	North	6	M
Rice							
Rice Farmer	SFR1	3	Semi-structured Interview	1	North	F	
Rice Farmer	SFR2	2	Semi-structured Interview	1	North	F	
Rice Farmer	SFR3	2	Semi-structured Interview	1	North	F	
Rice Farmer	SFR4	3	Semi-structured Interview	1	North	M	
Rice Farmer	SFR5	3	Semi-structured Interview	1	North	M	

8.2 Interview Guidelines

The interviews were semi-structured, and open-ended. Ideas and broad questions were prepared beforehand but interviews were highly flexible and adapted specifically to every situa-

tion. In this way, a general interview guide was prepared beforehand to clarify ethical considerations and provide a certain structure. Guidelines were as follows:

1. Informed consent, an introduction of all present and an introduction to the purpose of the study was given.
2. Learning about the implications that have arisen from palm oil plantations, which the people present have either observed or otherwise know of, including identifying available evidence of such impacts.
3. Learning about the context deemed important for oil palm development.
4. Learning about the current governance system and how it contributes to the development and the current situation at the site (e.g. through public legislation, law enforcement, voluntary action, certification schemes, and so on, and how these work in practice).
5. Learning about oil palm cultivation practices.

As according to Bryman (2008) and Mack & Woodsong (2005), questions were raised in a neutral, non-leading manner. Follow-up questions and probes followed the responses if deemed necessary. The interviews took no longer than 90 minutes and were held in a location of privacy of the interviewees.

The interviews were tape recorded. Moreover notes were taken during the interview to document observations about the participant, and the interview. This moreover served as back-up data (e.g. Bryman 2008; Creswell 2009; Mikkelsen 2005). Informal discussions and conversations were documented in detailed field notes capturing the main arguments. Records were transcribed shortly after consultations.