

Baseline Study of the Oil Palm Smallholders in the Project Areas Final Report



Submitted to
**GIZ Thailand: Project of Sustainable Palm Oil Production
for Bio-Energy**

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Research Team
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Executive Summary

The baseline study in the spring of 2010 of some 500 oil palm smallholders in the South and the East of Thailand identified structural gaps between their current farming practices and the project goals. The majority of the “farmers” are mid-aged and older, and nearly all of them obtained at most secondary education, and have on the average of 16 years of experience with oil palm production. Four of every five smallholders grow oil palms for the main income of their families. However, well over half of them have semi-permanent debt of two-third of their annual income from oil palm. The majority of their parcels have land title, but the ten hectare per family isn’t really enough to live from, and their palm trees are now aging to a dozen years, after which their production starts to get lower.

The currently ongoing cultivation of oil palms is managed fairly well by the generally aged, smallholders, who learned to react on the various problems experienced over the years, and through the various phases and seasons. However, the study although showed that there are various bottlenecks and shortcomings in the smallholders’ activities and in the understanding of the effects of proper applying fertilizer, handling hazardous chemicals and pesticides and several other aspects of oil palm growing and harvesting.

In addition, the majority of smallholders, for example, do not keep farm records due to its complexity and thus could not benefit from their own experience and from their neighbour proper and less good activities. This is more or less the case in half-a-dozen aspects of the overall management and decision-making for optimal benefit. The survey goes in great detail to identify those aspects as cost and return, problems faced, need for support and training, suggestions of modernizing the development of oil palm production and improving the quality of life of the oil palm smallholders.

Furthermore, the report identifies gaps between the current farm practices and the project goals, based on interviews and responses from the smallholders. Issues as types of soil, fertilizer management, soil conservation, quality of seedlings are not commonly understood and aspects labour law, an under developed smallholders’ organization, lack of management capacity and lack of land titles are all hampering the development of the smallholders as an important force in oil palm production.

The report presents the strengths and weaknesses of the Thai oil palm smallholders found and identified in the survey. The ‘farmers’ are quite positive and ready to improve their farm practices, provided they have enough incentives and if they receive appropriate support. On the issue of weaknesses, the report presents a dozen clearly identified issues, which need to be tackled in a careful way.

The report also presents the opportunities and the threats, and although the demand for palm oil both for consumption and biodiesel is steadily growing, the difficulty of developing new oil palm plantations forms a threat. On this issue, the trend among the consumers for palm oil quality as to environmental and social standards may become a hurdle, especially on the issue of the lack of specific laws to accommodate and control stakeholders in the oil palm chain. Although the Thai Oil Palm Board (TOPB) has been set up, it is slow in action and delays policy implementation. High price for fertilizer and/or fluctuating FFB price at the CPO mill are other factors which are seen by the smallholders as a threat.

Based on the above analysis, recommendations to fill gaps and suggestions for moving toward a sustainable palm oil production have now been formulated. However, in order to implement those, oil-palm smallholder groups have first to be set up, and the members should strengthen their management capacity to implement the suggestions effectively. Those pioneering groups should probably be formed and ‘supported’ by the CPO mills with additional assistance from the relevant governmental institutions, active in the oil palm production regions.

The following principles and suggestions, necessary for moving toward a sustainable palm oil production by certified smallholders groups with RSPO standard should be carefully considered. An essential point for such a move is to try to reach the young smallholders and next generation, because the current smallholders may not easily change their individualistic attitude.

The eight principles and suggestions to close current gaps which hinder the move to a better future for those smallholders are the following.

1. Commitment to transparency: Smallholders should possess the land title of their plots.

2. Compliance with applicable law and regulations: Smallholders should be knowledgeable about relevant labour laws.

3. Commitment to medium- and long-term economic and financial viability: The smallholders should assess their farm’s economic and financial performance regularly by using their own farm-records to better develop their oil palm production and reduce the main production cost; fertilizer, harvesting, and transportation of FFB.

4. Use of appropriate best practices by the growers: The nine specified activities found in the report boil down to the short and simple statement: “Every smallholder should adopt good agricultural practices (GAP) in oil palm production”.

5. Environmental insight and responsibility, and conservation of natural resources and bio-diversity.

6. Responsible consideration of employees and of individuals and the community as a whole by the growers is a must.

7. Responsible development of new plantings, i.e. land suitability, avoiding steep slopes, prevent erosion, and do not expand into forest land nor in reserved areas. Avoid conflicts or negative social impacts caused by new plantings.

8. Continuous improvement of the key-activities: Every smallholder should be or become aware of his or her responsibility versus nature and fellow inhabitants of the area and be an active environmentalist too.

Additional recommendations to relevant government institutions boil down to the role of the following institutions: The agricultural extension office at district level; the institutions responsible for handing out “land title”; the agencies which operate oil palm research centres and those which control the fertilizer prices; the agencies as the Department of Agriculture and the Department of land development, as these provide soil and leave analysis to farmers; the financial institutions or credit providers, as these may consider special loans for those smallholders who have oil palm plots without land title; and so on. And last, but not least, specific recommendations for the CPO mills, as this organization has frequent contact with the smallholders and could as such play a crucial role in attracting young smallholders who are more flexible and may be motivated to make their careers.

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List of Abbreviation

BAAC	Bank for Agriculture and Agricultural Cooperatives
BMU	The German Federal Ministry of Environment, Nature Conservation and Nuclear Safety
CIRAD	French Agricultural Research Centre for International Development
CPO	Crude Palm Oil
DOA	Department of Agriculture
FFB	Fresh Fruit Bunch
GIZ	German International Cooperation
IPM	Integrated Pest Management
MOA	Ministry of Agriculture
OAE	The Office of Agricultural Economics
OER	Oil Extraction Rate
PSU	Prince of Songkla University
RSPO	Roundtable on Sustainable Palm Oil
UPOIC	United Palm Oil Industry Public Co., Ltd
SWOT	Strength, Weakness, Opportunity, Threat
S.D.	Standard Deviation
TOPB	Thai Oil Palm Board
R&D	Research and Development
GAP	Good Agricultural Practices

Definition

rai	Land Unit of Thailand (6.25 rai = 1 ha)
Baht	Thai Currency
Contracted Harvesters	Those who hired by the smallholders to harvest FFB on a job-basis, most hiring per ton of FFB
Contractors	Those who hired by the smallholders to work in the farm or related activities on a job-basis. Wages depend on their agreement.
Land title	There are various types of land title in Thailand. For each type, there is/are particular rights attached to its. Examples of land title are; Chanod, Nor Sor 3 Kor Nor Sor 3, Sor Por Kor, Por Bor Tor 5, Kor Sor Nor. For the parcel of land that has Nor Sor 3, land has to be used, registered ownership, and ownership can be applied for.



Chapter 1

Introduction

1.1 Background of the Project

In respect to the efforts made to face the challenges of climate change the introduction of bio-fuel has been controversially discussed. Also related to rising prices of fossil oil and the use of edible oils for the production of energy, the plantation of oil palm, especially in South East Asia, increased rapidly in the last years. On the other side the production of palm oil in particular has been criticized by the public to be harmful to the environment, increase the pressure on rising food prices and support bad working conditions, hence being incompatible with the efforts to promote sustainable development.

The project on Sustainable Palm Oil Production for Bio-energy in Thailand, commissioned by the German Federal Ministry of Environment, Nature Conservation and Nuclear Safety (BMU) under the International Climate Protection Initiative and implemented by GIZ in cooperation with the Thai government, the Office of Agricultural Economics (OAE) and several other partner institutions, aims to promote sustainable palm oil production and to support the establishment of certification systems for sustainable produced palm oil in Thailand. This aims also to prove the feasibility of the production and export of sustainable palm oil. Thailand will serve as an example on how to certify smallholder oil palm production systems and optimize the whole value chain with regards to efficiency and sustainability as well as export competitiveness. Part of the project is the initiation of a multi-stakeholder dialogue to adjust the sustainability standard of the Roundtable on Sustainable Palm Oil (RSPO) to the conditions in Thailand. Therefore, the feasibility of implementing the standard in Thailand will be tested and supported. Regarding the requirements of the RSPO standard and the conditions of palm oil production in Thailand it will be necessary to organize smallholder oil palm farmers and to coordinate the activities along the value chain with other stakeholders.

The project has selected 4 pilot mills and one cooperative in order to work together in the project. Around each mill smallholder oil palm farmer groups will be invited to put sustainable palm oil production into practice and improve their livelihoods. To monitor the impacts of the project on the farmer groups and to develop lessons learnt for further dissemination, it is necessary to assess the baseline information of the participating farmers. This information can be used in the course of the project for project planning, monitoring and to analyze the impact of the project intervention in upcoming stages.



1.2 Objective

This study has 2 objectives which are as follows:

1) To investigate the socio-economic characteristics, the practices of existing oil palm production, performances, major constraints, and the farmers' attitudes on important factors of the pilot farmer groups, before project intervention.

2) To identify gaps between the current farm practices, and the project goals, while proposing ways to close those gaps.

1.3 Research Methodology

1.3.1 Target Research Areas

The study involves 4 mills and 1 cooperative, which are located in 3 provinces; Krabi, Surat Thani, and Chonburi (Table 1.1). This study focuses on the *oil palm smallholders* who will participate and will not participate in the project. However, for the smallholders who have links with Suksomboon, they are in Trat and Srakaew provinces.

Table 1.1 List of mills/cooperative and locations

No.	Mills/ Cooperative	Province
1	United Palm Oil Industry Public Co., Ltd	Krabi
2	Univanich Palm Oil Public Co., Ltd.	Krabi
3	Aoluk Cooperative Ltd.	Krabi
4	The Southern Palm Oil Industry Co., Ltd (1993)	Surat Thani
5	Suksomboon Palm Oil Co., Ltd	Chonburi

1.3.2 Data collection

To achieve the above objectives, personal interviews were directed to the *smallholders* using a structured questionnaire. Details of the data collected are summarized below.

1) Population and Sample Size

A total of 503 smallholders were interviewed during March-July, 2010. From this number, 418 of them (83%) are those who participated in the project and the rest (17%) did not participate, but they are in the same plantation area. Details of the sample size, for each mill/cooperative, are summarized in Table 1.2-1.3. The atmosphere during the data collection is shown in Figure 1.1.

2) Structured Questionnaire

The structured questionnaire was divided into 6 parts, covering the following aspects:

Part 1 included the questions related to the socio-economic characteristics of the oil palm smallholders such as; age, education, gender, household member,

farmer's group/association membership, farmer's registration to MOA, main source of income, land ownership, farm equipment, household income and debt etc.

Part 2 covered the questions concerning oil palm production practices such as; experience in oil palm production, plantation area (harvested and non-harvested), land title, topography, soil type, land use before oil palm plantation, age of oil palm, replanting plan, source of water, oil palm variety, source of seedlings, labour and sources of labour (hired labour, household), soil management and fertilizer use, pest and pest management, harvesting management, selling the FFB, cost and return, farm record keeping, source of information and knowledge, assistances etc.

Part 3 was about problems the smallholders are facing.

Part 4 related to support and the training needs of the smallholders.

Part 5 covered the smallholder's suggestions, and opinions towards the sustainability of oil palm production.

Part 6 related to the aspects quality of life of the smallholders. These included; the subjective evaluation questions about the status of material standard of living, access to education, information, healthcare, status of health, leisure and social life, and aspects of physical environment and safety (See more details in Appendix 1).

Table 1.2 Summary of the sample size

Mills/ Cooperative	Sample size		
	No. of smallholders participate in the project	No. of smallholders do not participate in the project	Total smallholders
1. United Palm Oil Industry Public Co., Ltd	105	26	131
2. Univanich Palm Oil Public Co., Ltd.	96	26	122
3. Aoluk Cooperative Ltd.	100	-	100
4. The Southern Palm Oil Industry Co., Ltd (1993)	62	20	82
5. Suksomboon Palm Oil Co., Ltd	55	13	68
Total	418 (83%)	85 (17%)	503



Table 1.3 Details of population and sample size for each mill and cooperative

Mill/cooperative	No. of smallholders participate in the project		No. of smallholders do not participate in the project	Total smallholders
	Population	Sample		
1. United Palm Oil Industry Public Co., Ltd				
- Group 1 Ban Bog Hong	17	16	5	21
- Group 2 Ban Na Kao	39	37	8	45
- Group 3 Around the mill	53	52	13	65
Total	109	105	26	131
2. Univanich Palm Oil Public Co., Ltd.				
- Group 1 Ban Chonglam	22	22	5	27
- Group 2 Ban Hadtour	16	16	4	20
- Group 3 Ban Saihor	17	16	5	21
- Group 4 Ban Saihor	34	29	4	33
- Group 5 Ban Na Suan	13	13	8	21
Total	102	96	26	122
3. Aoluk Cooperative Ltd				
- Group 13 Ban Keantong	94	20	*	20
- Group 14 Ban Klongsaikao	91	20	*	20
- Group 15 Ban Klongsaikao	81	18	*	18
- Group 16 Ban Klongsaikao	76	20	*	20
- Group 17 Ban Klongrai	59	22	*	22
Total	401	100	0	100
4. The Southern Palm Oil Industry Co., Ltd (1993)				
- Group 1 Ban Saingam	23	23	7	30
- Group 2 Ban Kuantarae	25	23	7	30
- Group 3 Ban Tarongchang	16	16	6	22
Total	64	62	20	82
5. Suksomboon Palm Oil Co., Ltd				
- Group 1 (Borai)	20	20	6	26
- Group 2 (Klonghad)	35	35	7	42
Total	55	55	13	68

Remark: All smallholders who are members of the cooperative want to participate in the project

1.3.3 Data Analysis

This research is based on descriptive analysis using, for example, percentage, frequency, mean, and standard deviation etc. Data will be illustrated in tables and graphs.



The smallholders who have links with UPOIC



The smallholders who have links with Univanich



The smallholders who have links with Aoluk cooperative

Figure 1.1 The atmosphere during the data collection



The smallholders who have links with Suksomboon



The smallholders who have links with Southern

Figure 1.1 The atmosphere during the data collection (cont.)



Chapter 2

Baseline Study of Oil Palm Smallholders in Thailand

This chapter presents overall results drawn from the primary data collected from 503 oil palm smallholders in the study areas. The personal interviews revealed the following facts.

2.1 Basic Information about the Smallholders and their Farms

2.1.1 Socio-Economic Characteristics of Oil Palm Smallholders

Socio-economic characteristics of the smallholders are summarized in Table 2.1. The survey showed that around 80% of the smallholders are over 40 years of age, the average being 50 years. About 86% obtained at most only secondary education. Only 9.1% received a Bachelor's degree or higher. According to the smallholders' age and education, it is likely that they would have a limited knowledge for oil palm management. Nearly three-fourth of the smallholders are male. However, practically all housewives assist their husbands in some activities in the production of oil palm. Approximately one-half of the smallholders have 4-5 household members. On average, they have 4 people per household.

Most of the smallholders (78.7%) grow oil palms as the primary source of income while 12.3% of them grow rubber. 77.5% of the smallholders obtained income from more than one source. Examples of a secondary source of income were; rubber plantations, and oil palm plantation. It is clear that most of the smallholders, especially in the south, depend for their income on rubber and oil palm.

The survey also showed that 79.3% of the smallholders managed most of the oil palm activities with their own family members, while the rest (20.7%) used mainly hired labourers. The second group of the smallholders usually grows oil palms as a secondary source of income and they lack time for proper oil palm management. As for experience in oil palm production, it varies a lot among the smallholders in different areas, from a few to more than 20 years. Some 42% of the smallholders have more than 15 years of experience in oil palm production, whilst 43% of the smallholders have at most 10 years of experience. On average, they have 15 years of experience. Most of the smallholders in the South, i.e. 80% from Aoluk cooperative, have over 20 years of experience. They have more experience in oil palm production than those from Suksomboon in the eastern part of Thailand where the smallholders have experience of only 10 years at most. Most experience was gained from their own plantations (Figure 2.1).



Table 2.1 Socio-economic characteristics of oil palm smallholders

Item	No. (n=503)	%
Age (years)		
- ≤30	13	2.7
- 31 – 40	100	19.8
- 41 – 50	146	29.0
- 51-60	152	30.2
- > 60	92	18.3
Mean (S.D.)	50.4 (11.9)	
Education		
- Primary school or under	319	63.4
- Secondary school	112	22.3
- Diploma	26	5.2
- Bachelor or higher	46	9.1
Gender		
- Male	367	73.0
- Female	136	27.0
Household members (people)		
- 1-3	195	38.8
- 4-5	249	49.5
- >5	59	11.7
Mean (S.D.)	3.9 (1.4)	
Main occupation		
- Oil palm grower	396	78.7
- Rubber farmer	62	12.3
- Other crop grower	24	4.8
- CPO employee	9	1.8
- Others (government official, trader and raising livestock)	12	2.4
Other occupation		
- No	113	22.5
- Yes	390	77.5
List of other occupations*	(n=390)	
- Rubber farmer	113	29.0
- Oil palm grower	107	27.4
- Other farmer (i.e. livestock raising, vegetable or fruit tree growing)	86	22.1
- Merchant	47	12.1
- Worker	36	9.2
- Others (i.e. government official, entrepreneur)	35	9.0
Overall oil palm management		
- Own management	399	79.3
- Majority hired labour	104	20.7
Experience in oil palm production (years)		
- ≤ 5	90	17.9
- 6-10	126	25.0
- 11-15	76	15.1
- >15	211	42.0
Mean (S.D.)	15.0 (9.2)	

Remark: * An oil palm smallholder can give more than one answer

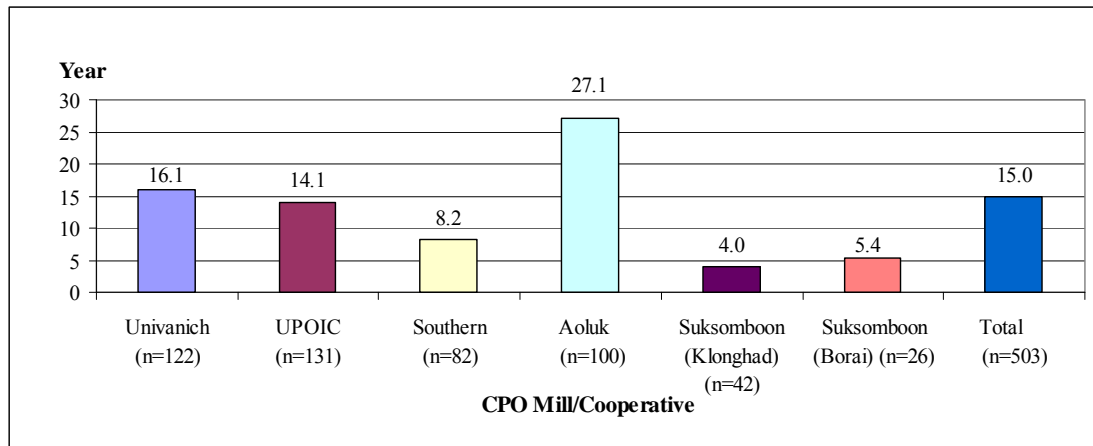


Figure 2.1 Experience in oil palm production of the smallholders

Table 2.2 summarizes income, debt, and farm assets of the smallholders. About 66% of the oil palm smallholders had a household income of at most 400,000 Baht per year. On average, they earned around 470,650 Baht per household per year. Of this amount, 60.2% was from oil palm production. The oil palm smallholders seem to have more income than other agriculturalists, except rubber farmers.

Credit plays an important role for the smallholders since 70.8% has continuous debt of nearly 300,000 baht per household. This amount of debt is much higher than the country's average, which is about 69,000 Baht per agricultural household in 2009 (OAE, 2010). Two-third of the smallholders relied on loans from the Bank for Agriculture and Agricultural Cooperatives (BAAC). Only 12.6% had a loan from a commercial bank and 13.5% had a loan from the agricultural cooperative, especially the smallholders from Aoluk. The majority of the smallholders used their loans for agricultural production and buying property. They used their loans primarily for oil palm production and other agricultural activities (61.5%), the purchasing of cars or trucks (14.6%), purchasing land (14%), and house construction (10.7%).

As to farm assets, the survey showed that the most popular assets are; 4-10 wheel trucks, mowers, weed sprayers, oil palm spades, weed sprayers, oil palm scythes, and a tractor, respectively.

Table 2.2 Income, debt, and farm assets of oil palm smallholders

Item	No. (n=503)	%
Total household income (Baht/year)		
- ≤200,000	123	24.4
- 200,001-400,000	207	41.2
- 400,001-600,000	103	20.5
- 600,001-800,000	19	3.8
- >800,000	51	10.1
Mean (S.D.)	470,649.5 (578,741)	

Table 2.2 Income, debt, and farm assets of oil palm smallholders (cont.)

Item	No. (n=503)	%
Income from oil palm production (% of total income)		
- ≤ 25	64	12.7
- 26 – 50	161	32.0
- 51 – 75	123	24.5
- 76 – 100	155	30.8
Mean (S.D.)	60.2 (27.3)	
Household debt		
- No	147	29.2
- Yes	356	70.8
Amount of debt (Baht/household)	(n=356)	
- ≤200,000	189	53.1
- 200,001-400,000	66	18.6
- 400,001-600,000	40	11.2
- >600,000	61	17.1
Mean (S.D.)	391,423.4 (556,153)	
Source of debt*	(n=356)	
- BAAC	238	66.9
- Other commercial banks	45	12.6
- Agricultural cooperative	48	13.5
- Village fund	14	3.9
- Others (i.e. finance, neighbour, informal source)	51	14.3
Objective of loans*	(n=356)	
- Oil palm production	164	46.1
- Other agricultural activities	55	15.4
- Purchasing of car and truck	52	14.6
- Purchasing of land	50	14.0
- House construction	38	10.7
- Others (children education, household expense, and invest in other business)	49	13.8
Farm assets*	(n=503)	
- 4-10 wheel truck	305	60.7
- Tractor	76	15.1
- Springer and watering instrument	38	7.6
- Oil palm scythe	196	39.0
- Oil palm spade	256	50.9
- Weed sprayer	234	46.5
- Mower	290	57.7
- Cart	11	2.2

Remark: * An oil palm smallholder can give more than one answer

2.1.2 Membership of Oil Palm Groups and Motivation to Grow Oil Palms

Normally, the agricultural office at the district level is responsible for the registration of major crop growers, and attempts to encourage the farmers to register with the office, in order to improve the government database on economic crops. However, the survey showed that only 61.2% of oil palm smallholders had registered. This may be the main reason for the poor database on oil palm at the regional and



national levels. As to oil palm groups and association membership, it is now clear that only one-fourth of the smallholders are members. When the smallholders were asked about their motivations to grow oil palm, their responses were interesting. The highest proportion, 42.2%, indicated that they grew oil palm because of the high price of FFB, and therefore a high return. One-third grew oil palm because it is not difficult to manage compared to other crops. Around one-fourth the smallholders chose oil palm because it is appropriate to the environment and 17.3% of them grew oil palm because they expected to earn income faster. Also it is interesting to take note in this area that the economic factor plays a major role to the smallholders' decision to grow oil palm. Other factors are summarized in Table 2.3.

Table 2.3 Oil palm groups membership and motivation to grow oil palm

	No. (n=503)	%
Oil palm groups membership/association		
- No	378	75.2
- Yes (excluding formed by GTZ)	125	24.8
Oil palm grower registration		
- No	195	38.8
- Yes	308	61.2
Motivation to grow oil palm *		
- High income and price	212	42.2
- Not difficult to manage plantation	167	33.2
- Appropriate environment	119	23.7
- Rapid yield	87	17.3
- Promoted by the cooperative	55	10.9
- Popular among the locals	44	8.7
- Bequest	34	6.8
- Facing disease in rubber	25	5.0
- Close to mill and buyer	17	3.4
- Wanting to diversify the crop	17	3.4
- Others (i.e. less labour problems compared to rubber, convinced by neighbour)	46	9.1

Remark: * An oil palm smallholder can give more than one answer

2.2 Characteristics of Oil Palm Production and Management by Smallholders

2.2.1 Relevant Aspect of Land, Topography, Soil and Oil Palms

On a per household basis, smallholders owned on average about 66.8 rai (10.69 ha), while some 63% of them owned at most 50 rai. Only 12.5% owned more than 100 rai. However, the smallholder owns more than the country's average which is 22.62 rai per agricultural household (OAE, 2010) (Table 2.4 and Figure 2.2).

For oil palm production, the average area is 44.9 rai (7.18 ha). Some 48.2% of them own up to 25 rai of oil palm plots and 31.6% own 26-50 rai per household. Smallholders own, on average, 2 oil palm plots, whilst 46.5% of the smallholders have only one plot (Table 2.4 and Figure 2.3).



The majority of land, at all oil palm plots (1,012 plots), owned by the smallholders had the land title. The most popular land title among them was Nor Sor 3. However, Sor Por Kor, and Por Bor Tor 5 were more common. The survey also showed that 8% (81 out of 1,012) of the oil palm plots had no land title (Table 2.4 and Figure 2.4).

Up to 61.9% of the oil palm plots are in plain areas, while 17.2 % and 15.7% of the plots are on hilly and sloping, and lowland areas, respectively. Oil palm plantation on hilly and sloping land must have soil conservation practices. For soil characteristics, most oil palm plots have clay, loam, sandy loam, gravelly soil, and sandy soil, respectively.

Land usage prior to oil palm was various. Nearly 40% of oil palm plots were un-used land, while some 26.6% was used for rubber production, 17% was used for other agricultural activities, and 13.2% was used for rice paddies. Only 1.5% had “always” been used for oil palm production (Figure 2.5). It is clear from the above information that un-used land and many agricultural plots, i.e. rubber and paddy field in the Southern part of Thailand, and sugarcane and cassava in Srakaew province, are replaced by oil palm. Some of the reasons the smallholders choose rubber for oil palm are that rubber requires extensive labours, and rubber trees may have disease in some areas. As to other crops such as; rice, sugarcane, and cassava, low net return is the main reason for the replacement. Since physical supply for land is fixed, competition among alternative uses cannot be avoided. Increasing productivity of oil palm production must be a key issue to focus to mitigate the problem of limited land use.

On average, palm trees are 11.8 years old. 46.7% of the oil palm plots have at most 8-year old palm trees, especially in the newly planted areas in Eastern provinces, Srakaew and Trat. In contrast, some 15.6% of oil palm plots have old oil palm trees (20+ years old), and the majority are owned by the smallholders in Aoluk (Figure 2.6). The findings also showed that some smallholders still maintained their old oil palms (25+ years old). Generally, old oil palms are not optimally productive and will also increase the cost of FFB production. Of the smallholders, 36.5% have plans to replant their old oil palms and most of them (85.7%) will replant those in the next few years. Only 11.7% of the smallholders intend to expand the area of oil palm production with an average acreage of 38.1 rai. It is clear that most of those expansions would come to replace other crops and will take place on the land of the larger farms.



Table 2.4 Land, topography, soil and oil palm tree

Item	No. (n=503)	%
Land ownership (rai/household)		
- ≤25	155	30.8
- 26-50	160	31.8
- 51-75	76	15.2
- 76-100	49	9.7
- >100	63	12.5
Mean (S.D.)	66.7 (101.7)	
Area of oil palm production (rai/household)		
- ≤25	243	48.2
- 26-50	159	31.6
- 51-75	40	8.0
- 76-100	30	6.0
- >100	31	6.2
Mean (S.D.)	44.6 (65.5)	
Number of oil palm plots (plot/household)		
- 1	234	46.5
- 2	133	26.4
- 3	78	15.5
- >3	58	11.6
Mean (S.D.)	2.0 (1.3)	
Land ownership for oil palm plot *	(n=1,012 plots)	
- Owned	1,012	100.0
Land title	(n=1,012 plots)	
- Chanod	143	14.1
- Nor Sor 3 Kor	29	2.9
- Nor Sor 3	313	30.9
- Sor Por Kor	245	24.2
- Por Bor Tor 5	151	14.9
- Kor Sor Nor 5/Kor Sor Nor 3	36	3.6
- Others	14	1.4
- No title	81	8.0
Topography	(n=1,012 plots)	
- Plain	626	61.9
- Hilly and mountainous	174	17.2
- Lowlands	159	15.7
- Highlands	53	5.2
Soil characteristics	(n=1,012 plots)	
- Gravelly soil	142	14.0
- Clay	297	29.3
- Sandy soil	120	11.9
- Loam	269	26.6
- Sandy loam	184	18.2
Land use prior to oil palm	(n=1,012 plots)	
- Rubber Plantation	269	26.6
- Un-used land	401	39.6
- Other agricultural land	172	17.0
- Oil palm plantation	15	1.5
- Paddy field	134	13.2
- Not available	21	2.1

Table 2.4 Land, topography, soil and oil palm tree (cont.)

Item	No. (n=503)	%
Age of oil palm tree (years)	(n=1,012 plots)	
- ≤3	139	13.7
- 4-8	334	33.0
- 9-14	194	19.2
- 15-20	187	18.5
- >20	158	15.6
Mean (S.D.)	11.8 (8.6)	
Oil palm replanting plan	(n=230)	
- No	146	63.5
- Yes	84	36.5
Year to replant	(n=84)	
- 2010-2012	72	85.7
- 2013-2015	11	13.1
- After 2015	1	1.2
Plan for new plantation		
- No	444	88.3
- Yes	59	11.7
Average expansion area (rai) (S.D.)	38.1 (72.5)	

Remark: * An oil palm smallholder can give more than one answer

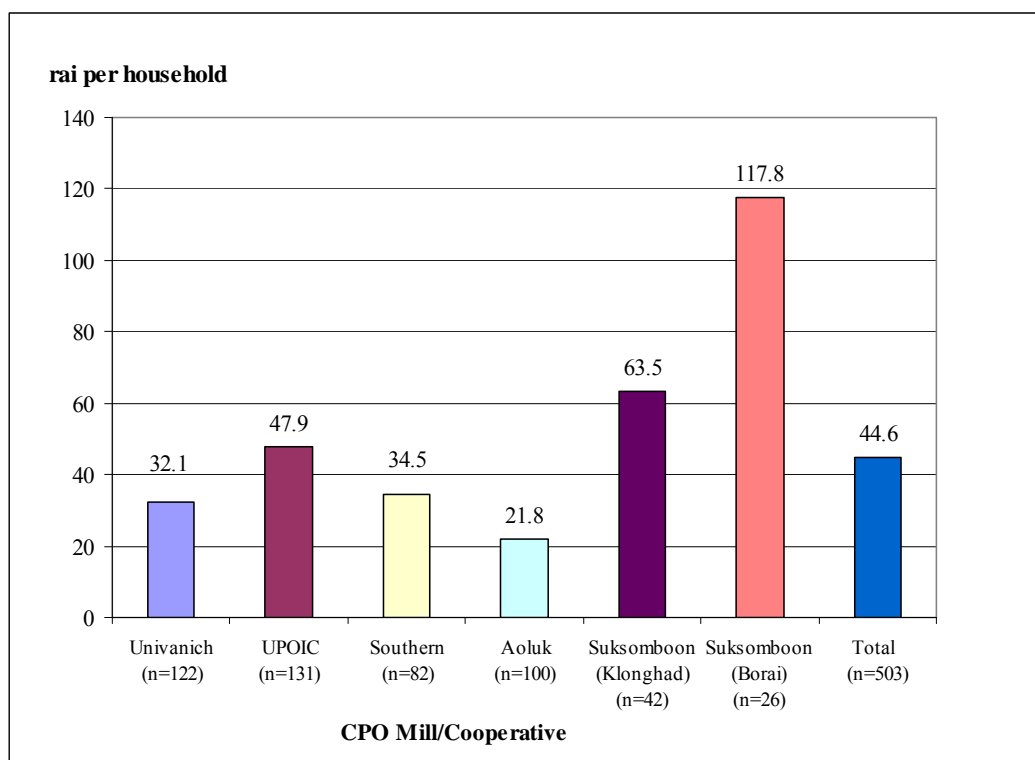


Figure 2.2 Average area of oil palm production

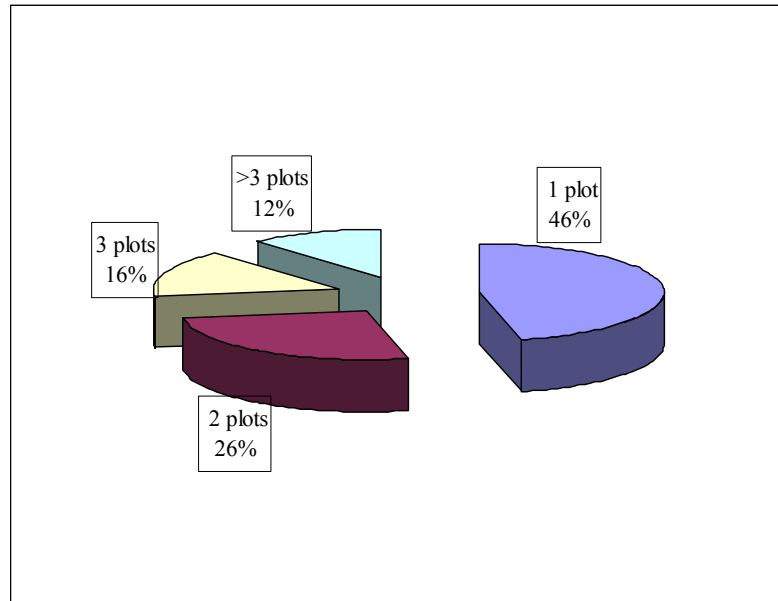


Figure 2.3 Number of oil palm plots owned by smallholders

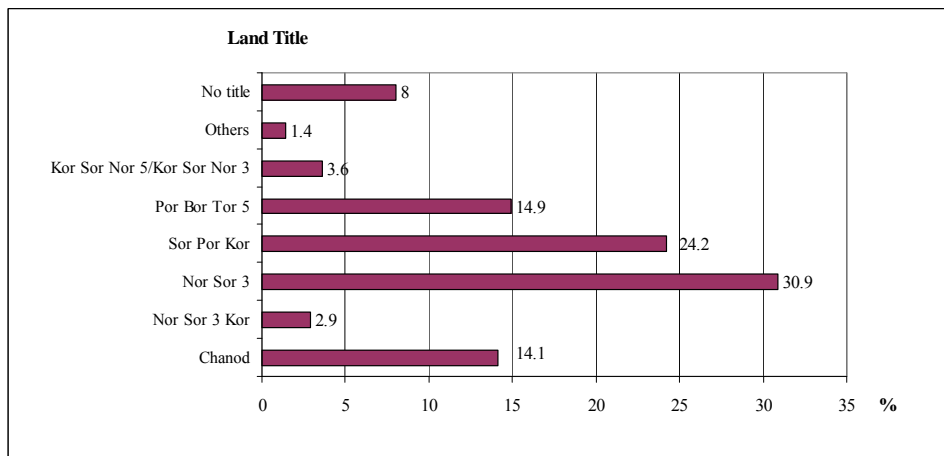


Figure 2.4 Land title of oil palm plantation

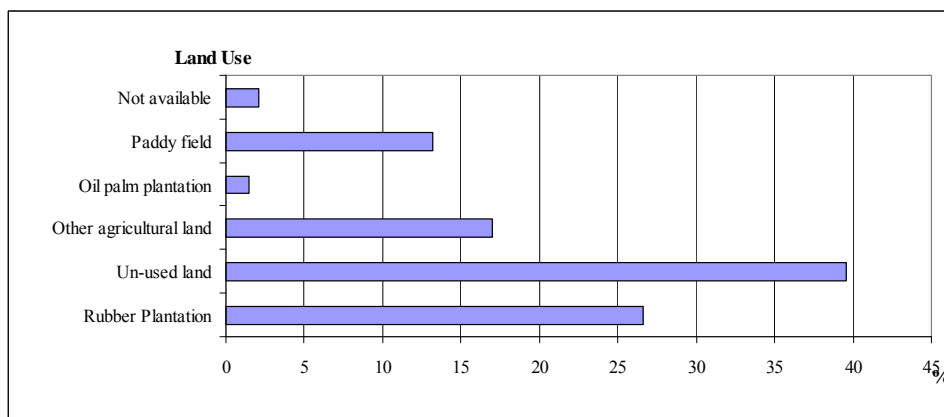


Figure 2.5 Land use prior to oil palm

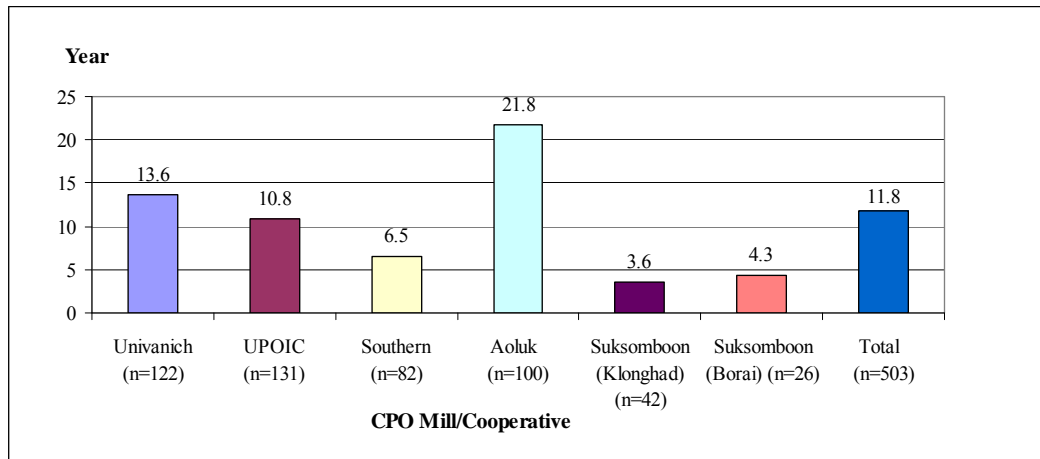


Figure 2.6 Age of oil palm tree classified by CPO mill

2.2.2 Variety of Oil Palm and Source of Seedlings

The survey showed that nearly all oil palm smallholders (99.2%) grow *tenera* (variety), because palm fruits of *tenera* contain the most oil. However, on some plots *dura* still exists (Table 2.5). By using *dura* seedlings, it is definite that they will get a low crop yield and low return on investment. It is also weird that some 5.2% of the smallholders do not know the oil palm variety they have planted. Hopefully, it would be *tenera*. Generally, the *tenera* grown is called according to trademark name or its origin i.e. Compact, CIRAD, Costa Rica, Surat Thani, and so on.

At least three-fourth of the smallholders purchased seedlings from oil palm nursery operators who had licenses issued by Department of Agriculture (DOA) i.e. oil palm companies in the study areas. About 18% of them bought seedlings from the private nurseries. Only 13% of them purchased seedlings from other sources, i.e. oil palm research centre. The main factors affecting the smallholders' decision to buy seedlings were; their quality, and the convenience to excess. Most smallholders used 7-12 months old seedlings. On most plots, 22 oil palm trees per rai were generally planted (Table 2.5). As for the age of seedlings used and the number of palm trees planted per rai, these are in line with the appropriate practices (Industrial Promotion Centre Region 10, 2008).

Table 2.5 Variety of oil palm planted by smallholders

Item	No. (n=503)	%
Variety *		
- Tenera	499	99.2
- Dura	24	4.8
- Not known	26	5.2
Source of seedlings*		
- Oil palm company	381	75.7
- Private nursery	91	18.1
- Others (i.e. Malaysia, government institution oil palm research centre, agricultural college, extension office)	65	12.9



Table 2.5 Variety of oil palm planted by smallholders (cont.)

Item	No. (n=503)	%
Factors affecting decision to buy seedlings *		
- Quality of seedlings	227	45.1
- Well accepted source/with license	223	44.3
- Convenience	140	27.8
- Supported by cooperative	38	7.6
- Cheap price	16	3.2
- Others (i.e. technical supervision, credit)	35	6.9
Number of palm trees per rai		
- ≤20	52	10.3
- 22	330	65.6
- 24	107	21.3
- >24	14	2.8
Age of seedlings (month)	(n=503)	
- 5 – 6	33	6.6
- 7 – 12	450	89.5
- > 12	20	3.9
Mean (S.D.)	9.8 (2.6)	

Remark: * An oil palm smallholder can give more than one answer

2.2.3 Use of Labour in Oil Palm Production

Table 2.6 summarizes the information on labour management in oil palm production. The results revealed that more than 70% of the smallholders used both family and hired labourers. The most popular activities (excluding FFB harvesting) utilizing family labour were; general management, applying fertilizer, weeding, transportation of FFB, and pruning, respectively. A smallholder had, on average, 1.7 people (80.8% of them had at most 2 people), working in the plantation. In contrast, the average amount of hired labour was 4.1 people per household.

The main reason for hiring labourers by the smallholders was insufficient household labour and/or lack of time. Of the smallholders who hired labour, only 28.1% of them provided fringe benefits to its labourers, especially food and housing. The labourers who obtained fringe benefits were those usually working full-time in the plantation.

Hired labourers worked in the plantation without any contract and they were not informed about labour rights. Half of the smallholders do not have any information about the minimum wage. Some 89% of the smallholders are aware of the farm injuries and most of them (96.5%) took preventive measures such as; putting on boots, wearing long-sleeved shirt and pants, and putting on mask, respectively.

With respect to accidents occurring to labourers on the farm, the interviews revealed that some 9.6% of the smallholders had encountered this problem and most of the accidents were not serious. Some 12.3% of the smallholders faced the issue of misunderstanding or unhappiness of hired labourers. This problem was usually solved by compromising or making new agreements, changing the labour team, clarifying misunderstanding issues, and help of third party. It is worth to note here



about labour issues in oil palm production that hiring labour was managed informally, unlike in other businesses, a rather unique aspect of the Thai agricultural production units.

The survey also indicates that oil palm smallholders, who hired labour, mostly hired them from their provinces. Most wages in oil palm production areas of Southern Thailand were determined on a job-basis, while in the newly production areas in the Eastern region most of the wages are set on a daily basis. Wages varied among activities, for example, an average wage for pruning was 9.1 Baht per tree (the average cost of pruning in Malaysia was RM 1.38 (Rahman, Ayat K. Ab, et al., 2008). For the transportation of FFB, wages were based on the distance between the ramp or mill and the smallholders' farm. From the sample smallholders, an average wage was 182.9 Baht per ton of FFB. For applying fertilizer, the average wage was 32.2 Baht per sack. Wages for other activities are shown in Table 2.7. It is known that when their wages are set on a job-basis, the labourers seem to work more efficiently. This type of arrangement is quite suitable for the growers in those areas which are short of labourers.

Table 2.6 Labour and labour management

Item	No. (n=503)	%
Source of labour*		
- Household labour	468	93.0
- Hired labour	405	80.5
Type of work using household labour *	(n=468)	
- Applying fertilizer	319	68.2
- Weeding	261	55.8
- General management	377	80.6
- Pruning	130	27.8
- Transportation of FFB	168	45.7
Number of household labours (people)	(n=468)	
- 1	167	35.7
- 2	211	45.1
- > 2	90	19.2
Mean (S.D.)	2.0 (1.0)	
Number of hired labours (people)	(n=405)	
- 1 – 3	147	36.3
- 4 – 6	172	42.5
- > 6	86	21.2
Mean (S.D.)	4.9 (3.0)	
Reason for hiring labour*	(n=405)	
- Insufficient household labour/lack of time	343	84.7
- Lack of skill and equipment	67	16.5
- Convenience in management	22	5.4
- Help labour	1	0.2



Table 2.6 Labour and labour management (cont.)

Item	No. (n=503)	%
Fringe benefit for labour	(n=405)	
- No	291	71.9
- Yes	114	28.1
Type of fringe benefit*	(n=114)	
- Food	68	59.6
- Housing	43	37.7
- Health insurance	15	13.2
- Healthcare, fuel, bonus, water supply, transportation	30	26.3
Hiring contract	(n=405)	
- No	402	99.3
- Yes	3	0.7
Information about minimum wage	(n=503)	
- No	247	49.1
- Yes	256	50.9
Informing about labour rights	(n=405)	
- No	388	95.8
- Yes	17	4.2
Awareness of farm injuries to labour	(n=503)	
- No	20	4.0
- Yes	483	96.0
Use of preventive measures	(n=483)	
- No	17	3.5
- Yes	466	96.5
Types of preventive measures*	(n=466)	
- Wearing long-sleeved shirt and pants	344	73.8
- Boots	425	91.2
- Mask	93	20.0
- Gloves	164	35.2
- Cap/Headgear	62	13.3
- More cautious	18	3.9
Accident occurred to hired labour	(n=405)	
- No	366	90.4
- Yes	39	9.6
Misunderstanding, or unhappiness of hired labour	(n=405)	
- No	355	87.7
- Yes	50	12.3
Type of management in case of misunderstanding/unhappiness of hired labour	(n=50)	
- Compromise or making new agreement	19	38.0
- Change to new labour team	10	20.0
- Clarify issue (misunderstood)	10	20.0
- Compromised by third party	10	20.0
- Warning	1	2.0

Remark: * An oil palm smallholder can give more than one answer

Table 2.7 Example of wage rate classified by activity (excluding FFB harvesting)

Item	No. of smallholders	Average wage
Hired labour in their provinces		
- Pruning (Baht/tree)	185	9.9
- Transportation of FFB (Baht/ton)	181	184.1
- Applying fertilizer (Baht/sack)	112	32.2
- Spraying (Baht/20 liter)	77	137.3
- Mowing (Baht/rai)	74	255.4
Hired labour from other provinces		
- Pruning (Baht/tree)	67	13.1
- Transportation of FFB (Baht/ton)	46	167.4
- Applying fertilizer (Baht/sack)	20	30.3
- Spraying (Baht/20 liter)	21	141.0
- Mowing (Baht/rai)	12	300.5

2.2.4 Water and Soil Management in Oil Palm Production

Table 2.8 summarizes the survey results regarding water and soil management of the smallholders. Most oil palm smallholders (89.1%) depend only on rainfall as the water source for oil palm production. Even though irrigation can significantly improve oil palm yield, most smallholders have not yet applied such system. This may be due to lack of water supply or to the high investment cost.

The result also revealed that 98.4% of the smallholders applied fertilizer. Of this figure, only 18% applied both organic and chemical fertilizers. The majority applied chemical fertilizer (Figure 2.7). Among these, 46.6% applied fertilizers twice a year. 13% applied chemical fertilizers once a year. About 34% and 6.8% of them applied chemical fertilizer three times and more a year, respectively. On average, the smallholders applied chemical fertilizer to the amount of 48.2 kg per rai (around 2 kg per tree) for each application. The most important factors affecting the smallholders' decision to apply fertilizer were the circle of applying fertilizer, appropriate timing, the price of fertilizer, and available capital, in this order. Only 5.3% and 4.6% of them applied fertilizers based on soil and leaf analysis, respectively. This evidence indicates very clearly the inappropriate practices undertaken by most smallholders. One of the main reasons is that they have no access to soil and leaf analysis facilities, which are not available throughout the oil palm production areas. Therefore, to help solve this problem should be a priority for the oil palm smallholders' intervention.

Only a small number of the smallholders (10.1%) grew cover crops in the plantations. The most popular cover crop was legume. Similarly, only 17.5% of the smallholders applied soil erosion protection measures. However, some 69.4% of the smallholders used other measures to improve soil fertility, especially using oil palm frond and leaves, and empty bunches, respectively. It is evident that empty bunches will increase nitrogen (N) to the soil and reducing fertilizer's cost for the smallholders.

As for information about soil and fertilizer, 79.3% of the smallholders indicated that they received such information. The survey also showed that the government officials, the extension officer from the mill, or a friend, respectively, played a significant role in providing information regarding soil and fertilizer management. Other sources of advice came from officers from the fertilizers' company, and from publications and the media, respectively (Figure 2.8). If we want to improve the knowledge of the smallholders, information flows via the farmers' group could thus be rather efficient.

Table 2.8 Water and soil management in oil palm production

Item	No. (n=503)	%
Source of water		
- Only rainfall	448	89.1
- Irrigation system	55	10.9
Use of fertilizer		
- No	8	1.6
- Yes	495	98.4
Type of fertilizer*	(n=495)	
- Organic	108	21.8
- Chemical	476	96.2
Amount of chemical fertilizer for each application (kg/rai)	(n=476)	
- ≤ 30	66	13.9
- 31-50	274	57.6
- > 50	136	28.5
Mean (S.D.)	48.0 (21.0)	
Frequency of applying chemical fertilizer (time/year)	(n=476)	
- 1	62	13.0
- 2	222	46.6
- 3	160	33.6
- > 3	32	6.8
Mean (S.D.)	2.4 (1.0)	
Factor affecting the smallholders' decision to apply fertilizer*	(n=495)	
- Price of fertilizer	67	13.5
- Period of applying fertilizer (circle)	195	39.4
- Appropriate timing (i.e. rain, soil moisture)	174	35.1
- Capital availability	57	11.5
- Age of palm tree	47	9.5
- Result of soil analysis	26	5.3
- Result of leaf analysis	23	4.6
- Price of FFB	22	4.4
- Brand of fertilizer	23	4.6
- Oil palm yield	6	1.2
- Convinced by neighbour	3	0.6

Table 2.8 Water and soil management in oil palm production (cont.)

Item	No. (n=503)	%
Cover crop	(n=503)	
- No	452	89.9
- Yes	51	10.1
Type of cover crop	(n=51)	
- Legume	43	84.3
- Others	8	15.7
Adoption of soil erosion protection measure	(n=452)	
- No	373	82.5
- Yes	79	17.5
Other measure to improve soil fertility	(n=503)	
- No	154	30.6
- Yes	349	69.4
Measure to improve soil fertility *	(n=349)	
- Use of oil palm frond and leaf	281	80.5
- Use of oil palm empty bunch	112	32.1
- Others (i.e. animal manure)	16	4.6
Receiving information about soil and fertilizer management	(n=503)	
- No	104	20.7
- Yes	399	79.3
Source of information about soil and fertilizer management*	(n=399)	
- Extension officer from CPO mill	69	17.3
- Sale Officer from fertilizer company	53	13.3
- Government officer	169	42.3
- Own experience	121	30.3
- Friend	69	17.3
- Other sources (i. e. book, internet, ramp)	29	7.3

Remark: * An oil palm smallholder can give more than one answer

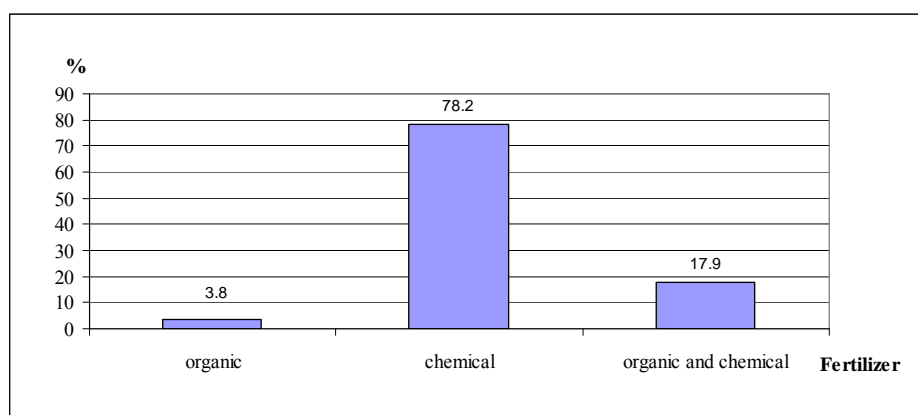


Figure 2.7 Type of fertilizer applied by smallholders

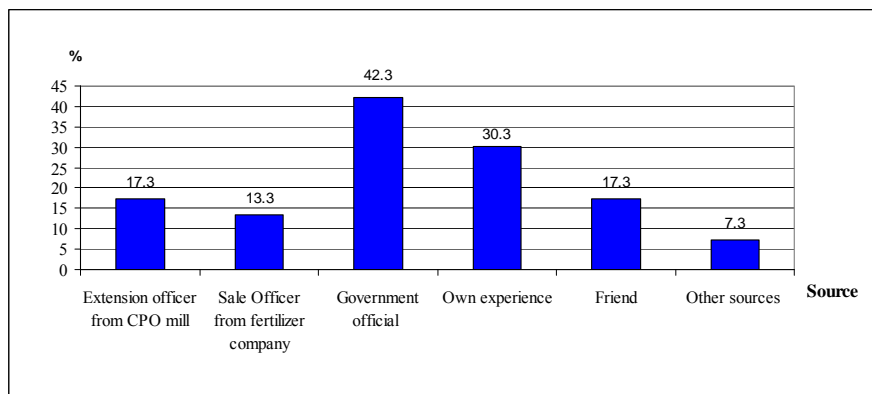


Figure 2.8 Source of information about soil and fertilizer management

2.2.5 Pest Management in Oil Palm

Data on pest management in oil palms are summarized in Table 2.9. The survey showed that major problems of pests were; weeds, rats, disease, and insects, respectively. To cope with them, the smallholders used different measures, for example, to get rid of weeds 60.1% of the smallholders used chemicals. To control rats, the uses of non-chemical measures, such as; traps, or nets were the most popular. As for disease control, half of the smallholders facing it did not apply any measures. Overall, 55% of the smallholders used chemicals in pest management.

For those who used chemicals, the survey showed that almost all smallholders (96.0%) used chemicals for the purpose of treating rather than for preventing pests. When using chemicals, 61.6% of them used it all at one time, while the rest (38.4%) stored part of it. Of this amount, the majority (71.6%) of the smallholders stored it in their houses. Most smallholders (90.9%) used protective guards when they had to apply chemicals. The most popular were gloves and masks. However, some 9.1% of them did not use any safety guards. To dispose of hazardous containers, some smallholders sold those, left the containers in the plantation, disposed those in the home bin, or kept those for agricultural use, respectively. It is evident that most smallholders did not adopt appropriate practices for the disposal of hazardous containers. However, when they were asked about their understanding the harmfulness of pesticide, 98.6% of them seem to be aware of it.

Only 52.1% of the smallholders received information about pest management. For those receiving it, the sources were various. 28.6% of them obtained it from the government officials, 17.6% got it from the extension officer from the CPO companies, and 16.4% received it from the chemicals company. As for Integrated Pest Management (IPM), the result revealed that only 7.0% of the smallholders had a proper idea about the concept of IPM.

Table 2.9 Pest management in oil palm

Item	No. (n=503)	%
Type of pests*		
- Weeds	391	77.7
- Rats	322	64.0
- Disease	154	30.6
- Insects	101	20.1
Weeding*	(n=391)	
- Use chemical	235	60.1
- Non- chemical measure	204	52.1
- Integrated measures	10	2.6
- Without management	8	2.0
Rat management*	(n=322)	
- Use chemical	53	16.5
- Non- chemical measure (i.e. use of trap, use net to cover oil palm tree)	193	60.0
- Integrated measures	7	2.2
- Without management	176	54.7
Disease management*	(n=154)	
- Use chemical	33	21.4
- Non- chemical measure (i.e. get rid of infected leaf)	73	47.4
- Without management	78	50.4
Insect management*	(n=101)	
- Use chemical	34	34.0
- Non-chemical measure (i.e. get rid of infected leaf)	42	42.0
- Without management	38	38.0
- Lack of appropriate measure	1	1.0
Chemical use in pest management	(n=503)	
- No	227	45.1
- Yes	276	54.9
Purpose of chemical use	(n=276)	
- Preventive measure	11	4.0
- Treating	265	96.0
Chemical storage	(n=276)	
- No storage (apply all)	170	61.6
- Yes	106	38.4
Storage	(n=106)	
- Storage room	76	71.6
- Near by house	25	23.6
- Cottage in the plantation	5	4.8
Safety guards when using chemical	(n=276)	
- Gloves and mask	197	71.4
- Mask	43	15.5
- Gloves	11	4.0
Without any safety guard	25	9.1

Table 2.9 Pest management in oil palm (cont.)

Item	No. (n=503)	%
Disposal of hazardous containers	(n=276)	
- Sell	133	48.2
- Leave in plantation	56	20.3
- Keep it for agricultural use	28	10.1
- Burn or bury	34	12.3
- Dispose to home bin	17	6.2
- Near by house	8	2.9
Perception about harmfulness of pesticides	(n=276)	
- No	4	1.4
- Yes	272	98.6
Receiving information about pest management	(n=503)	
- No	241	47.9
- Yes	262	52.1
Source of information about pest management*	(n=262)	
- Experience	96	36.6
- Extension officer from CPO	46	17.6
- Officer from chemical company	43	16.4
- Government officer	75	28.6
- Neighbour	18	6.9
- Other sources (i.e. book, TV)	49	18.7
Perception about IPM	(n=503)	
- No	468	93.0
- Yes	55	7.0

Remark: * An oil palm smallholder can give more than one answer

2.2.6 Harvesting Management and Selling of FFB

The survey indicates that 96.6% of the smallholders had harvested their palms (Table 2.10). In order to harvest FFB, the smallholders tend to depend on hired labourers. About 82.4% of them hired the labourers, while the rest used family members (Figure 2.9). Among these, the majority hired the contracted harvesters. Most of the contracted harvesters (89.8%) were independent from the ramp and mill. Harvesting cycles varied a lot, namely from 15-30 days. However, most of them harvested oil palm within the recommended period of 15-20 days. On average, the harvesting cycle was 19.2 days. Since most smallholders hired the contracted harvesters, the real harvesting cycle may be shorter or longer. The evidence of shorter harvesting cycles is supported by the number of unripe FFB, which had been harvested. It was also found that a rather high proportion of the smallholders (88.8%) who hired harvesting labourers did not pay attention to the quality of FFB. They did not have any condition or punishment on harvesting of unripe FFB even if it will reduce the quality of FFB. The rest (11.2%) put conditions on harvesting of unripe FFB. From this, 48.9% did not allow the contracted harvesters to harvest unripe FFB, 24.4% deduct the harvesting fee paid to the harvesters if the CPO mill returned unripe FFB, 15.6% and 8.9% did not pay for the harvesting and stopped hiring, respectively. Most smallholders did not pay attention to the quality of FFB because they do not

have enough incentives to manage it, receiving the same price for better quality. This problem is one of the most serious issues in the Thai oil palm industry.

The most important factors affecting the smallholders' decision to harvest FFB was ripeness (80.3%). Other factor was the harvesting cycle (14.0%). The fee paid to the contracted harvesters depended upon their agreement, which in many cases included transportation cost. For example, a harvesting fee of 320.3 Baht per ton, on average, would increase to 485.8 Baht per ton if transportation cost was included.

Table 2.10 Harvesting management

Item	No. (n=503)	%
Harvested palm tree	(n=503)	
- Non-harvested	17	3.4
- Harvested	486	96.6
Labour used*	(n=486)	
- Household	88	18.1
- Hired labour	401	82.4
Period of harvest (day)	(n=486)	
- < 20	136	28.0
- 20	309	63.6
- > 20	41	8.4
Mean (S.D.)	19.2 (3.0)	
Condition or punishment for harvesting unripe FFB	(n=401)	
- No	356	88.8
- Yes	45	11.2
Type of condition/ punishment	(n=45)	
- Deduct harvesting fee if the CPO factory return the FFB	11	24.4
- Stop hiring	7	15.6
- Not allowed to harvest unripe FFB	22	48.9
- No payment for harvesting	4	8.9
- Unripe FFB more than 5 bunches, deduct harvesting fee	1	2.2
Factor affecting the smallholders' decision to harvest FFB	(n=486)	
- Ripeness	390	80.3
- Harvesting cycle	68	14.0
- Labour availability	20	4.1
- Up to the buyer	7	1.4
- Price of FFB	1	0.2
Type of contract harvester	(n=304)	
- Independent contractor	273	89.8
- Ramp	21	6.9
- Relative	10	3.3
Fee paid to contractor	Average Wage	
- Harvesting only (Baht/ton)	310	
- Harvesting + transporting (Baht/ton)	468	

Remark: * An oil palm smallholder can give more than one answer

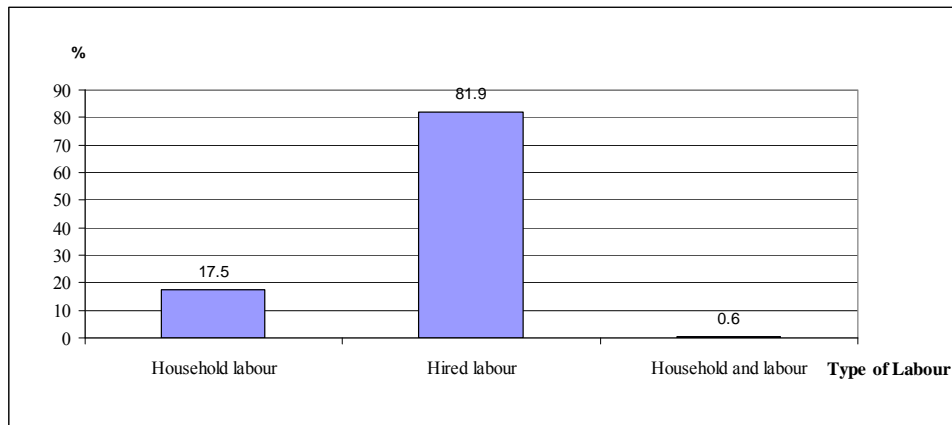


Figure 2.9 Labour used for harvesting

Table 2.11 summarizes the information on the selling of FFB. The highest proportion (36.2%) of the smallholders sold their FFB to the mill. About 26.8% and 24.9% of them sold their FFB to independent and cooperative ramps, respectively. The rest (12.1%) sold to the mill ramp (Figure 2.10). Most of those who sold FFB to the cooperative ramps, were from the Aoluk cooperative, while those who sold FFB to mill ramps were mainly from Klonghad and Borai, the Eastern part of Thailand where only mill ramps purchase their FFB.

The factors affecting the smallholders' decision to sell FFB to the buyers were various (Table 2.11). Those are fair balance and system of FFB grading, high FFB price, and closeness to buyer. For example, the main reasons to sell FFB to the mill were fairness of the balance and of the system of FFB grading (67.6%), high FFB price (62.5%), and closeness to the mill (33.0%). Most of those (94.6%) who sold FFB to the independent ramp indicated that they were close to a ramp. The main reason for them to sell FFB to the cooperative ramp is their membership.

The result also revealed that the distance between the plantation and the buyer was 6.5 km on average. About 54.8% of the smallholders were close to the buyers, 4 km at most. To transport FFB from plantation to buyer, 53.5% of the smallholders hired a contractor, while 45.7% managed it on their own. In case of hiring a contractor, the transportation cost varies depending upon the distance between the plantation and the buyer. For the sample smallholders, the average transportation cost was 179.2 Baht per ton. About 40.8% of them spent 101-150 Baht per ton and 36.2% spent 151-200 Baht per ton of transportation cost.

Table 2.11 Selling the FFB

Item	No. (n=503)	%
FFB buyer	(n=486)	
- Independent ramp	130	26.8
- Cooperative or community enterprise ramp	121	24.9
- Mill	176	36.2
- Mill ramp	59	12.1
Reason to sell FFB to mill*	(n=176)	
- Fair balance and system of FFB grading	119	67.6
- High FFB price	110	62.5
- Close to mill	58	33.0
- Good service and credit support	7	4.0
- Contract to a mill to get a better price	8	4.5
Reasons to sell FFB to independent ramps *	(n=130)	
- Close to ramp	123	94.6
- Good service (i.e. harvesting, transportation and support for factor of production)	11	8.5
- Less restriction on FFB grading	7	5.4
- High FFB price	27	20.8
- Relative	4	3.1
Reasons to sell FFB to cooperative or community enterprise *	(n=121)	
- Close to cooperative	10	8.3
- Member and get dividend	116	95.9
- High FFB price	2	1.7
- Avoid taking advantage from independent ramp	3	2.5
Reasons to sell FFB to mill ramp *	(n=59)	
- Close to mill ramp	43	72.9
- Good service (i.e. harvesting, transportation and support for factor of production)	14	23.7
- A sole buyer in the area	14	23.7
- High FFB price	6	10.2
Distance from plantation to buyer (km.)	(n=486)	
- ≤ 2.0	143	29.5
- 2.1 – 4.0	123	25.3
- 4.1 – 6.0	59	12.1
- 6.1 – 8.0	72	14.8
- >8.0	89	18.3
Mean (S.D.)	6.5 (7.9)	
Transportation	(n=486)	
- Hire the contractor	260	53.5
- Own management	222	45.7
- Hire in different agreement	4	0.8
Cost of transportation (Baht/ton)	(n=260)	
- ≤ 100	23	8.8
- 101 – 150	106	40.8
- 151 – 200	94	36.2
- > 200	37	14.2
Mean (S.D.)	181.9 (63.1)	

Table 2.11 Selling the FFB (cont.)

Item	No. (n=503)	%
Price of FFB in 2009 (Baht/kg)	(n=486)	
- ≤ 3.00	51	10.5
- 3.01 – 3.50	186	38.3
- 3.51 – 4.00	174	35.8
- > 4.00	75	15.4
Mean (S.D.)	3.7 (0.51)	
FFB pricing	(n=486)	
- According to FFB quality	213	43.8
- No consideration on FFB quality	273	56.2
Factor used for FFB grading*	(n=213)	
- Ripeness	167	78.4
- % OER	40	18.8
- Un-destroyed bunch	21	9.9
- Bunch size	30	14.1
Type of payment on FFB	(n=486)	
- Cash	470	96.7
- Via bank account	14	2.9
- Credit	2	0.4

Remark: * An oil palm smallholder can give more than one answer

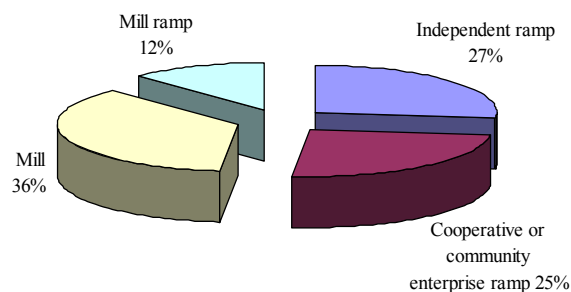


Figure 2.10 FFB buyer

As to the FFB yield, the average production in 2009 was 2,636 kg per rai per year, which was lower than the country's average, 2,694 kg per rai per year (OAE, 2010). The survey also showed that the yield of FFB varied a lot among oil palms of different age, namely oil palm at 9-14 years of age had the highest FFB yield (3,460.2 kg per rai per year), while young oil palm had the lowest yield (2,254.9 kg per rai per year) (Table 2.12 and Figure 2.11). The average price of FFB received by the smallholders was 3.7 Baht per kg in the same year. Most smallholders (56.2%) indicated that when they sold FFB, the price was determined without considering FFB quality while the rest (43.8%) received the price according to FFB quality. For the

second group, ripeness was the key-factor used for FFB grading. The majority of smallholders (96.7%) received cash when they sold the FFB.

Table 2.12 Yield of oil palm, classified by age (2009)

Item	Age of oil palm (yr)								Average (n=904 plots)	
	≤ 8 (n=365)		9-14 (n=194)		15-20 (n=187)		> 20 (n=158)			
	No.	%	No.	%	No.	%	No.	%	No.	%
Yield (kg/rai)										
≤ 1,000	71	19.5	6	3.1	12	6.4	7	4.4	96	10.6
1,001-2,000	105	28.8	18	9.3	36	19.3	44	27.8	203	22.5
2,001-3,000	84	23.0	60	30.9	91	48.7	53	33.5	288	31.9
> 3,000	105	28.8	110	56.7	48	25.7	54	34.2	317	35.1
Average	2,254.9		3,460.2		2,583.4		2,568.7		2,636.4	

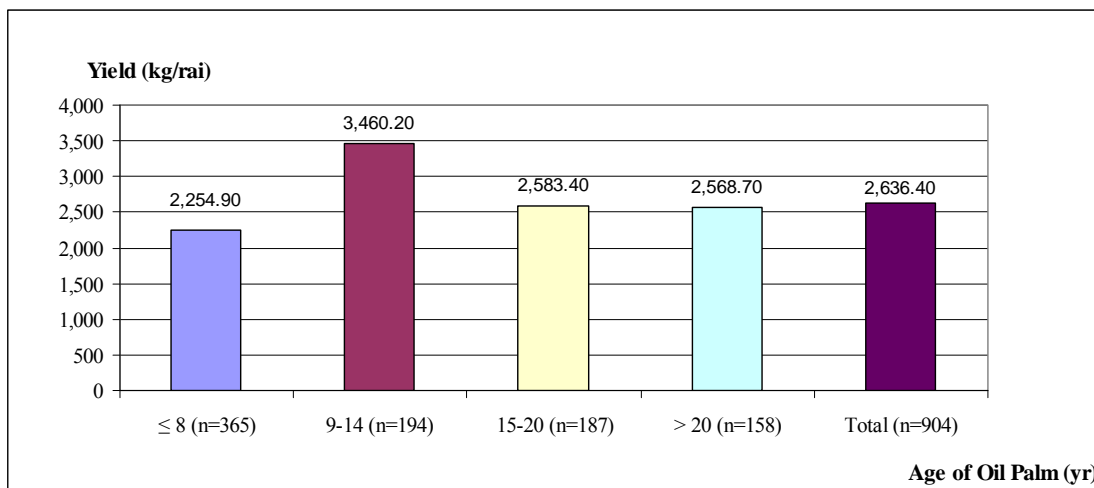


Figure 2.11 Average oil palm yield classified by age

2.2.7 Farm Records, Source of Information and Link with Ramp and Mill

Table 2.13 illustrates farm records, sources of information, and links with ramp and mill. The results show that the majority of smallholders (69.6%) did not keep their farm records due to complexity (25.1%); they could not see the benefit (29.1%), and time available (24.3%). For those who kept records, the items listed were; inflow-outflow, cost of fertilizer, and yield, respectively. Since farm record keeping is an important means to obtain basic information for farm self-assessment and use to improve the smallholders decision regarding the oil palm production management, a high priority should be given to learn to properly use the farm records.

With respect to the information about oil palm management, the survey revealed that 70.8% of the smallholders received such information while the rest (29.2%) did not receive any information. For those receiving it, about 36.8% obtained it from the government officials and 21.3% received it from the extension officer from the CPO mill. It can be seen that the agricultural extension officer of

both provincial and district levels, and the extension officer of the CPO mill, play significant roles in knowledge sharing with the oil palm smallholders. However, the role of the government officials varies among the provinces of oil palm production areas.

As for the marketing information, the results showed that only 63.4% of the smallholders received the information. However, the CPO mill's extension officer plays a more important role for this issue than the government officer. This is so because the CPO mill is the ultimate buyer of FFB and determines the FFB purchasing price.

When the smallholders were asked about the linkage with ramp and CPO mill, the survey revealed that only 36.8% and 5.8% of them had links, respectively. For those who had a proper link with the ramp, the most popular activities or supports are technical assistances, providing credit, and supplying cheap fertilizer. Similarly, links with CPO mill were seen most in the form of technical assistances.

Table 2.13 Farm records

Item	No. (n=503)	%
Farm records		
- No	350	69.6
- Yes	153	30.4
Reasons for not keeping records*	(n=350)	
- Complexity	88	25.1
- Cannot see the benefit	102	29.1
- Less time available for record	85	24.3
-No skill in record keeping	33	9.4
- Keep farm receipt	41	12.0
Activity/item record*	(n=153)	
- Inflow-outflow	113	73.9
- Cost of fertilizer	48	31.3
- Yield	29	18.9
- Labour	17	11.1
- All important activities	3	2.0
- Price of FFB	3	2.0
Receiving information about oil palm production management	(n=503)	
- No	147	29.2
- Yes	356	70.8

Table 2.13 Farm records (cont.)

Item	No. (n=503)	%
Source of information about oil palm production management*	(n=356)	
- Extension officer from CPO mill	76	21.3
- Own experience	127	35.7
- Government official	131	36.8
- Neighbour	55	15.4
- Sale officer from fertilizer company	9	2.5
- Others	41	11.5
Receiving oil palm marketing information	(n=503)	
- No	184	36.6
- Yes	319	63.4
Source of oil palm marketing information *	(n=319)	
- Extension officer from CPO mill	93	29.2
- Own experience	60	18.8
- Neighbour	30	9.4
- Government official	77	24.1
- Internet and TV	61	19.1
- Ramp	27	8.5
- Sale officer from fertilizer company	7	2.2
- Officer from Malaysia	4	1.3
- Others	6	1.9
Link with ramp and support	(n=503)	
- No	318	63.2
- Yes	185	36.8
Type of link with ramp and support*	(n=185)	
- Technical	76	41.1
- Provides cheaper fertilizer	36	19.5
- Credit	61	33.0
- Social link	2	1.0
- Truck service	4	2.2
- Harvesting	4	2.2
- Others	4	2.2
Link with mill and support	(n=503)	
- No	474	94.2
- Yes	29	5.8
Type of link with mill and support	(n=29)	
- Technical	20	69.1
- Credit	2	6.9
- Provides cheaper fertilizer	3	10.3
- Harvesting	3	10.3
- Additional fuel cost	1	3.4

Remark: * An oil palm smallholder can give more than one answer

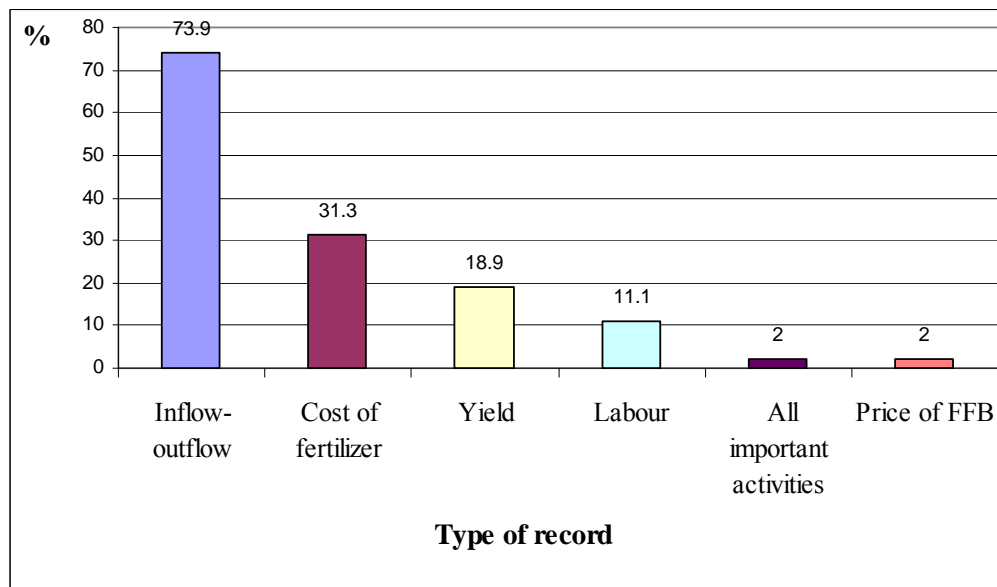
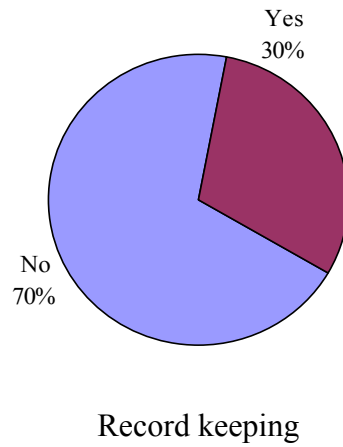


Figure 2.12 Record keeping and type of record

2.3 Costs and Return

This section presents the results of a cost-return analysis based on the data collected from the smallholders in the study areas. From each smallholder, a corresponding age of oil-palms was chosen for deriving the cost and yield data. In general, the total economic cost of production is composed of fixed and variable costs. Both the fixed and variable costs can be divided into cash, and non-cash costs. However, in this analysis, since it is not a pure or an in-depth economic study, the cost of production covers only key variables and cash costs. This can still be used as a basis for decision making at the farm level. The variable cash costs used in this analysis include; the cost of fertilizer, hired labor (excluding harvesting), chemicals, harvesting, transportation, and fuel. There are 3 components of labour cost, namely,

labour costs for applying fertilizer, pruning and collecting frond, and spraying. For the total or gross return, the average yield and price were used for the calculation. From this data, the net return was obtained by deduction of gross return by the variable cost. Net return was calculated per rai and per ton of FFB.

Table 2.14 summarizes the cost-return analysis of FFB production in 2009. The results revealed that the average cost of FFB production for all ages of oil palms was about 4,255 Baht per rai per year or 1,494 Baht per ton (In 2007, the cost of FFB production by independent smallholders in Malaysia was RM 165.10 per ton) (Rahman, Ayat K. Ab, et al., 2008). However, this cost figure varied a lot among oil palms of different age, namely oil palm at 9-14 years of age had the highest cost, while young oil palm had the lowest cost. It can also be seen in Table 2.14 that the highest cost corresponds with the highest yield of FFB.

As for the FFB production cost, the cost of fertilizer, harvesting, and transportation are the major components and account for 51.0%, 21.2%, and 12.6% of the total variable costs. It is clear that in order to reduce production cost or improve efficiency at the farm level, priority has to be given to soil and fertilizer management.

With respect to the FFB yield, the survey showed that the yield of FFB varied a lot (Table 2.12 and Table 2.14). However, the average FFB yield corresponding to the plots used for cost analysis was 2,848 kg per rai per year. Oil palms with 9-14 years of age give the highest FFB yield (3,538 kg per rai per year), while young oil palm had the lowest yield (2,451 kg per rai per year). Given the average FFB price the smallholders received in 2009 of 3.7 Baht per kg, oil palm yields provided a net return of 6,283 Baht per rai year. The highest net return, 8,514 Baht per kg, was obtained from 9-14 years old oil palms, while the smallholders who have young palms gained the lowest net return. Accordingly, at break-even price, the price of FFB that covers to the cost of FFB production on a per kg basis, is the highest for young palm (1.7 Baht per kg), while it is the lowest for palms 9-14 years, namely 1.3 Baht per kg. As for a break-even yield, the minimum yield the smallholders have to obtain to cover the production cost given the FFB price is the highest for 9-14 years oil palms, namely 1,236.4 kg per rai per year. This makes the FFB production cost the highest. It is clear that smallholders will obtain the highest net return when their oil palms are 9-14 years of age.

Table 2.14 Costs and return of FFB production

Item	Age of oil palm (yr)				Average (n=501)
	≤ 8 (n=199)	9-14 (n=118)	15-20 (n=92)	> 20 (n=92)	
Variable cost					
- Fertilizer	2,215.6	2,206.9	2,143.5	2,048.0	2,170.1 (51.0%)
- Labor (excluding harvesting)	273.7	356.8	355.7	379.1	332.0
- Chemicals	200.7	180.2	148.7	93.6	168.5
- Harvesting	792.8	1,068.0	879.3	876.0	901.0 (22.2%)
- Transportation	560.2	618.0	483.3	456.6	535.9 (12.6%)
- Fuel	165.2	144.9	154.0	94.0	147.9
Total variable cost (Baht/rai/yr)	4,208.2	4,574.8	4,164.5	3,947.3	4,255.4
Average cost (Baht/ton)	1,716.7	1,293.2	1,499.2	1,389.6	1,494.0
Yield (kg/rai/yr)	(n=185) 2,451.3	(n=117) 3,537.5	(n=92) 2,777.9	(n=92) 2,840.5	(n=486) 2,848.3
Average price of FFB (Baht/kg)	3.7				
Gross return (Baht/rai/yr)	9,069.8	13,088.8	10,278.2	10,509.9	10,538.7
Net return (Baht/rai/yr)	4,861.6	8,514.0	6,113.7	6,562.6	6,283.3
Break even price (Baht/kg)	1.7	1.3	1.5	1.4	1.5
Break even yield (kg/rai)	1,137.4	1,236.4	1,125.5	1,066.8	1,150.1

2.4 Problems Faced by Smallholders

Problems faced by the oil palm smallholders are summarized in Table 2.15. The major problems were; the high price of fertilizer, fluctuation of FFB price, lack of water in the dry season, lack of knowledge in oil palm management, low soil fertility, lack of knowledge in soil and fertilizer management, low quality of seedlings, lack of credit, and harvesting of unripe FFB, in this order. However, the problems vary among the study areas. The first three problems were quite common in all study areas. Lack of knowledge in overall oil palm management and in soil and fertilizer management was more serious in the newly planted area in the Eastern region than in production areas in the South where 58.8% and 39.7% of the smallholders are facing these problems, respectively. As to the problem of low quality of seedlings, it happened to those smallholders who have links with UPOIC and bought the seedlings from private nurseries. Another example is that a high percentage of the smallholders who have links with Suksomboon lack credit. It is evident that certain problems the smallholders are facing could be solved by specific interventions at a micro level, but other bottlenecks have to be solved by a proper macro policy.

Table 2.15 Problems faced by smallholders

Item	No. (n=503)	%
High fertilizer prices	360	71.6
Fluctuation of FFB prices	341	67.8
Lack of water in dry season	302	60.0
Lack of knowledge in oil palm management	184	36.6
Low soil fertility	137	27.2
Lack of knowledge in soil and fertilizer management	128	25.4
Low quality of seedlings	122	24.3
Lack of credit	111	22.1
Harvesting of unripe FFB	50	9.9
Impact of chemical usage	26	5.2
Lack of land title	21	4.2
Shortage of labour	19	3.8
Low quality of fertilizer	16	3.2
Lack of knowledge in soil and leaf analysis	14	2.8
Lack of farmers' group	9	1.8

2.5 Support and Training Needs

The results reflect that only 33.0% of sample smallholders had received support, and 25.8% were trained (Table 2.16). The main supporters and training providers were the agricultural extension officers, at the district level, and CPO companies in oil palm production areas, respectively. But for the smallholders who are members of the Aoluk cooperative, the main supporter and training provider was the cooperative. For those who had received the support, the main help was in knowledge on oil palm management, fertilizer and application, and credit, respectively. Similarly, the most popular training the smallholders received was related to fertilizer and its application, knowledge on oil palm management, and the selection of oil palm seedlings, in this order.

However, at present, the smallholders still need supports on several issues, i.e. raising and stabilizing the FFB price, controlling the fertilizer price and the price of other factors, develop high quality of seedlings, and supplying water. Other supports are summarized in Table 2.17. As for the training needs, they should cover key issues on oil palm plantation management, knowledge about soil and leaf analysis, and how to improve the oil palm yield, respectively. Other training topics required are found in Table 2.18.

Table 2.16 Support and training received in the past

Item	No. (n=503)	%
Support received in the past		
- No	337	67.0
- Yes	166	33.0
Support providers*	(n=166)	
- Agricultural extension officer at the district level	88	53.0
- CPO company	22	13.3
- Fertilizer middleman	9	5.4



Table 2.16 Support and training received in the past (cont.)

Item	No. (n=503)	%
- Cooperative	30	18.1
- Central government	14	8.4
- Other government institutes	11	6.6
Type of support received*	(n=166)	
- Knowledge in oil palm management	71	42.8
- Fertilizer and application	52	31.3
- Credit	20	12.1
- FFB price guarantee	9	5.4
- Marketing management	7	4.2
- Chemical usage	6	3.6
- Seedlings	5	3.0
- Water management	4	2.4
Training received in the past	(n=503)	
- No	373	74.2
- Yes	130	25.8
Topic of training*	(n=130)	
- Application of fertilizer	67	51.5
- Knowledge in oil palm management	70	53.8
- Selection of oil palm seedlings	11	8.5
- Soil analysis and soil conservation	19	14.6
- Pest management	9	6.9
- FFB quality improvement	8	6.2
Training provider*	(n=130)	
- CPO company	38	29.2
- Agricultural extension officer at the district level	60	46.2
- Cooperative	21	16.2
- Fertilizer middleman	9	6.9
- Other agricultural organization	14	10.8

Remark: * An oil palm smallholder can give more than one answer

Table 2.17 Major support needed by the smallholders

Item	No. (n=503)	%
Raising and stabilizing FFB price	202	40.2
Reducing or controlling fertilizer price and other factors' price	175	34.8
Soil and leaf analysis	156	31.0
Knowledge on oil palm management	135	26.8
Develop high quality of seedlings	49	9.7
Supply of water	46	9.1
Credit	37	7.4
Mean to reduce production cost	14	2.8
Disease control	8	1.6
Promote famers' group forming	5	1.0

Remark: * An oil palm smallholder can give more than one answer

Table 2.18 Major training needed by the smallholders

Item	No. (n=503)	%
Oil palm plantation management (i.e. applying fertilizer)	336	66.8
Soil and leaf analysis	160	31.8
Improving yield	61	12.1
Pest control and management/IPM	39	7.8
Selection of high quality of seedlings	35	7.0
Means to reducing cost	32	6.4
Soil conservation	24	4.8
Best practice of FFB harvesting	19	3.8
Knowledge on examining chemical fertilizer	10	2.0

Remark: * An oil palm smallholder can give more than one answer

2.6 Opinion on Sustainable Oil Palm Production

Table 2.19 summarizes the survey results, based on the opinion of the smallholders on the issue of sustainable oil palm production. The majority of smallholders (94.2%) are aware of the impact on the country's economy from oil palm production, especially in terms of generating farmers', and community income, along with enhancing economic growth, and creating jobs, respectively. About 85.7% see the positive impact in reducing social problems when being employed, improving income and having a fair degree of security in their daily life. However, only 55.6% are fully aware of the environmental impacts. Lack of water due to high consumption of oil palms, pollution from CPO, and contamination of chemicals are the key environmental issues. Only 20.7% of the smallholders, who are aware of the environmental impact, are willing to suggest the means to reducing it. The key suggestions include: CPO mill should treat water before discharge or use wastewater for other purposes; the smallholders should reduce the use of chemicals; and should improve the management of water. With respect to the location of oil palm plantation, only 4.2% of the smallholders indicate that their plantations are rather close to reserved areas.

Table 2.19 Opinion on sustainable oil palm production

Item	No. (n=503)	%
Economic impact		
- No	29	5.8
- Yes	474	94.2
Type of economic impact*	(n=474)	
- Generate farmer and community income	369	83.5
- Enhance economic growth, sufficiency for domestic consumption, reducing import and increasing export	162	34.2
- Better income distribution	13	2.7
- Promote alternative energy	4	0.8
- Create jobs	38	8.0
- Reduce risks from growing only rubber	17	3.6



Table 2.19 Opinion on sustainable oil palm production (cont.)

Item	No. (n=503)	%
Social impact	(n=503)	
- No	72	14.3
- Yes	431	85.7
Type of social impact*	(n=431)	
- Reduce social problems due to employment, improving income and more security in daily life	363	84.2
- More time to spend with family and more leisure/ better quality of life	101	23.4
- Encouraging or promoting cooperation among smallholders in the same area	10	2.3
Environmental impact	(n=503)	
- No	223	44.4
- Yes	280	55.6
Type of environmental impact *	(n=280)	
- Lack of water due to high water demand by oil palm	157	56.1
- Pollution from CPO	39	13.9
- Increasing atmosphere moisture	74	26.4
- Encroached forest land by both big companies, and smallholders	14	5.0
- Contamination of chemicals in the environment	26	9.3
- Global warming	8	2.9
Suggestion to reduce environmental impact	(n=280)	
- No	222	79.3
- Yes	58	20.7
Key Suggestions	(n=58)	
- Stop encroachment to forest land and reserved area	5	8.6
- Afforestation	2	3.5
- Water system management/reservoir	10	17.2
- Grow cover crop	2	3.5
- CPO mill treat water before discharge/use wastewater for other purposes	22	37.9
- Reduce chemical use	14	24.1
- Others	3	5.2
Oil palm plantation close to reserved area	(n=503)	
- No	482	95.8
- Yes	21	4.2

Remark: * An oil palm smallholder can give more than one answer

2.7 Suggestion for the Development of Oil Palm Production

Based on the suggestions of the smallholders for the development of oil palm production, the key issues are summarized in Table 2.20. Those are the knowledge support to smallholders on oil palm production management, the development of high quality seedlings, the raise and stabilization of the price of FFB, the reduction or control of the fertilizer price and the price of other factors, the provision of soil and

leaf analysis in the production area which the smallholders could access easily, and supply knowledge on how to reduce the cost production, respectively.

Table 2.20 Key suggestion to the development of oil palm production

Item	No. (n=503)	%
Support knowledge on oil palm production management	172	34.2
Raising and stabilize FFB prices	122	24.3
Develop high quality of seedlings	123	24.5
Reducing or controlling fertilizer price and other factors' price	60	11.9
Provide soil and leaf analysis in the area	46	9.1
Support knowledge on how to reduce the cost of production	23	4.6
Set up oil palm aid fund	8	1.6
Strengthen and promote farmers' group	6	1.2
CPO mill purchase FFB according to its quality	10	2.0
Provide water systems for oil palm production	10	2.0
Soft loans or credit	8	1.6
Promote quality of oil palm production	10	2.0
Ramp purchase ripe FFB, do not water and keep FFB overnight	10	2.0

2.8 Life Quality of the Oil Palm Smallholders

As explained in chapter 1, to evaluate the life quality of the smallholders, five groups of life quality indicators were asked. These included the questions about the material standard of living (4 questions), access to education and information (3), access to healthcare (1), individual physical and mental health support if needed (4), salutary aspects of physical environments, and safety (3), and leisure and social life (3). The results are summarized in Table 2.21

As for the subjective evaluation concerning the material standard of living, the smallholders were rather moderate across these aspects. However, they were satisfied with their living places. With respect to education and information, they are quite positive about the opportunity of their children attending university, and obtaining daily life information. However, they are rather moderate about their communication within the community. They are also moderate about access to health services. As for individual physical and mental health, they are positive in all aspects, except they feel they do not have enough energy for daily life. They are optimistic about their safety and health of their physical surroundings. But, they are moderate about the community awareness of health-damaging factors in the local environment. With respect to leisure and social life, they are positive about their working schedule and the opportunities for leisure. However, they are moderate about time flexibility in their job.

Table 2.21 Aspect of life quality of oil palm smallholders

Item	Mean	S.D.	Degree of relevance to smallholders
Material standard of living			
1. Do you have you enough money to meet your needs?	3.00	0.72	Moderately
2. Do you feel that you are being paid a fair amount of money for the work you do?	3.23	0.71	Moderately
3. When compared to others, do you feel that your income is too low?	2.88	0.71	Moderately
4. How satisfied are you with the standard of your living place?	3.60	0.65	Satisfied
Education and information			
5. How realistic is the prospect of your children attending university?	4.15	0.99	Mostly
6. How easy is it for you to get all the information that you need, for your day-to-day life?	3.61	0.73	Mostly
7. How good does communication within the community seem to you?	3.34	0.66	neither poor nor good
Access to health care			
8. How satisfied are you with your access to health services?	3.41	0.74	Neither dissatisfied nor satisfied
Individual physical and mental health			
9. How well are you able to concentrate?	3.52	0.67	Mostly
10. Do you have enough energy for your daily life?	3.22	0.97	Moderately
11. How satisfied are you with your ability to perform your daily living, and working activities?	3.62	0.61	Satisfied
12. How well do you sleep?	3.80	0.78	Good
Salutary aspects of physical environment, and safety			
13. How safe do you feel in your daily life?	3.58	0.61	Mostly
14. How healthy are your physical surroundings?	3.51	0.76	Mostly
15. Is your community aware of health-damaging factors, in your local environment?	2.95	0.77	Moderately
Leisure and social life			
16. Does your working schedule leave you enough time for recreation, hobbies, friends, and family?	3.83	0.68	Mostly
17. How often does your job leave time for you to recreate, and get other things done?	2.35	0.90	Moderately
18. To what extent do you have the opportunity for leisure activities, or for spending time with your family, and friends?	3.74	0.66	Mostly

Remark: Question 4, 8, 11 Degree of satisfaction of smallholders

Question 7, 12 Degree of life quality of smallholders

Chapter 3

Baseline Study of the Oil Palm Smallholders: Link with Univanich Palm Oil Public Co., Ltd.

This chapter summarizes the observations drawn from the primary data collected from **122** oil palm smallholders around Univanich CPO mill in Plaipraya district, Krabi. The personal interviews revealed the following facts (Table A2.1-A2.20 in Appendix 2).

Krabi province, where around 1.3 million rai of land is suitable for oil palm production, is now the top oil palm producing province in Thailand. In 2009, the total oil palm plantation area in Krabi was about 1.0 million rai (160,000 ha). It was accountable for 25% of Thailand's oil palm plantation area. Of this, around 85% has been harvested. An average yield of 2,790 kg per rai was received in 2009 (The country's average yield was 2,694 kg per rai, according to Office of Agricultural Economics). The plantation areas are in 8 districts. The major districts are; Kaophanom, Aoluk, Plaipraya, and Klongtom, respectively. In Krabi, there were approximately 21,000 oil palm growers in 2009 (19% of oil palm growers in Thailand). The majority of the growers (about 90%) are smallholders, with an average plantation area of 43 rai (around 7 ha) (Krabi Agriculture Office, 2010 and Office of Agricultural Extension and Development Region 5, 2010)

In Krabi, there are 21 CPO mills (The country has about 60 mills), in operation, in 2010. Nearly all mills depend mostly on FFB from small out-growers. Univanich Palm Oil Public Company Limited is a pioneer of the oil palm plantation industry in Thailand. Today Univanich is one of Thailand's leading palm oil producers, and the country's largest exporter of crude palm oils. Univanich operates three oil palm CPO mills located in Krabi. These three factories purchase approximately 80% of their FFB from small out-growers (Univanich Palm Oil Public Co., Ltd., 2010).

3.1 Basic Information about the Smallholders and their Farms

3.1.1 Socio-Economic Characteristics of Oil Palm Smallholders

Socio-economic characteristics of the smallholders are illustrated in Table A2.1. The survey showed that around 80% of the smallholders are over 40 years of age, the average age being 50 years. About 71% obtained at most only primary education. Only 5.7% received a Bachelor's degree or higher. Two-third of the smallholders are male. However, practically all housewives assist their husbands in the production of oil palm. Approximately one-half of the smallholders have 4-5 household members. On average, they have 3.7 people per household.

Around 92% of the smallholders grow oil palm, as the primary source of income. 80% of the smallholders obtained income from more than one source. Examples of a secondary source of income were rubber plantations, and merchandise.

The survey also showed that 70% of the smallholders managed most of the oil palm activities with their own family members, while the rest (30%) used mainly hired labourers. Some 48% of the smallholders have more than 15 years of experience in oil palm production. On average, they have 16.1 years of experience. For the most part, experience was gained from their own plantations.

Table A2.2 summarizes income, debt, and farm assets of the smallholders. Slightly less than half of the smallholders (46%) had a household income of 200,001-400,000 Baht per year. On average, they earned around 377,600 Baht per household per year. Of this amount, 69% was from oil palm production. Credit plays an important role for the smallholders since 48% has continuous debt of 350,800 baht per household. Approximately 68% of the smallholders relied on loans from the Bank for Agriculture and Agricultural Cooperative (BAAC). Only 16% had a loan from a commercial bank. The smallholders used their loan for oil palm production (41%), the purchasing of cars or trucks (21.7%), house construction (16.9%), and the purchasing land (13.3%).

As to farm assets, the survey showed that the most popular assets are weed sprayers, 4-wheel trucks, oil palm scythes, oil palm spades, and mowers, respectively.

3.1.2 Membership of Oil Palm Groups and Motivation to Grow Oil Palm

Normally, the agricultural office at the district level is responsible for the registration of major crop growers, and attempts to encourage the farmers to register with the office in order to improve the government database on economic crops. However, the survey showed that only 48% of oil palm smallholders had registered. This may be the main reason for the poor database on oil palm at the regional and national levels. As to oil palm groups, and association membership, none of the smallholders is member. When the smallholders were asked about their motivations to grow oil palm, their responses were interesting. The majority, 57%, indicated that oil palm is not difficult to manage compared to other crops, while 47% of them grew oil palm because the high FFB price, and therefore a high return. Some 21% of the smallholders chose oil palm because they expected to earn income faster. Also it is interesting to take note in this area that 14% of the smallholders had decided to grow oil palm because they were facing disease in rubber production which is considered as the competitive crop. Other factors are summarized in Table A2.3

3.2 Characteristics of Oil Palm Production and Management by Smallholders

3.2.1 Relevant Aspect of Land, Topography, Soil and Oil Palms

On a per household basis, a smallholder owned on average about 38 rai (6.08 ha), while some 42% of them owned at most 25 rai. Only 3% owned more than 100

rai. For oil palm production, the average area was 32 rai (5.12 ha). Some 55% of them owned up to 25 rai of oil palm plots. 30% owned 26-50 rai per household. Smallholders owned on average 2 oil palm plots, whilst 45% of the smallholders owned only one plot. The majority of land, at all oil palm plots (243 plots), owned by the smallholders had the land title. The most popular land title among them was Nor Sor 3. The survey also showed that about 8% of the oil palm plots had no land title (Table A2.4).

Up to 79% of the oil palm plots are in plain areas, while 13 % of the plots are on hilly and sloping areas. For soil characteristics, most oil palm plots have gravelly soil, loam, sandy loam and clay, respectively.

Land usage prior to oil palm was various. 46% of oil palm plots were used for rubber production, while some 35.8% was un-used land. Only 3% had “always” been used for oil palm production. On an average, palm trees are 13.6 years old. However, the findings showed that some smallholders still maintained their old oil palms (25+ years old). Generally, old oil palms are not optimally productive and will also increase the cost of FFB production. Some smallholders have plans to replant their old oil palms. Only 6.6% of the smallholders intend to expand the area of oil palm production with an average acreage of 17 rai.

3.2.2 Variety of Oil Palm and Source of Seedlings

The survey showed that all oil palm smallholders grow *tenera* (variety) because palm fruits of *tenera* contain the most oil. However, on some plots *dura* still exists. By using *dura* seedlings, it is definite that they will get low crop yield and low return on investment. At least 92% of the smallholders purchased seedlings from oil palm nursery operators who had licenses issued by Department of Agriculture i.e. Univanich. Few of them bought seedlings from the oil palm research centre. The main factors affecting the smallholders’ decision to buy seedlings were their quality, a well accepted source/with license, and convenience to excess, respectively. Most smallholders used 7-12 months old seedlings. On each plot, 22 oil palm trees per rai were widely planted (Table A2.5)

3.2.3 Use of Labour in Oil Palm Production

Table A2.6 summarizes the information about labour management in oil palm production. The results revealed that more than 80% of the smallholders used both family and hired labour. The most popular activities utilizing family labour were; applying fertilizer, weeding, general management, pruning, and transportation of FFB, respectively. On a household basis, a smallholder had on average of 2 people working in the plantation. In contrast, the average amount of hired labour was 4.7 people per household.

The main reason for hiring labourers by the smallholders was insufficient household labour and/or lack of time. Of the smallholders who hired labour, only 20% of them provided fringe benefits to labour, especially food. Hired labourers

worked in the plantation without any contract and they were not informed about the labour rights. 89% of the smallholders perceived about farm injuries and most of them took preventive measures such as; wearing long-sleeved shirt and pants, putting on boots and mask, respectively.

With respect to accidents occurring to labourers in the farm, the interviews revealed that some 6.9% of the smallholders had encountered this problem. Nearly one-fourth (22.5%) of the smallholders faced the issues of misunderstanding or unhappiness of hired labourers. This problem was solved by compromising or making new agreements.

The survey also indicated that oil palm smallholders who hired labour, nearly all hired them from Krabi. Wages varied among activities, for example, an average wage for pruning was 9.3 Baht per tree (an average cost of pruning in Malaysia was RM 1.38). For the transportation of FFB, wages were based on the distance between the ramp or mill and the smallholders' farm. From the sample smallholders, an average wage was 168 Baht per ton of FFB. Wages for other activities are shown in Table A2.7.

3.2.4 Water and Soil Management in Oil Palm Production

Table A2.8 summarizes the survey results regarding water and soil management of the smallholders. Most oil palm smallholders (97.5%) depended only on rainfall as the water source for oil palm production. Even though irrigation can significantly improve oil palm yield, most smallholders have not yet applied such system. This may be due to lack of water supply, or the high investment cost.

The result also revealed that 98.4% of the smallholders applied fertilizer. The majority applied chemical fertilizer. Among these, 55.6% applied fertilizers twice a year. 17.9% applied chemical fertilizers once a year. About 19.7% and 6.8% of them applied chemical fertilizer three times and four times a year, respectively. On the average, the smallholders applied chemical fertilizer to the amount of 41.4 kg per rai (around 2 kg per tree). The most important factor affecting the smallholders' decision to apply fertilizer was the fertilizer price. They also based their decisions on; the cycle of applying fertilizer, soil analysis, price of FFB, available capital, age of palm tree, and leaf analysis, respectively.

Only a small number of the smallholders (15.6%) grew cover crops in the plantations. The most popular cover crop was legume. Similarly, only 14.6% of the smallholders applied soil erosion protection measures. However, 62.3% of the smallholders used other measures to improve soil fertility, especially using oil palm frond and leaves, and empty bunches, respectively.

The survey also indicated that the extension officer from the CPO mill played a major role in providing information regarding soil and fertilizer management. Others included; sale officers from fertilizer company and the government officials, respectively.

3.2.5 Pest Management in Oil Palm

Data on pest management in oil palms are summarized in Table A2.9. The survey showed that major problems from pests were; weeds, rats, disease, and insects, respectively. To cope with them, the smallholders used different measures, for example, to get rid of weeds 82.6% of the smallholders used chemicals. To control rats, non-chemical measures such as; traps, or nets were the most popular. However, some smallholders did not apply any measures when facing the problem of pests.

For the smallholders who used chemicals, the survey showed that most of them (72.9%) used it all at one time, while 20% stored it in the room. The majority of smallholders used protective guards when they had to apply chemicals. The most popular were; gloves, and masks. However, 10.6% of them did not use any safety guards. To dispose of hazardous containers, some smallholders sold those, left the containers in the plantation, disposed those in the home bin, or kept those for agricultural use. Most smallholders (96.5%) understood the harmfulness of pesticides. Most obtained information about pest management from extension officer from the CPO mill, and from the chemicals company.

The result also revealed that only 2.5% of the smallholders had a proper idea about the concept of Integrated Pest Management (IPM).

3.2.6 Harvesting Management and the Sell of FFB

The survey indicates that all smallholders had harvested oil palm (Table A2.10). In order to harvest FFB, 82.8% of the smallholders hired the contracted harvesters, while the rest used family labour. Most harvesters were independent from the ramp and mill. Harvesting cycles varied a lot, namely from 15-30 days. 77.9% of the smallholders harvested FFB every 20 days. On average, the harvesting cycle was 20.2 days. It was also found that 63.9% of the smallholders, who hired the harvesters, did not have any condition or punishment on harvesting of unripe FFB even if it reduced the quality of FFB. The rest (36.6%) put conditions on harvesting of unripe FFB. From this, 59.5% did not allow the contractor to harvest unripe FFB, 21.6% deduct the harvesting fee paid to the harvesters if the CPO mill returned unripe FFB, and the same 8.1% did not pay for the harvesting, and stop hiring.

The most important factor affecting the smallholders' decision to harvest FFB was ripeness (77.0%). Other factor was the harvesting cycle (14.8%). The fee paid to the harvester depended upon their agreement in which in many cases transportation cost was included. For example, a harvesting fee of 310.6 Baht per ton, on average, would increase to 452.1 Baht per ton if transportation cost was included.

Table A2.11 summarizes the information on the selling of FFB. The majority (87.7%) of the smallholders sold their FFB to the mill. Some 9.8% and 2.5% were sold to independent and cooperative ramps, respectively. The main factors affecting the smallholders' decision to sell FFB to the mill were; fair balance, and the system of FFB grading (79.4%), the high FFB price (70.1%), and close to the mill (31.8%).

Most of those who sold FFB to the independent ramp indicated that they were close to a ramp.

The results also revealed that the distance between the plantation and the buyer was 4.3 km on average. To transport FFB from plantation to buyer, 64.8% of the smallholders hired a contractor while 32.0% managed it on their own. In case of hiring a contractor, the average transportation cost was 169.2 Baht per ton.

As to the FFB yield, the average production in 2009 was 2,965 kg per rai. The survey also showed that the yield of FFB varied a lot among oil palms of different age, namely oil palm at 9-14 years of age had the highest FFB yield (3,008.2 kg per rai per year), while oil palm at 15-20 years of age had the lowest yield (2,635.8 kg per rai per year) (Table A2.12). The average price of FFB, received by the smallholders, was 3.67 baht per kg in the same year. Most smallholders (56.6%) indicated that when they sold FFB, the price was determined according to FFB quality. The rest received the price without considering FFB quality. For the first group, ripeness was the key-factor used for FFB grading. The majority of smallholders (97.5%) received cash when they sold the FFB.

3.2.7 Farm Records, Source of Information and Link with Ramp and Mill

Table A2.13 illustrates farm records, sources of information, and links with ramp and mill. The results show that the majority of smallholders (72.1%) did not keep their farm records due to complexity; they could not see the benefit and time available, respectively. For those kept records, the items listed were; inflow-outflow, cost of fertilizer, and yield, respectively. With respect to the information on oil palm management, the survey revealed that only 65.6% of the smallholders received the information. For those receiving it, about 46.3% obtained from the extension officer from the CPO mill, while only 22.5% received it from the government officials. As for the marketing information, similarly, only 61.5% of the smallholders received it and most of them (54.7%) obtained marketing information from the mill's extension officer, while only 10.7% received it that from government officials. It is important to note here that the government officials play a minor role among the oil palm information providers, especially CPO mill. There were only small number of smallholders who had links with mill and ramp, 13.1% and 9.8% respectively.

3.3 Cost and Return

This section presents the results of a cost-return analysis, based on the data collected from the smallholders in the study areas. From each smallholder, a corresponding age of oil-palms was chosen for deriving the cost, and yield data. In general, the total economic cost of production is composed of fixed and variable costs. Both the fixed and variable costs can be divided into cash, and non-cash costs. However, in this analysis, since it is not a pure or an in-depth economic study, the cost of production covers only key variables and cash costs. This can still be used as a basis for decision making, at the farm level. The variable cash costs used in this

analysis include the cost of fertilizer, hired labor (excluding harvesting), chemicals, harvesting, transportation, and fuel. There are 3 components of labour cost, namely, the costs for; applying fertilizer, pruning and collecting frond, and spraying. For the total or gross return, the average yield and price were used for the calculation. From these data, the net return was obtained by deduction of gross return by the variable cost. Net return was calculated per rai and per ton of FFB.

Table A2.14 summarizes the cost-return analysis of FFB production in 2009. The results revealed that the average cost of FFB production for all ages of oil palms was about 3,893 Baht per rai per year or 1,260 Baht per ton (In 2007, the cost of FFB production by independent smallholders in Malaysia was RM 165.10 per ton) (Rahman, Ayat K. Ab, et al., 2008). However, this cost figure varied a lot among oil palms of different age, namely oil palm at most 8 years of age had the highest cost, while oil palm at 15-20 years of age had the lowest cost. It can also be seen in Table 3.14 that the lowest cost corresponds with the lowest yield of FFB.

As for the FFB production cost, the cost of fertilizer, harvesting, and transportation are the major components, and account for 47.5%, 24.9%, and 13% of the total variable costs. It is clear that in order to reduce production cost or improve efficiency at the farm level, priority has to be given to soil and fertilizer management.

With respect to the FFB yield, the survey showed that the yield of FFB varied a lot (Table A2.12 and Table A2.14). However, the average FFB yield corresponding to the plots used for cost analysis was 3,089 kg per rai per year. Oil palms with 9-14 years of age give the highest FFB yield (3,466 kg per rai per year), while oil palm at 15-20 years of age had the lowest yield (2,666 kg per rai per year). Given the average FFB price the smallholders received in 2009 of 3.67 Baht per kg, oil palm yields provided a net return of 7,444 Baht per rai per year. The highest net return, 8,753 Baht per kg, was obtained from 9-14 years old oil palms. The smallholders who have oil palms at 15-20 years of age gained the lowest net return. Accordingly, at break-even price, the price of FFB that covers to the cost of FFB production on a per kg basis, is the highest for oil palm at 15-20 years of age (1.4 Baht per kg), while it is the lowest for oil palms at 9-14 years of age, namely 1.1 Baht per kg. As for a break-even yield, the minimum yield the smallholders have to obtain to cover the production cost, given the FFB price, is the highest for young oil palms, namely 1,115 kg per rai per year, since FFB production cost is then the highest. It is clear that smallholders will obtain the highest net return when their oil palms are 9-14 years of age.

3.4 Problems Faced by Smallholders

Problems faced by smallholders were summarized in Table A2.15. The major problems were; the high price of fertilizer, fluctuation of FFB price, lack of water in dry season, low soil fertility, and lack of credit, in this order.

3.5 Support and Training Needs

The results reflect that only 17.2% of sample smallholders had received support, and 23.8% were trained (Table A2.16). The main supporters and training providers were the agricultural extension officer, at the district level, and Univanich, respectively. At present, the smallholders still need support on several issues, i.e. soil and leaf analysis, knowledge on oil palm management, raising and stabilizing FFB price, and reducing or controlling fertilizer price and the price of other factors (Table A2.17). The key training needs are; oil palm plantation management, knowledge about soil and leaf analysis, and how to improve the oil palm yield, respectively (Table A2.18).

3.6 Opinion on Sustainable Oil Palm Production

Table A2.19 summarizes the survey results, based on the opinion of the smallholders on the issue of sustainable oil palm production. The majority of smallholders (91.8%) are aware of the impacts to the country's economy from oil palm production, especially in terms of generating farmers' and community income, and creating jobs. Some 78.7% see the positive impact in reducing social problems due to employment, improving income, and assure a fair degree of security in their daily life. However, only 55.7% are fully aware of the environmental impacts. Lack of water due to high consumption of oil palms, and pollution from CPO are the key environmental issues. About 41.2% of the smallholders, who are aware of the environmental impact, are willing to suggest the means to reducing it. The key suggestions include; CPO mill treat water before discharge or use wastewater for other purposes, focus more on watershed conservation, and the smallholders reduce chemical usage. With respect to the location of oil palm plantation, only 9% of the smallholders indicate that their plantations are close to reserved area.

3.7 Suggestion for the Development of Oil Palm Production

Based on the suggestions of the smallholders to the development of oil palm production, the key issues are summarized in Table A2.20. Those were; the knowledge support to smallholders on the oil palm production management, raise and stabilize the price of FFB, reducing or controlling the fertilizer price and the price of other factors, provide soil and leaf analysis in the production area where the smallholders could access easily, and develop high quality of seedlings, respectively.

Chapter 4

Baseline Study of the Oil Palm Smallholders: Link with United Palm Oil Industry Public Co., Ltd (UPOIC)

This chapter summarizes the observations drawn from the primary data collected from **131** oil palm smallholders surrounding UPOIC CPO mill in Nueakhlung and Kaophanom districts, Krabi. The personal interviews revealed the following facts (Table A3.1-A3.20 in Appendix 3).

Krabi province, where around 1.3 million rai of land is suitable for oil palm production, is now the top oil palm producing province in Thailand. In 2009, the total oil palm plantation area in Krabi was about 1.0 million rai (160,000 ha). It was accountable for 25% of Thailand's oil palm plantation area. Of this, around 85% has been harvested. An average yield of 2,790 kg per rai was received in 2009 (The country's average yield was 2,694 kg per rai, according to Office of Agricultural Economics). The plantation areas are in 8 districts. The major districts are; Kaophanom, Aoluk, Plaipraya, and Klongtom, respectively. In Krabi, there were approximately 21,000 oil palm growers in 2009 (19% of oil palm growers in Thailand). The majority of the growers (about 90%) are smallholders, with an average plantation area of 43 rai (around 7 ha) (Krabi Agriculture Office, 2010 and Office of Agricultural Extension and Development Region 5, 2010)

In Krabi, there are 21 CPO mills (The country has about 60 mills), in operation, in 2010. Nearly all mills depend mostly on FFB from small out-growers. United Palm Oil Industry Public Company Limited (UPOIC) is in the oil palm plantation industry, and has produced CPO since 1978. UPOIC has a large oil palm plantation with a planted area of over 44,000 rai, in 6 districts of Krabi, and Surat Thani provinces, and a crushing mill with a capacity of 75 tons per hour of FFB, and 4.55 tons, per hour, of palm kernel seed. The UPOIC crushing mill purchases approximately 40% of their FFB from small out-growers (UPOIC, 2011)

4.1 Basic Information about the Smallholders and their Farms

4.1.1 Socio-Economic Characteristics of Oil Palm Smallholders

Socio-economic characteristics of the smallholders are summarized in Table A3.1. The survey showed that 77% of the smallholders are over 40 years of age, the average being 49.3 years. Nearly 80% obtained at most only secondary education. Only 13% received a Bachelor's degree or higher. Some 73% of the smallholders are male. However, practically all housewives assist their husbands in the production of oil palm. Approximately one-half of the smallholders have 4-5 household members. On average, they have 4 people per household.

Around 73% of the smallholders grow oil palm, as the primary source of income, and about 93% of the smallholders obtained income from more than one source. Example of a secondary source of income of the smallholders, who depended

on oil palm as the primary source, was rubber plantation. However, for those who work on some other activities for main income, oil palm production was the secondary source.

The survey also showed that 81.7% of the smallholders managed most of the oil palm activities with their own family members, while the rest (18.3%) used mainly hired labourers. Some 35% of the smallholders have more than 15 years of experience in oil palm production. On average, they have 14.1 years of experience. It is evident that the smallholders in Krabi have more experience in oil palm production than those in other provinces. Most experience was gained from their own plantations.

Table A3.2 summarizes income, debt, and farm assets of the smallholders. Nearly two-third of the smallholders (64%) had a household income of 200,001-600,000 Baht per year. On average, they earned around 562,070 Baht per household per year. Of this amount, 61% was from oil palm production.

Credit plays an important role for the smallholders since 78.6% has continuous debt of 473,864 baht per household. Three-fourth of the smallholders 74.8% relied on loans from the Bank for Agriculture and Agricultural Cooperative (BAAC). Only 12.6% had a loan from a commercial bank. Half of the smallholders used their loans for oil palm production, 15.5% of them used it for purchasing of land, 13.6% used it for the purchasing of cars or trucks, and 12.7% of them used their loans for house construction.

As to farm assets, the survey showed that the most popular assets are mowers, 4-10 wheel trucks, oil palm scythes, oil palm spades, and weed sprayers, respectively.

4.1.2 Membership of Oil Palm Groups and Motivation to Grow Oil Palm

Normally, the agricultural office at the district level is responsible for the registration of major crop growers, and attempts to encourage the farmers to register with the office, in order to improve the government database on economic crops. However, the survey showed that only 61.8% of oil palm smallholders had registered. This may be the main reason for the poor database on oil palm at the regional and national levels. As to oil palm groups and association membership, only 1.5% of the smallholders are members. When the smallholders were asked about their motivations to grow oil palm, their responses were interesting. The majority, 49.6%, of them grew oil palm because the high FFB price, and therefore a high return. 39.7% indicated that oil palm is not difficult to manage compared to other crops, while 22.1% of the smallholders chose oil palm because they expected to earn income faster. Other factors are summarized in Table A3.3

4.2 Characteristics of Oil Palm Production and Management by Smallholders

4.2.1 Relevant Aspect of Land, Topography, Soil and Oil Palms

On a per household basis, a smallholder owned on average about 71 rai (11.36 ha), while some 51.9% of them owned at most 50 rai. Only 16% owned more than 100 rai. For oil palm production, the average area was 47.9 rai (7.66 ha). Some 41.2% of them owned 26-50 rai of oil palm plots and 35.9% owned at most 25 rai per household. Smallholders owned on average 2 oil palm plots, whilst 40.5% of the smallholders owned only one plot. The majority of land, at all oil palm plots (289 plots), owned by the smallholders had the land title. The most popular land titles among them were; Sor Por Kor, Por Bor Tor 5, and Chanod, respectively. The survey also showed that about 4.9% of the oil palm plots had no land title (Table A3.4).

Up to 58.5% of the oil palm plots are in plain areas, while 25.6 % of the plots are on hilly and sloping areas. For soil characteristics, most oil palm plots have loam, clay, sandy loam, sandy soil, and gravelly soil, respectively.

Land usage prior to oil palm was various. 37% of oil palm plots were used for rubber production, and 34.3% was un-used land. 22.9% was used for rice paddies. Only 2.4% had “always” been used for oil palm production. On average, palm trees are 10.8 years old. However, the findings showed that some smallholders still maintained their old oil palms (25+ years old). Generally, old oil palms are not optimally productive and will also increase the cost of FFB production. Only 25 smallholders have plans to replant their old oil palms, and only 9.2% of them intend to expand the area of oil palm production with an average acreage of 43 rai.

4.2.2 Variety of Oil Palm and Source of Seedlings

The survey showed that all oil palm smallholders grow *tenera* (variety), because palm fruits of *tenera* contain the most oil. However, on some plots *dura* still exists. By using *dura* seedlings, it is definite that they will get low crop yield, and low return on investment. This group of the smallholders depended on seedlings from various sources. About 37.4% of them purchased seedlings from the private nursery, followed by oil palm companies (excluding UPOIC), and UPOIC, respectively. Few of them bought seedlings from the government institution, i.e. oil palm research centre. The main factors affecting the smallholders’ decision to buy seedlings were; a well accepted source/with licenses, their quality, and convenience to excess, respectively. Most smallholders used 7-12 months old seedlings. On each plot, 24 oil palm trees per rai were widely planted (Table A3.5).

4.2.3 Use of Labour in Oil Palm Production

Table A3.6 summarizes the information about labour management in oil palm production. The results revealed that more than 85% of the smallholders used both family and hired labour. The most popular activities utilizing family labour were

general management, applying fertilizer, weeding, transportation of FFB, and pruning, respectively. On a household basis, a smallholder had on average of 2 people working in the plantation. In contrast, the average amount of hired labour was 5.9 people per household.

The main reason for hiring labourers by the smallholders was insufficient household labour and/or lack of time. Of the smallholders who hired labour, only 24.3% of them provided fringe benefits to labour, especially food. Hired labourers worked in the plantation without any contract, and they were not informed about the labour rights. 97% of the smallholders are aware of the farm injuries and most of them took preventive measures such as; putting on boots, wearing long-sleeved shirt and pants, and putting on gloves, respectively.

With respect to accidents occurring to labourers in the farm, the interviews revealed that some 5.2% of the smallholders had encountered this problem. Some 7.8% of the smallholders faced the issues of misunderstanding or unhappiness of hired labourers. This problem was usually solved by compromising, or making new agreements.

The survey also indicated that oil palm smallholders who hired labour, nearly all hired them from Krabi. Wages varied among activities, for example, an average wage for pruning was 8.8 Baht per tree (an average cost of pruning in Malaysia was RM 1.38). For the transportation of FFB, wages were based on the distance between the ramp or mill and the smallholders' farm. From the sample smallholders, an average wage was 201.1 Baht per ton of FFB. Wages for other activities are shown in Table A3.7.

4.2.4 Water and Soil Management in Oil Palm Production

Table A3.8 summarizes the survey results regarding water and soil management of the smallholders. Most oil palm smallholders (96.2%) depended only on rainfall as the water source for oil palm production. Even though irrigation can significantly improve oil palm yield, most smallholders have not yet applied such system. This may be due to lack of water supply, or the high investment cost.

The result also revealed that 99.2% of the smallholders applied fertilizer. The majority applied chemical fertilizer. Among these, about 44.3% applied fertilizers twice a year. 41.8% applied chemical fertilizers three times a year. About 9.0% and 4.9% of them applied chemical fertilizer once, and four times a year, respectively. On average, the smallholders applied chemical fertilizer to the amount of 55.4 kg per rai (around 2.3 kg per tree). The most important factor affecting the smallholders' decision to apply fertilizer was the cycle of applying fertilizer. They also based their decisions on appropriate timing (rain, or soil moisture), brand of fertilizer, available capital, the fertilizer price, and price of FFB, respectively.

Only a small number of the smallholders (11.5%) grew cover crops in the plantations. The most popular cover crop was legume. Similarly, only 19.1% of the

smallholders applied soil erosion protection measures. However, 70.2% of the smallholders used other measures to improve soil fertility, especially using oil palm frond and leaves, and empty bunches, respectively.

The survey also indicated that the government officer played a major role on providing information regarding soil, and fertilizer management. Others included; farmer's experience, friend or neighbour, sale officer from the fertilizer company, and the extension officer from the CPO mill, respectively.

4.2.5 Pest Management in Oil Palm

Data on pest management in oil palms are summarized in Table A3.9. The survey showed that major problems from pests were; weeds, rats, disease, and insects, respectively. To cope with them, the smallholders used different measures, for example, to get rid of weeds 71.6% of the smallholders used non-chemicals measures. To control rats, the uses of non-chemical measures, such as; traps, or nets were the most popular. However, some smallholders did not apply any measures when facing the problem of pests.

For the smallholders, who used chemicals, the survey showed that most of them (84.8%) used it all at one time, while 15.2% stored it in the storage room. The majority of smallholders used protective guards when they had to apply chemicals. The most popular were; gloves, and masks. To dispose of hazardous containers, some smallholders left the containers in the plantation, sold those, or kept those for agricultural use, respectively. Most smallholders (97.8%) understood the harmfulness of pesticides. Most obtained information about pest management from government officials, their own experience, neighbour, and from the chemicals company, respectively.

The result also showed that only 11.5% of the smallholders had an informed idea about the concept of Integrated Pest Management (IPM).

4.2.6 Harvesting Management and the Sell of FFB

The survey indicates that 89.6% of the smallholders had harvested oil palm (Table A3.10). In order to harvest FFB, 93% of the smallholders hired the contracted harvesters, while the rest used family members. Most contracted harvesters were independent from the ramp, and mill. Harvesting cycles varied a lot, namely from 15-30 days. 66.4% of the smallholders harvested FFB every 20 days. On average, the harvesting cycle was 19.3 days. It was also found that most smallholders (97.5%), who hired the contracted harvesters, did not have any condition or punishment on harvesting of unripe FFB even if it did reduce the quality of FFB. The rest (2.5%) put conditions on harvesting of unripe FFB. From this, 66.7% deduct the harvesting fee paid to the harvesters if the CPO mills returned unripe FFB, and the rest, 33.3%, stop hiring.

The most important factor affecting the smallholders' decision to harvest FFB was ripeness (76.6%). Other factor was the harvesting cycle (19.5%). The fee paid to the contracted harvesters depended upon their agreement, which in many cases included transportation cost. For example, a harvesting fee of 332.9 Baht per ton, on average, would increase to 504.7 Baht per ton if transportation cost was included.

Table A3.11 summarizes the information on the selling of FFB. The majority of the smallholders (53.1%) sold their FFB to independent ramps. Some 32% and 14.9% of them sold their FFB to the mill and community enterprise ramps, respectively. The main factors affecting the smallholders' decision to sell FFB to independent ramps were; closeness to ramp, and high FFB price. Most of those who sold FFB to the mill indicated that the main factors were; high FFB price (70.7%), fair balance, and the system of FFB grading (43.9%), and closeness to the mill (26.8%). Most of those who sold FFB to the community enterprise ramps indicated that they are members of ramp, and can get dividend from ramps at the end of the year.

The results also revealed that the distance between the plantation and the buyer was 6.4 km on average. To transport FFB from plantation to buyer, 64.8% of the smallholders hired a contractor, while 35.2% managed it on their own. In case of hiring a contractor, the average transportation cost was 203.4 Baht per ton.

As to the FFB yield, the average production in 2009 was 3,072 kg per rai. The survey also showed that the yield of FFB varied a lot among oil palms of different age, namely old oil palm had the highest FFB yield (3,746.4 kg per rai per year), while oil palm at 15-20 years of age had the lowest yield (2,751.7 kg per rai per year) (Table A3.12). The average price of FFB, received by the smallholders, was 3.78 baht per kg in the same year. Up to 42% of the smallholders indicated that when they sold FFB, the price was determined according to FFB quality, while the rest (57.8%) received the price without considering FFB quality. For the first group, ripeness was the key-factor used for FFB grading. The majority of smallholders (91.4%) received cash when they sold the FFB.

4.2.7 Farm Records, Source of Information and Link with Ramp and Mill

Table A3.13 illustrates farm records, sources of information, and links with ramp and mill. The results showed that the majority of smallholders (75.6%) did not keep their farm records due to; less time available, complexity, they could not see the benefit, and had no skill in record keeping, respectively. For those who kept records, the items listed were; inflow-outflow, cost of fertilizer, and yield, respectively. With respect to the information on oil palm management, the survey revealed that only 68.7% of the smallholders received the information. For those receiving it, 43.3% obtained it from the government officials, while only 8.8% received it from the extension officer from the CPO mill. As for the marketing information, similarly, only 68.7% of the smallholders received it, and 28.4% obtained marketing information from the government officials, while 19.3% received it from the mill's

extension officer. It is important to note here that the government officials play a minor role among the oil palm information providers, especially CPO mill. There were only a small number of smallholders, who had links with ramp, and mill, 11.5% and 7.6% respectively.

4.3 Cost and Return

This section presents the results of a cost-return analysis, based on the data collected from the smallholders in the study areas. From each smallholder, a corresponding age of oil-palms was chosen for deriving the cost and yield data. In general, the total economic cost of production is composed of fixed and variable costs. Both the fixed and variable costs can be divided into cash, and non-cash costs. However, in this analysis, since it is not a pure or an in-depth economic study, the cost of production covers only key variables and cash costs. This can still be used as a basis for decision making, at the farm level. The variable cash costs used in this analysis include the cost of fertilizer, hired labor (excluding harvesting), chemicals, harvesting, transportation, and fuel. There are 3 components of labour cost, namely, labour costs for applying fertilizer, pruning and collecting frond, and spraying. For the total or gross return, the average yield and price were used for the calculation. From this data, the net return was obtained by deduction of gross return by the variable cost. Net return was calculated per rai and per ton of FFB.

Table A3.14 summarizes the cost-return analysis of FFB production in 2009. The results revealed that the average cost of FFB production for all ages of oil palms was about 4,872 Baht per rai per year or 1,440.8 Baht per ton (In 2007, the cost of FFB production by independent smallholders in Malaysia was RM 165.10 per ton) (Rahman, Ayat K. Ab, et al., 2008). However, this cost figure varied a lot among oil palms of different age, namely old palm had the highest cost, while oil palm at 15-20 years of age had the lowest cost. It can also be seen in Table A3.14 that the highest cost corresponds with the highest yield of FFB.

As for the FFB production cost, the cost of fertilizer, harvesting, and transportation are the major components, and account for 49.3%, 21.7%, and 13.6% of the total variable costs. It is clear that in order to reduce production cost or improve efficiency at the farm level, priority has to be given to soil and fertilizer management.

With respect to the FFB yield, the survey showed that the yield of FFB varied a lot (Table A3.12 and Table A3.14). However, the average FFB yield corresponding to the plots used for cost analysis was 3,381.5 kg per rai year. The old oil palms give the highest FFB yield (3,746.4 kg per rai per year), while oil palm at 15-20 years of age had the lowest yield (2,751.7 kg per rai per year). Given the average FFB price that the smallholders received in 2009 of 3.78 Baht per kg, oil palm yields provided a net return of 7,910.1 Baht per rai per year. The highest net return, 8,944.8 Baht per kg, was obtained from 9-14 years old oil palms, while the smallholders who have oil

palms at 15-20 years of age gained the lowest net return. Accordingly, at break-even price, the price of FFB that covers to the cost of FFB production, on a per kg basis, is the highest for oil palm at 15-20 years of age (1.7 Baht per kg), while it is the lowest for younger oil palms, namely 1.4 Baht per kg. As for a break-even yield, the minimum yield the smallholders have to obtain to cover the production cost given the FFB price is the highest for the old oil palms, namely 1,537.5 kg per rai per year. This makes FFB production cost the highest. It is clear that smallholders will obtain the highest net return when their oil palms are 9-14 years of age.

4.4 Problems Faced by Smallholders

Problems faced by smallholders were summarized in Table A3.15. The major problems were; fluctuation of FFB price, the high price of fertilizer, lack of water in dry season, low quality of seedlings, low soil fertility, and lack of knowledge in oil palm management, in this order.

4.5 Support and Training Needs

The results indicated that only 29% of sample smallholders had received support, and 23.7% were trained (Table A3.16). The main supporters and training providers were the agricultural extension officers at the district level. Presently, the smallholders still need support on several issues, i.e. raising and stabilizing the FFB price, soil and leaf analysis, reducing or controlling the fertilizer price, and the price of other factors, and knowledge on oil palm management, respectively (Table A3.17). The key training needs are; oil palm plantation management, knowledge about soil and leaf analysis, and how to improve the oil palm yield, respectively (Table A3.18).

4.6 Opinion on Sustainable Oil Palm Production

Table A3.19 summarizes the survey results, based on the opinion of the smallholders on the issue of sustainable oil palm production. The majority of smallholders (95.4%) are aware of the impacts on the country's economy from oil palm production, especially in terms of generating farmers', and community income. Some 89.3% see the positive impact in reducing social problems when being employed, improving income, and having a fair degree of security in their daily life. However, 64.9% are fully aware of the environmental impacts. Lack of water due to high consumption of oil palms, and pollution from CPO are the key environmental issues. About 12.9% of the smallholders, who are aware of the environmental impact, are willing to suggest the means to reducing it. The key suggestions include: stop encroachment to forest land, and CPO mill should treat water before discharge. With respect to the location of oil palm plantation, only 0.8% of the smallholders indicated that their plantations are rather close to reserved area.

4.7 Suggestion for the Development of Oil Palm Production

Based on the suggestions of the smallholders, for the development of oil palm production, the key issues are summarized in Table A3.20. Those are; the knowledge support to smallholders on the oil palm production management, the raising and stabilization of the FFB price, developing high quality seedlings, the reduction or control of the fertilizer price, and the price of other factors, and the provision of soil and leaf analysis in the production area which the smallholders could access easily, in this order.



Chapter 5

Baseline Study of the Oil Palm Smallholders: Link with Southern Palm Oil Industry Co., Ltd. (1993)

This chapter summarizes the observations drawn from the primary data collected from 82 oil palm smallholders who have links with Southern CPO mill in Phun-Phin district, Surat Thani. The personal interviews revealed the following facts (Table A4.1-A4.20 in Appendix 4).

Surat Thani province, where around 0.53 million rai of land is suitable for oil palm production, is now the second largest oil palm producing province in Thailand. In 2009, the total oil palm plantation area in Surat Thani was about 1.0 million rai (160,000 ha). It was accountable for 25% of Thailand's oil palm plantation area. Of this, around 85% has been harvested. An average yield of 2,588 kg per rai was received in 2009 (The country's average yield was 2,694 kg per rai, according to Office of Agricultural Economics). The plantation areas are in 17 districts. The major districts are; Prasaeng, Tachana, and Phunpin, respectively. In Surat Thani, there were approximately 28,000 oil palm growers in 2009 (26% of oil palm growers in Thailand). The majority of the growers (about 90%) are smallholders, with an average plantation area of 28 rai (around 4.5 ha) (Office of Agricultural Extension and Development Region 5, 2010 and Thongrak, S. et al., 2009)

In Surat Thani, there are 17 CPO mills (The country has about 60 mills), in operation, in 2010. Nearly all mills depend mostly on FFB from small out-growers. Southern Palm Oil Industry Company (1993) Limited has been in the oil palm industry and producing CPO since 1996. It is the second crushing mill, under the Southern Group Company. A crushing mill currently has a production capacity of 90 tons, per hour, of FFB. The Southern crushing mill purchases approximately 90% of their FFB from small out-growers in Surat Thani and nearby provinces (Southern Palm Oil Industry Company, 2011).

5.1 Basic Information about the Smallholders and their Farms

5.1.1 Socio-Economic Characteristics of Oil Palm Smallholders

Socio-economic characteristics of the smallholders are presented in Table A4.1. The survey showed that 52.4% of the smallholders are 41-60 years of age, the average being 48.7 years. 58% of the smallholders obtained primary education. Only 17% received a Diploma's degree or higher. About 87% of the smallholders are male. However, practically all housewives assist their husbands in the production of oil palm. Approximately 57% of the smallholders have 4-5 household members. On an average, they have 4.3 people per household.

Around 61% of the smallholders grow oil palm, as the primary source of income. 85% of the smallholders obtained income from more than one source.



Examples of a secondary source of income were; rubber plantations, livestock raising, and merchandise.

The survey also showed that 91% of the smallholders managed most of the oil palm activities with their own family members, while the rest used mainly hired labour. Around 41% of the smallholders have 6-10 years of experience in oil palm production. Only 8% have more than 15 years of experience. On average, they have 8.2 years of experience.

Table A4.2 summarizes income, debt, and farm assets of the smallholders. About 40% of the smallholders had a household income of 200,001-400,000 Baht per year. On average, they earned around 472,634 Baht per household per year. Of this amount, one-half was from oil palm production.

Credit plays an important role for the smallholders since 64.6% has continuous debt of 352,547 baht per household. Two-third of the smallholders (66%) relied on loans from the Bank for Agriculture and Agricultural Cooperative (BAAC). Only 18.9% had a loan from a commercial bank. The smallholders used their loans for oil palm production (35.8%), other agricultural activities (20.8%), purchasing land (18.9%), and the purchasing of cars, or trucks (13.2%).

As to farm assets, the survey showed that the most popular assets are oil palm spades, mowers, 4-wheel trucks, oil palm scythes, and weed sprayers, respectively.

5.1.2 Membership of Oil Palm Groups and Motivation to Grow Oil Palm

Normally, the agricultural office at the district level is responsible for the registration of major crop growers, and attempts to encourage the farmers to register with the office, in order to improve the government database on economic crop. However, the survey showed that only 48.8% of oil palm smallholders had registered. This may be the main reason for the poor database on oil palm at the regional and national levels. As to oil palm groups, and association membership, only 1.2% of the smallholders are members. When the smallholders were asked about their motivations to grow oil palm, their responses were interesting. The majority, 69.5%, chose oil palm because it is appropriate to the environment, while 29.3% grew oil palm because the high FFB price, and therefore a high return. Some 24% specified that oil palm is not difficult to manage compared to other crops. Other factors are summarized in Table A4.3.

5.2 Characteristics of Oil Palm Production and Management by Smallholders

5.2.1 Relevant Aspect of Land, Topography, Soil and Oil Palms

On a per household basis, a smallholder owned on average about 53 rai (8.5 ha) while some 29% of them owned at most 25 rai. Only 8.5% owned more than 100 rai. For oil palm production, the average area was 34 rai (5.5 ha). Some 53.7% of them owned up to 25 rai of oil palm plots and 32.9% owned 26-50 rai per household.



Smallholders owned, on average, 2 oil palm plots, while 40.2% of the smallholders have only one plot. The majority of land, at all oil palm plots (166 plots), owned by the smallholders had the land title. The most popular land title among them was Chanod, and Nor Sor 3. The survey also showed that 11% of the oil palm plots had no land title (Table A4.4). Around one-half of the oil palm plots (52%) are in lowland areas, while 39% are in plain areas. For soil characteristics, most oil palm plots have clay and loam.

Land usage prior to oil palm was various. 35.5% was un-used land, while some 29% of oil palm plots were used for rice production. Only 12% were used for rubber production. On average, palm trees are 6.5 years old. Some smallholders have plans to replant their old oil palms. Only 22% of the smallholders intend to expand the area of oil palm production with an average acreage of 23 rai.

5.2.2 Variety of Oil Palm and Source of Seedlings

The survey showed that all oil palm smallholders grow *tenera* (variety), because palm fruits of *tenera* contain the most oil. Nealy one-half of the smallholders (49%) purchased seedlings from oil palm nursery operators i.e. Southern, and Univanch. Around one-third (33%) bought seedlings from private nurseries. Some of them bought seedlings from oil palm research centre, and cooperative. The main factors affecting the smallholders' decision to buy seedlings were; their quality, a well accepted source/with licenses, and convenience to excess, respectively. Most smallholders used 7-12 months old seedlings. On each plot, 22 oil palm trees per rai were usually planted (Table A4.5).

5.2.3 Use of Labour in Oil Palm Production

The results revealed that all of the smallholders used family labour. 57.3% hired additional labourers. The most popular activities utilizing family labour were; general management, applying fertilizer, weeding, pruning, and transportation of FFB, respectively. On a household basis, a smallholder had on average of 2 people working in the plantation. In contrast, the average amount of hired labour was 3.7 people per household (Table A4.6).

The main reason for hiring labourers by the smallholders was insufficient household labour and/or lack of time. Of the smallholders who hired labour, 38.3% of them provided fringe benefits to its labourers, especially food, and housing. Most of hired labourers worked in the plantation without any contract. Only 6.4% worked with one year contract. Moreover, most of hired labourers were not informed about the labour rights. Up to 98% of the smallholders are aware of the farm injuries and most of them took preventive measures such as; putting on boots, wearing long-sleeved shirt and pants, and putting on gloves and cap, respectively.

With respect to accidents occurring to labourers in the farm, the interviews revealed that 21.3% of the smallholders had encountered this problem. Some 14.9%



of the smallholders faced the issues of misunderstanding or unhappiness of hired labourers. This problem was usually solved by compromising, or making new agreements, respectively.

The survey also indicated that oil palm smallholders who hired labour, nearly all hired them from Suratthani. Wages varied among activities, for example, an average wage for pruning was 8.0 Baht per tree (an average cost of pruning in Malaysia was RM 1.38). For the transportation of FFB, wages were based on the distance between the ramp or mill and the smallholders' farm. From the sample smallholders, an average wage was 168 Baht per ton of FFB. Wages for other activities are shown in Table A4.7.

5.2.4 Water and Soil Management in Oil Palm Production

Table A4.8 summarizes the survey results regarding water and soil management of the smallholders. Most oil palm smallholders (82.9%) depend only on rainfall as the water source for oil palm production. Even though irrigation can significantly improve oil palm yield, most smallholders have not yet applied such system. This may be due to lack of water supply or the high investment cost.

The results also revealed that most of the smallholders (98.8%) applied fertilizer. The majority applied chemical fertilizer. Among these, 45% applied chemical fertilizers three times a year. 37.5% applied twice a year. About 11.3% and 6.3% of them applied chemical fertilizer four times a year, and once a year, respectively. On average, the smallholders applied chemical fertilizer to the amount of 44.2 kg per rai (around 2 kg per tree). The most important factor that affects the smallholders' decision to apply fertilizer was the cycle of applying fertilizer. They also based their decisions on; age of palm tree, appropriate timing (soil moisture), available capital, and brand of fertilizer, respectively.

Only a small number of the smallholders (7.3%) grew cover crops in the plantations. The most popular cover crop was legume. About 23.7% of the smallholders applied soil erosion protection measures. However, 59.8% of the smallholders used other measures to improve soil fertility, especially using oil palm fronds and leaves, and empty bunches, respectively.

The survey also showed that the government officials played a major role in providing information regarding soil and fertilizer management. Others included farmers' experiences, and friends or neighbours, respectively.

5.2.5 Pest Management in Oil Palm

Data on pest management in oil palms are summarized in Table A4.9. The survey indicated that major problems from pests were; weeds, rats, disease, and insects, respectively. To cope with them, the smallholders used different measures, for example, to get rid of weeds one-half of the smallholders used chemicals. To control rats, the uses of non-chemical measures, such as; traps, or nets were the most



popular. However, some smallholders did not apply any measures when facing the problem of pests.

For the smallholders who used chemicals, the survey showed that 51.1% of them used it all at one time, while the rest (48.9%) stored it mainly in the storage room. The majority of smallholders used protective guards when they had to apply chemicals. The most popular were; gloves and masks. However, some 17.8% of them did not use any safety guards. To dispose of hazardous containers, some smallholders sold those, burn or bury, left the containers in the plantation, or kept those for agricultural use, respectively. All of smallholders understood the harmfulness of pesticides. Most received information about pest management from government officials, and their own experiences. The result also revealed that only 2.4% of the smallholders had an informed idea about the concept of Integrated Pest Management (IPM).

5.2.6 Harvesting Management and the Sell of FFB

The survey indicates that 97.6% of the smallholders had harvested FFB (Table A4.10). In order to harvest FFB, 57.5% of the smallholders hired the contracted harvesters, while the rest used family members. Harvesting cycles varied among the smallholders. The results showed that 67.5% of the smallholders harvested FFB every 20 days. On average, the harvesting cycle was 19.2 days.

Most contracted harvesters were independent from the ramp, and mill. It was also found that most of the smallholders (93.5%), who hired the contracted harvesters, did not have any condition, or punishment on harvesting of the unripe FFB even if it did reduce the quality of FFB. Only 6.5%, put conditions on harvesting of unripe FFB. From this, 66.7% did not pay for the harvesting, and stop hiring. The rest, (33.3%) did not pay for the harvesting.

The most important factors affecting the smallholders' decision to harvest FFB was ripeness (82.5%). Other factors were; the harvesting cycle, and labour availability, respectively. The fee paid to the contractor depended upon their agreement in which in many cases transportation cost was included. For example, a harvesting fee of 300 Baht per ton, on average, would increase to 453.5 Baht per ton if transportation cost was included.

Table A4.11 summarizes the information on the selling of FFB. The majority (62.5%) of the smallholders sold their FFB to independent ramps. Some 35% sold it to the mill. Only 2.5% sold it to mill ramps. The main factors affecting the smallholders' decision to sell FFB to the independent ramps were; closeness to ramp (100%) and high FFB price (16%). Most (57.1%) sold FFB to the mill because of a fair balance, and the system of FFB grading. Other factors were; closeness to the mill (46.4%), and high FFB price (21.4%). In addition, most of those who sold FFB to the mill ramp indicated that they were close to a mill ramp.



The result also revealed that the distance between the plantation and the buyer was 5.6 km on average. To transport FFB from plantation to buyer, 61.2% of the smallholders managed it on their own, while 38.8% hired a contractor. In case of hiring a contractor, the average transportation cost was 176.5 Baht per ton.

As to the FFB yield, the average production in 2009 was 2,433 kg per rai. The survey also showed that the yield of FFB varied a lot among oil palms of different age, namely oil palm at 9-14 years of age had the highest FFB yield (3,391.7 kg per rai per year), while old oil palm had the lowest yield (2,181.7 kg per rai year) (Table A4.12). The average price of FFB received by the smallholders was 3.60 baht per kg in the same year. Most smallholders (55%) indicated that they received the price without considering FFB quality, while the rest (45%) obtained the price which was determined according to FFB quality. For the latter group, % oil extracting rate (OER), and ripeness were the key-factors used for FFB grading. The majority of smallholders (98.7%) received cash when they sold the FFB.

5.2.7 Farm Records, Source of Information and Link with Ramp and Mill

Table A4.13 illustrates farm records, sources of information, and links with ramp and mill. The results showed that the majority of smallholders (64.6%) did not keep their farm records due to; available time, they could not see the benefit, and complexity, respectively. For those who kept records, the items listed were; inflow-outflow, cost of fertilizer, and yield, respectively. With respect to source of information on oil palm management, the survey revealed that 43.2% and 40.9% of the smallholders obtained it from government officials, and from their own experience, respectively. Similarly, the smallholders obtained marketing information from their own experience, and government officials, respectively. There were a small number of smallholders who had links with mill and ramps, 3.7% and 15.9%, respectively.

5.3 Cost and Return

This section presents the results of a cost-return analysis based on the data collected from the smallholders in the study areas. From each smallholder, a corresponding age of oil-palms was chosen for deriving the cost, and yield data. In general, the total economic cost of production is composed of fixed and variable costs. Both the fixed and variable costs can be divided into cash, and non-cash costs. However, in this analysis, since it is not a pure or an in-depth economic study, the cost of production covers only key variables and cash costs. This can still be used as a basis for decision making at the farm level. The variable cash costs used in this analysis include; the cost of fertilizer, hired labour (excluding harvesting), chemicals, harvesting, transportation, and fuel. There are 3 components of labour cost, namely, labour costs for applying fertilizer, pruning and collecting frond, and spraying. For the total or gross return, the average yield and price were used for the calculation.



From this data, the net return was obtained by deduction of gross return by the variable cost. Net return was calculated per rai and per ton of FFB.

Table A4.14 summarizes the cost-return analysis of FFB production in 2009. The results revealed that the average cost of FFB production for all ages of oil palms was about 4,306 Baht per rai per year or 1,590 Baht per ton (In 2007, the cost of FFB production by independent smallholders in Malaysia was RM 165.10 per ton) (Rahman, Ayat K. Ab, et al., 2008). However, this cost figure varied a lot among oil palms of different age, namely oil palm at 9-14 years of age had the highest cost, while old oil palm had the lowest cost.

As for the FFB production cost, the cost of fertilizer, harvesting, and transportation are the major components, and account for 52.8%, 20.4%, and 11% of the total variable costs. It is clear that in order to reduce production cost or improve efficiency at the farm level, priority has to be given to soil and fertilizer management.

With respect to the FFB yield, the survey showed that the yield of FFB varied a lot (Table A4.12 and Table A4.14). However, the average FFB yield corresponding to the plots used for cost analysis was 2,708 kg per rai per year. Oil palms with 9-14 years of age give the highest FFB yield (3,443.9 kg per rai per year), while young oil palm had the lowest yield (2,502.9 kg per rai per year). This excludes oil palm at 15 years of minimal age, which only 2 plots were analyzed. Given the average FFB price that the smallholders received in 2009 of 3.6 Baht per kg, oil palm yields provided a net return of 5,443 Baht per rai per year. The highest net return, 7,924 Baht per kg, was obtained from 9-14 years old oil palms, while the smallholders who have young palms gained the lowest net return. Accordingly, at break-even price, the price of FFB that covers to the cost of FFB production on a per kg basis, is the highest for young palm (1.7 Baht per kg), while it is the lowest for palms 9-14 years, namely 1.3 Baht per kg. As for a break-even yield, the minimum yield the smallholders have to obtain to cover the production cost given the FFB price is the highest for 9-14 years oil palms, namely 1,242.7 kg per rai per year. This makes FFB production cost the highest. It is clear that smallholders will obtain the highest net return when their oil palms are 9-14 years of age.

5.4 Problems Faced by Smallholders

Problems faced by smallholders were summarized in Table A4.15. The major problems were; fluctuation of FFB price, the high price of fertilizer, lack of knowledge in oil palm management, lack of knowledge in soil and fertilizer management, and lack of water in dry season, in this order.

5.5 Support and Training Needs

The results reflected that only 31.7% of smallholders had received support, and 18.3% were trained (Table A4.16). The main supporters and training providers were the agricultural extension officers, at the district level, and central government,



respectively. It is interesting to note that the Southern CPO mill played a minor role in providing support and training for smallholders.

At present, therefore, the smallholders still need support on several issues, i.e. soil and leaf analysis, raising and stabilizing FFB price, reducing or controlling fertilizer price and the price of other factors, knowledge on oil palm management, and water supply, respectively (Table A4.17). The key training needs are; oil palm plantation management, knowledge on soil and leaf analysis, how to select high quality seedlings, knowledge on pest management, and best practice of FFB harvesting, respectively (Table A4.18).

5.6 Opinion on Sustainable Oil Palm Production

Table A4.19 summarizes the survey results, based on the opinion of the smallholders on the issue of sustainable oil palm production. The majority of smallholders (90.2%) are aware of the impacts to the country's economy from the oil palm production, especially in terms of generating farmers', and community income. Some 82.9% see the positive impact in reducing social problems when being employed, improving income, and gaining more time to spend with family and a better quality of life. However, only 52.4% are fully aware of the environmental impacts. Lack of water due to high consumption of oil palms, and contamination of agricultural chemicals in the environment are the key negative environmental impacts.

5.7 Suggestion for the Development of Oil Palm Production

Based on the suggestions of the smallholders for the development of oil palm production, the key issues are summarized in Table A4.20. Those were; the knowledge support to smallholders on the oil palm production management, the raising and stabilization of FFB price, developing high quality seedlings, reduction or control of the fertilizer price and the price of other factors, and improving ramps' practices on FFB handling (do not water and keep FFB overnight), respectively.



Chapter 6

Baseline Study of the Oil Palm Smallholders: Link with Aoluk Cooperative Ltd.

This chapter summarizes the observations drawn from the primary data collected from **100** oil palm smallholders who are the member of Aoluk Cooperative in Aoluk district, Krabi. The personal interviews revealed the following facts (Table A5.1-A5.20 in Appendix 5).

Krabi province, where around 1.3 million rai of land is suitable for oil palm production, is now the top oil palm producing province in Thailand. In 2009, the total oil palm plantation area in Krabi was about 1.0 million rai (160,000 ha). It was accountable for 25% of Thailand's oil palm plantation area. Of this, around 85% has been harvested. An average yield of 2,790 kg per rai was received in 2009 (The country's average yield was 2,694 kg per rai, according to Office of Agricultural Economics). The plantation areas are in 8 districts. The major districts are; Kaophanom, Aoluk, Plaipraya, and Klongtom, respectively. In Krabi, there were approximately 21,000 oil palm growers in 2009 (19% of oil palm growers in Thailand). The majority of the growers (about 90%) are smallholders, with an average plantation area of 43 rai (around 7 ha) (Krabi Agriculture Office, 2010 and Office of Agricultural Extension and Development Region 5, 2010)

Aoluk Cooperative Estate Limited is one of Thailand's top estate cooperatives. It was established in 1975 by the Department of Cooperative Promotion, Ministry of Agriculture (MOA), with a total of 310 members. At the beginning, the cooperative members, who were landless residences in Krabi and nearby provinces, were allocated 24-25 rai of land. The land areas, allocated to the members, are in 3 sub-districts of Plaipraya district, and 2 sub-districts of Aoluk district. At that time the members were supported to grow oil palm, under the BAAC financial assistance (soft loans), a total of 120,000 Baht per household. Since then, the Cooperative has performed well, and the current members total more than 3,000. Most of the members depend on oil palm production as the primary source of income. After several years of membership, most of the members improve their income, and standard of living, as well as expanding their holding land areas. The smallholders, who are members of the Cooperative, sell their FFB to both Krabi Oil Palm Federal Cooperative mill in Aoluk, and the private CPO mills.

6.1 Basic Information about the Smallholders and their Farms

6.1.1 Socio-Economic Characteristics of Oil Palm Smallholders

Socio-economic characteristics of the smallholders are shown in Table A5.1. The survey showed that about 86% of the smallholders are over 40 years of age, the average being 55.3 years. Up to 78% obtained primary education. Only 2% received



a Bachelor's degree or higher. Two-third of the smallholders (68%) are male. Some 41% of the smallholders have 4-5 household members, while 10% have more than 5 household members. On an average, they have 3.8 people per household.

Nearly all of the smallholders (99%) grow oil palm, as the primary source of income. About 42% of the smallholders obtained income from more than one source. Examples of a secondary source of income were; rubber plantations, merchandise, vegetables production, and livestock raising.

The survey also showed that 82% of the smallholders managed most of the oil palm activities with their own family members, while the rest (18%) used mainly hired labourers. Up to 79% of the smallholders have over 26 years of experience in oil palm production. On average, they have 27.1 years of experience.

Table A5.2 summarizes income, debt, and farm assets of the smallholders. Most of the smallholders (82%) had a household income at most 400,000 Baht per year. On average, they earned around 314,209 Baht per household per year. Of this amount, 65.5% was from oil palm production.

Credit plays an important role for the smallholders since 66% has continuous debt of 315,321 baht per household. 58% of the smallholders relied on loans from the Bank for Agriculture and Agricultural Cooperative (BAAC), and 33% depended on loans from the agricultural cooperatives. Only 4.5% had a loan from a commercial bank. The smallholders used their loans for oil palm production (40.9%), other agricultural activities (18.2%), purchasing of cars, or trucks (16.7%), and purchasing land (12.1%).

As to farm assets, the survey indicated that the most popular assets are; mowers, 4-wheel trucks, oil palm scythes, weed sprayers, and oil palm spades, respectively.

6.1.2 Membership of Oil Palm Groups and Motivation to Grow Oil Palm

All of the smallholders are members of Aoluk Cooperative. Generally, the agricultural office at the district level is responsible for the registration of major crop growers and attempts to encourage the farmers to register with the office, in order to improve the government database on economic crops. Remarkably, the survey showed that up to 83% of oil palm smallholders had registered. When the smallholders were asked about their motivations to grow oil palm, their responses were interesting. The majority (55%) grew oil palm because they were promoted by the cooperative, while 31% grew oil palm because the high FFB price, and therefore a high return. Some 11% chose oil palm because it is appropriate to the environment. Other factors are summarized in Table A5.3.



6.2 Characteristics of Oil Palm Production and Management by Smallholders

6.2.1 Relevant Aspect of Land, Topography, Soil and Oil Palms

On a per household basis, a smallholder owned on average about 42 rai (6.8 ha) while about one-half of them owned at most 25 rai. Only 3% owned more than 100 rai. For oil palm production, the average area was 37.6 rai (6.0 ha). Some 60% of them owned up to 25 rai of oil palm plots and 24% owned 26-50 rai per household. Smallholders owned, on average, 1.8 oil palm plots, while 57% of the smallholders have only one plot. The majority of land, at all oil palm plots (177 plots), owned by the smallholders had the land title. The most popular land title among them was Nor Sor 3. The survey also revealed that 15% of the oil palm plots had no land title (Table A5.4). Around 72% of the oil palm plots are in plain areas, while 12.4 % of the plots are on hilly and sloping land. For soil characteristics, most oil palm plots have sandy loam, loam, clay, and sandy soil, respectively.

Land usage prior to oil palm was various. Up to 84% of oil palm plots were un-used land, while 14% of oil palm plots were used for rubber production. On average, palm trees are 21.8 years old. One-half of the smallholders have plans to replant their old oil palms, and 94% of them plan to replant by 2012. Only 4% of the smallholders intend to expand the area of oil palm production with an average acreage of 20.8 rai.

6.2.2 Variety of Oil Palm and Source of Seedlings

The survey showed that most of oil palm smallholders grow *tenera* (variety), because palm fruits of *tenera* contain the most oil. However, on some plots *dura* still exists. By using *dura* seedlings, it is definite that they will get low crop yield, and low return on investment. Slightly more than two-third of the smallholders (69%) purchased seedlings from Aoluk Cooperative, while 26% purchased it from oil palm nursery operators i.e. Southern, and Univanich. Only 6% of them bought seedlings from private nurseries. The main factors affecting the smallholders' decision to buy seedlings were; a well accepted source/with licenses, supported by cooperatives, their quality, and convenience to excess, respectively. Most smallholders used 7-12 months old seedlings. On each plot, 22 oil palm trees per rai were usually planted (Table A5.5).

6.2.3 Use of Labour in Oil Palm Production

The results revealed that more than 85% of the smallholders used both family and hired labour in oil palm production. The most popular activities utilizing family labour were; general management, applying fertilizer, weeding, transportation of FFB, and pruning, respectively. On a household basis, a smallholder had on average of 1.9 people working in the plantation. In contrast, the average amount of hired labour was 3.8 people per household (Table A5.6).



The main reason for hiring labourers by the smallholders was insufficient household labour and/or lack of time. Of the smallholders who hired labour, only 19.3% of them provided fringe benefits to its labourers, especially food, and housing. All of hired labourers worked in the plantation without any contract. Moreover, all of hired labourers were not informed about the labour rights. Nearly all of the smallholders (99%) are aware of the farm injuries, and most of them took preventive measures such as; putting on boots, wearing long-sleeved shirt and pants, and putting on gloves and cap, respectively.

With respect to accidents occurring to labourers in the farm, the interviews showed that 11.4% of the smallholders had encountered this problem. Some 5.7% of the smallholders faced the issues of misunderstanding or unhappiness of hired labourers. This problem was usually solved by changing to new labour team, compromised by third party, and making new agreements, respectively.

The survey also indicated that oil palm smallholders who hired labour, nearly all hired them from Krabi. Wages varied among activities, for example, an average wage for pruning was 15.2 Baht per tree. The wages of pruning is much higher than those in other areas because of old oil palms in Aoluk. For the transportation of FFB, wages were based on the distance between the ramp, or mill and the smallholders' farm. From the sample smallholders, an average wage was 168 Baht per ton of FFB. Wages for other activities are shown in Table A5.7.

6.2.4 Water and Soil Management in Oil Palm Production

Table A5.8 summarizes the survey results regarding water and soil management of the smallholders. All oil palm smallholders depended only on rainfall as the water source for oil palm production. Even though irrigation can significantly improve oil palm yield, smallholders have not yet applied such system. This may be due to lack of water supply or the high investment cost.

The results also revealed that most of the smallholders (97%) applied their oil palms. Among these, all of them applied chemical fertilizer. The majority, 57.7%, applied chemical fertilizers twice a year. About 25.8% and 15.5% of them applied chemical fertilizer three times and once a year, respectively. On average, the smallholders applied chemical fertilizer to the amount of 51 kg per rai (around 2.3 kg per tree). The most important factors that affect the smallholders' decision to apply fertilizer were; appropriate timing (rain or soil moisture), and the cycle of applying fertilizer. They also based their decisions on available capital, and soil and leaf analysis.

Only a small number of the smallholders (7%) grew cover crops in the plantations. The most popular cover crop was legume. Similarly, only 8.6% of the smallholders applied soil erosion protection measures. However, some 81% of the smallholders used other measures to improve soil fertility, especially using oil palm fronds and leaves, and empty bunches, respectively.



The survey also showed that the government officials played a major role in providing information regarding soil and fertilizer management. Others included farmers' experiences, neighbours, and sale officers from the fertilizer company, respectively.

6.2.5 Pest Management in Oil Palm

Data on pest management in oil palms are summarized in Table A5.9. The survey indicated that major problems from pests were weeds, rats, disease, and insects, respectively. To cope with them, the smallholders used different measures, for example, to get rid of weeds 46.9% of the smallholders used chemicals. To control rats, 5.4% of them used non-chemical measures such as; traps, or nets. However, most smallholders did not apply any measures when facing the problem of pest.

For the smallholders who used chemicals, the survey showed that 55.3% of them used it all at one time, while 44.7% stored it. The majority of smallholders used protective guards when they had to apply chemicals. The most popular were gloves and masks. However, some 6.4% of them did not use any safety guard. To dispose of hazardous containers, some smallholders sold those, burn or bury, kept those for agricultural use, or left the containers in the plantation, respectively. All of smallholders understood the harmfulness of pesticides. Some 34% received information about pest management from government officials, their own experiences, and officers from chemical company, respectively. The result also revealed that only 2% of the smallholders had an informed idea about the concept of Integrated Pest Management (IPM).

6.2.6 Harvesting Management and the Sell of FFB

The survey indicates that 99% of the smallholders had harvested FFB (Table A5.10). In order to harvest FFB, 92.9% of the smallholders hired labourers. Of this, 63.6% hired the contracted harvesters. The rest (7.1%) used family labour. Harvesting cycles varied among the smallholders. The results showed that 71.7% of the smallholders harvested FFB every 20 days. On average, the harvesting cycle was 19.8 days.

Most contracted harvesters were independent from the ramp, and mill. It was also found that most of the smallholders (97.8%) who hired labourers did not have any condition or punishment on harvesting of unripe FFB even if it did reduce the quality of FFB. Only 2.2%, put conditions on harvesting of unripe FFB. From this, 50% deduct harvesting fee if the CPO factory return, and the rest (50%) stop hiring.

The most important factors affecting the smallholders' decision to harvest FFB was ripeness (86.9%). Other factors were labour availability, and the harvesting cycle, respectively. The fee paid to the contracted harvesters depended upon their agreement, which in many cases included transportation cost. For example, a



harvesting fee of 310 Baht per ton, on average, would increase to 467.5 Baht per ton if transportation cost was included.

Table A5.11 summarizes the information on the selling of FFB. Every smallholder sold their FFB to cooperative ramps because they are members of the cooperative and they will get dividend at the end of the year. The result also revealed that the distance between the plantation and the buyer was 3.0 km on average. To transport FFB from plantation to buyer, 35.4% of the smallholders managed it on their own, while 64.6% hired a contractor. In case of hiring a contractor, the average transportation cost was 163.9 Baht per ton.

As to the FFB yield, the average production in 2009 was 2,446 kg per rai. The survey also showed that the yield of FFB varied a lot among oil palms of different age, namely oil palm at 15-20 years of age had the highest FFB yield (2,574 kg per rai per year), while young oil palm had the lowest yield (1,958 kg per rai per year) (Table A5.12). The average price of FFB, received by the smallholders, was 3.67 baht per kg in the same year. Most smallholders (61.6%) indicated that they received the price without considering FFB quality, while the rest (38.4%) obtained the price which was determined according to FFB quality. For the latter group, ripeness and bunch size were the key-factors used for FFB grading. Every smallholder received cash when they sold the FFB.

6.2.7 Farm Records, Source of Information and Link with Ramp and Mill

Table A5.13 illustrates farm records, sources of information, and links with ramp and mill. The results indicated that the majority of smallholders (81%) did not keep their farm records due to several reasons such as; they could not see the benefit, and have already kept farm receipt, complexity, and time available, respectively. For those who kept records, the items listed were; inflow-outflow, cost of fertilizer, and yield, respectively. With respect to the source of information on oil palm management, the survey showed that 52.4% and 46.3% of the smallholders obtained it from government officials, and from their own experience, respectively. Similarly, the smallholders obtained marketing information from government officials, and their own experience, respectively. All of smallholders have linked with cooperative ramp, especially receiving dividend and credit.

6.3 Cost and Return

This section presents the results of a cost-return analysis based on the data collected from the smallholders in the study areas. From each smallholder, a corresponding age of oil-palms was chosen for deriving the cost and yield data. In general, the total economic cost of production is composed of fixed and variable costs. Both the fixed and variable costs can be divided into cash, and non-cash costs. However, in this analysis, since it is not a pure or an in-depth economic study, the cost of production covers only key variables and cash costs. This can still be used as



a basis for decision making at the farm level. The variable cash costs used in this analysis include; the cost of fertilizer, hired labor (excluding harvesting), chemicals, harvesting, transportation, and fuel. There are 3 components of labour cost, namely, labour costs for applying fertilizer, pruning and collecting frond, and spraying. For the total or gross return, the average yield and price were used for the calculation. From this data, the net return was obtained by deduction of gross return by the variable cost. Net return was calculated per rai and per ton of FFB.

Table A5.14 summarizes the cost-return analysis of FFB production in 2009. The results revealed that the average cost of FFB production for all ages of oil palms was about 4,066 Baht per rai per year or 1,465 Baht per ton (In 2007, the cost of FFB production by independent smallholders in Malaysia was RM 165.10 per ton) (Rahman, Ayat K. Ab, et al., 2008). However, this cost figure varied a lot among oil palms of different age, namely oil palm at 9-14 years of age had the highest cost, while old oil palm had the lowest cost. It can also be seen in Table A5.14 that the highest cost corresponds with the highest yield of FFB.

As for the FFB production cost, the cost of fertilizer, harvesting, and transportation are the major components, and account for 51.6%, 20.8%, and 10.9% of the total variable costs. It is clear that in order to reduce production cost or improve efficiency at the farm level, priority has to be given to soil and fertilizer management.

With respect to the FFB yield, the survey showed that the yield of FFB varied a lot (Table A5.12 and Table A5.14). However, the average FFB yield corresponding to the plots used for cost analysis was 2,776 kg per rai per year. Oil palms with 9-14 years of age give the highest FFB yield (3,024 kg per rai per year), while young oil palm had the lowest yield (2,503 kg per rai per year). Given the average FFB price that the smallholders received in 2009 of 3.67 Baht per kg, oil palm yields provided a net return of 6,121 Baht per rai per year. The highest net return, 6,482 Baht per kg, was obtained from 9-14 years old oil palms, while the smallholders who have young palms gained the lowest net return. Accordingly, at break-even price, the price of FFB that covers to the cost of FFB production on a per kg basis, is the highest for young palm (1.7 Baht per kg), while it is the lowest for old palms (>20 years), namely 1.4 Baht per kg. As for a break-even yield, the minimum yield the smallholders have to obtain to cover the production cost, given the FFB price, is the highest for 9-14 years oil palms, namely 1,258 kg per rai per year. This makes FFB production cost the highest. It is clear that smallholders will obtain the highest net return when their oil palms are 9-14 years of age.

6.4 Problems Faced by Smallholders

Problems faced by smallholders were summarized in Table A5.15. The major problems were; the high price of fertilizer, lack of knowledge in oil palm



management, lack of water in dry season, fluctuation of FFB price, and facing low fertility of soil, in this order.

6.5 Support and Training Needs

The results reflected that 46% of smallholders had received support, and 35% were trained (Table A5.16). The main supporters and training providers were Aoluk cooperative as well as the agricultural extension officers at the district level, respectively. It is interesting to note that Aoluk cooperative played a major role in providing support, and training for the members' smallholders.

Presently, the smallholders still need support on several issues, i.e. raising and stabilizing FFB price, reducing or controlling fertilizer price, and the price of other factors, improving quality of seedlings, and knowledge on oil palm management, respectively (Table A5.17). The key training needs are oil palm plantation management, knowledge on soil and leaf analysis, and how to select high quality seedlings, respectively (Table A5.18).

6.6 Opinion on Sustainable Oil Palm Production

Table A5.19 summarizes the survey results, based on the opinion of the smallholders on the issue of sustainable oil palm production. The majority of smallholders (96%) are aware of the impacts to the country's economy from oil palm production, especially in terms of generating farmers', and community income. Some 88% see the positive impact in reducing social problems when being employed, improving income, and gaining more time to spend with family, and a better quality of life. However, only 38% are fully aware of the environmental impacts. Pollution from CPO mills, and lack of water due to high consumption of oil palms are the key negative environmental impacts.

6.7 Suggestion for the Development of Oil Palm Production

Based on the suggestions of the smallholders for the development of oil palm production, the key issues are summarized in Table A5.20. Those are; developing high quality seedlings, knowledge support to smallholders on the oil palm production management, the raising and stabilization of the FFB price, reduction or control of the fertilizer price, and the price of other factors, the provision of soil and leaf analysis in the production area where the smallholders could access easily, and knowledge support to select high quality seedlings, in this order.

Chapter 7

Baseline Study of the Oil Palm Smallholders: Link with Suksomboon Palm Oil Co., Ltd.

This chapter summarizes the observations drawn from the primary data collected from 68 oil palm smallholders who have links with Suksomboon CPO mill in Klonghad district, Srakaew and Borai district, Trat. The people interviews revealed the following facts (Table A6.1-A6.20 in Appendix 6).

The eastern part of Thailand is new, and a fast-growing oil palm production area. Land area, which is suitable for oil palm production, covers around 2.64 million rai. (25% of Thailand's oil palm suitable land). Most suitable oil palm land is in five provinces, i.e. Chantaburi, Trat, Pracheenburi, Srakaew, and Chachaengsao, respectively. However, currently oil palms are planted mostly in the Chonburi province. It accounts for 82,000 rai in 2009. Trat is the second largest oil palm producing province in the East, with a production area of 67,400 rai, while there is approximately 12,000 rai in Srakaew. Around 84% of oil palm production area in Chonburi, Trat, and Srakaew have been harvested. In 2009, the average yield of 2,665, 2,280, and 1,655 kg per rai was received in Chonburi, Trat, and Srakaew, respectively. (The country's average yield was 2,694 kg per rai, according to Office of Agricultural Economics). In Trat and Srakaew there were approximately 1,300 oil palm growers in 2010 (August) (Office of Agricultural Extension and Development Region 3, 2011).

In the East, there are 5 palm oil mills (The country has about 60 mills), in operation, during 2010. The mills depend mostly on FFB from small out-growers. Suksomboon Palm Oil Company Limited is in the oil palm industry, and has produced CPO since 1999. It was the pioneer, and the largest crushing mill in the East, located in Chonburi. A crushing mill currently has a production capacity of 90 tons, per hour, of FFB. Suksomboon's crushing mill purchases approximately 80% of their FFB from small out-growers, mainly in the eastern, northeast, and central provinces (Suksomboon Palm Oil Company Limited, 2011).

7.1 Basic information about the Smallholders and their Farms

7.1.1 Socio-Economic Characteristics of Oil Palm Smallholders

Socio-economic characteristics of the smallholders are shown in Table A6.1. In Klonghad, the results revealed that around 75% of the smallholders are over 40 years of age, the average being 47.5 years. Approximately 45% of the smallholders obtained primary education. Only 9.5% of the smallholders received a Bachelor's degree or higher. Similarly, in Borai, the results showed that around 73% of the smallholders are over 40 years of age, the average being 50.3 years. About 42% obtained primary education. However, 23.1% received a Bachelor's degree or higher.

In Klonghad and Borai, 81.0% and 69.2% of the smallholders are male, respectively. However, practically all housewives assist their husbands in the in the production of oil palm.

In addition, 52.4% and 46.2% of the smallholders have 4-5 household members. On average, they have 4.0 and 3.7 peoples per household, respectively. Approximately one-half of the smallholders in both areas grow oil palms, as the primary source of income. About 93% and 77% of the smallholders obtained income from more than one source, respectively. Examples of a secondary source of income in Klonghad were; sugarcane and cassava production, whilst in Borai there were fruit trees, and rubber plantations.

In Klonghad, the survey also showed that 69% of the smallholders managed most of the oil palm activities with their own family members, while the rest used mainly hired labourers. In Borai, the results showed that 80.8% of the smallholders managed most of the oil palm activities with their own family members. Around 86% of the smallholders have less than 5 years of experience in oil palm production. On average, they have only 4 years of experience. About 54% have less than 5 years of experience. On average, they have 5.4 years of experience.

Table A6.2 summarizes income, debt, and farm assets of the smallholders. In Klonghad, about 40% of the smallholders had a household income of 200,001-600,000 Baht per year. On average, they earned around 696,114 Baht per household per year. Of this amount, 41.9% was from oil palm production. In Borai, about 54% of the smallholders had a household income of 200,001-600,000 Baht per year. On average, they earned around 677,765 Baht per household per year. Of this amount, 53.4% was from oil palm production.

Credit plays an important role for the smallholders since 81% of the smallholders, in Klonghad, have continuous debt of 356,429 Baht per household. Approximately 76% of the smallholders relied on loans from the Bank for Agriculture and Agricultural Cooperative (BAAC). The smallholders used their loan for oil palm production (70.6%), and purchasing of land (5.9%). On average, in Borai, about 65% of the smallholders have a debt of 576,647 baht per household. Only 35.3% of the smallholders relied on loans from the BAAC. The rest had a loan from a commercial bank, and/or informal sources. The smallholders used their loans for oil palm production (47.1%), purchasing land (17.6%), and the purchasing of cars, or trucks (11.8%).

As to farm assets, the survey showed that, in Klonghad, the most popular assets are oil palm spades, weed sprayers, tractors, 4-wheel trucks, and mowers, respectively. In Borai, the results showed that the most popular assets are oil palm spades, 4-wheel trucks, weed sprayers, tractors, springer and watering instrument, and mowers, respectively.

7.1.2 Membership of Oil Palm Groups and Motivation to Grow Oil Palms

Normally, the agricultural office at the district level is responsible for the registration of major crop growers, and attempts to encourage the farmers to register with the office; in order to improve the government database on economic crops. However, the survey showed that only 71.4% of oil palm smallholders in Klonghad had registered, while 57.7% in Borai had registered. As to oil palm groups and association membership, only 4.8% of the smallholders in Klonghad are members while 76.9% in Borai are members.

When the smallholders were asked about their motivations to grow oil palm, their responses were interesting. In Klonghad, the results revealed that one-half of smallholders grew oil palm because the high FFB price, and therefore high return. Also one-half of smallholders chose oil palm because they expected to earn income faster, while 28.6% of them indicated that they grow oil palm because it is not difficult to manage compared to other crops. Similarly, in Borai, the results showed that 53.8% of smallholders grew oil palm because the high FFB price, and therefore a high return. Some 34.6% of smallholders indicated that oil palm is not difficult to manage compared to other crops. Other factors are summarized in Table A6.3.

7.2 Characteristics of Oil Palm Production and Management by Smallholders

7.2.1 Relevant Aspect of Land, Topography, Soil and Oil Palms

On a single household basis, a smallholder in Klonghad owned on average about 146 rai (23.36 ha), while some 35% of them owned at most 50 rai. About 38% owned more than 100 rai. For oil palm production, the average area was 63 rai (10.08 ha). Some 45% of them owned up to 25 rai of oil palm plots. 28.6% owned 26-50 rai per household. Smallholders owned on average 1.8 oil palm plots, while 59.5% of the smallholders have only one plot. The majority of land at all oil palm plots (76 plots) owned by the smallholders had the land title. The most popular land title among them was Sor Por Kor and Por Bor Tor 5 (Table A6.4).

In Borai, a smallholder owned on average about 186 rai (29.76 ha), while some 23% of them owned at most 50 rai. 46.2% owned more than 100 rai. For oil palm production, the average area was 118 rai (18.88 ha). Some 23.1% of them owned up to 25 rai of oil palm plots while 19.2% owned 26-50 rai per household. Smallholders owned on average 2.4 oil palm plots, whilst 42.3% of the smallholders have only one plot. The majority of land, at all oil palm plots (61 plots), owned by the smallholders had the land title. The most popular land title among them was Sor Por Kor, Chanod, and Por Bor Tor 5, respectively. The survey also showed that only 1.6% of the oil palm plots had no land title.

In Klonghad, up to 63.2% of the oil palm plots are in plain areas, while 18.4% of the plots are on hilly and sloping areas. For soil characteristics, most oil palm plots have clay, loam, and sandy loam, respectively. In Borai, around 38% of the oil palm plots are in plain areas, and 36% are on hilly, and sloping areas. For soil

characteristics, most oil palm plots have loam, sandy, gravelly soil, and clay, respectively.

In Klonghad, land usage prior to oil palm was field crops such as; sugarcane, cassava, maize, and rice paddies. On average, palm trees are 3.6 years old. This indicates that palm trees are at the beginning stage of harvesting. However, some 26.2% of the smallholders intend to expand the area of oil palm production with an average acreage of 81.4 rai.

Similarly, land uses prior to oil palm in Borai were field crops such as sugarcane, cassava, maize, and rice paddy. In addition, 8.2% of oil palm plots were used for rubber production while some 13.1% was un-used land. On average, palm trees are 4.3 years old. Nevertheless, 23.1% of the smallholders intend to expand the area of oil palm production with an average acreage of 33.3 rai.

7.2.2 Variety of Oil Palm and Source of Seedlings

In both areas, the results showed that all oil palm smallholders grow *tenera* (variety), because palm fruits of *tenera* contain the most oil. At least 90% of the smallholders purchased seedlings from oil palm nursery operators i.e. Suksomboon and Univanich. Few of them bought seedlings from private nurseries and the Oil Palm Research Centre.

In Klonghad, the main factors affecting the smallholders' decision to buy seedlings were their quality, convenience to excess and a well accepted source/with licenses, respectively. Most smallholders used 7-12 months old seedlings. On each plot, 22 oil palm trees per rai were usually planted (Table A6.5). In Borai, the main factors affecting the smallholders' decision to buy seedlings were their quality, well accepted source/with licenses, and convenience to excess, respectively. Most smallholders used 7-12 months old seedlings. On each plot, 22 oil palm trees per rai were usually planted.

7.2.3 Use of Labour in Oil Palm Production

In Klonghad, all of the smallholders used family labour, and 78.6% hired additional labourers. The most popular activities utilizing family labour were general management, transportation of FFB, applying fertilizer, weeding, and pruning, respectively. On a household basis, a smallholder had on average of 1.6 people working in the plantation. In contrast, the average amount of hired labour was 4.8 people per household (Table A6.6).

In Borai, 84.6% of the smallholders used family labour, and 76.9% hired labourers. The most popular activities utilizing family labour were; general management, transportation of FFB, applying fertilizer, weeding, and frond pruning, respectively. On a household basis, a smallholder had on average of 1.9 people working in the plantation. In contrast, the average amount of hired labour was 4.4 people per household (Table A6.6).

In both areas, the main reason for hiring labourers by the smallholders was insufficient household labour and/or lack of time. Of the smallholders who hired labour, approximately 60% of them provided fringe benefits to its labourers, especially food, housing and healthcare. Hired labourers worked in the plantation without any contract and most of them were not informed about labour rights. All of the smallholders are aware of farm injuries and most of them took preventive measures such as; putting on boots and gloves, wearing long-sleeved shirt and pants, and putting on mask, respectively.

With respect to accidents occurring to labourers in the farm, the interviews revealed that about 10% of the smallholders had encountered this problem. Some of the smallholders faced the issues of misunderstanding or unhappiness of hired labourers. This problem was usually solved by compromising or making new agreements.

The results also revealed that oil palm smallholders, who hired labour, hired them from their province, other provinces as well as a neighbouring country, namely Cambodia. Wages varied among activities; however, most of the hired labourers are paid on a daily basis. For example, an average wage for pruning in Klonghad was 183.3 Baht per day while it was 196 Baht per day in Borai, in addition, an average wage for applying fertilizer was 171.1 Baht per day, while it was 198.5 Baht per day in Borai. Wages for other activities are shown in Table A6.7.

7.2.4 Water and Soil Management in Oil Palm Production

Table A6.8 summarizes the survey results regarding water, and soil management of the smallholders. In both areas, about one-half of smallholders depended on rainfall as the water source for oil palm production. Even though irrigation can significantly improve oil palm yield, most smallholders have not yet applied such systems. This may be due to lack of water supply, or the high investment cost.

In Klonghad, the results showed that 97.6% of the smallholders applied fertilizer. They applied both organic, and chemical fertilizers, however the majority applied chemical fertilizer. Among these, 44.7% of the smallholders applied fertilizers three times a year. 23.7% equally applied chemical fertilizer twice, and once a year. On average, the smallholders applied chemical fertilizer to the amount of 49.3 kg per rai (around 2.2 kg per tree). The most important factor that affects the smallholders' decision to apply fertilizer was the appropriate timing (soil moisture). They also based their decisions on; the cycle of applying fertilizer, age of palm tree, and soil and leaf analysis, respectively.

In Borai, the results revealed that all of the smallholders applied fertilizer. They applied both organic and chemical fertilizers. The majority applied chemical fertilizer. Among these, about 36.4% equally applied fertilizer twice, or three times a year. Only 4.5% applied chemical fertilizer once a year. The smallholders applied chemical fertilizer an average of 44.7 kg per rai (around 2 kg per tree). The most

important factor that affects the smallholders' decision to apply fertilizer was the cycle of applying fertilizer. They also based their decisions on; appropriate timing (soil moisture), available capital, age of palm tree, and leaf analysis, respectively.

In Borai, 15.4% of the smallholders grew cover crops in the plantations, while none of them grew cover crops in Klonghad. The most popular cover crop was legume. Only 16.7% and 27.3% of the smallholders in Klonghad and Borai applied soil erosion protection measures, respectively. In Klonghad and Borai, 69%, and 84.6% of the smallholders used other measures to improve soil fertility, respectively. The popular measures were; using oil palm frond and leaves, and empty bunches, respectively.

In Klonghad, the survey also indicated that the extension officer from the CPO mill played a major role in providing information regarding soil, and fertilizer management. Others included; government officials, farmers' experiences, and friends, respectively. In Borai, the government officials played a major role in providing information regarding soil, and fertilizer management. Others included; farmers' experiences, sale officers from fertilizer companies, and extension officers from the mill, respectively.

7.2.5 Pest Management in Oil Palm

Data on pest management in oil palms are summarized in Table A6.9. In Klonghad, the survey showed that major problems from pests were; weeds, rats, disease, and insects, respectively. To cope with them, the smallholders used different measures, for example, to get rid of weeds, 92.5% of the smallholders used chemicals. To control rats, non-chemical measures such as; traps, or nets were the most popular. However, some smallholders did not apply any measures when facing the problem of pests.

In Borai, the results showed that major problems from pest were; weeds, diseases, rats, and insects, respectively. To cope with them, the smallholders used different measures, for example, to get rid of weeds, 76.2% of the smallholders used chemicals. To control diseases, the use of non-chemical measure; such as elimination of infected leaves, was widely used. However, some smallholders did not apply any measures when facing the problem of pests.

In Klonghad, 62.2% of the smallholders who used chemicals stored part of it, while the rest (37.8%) used it all at one time. The majority of smallholders used protective guards when they had to apply chemicals. The most popular were gloves and masks. However, some 5.4% of them did not use any safety guards. To dispose of hazardous containers, most of the smallholders (86.5%) sold them. All of the smallholders understood the harmfulness of pesticides. Most obtained information about pest management from extension officers from the CPO mill, their own experiences, and the chemicals companies, respectively. The result also revealed that 26.2% of the smallholders had an informed idea about the concept of Integrated Pest Management (IPM).

In Borai, 37.5% of the smallholders who used chemicals used it all at one time, while 62.5% stored it in a room. The majority of smallholders used protective guards when they had to apply chemicals. The most popular were gloves and masks. However, some 18.8% of them did not use any safety guards. To dispose of hazardous containers, some smallholders sold them, and kept them for agricultural use. All of the smallholders understood the harmfulness of pesticides. Most obtained information about pest management from; their own experiences, the government officials, and extension officers from the CPO mill, respectively. The result also showed that only 7.7% of the smallholders had an informed idea about the concept of Integrated Pest Management (IPM).

7.2.6 Harvesting Management and the Sell of FFB

The survey in Klonghad indicated that 78.6% of the smallholders had harvested their palms (Table A6.10). In order to harvest FFB, 75.7% of the smallholders hired labourers. Among this, 12.1% hired the contracted harvesters. The rest (27.3%) used family members. Harvesting cycles varied a lot, namely from 15-30 days. Most of the smallholders (90.9%) harvested oil palm every 15 days due to the services of mill ramps in the area. On average, the harvesting cycle was 15.3 days. It was also found that all of the smallholders who hired labourers did not have any condition, or punishment on harvesting of unripe FFB, even if it did reduce the quality of FFB. The most important factors affecting the smallholders' decision to harvest FFB was ripeness (84.8%). Other factor was the harvesting cycle (15.2%). The fee paid to the contracted harvesters depended upon their agreement, i.e. in this case an average harvesting fee was 300 Baht per ton.

In Borai, the results revealed that 92.3% of the smallholders had harvested their palms. In order to harvest FFB, 75% of the smallholders hired labourers. Among this, 33.3% hired the contracted harvester. The rest (25%) used family members. Most harvesters were independent from the ramp and mill. Harvesting cycles varied a lot, namely from 15-30 days. About 79.1% of the smallholders harvested oil palm every 15 days. On an average, the harvesting cycle was 16 days. It was also found that all of the smallholders who hired labourers did not have any condition, or punishment on harvesting of unripe FFB, even if it did reduce the quality of FFB. The most important factors affecting the smallholders' decision to harvest FFB was ripeness (75.0%). Other factor was the harvesting cycle (25%). The fee paid to the contractor depended upon their agreement, which in many cases included transportation cost. For example, a harvesting fee of 400 Baht per ton, on average, would increase to 600 Baht per ton if transportation cost was included.

Table A6.11 summarizes the information on the selling of FFB. The results in Klonghad showed that all of the smallholders sold their FFB to the mill ramp. The main factors affecting the smallholders' decision to sell FFB to the mill ramp were; close to a ramp, sole buyer in the area, good service, and high FFB price, respectively. The results also revealed that the distance between the plantation and the buyer was

18.5 km on average. Transportation of FFB from plantation to buyer, was managed by the smallholders themselves.

As to the FFB yield in Klonghad, the average production in 2009 was 904 kg per rai which corresponded to only young oil palm (Table A6.12). The average price of FFB received by the smallholders was 3.56 baht per kg in the same year. Only some smallholders (9.1%) indicated that when they sold FFB, the price was determined according to FFB quality, while the rest (90.9%) received the price without considering FFB quality. For the first group, ripeness was the key-factor used for FFB grading. All of smallholders received cash when they sold the FFB.

In addition, the results in Borai revealed that all of the smallholders sold their FFB to the mill ramp. The main factors affecting the smallholders' decision to sell FFB to the mill ramp were; close to ramp, good service, sole buyer in the area, and high FFB price, respectively. The results also indicated that the distance between the plantation and the buyer was 19.1 km on average. To transport FFB from plantation to buyer, 87.5% managed it on their own while 12.5% of the smallholders hired a contractor. In case of hiring a harvester, the average transportation cost was 300 Baht per ton.

As to the FFB yield, the average production in 2009 was 1,700 kg per rai. The average price of FFB, received by the smallholders, was 3.69 baht per kg in the same year. Some 54.2% of the smallholders specified that when they sold FFB, the price was determined according to FFB quality while the rest (45.8%) received the price without considering FFB quality. For the first group, bunch size was the key-factor used for FFB grading. The majority of smallholders (95.8%) received cash when they sold the FFB.

7.2.7 Farm Records, Source of Information and Link with Ramp and Mill

Table A6.13 shows farm records, sources of information, and links with ramp and mill. In Klonghad, the results showed that 35.7% of smallholders did not keep their farm records due to time available, farm receipt keeping, and no skill in record keeping, respectively. For those who kept records (64.3%), the items listed were inflow-outflow, cost of fertilizer, labour, and yield, respectively. With respect to the information on oil palm management, the survey revealed that 52.6% of the smallholders obtained it from the extension officer from CPO mill, while only 26.3% received it from government officials. Similarly, 83.3% of the smallholders obtained marketing information from the mill's extension officer while only 11.4% received it from government officials. It is important to note here that the government officials play a minor role among the oil palm information providers. Up to 70% of smallholders had links with mill ramps, especially technical support.

In Borai, the results revealed that the majority of smallholders (53.8%) did not keep their farm records because they could not see the benefit and they have already kept farm receipt. For those that kept records, the items listed were; inflow-outflow, cost of fertilizer, and yield, respectively. With respect to the information on oil palm



management, the survey indicated that 36.4% of the smallholders obtained it from the extension officer of the mill while only 9.1% received it from government officials. Similarly, 37.5% of the smallholders obtained marketing information from the mill's extension officer while only 18.8% received it from government officials. It is clear that the government officials play a minor role among the oil palm information providers. Some 57.7% of smallholders had links with mill ramps.

7.3 Cost and Return

This section presents the results of a cost-return analysis based on the data collected from the smallholders in the study areas. From each smallholder, a corresponding age of oil-palms was chosen for deriving the cost, and yield data. In general, the total economic cost of production is composed of fixed and variable costs. Both the fixed and variable costs can be divided into cash, and non-cash costs. However, in this analysis, since it is not a pure or an in-depth economic study, the cost of production covers only key variables and cash costs. This can still be used as a basis for decision making, at the farm level. The variable cash costs used in this analysis include the cost of fertilizer, hired labor (excluding harvesting), chemicals, harvesting, transportation, and fuel. There are 3 components of labour cost, namely, labour costs for applying fertilizer, pruning and collecting frond, and spraying. For the total or gross return, the average yield and price were used for the calculation. From this data, the net return was obtained by deduction of gross return by the variable cost. Net return was calculated per rai and per ton of FFB.

Table A6.14 summarizes the cost-return analysis of FFB production in 2009 in Klonghad and Borai. In Klonghad, the results revealed that the average cost of FFB production for all ages of oil palms, at most 8 years old, was about 3,034 Baht per rai per year or 2,515 Baht per ton (In 2007, the cost of FFB production by independent smallholders in Malaysia was RM 165.10 per ton (Rahman, Ayat K. Ab, et al., 2008).

As for the FFB production cost, the cost of fertilizer, and harvesting are the major components, and account for 70.1%, and 10.6% of the total variable costs.

With respect to the FFB yield, the survey showed that the average FFB yield corresponding to the plots used for cost analysis was 1,207 kg per rai per year. Given the average FFB price the smallholders received in 2009 of 3.56 Baht per kg, oil palm yields provided a net return of 1,261 Baht per rai per year. The net return is quite low compared to that in other areas in the South, because most of the smallholders have young oil palms. Accordingly, at break-even price, the price of FFB that covers to the cost of FFB production on a per kg basis, is 2.5 Baht per kg. As for a break-even yield, the minimum yield the smallholders have to obtain to cover the production cost given the FFB price is 852.4 kg per rai per year.

In Borai, the results revealed that the average cost of FFB production for all ages of oil palms was about 4,158 Baht per rai per year or 2,306 Baht per ton (In 2007, the cost of FFB production by independent smallholders in Malaysia was RM 165.10 per ton) (Rahman, Ayat K. Ab, et al., 2008). As for the FFB production cost,



the cost of fertilizer, harvesting, and transportation are the major components, and account for 60.9%, 13.2%, and 11.6% of the total variable costs. It is clear that in order to reduce production cost, or improve efficiency at the farm level, priority has to be given to soil, and fertilizer management.

With respect to the FFB yield, the survey showed that the average FFB yield corresponding to the plots used for cost analysis was 1,803.1 kg per rai per year. Given the average FFB price that the smallholders received in 2009 of 3.69 Baht per kg, oil palm yields provided a net return of 2,261 Baht per rai per year. The net return is quite low compared to that in other areas in the South, because most of the smallholders have young oil palms. Accordingly, at break-even price, the price of FFB that covers to the cost of FFB production, on a per kg basis, is 2.3 Baht per kg. As for a break-even yield, the minimum yield the smallholders have to obtain to cover the production cost given the FFB price is 1,168.1 kg per rai per year. This makes the FFB production cost the highest.

7.4 Problems Faced by Smallholders

Problems faced by smallholders are summarized in Table A6.15. In Klonghad, the major problems were; the high price of fertilizer, lack of water in dry season, fluctuation of FFB price, lack of knowledge in oil palm management, lack of credit, and low soil fertility, in this order. In Borai, the major problems faced by smallholders were; lack of knowledge in oil palm management, fluctuation of FFB price, the high price of fertilizer, lack of water in dry season, low soil fertility, and impact of chemical use, respectively.

7.5 Support and Training Needs

In Klonghad, the results showed that only 59.5% of smallholders had received support, and 33.3% were trained (Table A6.16). The main supporters and training providers were the agricultural extension officers, at the district level, and Suksomboon CPO Mill. At present, the smallholders still need support on several issues, i.e. water supply, credit, knowledge on oil palm management, and reducing or controlling fertilizer price, and the price of other factors (Table A6.17). The key training needs are; oil palm plantation management, knowledge about soil and leaf analysis, and how to improve the oil palm yield, respectively (Table A6.18).

In Borai, the results showed that only 38.5% of smallholders had received support, and 23.1% were trained. The main supporters and training providers were Suksomboon CPO Mill, and the agricultural extension officers, at the district level. Presently, the smallholders still need support on several issues, i.e. raising and stabilizing the FFB price, knowledge on oil palm management, reducing or controlling fertilizer price, and the price of other factors, and soil and leaf analysis, in this order. The key training needs are; oil palm plantation management, how to improve the oil palm yield, knowledge about soil, and leaf analysis, respectively.

7.6 Opinion on Sustainable Oil Palm Production

Table A6.19 summarizes the survey results, based on the opinion of the smallholders on the issue of sustainable oil palm production. In Klonghad, all of smallholders are aware of the impacts to the country's economy from oil palm production, especially in terms of generating farmers' and community income, along with enhancing economic growth. The majority of smallholders (88.1%) see the positive impact in reducing social problems due to employment, improving income, and having more time with family, and a better quality of life. Moreover, 83.3% are fully aware of the environmental impacts. Increasing moisture in the atmosphere is a key, positive environmental impact.

Similarly, in Borai, the majority of smallholders (96.2%) are aware of the impacts to the country's economy from oil palm production, especially in terms of generating farmers', and community income, and enhancing economic growth. Similarly, most of smallholders (96.1%) see the positive impact in reducing social problems, due to employment, improving income, and having more time with family and a better quality of life. However, only 42.3% are fully aware of the environmental impacts.

7.7 Suggestion for the Development of Oil Palm Production

Based on the suggestions of the smallholders, for the development of oil palm production, the key issues are summarized in Table A6.20. In Klonghad, key suggestions were knowledge support to smallholders on the oil palm production management, the raising and stabilization of the price of FFB, developing high quality seedlings, credit, and promoting the quality of oil palm production.

Similarly, in Borai, the key issues were the raising and stabilization of the FFB price, the supporting knowledge to smallholders on oil palm production management, the development of high quality seedlings, and promoting the quality of oil palm production, respectively.



Chapter 8

Conclusions and Recommendations

This chapter presents the conclusions of the baseline study, gap analysis, and recommendations.

8.1 Conclusions

This study aimed to 1) investigate the socio-economic characteristics, practices of existing oil palm production, performances, major constraints, farmers' attitudes on important factors, of the pilot farmer groups before project intervention, and 2) identify gaps between the current farm practices and the project goals and propose ways to close those gaps. Data were collected from 503 oil palm smallholders during March-July, 2010 using the structured questionnaire. From this number, 418 of them (83%) are those who participated in the project, and the rest (17%) has not participated. Data were analyzed descriptively. The results revealed the following facts.

8.1.1 Basic Information about the Smallholders and their Farms

The majority of the smallholders are over 40 years of age, the average being 50 years. Most of them obtained at most only secondary education. Nearly three-fourth of the smallholders is male. On average, the smallholders have 4 household members. Around four-fifth of the smallholders grow oil palms, as the primary source of income, and obtained income from more than one source. Most of them managed the oil palm activities by their own family members. On average, the smallholders have 15 years of experience in oil palm production. The smallholders earned an average income around 471,000 Baht per household per year. Of this amount, 60% was from oil palm production. Credit plays an important role for the smallholders since 71% has continuous debt of nearly 300,000 baht per household. Two-third of them relied on loans from the BAAC.

Only three-fifth of the smallholders had registered with the district agriculture office in the production area. One-fourth of them are members of oil palm groups, and association. More than two-fifth of the smallholders grew oil palm because of the high FFB price. One-third grew oil palm because it is not difficult to manage compared to other crops. Only one-fourth of them chose oil palm because it is appropriate to the environment, and 17% grow oil palm because they expected to earn income faster.

8.1.2 Characteristics of Oil Palm Production and Management by Smallholders

1) Relevant Aspect of Land, Topography, Soil and Oil Palms

A smallholder owned about 66.8 rai (10.69 ha) per household. For oil palm production, the average area is 44.9 rai (7.18 ha). Smallholders own, on average, 2 oil

palm plots. The majority of land, at all oil palm plots (1,012 plots), owned by the smallholders had the land title. However, 8% of the oil palm plots had no land title. Land uses prior to oil palm were; un-used land, rubber plantation, other agricultural activities, and rice paddies. Only 1.5% had been used for oil palm production. On average, palm trees are 11.8 years old. Some smallholders still maintained their old oil palms (25+ years old). Only 12% of them intend to expand the area of oil palm production.

Nearly all smallholders grow *tenera* (variety). At least, three-fourth of the smallholders purchased seedlings from oil palm nursery operators who had licenses issued by Department of Agriculture. About 18% of them bought seedlings from the private nurseries. 13% of them purchased seedlings from other sources, i.e. the oil palm research centre. The main factors affecting the smallholders' decision to buy seedlings were; their quality, and the convenience to excess. Most smallholders used 7-12 months old seedlings.

2) Use of Labour in Oil Palm Production

More than 70% of the smallholders used both family and hired labourers. The most popular activities (excluding FFB harvesting) utilizing family labour were; general management, applying fertilizer, weeding, transportation of FFB, and pruning, respectively. A smallholder had, on average, 1.7 people working in the plantation. In contrast, the average amount of hired labour was 4.1 people per household. The main reason for hiring labourers by the smallholders was insufficient household labour and/or lack of time. Hired labourers worked in the plantation without any contract and they were not informed about labour rights. Some 89% of the smallholders are aware of the farm injuries and most of them (96.5%) took preventive measures. With respect to accidents occurring to labourers on the farm, around one-tenth of the smallholders had encountered this problem and most of the accidents were not serious.

Most wages in oil palm production areas of Southern Thailand were determined on a contract basis, while in the newly production areas in the Eastern region most of the wages are set on a daily basis.

4) Water and Soil Management in Oil Palm Production

Most of the smallholders depend only on rainfall as the water source for oil palm production. Nearly all of them applied fertilizer. The majority applied chemical fertilizer. Only 18% applied both organic and chemical fertilizers. About one-half applied chemical fertilizers twice a year and 13% applied chemical fertilizers once a year. On average, the smallholders applied chemical fertilizer to the amount of 48.2 kg per rai (around 2 kg per tree) for each application. The most important factors affecting the smallholders' decision to apply fertilizer were; the circle of applying fertilizer, appropriate timing, the price of fertilizer, and the available capital, in this order. Only 5.3% and 4.6% of them applied fertilizers based on soil and leaf analysis. Only one-tenth of the smallholders grew cover crops in their plantation and only 18%

of them applied soil erosion protection measures. Some 69% of them used oil palm frond and leaves, and empty bunches to fertile their soil.

5) Pest Management in Oil Palm

The major problems of pests were weeds, rats, disease, and insects, respectively. To cope with them, the smallholders used different measures i.e. to get rid of weeds three-fifth of the smallholders used chemicals. To control rats, most of them used traps, or nets. Overall, a half of the smallholders used chemicals in pest management. For those who used chemicals, it is evident that most smallholders did not adopt appropriate practices for the disposal of hazardous containers. However, nearly all of them seem to be aware of the harmfulness of pesticides. Only 7% of them had a proper idea about the concept of Integrated Pest Management (IPM).

6) Harvesting Management and Selling of FFB

Nearly all of the smallholders had harvested their palms. In order to harvest FFB, four-fifth of them hired the labourers (both contracted and regulars). The majority hired the independent harvesters. Most of them harvested oil palm within the recommended period of 15-20 days. It was also found that a rather high proportion of the smallholders who hired harvesting labourers did not pay attention to the quality of FFB. They did not have any condition or punishment on harvesting of unripe FFB. The most important factors affecting the smallholders' decision to harvest FFB was ripeness. The fee paid to the harvesters depended upon their agreement. For example, a harvesting fee of 320 Baht per ton, on average, would increase to 486 Baht per ton if transportation cost was included.

The factors affecting the smallholders' decision to sell FFB to the buyers were various. Those are fair balance, system of FFB grading, high FFB price, and closeness to buyer. To transport FFB from plantation to buyer, a half of the smallholders hired a contractor, while the rest managed it on their own. In case of hiring a contractor, the transportation cost varies depending upon the distance between the plantation and the buyer. For the sample smallholders, the average transportation cost was 179 Baht per ton.

The average FFB yield in 2009 was 2,636 kg per rai per year. The average price of FFB received by the smallholders was 3.7 Baht per kg in the same year. Nearly three-fifth of smallholders indicated that when they sold FFB, the price was determined without considering FFB quality.

7) Farm Records, Source of Information and Link with Ramp and Mill

The majority of smallholders did not keep their farm records due to complexity; they could not see the benefit; and time available. With respect to the information about oil palm management, more than two-third of the smallholders received such information. For those receiving it, about one-third obtained it from the government officials and around one-fifth received it from the extension officer from the CPO mill. As for the marketing information, slightly less than two-third of the smallholders received the information. However, the CPO mill's extension officer plays a more important role for this issue than the government officials.

8.1.3 Costs and Return

The cost of production covers only key variable and cash cost. The variable cash costs include the cost of fertilizer, hired labour (excluding harvesting), chemicals, harvesting, transportation, and fuel. The average cost of FFB production for all ages of oil palms was about 4,255 Baht per rai per year or 1,494 Baht per ton. From this, the cost of fertilizer, harvesting, and transportation are the major components and account for 51%, 21.2%, and 12.6% of the total variable costs. It is clear that in order to reduce production cost at the farm level, priority has to be given to soil and fertilizer management. With respect to the FFB yield, the average production was 2,848 kg per rai per year. Given the average FFB price the smallholders received in 2009 of 3.7 Baht per kg, oil palm yields provided a net return of 6,283 Baht per rai per year.

8.1.4 Problems Faced by Smallholders

The major problems faced by the smallholders were the high price of fertilizer, fluctuation of FFB price, lack of water in the dry season, lack of knowledge in oil palm management, low soil fertility, lack of knowledge in soil and fertilizer management, low quality of seedlings, lack of credit, and harvesting of unripe FFB, in this order. However, the problems vary among the study areas. The first three problems were quite common in all study areas. Lack of knowledge in overall oil palm management and in soil and fertilizer management was more serious in the newly planted area in the Eastern region than in production areas in the South.

8.1.5 Support and Training Needs

The smallholders need supports on several issues, i.e. the raise and stabilization of the FFB price, control of the fertilizer price and the price of other factors, the development of high quality seedlings, and supplying water. As for the training needs, they should cover key issues on oil palm plantation management, knowledge about soil and leaf analysis, and how to improve the oil palm yield.

8.1.6 Opinion on Sustainable Oil Palm Production

The majority of smallholders are aware of the impact on the country's economy from the oil palm production, especially in terms of generating farmers', and community income, along with enhancing economic growth, and creating jobs. Most of them see the positive impact in reducing social problems, improving income, and having a fair degree of security in their daily life. Slightly more than half of the smallholders are fully aware of the environmental impacts.

8.1.7 Suggestion for the Development of Oil Palm Production

The key suggestion of the smallholders for the development of oil palm production are the knowledge support to smallholders on the oil palm production management, the development of high quality seedlings, the raise and stabilization of

the price of FFB, the reduction or control of the fertilizer price and the price of other factors, the provision of soil and leaf analysis in the production area, and supply knowledge on how to reduce the cost production.

8.1.8 Life Quality of the Oil Palm Smallholders

As for the subjective evaluation concerning the material standard of living, the smallholders were rather moderate across these aspects. However, they were satisfied with their living places. With respect to education and information, they are quite positive about the opportunity of their children attending university, and obtaining daily life information. However, they are rather moderate about their communication within the community. They are also moderate about access to health services. As for individual physical and mental health, they are positive in all aspects, except they feel they do not have enough energy for daily life. They are optimistic about their safety and health of their physical surroundings. But, they are moderate about the community awareness of health-damaging factors in the local environment. With respect to leisure and social life, they are positive about their working schedule and the opportunities for leisure. However, they are moderate about time flexibility in their job.

8.2 Gap Analysis

This section identifies gaps between the current farm practices, and the project goals, which aim to certify smallholders group with RSPO standard using SWOT analysis. The important strengths, weaknesses, opportunities, and threats of oil palm smallholders are summarized in Table 8.1

Table 8.1 Strength, weakness, opportunity, and threats of Thai oil palm smallholders

Strength/Weakness
Strength
<ul style="list-style-type: none"> ▪ The smallholders are quite ready, and positive to improve their farm practices. When they have enough incentives, and been provided with appropriate support. ▪ Smallholders try to use, and modify local knowledge for improving plantations i.e. use of frond, empty bunch to improve soil fertility.
Weakness
<ul style="list-style-type: none"> ▪ Most smallholders have limitations to access information, and the technology of oil palm production. ▪ The smallholders lack of credit. ▪ The smallholders lack knowledge in basic oil palm production management i.e. soil and fertilizer management, soil conservation, and the high quality of seedlings. ▪ The smallholders lack knowledge about labour law. ▪ There are limited numbers of smallholder's organizations. ▪ The smallholder's organization lacks management capacity. ▪ Many oil palm plantation plots, owned by smallholders, do not have any land titles. ▪ Some smallholders grow oil palm in unsuitable land, or replace them with other crops. ▪ The smallholders are facing a low capacity of hired labour. ▪ The smallholders do not keep farm records. ▪ The smallholders are facing high production cost. (Especially chemical fertilizers) ▪ Most smallholders still harvest unripe FFB, causing low percent of OER, and thus a lower price of FFB. ▪ The smallholders are facing low productivity, mostly because they have not yet adopted appropriate oil palm production practices. ▪ Most smallholders have insufficient awareness about environmental and health concerns.



Table 8.1 Strength, weakness, opportunity, and threats of Thai oil palm smallholders
(cont.)

Opportunity/Threat
Opportunity
<ul style="list-style-type: none"> ▪ Growth in demand for palm oil both for consumption purposes, and biodiesels. ▪ The Thai government policy to promote oil palm plantation for bio-fuel production, followed by many support programs to smallholders, and related stakeholders, in oil palm chains. ▪ Many research institutions put efforts on R&D in oil palm technology ▪ Many CPO mills located in oil palm production areas, with plenty of production capacity to absorb FFB from the smallholders.
Threat
<ul style="list-style-type: none"> ▪ Less and more expensive land for the expansion of new oil palm plantations. ▪ Increasing trends, in consumer's demand for palm oil quality with respect to environmental and social standards. ▪ Lack of specific oil palm, and palm oil laws to facilitate, and control stakeholders in oil palm chains. ▪ Thai Oil Palm Board (TOPB) has been set up but it is slow and delayed policy implementation. This directly impacts the smallholders in various aspects i.e. the price of fertilizer, and the FFB price. ▪ Concerned government agencies have limited capacity to actively support oil palm smallholders in various aspects i.e. seedlings, technology, and management. This is mainly caused by structure, budgets, and personnel constraints. ▪ High input price, especially the high price of chemical fertilizer. ▪ Fluctuation of the FFB price. ▪ No policy to guarantee the price of FFB from being lower than the production cost (only temporary program to purchase CPO)

8.3 Recommendations to Fill Gaps

Based on the above analysis, the authors are now able to present the key suggestions for moving toward sustainable oil palm production, and certifying smallholder groups with RSPO standard. Those suggestions are summarized in Table 8.2. In order to achieve the above objective, oil palm smallholder groups have to be firstly set up, and strengthen their management capacity. As a result, the suggestions listed in Table 8.2 can be implemented efficiently. Those groups should be formed,

and mainly supported by CPO mills with special assistances by the concerned government institutes in oil palm production areas.

Table 8.2 Key suggestions for moving toward sustainable oil palm production, certifying smallholders group with RSPO standard

Principle	Gaps and Suggestions
1. Commitment to transparency	<ul style="list-style-type: none"> ▪ Those smallholders who cultivate plots for oil palm plantation, without land title, should be sure that the pieces of land are not involved in any conflict. Land owners should also pay tax regularly for the use of these plots, and keep their receipts.
2. Compliance with applicable laws and regulations	<ul style="list-style-type: none"> ▪ The smallholders should pay more attentions to the information about related laws and regulations i.e. land, and labour laws
3. Commitment to long-term economic and financial viability	<ul style="list-style-type: none"> ▪ The smallholders should have their own self- assessments on farm economic, and financial performances regularly by using their own farm records to develop oil palm production management i.e. they should improve farm efficiency by reducing the production costs (given oil palm yield), namely the cost of fertilizers, harvesting, and transportation of FFB. These are the three main factors and the main costs of production. ▪ Smallholders, who have old oil palm plots, should have replanting plans a few years ahead.
4. Use of appropriate best practices by growers	<ul style="list-style-type: none"> ▪ Every smallholder should adopt good agricultural practice (GAP) in oil palm production. ▪ The smallholders must pay more attention to soil and fertilizer management. They should use fertilizer according to a soil and leaf analysis, grow cover-crops, and fertilize their plots by using available materials (frond, empty bunches, or wastewater from CPO mill). ▪ The smallholders should have a strong awareness about their safety, and health while working in the plantation. ▪ Since oil palm seedlings significantly affect the long term production of FFB, or yield, smallholders have to consider the selection of seedlings carefully to ensure quality before planting.

Table 8.2 Key suggestions for moving toward sustainable oil palm production, certifying smallholders group with RSPO standard (cont.)

Principle	Gaps and Suggestions
4. Use of appropriate best practices by growers	<ul style="list-style-type: none"> ▪ The smallholders who have oil palm plots, where water is available, should consider an investment in a farm-irrigation system to improve oil palm productivity. If there is no capital constraint and a reasonable FFB price. For example, a simple water dripping system can be put in place. ▪ The smallholder must keep his farm records, and analyze the farm data regularly to improve the management of his farm i.e. fertilizer, chemicals. ▪ The smallholders must be trained to improve their knowledge about overall oil palm production management, especially soil and fertilizer management, soil conservation, pest management/IPM, chemical usage, the selection of high quality seedlings, and farm records. ▪ The smallholder must be eager to join formal and informal group or sub-group meetings and undertake training. ▪ The smallholders, who hire labourers, should educate them regularly, and monitor their work closely, especially on applying fertilizer, when harvesting, and when spraying.
5. Environmental responsibility and conservation of natural resources and biodiversity	<ul style="list-style-type: none"> ▪ The smallholders must be trained to improve their knowledge about environmental conservation, appropriate disposal of hazardous chemicals, and their containers along with energy savings.
6. Responsible consideration of employees and of individuals and community by growers	<ul style="list-style-type: none"> ▪ Since most of the oil palm smallholders hired labour in their plantations, they should therefore follow the labour laws i.e. do not hire child labour, avoid discrimination.
7. Responsible development of new plantings	<ul style="list-style-type: none"> ▪ The smallholders who want to plant oil palms on new plots should be aware of the land suitability for oil palm production i.e. avoiding high sloping land. Moreover, they must not expand into forest land, or any reserved area. They should also avoid any conflicts or negative social impacts that might occur from new plantings.
8. Commitment to continuous improvement in key areas of activity	<ul style="list-style-type: none"> ▪ The smallholder must be trained regularly, and continuously about oil palm production management, as well as related issues on environmental conservation, appropriate disposal of hazardous chemicals, and their containers, energy saving, and social impacts.

8.4 Other recommendations

8.4.1 Recommendations to relevant Government Institutions

1) The agricultural extension office, at the district level, should encourage the smallholders to register as oil palm growers. The agricultural extension offices, in the oil palm production areas, should set up a monitoring system to enhance the reliability of the oil palm growers database at all levels.

2) Since “land title” is one of the major problems faced by the smallholders, the responsible institutions (namely the Land Department and the Ministry of Agriculture) should work closely, and pro-actively to resolve this issue.

3) The concerned agencies, for example the local oil palm research centre, must put more effort, and budget into improving oil palm varieties and/or developing new clones.

4) The government should control the price of fertilizer to a level that is not too high (compared to the competitor).

5) The concerned agencies (the Department of Agriculture and the Department of Land Development) should provide a soil, and leave analysis service to the farmers. This should be easy to access at a reasonable price.

6) The financial institutions or credit providers should consider special loans for the smallholders who have oil palm plantation plots without land title, because oil palm production is profitable.

7) Since the smallholders still lack the knowledge about the appropriate management of oil palm production, the responsible institutions i.e. agricultural extension office at all levels should improve the knowledge dissemination to oil palm growers through active farmers’ groups.

Examples of knowledge and information that the growers usually lack are: farm record keeping, the selection of oil palm seedlings, proper soil and fertilizer management, harvesting management, optimal use of chemicals and IPM, and means to reduce production costs. The examples of the “Oil Palm Academic School” in Krabi should be followed in other relevant provinces.

8) The relevant agencies have to be pro-active to strengthen the farmers’ group.

9) Government agencies, which are responsible for oil palm and palm oil production, should work holistically for the planning, and development of the agro-industry. Moreover, they should have a high level of cooperation with the private sector i.e. CPO mills.

10) The government policy to promote oil palm, and palm oil production should emphasize on enhancing productivity, rather than the expansion of the production area.

8.4.2 Recommendations to the CPO Mill

1) The CPO mills should buy FFB according to its quality to create an incentive in improving FFB quality. Thus, giving a high return to the smallholders.

2) The CPO mills should allocate relevant budgets to support the farmers to improve farm productivity, which will ultimately increase raw material to the CPO mills. For example, CPO mills can provide soil, and leaf analysis services, to the farmers, at a reasonable price or partial support, and/or by making these easy to access.

3) The CPO mills can also support the oil palm growers by reducing their production costs by providing cheaper fertilizer, returning the empty bunches to the growers to improve soil fertility, and so forth.

4) The technical team of the CPO mills should help improve the knowledge dissemination to oil palm growers through the farmers' group, and individual farmers.

5) The CPO mills should set up oil palm contract farming for the smallholders around the CPO mill to assure the sustainable production of raw material. This bond will bring more benefits and enhance the production and effectiveness of both the CPO and the smallholders over the years.



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Appendix



Appendix 1 Questionnaire

This questionnaire is specifically designed to collect baseline information of oil palm smallholders from pilot farmer groups before project intervention. The information needed includes the socio-economic characteristics, practices of existing oil palm production, performances, major constraints, farmers' attitudes on important factors, and support and training needs to improve the farm's performance and their livelihood.

Name of Respondent.....

Address:

Moo.....Tambon.....Amphoe.....Province.....

Telephone.....

Date of Interview.....

Interviewer.....

Mills and Cooperative

- | | | |
|---|----------|--------------|
| <input type="checkbox"/> 1. United Palm Oil Industry Public Co.,Ltd, Krabi | Group... | Farm ID..... |
| <input type="checkbox"/> 2. Univanich Palm Oil Public Co., Ltd, Krabi | Group... | Farm ID..... |
| <input type="checkbox"/> 3. Aoluk Cooperative Ltd., Krabi | Group... | Farm ID..... |
| <input type="checkbox"/> 4. The Southern Palm Oil Industry Co.Ltd(1993),
Surat Thani | Group... | Farm ID..... |
| <input type="checkbox"/> 5. Suksomboon Palm Oil Co., Ltd, Chonburi | Group... | Farm ID..... |

Type of Farmer

1. Farmer's Participating in the Project
2. Farmer's not Participating in the Project

The questionnaire is divided into 6 parts as follows:

Part 1 Socio-economic characteristics of oil palm growers

Part 2 Oil palm growing practices

Part 3 Problems facing oil palm growers

Part 4 Support and training needs

Part 5 Farmer's suggestion and opinion for sustainable oil palm production

Part 6 Aspects of life quality of oil palm growers

Note: Please answer the following questions that fit to you and your plantation.

Part 1 Socio-economic characteristics of oil palm growers

1. Overall oil palm management
 - () 1. Owner of oil palm plantation but majority hire labourers
 - () 2. Owner of oil palm plantation and majority managed by their own
2. In what year were you born?
3. What is the best describes your level of education?.....
4. Gender () 1. Male () 2. Female
5. How many household members that live with you currently?person
 - () 5.1 How many children under age of 15 years old?person
 - () 5.2 How many household members age 15-60 years old?person
 - () 5.3 How many household members age over 60 years old?person
6. Are you a member of any oil palm group/association?
 - () 1. No
 - () 2. Yes (Please specify)
 - 6.1 In case of you are a member, please specify the activities.....
 - 6.2 In case of you are a member, please specify the administration structure of the group/association.....
7. Have you registered to MOA for oil palm grower or farmer?
 - () 1. No
 - () 2. Yes (Please specify)
8. Do you grow oil palm for your main living or for secondary source of income?
 - () 1. For main living (Please specify the secondary source of income).....
 - () 2. For secondary source of income (Please specify the main source of come).....
 - 8.1 What are your motivations to grow oil palm? (Please specify at most 3 reasons)
9. How many rai of land do you occupy in total?Rai
 - () 9.1 Owned.....Rai
 - () 9.2 Rented..... Rai
 - () 9.3 Others.....Rai
10. What kind of farm equipments do you have?
 - () 10.1 Trucks (Please specify number)..... Trucks
 - () 10.2 Tractor (Please specify number).....Trucks
 - () 10.3 Irrigation equipment (Please specify name/number).....
 - () 10.4 Harvesting equipment (Please specify name/number).....
 - () 10.4 Other equipments (Please specify name/number).....
11. What is your average total household income?Baht/year
 - 11.1 What is the proportion of oil palm income (after expenses).....%

12. Does your household have any debt?

() 1. No (go to part 2)

() 2. Yes

12.1 What is your household total debt?.....Baht

12.2 What are the sources of loan? (Please specify).....

12.3 What are the purposes of loan? (Please specify).....

Part 2 Oil palm growing practices

1. How many years have you been growing oil palm?years of oil palm production

2. How many plots of your oil palm plantation?.....plots

And how many rai of oil palm plantation in total?.....Rai

Item	Plot 1	Plot 2	Plot 3	Plot 4
1. Plantation Area (Rai)				
2. Land Ownership (owned, rent or others)				
2.1 In case of owned land please specify land title				
2.2 In case of rented land please specify rented period				
3. Topography (plain, highland, hilly area)				
4. Soil type (sandy, silt, clay)				
5. Land use before oil palm plantation (agric.land uses or forest or others)				
6. Age of oil palm tree (years)				
7. Harvested (Yes, No)				
8. Average yield (kg/rai)				

2.1 In case of old oil palm, do you have any plan to replant?

() 1. No () 2. Yes (Please specify when).....

2.2 Do you have any plan to expand area of oil palm plantation?

() 1. No () 2. Yes (Please specify acreage).....Rai

3. What are the main sources of water supply for oil palm plantation? And how do you manage it?

() 1. Only rainfall

() 2. Irrigation system (Please specify).....

4. What are the oil palm variety have you currently planted in your plantation? (Please specify including trade mark).....

5. Where did you obtain such variety? (Please specify the name of nursery or company)

And why did you buy from them? (Please specify.....)

6. How many oil palm trees per rai?Trees. And what was the age of your seedling?months

7. What are the sources of labour used in your oil palm plantation? And how do you manage it? (excluding harvesting labour)

Source of labour	No. (person)	Activity
1. Household labour		
2. Hired labour		

7.1 In case of hired labour, apart from their wage or salary do you provide any other services? (can give more than one answer)

- () 1. Housing
- () 2. Food
- () 3. Health care
- () 4. Insurance
- () 5. Others.....

7.2 Do you have any work contract for hired labour?

- () 1. No
- () 2. Yes (Please specify for how long).....

7.3 In case of hired labour, please fill in the table below

Source of hired labour	Type of payments (Wage/person)				Reason to hire labour
	Daily	Monthly	Lump-sum	Others	
1. Local/within the province					
2. Other province					
3. Oversea					

7.4 Do you know the minimum wage in the area?

- () 1. No
- () 2. Yes (Please specify).....Baht/day

7.5 Do you inform hired labour about their rights?

- () 1. No
- () 2. Yes (Please specify).....

7.6 In case of hired labour from oversea, what country are they from?

- () 1. Burma
- () 2. Laos
- () 3. Cambodia
- () 4. Other (Please specify).....

7.7 Is your labour aware of risk or accident that may occur while working in the plantation?

- () 1. No
- () 2. Yes (Please specify preventive measures).....

7.8 Has hired labour ever got an accident in the plantation?

- () 1. No
- () 2. Yes (Please specify in what activity and frequency per year).....

7.9 In case of facing the issues of misunderstanding or unhappiness of hired labour, how do you solve this problem? (Please specify)

8. Soil management and fertilization

8.1 Do you apply fertilizer in your oil palm plantation?

1. No 2. Yes (Please specify in Table below)

Type of fertilizer applied	Amount (kg/time/yr)	Frequency of application (time/yr)
Organic fertilizer		
Chemical fertilizer (Please specify formular).....		

8.2 What are criteria do you use to apply fertilizer? (how much do you use and frequency) (can give more than one answer)

1. Result of soil analysis
- 2 Result of leaves analysis
3. Other factors i.e. price of fertilizer, FFB price and yield, capital (please specify)

8.3 Do you grow cover crop in your oil palm plantation?

1. No (Please specify why?).....
2. Yes (Please specify crop).....

8.4 In case of not growing cover crop, do you use other measure to control soil erosion?

1. No 2. Yes (Please specify measure).....

8.5 Do you use any other measures to improve soil fertility in your plantation?

1. No 2. Yes (Please specify measure).....

8.6 Have you received any information or suggestion about soil and fertilizer management

1. No 2. Yes (Please choose relevance to you)
1. Extension officer from mills
2. Government officers (Please specify the office).....
3. Staffs from fertilizer company
4. Other (Please specify).....

9. Pest and Pest Management

Type of Pest	No	Yes	Management practices		
			Only Chemical	No Chemical	Both or IPM
Pathogens (specify).....					
Insect (specify).....					
Rat					
Weed.....					

9.1 In case of using chemicals, please answer the following questions?

- 1) Do you use for preventive purpose or control?.....
- 2) How do you store the chemicals?

12. What was an average yield per rai last year (2009)?ton or kg/rai
13. What was an average price received last year (2009)?Bath per kg
14. Have you received the price according to FFB quality?
1. No (Please specify other criteria for determining FFB price).....
2. Yes (Please specify criteria for FFB quality and what was your FFB grade)
15. How did you receive a payment for the sale of FFB?
1. Cash 2. Via bank transfer
3. Credit (for how long)Days 4. Others (Specify).....
16. What was an average cost of oil palm production last year (production year 2009)?Baht/Kg of FFB orBaht/rai/yr
(above cost excludes investment cost i.e. land planting and seedlings) please specify only variable cash cost
- 16.1 Fertilizer.....Baht/rai/yr
- 16.2 Labour Baht/rai/yr
- 16.3 Chemicals Baht/rai/yr
- 16.4 Harvesting..... Baht/ton or.....Baht/rai/yr
- 16.5 Transportation..... Baht/ton or.....Baht/rai/yr
- 16.6 Others (Specify).....Baht/rai/yr
- (In case of having more than one plot/household and oil palm with different age, please choose to ask the cost of production corresponding to particular plot in section 2 question 2 only one plot (specify age of oil palm).....yrs
17. Have you kept your farm activity records (main activity, variety and source, fertilizer and applications, expenses, yield, price of FFB)?
1. No (Why).....
2. Yes (Please specify).....
18. What is the main source of information and knowledge on oil palm production and management? (Please choose the relevance)
1. Extension officers from mills
2. Government officers (Please specify the office).....
3. Staffs from chemical/fertilizer company or salesman
4. Others (Please specify).....
19. What is the main source of information and knowledge on oil palm marketing? (Please choose the relevance)
1. Extension officers from mills
2. Government officers (Please specify the office).....
3. Staffs from chemical/fertilizer company or salesman
4. Others (Please specify).....
20. In the past, did you have any assistance or link with the ramp?
1. No (go to Q 21)
2. Yes

- 20.1 What kind of assistance or link with the ramp?
- () 1. Technical assistance
 - () 2. Credit
 - () 3. Other factors of production (specify).....
 - () 4. Harvesting
 - () 5. Others (specify).....

21. In the past, did you have any assistance or link with the mill?

- () 1. No.
- () 2. Yes

- 21.1 What kind of assistance or link with the mill?
- () 1. Technical assistance
 - () 2. Credit
 - () 3. Other factors of production (specify).....
 - () 4. Harvesting
 - () 5. Others (specify).....

Part 3 Problems faced by oil palm growers

Problem	No	Yes	Details of problem
1. Soil and land			
2. Water			
3. Labour			
4. Variety			
4. Fertilizer			
6. Chemicals			
7. Capital			
8. Harvesting of raw/unripe FFB			
9. Transportation of FFB			
10. Fluctuation of FFB price			
11. Price of FFB received not reflect FFB quality			
12. Lack of knowledge in oil palm production management			
13. Lack of farmers' group			
14. Others (Please specify).....			

Part 4 Support and training needs

- 1. In the past, have you ever obtained any support from the government (national, local, and private sector)?
 1. No 2. Yes (Please specify).....
- 2. What kind of support do you currently need from the government to improve your oil palm production)? (Please specify).....
- 3. In the past, have you ever been trained about oil palm management or related topics?
 1. No 2. Yes (Please specify).....
- 4. With respect to your problems, what kind of training do you urgently need to improve your skill and knowledge in oil palm production? (Please specify 3 aspects).....

Part 5 Farmer’s suggestion and opinion for sustainable oil palm production

- 1. What, if anything, do you consider to be the major economic impacts of oil palm production in Thailand? (Please specify).....
- 2. What, if anything, do you consider to be the major social impacts of oil palm production in Thailand? (Please specify).....
- 3. What, if anything, do you consider to be the major environmental impacts of oil palm production in Thailand? (Please specify).....
 - 3.1 In case of oil palm production has negative impacts to the environment, what are your suggestions to reducing those impacts? (please specify).....
- 4. In the past, did you receive information about how to reduce an environmental impact?
 1. No 2. Yes (Please specify).....
- 5. In your oil palm production area, have you seen any oil palm plot is closed to reserved area?.
 1. No 2. Yes (answer 5.1).....
 - 5.1 Do you or related agencies introduce any measure to prevent fire?
 1. No 2. Yes (Please specify).....
- 6. What, if anything, would you suggest to improve oil palm production in Thailand? (Please specify).....

Part 6 Aspects of life quality of oil growers

	Item	Not at all	A little	Moderately	Mostly	Completely
1	Do you have enough money to meet your needs?	1	2	3	4	5
	If you checked the boxes 1 or 2, please specify why:					
2	How safe do you feel in your daily life?	1	2	3	4	5
	If you checked 1 or 2, please specify why:					
3	Do you feel that you are being paid a fair amount of money for the work you do?	1	2	3	4	5
4	How well are you able to concentrate?	1	2	3	4	5
5	How realistic is the prospect of your children attending university?	1	2	3	4	5
	If you checked 1 or 2, please specify why:					
		Very dissatisfied	Dissatisfied	Neither satisfied	Satisfied	Very satisfied
6	How satisfied are you with your access to health services?	1	2	3	4	5
7	How satisfied are you with your ability to perform your daily living and working activities?	1	2	3	4	5
8	How satisfied are you with the life standard of your living place?	1	2	3	4	5

Part 6 Aspects of life quality of oil growers (cont.)

	Item	Very poor	Poor	Neither poor nor good	Good	Very good
9	How good does communication within the community seem to you?	1	2	3	4	5
10	How good is your sleep?	1	2	3	4	5
		Not at all	A little	A moderate	Very much	Extremely
11	Does your working schedule leave you enough time for recreation, hobbies, friends and family?	1	2	3	4	5
12	Do you have enough energy for your daily life?	1	2	3	4	5
13	How healthful are your physical surroundings?	1	2	3	4	5
	If you checked 1 or 2, please specify why:					
14	How easy is it for you to get all the information that you need for your day-to-day life?	1	2	3	4	5
	If you checked 1 or 2, please specify the difficulties you are facing:					
15	How often does your job leave only little time for you to recreate and get other things done?	1	2	3	4	5
16	Is your community aware of health-damaging factors in your local environment?	1	2	3	4	5
17	To what extent do you have the opportunity for leisure activities, or for spending time with your family and friends?	1	2	3	4	5
18	When compared to others, do you feel that your income is too low?	1	2	3	4	5
	If you checked 1 or 2, please specify why:					

Notes: - For question 15 and 18 the coding needs to be reversed.

- Subjective evaluation of material standard of living: 1, 3, 8, 18
- Access to Education/Information: 5, 9, 14
- Access to healthcare: 6
- Individual Physical and Mental Health: 4, 7, 10, 12
- Salutory aspects of physical environment and safety: 2, 13, 16
- Leisure and social life: 11, 15, 17



Appendix 2
Table for Chapter 3

Table A2.1 Socio-economic characteristics of oil palm smallholders

Item	Univanich	
	No. (n=122)	%
Age (years)		
- ≤30	1	0.8
- 31 – 40	24	19.7
- 41 – 50	42	34.4
- 51-60	35	28.7
- > 60	20	16.4
Mean (S.D.)	49.8 (11.2)	
Education		
- Primary school or under	87	71.3
- Secondary school	24	19.7
- Diploma	4	3.3
- Bachelor or higher	7	5.7
Gender		
- Male	81	66.4
- Female	41	33.6
Household members (people)		
- 1-3	50	41.0
- 4-5	62	50.8
- >5	10	8.2
Mean (S.D.)	3.7 (1.2)	
Average household member age under 15 years (people)	(n= 60)	1.4
Average household member age 15-60 years (people)	(n= 118)	2.9
Average household member age over 60 years (people)	(n= 20)	1.6
Main occupation		
- Oil palm grower	112	91.8
- Univanich's employee	4	3.3
- Rubber farmer	4	3.3
- Others	2	1.6
Other occupation		
- No	25	20.5
- Yes	97	79.5
Lists of other occupations*	(n=97)	
- Rubber farmer	29	29.9
- Merchant	26	26.8
- Oil palm grower	10	10.3
- Worker	9	9.3
- Other farmer	8	8.3
- Others	15	15.5
Overall oil palm management		
- Own management	85	69.7
- Majority hired labour	37	30.3

Table A2.1 Socio-economic characteristics of oil palm smallholders (cont.)

Item	Univanich	
	No. (n=122)	%
Experience in oil palm production (years)		
- ≤ 5	5	4.1
- 6-10	34	27.9
- 11-15	25	20.5
- >15	58	47.5
Mean (S.D.)	16.1 (7.4)	

Remark: * An oil palm smallholder can give more than one answer

Table A2.2 Income, debt, and farm assets of oil palm smallholders

Item	Univanich	
	No. (n=122)	%
Total household income (Baht/year)		
- ≤ 200,000	29	23.8
- 200,001-400,000	56	45.9
- 400,001-600,000	25	20.5
- 600,001-800,000	3	2.5
- > 800,000	9	7.4
Mean (S.D.)	377,622.3 (281,645)	
Income from oil palm production (% of total income)		
- ≤ 25	1	0.8
- 26 – 50	35	28.7
- 51 – 75	35	28.7
- 76 – 100	51	41.8
Mean (S.D.)	69.4 (23.2)	
Household debt		
- No	39	32.0
- Yes	83	68.0
Amount of debt (Baht/household)	(n=83)	
- ≤ 200,000	47	56.6
- 200,001- 400,000	18	21.7
- 400,001- 600,000	5	6.0
- > 600,000	13	15.7
Mean (S.D.)	350,832.8 (513,513)	
Source of debt*	(n=83)	
- BAAC	56	67.5
- Other commercial banks	13	15.7
- Agricultural cooperative	8	9.6
- Others	11	13.3
Objective of loans*	(n=83)	
- Oil palm production	34	41.0
- Purchasing of car and truck	18	21.7
- House construction	14	16.9
- Purchasing of land	11	13.3
- Others	11	13.3

Table A2.2 Income, debt, and farm assets of oil palm smallholders (cont.)

Item	Univanich	
	No. (n=122)	%
Farm assets*		
- 4-wheel truck	51	41.8
- 6-10 wheel truck	2	1.6
- Tractor	5	4.1
- Springer and watering instrument	2	1.6
- Oil palm scythe	51	41.8
- Oil palm spade	49	40.2
- Weed sprayer	58	47.5
- Mower	48	39.3
- Cart	8	6.6

Remark: * An oil palm smallholder can give more than one answer

Table A2.3 Oil palm groups' membership, and motivation to grow oil palm

Item	Univanich	
	No. (n=122)	%
Oil palm groups membership/association		
- No	122	100.0
Oil palm grower registration		
- No	63	51.6
- Yes	59	48.4
Motivation to grow oil palm *		
- Not difficult to manage plantation	70	57.4
- High income and price	57	46.7
- Rapid yield	25	20.5
- Appropriate environment	20	16.4
- Facing disease in rubber	17	13.9
- Bequest	14	11.5
- Close to mill and buyer	11	9.0
- Popular among the locals	5	4.1
- Wanting to diversify the crop	4	3.3
- Others	10	8.2

Remark: * An oil palm smallholder can give more than one answer

Table A2.4 Land, topography, soil and oil palm

Item	Univanich	
	No. (n=122)	%
Land ownership (rai/household)		
- ≤25	51	41.8
- 26-50	45	36.9
- 51-75	12	9.8
- 76-100	10	8.2
- >100	4	3.3
Mean (S.D.)	38.4 (31.7)	
Area of oil palm production (rai/household)		
- ≤25	67	54.9
- 26-50	37	30.3
- 51-75	9	7.4
- 76-100	6	4.9
- >100	3	2.5
Mean (S.D.)	32.1 (28.9)	
Number of oil palm plots (plot/household)		
- 1	55	45.1
- 2	33	27.0
- 3	24	19.7
- >3	10	8.2
Mean (S.D.)	2.0 (1.3)	
Land ownership for oil palm plot *	(n=243 plots)	
- Owned	243	100.0
Land title	(n=243 plots)	
- Chanod	15	6.2
- Nor Sor 3 Kor	8	3.3
- Nor Sor 3	124	51.0
- Sor Por Kor	23	9.5
- Por Bor Tor 5	25	10.3
- Kor Sor Nor 5/Kor Sor Nor 3	25	10.3
- Others	3	1.2
- No title	20	8.2
Topography	(n=243 plots)	
- Plain	193	79.4
- Hilly and mountainous	32	13.2
- Lowlands	10	4.1
- Highlands	8	3.3
Soil characteristics	(n=243 plots)	
- Gravelly soil	77	31.7
- Clay	40	16.5
- Sandy soil	15	6.2
- Loam	70	28.8
- Sandy loam	41	16.9

Table A2.4 Land, topography, soil and oil palm (cont.)

Item	Univanich	
	No. (n=122)	%
Land use prior to oil palm	(n=243 plots)	
- Rubber plantation	112	46.1
- Un-used land	87	35.8
- Other agricultural land	20	8.2
- Oil palm plantation	8	3.3
- Paddy field	7	2.9
- Not available	9	3.7
Age of oil palm tree (years)	(n=243 plots)	
- ≤3	15	6.2
- 4-8	58	23.9
- 9-14	63	25.9
- 15-20	71	29.2
- >20	36	14.8
Mean (S.D.)	13.6 (7.7)	
Oil palm replanting plan	(n=46)	
- No	24	52.2
- Yes	22	47.8
Year to replant	(n=22)	
- 2010-2012	15	68.2
- 2013-2015	6	27.3
- After 2015	1	4.5
Plan for new plantation		
- No	114	93.4
- Yes	8	6.6
Area of expansion (rai)	(n=8)	
- ≤ 10	5	62.5
- 11-50	3	37.5
Mean (S.D.)	17.1 (18.0)	

Remark: * An oil palm smallholder can give more than one answer

Table A2.5 Variety of oil palm planted by smallholders

Item	Univanich	
	No. (n=122)	%
Variety *		
- Tenera	122	100.0
- Dura	16	13.1
Source of seedlings*		
- Oil palm company (Univanich)	112	91.8
- Private nursery	6	4.9
- Others (i.e. cooperative, oil palm research centre)	4	3.3
Factors affecting decision to buy seedlings *		
- Quality of seedlings	76	62.3
- Well accepted source/with license	46	37.7
- Convenience	39	31.9
- Cheap price	3	2.5
- Technical supervision	2	1.6
- Others (i.e. technical supervision, credit)	10	8.2

Table A2.5 Variety of oil palm planted by smallholders (cont.)

Item	Univanich	
	No. (n=122)	%
Number of palm trees per rai		
- 20	10	8.2
- 22	105	86.1
- 24	1	0.8
- 25	6	4.9
Age of seedlings (month)		
- 5 – 6	9	7.4
- 7 – 12	111	91.0
- > 12	2	1.6
Mean (S.D.)	9.9 (2.5)	

Remark: * An oil palm smallholder can give more than one answer

Table A2.6 Labour and labour management

Item	Univanich	
	No. (n=122)	%
Source of labour*		
- Household labour	106	86.9
- Hired labour	102	83.6
Type of work using household labour *	(n=106)	
- Applying fertilizer	78	73.6
- Weeding	71	67.0
- General management	40	37.7
- Pruning	32	30.2
- Transportation of FFB	31	29.2
Number of household labours (people)	(n=106)	
- 1	35	33.0
- 2	46	43.4
- > 2	25	23.6
Mean (S.D.)	2.0 (1.0)	
Number of hired labours (people)	(n=102)	
- 1 – 3	41	40.2
- 4 – 6	36	35.3
- > 6	25	24.5
Mean (S.D.)	4.7 (2.8)	
Reason for hiring labour*	(n=102)	
- Insufficient household labour/lack of time	78	76.5
- Lack of skill and equipment	16	15.7
- Convenience in management	13	12.7
Fringe benefit for labour	(n=102)	
- No	82	80.4
- Yes	20	19.6

Table A2.6 Labour and labour management (cont.)

Item	Univanich	
	No. (n=122)	%
Type of fringe benefit*	(n=20)	
- Food	19	95.0
- Health insurance	2	10.0
- Healthcare, fuel, bonus	3	15.0
Hiring contract	(n=102)	
- No	102	100.0
Information about minimum wage		
- No	59	48.4
- Yes	63	51.6
Minimum wage (Baht/day)	(n=63)	
- 130 – 160	12	19.0
- 161 – 170	27	42.9
- 171 – 180	6	9.5
- > 180	18	28.6
Mean (S.D.)	200.4 (73.8)	
Informing about labour rights	(n=102)	
- No	102	100.0
Awareness of farm injuries to labour		
- No	13	10.7
- Yes	109	89.3
Use of preventive measures	(n=109)	
- No	6	5.5
- Yes	103	94.5
Types of preventive measures*	(n=103)	
- Wearing long-sleeved shirt and pants	94	91.3
- Boots	88	85.4
- Mask	59	57.3
- Gloves	15	14.6
- Cap/Headgear	7	6.8
- More cautious	10	9.7
Accident occurred to hired labour	(n=102)	
- No	95	93.1
- Yes	7	6.9
Misunderstanding or unhappiness of hired labour	(n=102)	
- No	79	77.5
- Yes	23	22.5
Type of management in case of misunderstanding/unhappiness of hired labour	(n=23)	
- Compromise or making new agreement	11	47.8
- Change to new labour team	4	17.4
- Clarify issue (misunderstood)	4	17.4
- Compromised by third party	3	13.0
- Warning	1	4.4

Remark: * An oil palm smallholder can give more than one answer

Table A2.7 Example of wage rate classified by activity (excluding FFB harvesting)

Item	Univanich	
	No.(n=102)	Average wage
Hired labour in Krabi province		
- Pruning (Baht/tree)	54	9.3
- Transportation of FFB (Baht/ton)	49	168.1
- Applying fertilizer (Baht/sack)	39	28.7
- Spraying (Baht/20 liter)	31	132.3
- Spraying (Baht/rai)	1	120.0
- Mowing(Baht/rai)	15	184.0
Hired labour from other provinces		
- Pruning (Baht/tree)	1	8.0
- Transportation of FFB (Baht/ton)	1	150.0

Table A2.8 Water and soil management in oil palm production

Item	Univanich	
	No. (n=122)	%
Source of water		
- Only rainfall	119	97.5
- Irrigation system	3	2.5
Use of fertilizer		
- No	2	1.6
- Yes	120	98.4
Type of fertilizer*	(n=120)	
- Organic	11	9.2
- Chemical	117	97.5
Amount of chemical fertilizer for each application (kg/rai)	(n=117)	
- ≤ 30	24	20.5
- 31 – 50	78	66.7
- > 50	15	12.8
Mean (S.D.)	41.4 (16.3)	
Frequency of applying chemical fertilizer (time/year)	(n=117)	
- 1	21	17.9
- 2	65	55.6
- 3	23	19.7
- 4	8	6.8
Mean (S.D.)	2.2 (0.8)	
Factor affecting the smallholders' decision to apply fertilizer*	(n=120)	
- Price of fertilizer	47	39.2
- Period of applying fertilizer (circle)	55	45.8
- Result of soil analysis	13	10.8
- Price of FFB	12	10.0
- Capital availability	12	10.0

Table A2.8 Water and soil management in oil palm production (cont.)

Item	Univanich	
	No. (n=122)	%
- Age of palm tree	11	9.2
- Result of leaf analysis	5	4.2
- Oil palm yield	4	3.3
- Brand of fertilizer	1	0.8
- Convinced by neighbour	1	0.8
Cover crop		
- No	103	84.4
- Yes	19	15.6
Type of cover crop	(n=19)	
- Legume	18	94.7
- Others	1	5.3
Adoption of soil erosion protection measure	(n=103)	
- No	88	85.4
- Yes	15	14.6
Other measure to improve soil fertility		
- No	46	37.7
- Yes	76	62.3
Measure to improve soil fertility *	(n=76)	
- Use of oil palm frond and leaf	53	69.7
- Use of oil palm empty bunch	27	35.5
- Others (i.e. animal manure)	7	9.2
Receiving information about soil and fertilizer management*	(n=122)	
- No	28	23.0
- Yes	94	77.0
Source of information about soil and fertilizer management*	(n=94)	
- Extension officer from CPO mill	29	30.9
- Sale officer from fertilizer company	22	23.4
- Government officer	16	17.0
- Other sources (i.e. book, internet, ramp)	58	61.7

Remark: * An oil palm smallholder can give more than one answer

Table A2.9 Pest management in oil palm

Item	Univanich	
	No. (n=122)	%
Type of pests		
- Weeds	86	70.5
- Rats	73	59.8
- Disease	39	32.0
- Insects	22	18.0
Weed management*	(n=86)	
- Use chemical	71	82.6
- Non- chemical measure (i.e. ploughing)	30	34.9
- Without management	2	2.3

Table A2.9 Pest management in oil palm (cont.)

Item	Univanich	
	No. (n=122)	%
Rat management *	(n=73)	
- Use chemical	20	27.4
- Non- chemical measure (i.e. use of trap, use net to cover oil palm tree)	42	57.5
- Without management	37	50.7
Disease management *	(n=39)	
- Use chemical	9	23.1
- Non- chemical measure (i.e. get rid of infected leaf)	15	38.5
- Without management	24	61.5
Insect management*	(n=22)	
- Use chemical	5	22.7
- Non-chemical measure (i.e. get rid of infected leaf)	12	54.5
- Without management	7	31.8
Chemical use in pest management		
- No	37	30.3
- Yes	85	69.7
Purpose of chemical use	(n=85)	
- Preventive measure	7	8.2
- Treating	78	91.8
Chemical storage	(n=85)	
- No storage (apply all)	62	72.9
- Yes	23	27.1
Storage		
- Storage room	17	20.0
- Near by house	5	5.9
- Cottage in the plantation	1	1.2
Safety guards when using chemical	(n=85)	
- Gloves and mask	61	71.8
- Gloves	8	9.4
- Mask	7	8.2
- Without any safety guard	9	10.6
Disposal of hazardous containers	(n=85)	
- Sell	32	37.7
- Leave in plantation	23	27.1
- Dispose to home bin	14	16.5
- Keep it for agricultural use	7	8.2
- Nearby house	2	2.4
- Burn or bury	7	8.2
Perception about harmfulness of pesticides	(n=85)	
- No	3	3.5
- Yes	82	96.5
Receiving information about pest management	(n=122)	
- No	47	38.5
- Yes	75	61.5
Source of information about pest management	(n=75)	
- Own experience	35	46.7
- Extension officer from CPO	21	28.0
- Officer from chemical company	13	17.3
- Government officer	5	6.7
- Other sources	11	14.7

Table A2.9 Pest management in oil palm (cont.)

Item	Univanich	
	No. (n=122)	%
Perception about IPM		
- No	119	97.5
- Yes	3	2.5

Remark: * An oil palm smallholder can give more than one answer

Table A2.10 Harvesting management

Item	Univanich	
	No. (n=122)	%
Harvested palm tree	(n=122)	
- Non-harvested	-	-
- harvested	122	100.0
Labour used*	(n=122)	
- Household	23	18.9
- Hired labour	101	82.8
Period of harvest (day)	(n=122)	
- 15, 17	10	8.2
- 20	95	77.9
- 21, 22	10	8.2
- 25, 30	7	5.7
Mean (S.D.)	20.2 (2.5)	
Condition or punishment for harvesting unripe FFB	(n=101)	
- No	64	63.4
- Yes	37	36.6
Type of condition/punishment	(n=37)	
- Not allowed to harvest unripe FFB	22	59.5
- Deduct harvesting fee if the CPO factory return the FFB	8	21.6
- No payment for harvesting	3	8.1
- Stop hiring	3	8.1
- Unripe FFB more than 5 bunches, deduct harvesting fee	1	2.7
Factor affecting the smallholders' decision to harvest FFB		
- Ripeness	94	77.0
- Harvesting cycle	18	14.8
- Labour availability	5	4.1
- Up to the buyer	4	3.3
- Price of FFB	1	0.8
Type of contract harvester	(n=101)	
- Independent harvester	95	94.1
- Ramp	4	4.0
- Relative	2	2.0
Fee paid to contractor	No. (%)	Wage
- Harvesting only (Baht./ton)	52 (51.5)	310.6
- Harvesting + transportation (Baht./ton)	46 (45.5)	452.2
- Harvesting + transportation + pruning (Baht./ton)	2 (2.0)	520.0

Remark: * An oil palm smallholder can give more than one answer

Table A2.11 Selling of FFB

Item	Univanich	
	No. (n=122)	%
FFB buyer		
- Independent ramp	12	9.8
- Cooperative ramp	3	2.5
- Mill	107	87.7
Reason to sell FFB to mill*	(n=107)	
- Fair balance and system of FFB grading	85	79.4
- High FFB price	75	70.1
- Close to mill	34	31.8
- Contract to a mill to get a better price	8	7.5
- Good service and credit support	5	4.7
Reason to sell FFB to ramps *	(n=12)	
- Close to ramp	8	66.7
- Good service (i.e. harvesting, transportation and support for factor of production)	5	41.7
- Less restriction on FFB grading	3	25.0
- High FFB price	2	16.7
Reason to sell FFB to cooperative*	(n=3)	
- Close to cooperative	3	100.0
- Avoid taking advantage from independent ramp	3	100.0
- Member and get dividend	3	100.0
Distance from plantation to buyer (km.)		
- ≤ 2.0	37	30.3
- 2.1 – 4.0	48	39.3
- 4.1 – 6.0	19	15.6
- > 6.0	18	14.8
Mean (S.D.)	4.3 (4.0)	
Transportation		
- Hire the contractor	79	64.8
- Own management	39	32.0
- Hire in different agreement	4	3.2
Cost of transportation (Baht/ton)	(n=79)	
- ≤ 100	12	15.2
- 101 – 150	37	46.8
- 151 – 200	21	26.6
- > 200	9	11.4
Mean (S.D.)	169.2 (63.2)	

Table A2.11 Selling of FFB (cont.)

Item	Univanich	
	No. (n=122)	%
Price of FFB in 2009 (Baht/kg)		
- ≤ 3.00	18	14.8
- 3.01 – 3.50	48	39.3
- 3.51 – 4.00	42	34.4
- > 4.00	14	11.5
Mean (S.D.)	3.67 (0.5)	
FFB pricing		
- According to FFB quality	69	56.6
- No consideration on FFB quality	53	43.4
Factor used for FFB grading*	(n=69)	
- Ripeness	62	89.9
- Un-destroyed bunch	14	20.3
- Bunch size	3	4.3
Type of payments on FFB		
- Cash	119	97.5
- Via bank account	1	0.8
- Credit	2	1.6

Remark: * An oil palm smallholder can give more than one answer

Table A2.12 Yield of oil palm, classified by age (2009)

Item	Age of oil palm (yr)								Average (n=236)	
	≤ 8 (n=66)		9-14 (n=63)		15-20 (n=71)		> 20 (n=36)			
	No.	%	No.	%	No.	%	No.	%	No.	%
Yield (kg/rai)										
≤ 1,000	10	15.2	4	6.3	8	11.3	2	5.6	24	10.2
1,001-2,000	13	19.7	3	4.8	10	14.1	9	25.0	35	14.8
2,001-3,000	10	15.2	14	22.2	31	43.7	8	22.2	63	26.7
> 3,000	33	50.0	42	66.7	22	31.0	17	47.2	114	48.3
Average	2,853.2		3,008.2		2,635.8		2,774.2		2,964.5	

Table A2.13 Farm records

Item	Univanich	
	No. (n=122)	%
Farm Records		
- No	88	72.1
- Yes	34	27.9
Reasons for not keeping records	(n=88)	
- Complexity	35	39.8
- Cannot see the benefit	29	32.9
- Less time available for record	13	14.8
- No skill in record keeping	7	8.0
- Keep farm receipt	4	4.5
Activity/item record*	(n=34)	
- Inflow-outflow	12	35.3
- Cost of fertilizer	7	20.6
- Yield	4	11.8
- Labour	2	5.9
- All important activities	3	8.8
Receiving information about oil palm production management	(n=122)	
- No	42	34.4
- Yes	80	65.6
Source of information about oil palm production management*	(n=80)	
- Extension officer from CPO mill	37	46.3
- Own experience	23	28.8
- Government official	18	22.5
- Neighbour	11	13.8
- Sale officer from fertilizer company	4	5.0
- Others	6	7.5
Receiving oil palm marketing information	(n=122)	
- No	47	38.5
- Yes	75	61.5
Source of oil palm marketing information *	(n=75)	
- Extension officer from CPO mill	41	54.7
- Own experience	11	14.7
- Neighbour	9	12.0
- Government official	8	10.7
- Internet and TV	8	10.7
- Ramp	4	5.3
- Sale officer from fertilizer company	3	4.0
- Officer from Malaysia	2	2.7
Link with ramp and support		
- No	110	90.2
- Yes	12	9.8

Table A2.13 Farm records (cont.)

Item	Univanich	
	No. (n=122)	%
Type of link with ramp and support	(n=12)	
- Technical	5	41.6
- Provides cheaper fertilizer	4	33.3
- Harvesting	1	8.3
- Additional price for regular sell	1	8.3
- Truck service	1	8.3
Link with mill and support		
- No	106	86.9
- Yes	16	13.1
Type of link with mill and support	(n=16)	
- Technical	11	68.8
- Provides cheaper fertilizer	3	18.8
- Harvesting	2	12.4

Remark: * An oil palm smallholder can give more than one answer

Table A2.14 Costs and returns of FFB production

Item	Age of oil palm (yr)				Average (n=122)
	≤ 8 (n=30)	9-14 (n=37)	15-20 (n=38)	> 20 (n=17)	
Variable Cost					
- Fertilizer	1,832.1	1,743.0	1,859.0	2,114.5	1,850.6
- Labor (excluding harvesting)	246.6	300.4	238.2	203.4	253.6
- Chemicals	237.8	177.3	173.4	136.0	188.4
- Harvesting	1,051.8	1,081.3	782.7	984.2	968.3
- Transportation	618.1	522.1	423.3	471.8	507.7
- Fuel	106.6	143.5	123.3	87.0	124.8
Total variable cost (Baht/rai/yr)	4,093.0	3,967.6	3,599.9	3,996.9	3,893.4
Average cost (Baht/ton)	1,280.0	1,144.7	1,350.4	1,321.6	1,260.3
Yield (kg/rai/yr)	(n=30) 3,197.7	(n=37) 3,466.2	(n=38) 2,665.9	(n=17) 3,024.3	(n=122) 3,089.3
Average price of FFB (Baht/kg)	3.67				
Gross return (Baht/rai/yr)	11,735.6	12,721.0	9,783.9	11,099.2	11,337.7
Net return (Baht/rai/yr)	7,642.6	8,753.4	6,184.0	7,102.3	7,444.3
Break even price (Baht/kg)	1.3	1.1	1.4	1.3	1.3
Break even yield (kg/rai)	1,115.3	1,081.1	980.9	1,089.1	1,060.9

Table A2.15 Problems faced by smallholders

Item*	Univanich	
	No. (n=122)	%
High fertilizer prices	93	76.2
Fluctuation of FFB prices	84	68.8
Lack of water in dry season	80	65.6
Low soil fertility	41	33.6
Lack of credit	31	25.4
Lack of knowledge in oil palm management	26	21.3
Harvesting of unripe FFB	22	18.0
Low quality of seedlings	19	15.6
Lack of knowledge in soil and fertilizer management	11	9.0
Impact of chemical usage	10	8.2
Lack of land title	10	8.2

Remark: * An oil palm smallholder can give more than one answer

Table A2.16 Support and training received in the past

Item	Univanich	
	No. (n=122)	%
Support received in the past		
- No	101	82.8
- Yes	21	17.2
Support providers*	(n=21)	
- Agricultural extension officer at the district level	8	38.1
- Univanich	6	28.6
- GTZ	4	19.0
- Central government	3	14.3
- Fertilizer middleman	2	9.5
- Ramp	1	4.8
Type of support received*	(n=21)	
- Knowledge in oil palm management	6	28.6
- Fertilizer and application	7	33.3
- FFB price guarantee	5	23.8
- Marketing management	2	9.5
- Chemical usage	2	9.5
- Others (i.e. cheap fertilizer, harvesting, soil analysis, soil conservation, credit and improving productivity)	6	28.6
Training received in the past	(n=122)	
- No	93	76.2
- Yes	29	23.8
Topic of training*	(n=29)	
- Application of fertilizer	14	48.3
- Knowledge in oil palm management	8	27.6
- Selection of oil palm seedlings	4	13.8
- FFB quality improvement	4	13.8

Table A2.16 Support and training received in the past (cont.)

Item	Univanich	
	No. (n=122)	%
- Soil analysis and soil conservation	3	10.3
- Chemical usage	2	6.9
- Others (i.e. reducing cost of fertilizer and sustainable oil palm production)	3	10.3
Training provider*	(n=29)	
- Univanich	16	55.2
- Paknam and Plaipraya cooperatives	6	20.7
- Agricultural extension officer at the district level	6	20.7
- GTZ	3	10.3
- Fertilizer middleman	1	3.4

Remark: * An oil palm smallholder can give more than one answer

Table A2.17 Major support needed by the smallholders

Item*	Univanich	
	No. (n=122)	%
Soil and leaf analysis	59	48.4
Knowledge on oil palm management	55	45.0
Raising and stabilizing FFB price	45	36.9
Reducing or controlling fertilizer price and other factors' price	44	36.1
Supply of water	9	7.4
Develop high quality of seedlings	9	7.4
Disease control	5	4.1
Credit	3	2.5
Mean to reduce production cost	2	1.6
Others	8	6.4

Table A2.18 Major training needed by the smallholders

Item*	Univanich	
	No. (n=122)	%
Oil palm plantation management (i.e. applying fertilizer)	82	67.2
Soil and leaf analysis	44	36.1
Improving yield	12	9.8
Pest control and management/IPM	6	8.2
Mean to reducing cost	5	4.1
Chemical usage	5	4.1
Selection of high quality of seedlings	5	4.1
Best practice of FFB harvesting	4	3.3
Knowledge on examining chemical fertilizer	3	2.5
Accounting	2	1.6
Others	4	3.3

Remark: * An oil palm smallholder can give more than one answer

Table A2.19 Opinion on sustainable palm oil production

Item	Univanich	
	No. (n=122)	%
Economic impact		
- No	10	8.2
- Yes	112	91.8
Type of economic impact*	(n=112)	
- Generate farmer and community income	68	60.8
- Create jobs	39	34.8
- Enhance economic growth, sufficiency for domestic consumption, reducing import and increasing export	30	26.8
- Reduce risks from growing rubber or other crops	17	15.2
- Fluctuation of FFB and palm oil price may affect overall economic performance and the smallholders	6	5.4
Social impact		
- No	26	21.3
- Yes	96	78.7
Type of social impact*	(n=96)	
- Reduce social problems due to employment, improving income and more security in daily life	96	100.0
- More time to spend with family and more leisure	6	6.3
- Encouraging or promoting cooperation among smallholders in the same area	2	2.1
Environmental impact		
- No	54	44.3
- Yes	68	55.7
Type of environmental impact *	(n=68)	
- Lack of water due to high water demand by oil palm	36	52.9
- Pollution from CPO mill	17	25.0
- Increasing atmosphere moisture	16	23.5
- Encroached forest land by both big companies and smallholders	8	11.8
- Contamination of chemicals in the environment	7	10.3
Suggestion to reduce environmental impact	(n=68)	
- No	40	58.8
- Yes	28	41.2
Key Suggestions	(n=28)	
- CPO mill treat water before discharge/use wastewater for other purposes	18	64.3
- Watershed conservation	6	21.4
- Reduce chemical usage	5	17.9
- Others (i.e. zoning of oil palm production, use inorganic fertilizer)	3	10.7
Oil palm plantation close to reserved area	(n=122)	
- No	111	91.0
- Yes	11	9.0

Remark: * An oil palm smallholder can give more than one answer

Table A2.20 Key suggestion to the development of oil palm production

Suggestion*	Univanich	
	No. (n=122)	%
Support knowledge on oil palm production management	47	38.5
Raising and stabilize FFB prices	37	30.3
Develop high quality of seedlings	21	17.2
Reducing or controlling fertilizer price and other factors' price	26	21.3
Provide soil and leaf analysis in the area	25	20.5
Support knowledge on how to reduce the cost of production	8	6.6
CPO mill purchase FFB according to the quality	4	3.3
Provide water systems for oil palm production	7	5.7

Remark: * An oil palm smallholder can give more than one answer

Appendix 3
Table for Chapter 4

Table A3.1 Socio-economic characteristics of oil palm smallholders

Item	UPOIC	
	No. (n=131)	%
Age (years)		
- ≤30	4	3.1
- 31 – 40	26	19.9
- 41 – 50	40	30.5
- 51-60	43	32.8
- > 60	18	13.7
Mean (S.D.)	49.3 (10.9)	
Education		
- Primary school or under	76	58.0
- Secondary school	28	21.4
- Diploma	10	7.6
- Bachelor or higher	17	13.0
Gender		
- Male	95	72.5
- Female	36	27.5
Household members (people)		
- 1-3	47	35.9
- 4-5	65	49.6
- >5	19	14.5
Mean (S.D.)	4.0 (1.6)	
Average household member age under 15 years (people)	(n=60) 1.6	
Average household member age 15-60 years (people)	(n=129) 3.2	
Average household member age over 60 years (people)	(n=18) 1.4	
Main occupation		
- Oil palm grower	100	76.3
- UPOIC's employee	1	0.8
- Rubber farmer	25	19.1
- Others (i.e. government official, trader and livestock raising)	5	3.8
Other occupation		
- No	9	6.9
- Yes	122	93.1
Lists of other occupations*	(n=122)	
- Rubber farmer	47	38.5
- Merchant	9	7.4
- Oil palm grower	31	25.4
- Worker	10	8.2
- Other agricultural activities	13	10.7
- Others (i.e. government official, trader and livestock raising)	12	9.8
Overall oil palm management		
- Own management	107	81.7
- Majority hired labour	24	18.3



Table A3.1 Socio-economic characteristics of oil palm smallholders (cont.)

Item	UPOIC	
	No. (n=131)	%
Experience in oil palm production (years)		
- ≤ 5	5	3.8
- 6-10	40	30.5
- 11-15	40	30.5
- >15	46	35.2
Mean (S.D.)	14.1 (6.1)	

Remark: * An oil palm smallholder can give more than one answer

Table A3.2 Income, debt, and farm assets of oil palm smallholders

Item	UPOIC	
	No. (n=131)	%
Total household income (Baht/year)		
- ≤200,000	22	16.8
- 200,001-400,000	52	39.7
- 400,001-600,000	32	24.4
- 600,001-800,000	4	3.1
- >800,000	21	16.0
Mean (S.D.)	562,070.2 (590,858)	
Income from oil palm production (% of total income)		
- ≤ 25	15	11.5
- 26 – 50	44	33.5
- 51 – 75	36	27.5
- 76 – 100	36	27.5
Mean (S.D.)	61.0 (26.1)	
Household debt		
- No	28	21.4
- Yes	103	78.6
Amount of debt (Baht/household)	(n=103)	
- ≤200,000	46	44.6
- 200,001-400,000	20	19.4
- 400,001-600,000	12	11.7
- >600,000	25	24.3
Mean (S.D.)	473,864.0 (541,558)	
Source of debt*	(n=103)	
- BAAC	77	74.8
- Other commercial banks	13	12.6
- Agricultural cooperative	7	6.8
- Village fund	10	9.7
- Others (i.e. finance, neighbour, informal source)	14	13.6
Objective of loans*	(n=103)	
- Oil palm production	52	50.5
- Purchasing of car and truck	14	13.6
- House construction	13	12.7
- Purchasing of land	16	15.5
- Other agricultural activities	13	12.7
- Others (i.e. children education, household expense, and invest in other business)	18	17.5



Table A3.2 Income, debt, and farm assets of oil palm smallholders (cont.)

Item	UPOIC	
	No. (n=131)	%
Farm assets*		
- 4-wheel truck	73	55.7
- 6-10 wheel truck	3	2.3
- Tractor	2	1.5
- Springer and watering instrument	1	0.8
- Oil palm scythe	57	43.5
- Oil palm spade	46	35.1
- Weed sprayer	45	34.4
- Mower	78	59.5
- Cart	1	0.8

Remark: * An oil palm smallholder can give more than one answer

Table A3.3 Oil palm groups' membership, and motivation to grow oil palm

Item	UPOIC	
	No. (n=131)	%
Oil palm groups' membership/association		
- No	129	98.5
- Yes (Excluding formed by GTZ)	2	1.5
Oil palm grower registration		
- No	50	38.2
- Yes	81	61.8
Motivation to grow oil palm *		
- Not difficult to manage plantation	52	39.7
- High income and price	65	49.6
- Rapid yield	29	22.1
- Appropriate environment	27	20.6
- Facing disease in rubber	5	3.8
- Bequest	5	3.8
- Close to mill and buyer	1	0.8
- Popular among the locals	11	8.4
- Wanting to diversify the crop	9	6.9
- Less labour problems compared to rubber	4	3.1
- Others	7	5.4

Remark: * An oil palm smallholder can give more than one answer



Table A3.4 Land, topography, soil and oil palm tree

Item	UPOIC	
	No. (n=131)	%
Land ownership (rai/household)		
- ≤25	18	13.7
- 26-50	50	38.2
- 51-75	30	22.9
- 76-100	12	9.2
- >100	21	16.0
Mean (S.D.)	71.0 (68.7)	
Area of oil palm production (rai/household)		
- ≤25	47	35.9
- 26-50	54	41.2
- 51-75	11	8.4
- 76-100	8	6.1
- >100	11	8.4
Mean (S.D.)	47.9 (49.5)	
Number of oil palm plots (plot/household)		
- 1	53	40.5
- 2	32	24.4
- 3	29	22.1
- >3	17	13.0
Mean (S.D.)	2.2 (1.4)	
Land ownership for oil palm plot *	(n=289 plots)	
- Owned	289	100.0
Land title	(n=289 plots)	
- Chanod	48	16.6
- Nor Sor 3 Kor	4	1.4
- Nor Sor 3	30	10.4
- Sor Por Kor	125	43.3
- Por Bor Tor 5	64	22.1
- Kor Sor Nor 5/Kor Sor Nor 3	1	0.3
- Others	3	1.0
- No title	14	4.9
Topography	(n=289 plots)	
- Plain	169	58.5
- Hilly and mountainous	74	25.6
- Lowlands	25	8.6
- Highlands	21	7.3
Soil characteristic	(n=289 plots)	
- Gravelly soil	35	12.1
- Clay	70	24.2
- Sandy soil	46	15.9
- Loam	72	24.9
- Sandy loam	66	22.9
Land use prior to oil palm	(n=289 plots)	
- Rubber plantation	107	37.0
- Un-used land	99	34.3
- Other agricultural land	9	3.1

Table A3.4 Land, topography, soil and oil palm tree (cont.)

Item	UPOIC	
	No. (n=131)	%
- Oil palm plantation	7	2.4
- Paddy field	66	22.9
- Not available	1	0.3
Age of oil palm tree (years)	(n=289 plots)	
- ≤3	33	11.4
- 4-8	73	25.3
- 9-14	96	33.2
- 15-20	74	25.6
- 21-25	10	3.5
- >26	3	1.0
Mean (S.D.)	10.8 (6.0)	
Oil palm replanting plan	(n=25)	
- No	15	60.0
- Yes	10	40.0
Year to replant	(n=10)	
- 2553	2	20.0
- 2554	2	20.0
- 2555	4	40.0
- 2556	1	10.0
- 2557	1	10.0
Plan for new plantation		
- No	119	90.8
- Yes	12	9.2
Area of expansion (rai)	(n=12)	
- ≤ 10	2	16.7
- 11-20	7	58.3
- > 20	3	25.0
Mean (S.D.)	43.0 (56.6)	

Remark: * An oil palm smallholder can give more than one answer

Table A3.5 Variety of oil palm planted by smallholders

Item	UPOIC	
	No. (n=131)	%
Variety *		
- Tenera	131	100.0
- Dura	4	3.1
- Not known	26	19.8
Source of seedlings*		
- UPOIC	26	19.8
- Other oil palm company	44	33.6
- Private nursery	49	37.4
- Government institution i.e. oil palm research centre, agricultural college, extension office)	17	13.0
- Others	13	9.9



Table A3.5 Variety of oil palm planted by smallholders (cont.)

Item	UPOIC	
	No. (n=131)	%
Factors affecting decision to buy seedlings *		
- Quality of seedlings	43	32.8
- Well accepted source/with license	78	59.5
- Convenience	39	29.8
- Cheap price	4	3.1
- Others (i.e. supported by government, suggested by friend)	9	6.9
Number of palm tree per rai		
- ≤20	24	18.4
- 22	2	1.5
- 24	103	78.6
- ≥24	2	1.5
Age of seedlings (month)		
- 5 – 6	9	6.9
- 7 – 12	118	90.1
- > 12	4	3.0
Mean (S.D.)	9.6 (2.4)	

Remark: * An oil palm smallholder can give more than one answer

Table A3.6 Labour and labour management

Item	UPOIC	
	No. (n=131)	%
Source of labour*		
- Household labour	117	89.3
- Hired labour	115	87.8
Type of work using household labour *	(n=117)	
- Applying fertilizer	68	58.1
- Weeding	51	43.6
- General management	100	85.5
- Pruning	27	23.1
- Transportation of FFB	40	34.2
Number of household labours (people)	(n=117)	
- 1	45	38.5
- 2	47	40.2
- > 2	25	21.3
Mean (S.D.)	2.0 (1.2)	
Number of hired labours (people)	(n=115)	
- 1 – 3	30	26.1
- 4 – 6	48	41.7
- > 6	37	32.2
Mean (S.D.)	5.9 (3.6)	
Reason for hiring labour*	(n=115)	
- Insufficient household labour/lack of time	99	86.1
- Lack of skill and equipment	18	15.7
- Convenience in management	2	1.7

Table A3.6 Labour and labour management (cont.)

Item	UPOIC	
	No. (n=131)	%
Fringe benefit for labour	(n=115)	
- No	87	75.7
- Yes	28	24.3
Type of fringe benefit*	(n=28)	
- Food	20	71.4
- Housing	8	28.6
- Health insurance	3	10.7
- Healthcare, fuel, bonus, water supply, transportation	10	35.7
Hiring contract	(n=115)	
- No	115	100.0
Information about minimum wage	(n=115)	
- No	58	50.4
- Yes	57	49.6
Minimum wage (Baht/day)	(n=57)	
- < 180	14	24.6
- 180 – 200	19	33.3
- > 200	24	42.1
Mean (S.D.)	225.8 (53.1)	
Informing about labour rights	(n=115)	
- No	115	100.0
Awareness of farm injuries to labour	(n=131)	
- No	4	3.1
- Yes	127	96.9
Preventive measures	(n=127)	
- No	5	3.9
- Yes	122	96.1
Types of preventive measures*	(n=122)	
- Wearing long-sleeved shirt and pants	68	55.7
- Boots	112	91.8
- Mask	17	13.9
- Gloves	55	45.1
- Cap/Headgear	17	13.9
- More cautious	7	5.7
- Keep the chemical in a safe place	1	0.8
Accident occurred to hired labour	(n=115)	
- No	109	94.8
- Yes	6	5.2
Misunderstanding or unhappiness of hired labour	(n=115)	
- No	106	92.2
- Yes	9	7.8



Table A3.6 Labour and labour management (cont.)

Item	UPOIC	
	No. (n=131)	%
Type of management in case of misunderstanding/ unhappiness of hired labour	(n=9)	
- Compromise or making new agreement	3	33.4
- Change to new labour team	2	22.2
- Clarify issue (misunderstood)	2	22.2
- Compromised by third party	2	22.2

Remark: * An oil palm smallholder can give more than one answer

Table A3.7 Example of wage rate classified by activity (excluding FFB harvesting)

Item	UPOIC	
	No.(n=102)	Wage
Hired labour in Krabi province		
- Pruning (Baht/tree)	67	8.8
- Pruning (Baht/rai)	2	260.0
- Transportation of FFB (Baht/ton)	71	201.1
- Applying fertilizer (Baht/sack)	55	32.4
- Applying fertilizer (Baht/rai)	1	400
- Spraying (Baht/20 liter)	20	143
- Mowing (Baht/rai)	32	282.1
Hired labour from other provinces		
- Pruning (Baht/tree)	22	9.5
- Transportation of FFB (Baht/ton)	10	183
- Applying fertilizer (Baht/sack)	13	30.4
- Applying fertilizer (Baht/rai)	3	160
- Spraying (Baht/20 liter)	1	50
- Mowing (Baht/rai)	9	295.1



Table A3.8 Water and soil management in oil palm production

Item	UPOIC	
	No. (n=131)	%
Source of water		
- Only rainfall	126	96.2
- Irrigation system	5	3.8
Use of fertilizer		
- No	1	0.8
- Yes	130	99.2
Type of fertilizer*	(n=130)	
- Organic	29	22.3
- Chemical	122	93.8
Amount of chemical fertilizer for each application (kg/rai)	(n=122)	
- ≤ 30	7	5.7
- 31-50	64	52.5
- > 50	51	41.8
Mean (S.D.)	55.4 (19.6)	
Frequency of applying chemical fertilizer (time/year)	(n=122)	
- 1	11	9.0
- 2	54	44.3
- 3	51	41.8
- > 3	6	4.9
Mean (S.D.)	2.4 (0.8)	
Factor affecting the smallholders' decision to apply fertilizer*	(n=122)	
- Price of fertilizer	12	9.8
- Period of applying fertilizer (circle)	51	41.8
- Result of soil analysis	3	2.5
- Price of FFB	7	5.7
- Capital availability	13	10.7
- Age of palm tree	4	3.3
- Result of leaf analysis	1	0.8
- Brand of fertilizer	14	11.5
- Convinced by neighbour	1	0.8
- Appropriate timing (i.e. rain, soil moisture)	49	40.2
Cover crop	(n=131)	
- No	116	88.5
- Yes	15	11.5
Type of cover crop	(n=15)	
- Legume	15	100.0
Adoption of soil erosion protection measure	(n=131)	
- No	106	80.9
- Yes	25	19.1
Other measure to improve soil fertility	(n=131)	
- No	39	29.8
- Yes	92	70.2



Table A3.8 Water and soil management in oil palm production (cont.)

Item	UPOIC	
	No. (n=131)	%
Measure to improve soil fertility *	(n=92)	
- Use of oil palm frond and leaf	82	89.1
- Use of oil palm empty bunch	22	23.9
Receiving information about soil and fertilizer management		
- No	34	26.0
- Yes	97	74.0
Source of information about soil and fertilizer management*	(n=97)	
- Extension officer from CPO mill	10	10.3
- Sale officer from fertilizer company	12	12.4
- Government official	46	47.4
- Own experience	27	27.8
- Friend	15	15.5
- Other sources (i.e. book, internet, ramp)	10	10.3

Remark: * An oil palm smallholder can give more than one answer

Table A3.9 Pest management in oil palm

Item	UPOIC	
	No. (n=131)	%
Type of pest*		
- Disease	41	31.3
- Insect	29	22.1
- Rat	75	57.3
- Weeds	88	67.2
Disease management *	(n=41)	
- Use chemical	5	12.2
- Non-chemical measure (i.e. get rid of infected leaf)	19	46.3
- Without management	25	61.0
Insect management*	(n=29)	
- Use chemical	2	6.9
- Non-chemical measure (i.e. get rid of infected leaf)	13	44.8
- Without management	16	55.2
Rat management*	(n=75)	
- Use chemical	10	13.3
- Non-chemical measure (i.e. use of trap, use net to cover oil palm tree)	58	77.3
- Without management	44	58.7
Weeding*	(n=88)	
- Use chemical	36	40.9
- Non-chemical measure (i.e. ploughing)	63	71.6
- Without management	1	1.1
Chemical use in pest management	(n=131)	
- No	85	64.9
- Yes	46	35.1



Table A3.9 Pest management in oil palm (cont.)

Item	UPOIC	
	No. (n=131)	%
Purpose of chemical use	(n=46)	
- Preventive measure	2	4.3
- Treating	44	95.7
Chemical storage	(n=46)	
- No storage (apply all)	39	84.8
- Yes	7	15.2
Storage	(n=7)	
- Storage room	7	100.0
Safety guards when using chemical	(n=46)	
- Gloves and mask	44	95.7
- Mask	2	4.3
Disposal of hazardous containers	(n=46)	
- Sell	17	36.9
- Leave in plantation	21	45.7
- Keep it for agricultural use	7	15.2
- Burn or bury	1	2.2
Perception about harmfulness of pesticides	(n=46)	
- No	1	2.2
- Yes	45	97.8
Receiving information about pest management	(n=131)	
- No	62	47.3
- Yes	69	52.7
Source of information about pest management*	(n=69)	
- Own experience	16	23.2
- Extension officer from CPO mill	5	7.2
- Officer from chemical company	10	14.5
- Government official	24	34.8
- Neighbour	14	20.3
- Other sources (i.e. book, TV)	5	7.2
Perception about IPM		
- No	116	88.5
- Yes	15	11.5

Remark: * An oil palm smallholder can give more than one answer



Table A3.10 Harvesting management

Item	UPOIC	
	No. (n=131)	%
Harvested palm tree	(n=131)	
- Non-harvested	3	2.3
- Harvested	128	97.7
Labour used*	(n=128)	
- Household	9	7.0
- Hired labour	119	93.0
Period of harvest (day)	(n=128)	
- < 20	34	26.6
- 20	85	66.4
- > 20	9	7.0
Mean (S.D.)	19.3 (2.6)	
Condition or punishment for harvesting unripe FFB	(n=119)	
- No	116	97.5
- Yes	3	2.5
Type of condition/ punishment	(n=3)	
- Deduct harvesting fee if the CPO factory return the FFB	2	66.7
- Stop hiring	1	33.3
Factor affecting the smallholders' decision to harvest FFB	(n=128)	
- Ripeness	98	76.6
- Harvesting cycle	25	19.5
- Labour availability	2	1.6
- Up to the buyer	3	2.3
Type of contracted harvester	(n=82)	
- Independent harvester	79	96.4
- Ramp	2	2.4
- Relative	1	1.2
Fee paid to harvester	No. (%)	Wage
- Harvesting only (Baht/ton)	37 (31.1)	332.9
- Harvesting + transportation (Baht/ton)	81 (68.1)	504.7
- Harvesting + transportation + pruning (Baht/ton)	1 (0.01)	500.0

Remark: * An oil palm smallholder can give more than one answer



Table A3.11 Selling of FFB

Item	UPOIC	
	No. (n=131)	%
FFB buyer	(n=128)	
- Independent ramp	68	53.1
- Cooperative or community enterprise ramp	19	14.9
- Mill	41	32.0
Reason to sell FFB to mill*	(n=41)	
- Fair balance and system of FFB grading	18	43.9
- High FFB price	29	70.7
- Close to mill	11	26.8
- Good service and credit support	1	2.4
Reason to sell FFB to independent ramps *	(n=68)	
- Close to ramp	65	95.5
- Good service (i.e. harvesting, transportation, and support factors of production)	3	4.4
- Less restriction on FFB grading	3	4.4
- High FFB price	17	25.0
Reasons to sell FFB to cooperative or community enterprise *	(n=19)	
- Close to cooperative	5	26.3
- Member and get dividend	14	73.7
- High FFB price	2	10.5
Distance from plantation to buyer (km.)	(n=131)	
- ≤ 2.0	25	19.1
- 2.1 – 4.0	23	17.6
- 4.1 – 6.0	24	18.3
- 6.1 – 8.0	24	18.3
- > 8.0	35	26.7
Mean (S.D.)	6.4 (4.2)	
Transportation	(n=128)	
- Hire the contractor	83	64.8
- Own management	45	35.2
Cost of transportation (Baht/ton)	(n=83)	
- ≤ 100	8	9.6
- 101 – 150	15	18.1
- 151 – 200	40	48.2
- > 200	20	24.1
Mean (S.D.)	203.4 (69.4)	



Table A3.11 Selling of FFB (cont.)

Item	UPOIC	
	No.(n=131)	%
Price of FFB in 2009 (Baht/kg)	(n=128)	
- ≤ 3.00	14	10.9
- 3.01 – 3.50	50	39.1
- 3.51 – 4.00	35	27.3
- > 4.00	29	22.7
Mean (S.D.)	3.78 (0.6)	
FFB pricing	(n=128)	
- According to FFB quality	54	42.2
- No consideration on FFB quality	74	57.8
Factor used for FFB grading*	(n=54)	
- Ripeness	44	81.5
- Un-destroyed bunch	1	1.9
- Bunch size	6	11.1
- % OER	18	33.3
Type of payment on FFB	(n=128)	
- Cash	117	91.4
- Via bank account	11	8.6

Remark: * An oil palm smallholder can give more than one answer

Table A3.12 Yield of oil palm, classified by age (2009)

Item	Age of oil palm (yr)								Average (n=259 plots)	
	≤ 8 (n=76)		9-14 (n=96)		15-20 (n=74)		> 20 (n=13)			
	No.	%	No.	%	No.	%	No.	%	No.	%
Yield (kg/rai)										
≤ 1,000	5	6.6	1	1.0	3	4.1	-	-	9	3.5
1,001-2,000	5	6.6	9	9.4	10	13.5	3	23.1	27	10.4
2,001-3,000	27	35.5	31	32.3	47	63.5	6	46.2	111	42.9
> 3,000	39	51.3	55	57.3	14	18.9	4	30.8	112	43.2
Average	3,007.7		3,555.8		2,549.5		2,845.9		3,071.9	



Table A3.13 Farm records

Item	UPOIC	
	No.(n=131)	%
Farm records		
- No	99	75.6
- Yes	32	24.4
Reasons for not keeping records	(n=99)	
- Complexity	27	27.3
- Cannot see the benefit	14	14.1
- Less time available for record	39	39.4
- No skill in record keeping	10	10.1
- Keep farm receipt	9	9.1
Activity/item record*	(n=32)	
- Inflow-outflow	28	87.5
- Cost of fertilizer	8	25.0
- Yield	7	21.9
- Labour	3	9.4
Receiving information about oil palm production management	(n=131)	
- No	41	31.3
- Yes	90	68.7
Source of information about oil palm production management*	(n=90)	
- Extension officer from CPO mill	8	8.8
- Own experience	35	38.8
- Government official	39	43.3
- Neighbour	17	18.8
- Sale officer from fertilizer company	2	2.2
- Others	3	3.3
Receiving oil palm marketing information	(n=131)	
- No	43	32.8
- Yes	88	67.2
Source of oil palm marketing information *	(n=88)	
- Extension officer from CPO mill	17	19.3
- Own experience	12	13.6
- Neighbour	11	12.5
- Government official	25	28.4
- Internet and TV	11	12.5
- Ramp	14	15.9
- Sale officer from fertilizer company	2	2.3
- Officer from Malaysia	2	2.3
Link with ramp and support	(n=131)	
- No	116	88.5
- Yes	15	11.5



Table A3.13 Farm records (cont.)

Item	UPOIC	
	No.(n=131)	%
Type of link with ramp and support	(n=15)	
- Technical	4	26.7
- Provides cheaper fertilizer	1	6.6
- Credit	7	46.7
- Social link	2	13.3
- Truck service	1	6.7
Link with mill and support	(n=131)	
- No	121	92.4
- Yes	10	7.6
Type of link with mill and support	(n=10)	
- Technical	8	80.0
- Credit	2	20.0

Remark: * An oil palm smallholder can give more than one answer

Table A3.14 Costs and returns of FFB production

Item	Age of oil palm (yr)				Average (n=131)
	≤ 8 (n=30)	9-14 (n=60)	15-20 (n=37)	> 20 (n=4)	
Variable Cost					
- Fertilizer	2,284.1	2,422.3	2,414.0	2,883.9	2,402.3
- Labor (excluding harvesting)	336.5	396.4	390.3	859.9	394.1
- Chemicals	219.0	228.0	191.1	96.4	205.1
- Harvesting	1,067.4	1,122.0	936.4	1,258.7	1,059.0
- Transportation	692.2	709.4	545.6	602.0	662.3
- Fuel	225.0	148.4	147.0	111.0	149.2
Total variable cost (Baht/rai/yr)	4,824.2	5,026.5	4,624.4	5,811.9	4,872.0
Average cost (Baht/ton)	1,378.8	1,359.9	1,680.6	1,551.3	1,440.8
Yield (kg/rai/yr)	(n=28) 3,498.9	(n=59) 3,696.1	(n=37) 2,751.7	(n=4) 3,746.4	(n=128) 3,381.5
Average price of FFB (Baht/kg)	3.78				
Gross return (Baht/rai/yr)	13,225.8	13,971.3	10,401.4	14,161.4	12,782.1
Net return (Baht/rai/yr)	8,401.6	8,944.8	5,777.0	8,349.5	7,910.1
Break even price (Baht/kg)	1.4	1.4	1.7	1.6	1.4
Break even yield (kg/rai)	1,276.2	1,329.8	1,223.4	1,537.5	1,288.9



Table A3.15 Problems faced by smallholders

Item*	UPOIC	
	No. (n=131)	%
High fertilizer prices	95	72.5
Fluctuation of FFB prices	112	85.5
Lack of water in dry season	84	64.1
Low soil fertility	34	25.9
Low quality of fertilizer	16	12.2
Lack of knowledge in oil palm management	27	20.6
Harvesting of unripe FFB	10	7.6
Low quality of seedlings	53	40.4
Lack of knowledge in soil and fertilizer management	29	22.1
Lack of knowledge in soil and leaf analysis	14	10.7

Table A3.16 Support and training received in the past

Item	UPOIC	
	No.(n=131)	%
Support received in the past		
- No	93	71.0
- Yes	38	29.0
Support providers*	(n=38)	
- Agricultural extension officer at the district level	37	97.4
- Univanich and Sricharoen Palm	2	5.3
- Fertilizer middleman	4	10.5
Type of support received*	(n=38)	
- Knowledge in oil palm management	14	36.8
- Fertilizer and application	19	50.0
- FFB price guarantee	2	5.3
- Marketing management	1	2.6
- Chemical usage	1	2.6
- Seedlings	5	13.2
- Water management	4	10.5
- Others (i.e. cheap fertilizer, harvesting, soil analysis, soil conservation, credit and improving productivity)	4	10.5
Training received in the past	(n=131)	
- No	100	76.3
- Yes	31	23.7
Topic of training*	(n=31)	
- Application of fertilizer	16	51.6
- Knowledge in oil palm management	18	58.1
- Selection of oil palm seedlings	4	12.9
- Soil analysis and soil conservation	6	19.4
- Pest management	1	3.2



Table A3.16 Support and training received in the past (cont.)

Item	UPOIC	
	No.(n=131)	%
Training provider*	(n=31)	
- Univanich and UPOIC	3	9.7
- Agricultural extension officer at the district level	21	67.7
- Fertilizer middleman	2	6.5
- Other agricultural organization	14	45.2

Remark: * An oil palm smallholder can give more than one answer

Table A3.17 Major support needed by the smallholders

Item*	UPOIC	
	No.(n=131)	%
Soil and leaf analysis	48	36.6
Knowledge on oil palm management	36	27.5
Raising and stabilizing FFB price	60	45.8
Reducing or controlling fertilizer price and other factors' price	47	35.9
Supply of water	3	2.3
Develop high quality of seedlings	14	10.7
Promote famers' group forming	5	3.8
Credit	11	8.4
Means to reduce production cost	7	5.3
Others	6	4.6

Remark: * An oil palm smallholder can give more than one answer

Table A3.18 Major training needed by the smallholders

Item*	UPOIC	
	No. (n=131)	%
Oil palm plantation management (i.e. applying fertilizer)	84	64.1
Soil and leaf analysis	46	35.1
Improving yield	20	15.3
Pest control and management/IPM	6	4.6
Means to reduce cost	5	3.8
Soil conservation	13	9.9
Selection of high quality of seedlings	7	5.3
Water management	3	2.3
Best practice of FFB harvesting	3	2.3
Knowledge on examining chemical fertilizer	5	3.8

Remark: * An oil palm smallholder can give more than one answer



Table A3.19 Opinion on sustainable oil palm production

Item	UPOIC	
	No. (n=131)	%
Economic impact		
- No	6	4.6
- Yes	125	95.4
Type of economic impact*	(n=125)	
- Generate farmer and community income	114	91.2
- Enhance economic growth, sufficiency for domestic consumption, reducing import and increasing export	44	35.2
- Better income distribution	13	10.4
- Promote alternative energy	2	1.6
Social impact	(n=131)	
- No	14	10.7
- Yes	117	89.3
Type of social impact*	(n=117)	
- Reduce social problems due to employment, improving income and more security in daily life	98	83.8
- More time to spend with family and more leisure/better quality of life	25	21.4
- Encouraging or promoting cooperation among smallholders in the same area	1	0.9
Environmental impact	(n=131)	
- No	46	35.1
- Yes	85	64.9
Type of environmental impact*	(n=85)	
- Lack of water due to high water demand by oil palm	76	89.4
- Pollution from CPO	3	3.5
- Increasing atmosphere moisture	6	7.1
- Encroached forest land by both big companies and smallholders	4	4.7
- Contamination of chemicals in the environment	7	8.2
Suggestion to reduce environmental impact	(n=85)	
- No	74	87.1
-Yes	11	12.9
Key suggestions*	(n=11)	
- Stop encroachment to forest land and reserved Area	4	36.4
- Afforestation	2	18.2
- Water system management/reservoir	2	18.2
- Grow cover crop	2	18.2
- CPO mill treat water before discharge	1	9.1
Oil palm plantation close to reserved area	(n=131)	
- No	130	99.2
- Yes	1	0.8

Remark: * An oil palm smallholder can give more than one answer



Table A3.20 Key suggestion to the development of oil palm production

Suggestion	UPOIC	
	No. (n=131)	%
Support knowledge on oil palm production management	49	37.4
Raising and stabilize FFB prices	34	26.0
Develop high quality of seedlings	28	21.4
Reducing or controlling fertilizer price and other factors' price	13	9.9
Provide soil and leaf analysis in the area	13	9.9
Support knowledge on how to reduce the cost of production	8	6.1
Set up oil palm aid fund	8	6.1
Strengthen and promote farmers' group	6	4.6
CPO mill purchase FFB according to its quality	5	3.8
Provide water systems for oil palm production	3	2.3



Appendix 4 Table for Chapter 5

Table A4.1 Socio-economic characteristics of oil palm smallholders

Item	Southern	
	No. (n=82)	%
Age (years)		
- ≤30	4	4.9
- 31 – 40	23	28.0
- 41 – 50	20	24.4
- 51-60	23	28.0
- > 60	12	14.7
Mean (S.D.)	48.7 (12.3)	
Education		
- Primary school or under	48	58.5
- Secondary school	20	24.4
- Diploma	4	4.9
- Bachelor or higher	10	12.2
Gender		
- Male	71	86.6
- Female	11	13.4
Household members (people)		
- 1-3	21	25.6
- 4-5	47	57.3
- >5	14	17.1
Mean (S.D.)	4.3 (1.3)	
Average household member age under 15 years (people)	(n= 47)	1.6
Average household member age 15-60 years (people)	(n= 80)	2.9
Average household member age over 60 years (people)	(n= 30)	1.5
Main occupation		
- Oil palm grower	50	61.0
- Southern's employee	3	3.7
- Rubber farmer	28	34.1
- Government official	1	1.2
Other occupation		
- No	12	14.6
- Yes	70	85.4
Lists of other occupations*	(n=70)	
- Oil palm grower	32	45.7
- Rubber farmer	20	28.6
- Worker	8	11.4
- Other farmer (i.e. livestock raising, fruit tree growing)	7	10.0
- Merchant	3	4.3
- Others (government officer, trader and raising livestock)	2	2.9
Overall oil palm management		
- Own management	75	91.5
- Majority hired labour	7	8.5



Table A4.1 Socio-economic characteristics of oil palm smallholders (cont.)

Item	Southern	
	No. (n=82)	%
Experience in oil palm production (years)		
- ≤ 5	30	36.6
- 6-10	34	41.5
- 11-15	11	13.4
- >15	7	8.5
Mean (S.D.)	8.2 (4.9)	

Remark: * An oil palm smallholder can give more than one answer

Table A4.2 Income, debt, and farm assets of oil palm smallholders

Item	Southern	
	No. (n=82)	%
Total household income (Baht/year)		
- ≤200,000	21	25.6
- 200,001-400,000	33	40.2
- 400,001-600,000	19	23.2
- 600,001-800,000	4	4.9
- >800,000	5	6.1
Mean (S.D.)	472,634.1(626,709)	
Income from oil palm production (% of total income)		
- ≤ 25	17	20.7
- 26 – 50	40	48.8
- 51 – 75	8	9.8
- 76 – 100	17	20.7
Mean (S.D.)	50.3 (27.5)	
Household debt		
- No	29	35.4
- Yes	53	64.6
Amount of debt (Baht/household)	(n=53)	
- ≤200,000	31	58.5
- 200,001-400,000	9	17.0
- 400,001-600,000	7	13.2
- >600,000	6	11.3
Mean (S.D.)	352,547.1 (502,109)	
Source of debt*	(n=53)	
- BAAC	35	66.0
- Other commercial banks	10	18.9
- Agricultural cooperative	6	11.3
- Village fund	3	5.7
- Others (i.e. finance, neighbour, informal source)	5	9.4
Objective of loans*	(n=53)	
- Oil palm production	19	35.8
- Other agricultural activities	11	20.8
- Purchasing of Land	10	18.9
- Purchasing of car and truck	7	13.2
- House construction	5	9.4
- Others (i.e. children education, and invest in other business)	7	13.2



Table A4.2 Income, debt, and farm assets of oil palm smallholders (cont.)

Item	Southern	
	No. (n=82)	%
Farm asset*		
- 4-wheel truck	54	65.9
- 6-10 wheel truck	5	6.1
- Tractor	16	19.5
- Springer and watering equipment	6	7.3
- Oil palm scythe	42	51.2
- Oil palm spade	71	86.6
- Weed sprayer	40	48.8
- Mower	61	74.4
- Cart	1	1.2

Remark: * An oil palm smallholder can give more than one answer

Table A4.3 Oil palm groups membership, and motivation to grow oil palm

Item	Southern	
	No. (n=82)	%
Oil palm groups membership/Association		
- No	81	98.8
- Yes (Excluding formed by GTZ)	1	1.2
Oil palm grower registration		
- No	42	51.2
- Yes	40	48.8
Motivation to grow oil palm *		
- Appropriate environment	57	69.5
- High income and price	24	29.3
- Not difficult to manage plantation	20	24.4
- Rapid yield	7	8.5
- Popular among the locals	5	6.1
- Close to mill and buyer	4	4.9
- Bequest	3	3.7
- Wanting to diversify the crop	2	2.4
- Facing disease in rubber	1	1.2

Remark: * An oil palm smallholder can give more than one answer



Table A4.4 Land, topography, soil and oil palm tree

Item	Southern	
	No. (n=82)	%
Land ownership (rai/household)		
- ≤25	24	29.3
- 26-50	28	34.1
- 51-75	15	18.3
- 76-100	8	9.8
- >100	7	8.5
Mean (S.D.)	53.1 (44.8)	
Area of oil palm production (rai/household)		
- ≤25	44	53.7
- 26-50	27	32.9
- 51-75	6	7.3
- 76-100	3	3.7
- >100	2	2.4
Mean (S.D.)	34.5 (38.0)	
Number of oil palm plots (plot/household)		
- 1	33	40.2
- 2	28	34.2
- 3	11	13.4
- >3	10	12.2
Mean (S.D.)	2.0 (1.2)	
Land ownership for oil palm plot	(n=166 plots)	
- Owned	166	100.0
Land title	(n=166 plots)	
- Chanod	54	32.6
- Nor Sor 3 Kor	11	6.6
- Nor Sor 3	45	27.1
- Por Bor Tor 5	17	10.2
- Sor Por Kor	14	8.4
- Nor Sor 2	6	3.6
- No title	19	11.5
Topography	(n=166 plots)	
- Lowlands	86	51.8
- Plain	65	39.2
- Hilly and mountainous	10	6.0
- Highlands	5	3.0
Soil characteristics	(n=166 plots)	
- Clay	93	56.0
- Loam	40	24.1
- Sandy soil	13	7.9
- Sandy loam	14	8.4
- Gravelly soil	6	3.6
Land use prior to oil palm	(n=166 plots)	
- Un-used land	59	35.5
- Other agricultural land	39	23.5
- Paddy field	48	28.9
- Rubber plantation	20	12.1



Table A4.4 Land, topography, soil and oil palm tree (cont.)

Item	Southern	
	No. (n=82)	%
Age of oil palm tree (years)	(n=166 plots)	
- ≤3	32	19.3
- 4-8	102	61.4
- 9-14	23	13.9
- 15-20	6	3.6
- >20	3	1.8
Mean (S.D.)	6.5 (4.3)	
Oil palm replanting plan	(n=4)	
- No	1	25.0
- Yes	3	75.0
Year to replant	(n=3)	
- 2010-2012	3	100.0
Plan for new plantation		
- No	64	78.0
- Yes	18	22.0
Area of expansion (rai)	(n=18)	
- ≤ 10	7	38.9
- 11-50	11	61.1
Mean (S.D.)	23.0 (31.1)	

Remark: *An oil palm smallholder can give more than one answer

Table A4.5 Variety of oil palm planted by smallholders

Item	Southern	
	No. (n=82)	%
Variety		
- Tenera	82	100.0
Source of seedlings *		
- Palm oil company (Southern, Univanich)	40	48.7
- Private nursery	27	32.9
- Others (i.e. cooperative, oil palm research centre)	20	24.4
Factors affecting decision to buy seedlings *		
- Quality of seedlings	40	48.7
- Well accepted source/with license	31	37.8
- Convenience	29	35.4
- Cheap price	8	9.8
Number of palm trees per rai		
- 20	14	17.1
- 22	64	78.0
- 24	1	1.2
- 25	3	3.7
Age of seedlings (month)		
- 5 – 6	5	6.1
- 7 – 12	68	82.9
- > 12	9	11.0
Mean (S.D.)	10.4 (3.3)	

Remark: * An oil palm smallholder can give more than one answer



Table A4.6 Labour and labour management

Item	Southern	
	No. (n=82)	%
Source of labour*		
- Household labour	82	100.0
- Hired labour	47	57.3
Type of work using household labour *		
- Applying fertilizer	60	73.2
- Weeding	51	62.2
- General management	82	100.0
- Pruning	39	47.6
- Transportation of FFB	34	41.5
Number of household labours (people)		
- 1	27	32.9
- 2	36	43.9
- > 2	19	23.2
Mean (S.D.)	2.0 (1.0)	
Number of hired labours (people)	(n=47)	
- 1 – 3	26	55.3
- 4 – 6	15	31.9
- > 6	6	12.8
Mean (S.D.)	3.7 (2.7)	
Reason for hiring labour*	(n=47)	
- Insufficient household labour/lack of time	38	80.9
- Lack of skill and equipment	5	10.6
- Convenience in management	4	8.5
Fringe benefit for labour	(n=47)	
- No	29	61.7
- Yes	18	38.3
Type of fringe benefit*	(n=18)	
- Housing	6	33.3
- Food	6	33.3
- Health insurance	4	22.2
- Healthcare, fuel, bonus	2	11.1
Hiring contract	(n=47)	
- No	44	93.6
- Yes (one year contract)	3	6.4
Information about minimum wage		
- No	41	50.0
- Yes	41	50.0
Minimum wage (Baht/day)	(n=41)	
- 130 – 160	14	34.2
- 161 – 170	3	7.3
- 171 – 180	1	2.4
- > 180	23	56.1
Mean (S.D.)	203.6 (55.3)	
Informing about labour rights	(n=47)	
- No	41	87.2
- Yes	6	12.8

Table A4.6 Labour and labour management (cont.)

Item	Southern	
	No. (n=82)	%
Awareness of farm injuries to labour		
- No	2	2.4
- Yes	80	97.6
Preventive measures	(n=80)	
- No	2	2.5
- Yes	78	97.5
Types of preventive measures*	(n=78)	
- Wearing long-sleeved shirt and pants	54	69.2
- Boots	74	94.9
- Mask	3	3.8
- Gloves	30	38.5
- Cap/Headgear	19	24.4
Accident occurred to hired labour	(n=47)	
- No	37	78.7
- Yes	10	21.3
Misunderstanding or unhappiness of hired labour	(n=47)	
- No	40	85.1
- Yes	7	14.9
Type of management in case of misunderstanding/ unhappiness of hired labour	(n=7)	
- Compromise or making new agreement	2	28.6
- Clarify issue (misunderstood)	1	14.3
- Compromised by third party	4	57.1

Remark: * An oil palm smallholder can give more than one answer

Table A4.7 Example of wage rate classified by activity (excluding FFB harvesting)

Item	Southern	
	No. (n=47)	Wage
Hired labour in Surat Thani province		
- Pruning (Baht/tree)	22	8.0
- Transportation of FFB (Baht/ton)	23	168.3
- Applying fertilizer (Baht/sack)	9	44.4
- Spraying (Baht/20 liter)	7	138.6
- Mowing (Baht/rai)	16	233.5
Hired labour from other provinces		
- Applying fertilizer (Baht/sack)	1	25.0
- Mowing (Baht/rai)	1	300.0
Hired labour from other countries		
- Applying fertilizer (Baht/sack)	6	35.0
- Pruning (Baht/tree)	1	8.0
- Mowing (Baht/rai)	1	150.0



Table A4.8 Water and soil management in oil palm production

Item	Southern	
	No. (n=82)	%
Source of water		
- Only rainfall	68	82.9
- Irrigation system	14	17.1
Use of fertilizer		
- No	1	1.2
- Yes	81	98.8
Type of fertilizer*	(n=81)	
- Organic	15	18.5
- Chemical	80	98.8
Amount of chemical fertilizer for each application (kg/rai)	(n=80)	
- ≤ 30	14	17.5
- 31 – 50	45	56.3
- > 50	21	26.2
Mean (S.D.)	44.2 (16.7)	
Frequency of application (time/year)	(n=80)	
- 1	5	6.3
- 2	30	37.5
- 3	36	45.0
- >3	9	11.3
Mean (S.D.)	2.7 (0.9)	
Factor affecting the smallholders' decision to apply fertilizer*	(n=81)	
- Price of fertilizer	3	3.7
- Period of applying fertilizer (circle)	40	49.4
- Result of soil analysis	2	2.5
- Price of FFB	2	2.5
- Capital availability	10	12.3
- Age of palm tree	22	27.2
- Brand of fertilizer	8	9.9
- Appropriate timing (i.e. rain, soil moisture)	21	25.9
Cover crop		
- No	76	92.7
- Yes	6	7.3
Type of cover crop	(n=6)	
- Legume	4	66.7
- Vegetable	2	33.3
Adoption of soil erosion protection measure	(n=76)	
- No	58	76.3
- Yes	18	23.7
Other measure to improve soil fertility		
- No	33	40.2
- Yes	49	59.8
Measure to improve soil fertility *	(n=49)	
- Use of oil palm frond and leaf	48	98.0
- Use of oil palm empty bunch	4	8.2



Table A4.8 Water and soil management in oil palm production (cont.)

Item	Southern	
	No. (n=82)	%
Receiving information about soil and fertilizer management		
- No	23	28.0
- Yes	59	72.0
Source of information about soil and fertilizer management*	(n=59)	
- Extension officer from CPO mill	6	10.2
- Sale officer from fertilizer company	6	10.2
- Government official	22	37.3
- Own experience	16	27.1
- Friend	15	25.4
- Other sources (i.e. book, internet)	7	11.9

Remark: * An oil palm smallholder can give more than one answer

Table A4.9 Pest management in oil palm

Item	Southern	
	No. (n=82)	%
Type of pests*		
- Weeds	60	73.2
- Rats	59	72.0
- Disease	23	28.0
- Insects	22	26.8
Weeding*	(n=60)	
- Use chemical	30	50.0
- Non- chemical measure	34	56.7
- Without management	5	8.4
Rat management*	(n=59)	
- Use chemical	11	18.6
- Non-chemical measure (i.e. use of trap, use net to cover oil palm tree)	53	89.8
- Integrated measures	7	11.9
- Without management	15	25.4
Disease management *	(n=23)	
- Use chemical	6	26.1
- Non-chemical measure (i.e. get rid of infected leaf)	16	69.6
- Without management	13	56.5
Insect management*	(n=22)	
- Use chemical	15	68.2
- Non-chemical measure (i.e. get rid of infected leaf)	6	27.3
- Without management	6	27.3
Chemical use in pest management		
- No	37	45.1
- Yes	45	54.9
Purpose of chemical use	(n=45)	
- Preventive measure	2	4.4
- Treating	43	95.6



Table A4.9 Pest management in oil palm (cont.)

Item	Southern	
	No. (n=82)	%
Chemical storage	(n=45)	
- No storage (apply all)	23	51.1
- Yes	22	48.9
Storage	(n=22)	
- Storage room	18	81.8
- Nearby house	3	13.6
- Cottage in the plantation	1	4.5
Safety guards when using chemical	(n=45)	
- Gloves and Mask	31	68.9
- Gloves	1	2.2
- Mask	5	11.1
- Without any safety guard	8	17.8
Disposal of hazardous containers	(n=45)	
- Sell	22	48.9
- Leave in plantation	5	11.1
- Dispose to home bin	1	2.2
- Keep it for agricultural use	4	8.9
- Nearby house	1	2.2
- Burn or bury	12	26.7
Perception about harmfulness of pesticides	(n=45)	
- Yes	45	100.0
Receiving information about pest management*		
- No	50	61.0
- Yes	32	39.0
Source of information about pest management*	(n=32)	
- Own experience	11	34.4
- Extension officer from CPO mill	1	3.1
- Officer from chemical company	4	12.5
- Government official	13	40.7
- Other sources (i.e. book, friend)	10	31.3
Perception about IPM		
- No	80	97.6
- Yes	2	2.4

Remark: * An oil palm smallholder can give more than one answer

Table A4.10 Harvesting management

Item	Southern	
	No. (n=82)	%
Harvested palm tree		
- Non-harvested	2	2.4
- Harvested	80	97.6
Labour used*	(n=80)	
- Household	34	42.5
- Hired labour	46	57.5
Period of harvest (day)	(n=80)	
- < 20	21	26.3
- 20	54	67.5
- >20	5	6.2
Mean (S.D.)	19.2 (2.8)	
Condition or punishment for harvesting unripe FFB	(n=46)	
- No	43	93.5
- Yes	3	6.5
Type of condition/ punishment	(n=3)	
- Stop hiring	2	66.7
- No payment for harvesting	1	33.3
Factor affecting the smallholders' decision to harvest FFB	(n=80)	
- Ripeness	66	82.5
- Harvesting cycle	13	16.3
- Labour availability	1	1.3
Type of contract harvester	(n=46)	
- Independent harvester	25	54.4
- Ramp	15	32.6
- Relative	6	13.0
Fee paid to harvester	No. (%)	Wage
- Harvesting only (Baht/ton)	20 (43.5)	300.0
- Harvesting + transportation (Baht/ton)	26 (56.5)	453.5

Remark: * An oil palm smallholder can give more than one answer

Table A4.11 Selling the FFB

Item	Southern	
	No. (n=80)	%
FFB buyer		
- Independent ramp	50	62.5
- Mill ramp	2	2.5
- Mill	28	35.0
Reason to sell FFB to mill*	(n=28)	
- Fair balance and system of FFB grading	16	57.1
- High FFB price	6	21.4
- Close to mill	13	46.4
- Good service and credit support	1	3.6
Reasons to sell FFB to ramp *	(n=50)	
- Close to ramp	50	100.0
- Good service (i.e. harvesting, transportation and support factor of production)	3	6.0



Table A4.11 Selling the FFB (cont.)

Item	Southern	
	No. (n=80)	%
- Less restriction on FFB grading	1	2.0
- Relative	4	8.0
- High FFB price	8	16.0
Reasons to sell FFB to mill ramp*	(n=2)	
- Close to mill ramp	2	100.0
Distance from plantation to buyer (km.)		
- ≤ 2.0	27	33.8
- 2.1 – 4.0	18	22.5
- 4.1 – 6.0	10	12.5
- > 6.0	25	31.2
Mean (S.D.)	5.6 (5.1)	
Transportation		
- Hire the contractor	31	38.8
- Own management	49	61.2
Cost of transportation (Baht/ton)	(n=31)	
- ≤ 100	3	9.7
- 101 – 150	15	48.4
- 151 – 200	10	32.3
- > 200	3	9.7
Mean (S.D.)	176.5 (63.7)	
Price of FFB in 2009 (Baht/kg)		
- ≤ 3.00	7	8.7
- 3.01 – 3.50	39	48.8
- 3.51 – 4.00	23	28.8
- > 4.00	11	13.7
Mean (S.D.)	3.60 (0.48)	
FFB pricing		
- According to FFB quality	36	45.0
- No consideration on FFB quality	44	55.0
Factor used for FFB grading*	(n=36)	
- Ripeness	17	47.2
- % OER	22	61.2
- Un-destroyed bunch	5	13.9
- Bunch size	6	16.7
Type of payments on FFB		
- Cash	79	98.7
- Via bank account	1	1.3

Remark: * An oil palm smallholder can give more than one answer



Table A4.12 Yield of oil palm, classified by age (2009)

Item	Age of oil palm (yr)								Average (n=148 plots)	
	≤ 8 (n=116)		9-14 (n=23)		15-20 (n=6)		> 20 (n=3)			
	No.	%	No.	%	No.	%	No.	%	No.	%
Yield (kg/rai)										
≤ 1,000	14	12.1	-	-	-	-	-	-	14	9.5
1,001-2,000	44	37.9	1	4.4	4	66.6	2	66.7	49	33.1
2,001-3,000	32	27.6	13	56.5	1	16.7	-	-	48	32.4
> 3,000	26	22.4	9	39.1	1	16.7	1	33.3	37	25.0
Average	2,232.6		3,391.7		2,440.8		2,181.7		2,433.2	

Table A4.13 Farm records

Item	Southern	
	No. (n=82)	%
Farm Records		
- No	53	64.6
- Yes	29	35.4
Reasons for not keeping records*	(n=53)	
- Complexity	12	22.6
- Cannot see the benefit	16	30.2
- Less time available for record	17	32.1
- No skill in record keeping	5	9.4
- Keep farm receipt	3	5.7
Activity/item record*	(n=29)	
- Inflow-outflow	25	86.2
- Cost of fertilizer	7	24.1
- Yield	3	10.3
- Labour	1	3.4
Receiving information about oil palm production management		
- No	38	46.3
- Yes	44	53.7
Source of information about oil palm production management*	(n=44)	
- Extension officer from CPO mill	2	4.5
- Own experience	18	40.9
- Government official	19	43.2
- Neighbour	10	22.7
- Others (i.e. book, TV)	4	9.1
Receiving oil palm marketing information		
- No	45	54.9
- Yes	37	45.1
Source of oil palm marketing information*	(n=37)	
- Extension officer from CPO mill	7	18.9
- Own experience	11	29.7
- Neighbour	4	10.8
- Government official	8	21.6
- Internet and TV	7	18.9
- Ramp	8	21.6



Table A4.13 Farm records (cont.)

Item	Southern	
	No. (n=82)	%
Link with ramp and support		
- No	69	84.1
- Yes	13	15.9
Type of link with ramp and support*	(n=13)	
- Technical	4	30.8
- Provides cheaper fertilizer	3	23.1
- Harvesting	2	15.4
- Credits	3	23.1
- Truck service	2	15.4
Link with mill and support		
- No	79	96.3
- Yes	3	3.7
Type of link with mill and support	(n=3)	
- Technical	1	33.4
- Additional fuel cost	1	33.3
- Harvesting	1	33.3

Remark: * An oil palm smallholder can give more than one answer

Table A4.14 Costs and returns of FFB production

Item	Age of oil palm (yr)				Average (n=82)
	≤ 8 (n=66)	9-14 (n=14)	15-20 (n=1)	> 20 (n=1)	
Variable Cost					
- Fertilizer	2,251.0	2,444.3	1,376.2	2,000.0	2,272.9
- Labor (excluding harvesting)	288.8	220.9	547.6	45.0	274.3
- Chemicals	201.4	107.3	0.0	150.0	185.6
- Harvesting	823.0	960.3	1,500.0	972.0	879.8
- Transportation	442.1	520.0	750.0	0.0	475.1
- Fuel	229.0	220.8	0.0	270.0	218.0
Total variable cost (Baht/rai/yr)	4,235.3	4,473.6	4,173.8	3,437.0	4,305.7
Average cost (Baht/ton)	1,692.2	1,299.0	834.8	1,060.8	1,590.0
Yield (kg/rai/yr)	(n=64) 2,502.9	(n=14) 3,443.9	(n=1) 5,000.0	(n=1) 3,240.0	(n=80) 2,708.0
Average price of FFB (Baht/kg)	3.60				
Gross return (Baht/rai/yr)	9,010.4	12,398.0	18,000.0	11,664.0	9,748.8
Net Return (Baht/rai/yr)	4,775.1	7,924.4	13,826.2	8,227.0	5,443.1
Break even price (Baht/kg)	1.7	1.3	0.8	1.1	1.6
Break even yield (kg/rai)	1,176.5	1,242.7	1,159.4	954.7	1,196.0



Table A4.15 Problems faced by smallholders

Item*	Southern	
	No. (n=82)	%
Fluctuation of FFB prices	58	70.7
High fertilizer prices	57	69.5
Lack of knowledge in oil palm management	39	47.6
Lack of knowledge in soil and fertilizer management	38	46.3
Lack of water in dry season	37	45.1
Lack of credit	25	30.5
Low quality of seedlings	17	20.7
Low soil fertility	16	19.5
Harvesting of unripe FFB	11	13.4
Impact of chemical usage	6	7.3
Lack of land title	6	7.3

Remark: * An oil palm smallholder can give more than one answer

Table A4.16 Support and training received in the past

Item	Southern	
	No. (n=82)	%
Support received in the past		
- No	56	68.3
- Yes	26	31.7
Support providers*	(n=26)	
- Agricultural extension officer at the district level	14	53.9
- Central government	9	34.6
- Southern	1	3.8
- Fertilizer middleman	1	3.8
- BAAC	1	3.8
- PSU	1	3.8
Type of support received*	(n=26)	
- Knowledge in oil palm management	11	42.3
- Credit	10	38.5
- Fertilizer and application	3	11.5
- FFB price guarantee	2	7.7
- Marketing management	1	3.8
Training received in the past		
- No	67	81.7
- Yes	15	18.3
Topic of training*	(n=15)	
- Application of fertilizer	6	40.0
- Knowledge in oil palm management	8	53.3
- FFB quality improvement	4	26.7
- Soil analysis and soil conservation	3	20.0
- Selection of oil palm seedlings	1	6.7



Table A4.16 Support and training received in the past (cont.)

Item	Southern	
	No. (n=82)	%
Training provider*	(n=15)	
- Southern	1	6.7
- Agricultural extension officer at the district level	10	66.7
- Central government	2	13.4
- GTZ	1	6.7
- PSU	1	6.7
- Fertilizer middleman	1	6.7

Table A4.17 Major support needed by the smallholders

Item*	Southern	
	No. (n=82)	%
Soil and leaf analysis	36	43.9
Raising and stabilizing FFB price	30	36.6
Reducing or controlling fertilizer price and other factors' price	28	34.1
Knowledge on oil palm management	27	32.9
Supply of water	10	12.2
Develop high quality of seedlings	4	4.9
Disease control	3	3.7
Credit	1	1.2
Mean to reduce production cost	3	3.7

Remark: * An oil palm smallholder can give more than one answer

Table A4.18 Major training needed by the smallholders

Item*	Southern	
	No. (n=82)	%
Oil palm plantation management	58	70.7
Soil and leaf analysis	25	30.5
Improving yield	6	7.3
Pest control and management	9	11.0
Means to reduce production cost	4	4.9
Selection of high quality of seedlings	10	12.2
Best practice of FFB harvesting	8	9.8
Knowledge on examining chemical fertilizer	2	2.4
Accounting/farm record	3	3.7

Remark: * An oil palm smallholder can give more than one answer



Table A4.19 Opinion on sustainable oil palm production

Item	Southern	
	No. (n=82)	%
Economic impact		
- No	8	9.8
- Yes	74	90.2
Type of economic impact*	(n=74)	
- Generate farmer and community income	74	100.0
- Enhance economic growth, sufficiency for domestic consumption, reducing import and increasing export	33	44.6
Social impact		
- No	14	17.1
- Yes	68	82.9
Type of social impact*	(n=68)	
- Reduce social problems due to employment, improving income and more security in daily life	53	77.9
- More time to spend with family and more leisure/ better quality of life	33	48.5
- Encouraging or promoting cooperation among smallholders in the same area	1	1.5
Environmental impact		
- No	39	47.6
- Yes	43	52.4
Type of environmental impact *	(n=43)	
- Lack of water due to high water demand by oil palm	32	74.4
- Pollution from CPO	4	9.3
- Increasing atmosphere moisture	6	14.0
- Encroached forest land by both big companies and smallholders	2	4.7
- Contamination of chemicals in the environment	5	11.6
Suggestion to reduce environmental impact	(n=43)	
- No	33	47.6
- Yes	10	52.4
Key suggestions*	(n=10)	
- Water system management/reservoir	5	50.0
- CPO mill treat water before discharge/use wastewater for other purposes	2	20.0
- Reduce chemical usage	2	20.0
- Stop encroachment to forest land and reserved Area	1	10.0
Receiving information/knowledge to reduce the environmental impact		
- No	81	98.8
- Yes	1	1.2
Oil palm plantation close to reserved area		
- No	73	89.0
- Yes	9	11.0

Remark: * An oil palm smallholder can give more than one answer



Table A4.20 Key suggestion to development of oil palm production

Item	Southern	
	No. (n=82)	%
Support knowledge on oil palm production management	34	41.5
Raising and stabilize FFB prices	22	26.8
Develop high quality of seedlings	20	24.4
Reducing or controlling fertilizer price and other factors' price	7	8.5
Ramp purchase ripe FFB, do not water and keep FFB overnight	5	6.1
Promote quality of oil palm production	4	4.9
Regular farm visit by related agencies	4	4.9
Provides soil and leaf analysis in the area	1	1.2
CPO mill purchase FFB according to its quality	1	1.2

Remark: * An oil palm smallholder can give more than one answer



Appendix 5 Table for Chapter 6

Table A5.1 Socio-economic characteristics of oil palm smallholders

Item	Aoluk	
	No. (n=100)	%
Age (years)		
- ≤30	3	3.0
- 31 – 40	11	11.0
- 41 – 50	23	23.0
- 51-60	28	28.0
- > 60	35	35.0
Mean (S.D.)	55.3 (13.1)	
Education		
- Primary school or under	78	78.0
- Secondary school	15	15.0
- Diploma	5	5.0
- Bachelor or higher	2	2.0
Gender		
- Male	68	68.0
- Female	32	32.0
Household members (people)		
- 1-3	49	49.0
- 4-5	41	41.0
- >5	10	10.0
Mean (S.D.)	3.8 (1.6)	
Average household member age under 15 years (people)	(n=46) 1.7	
Average household member age 15-60 years (people)	(n=91) 2.5	
Average household member age over 60 years (people)	(n=42) 1.6	
Main occupation		
- Oil palm grower	99	99.0
- UPOIC's employee	1	1.0
Other occupation		
- No	58	58.0
- Yes	42	42.0
Lists of other occupations*	(n=42)	
- Rubber farmer	11	26.2
- Merchant	9	21.4
- Oil palm grower	1	2.4
- Worker	8	19.1
- Other farmer (i.e. livestock raising, fruit tree growing)	15	35.7
- Others	3	7.1
Overall oil palm management		
- Own management	82	82.0
- Majority hired labour	18	18.0
Experience in oil palm production (years)		
- ≤ 20	15	15.0
- 21-25	6	6.0
- 26-30	59	59.0
- >30	20	20.0
Mean (S.D.)	27.1 (5.3)	

Remark: * An oil palm smallholder can give more than one answer



Table A5.2 Income, debt, and farm assets of oil palm smallholders

Item	Aoluk	
	No. (n=100)	%
Total household income (Baht/year)		
- ≤200,000	34	34.0
- 200,001-400,000	48	48.0
- 400,001-600,000	14	14.0
- 600,001-800,000	1	1.0
- >800,000	3	3.0
Mean (S.D.)	314,208.9 (277,891)	
Income from oil palm production (% of total income)		
- ≤ 25	9	9.0
- 26 – 50	20	20.0
- 51 – 75	26	26.0
- 76 – 100	45	45.0
Mean (S.D.)	65.5 (21.6)	
Household debt		
- No	34	34.0
- Yes	66	66.0
Amount of debt (Baht/household)	(n=66)	
- ≤200,000	43	65.2
- 200,001-400,000	9	13.6
- 400,001-600,000	8	12.1
- >600,000	6	9.1
Mean (S.D.)	315,321.2 (733,173)	
Source of debt*	(n=66)	
- BAAC	38	57.6
- Other commercial banks	3	4.5
- Agricultural cooperative	22	33.3
- Others	8	12.1
Objective of loans*	(n=66)	
- Oil palm production	27	40.9
- Invest in other agricultural activities	12	18.2
- Purchasing of car and truck	11	16.7
- House construction	5	7.6
- Purchasing of land	8	12.1
- Others (i.e. household expense, education)	10	15.2
Farm assets*		
- 4-wheel truck	43	43.0
- 6-wheel truck	4	4.0
- Springer and watering instrument	1	1.0
- Oil palm scythe	38	38.0
- Oil palm spade	27	27.0
- Weed sprayer	34	34.0
- Mower	68	68.0

Remark: * An oil palm smallholder can give more than one answer

Table A5.3 Oil palm groups' membership, and motivation to grow oil palm

Item	Aoluk	
	No. (n=100)	%
Oil palm groups membership/association - Yes (excluding formed by GTZ)	100	100.0
Oil palm grower registration		
- No	17	17.0
- Yes	83	83.0
Motivation to grow oil palm *		
- Promoted by the cooperative	55	55.0
- Not difficult to manage plantation	4	4.0
- High income and price	31	31.0
- Rapid yield	3	3.0
- Appropriate environment	11	11.0
- Facing disease in rubber	2	2.0
- Bequest	9	9.0
- Close to mill and buyer	1	1.0
- Popular among the locals	10	10.0
- Others (i.e. obtain yield throughout the year, less labour problems)	12	12.0

Remark: * An oil palm smallholder can give more than one answer

Table A5.4 Land, topography, soil and oil palm tree

Item	Aoluk	
	No. (n=100)	%
Land ownership (rai/household)		
- ≤ 25	57	57.0
- 26-50	21	21.0
- 51-75	11	11.0
- 76-100	8	8.0
- >100	3	3.0
Mean (S.D.)	42.5 (37.9)	
Area of oil palm production (rai/household)		
- ≤ 25	60	60.0
- 26-50	24	24.0
- 51-75	8	8.0
- 76-100	5	5.0
- >100	3	3.0
Mean (S.D.)	37.6 (28.1)	
Number of oil palm plots (plot/household)		
- 1	57	57.0
- 2	26	26.0
- 3	6	6.0
- >3	11	11.0
Mean (S.D.)	1.8 (1.1)	
Land ownership for oil palm plot *	(n=177 plots)	
- Owned	177	100.0
Land title	(n=177 plots)	
- Chanod	5	2.8
- Nor Sor 3 Kor	5	2.8
- Nor Sor 3	110	62.1



Table A5.4 Land, topography, soil and oil palm tree (cont.)

Item	Aoluk	
	No. (n=100)	%
- Sor Por Kor	9	5.1
- Por Bor Tor 5	11	6.2
- Kor Sor Nor 5 / Kor Sor Nor 3	9	5.1
- Others (Sor Kor 1)	1	0.6
- No title	27	15.3
Topography	(n=177 plots)	
- Plain	128	72.3
- Hilly and mountainous	22	12.4
- Lowlands	15	8.5
- Highlands	12	6.8
Soil characteristics	(n=177 plots)	
- Gravelly soil	4	2.3
- Clay	42	23.7
- Sandy soil	31	17.5
- Loam	47	26.6
- Sandy loam	53	29.9
Land use prior to oil palm	(n=177 plots)	
- Rubber plantation	25	14.1
- Un-used land	148	83.6
- Paddy field	1	0.6
- Upland crop	3	1.7
Age of oil palm tree (years)	(n=177 plots)	
- ≤3	9	5.1
- 4-8	16	9.0
- 9-14	10	5.7
- 15-20	36	20.3
- >20	106	59.9
Mean (S.D.)	21.8 (9.3)	
Oil palm replanting plan	(n=92)	
- No	43	46.7
- Yes	49	53.3
Year to replant	(n=49)	
- 2553	18	36.8
- 2554	19	38.8
- 2555	9	18.4
- 2556	1	2.0
- 2557	1	2.0
- 2558	1	2.0
Plan for new plantation		
- No	96	96.0
- Yes	4	4.0
Area of expansion (rai)	(n=4)	
- ≤ 15	2	50.0
- 16 – 50	2	50.0
Mean (S.D.)	20.8 (13.7)	

Remark: * An oil palm smallholder can give more than one answer



Table A5.5 Variety of oil palm planted by smallholders

Item	Aoluk	
	No. (n=100)	%
Variety *		
- Tenera	96	96.0
- Dura	4	4.0
Source of seedlings *		
- Aoluk cooperative	69	69.0
- Private company (i.e. Univanich, Southern)	26	26.0
- Private nursery	6	6.0
- Others (i.e. oil palm research centre, Malaysia)	5	5.0
Factors affecting decision to buy seedlings *		
- Quality of seedlings	31	31.0
- Well accepted source/with license	45	45.0
- Convenience	10	10.0
- Supported by cooperative	38	38.0
- Provides credit	5	5.0
Number of palm trees per rai		
- 22	99	99.0
- 25	1	1.0
Age of seedlings (month)		
- 5 – 6	7	7.0
- 7 – 12	92	92.0
- > 12	1	1.0
Mean (S.D.)	9.5 (2.5)	

Remark: * An oil palm smallholder can give more than one answer

Table A5.6 Labour and labour management

Item	Aoluk	
	No. (n=100)	%
Source of labour*		
- Household labour	99	99.0
- Hired labour	88	88.0
Type of work using household labour *	(n=99)	
- Applying fertilizer	86	86.9
- Weeding	66	66.7
- General management	99	100.0
- Pruning	19	19.2
- Transportation of FFB	33	33.3
Number of household labours (people)	(n=99)	
- 1	32	32.3
- 2	53	53.5
- > 2	14	14.2
Mean (S.D.)	1.9 (0.8)	
Number of hired labours (people)	(n=88)	
- 1 – 3	27	30.7
- 4 – 6	53	60.2
- > 6	8	9.1
Mean (S.D.)	3.8 (1.9)	



Table A5.6 Labour and labour management (cont.)

Item	Aoluk	
	No. (n=100)	%
Reason for hiring labour*	(n=88)	
- Insufficient household labour/lack of time	76	86.4
- Lack of skill and equipment	26	29.5
- Help labour	1	1.1
Fringe benefit for labour	(n=88)	
- No	71	80.7
- Yes	17	19.3
Type of fringe benefit	(n=17)	
- Housing	6	35.3
- Food	11	64.7
- Health insurance	1	5.9
- Healthcare, fuel, bonus	2	11.8
Hiring contract	(n=88)	
- No	88	100.0
Information about minimum wage	(n=100)	
- No	65	65.0
- Yes	35	35.0
Minimum wage (Baht/day)	(n=35)	
- 150-200	11	31.4
- 201-250	9	25.7
- 251-300	14	40.0
- >301	1	2.9
Mean (S.D.)	251.7 (54.3)	
Informing about labour rights	(n=88)	
- No	88	100.0
Awareness of farm injuries to labour	(n=100)	
- No	1	1.0
- Yes	99	99.0
Preventive measures	(n=99)	
- No	1	1.1
- Yes	98	98.9
Types of preventive measures*	(n=99)	
- Wearing long-sleeved shirt and pants	93	93.9
- Boots	96	96.9
- Mask	1	1.0
- Gloves	27	27.3
- Cap/Headgear	13	13.1
Accident occurred to hired labour	(n=88)	
- No	78	88.6
- Yes	10	11.4
Misunderstanding or unhappiness of hired labour	(n=88)	
- No	83	94.3
- Yes	5	5.7



Table A5.6 Labour and labour management (cont.)

Item	Aoluk	
	No. (n=100)	%
Type of management in case of misunderstanding/unhappiness of hired labour	(n=5)	
- Compromise or making new agreement	1	20.0
- Change to new labour team	2	40.0
- Clarify issue (misunderstood)	1	20.0
- Compromised by third party	1	20.0

Remark: * An oil palm smallholder can give more than one answer

Table A5.7 Example of wage rate classified by activity (excluding FFB harvesting)

Item	Aoluk	
	No.(n=100)	Wage
Hired labour in Krabi province		
- Pruning (Baht/tree)	33	15.2
- Pruning (Baht/rai)	1	250.0
- Transportation of FFB (Baht/ton)	25	167.6
- Applying fertilizer (Baht/sack)	6	32.5
- Spraying (Baht/20 liter)	18	138.6
- Mowing(Baht/rai)	7	303.7
Hired labour from other provinces		
- Pruning (Baht/tree)	42	15.1
- Pruning (Baht/rai)	1	300.0
- Transportation of FFB (Baht/ton)	33	163.3
- Applying fertilizer (Baht/sack)	7	30.0
- Spraying (Baht/20 liter)	17	137.0
- Mowing(Baht/rai)	3	316.7

Remark: * An oil palm smallholder can give more than one answer

Table A5.8 Water and soil management in oil palm production

Item	Aoluk	
	No. (n=100)	%
Source of water		
- Only rainfall	100	100.0
- Irrigation system	-	-
Use of fertilizer		
- No	3	3.0
- Yes	97	97.0
Type of fertilizer*	(n=97)	
- Organic	9	9.3
- Chemical	97	100.0
Amount of chemical fertilizer for each application (kg/rai)	(n=97)	
- ≤ 30	3	3.1
- 31-50	63	64.9
- > 50	31	32.0
Mean (S.D.)	51.0 (17.2)	



Table A5.8 Water and soil management in oil palm production (cont.)

Item	Aoluk	
	No. (n=100)	%
Frequency of applying chemical fertilizer (time/year)	(n=97)	
- 1	15	15.5
- 2	56	57.7
- 3	25	25.8
- 4	1	1.0
Mean (S.D.)	2.1 (0.7)	
Factor affecting the smallholders' decision to apply fertilizer*	(n=97)	
- Price of fertilizer	1	1.0
- Period of applying fertilizer (circle)	24	24.7
- Result of soil analysis	1	1.0
- Capital availability	12	12.4
- Result of leaf analysis	8	8.2
- Appropriate timing (i.e. rain)	73	75.3
Cover crop		
- No	93	93.0
- Yes	7	7.0
Type of cover crop	(n=7)	
- Legume	4	57.1
- Vegetables	3	42.9
Adoption of soil erosion protection measure	(n=93)	
- No	85	91.4
- Yes	8	8.6
Other measure to improve soil fertility		
- No	19	19.0
- Yes	81	81.0
Measure to improve soil fertility *	(n=81)	
- Use of oil palm frond and leaf	56	69.1
- Use of oil palm empty bunch	47	58.0
- Others (i.e. animal manure, oil palm cake)	2	2.5
Receiving information about soil and fertilizer management		
- No	13	13.0
- Yes	87	87.0
Source of information about soil and fertilizer management*	(n=87)	
- Sale officer from fertilizer company	5	5.7
- Government official	60	69.0
- Own experience	33	38.0
- Neighbour	13	14.9
- Other sources	1	1.2

Remark: * An oil palm smallholder can give more than one answer



Table A5.9 Pest management in oil palm

Item	Aoluk	
	No. (n=100)	%
Type of pests*		
- Disease	19	19.0
- Insects	4	4.0
- Rats	74	74.0
- Weeds	96	96.0
Disease management	(n=19)	
- Non- chemical measure (i.e. get rid of infected leaf)	3	15.7
- Lack of appropriate measure	12	63.2
- Without management	4	21.1
Insect management	(n=4)	
- Without management	3	75.0
- Lack of appropriate measure	1	25.0
Rat management*	(n=74)	
- Use chemical	3	4.1
- Non- chemical measure (i.e. use of trap, use net to cover oil palm tree)	4	5.4
- Without management	67	90.5
Weeding*	(n=96)	
- Use chemical	45	46.9
- Non- chemical measure	53	55.2
- Mixed	3	3.1
Chemical use in pest management	(n=100)	
- No	53	53.0
- Yes	47	47.0
Purpose of chemical use	(n=47)	
- Preventive measure	-	-
- Treating	47	100.0
Chemical storage	(n=47)	
- No storage (apply all)	26	55.3
- Yes	21	44.7
Storage	(n=21)	
- Storage room	5	23.8
- Nearby house	13	61.9
- Cottage in the plantation	3	14.3
Safety guards when using chemical	(n=47)	
- Gloves and mask	32	68.1
- Mask	12	25.5
- Without any safety guard	3	6.4
Disposal of hazardous containers	(n=47)	
- Sell	19	40.4
- Leave in plantation	4	8.5
- Dispose to home bin	1	2.1
- Keep it for agricultural use	7	14.9
- Nearby house	3	6.4
- Burn or bury	13	27.7
Perception about harmfulness of pesticides	(n=47)	
- Yes	47	100.0



Table A5.9 Pest management in oil palm (cont.)

Item	Aoluk	
	No. (n=100)	%
Receiving information about pest management	(n=100)	
- No	66	66.0
- Yes	34	34.0
Source of information about pest management*	(n=34)	
- Own experience	19	55.9
- Officer from chemical company	13	38.2
- Government official	22	64.7
- Neighbour	4	11.8
Perception about IPM		
- No	98	98.0
- Yes	2	2.0

Remark: * An oil palm smallholder can give more than one answer

Table A5.10 Harvesting management

Item	Aoluk	
	No. (n=100)	%
Harvested palm tree	(n=100)	
- Non-harvested	1	1.0
- Harvested	99	99.0
Labour used	(n=99)	
- Household	7	7.1
- Hired labour	92	92.9
Period of harvest (day)	(n=99)	
- 10	1	1.0
- 15, 17, 18	18	18.2
- 20	71	71.7
- 25	4	4.0
- 30	5	5.1
Mean (S.D.)	19.8 (3.3)	
Condition or punishment for harvesting unripe FFB	(n=92)	
- No	90	97.8
- Yes	2	2.2
Type of condition/ punishment	(n=2)	
- Deduct harvesting fee if the CPO factory return the FFB	1	50.0
- Stop hiring	1	50.0
Factor affecting the smallholders' decision to harvest FFB	(n=99)	
- Ripeness	86	86.9
- Harvesting cycle	1	1.0
- Labour availability	12	12.1
Type of contract harvester	(n=92)	
- Independent harvester	90	97.8
- Relative	2	2.2
Fee paid to harvester	No. (%)	Wage
- Harvesting only (Baht/ton)	29 (31.5)	310.0
- Harvesting + transportation (Baht/ton)	63 (68.5)	467.5

Remark: * An oil palm smallholder can give more than one answer

Table A5.11 Selling of FFB

Item	Aoluk	
	No. (n=100)	%
FFB buyer	(n=99)	
- Cooperative ramp	99	100.0
Reason to sell FFB to cooperative*	(n=99)	
- Member and get dividend	99	100.0
Distance from plantation to buyer (km.)	(n=99)	
- ≤ 2.0	54	54.5
- 2.1 – 4.0	34	34.3
- 4.1 – 6.0	6	6.1
- > 6.0	5	5.1
Mean (S.D.)	3.0 (4.6)	
Transportation	(n=99)	
- Hire the contractor	64	64.6
- Own management	35	35.4
Cost of transportation (Baht/ton)	(n=64)	
- 101 – 150	39	60.9
- 151 – 200	22	34.4
- > 200	3	4.7
Mean (S.D.)	163.9 (29.3)	
Price of FFB in 2009 (Baht/kg)	(n=99)	
- ≤ 3.00	6	6.1
- 3.01 – 3.50	30	30.3
- 3.51 – 4.00	49	49.5
- > 4.00	14	14.1
Mean (S.D.)	3.67 (0.41)	
FFB pricing	(n=99)	
- According to FFB quality	38	38.4
- No consideration on FFB quality	61	61.6
Factor used for FFB grading*	(n=38)	
- Ripeness	38	100.0
- Un-destroyed bunch	1	2.6
- Bunch size	4	10.5
Type of paymentson FFB	(n=99)	
- Cash	99	100.00

Remark: * An oil palm smallholder can give more than one answer

Table A5.12 Yield of oil palm, classified by age (2009)

Item	Age of oil palm (yr)								Average (n=170 plots)	
	≤ 8 (n=18)		9-14 (n=10)		15-20 (n=36)		> 20 (n=106)			
	No.	%	No.	%	No.	%	No.	%	No.	%
Yield (kg/rai)										
≤ 1,000	3	16.7	-	-	1	2.8	5	4.7	9	5.3
1,001-2,000	8	44.4	4	40.0	12	33.3	30	28.3	54	31.8
2,001-3,000	4	22.2	2	20.0	12	33.3	39	36.8	57	33.5
> 3,000	3	16.7	4	40.0	11	30.6	32	30.2	50	29.4
Average	1,957.6		2,541.9		2,573.7		2,475.9		2,445.6	



Table A5.13 Farm records

Item	Aoluk	
	No. (n=100)	%
Farm records		
- No	81	81.0
- Yes	19	19.0
Reasons for not keeping records	(n=81)	
- Complexity	12	14.8
- Cannot see the benefit	35	43.2
- Lack of time	11	13.6
- No skill in record keeping	8	9.9
- Keep farm receipt	15	18.5
Activity/item record*	(n=19)	
- Inflow-outflow	18	94.7
- Cost of production	7	36.8
- Yield	3	15.8
- FFB Price	1	5.3
Receiving information about oil palm production management	(n=100)	
- No	18	18.0
- Yes	82	82.0
Source of information about oil palm production management*	(n=82)	
- Extension officer from CPO mill	1	1.21
- Own experience	38	46.3
- Government official	43	52.4
- Neighbour	8	9.8
- Sale officer from fertilizer company	2	2.4
- Others	2	2.4
Receiving oil palm marketing information	(n=100)	
- No	32	32.0
- Yes	68	68.0
Source of oil palm marketing information *	(n=68)	
- Extension officer From CPO mill	1	1.5
- Own experience	19	28.0
- Neighbour	4	5.9
- Government official	29	42.6
- Internet and TV	25	36.8
Link with ramp cooperative and support	(n=100)	
- Yes	100	100.0
Type of link with ramp and support *		
- Technical	23	23.0
- Provides cheaper fertilizer	21	21.0
- Harvesting	1	1.0
- Credit	51	51.0
- Dividend	100	100.0
Link with mill and support	(n=100)	
- No	100	100.0

Remark: * An oil palm smallholder can give more than one answer

Table A5.14 Costs and returns of FFB production

Item	Age of oil palm (yr)				Average (n=99)
	≤ 8 (n=7)	9-14 (n=6)	15-20 (n=16)	> 20 (n=70)	
Variable Cost					
- Fertilizer	2,424.4	2,602.5	2,240.9	1,983.9	2,096.4
- Labor (excluding harvesting)	307.8	508.8	449.8	402.0	408.0
- Chemicals	158.8	61.3	134.7	82.5	90.1
- Harvesting	851.1	907.1	900.6	831.6	847.5
- Transportation	367.6	455.5	470.4	443.5	442.1
- Fuel	105.0	81.0	251.3	156.3	182.0
Total variable cost (Baht/rai/yr)	4,214.7	4,616.2	4,447.7	3,899.8	4,066.1
Average cost (Baht/ton)	1,684.1	1,526.5	1,499.7	1,424.2	1,464.9
Yield (kg/rai/yr)	2,502.7	3,024.0	2,965.7	2,738.3	2,775.7
Average price of FFB (Baht/kg)	3.67				
Gross return (Baht/rai/yr)	9,184.9	11,098.1	10,884.1	10,049.6	10,186.8
Net return (Baht/rai/yr)	4,970.2	6,481.9	6,436.4	6,149.8	6,120.7
Break even price (Baht/kg)	1.7	1.5	1.5	1.4	1.5
Break even yield (kg/rai)	1,148.4	1,257.8	1,211.9	1,062.6	1,107.9

Table A5.15 Problems faced by smallholders

Item*	Aoluk	
	No. (n=100)	%
High fertilizer prices	75	75.0
Fluctuation of FFB prices	47	47.0
Lack of water in dry season	51	51.0
Low soil fertility	30	30.0
Lack of credit	29	29.0
Lack of knowledge in oil palm management	52	52.0
Transportation of FFB/due to road	12	12.0
Low quality of seedlings	22	22.0
Lack of knowledge in soil and fertilizer management	23	23.0
Shortage of labour	19	19.0
Lack of land title	5	5.0

Remark: * An oil palm smallholder can give more than one answer



Table A5.16 Support and training received in the past

Item	Aoluk	
	No. (n=100)	%
Support received in the past		
- No	54	54.0
- Yes	46	46.0
Support providers*	(n=46)	
- Aoluk cooperative	30	65.2
- Agricultural extension officer at the district level	14	30.4
- BAAC	4	8.7
- Other government institutes	7	15.2
- Others (i.e. fertilizer middleman, Univanich)	2	4.3
Type of support received*	(n=46)	
- Knowledge in oil palm management	23	50.0
- Fertilizer and application	9	19.6
- Credit	20	43.5
- Others (i.e. chemical usage, soil and leaf analysis)	7	15.2
Training received in the past		
- No	65	65.0
- Yes	35	35.0
Topic of training*	(n=35)	
- Application of fertilizer	17	48.6
- Knowledge in oil palm management	24	68.6
- Selection of oil palm seedlings	2	5.7
- Soil analysis and soil conservation	3	8.6
- Chemical usage	3	8.6
Training provider*	(n=35)	
- Aoluk cooperative	21	60.0
- Agricultural extension officer at the district level	14	40.0
- Fertilizer middleman	5	14.3

Remark: * an oil palm smallholder can give more than one answer

Table A5.17 Major support needed by the smallholders

Item*	Aoluk	
	No. (n=100)	%
Soil and leaf analysis	9	9.0
Knowledge on oil palm management	11	11.0
Raising and stabilizing FFB price	49	49.0
Reducing or controlling fertilizer price and other factor's price	46	46.0
Supply of water	6	6.0
Develop high quality of seedlings	21	21.0
Credit for replanting and soft loans	9	9.0
Improve road	7	7.0
Set up oil palm aid fund	2	2.0
Others (i.e. land title, pest control)	2	2.0

Remark: * An oil palm smallholder can give more than one answer



Table A5.18 Major training needed by the smallholders

Item*	Aoluk	
	No. (n=100)	%
Oil palm plantation management (i.e. applying fertilizer)	67	67.0
Soil and leaf analysis	30	30.0
Improving yield	5	5.0
Pest control and management	2	2.0
Means to reducing cost	9	9.0
Soil conservation	11	11.0
Selection of high quality of seedlings	11	11.0

Remark: * An oil palm smallholder can give more than one answer

Table A5.19 Opinion on sustainable palm oil production

Item	Aoluk	
	No. (n=100)	%
Economic impact		
- No	4	4.0
- Yes	96	96.0
Type of economic impact*	(n=96)	
- Generate farmer and community income	90	93.8
- Enhance economic growth, sufficiency for domestic consumption, reducing import and increasing export	28	29.2
- Promote alternative energy	2	2.1
Social impact	(n=100)	
- No	12	12.0
- Yes	88	88.0
Type of social impact*	(n=88)	
- Reduce social problems due to employment, improving income and more security in daily life	66	75.0
- More time to spend with family and more leisure	25	28.4
- Encouraging or promoting cooperation among smallholders in the same area	1	1.1



Table A5.19 Opinion on sustainable oil palm production (cont.)

Item	Aoluk	
	No. (n=100)	%
Environmental impact	(n=100)	
- No	62	62.0
- Yes	38	38.0
Type of environmental impact *	(n=38)	
- Lack of water due to high water demand by oil palm	10	26.3
- Pollution from CPO mill	14	36.8
- Increasing atmosphere/green	9	23.7
- Global warming	8	9.6
- Contamination of chemicals in the environment	3	7.9
Suggestion to reduce environmental impact	(n=38)	
- No idea	36	94.7
- CPO mill treat water before discharge	2	5.3
Oil palm plantation close to reserved area	(n=100)	
- No	100	100.0

Remark: * An oil palm smallholder can give more than one answer

Table A5.20 Key suggestion to the development of oil palm production

Item*	Aoluk	
	No. (n=100)	%
Support knowledge on oil palm production management	22	22.0
Raising and stabilize FFB prices	12	12.0
Develop high quality of seedlings	43	43.0
Reducing or controlling fertilizer price and other factor's price	9	9.0
Provide soil and leaf analysis in the area	7	7.0
Support knowledge on how to select high quality of seedlings	7	7.0

Remark: * An oil palm smallholder can give more than one answer



Appendix 6
Table for Chapter 7

Table A6.1 Socio-economic characteristics of oil palm smallholders

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
Age (years)				
- ≤30	-	-	1	3.9
- 31 – 40	10	23.8	6	23.1
- 41 – 50	14	33.3	7	26.9
- 51-60	16	38.1	7	26.9
- > 60	2	4.8	5	19.2
Mean (S.D.)	47.5 (9.0)		50.3 (13.5)	
Education				
- Primary school or under	19	45.2	11	42.3
- Secondary school	17	40.5	8	30.8
- Diploma	2	4.8	1	3.8
- Bachelor or higher	4	9.5	6	23.1
Gender				
- Male	34	81.0	18	69.2
- Female	8	19.0	8	30.8
Household members (people)				
- 1-3	15	35.7	13	50.0
- 4-5	22	52.4	12	46.2
- >5	5	11.9	1	3.8
Mean (S.D.)	4.0 (1.5)		3.7 (1.3)	
Average household member age under 15 years (people)	(n=27)	1.5	(n=11)	1.5
Average household member age 15-60 years (people)	(n=40)	2.7	(n=22)	3.1
Average household member age over 60 years (people)	(n=12)	1.5	(n=5)	2.2
Main occupation				
- Oil palm grower	21	50.0	14	53.8
- Rubber farmer	1	2.3	4	15.4
- Other crop grower	18	42.9	6	23.1
- Others (i.e. government official, trader, merchant)	2	4.8	2	7.7
Other occupation				
- No	3	7.1	6	23.1
- Yes	39	92.9	20	76.9
Lists of other occupations*	(n=39)		(n=20)	
- Rubber farmer	1	2.6	5	25.0
- Oil palm grower	21	53.8	12	60.0
- Worker	1	2.6	-	-
- Other farmer	19	48.7	4	20.0
- Others (i.e. government official, trader)	2	5.1	1	5.0
Overall oil palm management				
- Own management	29	69.0	21	80.8
- Majority hired labour	13	31.0	5	19.2



Table A6.1 Socio-economic characteristics of oil palm smallholders (cont.)

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
Experience in oil palm production (years)				
- ≤ 5	36	85.7	14	53.8
- 6-10	6	14.3	12	46.2
Mean (S.D.)	4.0 (1.6)		5.4 (2.0)	

Remark: * An oil palm smallholder can give more than one answer

Table A6.2 Income, debt, and farm assets of oil palm smallholders

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
Total household income (Baht/year)				
- ≤200,000	12	28.5	5	19.2
- 200,001-400,000	10	23.8	8	30.8
- 400,001-600,000	7	16.7	6	23.1
- 600,001-800,000	6	14.3	1	3.8
- >800,000	7	16.7	6	23.1
Mean (S.D.)	696,114.4 (1,083,538)		677,765.2 (841,746)	
Income from oil palm production (% of total income)				
- ≤ 25	18	42.9	4	15.4
- 26 – 50	13	31.0	9	34.6
- 51 – 75	8	19.0	10	38.5
- 76 – 100	3	7.1	3	11.5
Mean (S.D.)	41.9 (23.8)		53.4 (21.1)	
Household debt				
- No	8	19.0	9	34.6
- Yes	34	81.0	17	65.4
Amount of debt (Baht/household)	(n=34)		(n=17)	
- ≤200,000	16	47.1	6	35.3
- 200,001-400,000	8	23.5	2	11.8
- 400,001-600,000	5	14.7	3	17.6
- >600,000	5	14.7	6	35.3
Mean (S.D.)	356,429.4 (349,300)		576,647.0 (516,389)	
Source of debt*	(n=34)		(n=17)	
- BAAC	26	76.5	6	35.3
- Other commercial banks	2	5.9	4	23.5
- Agricultural cooperative	2	5.9	3	17.6
- Village fund	3	8.8	1	5.9
- Others (i.e. neighbour, informal source)	5	14.7	5	29.4
Objective of loans*	(n=34)		(n=17)	
- Oil palm production	24	70.6	8	47.1
- Purchasing of car and truck	-	-	2	11.8
- House construction	1	2.9	-	-
- Purchasing of land	2	5.9	3	17.6
- Other agricultural activities	15	44.1	4	23.5



Table A6.2 Income, debt, and farm assets of oil palm smallholders (cont.)

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
- Others (i.e. children education, household expense, and invest in other business)	2	5.9	1	5.9
Farm assets*				
- 4-wheel truck	32	76.2	25	96.2
- 6-wheel truck	12	28.6	1	3.8
- Tractor	37	88.1	16	61.5
- Springer and watering instrument	13	31.0	15	57.7
- Oil palm scythe	2	4.8	6	23.1
- Oil palm spade	38	90.5	25	96.2
- Weed sprayer	37	88.1	20	76.9
- Mower	22	52.4	13	50.0
- Cart	-	-	1	3.8

Remark: * An oil palm smallholder can give more than one answer

Table A6.3 Oil palm groups membership, and motivation to grow oil palm

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
Oil palm groups membership/association				
- No	40	95.2	6	23.1
- Yes (Excluding formed by GTZ)	2	4.8	20	76.9
Oil palm grower registration				
- No	12	28.6	11	42.3
- Yes	30	71.4	15	57.7
Motivation to grow oil palm *				
- Not difficult to manage plantation	12	28.6	9	34.6
- High income and price	21	50.0	14	53.8
- Rapid yield	21	50.0	2	7.7
- Appropriate environment	2	4.8	2	7.7
- Bequest	1	2.4	2	7.7
- Popular among the locals	6	14.3	7	26.9
- Wanting to diversify the crop	-	-	2	7.7
- Others (i.e. less labour problem compared to rubber, convinced by neighbour)	9	21.4	4	15.4

Remark: * An oil palm smallholder can give more than one answer



Table A6.4 Land, topography, soil and oil palm tree

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
Land ownership (rai/household)				
- ≤25	4	9.5	1	3.8
- 26-50	11	26.2	5	19.2
- 51-75	4	9.5	4	15.4
- 76-100	7	16.7	4	15.4
- >100	16	38.1	12	46.2
Mean (S.D.)	146.5 (200.6)		186.4 (260.3)	
Area of oil palm production (rai/household)				
- ≤25	19	45.2	6	23.1
- 26-50	12	28.6	5	19.2
- 51-75	1	2.4	5	19.2
- 76-100	3	7.1	5	19.2
- >100	7	16.7	5	19.2
Mean (S.D.)	63.5 (84.1)		117.8 (205.6)	
Number of oil palm plots (plot/household)				
- 1	25	59.5	11	42.3
- 2	7	16.7	7	26.9
- 3	6	14.3	2	7.7
- >3	4	9.5	6	23.1
Mean (S.D.)	1.8 (1.2)		2.4 (1.8)	
Land ownership for oil palm plot *	(n=76 plots)		(n=61 plots)	
- Owned	76	100.0	61	100.0
Land title	(n=76 plots)		(n=61 plots)	
- Chanod	5	6.6	16	26.2
- Nor Sor 3 Kor	-	-	1	1.6
- Nor Sor 3	1	1.3	3	4.9
- Sor Por Kor	49	64.5	25	41.0
- Por Bor Tor 5	20	26.3	14	23.0
- Kor Sor Nor 5/Kor Sor Nor 3	1	1.3	-	-
- Others	-	-	1	1.6
- No title	-	-	1	1.6
Topography	(n=76 plots)		(n=61 plots)	
- Plain	48	63.2	23	37.7
- Hilly and mountainous	14	18.4	22	36.0
- Lowlands	13	17.1	10	16.5
- Highlands	1	1.3	6	9.8
Soil characteristics	(n=76 plots)		(n=61 plots)	
- Gravelly soil	7	9.2	13	21.3
- Clay	39	51.3	13	21.3
- Sandy soil	1	1.3	14	23.0
- Loam	20	26.3	20	32.8
- Sandy loam	9	11.9	1	1.6

Table A6.4 Land, topography, soil and oil palm tree (cont.)

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
Land use prior to oil palm	(n=76 plots)		(n=61 plots)	
- Rubber plantation	-	-	5	8.2
- Un-used land	-	-	8	13.1
- Other agricultural land	72	94.7	29	47.6
- Paddy field	4	5.3	8	13.1
- Others	-	-	11	18.0
Age of oil palm tree (years)	(n=76 plots)		(n=61 plots)	
- ≤3	29	38.2	21	34.4
- 4-8	47	61.8	38	62.3
- 9-14	-	-	2	3.3
Mean (S.D.)	3.6 (1.7)		4.3 (2.2)	
Oil palm replanting plan				
- No	42	100.0	26	100.0
Plan for new plantation				
- No	31	73.8	20	76.9
- Yes	11	26.2	6	23.1
Area of expansion (rai)	(n=11)		(n=6)	
- ≤ 50	8	72.7	6	100.0
- 51-100	1	9.1	-	-
- >100	2	18.2	-	-
Mean (S.D.)	81.4 (146.4)		33.3 (34.4)	

Remark: * An oil palm smallholder can give more than one answer

Table A6.5 Variety of oil palm planted by smallholders

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
Variety				
- Tenera	42	100.0	26	100.0
Source of seedlings*				
- Palm oil company (Suksomboon, Univanich, Southern)	38	90.5	26	100.0
- Private nursery	2	4.8	1	3.8
- Others (i.e. cooperative, oil palm research centre)	4	9.5	2	7.7
Factors affecting decision to buy seedlings*				
- Quality of seedlings	22	52.4	15	57.7
- Well accepted source/with license	10	23.8	13	50.0
- Convenience	14	33.3	9	34.6
- Cheap price	1	2.4	-	-
- Technical supervision	4	9.5	1	3.8
- Others	2	4.8	2	7.7



Table A6.5 Variety of oil palm planted by smallholders (cont.)

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
Number of palm trees per rai				
- 16	-	-	1	3.8
- 20	1	2.4	2	7.7
- 22	39	92.8	21	80.8
- 23	-	-	1	3.8
- 24	1	2.4	-	-
- 25	1	2.4	1	3.8
Age of seedlings (month)				
- 5 – 6	1	2.4	2	7.7
- 7 – 12	38	90.5	23	88.5
- > 12	3	7.1	1	3.8
Mean (S.D.)	9.7 (2.3)		10.1 (2.8)	

Remark: * An oil palm smallholder can give more than one answer

Table A6.6 Labour and labour management

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
Source of labour*				
- Household labour	42	100.0	22	84.6
- Hired labour	33	78.6	20	76.9
Type of work using household labour *	(n=42)		(n=22)	
- Applying fertilizer	16	38.1	11	50.0
- Weeding	13	31.0	9	40.9
- General management	38	90.5	18	81.8
- Pruning	8	19.0	5	22.7
- Transportation of FFB	18	42.9	12	54.5
Number of household labours (people)	(n=42)		(n=22)	
- 1	20	47.6	8	36.4
- 2	19	45.2	10	45.5
- > 2	3	7.2	4	18.1
Mean (S.D.)	1.6 (0.7)		1.9 (1.0)	
Number of hired labours (people)	(n=33)		(n=20)	
- 1 – 3	13	39.4	10	50.0
- 4 – 6	13	39.4	7	35.0
- > 6	7	21.2	3	15.0
Mean (S.D.)	4.8 (2.6)		4.4 (3.4)	
Reason for hiring labour*	(n=33)		(n=20)	
- Insufficient household labour/lack of time	32	97.0	20	100.0
- Lack of skill and equipment	1	3.0	1	5.0
- Convenience in management	1	3.0	2	10.0
Fringe benefit for labour	(n=33)		(n=20)	
- No	14	42.4	8	40.0
- Yes	19	57.6	12	60.0

Table A6.6 Labour and labour management (cont.)

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
Type of fringe benefit*	(n=19)		(n=12)	
- Food	10	52.6	7	58.3
- Health insurance	3	15.8	2	16.7
- Healthcare, fuel, bonus	7	36.8	6	50.0
- Housing	12	63.2	6	50.0
Hiring contract	(n=33)		(n=20)	
- No	33	100.0	20	100.0
Information about minimum wage				
- No	8	19.0	7	26.9
- Yes	34	81.0	19	73.1
Minimum wage (Baht/day)	(n=34)		(n=19)	
- < 150	25	73.5	-	-
- 151 – 180	4	11.8	12	63.2
- > 180	5	14.7	7	36.8
Mean (S.D.)	160.3 (29.1)		181.6 (16.8)	
Informing about labour rights	(n=33)		(n=20)	
- No	27	81.8	15	75.0
- Yes	6	18.2	5	25.0
Awareness of farm injuries to labour				
- Yes	42	100.0	26	100.0
Preventive measures				
- No	3	7.1	-	-
- Yes	39	92.9	26	100.0
Types of preventive measures*	(n=39)		(n=26)	
- Wearing long-sleeved shirt and pants	18	46.2	13	50.0
- Boots	32	82.1	23	88.5
- Mask	6	15.4	7	26.9
- Gloves	20	51.3	17	65.4
- Cap/Headgear	3	7.7	3	11.5
- More cautious	-	-	1	3.8
Accident occurred to hired labour	(n=33)		(n=20)	
- No	29	87.9	18	90.0
- Yes	4	12.1	2	10.0
Misunderstanding or unhappiness of hired labour	(n=33)		(n=20)	
- No	31	93.9	16	80.0
- Yes	2	6.1	4	20.0
Type of management in case of misunderstanding/ unhappiness of hired labour	(n=2)		(n=4)	
- Compromise or making new agreement	1	50.0	1	25.0
- Change to new labour team	1	50.0	1	25.0
- Clarify issue (misunderstood)	-	-	2	50.0

Remark: * An oil palm smallholder can give more than one answer



Table A6.7 Example of wage rate classified by activity (excluding FFB harvesting)

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	Wage	No.(n=26)	Wage
Hired labour in Srakeaw/Trad province				
- Pruning (Baht/tree)	1	5.0	3	5.3
- Pruning (Baht/people/day)	3	183.3	5	196.0
- Transportation of FFB (Baht/ton)	-	-	2	350.0
- Applying fertilizer (Baht/people/day)	9	171.1	13	198.5
- Applying fertilizer (Baht/sack)	1	50.0	-	-
- Spraying (Baht/people/day)	7	235.7	6	225.0
- Spraying (Baht/rai)	-	-	1	110.0
- Mowing (Baht/people/day)	6	175.0	8	281.3
- FFB loading (Baht/people/day)	-	-	1	200.0
- Truck driving for FFB transportation (Baht/people/day)	-	-	1	500.0
Hired labour from other provinces				
- Applying fertilizer (Baht/people/day)	1	200.0	1	200.0
- Spraying (Baht/people/day)	2	200.0	1	200.0
- Pruning (Baht/people/day)	1	200.0	-	-
Hired labour from the neighbouring countries				
- Applying fertilizer (Baht/people/day)	14	138.5	2	185.0
- Applying fertilizer (Baht/sack)	1	25.0	-	-
- Mowing (Baht/people/day)	8	152.5	1	360.0
- Spraying (Baht/people/day)	9	164.4	1	230.0
- Pruning (Baht/people/day)	4	162.5	-	-

Table A6.8 Water and soil management in oil palm production

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
Source of water				
- Only rainfall	23	54.8	12	46.2
- Irrigation system	19	45.2	14	53.8
Use of fertilizer				
- No	1	2.4	-	-
- Yes	41	97.6	26	100
Type of fertilizer*	(n=41)		(n=26)	
- Organic	29	70.7	15	57.7
- Chemical	38	92.7	22	84.6
Amount of chemical fertilizer for each application (kg/rai)	(n=38)		(n=22)	
- ≤ 30	10	26.3	8	36.4
- 31-50	16	42.1	8	36.4
- > 50	12	31.6	6	27.3
Mean (S.D.)	49.3 (30.3)		44.7 (41.8)	

Table A6.8 Water and soil management in oil palm production (cont.)

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
Frequency of application (time/year)	(n=38)		(n=22)	
- 1	9	23.7	1	4.5
- 2	9	23.7	8	36.4
- 3	17	44.7	8	36.4
- > 3	3	7.9	5	22.7
Mean (S.D.)	2.4 (1.0)		3.6 (2.9)	
Factor affecting the smallholders' decision to apply fertilizer*	(n=41)		(n=26)	
- Price of fertilizer	2	4.9	2	7.7
- Period of applying fertilizer (circle)	17	41.5	10	38.5
- Price of FFB	-	-	1	3.8
- Capital availability	3	7.3	5	19.2
- Age of palm tree	5	12.2	5	19.2
- Result of leaf analysis	5	12.2	4	15.4
- Result of soil analysis	4	9.8	3	11.5
- Oil palm yield	1	2.4	1	3.8
- Appropriate timing (i.e. rain, soil moisture)	22	53.6	9	34.6
- Convinced by neighbour	-	-	2	7.7
Cover crop				
- No	42	100.0	22	84.6
- Yes	-	-	4	15.4
Type of cover crop			(n=4)	
- Legume	-	-	2	50.0
- Vegetables	-	-	2	50.0
Adoption of soil erosion protection measure	(n=42)		(n=22)	
- No	35	83.3	16	72.7
- Yes	7	16.7	6	27.3
Other measure to improve soil fertility				
- No	13	31.0	4	15.4
- Yes	29	69.0	22	84.6
Measure to improve soil fertility *	(n=29)		(n=22)	
- Use of oil palm frond and leaf	26	89.7	16	72.7
- Use of oil palm empty bunch	6	20.7	6	27.3
- Others (i.e. animal manure)	3	10.3	4	18.2
Receiving information about soil and fertilizer management				
- No	4	9.5	2	7.7
- Yes	38	90.5	24	92.3
Source of information about soil and fertilizer management*	(n=38)		(n=24)	
- Extension officer from CPO mill	20	52.6	4	16.7
- Sale officer from fertilizer company	2	5.3	6	25.0
- Government official	15	39.5	10	41.7



Table A6.8 Water and soil management in oil palm production (cont.)

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
- Own experience	4	10.5	8	33.3
- Friend	4	10.5	2	8.3
- Other sources (i.e. book, internet)	4	10.5	5	20.8

Remark: *An oil palm smallholder can give more than one answer

Table A6.9 Pest management in oil palm

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
Type of pest *				
- Weeds	40	95.2	21	80.8
- Rats	31	73.8	10	38.5
- Disease	21	47.6	11	42.3
- Insects	17	40.5	7	26.9
Weeding*	(n=40)		(n=21)	
- Use chemical	37	92.5	16	76.2
- Non-chemical measure	11	27.5	13	61.9
- Integrated measures	-	-	7	33.3
Rat management*	(n=31)		(n=10)	
- Use chemical	7	22.6	2	20.0
- Non- chemical measure (i.e. use of trap, use net to cover oil palm tree)	27	87.1	9	90.0
- Without management	13	41.9	-	-
Disease management *	(n=21)		(n=11)	
- Use chemical	5	23.8	5	45.5
- Non- chemical measure (i.e. get rid of infected leaf)	16	76.2	7	63.3
- Without management	9	42.9	3	27.3
Insect management*	(n=17)		(n=7)	
- Use chemical	10	58.8	2	28.6
- Non-chemical measure i.e. get rid of infected leaf	7	41.2	4	57.1
- Without management	5	29.4	1	14.3
Chemical use in pest management				
- No	5	11.9	10	38.5
- Yes	37	88.1	16	61.5
Purpose of chemical use	(n=37)		(n=16)	
- Preventive measure	-			
- Treating	37	100.0	16	100.0
Chemical storage	(n=37)		(n=16)	
- No storage (apply all)	14	37.8	6	37.5
- Yes	23	62.2	10	62.5
Storage	(n=23)		(n=10)	
- Storage room	21	91.3	8	80.0
- Near by house	2	8.7	2	20.0



Table A6.9 Pest management in oil palm (cont.)

Item	Suksomboon			
	Klonghad		Borai	
	No.(n=42)	%	No.(n=26)	%
Safety guards when using chemical	(n=37)		(n=16)	
- Gloves and Mask	23	62.2	6	37.5
- Gloves	2	5.4	-	-
- Mask	10	27.0	7	43.7
- Without any safety guard	2	5.4	3	18.8
Disposal of hazardous containers	(n=37)		(n=16)	
- Sell	32	86.5	11	68.8
- Leave in plantation	2	5.4	1	6.2
- Dispose to home bin	-	-	1	6.2
- Keep it for agricultural use	1	2.7	2	12.5
- Near by house	1	2.7	1	6.2
- Burn or bury	1	2.7	-	-
Perception about harmfulness of pesticides	(n=37)		(n=16)	
- Yes	37	100.0	16	100.0
Receiving information about pest management	(n=42)		(n=26)	
- No	7	16.7	9	34.7
- Yes	35	83.3	17	65.3
Source of information about pest management*	(n=35)		(n=17)	
- Own experience	8	22.9	7	41.2
- Extension officer from CPO mill	15	42.9	4	23.5
- Officer from chemical company	1	2.9	2	11.8
- Government official	7	20.0	4	23.5
- Neighbour	1	2.9	3	17.6
- Other sources (i.e. book, TV)	13	37.1	6	35.3
Perception about IPM				
- No	31	73.8	24	92.3
- Yes	11	26.2	2	7.7

Remark: * An oil palm smallholder can give more than one answer



Table A6.10 Harvesting management

Item	Suksomboon			
	Klonghad		Borai	
	No. (n=42)	%	No. (n=26)	%
Harvested of palm tree				
- Non-harvested	9	21.4	2	7.7
- Harvested	33	78.6	24	92.3
Labour used*	(n=33)		(n=24)	
- Household	9	27.3	6	25.0
- Hired labour	25	75.7	18	75.0
Period of harvest (day)	(n=33)		(n=24)	
- 12	1	3.0	-	-
- 13	1	3.0	-	-
- 15	30	90.9	19	79.1
- 18	-	-	1	4.2
- 20	-	-	4	16.7
- 30	1	3.0	-	-
Mean (S.D.)	15.3 (2.7)		16.0 (1.9)	
Condition or punishment for harvesting unripe FFB	(n=25)		(n=24)	
- No	25	100.0	24	100.0
Factor affecting the smallholders' decision to harvest FFB	(n=33)		(n=24)	
- Ripeness	28	84.8	18	75.0
- Harvesting cycle	5	15.2	6	25.0
Type of contract harvester	(n=4)		(n=7)	
- Independent harvester	4	100.0	7	100.0
Fee paid to harvester	No. (%)	Wage	No. (%)	Wage
- Harvesting only (Baht/ton)	4 (100.0)	300.0	4 (57.0)	400.0
- Harvesting + transportation (Baht/ton)	-	-	3 (43.0)	600.0

Remark: * An oil palm smallholder can give more than one answer



Table A6.11 Selling the FFB

Item	Suksomboon			
	Klonghad		Borai	
	No. (n=42)	%	No. (n=26)	%
FFB buyer - Mill ramp	(n=33) 33	100.0	(n=24) 24	100.0
Reason to sell FFB to mill ramp *	(n=33)		(n=24)	
- Close to mill ramp	25	75.8	16	66.7
- Good service (i.e. harvesting, transportation and support factor of production)	4	12.1	10	41.7
- A sole buyer in the area	10	30.3	4	16.7
- High FFB price	3	9.1	3	12.5
Distance from plantation to buyer (km.)	(n=33)		(n=24)	
- ≤ 10	14	42.4	6	25.0
- 11 – 20	11	33.3	12	50.0
- 21 - 30	5	15.2	6	25.0
- >30	3	9.1	-	-
Mean (S.D.)	18.5 (15.7)		19.1 (12.9)	
Transportation	(n=33)		(n=24)	
- Hire the contractor	-	-	3	12.5
- Own management	33	100.0	21	87.5
Cost of transportation (Baht/ton)			(n=3)	
- 200	-	-	1	33.3
- 350	-	-	2	66.7
Mean (S.D.)	-		300.0 (86.6)	
Price of FFB in 2009 (Baht/kg)	(n=33)		(n=24)	
- ≤ 3.00	2	6.1	4	16.7
- 3.01 – 3.50	14	42.4	5	20.8
- 3.51 – 4.00	14	42.4	11	45.8
- > 4.00	3	9.1	4	16.7
Mean (S.D.)	3.56 (0.4)		3.69 (0.5)	
FFB pricing	(n=33)		(n=24)	
- According to FFB quality	3	9.1	13	54.2
- No consideration on FFB quality	30	90.9	11	45.8
Factor used for FFB grading*	(n=3)		(n=13)	
- Ripeness	3	100.0	3	23.1
- Bunch size	-	-	11	84.6
Type of payments on FFB	(n=33)		(n=24)	
- Cash	33	100.0	23	95.8
- Via bank account	-	-	1	4.2

Remark: * An oil palm smallholder can give more than one answer



Table A6.12 Yield of oil palm, classified by age (2009)

Item	Age of oil palm (yr)				Average	
	≤ 8		9-14			
	No.	%	No.	%	No.	%
Klonghad						
Yield (kg/rai)	(n=51)				(n=51)	
≤ 1,000	33	64.7	-	-	33	64.7
1,001-2,000	14	27.5	-	-	14	27.5
2,001-3,000	4	7.8	-	-	4	7.8
> 3,000	-	-	-	-	-	-
Average	904.1		-		904.1	
Borai						
Yield (kg/rai)	(n=38)		(n=2)		(n=40)	
≤ 1,000	6	15.8	1	50.0	7	17.5
1,001-2,000	21	55.3	1	50.0	22	55.0
2,001-3,000	7	18.4	-	-	7	17.5
> 3,000	4	10.5	-	-	4	10.0
Average	1,731.8		1,093.8		1,699.9	

Table A6.13 Farm records

Item	Suksomboon			
	Klonghad		Borai	
	No. (n=42)	%	No. (n=26)	%
Farm Records				
- No	15	35.7	14	53.8
- Yes	27	64.3	12	46.2
Reasons for not keeping records	(n=14)		(n=14)	
- Complexity	1	7.1	1	7.1
- Cannot see the benefit	1	7.1	7	50.0
- Less time available for record	5	35.7	-	-
- No skill in record keeping	2	14.3	1	7.1
- Keep farm receipt	5	35.7	5	35.7
Activity/item record*	(n=27)		(n=12)	
- Inflow-outflow	20	74.1	10	83.3
- Cost of fertilizer	13	48.1	6	50.0
- Yield	7	25.9	5	41.7
- Labour	8	29.6	3	25.0
- FFB price	-	-	2	16.7
Receiving information about oil palm production management	(n=42)		(n=26)	
- No	4	9.5	4	15.4
- Yes	38	90.5	22	84.6



Table A6.13 Farm records (cont.)

Item	Suksomboon			
	Klonghad		Borai	
	No. (n=42)	%	No. (n=26)	%
Source of information about oil palm production management*	(n=38)		(n=22)	
- Extension officer from CPO mill	20	52.6	8	36.4
- Own experience	6	15.8	7	31.8
- Government official	10	26.3	2	9.1
- Neighbour	4	10.5	5	22.7
- Sale officer from fertilizer company	-	-	1	4.5
- Others (i.e. book, TV)	18	47.4	8	36.4
Receiving oil palm marketing information	(n=42)		(n=26)	
- No	7	16.7	10	38.5
- Yes	35	83.3	16	61.5
Source of oil palm marketing information *	(n=35)		(n=16)	
- Extension officer from CPO mill	21	60.0	6	37.5
- Own experience	2	5.7	5	31.3
- Neighbour	1	2.9	1	6.3
- Government official	4	11.4	3	18.8
- Radio and TV	8	22.9	2	12.5
- Ramp	-	-	1	6.3
- Sale officer from fertilizer company	-	-	2	12.5
- Others (i.e. book, internet)	6	17.1	-	-
Link with mill ramp and support				
- No	12	28.6	11	42.3
- Yes	30	71.4	15	57.7
Type of link with mill ramp and support*	(n=30)		(n=15)	
- Technical	29	96.7	11	73.3
- Factor of production (i.e. provides cheaper fertilizer and seedlings)	6	20.0	1	6.7
- Others (i.e. excursion, additional fuel cost)	-	-	3	20.0

Remark: * An oil palm smallholder can give more than one answer



Table A6.14 Costs and returns of FFB production

Item	Klonghad		Borai	
	Age of oil palm (yr)		Age of oil palm (yr)	
	≤ 8 (n=41)	≤ 8 (n=25)	9-14 (n=1)	Average (n=26)
Variable Cost				
- Fertilizer	2,127.8	2,611.0	748.0	2,533.4
- Labor (excluding harvesting)	228.7	192.8	120.0	190.0
- Chemicals	142.3	254.0	0.0	254.0
- Harvesting	320.9	541.5	720.0	548.4
- Transportation	0.0	481.7	0.0	481.7
- Fuel	214.7	149.5	180.0	150.9
Total variable cost (Baht/rai/yr)	3,034.4	4,230.5	1,768.0	4,158.4
Average cost (Baht/ton)	2,515.0	2,312.6	1,475.3	2,306.3
Yield (kg/rai/yr)	(n=33) 1,206.5	(n=23) 1,829.3	(n=1) 1,200.0	(n=24) 1,803.1
Average price of FFB (Baht/kg)	3.56	3.69		
Gross return (Baht/rai/yr)	4,295.1	6,512.3	4,272.0	6,419.0
Net return (Baht/rai/yr)	1,260.7	2,281.8	2,504.0	2,260.6
Break even price (Baht/kg)	2.5	2.3	1.5	2.3
Break even yield (kg/rai)	852.4	1,188.3	496.6	1,168.1

Table A6.15 Problems faced by smallholders

Item*	Suksomboon			
	Klonghad		Borai	
	No. (n=42)	%	No. (n=26)	%
High fertilizer prices	29	69.0	11	42.3
Fluctuation of FFB prices	24	57.1	16	61.5
Lack of water in dry season	25	59.5	5	19.2
Low soil fertility	12	28.6	4	15.4
Lack of credit	19	45.2	7	26.9
Lack of knowledge in oil palm management	23	54.8	17	65.4
Harvesting of unripe FFB	4	9.5	3	11.5
Low quality of seedlings	8	19.0	3	11.5
Lack of knowledge in soil and fertilizer management	11	26.2	16	61.5
Impact of chemical usage	6	14.3	4	15.4
Lack of farmers' group	7	16.7	2	7.7

Remark: * An oil palm smallholder can give more than one answer



Table A6.16 Support and training received in the past

Item	Suksomboon			
	Klonghad		Borai	
	No. (n=42)	%	No. (n=26)	%
Support received in the past				
- No	17	40.5	16	61.5
- Yes	25	59.5	10	38.5
Support providers*	(n=25)		(n=10)	
- Suksomboon	8	32.0	5	50.0
- Agricultural extension officer at the district/provincial level	11	44.0	4	40.0
- GTZ	8	32.0	1	10.0
- Central government	3	12.0	2	20.0
Type of support received*	(n=25)		(n=10)	
- Knowledge in oil palm management	13	52.0	4	40.0
- Fertilizer and application	12	48.0	2	20.0
- Marketing management	3	12.0	-	-
- Chemical usage	3	12.0	-	-
- Others (i.e. cheap fertilizer, harvesting, soil analysis, soil conservation, credit and improving productivity)	16	64.0	5	50.0
Training received in the past				
- No	28	66.7	20	76.9
- Yes	14	33.3	6	23.1
Topic of training*	(n=14)		(n=6)	
- Application of fertilizer	11	78.6	3	50.0
- Knowledge in oil palm management	9	64.3	3	50.0
- Soil analysis and soil conservation	4	28.6	-	-
- Chemical usage	3	21.4	-	-
- Others (i.e. reduce the cost of fertilizer, and sustainable oil palm production)	2	14.2	3	50.0
Training provider*	(n=14)		(n=6)	
- Suksomboon	9	64.3	3	50.0
- Central government	2	14.2	-	-
- Agricultural extension officer at the district/provincial level	4	28.6	5	83.3
- GTZ	8	57.1	4	66.7

Remark: * An oil palm smallholder can give more than one answer



Table A6.17 Major support needed by the smallholders

Item*	Suksomboon			
	Klonghad		Borai	
	No. (n=42)	%	No. (n=26)	%
Soil and leaf analysis	1	2.4	3	11.5
Knowledge on oil palm management	10	23.8	6	23.1
Raising and stabilizing FFB price	4	9.5	14	53.8
Reducing or controlling fertilizer price and other factors' price	5	11.9	5	19.2
Supply of water	17	40.5	1	3.8
Develop high quality of seedlings	1	2.4	-	-
Disease control	1	2.4	-	-
Credit	14	33.3	2	7.7
Mean to reduce production cost	-	-	2	7.7

Remark: * An oil palm smallholder can give more than one answer

Table A6.18 Major training needed by the smallholders

Item*	Suksomboon			
	Klonghad		Borai	
	No. (n=42)	%	No. (n=26)	%
Oil palm plantation management (i.e. applying fertilizer)	19	45.2	26	100.0
Soil and leaf analysis	8	19.0	7	26.9
Improving yield	8	19.0	10	38.5
Pest control and management	3	7.1	4	15.4
Mean to reduce production cost	5	11.9	4	15.4
Chemical usage	1	2.4	1	3.8
Selection of high quality of seedlings	2	4.8	-	-
Best practice of FFB harvesting	1	2.4	3	11.5

Remark: * An oil palm smallholder can give more than one answer



Table A6.19 Opinion on sustainable palm oil production

Item	Suksomboon			
	Klonghad		Borai	
	No. (n=42)	%	No. (n=26)	%
Economic impact				
- No	-	-	1	3.8
- Yes	42	100.0	25	96.2
Type of economic impact*	(n=42)		(n=25)	
- Generate farmer and community income	36	85.7	14	56.0
- Create jobs	4	9.5	4	16.0
- Enhance economic growth, sufficiency for domestic consumption, reducing import and increasing export	19	45.2	8	32.0
- Fluctuation of FFB and palm oil price may affect overall economic performance and the smallholders	-	-	2	8.0
Social impact				
- No	5	11.9	1	3.9
- Yes	37	88.1	25	96.1
Type of social impact*	(n=37)		(n=25)	
- Reduce social problems due to employment, improving income and more security in daily life	29	78.4	21	84.0
- More time to spend with family and more leisure/ better quality of life	8	21.6	4	16.0
- Encouraging or promoting cooperation among smallholders in the same area	2	5.4	3	12
Environmental impact				
- No	7	16.7	15	57.7
- Yes	35	83.3	11	42.3
Type of environmental impact *	(n=35)		(n=11)	
- Lack of water due to high water demand by oil palm	2	5.7	1	9.1
- Pollution from CPO mill	-	-	1	9.1
- Increasing atmosphere moisture	32	91.4	7	63.6
- Contamination of chemicals in the environment	2	5.7	2	18.2
Suggestion to reduce environmental impact	(n=35)		(n=11)	
- No	33		9	
- Yes	1		2	
Key suggestion to reduce the environmental impact*	(n=1)		(n=2)	
- Reduce chemical usage	1	100.0	2	100.0
Receiving information/knowledge to reduce the environmental impact				
- No	40	95.2	26	100.0
- Yes	2	4.8	-	-
Oil palm plantation close to reserved area				
- No	42	100.0	26	100.0

Remark: * An oil palm smallholder can give more than one answer



Table A6.20 Key suggestion to the development of oil palm production

Item*	Suksomboon			
	Klonghad		Borai	
	No. (n=42)	%	No. (n=26)	%
Support knowledge on oil palm production management	14	33.3	8	30.8
Raising and stabilize FFB price	7	16.7	10	38.5
Soft loans or credit	7	16.7	1	3.8
Develop high quality of seedlings	7	16.7	4	15.4
Reducing or controlling fertilizer price and other factors' price	5	11.9	-	-
Ramp purchase ripe FFB, do not water and keep FFB overnight	1	2.4	-	-
Promote quality of oil palm production	6	14.3	4	15.4
Regular farm visit by related agencies	1	2.4	2	7.7
Strengthen and promote farmers' group	2	4.8	-	-

Remark: *An oil palm smallholder can give more than one answer