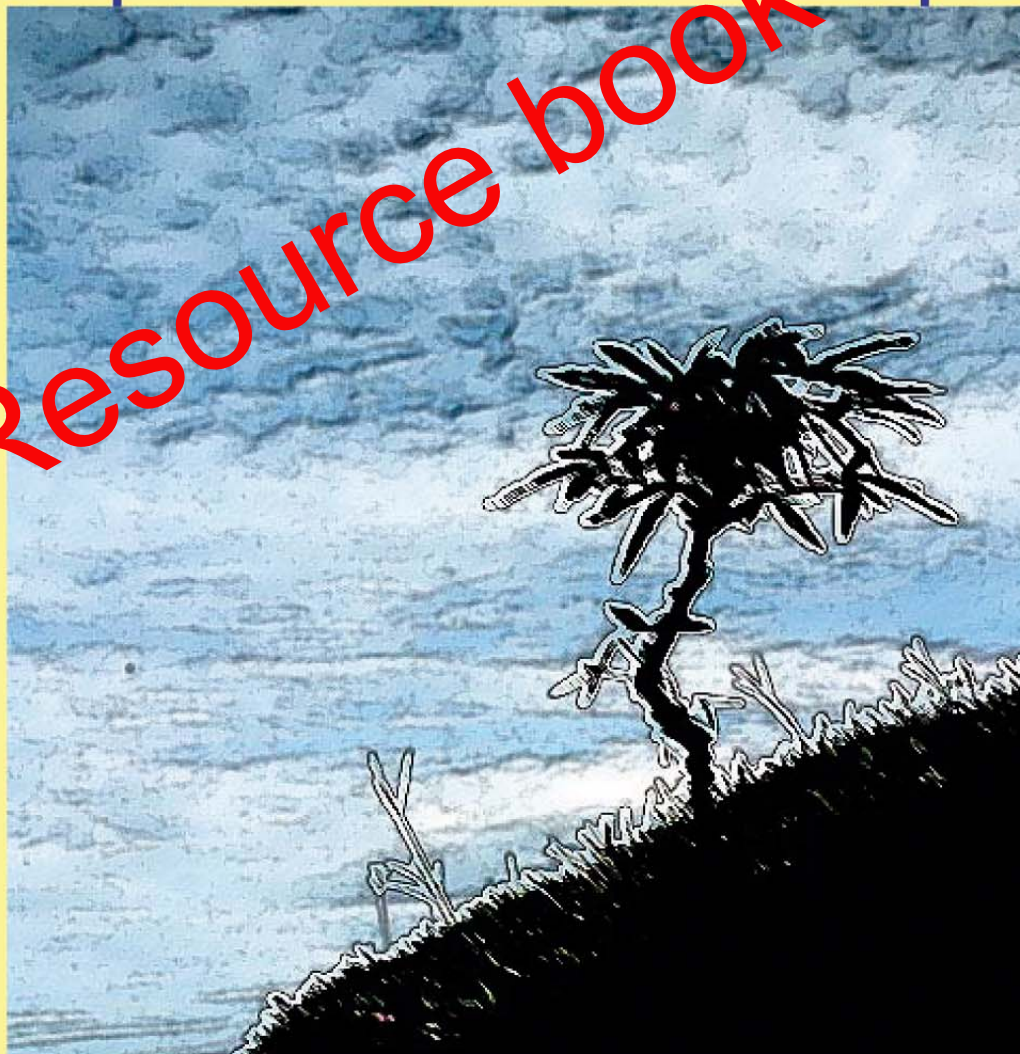


Resource book



Sustainable  
**Supply**  
Of  
**Tapioca**  
For  
**Ethanol Production**

AN INTEGRATIVE APPROACH FOR A  
COOPERATION MODEL BETWEEN THAI  
FARMERS AND ETHANOL COMPANIES



gtz giz - German Programme  
for Enterprise Competitiveness

E3Agro  
Project

**Concept Paper**

Cover photograph:  
Wild Tapioca on a slope

## Sustainable Supply of Tapioca for Ethanol Production

GTZ (ed.): **Sustainable Supply of Tapioca for Ethanol Production**. A concept paper prepared by Southeast Asia Consult & Resource Company Limited. Bangkok/Nakorn Ratchasima/Chiang Mai, February 2007.  
[www.gtz.de/thailand](http://www.gtz.de/thailand), [www.gtz.de](http://www.gtz.de)

## Resource book



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<b>Table of Contents</b>	<b>Page</b>
<b>Executive Summary</b>	VI
<b>Part A:</b>	
<b>Background Information and Introduction to Tapioca Cultivation/Ethanol Production</b>	
<b>1. Background information</b>	2
<b>1.1 Project history</b>	2
<b>1.2 Stakeholders, players and roles</b>	2
<b>1.3 Data collected for this study</b>	3
<b>1.4 Applied assumptions</b>	3
<b>1.5 The cultural perspective of the base-concept</b>	4
<b>1.6 Tapioca related government policies in place</b>	6
<b>1.7 Sustainable biomass standards being developed/considered</b>	8
<b>2. Tapioca cultivation in the Karat area</b>	10
<b>2.1 Structural description</b>	10
<b>2.2 Tapioca cultivation operational procedures and time-line</b>	13
<b>2.3 Tapioca cultivation advantages and problems from a cooperative perspective</b>	15
<b>2.4 Costs/profits for farmers and cooperatives</b>	17
<b>2.5 Cooperative's role and related income resources</b>	18
<b>3. Outlining bio-ethanol production from tapioca processing</b>	19
<b>3.1 Introduction</b>	19
<b>3.2 Potential value chain of ethanol production</b>	20
<b>3.3 Ethanol production and tapioca cultivation</b>	21
<b>3.4 Costs / Profits</b>	22
<b>Part B:</b>	
<b>Descriptive Analysis</b>	
<b>4. Alternatives to tapioca cultivation</b>	25
<b>5. Capital / Market access</b>	28
<b>5.1 Capital</b>	28
<b>5.2 Market access</b>	29
<b>6. Prices and income</b>	32
<b>6.1 Prices and their development</b>	32
<b>6.2 Price fluctuations and stability</b>	34
<b>6.3 Real Income</b>	37
<b>7. Common denominators</b>	39

<b>Part C: Proposition for a model of cooperation</b>	
<b>8. Concept of cooperation, Phase 1</b>	43
<b>8.1 Phase 1, initiating a cooperation</b>	43
<b>8.2 Implementation options for phase 1</b>	45
<b>8.2.1 Loans and credits</b>	45
<b>8.2.2 Chip-factory: Additional income generation/value chain integration</b>	45
<b>8.2.3 Improved market access</b>	45
<b>8.2.4 Cooperation structure, monitoring and mediation</b>	46
<b>9. Concept of cooperation, Phase 2</b>	48
<b>9.1 Roles and responsibilities under step 2</b>	49
<b>9.2 Soil maps</b>	49
<b>9.3 Planting technology trials</b>	49
<b>9.4 Harvesting technology</b>	50
<b>9.5 Environmental technology and eco-efficient crop-cycle management</b>	50
<b>9.6 Tapioca or ethanol standard label</b>	50
<b>9.7 Debt-restructuring advisory services</b>	51
<b>10. Benefits</b>	52
<b>10.1 Benefits I: Economic dimension</b>	52
<b>10.2 Benefits II: Social and development dimension</b>	53
<b>10.3 Benefits III: Environment</b>	55
<b>11. Strategy and Policy Recommendations</b>	56
<b>11.1 Strategies and policies</b>	56
<b>11.2 Linkages with other projects of TG-PEC</b>	57
<b><u>Attachments:</u></b>	
- <b>Bibliography</b>	I
- <b>Information from internet</b>	II
- <b>Data collection</b>	III

### Acronyms (Database of Abbreviations)

Abbreviation	Full Name/Expression
GTZ	German Technical Cooperation
E3Agro	Energy and Eco-Efficiency in Agro-Industry
DEDE	Department of Alternative Energy Development and Efficiency
BMZ	German Federal Ministry for Economic Cooperation and Development
TG-PEC	Thai-German Programme for Enterprise Competitiveness
OBA	Observer Based Assessments
SEA-C.R.	Southeast Asia Consult & Resource Company Limited
CSR	Corporate Social Responsibility
MOEN	Ministry of Energy
CP	Charoen Pokphand Group
TAO	Tambon Administrative Organization
NPOs	None Product Outputs
Co-op	Cooperative
SME	Small and Medium Enterprises
WWF	World Wide Fund for Nature

### List of Figures

Figures	Content	Page
Figure 1	The by-products of ethanol production	20
Figure 2	Agricultural and industrial coordination for sustainable ethanol production	22
Figure 3	Areas of potential cooperation to the target groups mutual benefit	39

### List of Tables

Note: The numbers in superscript are from sources other than primary data generated by this study. See listings on page v

Table	Content	Page
Table 1 <sup>17</sup>	Bio Mass standards	9
Table 2	Members and land-area of participating cooperatives	10
Table 3	Number of members engaged in and land-area used for tapioca cultivation	10
Table 4 <sup>5</sup>	Tapioca seed varieties used in the study area	12
Table 5	Planting time-tables and starch contents at harvesting	13
Table 6	Tapioca crop cycle	13
Table 6a	Tapioca crop cycle, crop preparation	14
Table 6b	Tapioca crop cycle, planting	14
Table 6c	Tapioca crop cycle, tapioca stem maintenance	14
Table 6d	Tapioca crop cycle, harvesting season	14
Table 6e	Tapioca crop cycle, sale of tapioca / loan payment	15
Table 6f	Tapioca crop cycle, post-harvesting period	15
Table 7	Cost and profit for tapioca	17

Table 8	Cost analysis for tapioca	17
Table 9	Cooperative's income resources	18
Table 10 <sup>6</sup>	The production price of ethanol from tapioca	23
Table 11	Capital costs of raw materials for production	23
Table 12a	Corn cultivation, basic data I	25
Table 12b	Corn cultivation, basic data II	25
Table 13	Base costs for corn cultivation	26
Table 14	Cost analysis for corn and tapioca in comparison	26
Table 15a <sup>7</sup>	Number of factories processing tapioca	29
Table 15b <sup>7</sup>	Ethanol factories in Thailand	30
Table 16 <sup>8</sup>	Processing steps and value added comparing unprocessed root	30
Table 17 <sup>9</sup>	Tapioca prices according to the percentage of starch content 2005/2006	32
Table 18 <sup>10,11</sup>	Tapioca Roots and products Prices, 1990-2005	33
Table 19	The total cost of soil inspection	49
Table 20	Cost to establish the yield of a new variety of tapioca in a given area	49
Table 21	The details of cost reduction in production process	52
Table 22	Possible cost reduction in Baht and % of overall cultivation costs/rai:	52
Table 23	Potential increase and cost increase for planting CMR 35	53
Table 24	Cost and profit analysis for planting CMR 35	53
Table 25	Cost breakdown of tapioca plantation	At.iii
Table 26	Selling tapioca to ethanol refinery	At.iii
Table 27	Tapioca cultivation; members/rai/amounts	At.v

### List of Graphs

Note: The numbers in superscript are from sources other than primary data generated by this study. See listings on page v

<b>Graphs</b>	<b>Content</b>	<b>Page</b>
Graph 1 <sup>12</sup>	Price fluctuations and production output 1991-2006	34
Graph 2 <sup>13</sup>	Tapioca roots price, highlighting Nov-Feb 2003-2007	35
Graph 3 <sup>14</sup>	Tapioca root prices 2003-2007	36
Graph 4	Tapioca chips prices 2005-2007	36
Graph 5	Tapioca root prices and monthly production 2003-2007	37
Graph 6 <sup>15,16</sup>	Inflation adjusted tapioca root prices 1991-2007	38
Graph 7	Average income adjusted to 1991 levels	38
Graph 8	Farmers current modus operandi	44
Graph 9	Modus operandi of cooperation, first phase	44
Graph 10	Cooperating structure: Monitoring and mediation	46
Graph 11	Complete cooperative structure	47
Graph 12	Cooperating structure: Phase one and two	48

## List of Maps

Note: The numbers in superscript are from sources other than primary data generated by this study. See listings this page

Map	Content	Page
Map 1 <sup>1,2</sup>	Tapioca planting areas around Nakornratchasima Province	11
Map 2 <sup>3,4</sup>	Location of the participating and associate cooperatives	11

## List of Sources

1. Thai Tapioca Development Institute
2. Office of Election Commission of Nakornratchasima
3. Thai Tapioca Development Institute
4. Office of Election Commission of Nakornratchasima
5. Office of the National Research Council of Thailand
6. Department of Mineral Fuels, Ministry of Energy
7. Association of Tapioca Factories Northeastern Region
8. AgriSource's estimate modified from The Thai Tapioca Trade Association year Book 2004, (Based on Data from the Ministry of Agriculture and Cooperatives & The Customs Department)
9. Association of Tapioca Factories Northeastern Region
10. Office of Agricultural Economics, Ministry of Agriculture and Cooperatives
11. Department of Business Economics, Ministry of Commerce Note: Tapioca Crop Average: Oct-Sep.
12. Office of agricultural Economics, Ministry of Agriculture and Cooperatives
13. Department of Internal Trade, Ministry of Commerce
14. Department of Internal Trade, Ministry of Commerce
15. Office of Agricultural Economics, Ministry of Agriculture and Cooperatives.
16. International Monetary Fund
17. ÖKO institute

## ***Executive Summary***

The concept paper 'Sustainable Supply of Tapioca for Ethanol Production' is a study initiated by the E3Agro-Project of Thai-German Programme for Enterprise Competitiveness (On behalf of the German Ministry for Economic Cooperation and Development (BMZ)) and in cooperation with the Thai Ministry of Energy, Department of Alternative Energy Development and Efficiency (DEDE), Bureau of Energy Research

The study was executed by Southeast Asia Consult & Resource Co. Ltd as mediator and external consultant. One ethanol producing company and 4 Cooperatives from the Karat area constituting the pilot target group providing data.

The study objectives can be summarized as follows:

Since The Government of Thailand set ambitious targets to promote renewable energy and energy efficiency, including the production of bio-fuels from tapioca and sugar as well as bio-diesel from palm oil. Securing a long term supply of raw material at affordable prices is a major concern for every investor in bio-fuels production. To increase the income of farmers and to increase the energy security of the country by replacing costly oil imports with renewable resources like bio-ethanol is now one of the main interests of the Thai government.

On the plantation side the main issue is increasing the yields and income from tapioca farming without a negative impact on the environment. On the factory side the main issue is to secure a long term supply of tapioca at affordable prices. The concept is developed with the participation of all key stakeholders to build up mutual understanding, ownership and trust in order to find a solution where the benefits and risks are evenly divided between the interest groups.

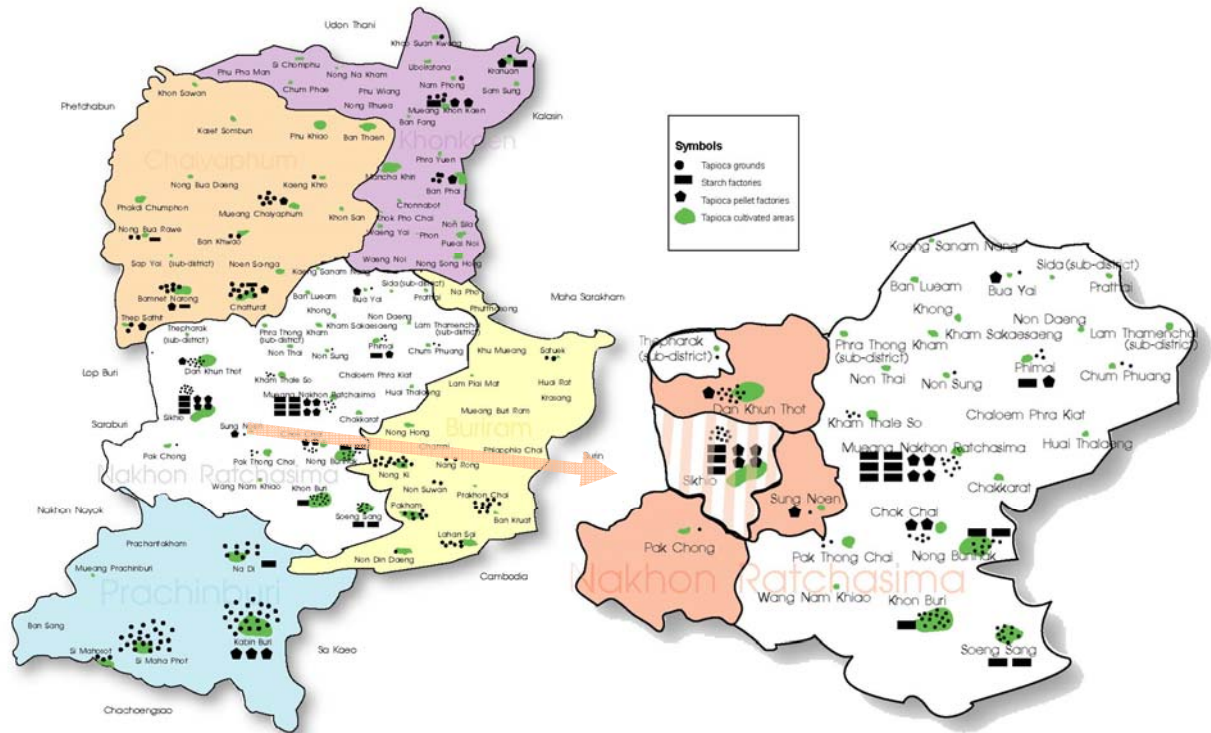
So the study will:

- Produce a concept for sustainable tapioca supply acceptable to both the farmers and ethanol producers.
- Describes the roles, measures and structures needed for the concept.
- Develops the concept outline sufficiently to become a potential pilot and role model.

This leads on to a model of cooperation developed to achieve the following goals:

- Envisioned maximum thru-put capacity for ethanol production: up to 1.000.000 tons of tapioca per year, or 3,000 tons per day (330 days/year).
- Current maximum feedstock production capacity of cooperatives 170,000 rai with an average yield of 3 tons/rai, or 510.000 tons per year.
- Envisioned maximum feedstock production per year 250.000 rai with an average yield of 4.5 tons/rai or 1,125,000 tons per year.

Thailand is one of the main exporters of Tapioca in the world. The growth of the sub-sector in terms of land-use has over the last decade increased to more than 10 million rai or 1.6 million hectares, of which 6.5 million rai or 1 million hectares are under constant cultivation. The government saw a temporary (until 2006) need to restrict the overall land-area for tapioca cultivation to encourage development of agricultural technology over increased land exploitation. (See: Tapioca cultivation in the Karat area P10)



Tapioca planting areas around Nakornratchasima Province and location of the participating and associate cooperatives (full light orange and striped orange) (See P11)

### The main issues

The main issues identified for the farmers were:

- Capital and loans
- Know-How and Technology
- Labor
- Soils and fertilizers
- Irrigation
- Shifting markets
- Unstable prices
- Soil degradation
- Soil quality
- Closed markets

Out of these issues the study identified 5 main problem areas for the tapioca farmers and subsequently analyzed for this study. These were:

- Sales prices.
- Loan conditions & availability of cash.
- A “truly manageable” crop-cycle management.
- Reliable markets.
- Value-chain participation.

The study also found 4 main problem areas for the ethanol company and these were identified as:

- Un-interrupted feedstock supply.
- Low-tech farming (low yield).
- Multiple and dispersed feedstock sources.
- Risk - minimized mid and long - term development options

### **Introduction of a model of cooperation**

From this information chapter 4 (See P25) introduces a model of cooperation that takes a number of basic Thai social structures into account (See P4). While this seemingly restricts the model-character of the concept to Thailand, in reality, the structures referred to are equally applicable to all the Theravada Buddhist countries of Asia. This is especially true for rural areas. The main points are:

Important common denominators between the farmers and the ethanol factory were found to be: (See Common denominators P39)

- Capitalization.
- Improved tapioca varieties.
- Soil preparation.
- Planting season.
- Cultivation technology.
- Harvesting technology.
- Management and coordination.
- Chip production.

### **Concept of cooperation**

- It is comprised of a two step approach.
- With short and long-term options.
- Provides an immediate positive economic impact.
- An immediate competitive advantage.

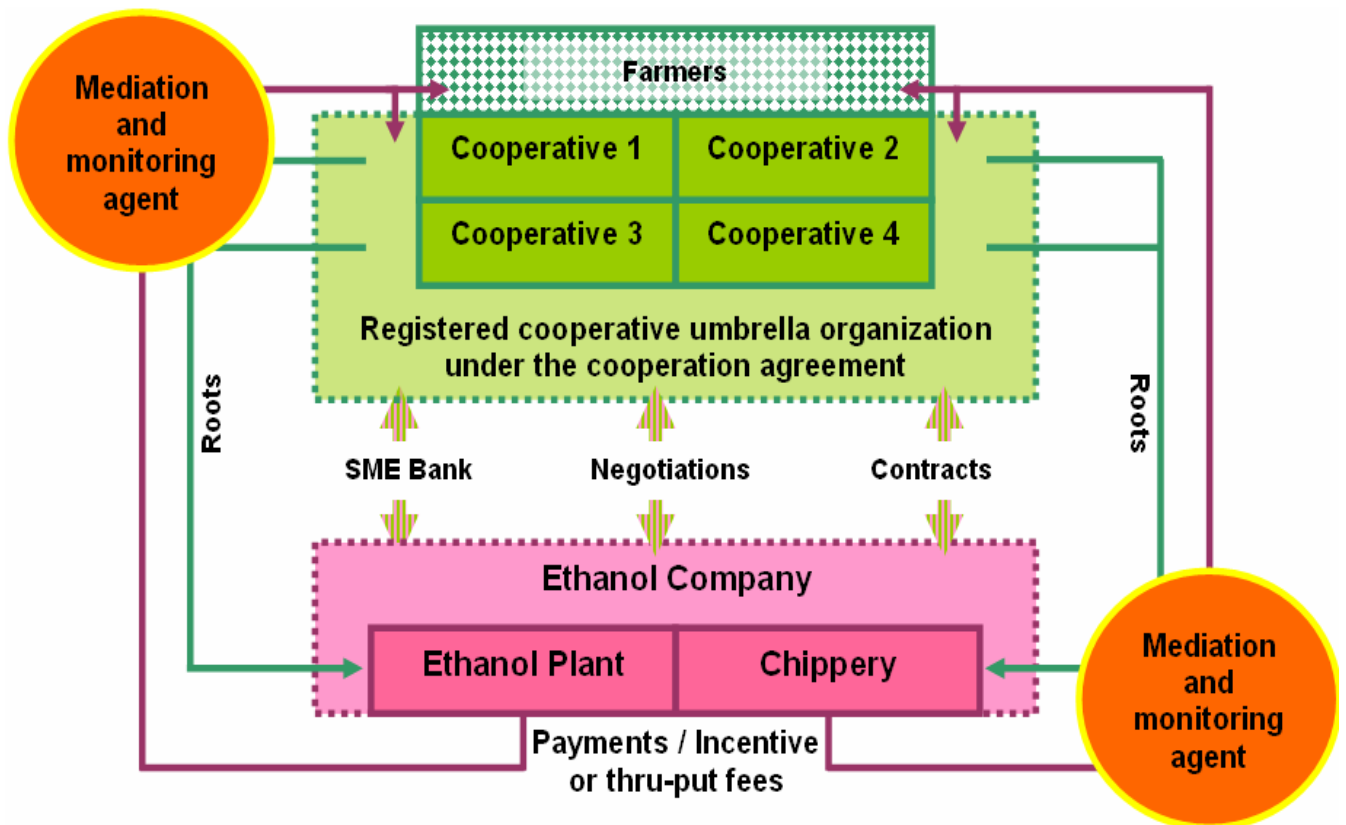
### **Phase 1: Initiating the cooperation** (See P43)

Products are delivered to the various markets by mainly three players, cooperatives, farmers as individuals (members and non-members of cooperatives), as well as middle men. The latter do not only play a well established role as service providers locally, but also are the product's main link to regional and international markets. Although recently their former dominance here is weakening as farmers and cooperatives alike try to gain access to these markets themselves.

The cooperation structure should be streamlined for efficiency and the least amount of administrative procedures.

To implement the first phase, the study proposes to prepare a Memorandum of understanding between all parties concerned that describes:

- Short- and long-term intentions
- Commitments being made regarding price, financial services, starch measuring methods and chippery factory construction
- Goals and a related time-table for them to be achieved
- Structural cooperation details with a system of financial services offered, incentive payments to farmers and product payments to cooperatives
- Actions to be taken in case of non-fulfillment of agreement. This would concern cases of non-delivery or under-delivery of crops by the cooperatives and/or non-purchase or under-purchase of crop by the Ethanol Company.
- Actions to be taken in case of non-fulfillment of agreement. This would concern cases of non-delivery or under-delivery of crops by the cooperatives and/or non-purchase or under-purchase of crop by the Ethanol Company.



Complete cooperating structure (graph P46)

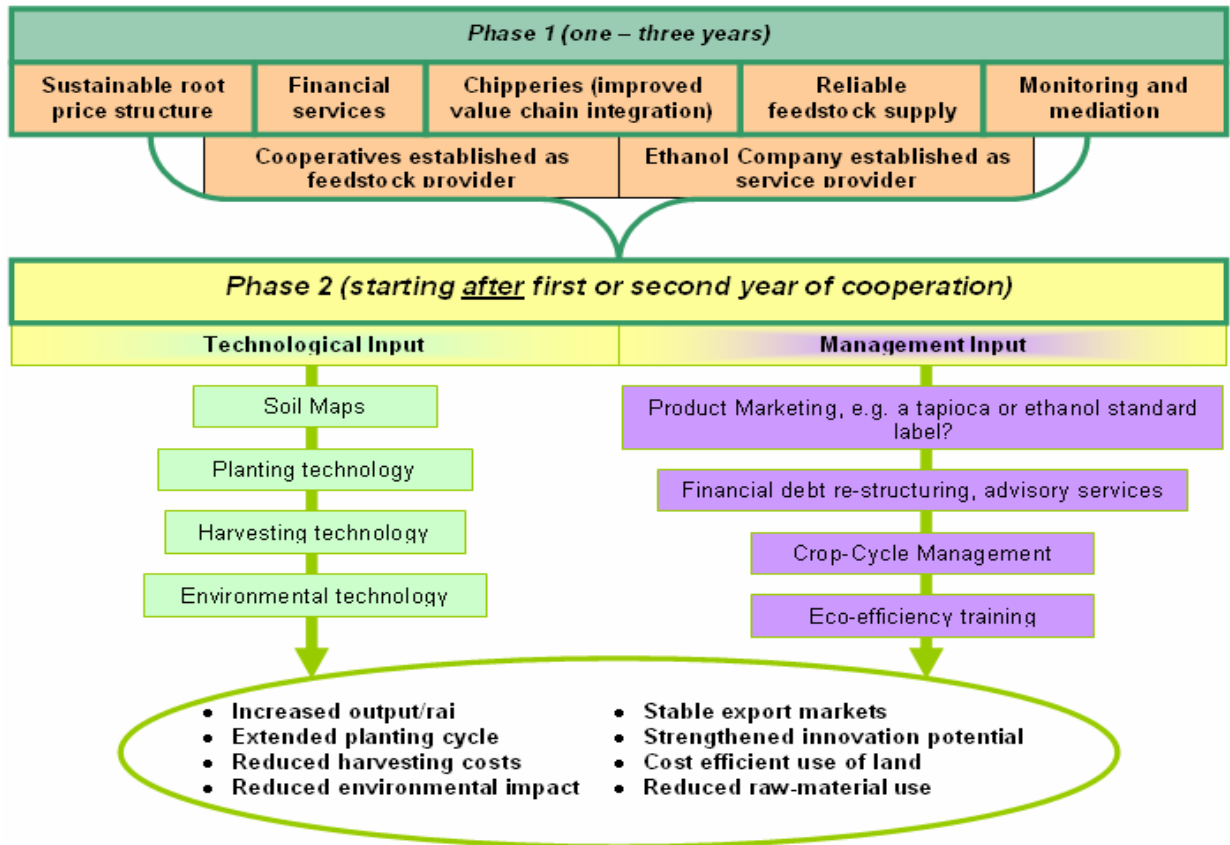
The second phase of the cooperation is based on the successful conclusion of phase 1, which should deliver the following output before extending the cooperation effort:

- Establish a tapioca root price structure in place.
- A fair and objective starch measuring method in use.
- Working financial services for the cooperative and their farmers.
- Working chipperies ready to accept feedstock.
- A feedstock production output in line with plans and agreements.

Once these objectives are achieved, trust between the participating stakeholders ought to be sufficiently established to continue cooperation into the levels of technological and management cooperation. The Ethanol Company has established itself as a reliable service provider, while the cooperatives have proven to be a reliable source of supply.

#### **Phase two** (See P48)

Phase 2 establishes the individual stakeholders of the cooperation as partners that can develop productivity and eco-efficiency together for mutual benefit.



Cooperating structure: Phase one and two (Graph P48)

**Benefits gained will be through:** (See P52)

- Improved technology in the areas of,
  - Preparation for planting.
  - Planting.
  - Maintenance.
  - Harvesting.
- Introducing different Plant varieties will produce advantages for,
  - New income.
  - Investment costs.
  - Increased profits after introducing CMR 35.

**Benefits likely to be instrumental in future standards for export:**

- In the mid-term, new innovative technologies and management will improve:
  - Fertilizer/pesticide input ratio needed per rai of tapioca cultivation.
  - Soil conditions.
  - Water resources.
  - Energy and transportation costs.
  - Arrests at least to some degree soil erosion.
  - Limiting the amount of new land needed to be improved.
  - Economic participation of farmers.
  - Export options and opportunities of the all stakeholders/sector.

### **Strategy and Policy recommendations** (See P56)

In the past, the main strategy on the farming level was to slightly curb the overall area allowed for tapioca cultivation leading to innovation improving the starch/weight ratio of the roots, instead of using up more land. While this policy might be effective towards motivating research and innovation, it is not enough to keep tapioca cultivation profitable for the farmers and thus provide a reliable supply.

The strategic approach towards developing the tapioca sub-sector might consider refocusing on the value chain under a perspective that begins with the farming level as the most important aspect of the industry, as it supplies the feedstock. Here, economic viability for the farmers and debt-restructuring has to be the foremost visions to stabilize the feedstock market.

#### **A. Increase innovation and investment opportunities for farmers**

- Prices are the most important determining factor for a farmer.
- Standards for Thai tapioca feedstock that anticipate calls for standard requirements.
- Support new farming technologies with regulations and incentives.
- Farmer debt-restructuring for employed/practiced innovation or achieved increase in yield.

#### **B. Re-evaluate the tapioca value chain product regulations**

- Make export of tapioca chips less attractive and focus on starch and its related products including ethanol for export.
- Support sustainable cooperation options over contract farming.
- Create standards for the different products along the value chain.

#### **C. Link renewable energy with sustainability in agriculture**

- Production targets for ethanol should refer to the industry sub-sector and offer the sub-sector assistance in reaching the targets.
- Targets should not refer to the introduction of gasohol 95 in a top-down manner, for example, 'the phasing out of premium gasoline has to be achieved by.....' This puts unnecessary pressure on the farmers to produce feedstock without an appropriate frame or structure of cooperation with the processing industry. The market should decide via demand and price on the pace of introduction for ethanol and bio-diesel based petrol, respectively.
- Restrict , or at least outline the type of land that can be used to grow renewable products
- Reward industries that comply with needs for innovation, environmental protection and sustainability demands

### **Linkages with other projects of TG-PEC** (See P57)

By working as a pilot project the cooperation agreement that incorporates an extensive part of the tapioca value chain, linkages to other TG-PEC projects are not only feasible, but to the mutual benefit.

The following areas of cooperation, either within or outside a PPP agreement would benefit the tapioca sub-sector as a whole:

- Develop a standard and pilot for chip production (E3Agro)
- Develop a standard and pilot for ethanol production (E3Agro)

- Debt restructuring advisory services (SIFA)
- Eco efficiency models for all aspects of tapioca crop-cycles (Component 2)
- Management Information Services for Ethanol Production (MIS)
- Tapioca and ethanol related market research (components 1&2)

### III.3 Farmers / Cooperatives Value Chain analysis

#### Farmers / Cooperatives Value Chain

The farmers who are members of the 4 cooperatives possess similar value chains. Most farmers rely mainly on crops of tapioca (8 – 9 months/year) and other cash crops as a supplementary income, sugar cane, maize, chili, and marigold plantations (3 months/year). Other income-generating activities include custard apples, mangoes, and dragon fruits, as well as animal husbandry, i.e. dairy and beef cattle.

There are 4 main factors affecting the costs of tapioca production:

1. **Land:** which falls into 3 categories; 1, land under ownership, 2, land hired for agricultural purposes and 3, land used without title deeds or land rights.
2. **Variety:** The varieties used by farmers are the stems left over from previous harvests, and those that are purchased.
3. **Fertilizer:** After the planting, fertilizer plays a critical role in maintaining a healthy crop growth process. In addition most farmers need to buy fertilizer after plowing over previous crops.
4. **Funding:** Sources of funding for production costs, land rent, and revolving capital for fertilizer are loans from their cooperatives, the Bank for Agriculture and Agricultural Cooperatives.

With the previous tapioca production for the Ethanol producing factory, farmers would spend 8 – 9 months for crop growth and harvest, and then after the fresh tapioca is sent to the factory, stems will be graded and used for the next plantation and the left-over is ploughed into the fields as fertilizer.

Some farmers would grow other cash crops in between seasons; others just wait for the next season.

#### Factory Value Chain

After the factory purchases fresh tapioca from the farmers for ethanol production, there are amounts left over as waste. The factory uses such waste to produce bio-gas for electricity generation. Surplus gas is sold to farmers at production cost for household use. Waste left over from gas production is then used for animal feed or organic fertilizer and sold to farmers and cooperatives at production cost. Also the cooperatives or farmers may apply to be distributors for such animal feed or organic fertilizer produced by the factory.

In the production process, the factory emitted pollution which contributed to the greenhouse effect. However, the factory solved that problem by converting to an alternative energy source. The factory therefore reserves right to sell Carbon Credits to the UN, and are willing to give 1/3 of the selling price dividend to the cooperatives.

#### Farmers / Cooperatives Value Chain analysis

The brain-storming sessions amongst farmers in the 4 cooperatives found issues in common with the factories as well as differences. These were as follows:

**Common interests:**

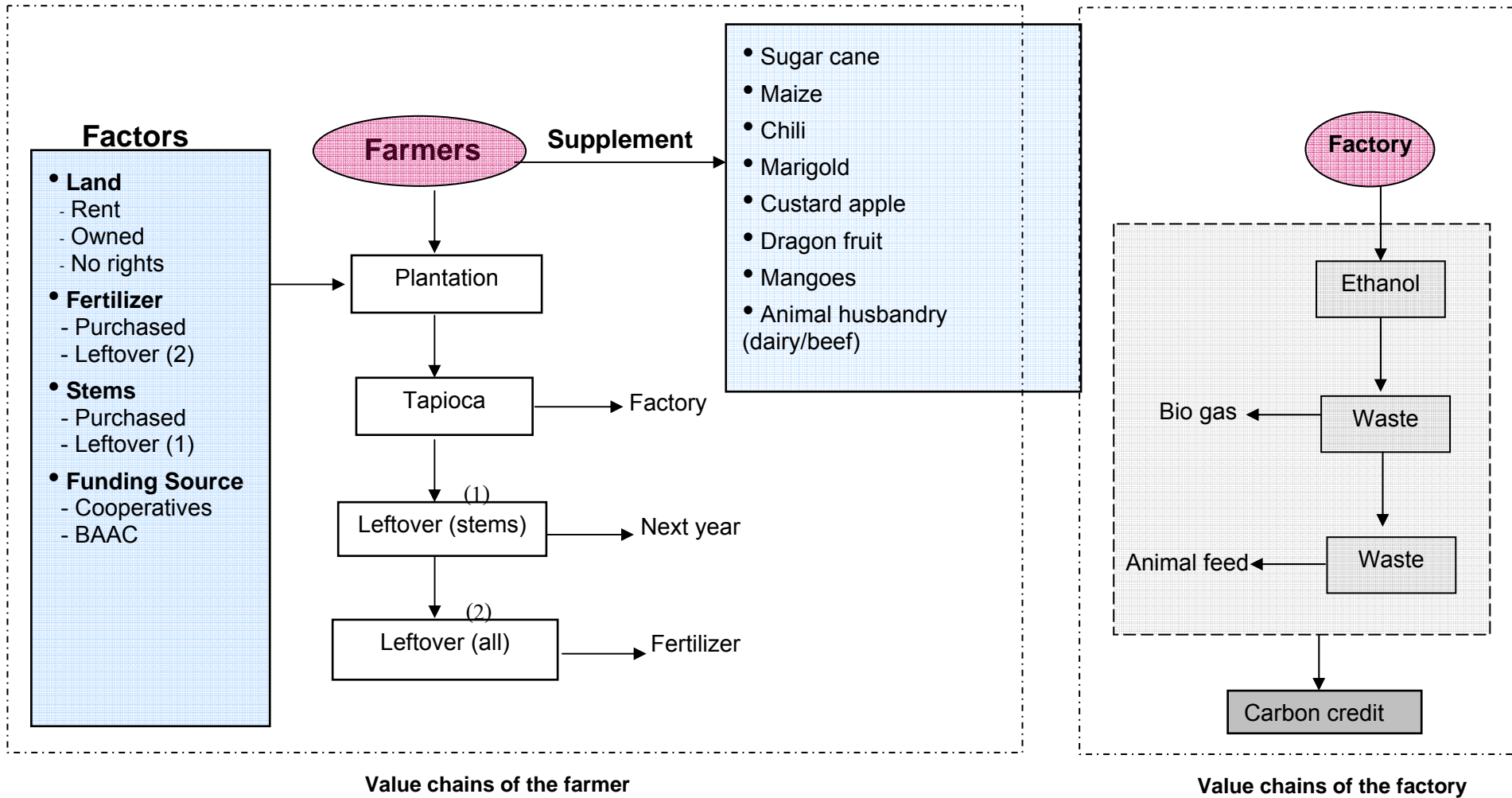
1. **Ethanol production:** waste that is left is used for bio-gas production, animal feed, and fertilizer. The Ethanol producing factory is willing to sell **bio-gas, animal feed, and fertilizer** to farmers at production cost, which are inline with farmers' requests as they need fertilizer for their crops, animal feed and gas for household use.
2. **Harvest:** The Ethanol producing factory is willing to harvest the crop without cost to farmers, and the farmers willingly accepted.
3. **Funding:** For farmers who require loans but lack security, the Ethanol producing factory will act as a guarantor in loan applications for tapioca production.

**Open Issues;**

1. Variety: The Ethanol producing factory requires that farmers plant CMR 35 which has a higher yield content of starch, and furthermore wanted an agreement to supply stems for plantation, the farmers accepted these points.

One problem, however, is the suitability of soil conditions in the different areas. Farmers proposed trial crops in the different soil qualities, with factory support in stems and funding for CMR 35 trial plantations.

The farmers also requested the Ethanol producing factory to purchase the other varieties of tapioca produced.



### III.4 Meetings summary

#### Progress Summary for the period 28 August – 30 September 2006

##### Data Collecting Plan

###### *Factory*

1. Staff will collect data on the factory between 18-20 September 2006
2. After collection, data will be analyzed and then make a plan for cooperation with the farmers.

###### *Farmers*

1. Staff will collect data on the factory between 15-19 October 2006
2. After collection, data will be analyzed and then make a plan for cooperation with the factory.

###### *Secondary data collection / Network*

1. Research related information / documents from internet and library
2. Cooperate / request information from cooperatives, farmers' network and other related bodies.

#### Field Trip Meeting Summary

The first meeting (between farmers' reps., Ethanol factory reps., Dept. of Alternative Energy and Energy Conservation's reps., GTZ reps.) was concluded as follows:

From the discussion, the farmers expressed similar concerns in 3 areas:

- Is there a market for increased production of tapioca?
- Plantation costs vs. selling price
- Production revolving capital

External factors effecting farmers are:

- Government policy encouraging farmers to produce tapioca for ethanol factories, or other factories based on tapioca as raw material. Ambiguity lies in the setting up of factories.
- Investors are prepared to set up tapioca-based factories.
- Tapioca price of the middle-men

The above-mentioned factors directly influence farmers' decision in increasing plantation areas and quantity, and may cause market surplus

#### The second meeting was concluded as follows:

Data collection from the Ethanol producing factory can be concluded as follows:

The meeting came to the following conclusions:

##### 1. Vision:

- a. The envisioned Ethanol producing factory and its concept of cooperation will not only be **sustainable**, but also **self-sustaining**
- b. The working concept of cooperation between farmers and the Ethanol producing factory will provide an **integrated set of win-win situations** based

on and **linking the individual value chains** of farmers and factory (further referred to as “Alliance by Value chain Integration” = **AVI**)

- c. Build on mutual trust between farmers and Ethanol producing factory, the concept of cooperation is able to **rally support on the policy level and of third parties**

## 2. Mission:

- a. Provide a concept of **affordable access** to high-tech and/or high-tech products for and **accepted by farmers**, for example at harvesting and/or high-end animal feed
- b. Provide an framework for **additional financial options** to the farmers for the potential expansion of their activities
- c. Provide a flexible system of **dependable product pricing** that is fair and considers the needs of both farmers and factory
- d. Provide a system of cooperation that pro-actively **links farmers at least in part within the production, marketing and use of higher-end value chain products**, i.e. products made from bio-mass left over from the ethanol production
- e. The linking of the farmer/factory value chains increases decision-making options by avoiding **unnecessary middle-man activity between the two value chains and the market place**

## 3. Basic practical needs discussed:

- a. Introduce a factory/farmer **concerted planting and harvesting pattern** and possibly new necessary planting/harvesting cycles
- b. Introduce new varieties of tapioca to **increase starch-yield** at the very outset of the project
- c. Some form of **coordination body for the farmer/factory cooperation** concerning technology, know-how, planning, monitoring and mediation

## 4. Other topics discussed:

- a. Consider options on how to build a **tapioca chip reserve** between January 2007 and the planned first harvest in April 2008
- b. Consider options to **sell carbon credits** to the Thai government and distribute the monetary benefits equally between farmers and factory

## The working summary during October 1 - 31, 2006

### Collecting secondary data/network

- Researching information/relevant document from the internet and library

**The Obtained result**            The information about species of potatoes cultivated in Thailand Information about type CMR 35 species

The obtained information was used as a supplementary document for the meeting on November 13, 06.

- Coordination / searching for co-operative, farmers and other relevant networks

**The Obtained result**            Searching and asking for tapioca information in cooperation with Rayong Field Crop Researching Center, Department of Agronomy, Chiang Mai University and the Ethanol Company

### Plan for Collecting Data

The staff concluded the result of the discussions in small groups with four Agro cultural cooperatives. The staff then arranged a plan for collecting the data as follows:

- The staff presented the summary of the discussion with the four cooperatives and Ethanol producing factory
- Selecting and arranging the consultant committee determining the scope of the framework of MOU, the cooperation between farmers and Ethanol producing factory to prepare for the up coming year 2550
- Discussion on the consensus agreement of cooperation. The meeting was held on November 13, 2006, in Nakornratchasima.

## Schedule plan of working

The staff summarized the scheduled plan for working on the project beginning from October 31, 2006 to March, 2007 as following

### MEDIATION in Tapioca

Steps	Time-line	Target group related activities	Support structure related activities
Mediating MOU	<b>October:</b> 31 <sup>st</sup> : up-date meeting in Trang	Preparation of mediating MOU: <ul style="list-style-type: none"> <li>Needs and demands of target groups</li> <li>Possible conflict areas</li> <li>Possible win-win scenarios</li> </ul>	
	<b>November:</b> 13 <sup>th</sup> : Meeting in Korat	First mediation session Formation of MOU negotiating committee	After 13 <sup>th</sup> : Start circulating the outline of the cooperation to the potential parties of a support network
	After the 13 <sup>th</sup> in bi-monthly intervals:	Negotiating <ul style="list-style-type: none"> <li>planting and harvesting cycles</li> <li>value chain integration</li> <li>pricing policies</li> <li>additional topics identified on November 13<sup>th</sup></li> </ul>	Contact other programme components to build support structures: <ul style="list-style-type: none"> <li>SME Bank/GTZ financial services</li> <li>Available support structure Ethanol producing factory</li> <li>Available support structure of cooperatives</li> <li>CIM related support structures</li> <li>others</li> </ul>
	December	Begin of feed-back-cycles with agricultural consultants: <ul style="list-style-type: none"> <li>agriculture</li> <li>business and finances</li> </ul>	
Editing MOU	January		
	February	GTZ / SEA-C.R. internal feedback cycle considering support structure issues	Identifying cross-utilization with other GTZ activities, for example: ethanol as boiler fuel in Saa-Paper production
Presentation		Public presentation of cooperation structure	
Signing of MOU	March	MOU signing ceremony between representatives of target-groups and attended by support network, newspapers, etc.	
Start of cooperation		Begin the pilot implementation and monitoring	

### The objectives of the concept

1. Collecting the information about the status quo (background information) of farmers and the Ethanol producing factory ( the duration of data collection is from October, 2006 to February 2007)
2. The farmers need to know the cost of investment in terms of quantity/number, ranking from the preparation ,planting, maintenance, harvest, tapioca sale, post harvest, as well as additional jobs of the farmers (the duration of data collection is December, 2006 )
3. The factory needs to know the cost of investment in terms of quantity/number, ranking from species selection, planting (area/time) Harvest, Ethanol production (Biogas ,animal feeds and fertilizers) drying/drying for producing Ethanol out of harvesting season (the duration of data collection is December, 2006 )

4. When the two parties (farmers and the factory) received the quantity/number detailing the investment costs, they will, according to the information, consult / negotiate with each other. SEA – C.R. LTD. acts as the coordinator ( the team worked to realize the effects of the present concept to the farmers and the factory) (the duration is of January, 2007)
5. The staff will collect more information from both farmers and the factory to be assured in having all necessary information. (after the farmers and the factory present their information in the discussion to determine the consensus agreement ) (the duration is January, 2007)
6. Reaching the framework of cooperation between farmers and the factory, we will understand the concept of supplying the network that will offer support to the farmers and the factory for reaching the model of outcome structure of cooperation between farmers and the factory.
7. Presenting the cooperation structure to the agricultural business consultant company, the specialists of GTZ to ask for the feedback – cycles (around March, 2007)
8. Presenting the report showing the model of cooperation with GTZ (around March, 2007)

### **The summary of the discussion with farmers**

The summary of the discussion with farmers from four cooperatives can be categorized as following:

*From a conversation with small groups of farmers, there are similar requirements about:*

1. Buying price
2. The confidence the factory guaranteed
3. The issues of planting new species
4. Information about type CMR 35
5. Fund providing sources
6. Support on fertilizers and animal feeds
7. Planting and harvest time that occurs at the same period
8. The way farmers will be trained to inspect soil (with support and equipment from the factory), to learn more about potatoes, this will enhance the higher quality of starch production and the trained farmers will later teach the other farmers who haven't been trained.
9. The problem about environmental management
10. The problem of giving a social tax to community

*From a conversation with small groups of farmers, there are different requirements about:*

1. The appropriateness of soil conditions indifferent areas for each species
2. Planting time that occurs at different periods because of the condition of the soil
3. The crop rotation that farmers employ after growing potatoes
4. The different plant diseases, plant louses, geological problems that will have some effect on the product.

## Summary of working implementation from 1<sup>st</sup> to 28<sup>th</sup> November 2006

### Accumulation of secondary data / networks

- **Searching for data / relevant literature from the internet and libraries**

*Things obtained:* Information relevant to Biogas

The obtained information will be used as attached documents in the meeting on 14/12/2006

- Coordination/Collecting data from cooperative networks, farmers and other relevant organizations

Things obtained: Coordination to collect information about Biogas  
Chiang Mai University

### The implementation plan for data collection

The working team has summarized the results obtained from the meeting between 4 cooperatives and Ethanol producing factory. The staff then makes a plan to collect data and create implementation process as follows:

- The working team will be working in the target areas from 28 November to 9 December 2006. The team will recommend the farmers and Ethanol producing factory prepare all expense they pay. Throughout the growing process, farmers should prepare the data about growing tapioca from the planting preparation process to post harvesting process. The Ethanol producing factory should prepare data covering processes starting from crop selection to fertilizer / animal feed production obtained from Ethanol production process. The expected data provided are to be in form of qualitative and quantitative data. The data obtained from this meeting will be used for working team to discuss with stakeholders in the meeting on 14 November 2006 at Nakornratchasima.
- The working team has created a set of questions to facilitate farmers and the ethanol factory to provide quantitative data. The guiding questions are showed in the reference document 1.
- The working team prepare the meeting that will be held on 14 November 2006 at Nakornratchasima (the 1<sup>st</sup> negotiation for MOU)

## Meeting Summary

From the meeting about cooperation between farmers and the Ethanol producing factory in November 13, 2006, which is run by Southeast Asia Consult and Resource Co., Ltd. (SEA-C.R.) under the E3Agro project [Department of alternative Energy Development and Efficiency (DEDE)] and German Technical Cooperation (GTZ), it resulted in the framework of cooperation between farmers and the ethanol producing plant ,at the same time, the meeting provided the opportunity to select the cooperative committee. The result of the meeting decided the committee should consist of 13 members. With the exception of cooperative 5 which has one representative, two representatives from each cooperative sit on the committee. The other four members' are from Ethanol producing factory

In the meeting we derived a set of questions which can be categorized in to the groups as following:

### Technology

#### O Plant Species / Soil

Where could we obtain plant species?

How long will it take to harvest CMR 35?

What are the harvesting seasons of each area?

Does the company have any technicians to help facilitate and support the farmers?

Which kind of soil, sandy, reddish sandy or Kieb soil (salty or acid soil), is the most suitable for planting CMR 35? And in what way is CMR 35 different from other species?

#### O Cultivating / Harvest

How does the harvesting machine work?

What is the time of the harvesting season in each cultivated area?

How can the factory calculate the weight and the percentage of starch when transporting tapioca from the planting fields?

How can the factory manage to deliver the tapioca if there's not enough trucks for transport, can one truck transport from more than one field?

Does the company offer specialists to facilitate farmers?

How could the factory lessen the problems of plant diseases, such as fungi as well as plant and soil pests?

What is the process of investigation for starch percentages? And how can we rely on the process?

#### O Value Chain

Do farmers use other kinds of fertilizer besides inorganic ones? And is the quality of the fertilizers provided by the factory suitable for the condition of the soil? (Sandy soil)

What are the components of the fertilizer made through the production process?

How many kinds of fertilizer does the factory produce? In what form are the fertilizers, liquid or granular?

Does the cooperative sell animal feed to members? If so, from where does the cooperative obtain information about the quality and quantity of the feed?

What are the details about the components and the price of animal feed?

## **Capital**

### **O Plant species / Soil**

How much money does the company offer in investment funds to the farmers?

What are the dates for the harvesting seasons in each cultivated area?

How much money does it cost for harvesting?

Does the factory supply investment funds?

According to the factory, how much should each farmer invest in cultivating tapioca? And who'll be responsible for the control, maintenance and facilitation?

### **O Cultivating / Harvest**

How does the harvesting machine work?

What are the dates for the harvesting seasons in each cultivated area?

How much does it cost for harvesting?

Does the factory supply investment funds?

### **O Value chain**

Do farmers use other kinds of fertilizer besides inorganic ones? And is the quality of the fertilizers provided by the factory suitable for the condition of the soil? (Sandy soil)

Does the factory supply investment funds?

### **O Cooperative Working**

Does the Ethanol producing factory supply investment funds?

Does the Ethanol producing factory offer any investment support?

Does the Ethanol producing factory offer tapioca stems for free? Or does the plant offer any money to help purchase them?

Are there any other extra fund resources providing investment funds for farmers? If there is, what are the interest rates?

According to the Ethanol producing factory, how much should each farmer invest in cultivating tapioca? And who'll be responsible for the control, maintenance and facilitation?

## **Timing**

### **O Plant species / Soil**

What is the time of the harvesting seasons in each cultivated area?

### **O Cultivating / Harvest**

How does the harvesting machine work?

What are the dates for the harvesting seasons in each cultivated area?

## **Cost**

### **O Cultivating / Harvest**

How does the harvesting machine work?

How much does it cost for harvesting?  
Who'll be responsible for transportation of tapioca, farmers or the factory? If farmers have to transport the tapioca themselves, do they have to pay for this or is there support from the plant?  
If the plant is responsible for harvesting, who'll pay for this expense?  
How much does it cost to transport each ton?  
The present cost of maintenance is 2500 baht per rai, how much does the factory contribute for the maintenance of each rai?

○ Value chain

Do farmers use other kinds of fertilizer besides inorganic ones? And is the quality of the fertilizers provided by the factory suitable for the condition of the soil? (Sandy soil)

**Working Structure**

○ Plant species / Soil

Who'll be responsible for financing the first crop? And how much does it cost each farmer?  
Does the Ethanol producing factory offer tapioca sticks for planting?  
Are there enough tapioca sticks offered by the factory? Are the tapioca sticks for free or for sale? If for sale, how much do they cost?

○ Cultivating / Harvest

How does the harvesting machine work?  
The present cost of maintenance is 2,500 baht per rai, how much does the Ethanol producing factory pay for the maintenance of each rai?  
Who'll be responsible for harvesting tapioca throughout the process?  
Who'll be responsible for storing/collecting tapioca strips, the Ethanol producing factory or the cooperatives?  
If the Ethanol producing factory doesn't buy the agreed quota of tapioca, is the factory fined and do they repay the farmer?  
What is the guaranteed price the factory will offer?  
How can the factory offer any help to resolve plant disease problems?  
How can the factory offer any help to resolve problems about soil pest and plant louse?  
What are the recommended spaces between rows and stems?  
Does the factory buy the different kinds of tapioca at the same price, or is the price graded to the quality?  
If the percentage of starch doesn't reach 30%, what's the reduced rate (price) the factory will offer?  
Could the factory schedule the selling and buying of tapioca and inform the farmers who'll later set the plan for cultivation?  
If the percentage of starch doesn't reach 30%, will the factory buy a mixed quality of tapioca?  
Who'll be responsible for transportation of tapioca, farmers or the factory?  
If farmers have to transport the tapioca themselves, do they have to pay for this or is there support from the Ethanol producing factory?  
Do the farmers have to pay for the harvesting costs if the Ethanol producing factory is responsible for the harvest?

If the cost is 1.50 baht for 30% of starch, what will be the prices offered by the Ethanol producing factory when there's a lower percentage of starch?  
How much does it cost for transporting each ton of tapioca?  
How could we coordinate all tasks relevant to the tapioca?  
What are the methods to fix the prices farmers require?  
Because of the insufficiency of labor at harvesting times, farmers need to use a harvesting machine, what is the minimum number of rai needed before the harvester can be used?

○ value chain

Do farmers use other kinds of fertilizer besides inorganic ones? And is the quality of the fertilizers provided by the factory suitable for the condition of the soil? (sandy soil)

Does the cooperative sell animal feed to members? If so, from where does the cooperatives obtain information about the quality and quantity of the feed?

○ Marketing

What is the guaranteed price the company will offer?

Has the Ethanol producing factory deployed specialists to analyze the marketing strategy of its competitors?

○ Capital

Does the factory offer investment money to support the project?

Does the factory offer potato stems for free? Or does the factory offer any money to help purchase them?

If the factory is responsible for the invested funds, how can the factory retain the confidence of the farmers?

**The exclusive information on Ethanol producing factory sector**

○ In the case of a 6 – month harvesting period, how can the factory manage the problem regarding the quantity of tapioca arriving at the factory?

○ Does the project management need to arrange a process to guarantee minimum/maximum prices for the farmers and the factory?

○ The question is- "What are the chances of building the Ethanol factory in the future?" because, previously, there were several companies saying they wanted to start a similar project but failed to follow through.

○ When will the plan for building the factory be completed? And at what date will the company start building the factory and how?

○ Where will the factory will be built? And does the company still support the cooperative 6? (Castor – oil plant)

○ The factory could produce 256 tons of animal feed daily. (More than 20 percentage of protein)

○ Is there any possibilities of building the factory in Korat? What are the chances in percentage terms of building the factory?

○ The government should regulate the amount of shares foreigners can hold in this project?

### **The exclusive information on farmers**

- How much does it cost to finance the capital for cultivating and transporting for each rai?
- Has the cooperative ever offered CMR 35 to farmers for cultivating?
- Does the project management need to arrange a process to guarantee minimum/maximum prices for the farmers and the factory?
- Generally, to whom will the farmers sell the tapioca, the middle man or the cooperatives?

### **Working summary for December 2006 and the work plan for January 2007**

#### **The conclusions of working for December 2006 are as follows:**

1. Data collection in field work from the 4 cooperatives during November 30, 2006 to December 9, 2006. The data collected was mainly involved with capital costs and about the costs the factory has to pay. The data should be in the form of quantitative data. This data was used as background information for making an agreement for cooperation between the Ethanol producing factory and the cooperatives. (reference document 1)
2. The meeting with the SMEs bank on December 6, 2006 (The first meeting) (reference document 2)
3. The meeting with the SMEs bank on December 19, 2006 (The second meeting) (reference document 2)
4. The staff prepared for the upcoming meeting about cooperation between the factory and the cooperatives (the first meeting) on December 14, 2006 at cooperative 5 in Nakornratchasima. (reference document 3)
5. The staff prepared for the meeting to make an effort to reach an agreement between the factory and the cooperative (the second meeting) on December 21, 2006 at cooperative 5 in Nakornratchasima. (reference document 4)

#### **The working plan for January 2007**

The staff has a plan for data collection in more detail. The objective is to make an effort to reach an agreement between the Ethanol producing factory and the cooperative.

## Outlining the current status quo for investment in bio-ethanol production through tapioca processing

The following quantitative and qualitative data will be collected for this chapter:

### Technology

#### 1 Plant species/soil

##### Operational procedures:

- q. *What are the methods / criteria of selecting tapioca species to be promoted by the Ethanol producing factory?*
  - a. High yield per rai, high starch content, high content of free sugars.
  
- q. *Is there a soil quality check for certain types of tapioca in place? And how?*
  - a. Not really. Drainage is more important than soil quality. Poor soil can be enhanced by fertilizer.
  
- q. *What are the special qualities of CMR 35 and Rayong 9, which are favored by the Ethanol producing factory?*
  - a. Both give higher yield per rai and higher starch content. Rayong 9 has a higher content of free sugars and gives an ethanol yield of 200 lts/ton

##### Costs / Profits:

- q. *Is there any cost involved in selecting tapioca species that give a high percentage of starch?*
  - a. It's the time factor rather than cost. Rayong 9 has just finished testing. It takes 2 years to propagate sufficient numbers of stems to enable production of 500,000 lts/day
  
- q. *Is there any cost for soil quality checks? How much does it cost each time?*
  - a. To my knowledge there is very little soil testing.

#### 2 Planting / harvest

##### Operational procedures:

- q. *Are there techniques that can increase the quantity of tapioca harvested and/or starch per kilogram produced? And how do they work, how can the techniques be disseminated to the farmers?*
  - a. There are techniques than could increase the yield to 10-12 tons per rai. Mainly through land preparation, cassava type fertilizer and the correct distance between plants.
  
- q. *What are the methods and equipment used in the harvesting process? And Are the conditions right for them to be used in the Nakornratchasima area with the cooperatives?*
  - a. All harvesting is done by hand. We are now working at mechanical harvesting as it is done in Brazil.

- q. *Are there techniques or methods to inspect starch quantity? And how can they be disseminated?*
- a. There are techniques but they can be improved upon.
  
- q. *How can the Ethanol producing factory guarantee its tapioca raw material supply for ethanol production during the different harvesting seasons?*
- a. A system has to be set up whereby there is year round harvesting.
  
- q. *Does the Ethanol producing factory compare and contrast the qualities of ethanol produced from fresh and dried tapioca? And in what form?*
- a. We are looking at all chips. This halves raw material logistics costs. Roots due to high viscosity is a problem during scarification and fermentation.

**Costs / Profits:**

- q. *How much does it cost using the techniques to increase tapioca production per one rai / starch content per one kilogram?*
- a. Not much
  
- q. *How much does it cost to harvest one rai?*
- a. You have to ask the farmer
  
- q. *How much does it cost to inspect starch content?*
- a. The cost is Insignificant, unless inspected by gas spectrometry.
  
- q. *What is the minimum area of land needed by the factory to produce sufficient tapioca for ethanol production?*
- a. No response forthcoming
  
- q. *What is the minimum amount of tapioca needed for ethanol production?*
- a. The minimum amount must be sufficient to produce 500,000 lts/day. The same amount of energy is required to produce at full or half. The full amount of 250,000 lts/day production capacity. Thus, anything less is wasted energy.

**3 Value chain**

**Operational procedures:**

- q. *What are the detailed steps of the factory based value chain in tapioca processing?*
- a. No response forthcoming
  
- q. *While operating, would the Ethanol producing factory be concerned about the social standards of the tapioca farmers and production effects on the environment? And in what form?*
- a. We want the farmers to increase their income and livelihood. Tapioca has no known pests in Thailand thus harmful pesticides are not used. The fertilizer needed is Bio friendly.

- q. *How can the Ethanol producing factory produce animal feed, fertilizer, and Biogas from the post production waste?*
- a. Refer to the production flow diagram.

**Costs / Profits:**

- q. *What is the cost in recycling bio-mass to other products?*
- a. Refer to the cost analysis report
  
- q. *How much can the factory produce through the recycling process?*
- a. Considerable

**Capital**

**1 Plant species/ soil**

**Operational procedures:**

- q. *Does the Ethanol producing factory offer tapioca species to farmers?*
- a. It can by working with tapioca research centers.
  
- q. *Does the Ethanol producing factory offer funds when farmers want to extend their cultivated land?*
- a. This is now in negotiation with the SMEs Bank

**Costs / Profits:**

- q. *For how much does the Ethanol producing factory offer tapioca species to each farmer per one rai?*
- a. This depends on the availability of cuttings.
  
- q. *For how much does the Ethanol producing factory offer tapioca species to each farmer in case of extending their cultivated areas?*
- a. Same as above

**2 Planting / harvest**

**Operational procedures:**

- q. *Does the Ethanol producing factory offer funds to support the farmers from planting through to the harvesting cycle?*
- a. We are now investigating this
  
- q. *What exactly is the level of commitment in offering funds for each farmer from planting to the harvesting process?*
- a. The crop is mortgaged to the company at an agreed price.

**Time**

**1 Plant species / soil**

**Operational procedures:**

- q. *What is the time needed by the factory to prepare tapioca species for farmers?*
- a. New variety e.g. Rayong 9 needs 2 years

- q. *What is the time needed by the factory to help in preparing / improving soils for farmers?*
- a. This requires training and supervision.

## 2 Planting / harvest

### Operational procedures:

- q. *When do farmers grow tapioca according to the factory plan?*
- a. The company will set up a planting harvesting plan district by district.
  
- q. *At what time do the factory harvests tapioca produced by farmers?*
- a. We would like to stagger harvesting so it is all year
  
- q. *What is the scheduled plan for harvesting? And how can the factory operate according to this plan?*
- a. This refers again to our logistical plan
  
- q. *How long does the harvesting take based on technology provided by the factory and what is the factory's capability to harvest in one day?*
- a. This is still being investigated. We believe one harvesting machine can do 300 tons/day

### Costs / Profits:

- q. *How much would that technology cost the farmers?*
- a. This is being analyzed.

## Working structure

### 1 Plant species/ soil

#### Operational procedures:

- q. *Does the Ethanol producing factory act as a guarantor when farmers take on loan from other resources?*
- a. No.
  
- q. *Is there any soil checking training program for farmers?*
- a. This can be arranged if necessary tapioca will grow on marginal land if it is drained properly.

#### Costs / Profits:

- q. *How much does it cost to offer the soil checking program to each farmer?*
- a. No response forthcoming

### 2 Planting / harvest

#### Operational procedures:

- q. *During the harvest, does the factory harvest tapioca by its own system exclusively, or are other harvesting methods acceptable?*
- a. Other methods are acceptable since the harvesting machines cannot cover all the farms

- q. *Does the factory offer a long-term social plan that can encourage farmers to produce tapioca and build a reliable supply for the factory?*
- a. No response forthcoming

**Costs / Profits:**

- q. *How much does harvesting by factory technology cost for each farmer per one rai?*
- a. No response forthcoming
  
- q. *How much does it cost offering specialists for farmers?*
- a. No response forthcoming

**3 Marketing**

**Operational procedures:**

- q. *How can the factory use marketing strategies to motivate the farmers to sell tapioca to the factory?*
- a. This goes beyond the marketing strategies; the factory is looking to increase income to farmers through increased yield and guaranteeing income.

**Costs / Profits:**

- q. *What are the costs spent on implementing motivating strategies?*
- a. No response forthcoming
  
- q. *What is the buying price the factory offers to farmers? And what are the conditions?*
- a. We are working on a formula to be negotiated to farmers.

**4 Value chain**

**Operational procedures:**

- q. *Does the factory sell processed tapioca-based products to farmers? And in what form?*
- a. Fertilizer and animal feed can be made available.
  
- q. *Does the factory do research about the effect on environment? In what form?*
- a. Every effort will be taken to ensure that there is no negative environmental impact.
  
- q. *Besides buying tapioca, is there another plan for increasing farmer's incomes?*
- a. If the firm operates its own chip making plant. Farmers could be employed as drivers during growing season. We are looking at a profit sharing plan in addition to the cost paid to the farmers for the tapioca. This would be based on the amount of tapioca supplied by each farmer.

## Outlining the current status quo of tapioca growers

The following quantitative and qualitative data will be collected for this chapter:

### Technology

#### 1 Plant species/ soil

##### Operational procedures:

q. What are the species used for planting?

Cooperative 1	Kasetsart 50, Rayong 5, Huoybong 60, Rayong 72
Cooperative 2	Kasetsart and Huoybong
Cooperative 3	CMR 35, Huoybong, Rayong 9 and Kasetsart
Cooperative 4	Rayong 9, Rayong 60, Kasetsart, CMR 35 and Saidiew

q. What is the selection method for planting species?

Cooperative 1	<ul style="list-style-type: none"> <li>obtaining some advice from the local tapioca research center</li> <li>recollecting the knowledge of the previous tapioca cultivations</li> <li>exchanging the body of knowledge among the growing tapioca groups</li> </ul>
Cooperative 2	<ul style="list-style-type: none"> <li>recollecting the knowledge of the previous tapioca cultivations</li> <li>exchanging the body of knowledge among the growing tapioca groups</li> </ul>
Cooperative 3	
Cooperative 4	

q. Are there any soils inspections to check the appropriateness for the plant species?

Cooperative 1	On the basis there's a soil inspection offered by a volunteer soil doctor in villages who has been trained from the district agricultural department and Houybong tapioca research center.
Cooperative 2	On the basis there's a soil inspection offered by a volunteer soil doctor in villages who has been trained from the district agricultural department.
Cooperative 3	
Cooperative 4	On the basis there's a soil inspection offered by a volunteer soil doctor in villages who has been trained from the district agricultural department

q. Are soil conditions in cultivated areas suitable for tapioca species? If so in what ways?

Cooperative 1	There are various conditions of the cultivated areas regarding to the differences of the geographical matter and the locations. There's a soil inspection offered from volunteer soil doctor. So the suitable plant species can be provided in accordance with the conditions of the soil in each area.
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. What are the tapioca species farmers grow at present?

Cooperative 1	Kasetsart 50, Rayong 5, Huoybong 60, Rayong 72
Cooperative 2	Kasetsart and Huoybong
Cooperative 3	CMR 35, Huoybong, Rayong9 and Kasetsart
Cooperative 4	Rayong9, Rayong 60, Kasetsart, CMR 35 and Saidiew

### Costs / Profits:

q. How much does it cost for species selection?

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. How much does it cost in the process of soil preparation before planting?

Cooperative 1	<ul style="list-style-type: none"><li>• Plowing cost 250 baht/rai</li><li>• Plowing in rows cost 150 baht/rai</li></ul>
Cooperative 2	<ul style="list-style-type: none"><li>• Plowing cost 250 baht/rai</li><li>• Plowing in rows cost 150 baht/rai</li></ul>
Cooperative 3	<ul style="list-style-type: none"><li>• Plowing cost 250 baht/rai</li><li>• Plowing in rows cost 150 baht/rai</li></ul>
Cooperative 4	<ul style="list-style-type: none"><li>• Plowing cost 250 baht/rai</li><li>• Plowing in rows cost 150 baht/rai</li></ul>

q. Is there any cost for soil inspection each time?

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. How much does it cost to fertilize soils making them suitable to be cultivated each time?

Cooperative 1	Use chicken droppings bought locally ( 15 baht /1 sack)
Cooperative 2	N/A
Cooperative 3	
Cooperative 4	

q. What is the average cost spent on species selection at present?

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

## 2 Planting / harvest

### Operational procedures:

q. From where do farmers obtain plant species?

- i. selling
- ii. cuttings

Cooperative 1	<ul style="list-style-type: none"><li>• buying from other farmers</li><li>• off springing themselves</li></ul>
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. What are the possible ways to grow tapioca per one rai? (for example, determine the spaces between plants)

Cooperative 1	row to row 100 CM stem to stem 50 CM
Cooperative 2	row to row 100 CM stem to stem 50 CM
Cooperative 3	row to row 80 CM stem to stem 60-70 CM
Cooperative 4	row to row 100 CM stem to stem 50 CM

- q. In planting process, do farmers use fertilizer?

Cooperative 1	Chemical fertilizer of 15-15-15 formula
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. What are the maintenance methods, using pesticides for example?

Cooperative 1	Normally the soil will be fertilized just once. If the tapioca roots don't meet the appropriate quality, we can fertilize the soil twice and use pesticide and weed killer.
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. What are the methods and the equipment farmers use to harvest?

Cooperative 1	<ul style="list-style-type: none"> <li>• For cutting trunks they do this manually because it's easy for digging tapioca roots.</li> <li>• Use plowing tractor for</li> <li>• For harvesting tapioca, they do it manually.</li> </ul>
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. What is the method for starch content inspection? How?

Cooperative 1	There is a starch inspection at the middle point, for example, tapioca ground, starch factory. However the farmers don't have any knowledge about inspection – they don't know whether the inspection is standardized or not.
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. What are the crop results of the cultivating processes farmers use at the present?

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. Are farmers concerned about the effect of using chemicals on the environment? If so, what concerns do the farmers have?

Cooperative 1	There is no concern about this issue. The farmer's only concern is about the amount of product rather than the effects on the environment.
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. Do farmers have any techniques for growing tapioca to increase the percentage of starch?

Cooperative 1	The farmer's have no procedure that will help in increasing the content of starch. They have only the technique of nourishing tapioca roots to make tapioca grow larger in size.
Cooperative 2	
Cooperative 3	
Cooperative 4	

### Costs / Profits:

- q. How much does plant preparation cost?

Cooperative 1	Plant species cost 800 baht/rai
Cooperative 2	Plant species cost 800-1,200 baht/rai
Cooperative 3	Plant species cost 500 baht/rai
Cooperative 4	Plant species 300 baht/rai

- q. How much the planting cost per one rai?

Cooperative 1	Laboring costs for planting 130-150 baht/rai
Cooperative 2	Laboring costs for planting 150 baht/rai
Cooperative 3	Laboring costs for planting 200 baht/rai
Cooperative 4	Laboring costs for planting 150 baht/rai

- q. How much does it cost for buying fertilizers?

Cooperative 1	Fertilizer costs 500 baht/rai
Cooperative 2	Fertilizer costs 600 baht/rai
Cooperative 3	Fertilizer costs 500 baht/rai
Cooperative 4	Fertilizer costs 500 baht/rai

- q. How much does it cost for maintenance, for example, buying pesticides, irrigation?

Cooperative	Laboring costs for fertilization 130 – 150 baht/day
Cooperative	<ul style="list-style-type: none"> <li>• Laboring costs for fertilization 50 baht/rai</li> <li>• Laboring costs and pesticide cost 250 baht/rai</li> </ul>
Cooperative	<ul style="list-style-type: none"> <li>• Laboring costs for fertilization 100 baht/rai</li> <li>• Laboring costs and pesticide cost 200 baht/rai</li> </ul>
Cooperative	Laboring costs and pesticide cost 300 baht/rai

- q. How much does harvesting cost?

Cooperative 1	<ul style="list-style-type: none"> <li>• Laboring costs for cutting trunks 130-150 baht/rai</li> <li>• Tractor plowing costs for digging tapioca 220-250 baht/rai</li> <li>• Laboring costs for harvesting tapioca 130-150 baht/rai</li> </ul>
Cooperative 2	<ul style="list-style-type: none"> <li>• Laboring costs for cutting trunks and tractor plowing costs for digging tapioca 200 baht/rai</li> <li>• Laboring cost for harvesting tapioca 150 baht/rai</li> </ul>

Cooperative 3	Contract workers will be responsible for harvesting and transportation with the rate of 300 baht/ton. The total products per one rai are about 5 tons and in average the cost will be 1,500 baht/rai.
Cooperative 4	Contract workers will be responsible for harvesting and transportation with the rate of 800 baht / ton. The total products per one Rai is about 5 tons

q. How much does a starch content inspection cost?

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. On average, how much tapioca can farmers produce per one Rai, how many kilograms?

Cooperative 1	The average amount of products is 3 ton/Rai
Cooperative 2	The average amount of products is 3 ton/Rai
Cooperative 3	The average amount of products is 3-5 ton/Rai
Cooperative 4	The average amount of products is 5 ton/Rai

### 3 Value chain

#### Operational procedures:

q. After harvesting, do farmers recycle the waste? How?

Cooperative 1	The plowing process after harvesting period will add more fertilizer to soil.
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. Is there any institute or organization who give advice about tapioca production?

Cooperative 1	District Agriculture department and Houybong tapioca research Center
Cooperative 2	There no institutions or organizations who's responsible for this.
Cooperative 3	
Cooperative 4	Local administration organization

#### Costs / Profits:

q. What are the costs / profit from waste recycling processes?

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

## Capital

### 1. Plant species / soil / planting / harvesting

#### Operational procedures:

- q. From where do farmers obtain funds?
- Ago – cultural bank and co- operative
  - co- operative
  - private loan
  - circulating funds

Cooperative 1	The main sources for fund raising <ul style="list-style-type: none"> <li>• Cooperatives</li> <li>• Ago- Cultural cooperatives</li> <li>• Private loan from tapioca ground or starch factory ,for example</li> </ul>
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. How do farmers obtain funds?
1. Loan?
  2. Credit?
  3. Others?

Cooperative 1	From private loan only
Cooperative 2	
Cooperative 3	
Cooperative 4	

#### Costs / Profits:

- q. Opportunity cost of raising funds

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. Profit before loan and after loan

Cooperative 1	The key rate of interest of the fund farmers loan are: <ul style="list-style-type: none"> <li>• Cooperatives 9 percent / year</li> <li>• Ago- Cultural cooperatives 6 percent / year</li> <li>• Private loan from tapioca ground or starch factory ,for example 3-5 percent / month</li> </ul>
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. Do farmers have overhead for transportation, cooperative fees, etc.?

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

## Time

### 1. Plant species / soil / planting / harvest

#### Operational procedures:

q. What is the appropriate time for species selection?

Cooperative 1	During February
Cooperative 2	There will be no plant species selection because plant species are not suitable for off springing. So the plant species are only bought.
Cooperative 3	During February - March
Cooperative 4	

q. What is the appropriate time for soil preparation?

Cooperative 1	During February - March
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. What is the appropriate time for planting?

Cooperative 1	Start planting around March or when it starts raining.
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. What is the appropriate time for maintenance?

Cooperative 1	The time for maintaining is in the same period of the planting time.
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. What is the appropriate time for harvest?

Cooperative 1	The harvesting time is during November to January.
Cooperative 2	The factors determining the harvesting period depends on the maximum and minimum prices, climate (rain). Rain will spoil tapioca.
Cooperative 3	
Cooperative 4	

q. How long does it take for species selection?

Cooperative 1	1 month
Cooperative 2	There will be no plant species selection because plant species are not suitable for off springing. So the plant species are only bought.
Cooperative 3	1-2 months
Cooperative 4	1-2 months

q. How long does the soil preparation process take?

Cooperative 1	1-2 months
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. How long does it take to plant?

Cooperative 1	8 -12 months (depending on the type of each species)
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. How long does maintenance take?

Cooperative 1	The time for maintaining is in the same period of the planting time.
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. How long does the harvest take?

Cooperative 1	To harvest tapioca it depends on the cultivated areas. Normally it lasts 1 – 3 months.
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. After harvesting tapioca, do farmers use the fallow areas for any other activities? What are the activities? And what are the reasons for choosing these activities?

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

**Costs / Profits:**

q. Do farmers receive any benefit from post harvest activities? And how do they farmers benefit from them?

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

**Working structure**

**1. Plant species/ soil**

**Operational procedures:**

q. Who will / should be responsible for species preparation?

Cooperative 1	In the present farmers prepare plant species themselves.
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. From where do farmer receive soil inspection services?

Cooperative 1	The volunteer soil doctors of the village or Tambon who were trained by district cultural department.
Cooperative 2	
Cooperative 3	
Cooperative 4	

### Costs / Profits:

- q. How much does it cost for species preparation, per on Rai?

Cooperative 1	Plant species cost 800 baht/Rai
Cooperative 2	Plant species cost 800- 1200 baht/Rai
Cooperative 3	Plant species cost 500 baht/Rai
Cooperative 4	Plant species cost 300 baht/Rai

- q. How much does it cost for soil inspection each time?

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

## 2. Planting / harvest

### Operational procedures:

- q. Who will be responsible for giving advice and planting techniques for farmers?

Cooperative 1	Houybong tapioca research center
Cooperative 2	N/A
Cooperative 3	
Cooperative 4	

- q. Who'll be involved in the harvesting process? And how is it organized?

Cooperative 1	In harvesting tapioca, farmers will be responsible for the whole processes of tractors and labor supplying.
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. In the tapioca cultivating process, is there any institute or organization that gives suggestions on using chemicals and their effects on the environment?

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. Are tapioca harvests sold in advance to any institution or organization? Which ones?

Cooperative 1	Tapioca ground and starch factory
Cooperative 2	Tapioca ground and starch factory
Cooperative 3	Tapioca ground and starch factory and cooperatives
Cooperative 4	Tapioca ground and starch factory and cooperatives

### Costs / Profits:

- q. Is there any cost of receiving advice and techniques from the specialists? And how?

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. How much capital is needed for harvesting labor?

Cooperative 1	Labor cost for harvesting 200 – 300 baht/Rai
Cooperative 2	
Cooperative 3	The contract worker will be responsible for harvesting and transportation with the rate of 300 baht/ton. The total products per one rai are about 5 tons and in average the cost will be 1,500 baht/rai.
Cooperative 4	The contract worker will be responsible for harvesting and transportation with the rate of 800 baht/ton. The total products per one rai is about 5 tons

### 3. Marketing

#### Operational procedures:

- q. Who'll be responsible for determining the middle price of selling and buying tapioca?

Cooperative 1	The tapioca ground and starch factory will determine the middle price.
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. Who'll be responsible for tapioca transportation to the factory?

Cooperative 1	In the present farmers are responsible for tapioca transportation.
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. When buying tapioca, does the factory inspect the percentage of starch? And how?

Cooperative 1	There are starch inspections run by tapioca ground and starch factories that inspect the content of starch themselves.
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. When buying tapioca, does each kind of tapioca give different prices?

Cooperative 1	The selling and buying price of tapioca depends on the content of starch only. There nothing to do with plant species in this case.
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. Who'll be responsible for transporting tapioca to markets?

Cooperative 1	At the present farmers are responsible for tapioca transportation.
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. What factors do the farmers consider before selling tapioca to a buyer?

Cooperative 1	The factors that have some influences on farmers when deciding to sell tapioca are the selling and buying price, the distance, the loan taken from tapioca ground and starch factory.
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. What would raise the confidence of farmers to continually plant tapioca for the factory?

Cooperative 1	<ul style="list-style-type: none"> <li>• Selling and buying price</li> <li>• Support in giving funds</li> <li>• Consultant team who will provide some advice for planting process.</li> </ul>
Cooperative 2	
Cooperative 3	
Cooperative 4	

**Costs / Profits:**

q. What is the middle price of selling and buying tapioca per one kilogram or ton?

Cooperative 1	At the present, the middle price is now at 1.20 – 1.50 baht/kg.
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. Is there any expense for tapioca transportation? How much does it cost for each transportation?

Cooperative 1	Transportation cost is 100 baht/ton
Cooperative 2	Transportation cost is 150 baht/ton
Cooperative 3	Transportation cost is 100 - 150 baht/ton
Cooperative 4	Transportation cost is 100 - 150 baht/ton

q. What is the buying price regarding to the percentage of starch?

Cooperative 1	No response
Cooperative 2	
Cooperative 3	
Cooperative 4	

q. What are the different prices when buying each kind of tapioca?

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. What would be a satisfying tapioca price offered to farmers and under what conditions?

Cooperative 1	The starch producing factory will determine the selling and buying price so the reason why farmers decide to sell tapioca to any tapioca ground is the satisfied price offered by any tapioca ground.
Cooperative 2	
Cooperative 3	
Cooperative 4	

#### 4 value chain

##### Operational procedures:

- q. Is there any institute or organization that offer support for waste recycling? And do farmers gather for running the waste recycle operation such as producing fertilizer from waste?

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. Do the co-operatives offer support or sell animal feed and fertilizer to farmers?

Cooperative 1	Mostly the cooperatives sell fertilizer to farmers. Selling animal foods are the least part.
Cooperative 2	
Cooperative 3	
Cooperative 4	

##### Costs / Profits:

- q. Is there any cost on running waste recycle process? And how?

Cooperative 1	N/A
Cooperative 2	
Cooperative 3	
Cooperative 4	

- q. What are the costs farmers have to pay for receiving, for example, all forms of assistance, animal feed or fertilizer?

Cooperative 1	Member admission fee is 50 baht/person. The cost for share is 10 baht. Each farmer can hold 5 shares in maximum.
Cooperative 2	A member admission fee is 50 baht.
Cooperative 3	Member admission fee is 50 baht/person. The cost for share is 10 baht. Each farmer can hold 20 shares in maximum.
Cooperative 4	<ul style="list-style-type: none"> <li>• A member admission fee is 50 baht.</li> <li>• Document cost is 20 baht/person.</li> <li>• The initial funeral cost is 500 baht/person</li> </ul>

## **The results of the meeting with SME Bank**

### **The first meeting on December 6, 2006**

#### **The meeting attendances**

The representative from SEA C.R. authorities, representatives from SME Bank and the representatives from GTZ.

#### **Objective**

The objectives of the meeting are to find some alternative agreements in principle for the agreed price in selling and buying tapioca products between the ethanol producing factory and cooperatives. The agreed prices should be acceptable by both parties.

### **The second meeting on December 19, 2006**

#### **The meeting attendances**

The representative from SEA-C.R. Co., Ltd., representatives from the Ethanol producing factory and representatives from SME Bank.

#### **The meeting is involved with two main issues that are:**

1. An effort to try to establish the concept of cooperation in the future between Ethanol producing factory and the SME bank
2. An effort to try to establish the policies, strategies, perspectives for the loan system of each cooperatives that will work hand in hand with Ethanol producing factory

**The meeting summary on the issue of establishing the agreements between the  
cooperatives and the ethanol producing factory  
The development of cooperation of supplying tapioca for sustainable ethanol  
production December 14, 2006  
At Amphur Srikiew Nakornratchasima**

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**The meeting attendances**

The representatives from five cooperatives, Ethanol producing factory representatives, SEA C.R. authorities and the representatives from GTZ.

**The details of the meeting and the conclusions obtained****Agenda 1 considering the issues****Agenda 1.1 the species of tapioca used in cultivation**

The representatives from the Ethanol producing factory proposed to use the species CMR 35 – 22/196 in cultivation because they have information from agro cultural research center in Chanthaburi informing them about the quite high amount of products obtained when growing this kind of tapioca. The amount obtained is about 4 ton/rai with a high percentage of starch at 25.9%.

The representatives from the cooperatives said to the meeting that:

1. They worried about the production capability of the tapioca species offered by the Ethanol producing factory. They have information about the different amounts of production that varies from area to area similar to their previous crops of tapioca
2. The representatives from the cooperatives still worried about the price of tapioca stock because the new species of tapioca is usually higher in price when compared to the old stocks farmers had planted previously.
3. In the first year (2007), farmers propose to set up a demonstration crop in each area that each cooperative is responsible for.

**The conclusion**

In the first year of cooperation a demonstration crop to test species type CMR 35 will be planted comparing it to the old type previously grown by the farmers. Each cooperative will prepare a planted area for the demonstration crop as following:

1. Cooperative 1	2	Rai
2. Cooperative 2	12	Rai
3. Cooperative 3	20	Rai
4. Cooperative 4	30	Rai

**Agenda 1.2 the planting time**

The representatives from cooperatives informed the meeting about the time of planting as following:

The planting time for the cooperative 1 is January to July. The planting time for the other three cooperatives is more condensed from March to May depending on the climate (rain). In addition the cooperatives proposed the idea of transferring the planting stock of CMR 35 from the factory to farmers 15 days in advance before planting also they prefer fresh and standardized stock that is able to produce four sticks out of one.

**Agenda 1.3 times for harvesting**

The representatives from the cooperatives provided information to the meeting that harvesting time is November to April. Farmers will harvest at different times depending on

many factors; planting time, the end of rainy season and moisture in soil for example. For the harvesting methods, there are many ways to do it like using tractors for instance for digging tapioca plants up then picking them up by hand or digging by hand and then picking them up.

### **Agenda 2 other issues**

After the meeting to consider the previous three issues, the meeting then dealt with other issues as following:

#### **The amount of production**

The representatives from the Ethanol producing factory were worried about the possibility that the farmers might sell the tapioca somewhere else. The representatives from the cooperatives explained that the cooperatives can deal with this problem because they will select the farmers who will join in the project. Besides this, the selected farmers would be the members who have been engaging in cooperative activities. Also the cooperatives will implement the scheme as a project that farmers would prefer to be part of.

#### **Credit issues**

The representatives from the cooperative provided information to the meeting about the granting of different kinds of credit that depends on the level of debt for farmers and the activities they proposed. Furthermore some companies work with cooperatives to provide support for farmers who are the member of the cooperatives; granting credit for instance to some members in order to buy medium size tractors that will be used for hire in harvesting tapioca crops.

For the issues regarding the sale of tapioca, the representatives from the cooperatives informed the meeting that most of farmers usually sell their products to the cooperatives because they feel secure about the quality of the scales used to measure the weights and starch content of the tapioca.

#### **The amount of production that will be transferred to the factory**

The representatives from the factory were concerned about the shortage of tapioca that will be delivered to the factory on occasions. The meeting came up with two ideas. The first idea is that the factory will be responsible for storing tapioca. And the other solution is to make a mutual plan between the factory and the cooperatives for the periodic or progressive growing of tapioca according to the needs of the factory.

**The meeting summary on the issue of establishing the agreements between the  
cooperatives and the ethanol producing factory  
The development of cooperation of supplying tapioca for sustainable ethanol  
production December 21, 2006  
At Cooperative 5 Amphur Srikiew Nakornratchasima**  
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**The meeting attendances**

The representatives from four cooperatives, Ethanol producing factory representatives and SEA C.R. authorities

**The meeting issues**

1. To reconsider the agreement of the meeting on December 14, 2006
2. The pattern of working together between the Ethanol producing factory and cooperatives

**The details of the meeting and the conclusions obtained****Agenda 1 considering the issues****Agenda 1.1 reconsidering the understandings of the meeting on December 14, 2006**

The meeting reconsidered the agreements regarding the method of cooperation between the factory and the cooperatives, and the understanding about the demonstration crop that will use Species type CMR 35.

**Agenda 1.2 the pattern of working together between the factory and cooperatives**

The discussion about the pattern of cooperation between the Ethanol producing factory and the cooperatives decided on the following issues:

**1. Coordination**

Every one at the meeting agreed that the cooperatives will be the responsible organization dealing with coordination between the Ethanol producing factory and the farmers on all matters involved, for example, plant species, technology used, buying and selling tapioca and funds for the project.

**2. The capital for production**

The factory asked the cooperatives for information about the capital farmers' use in growing tapioca. The information can be categorized as following:

- Land rental cost                      300 – 500 baht
- Plowing costs                            250 – 800 baht
- Tapioca stock costs                    800        baht
- Fertilizer costs                         500 – 700 baht
- Tapioca regeneration costs        130 – 150 baht
- Harvesting costs                        220 – 250 baht
- Labor costs                                130 – 150 baht
- Transportation costs                  5 – 10 satang/kg. or 300 baht/rai

The capital farmers' use is different depending on the growing areas and the pattern of working for instance plowing costs might be higher if some cooperatives plow rows for the

farmers. The tapioca regeneration costs will also be different because the farmers in some areas use pesticides.

### **3. The funds for project implementation**

There was a question regarding the funds offered by the factory to the cooperatives and the cooperatives were concerned about following things:

- Cooperative 1 emphasized about increasing the amount of tapioca. The cooperative asked for the possibility that the factory will offer, for example, plowing costs, the machine for turning hard soils into a useable condition for growing tapioca.  
Previously the farmers have to rent this kind of machine that cost 400 baht/Rai. In one day, the machine can plow through a cultivated area 50 -60 cm in depth. When adding the costs for fertilizer and tapioca stock the total costs comes to 3,000 baht per Rai.
- Three cooperatives, 2, 3 and 4, have the same requirements for funds needed in project implementation. The amount needed should be around 3,000 baht/rai. The funds secured should come without any interest payments

### **4. The soil improvement methods used by farmers**

- Plowing through hardened soil
- Crop rotation
- Soil analysis
- Making compost and organic fertilizer
- Using compost and organic fertilizer

### **Agenda 2 other issues**

Besides the issues emerging from the first agenda, the meeting discussed relevant opinions and ideas about the following:

1. The cooperatives asked the Ethanol producing factory to consider the methods of storing tapioca when there is a period of shortage.
2. Information about the buying and selling places that the cooperatives will use each year

Cooperative 1	3 tapioca grounds
Cooperative 2	1 tapioca ground
Cooperative 3	2 tapioca grounds
Cooperative 4	3 tapioca grounds
3. Tapioca drying process needs 3 – 5 days depending on the moisture in the tapioca.
4. The Ethanol producing factory was concerned that farmers will sell tapioca to other buyers. However the cooperatives assured the Ethanol producing factory representatives that this problem can be controlled because they will select the farmers who will join in this project by checking the history of their activities and they will also monitor the farmers involved in the project.
5. In regard to cooperation with the Ethanol producing factory, the cooperatives wanted to make this project different from other projects.
6. In regards to the funds for project implementation, the cooperatives wanted these funds to be part of cooperative funds

## **Working summary of January 2007**

**The working staff concludes the works of January 2007 as follows:**

1. Researching and collecting the data about the cost of soil inspection. (Reference 1)
2. Collecting the additional data for composing a concept paper. (Reference 2)
3. MOU describing the cooperation between cooperatives and Ethanol producing factory.
4. The meeting where joined by small and medium enterprise development bank (SME Bank) on January 6, 2007.

See the attached references

## 1. Collecting data about the cost emerging from soil inspection (the data provided by Professional from Chiang Mai University.)

**The total cost of soil inspection is 400 baht / 1 sample. It can be divided as follows:**

- Collecting soil samples 50 baht/1 sample
- Cost of sample preparation (grinded and dried) before sending to a laboratory 50 baht/1 sample
- Cost of soil checking in a laboratory 300 baht/1 sample

### **Additional information:**

- Area checked , 5 rais approximately = 1 sample
- The total numbers of samples checked daily are 50 – 100.

Cooperatives	Total cultivated areas (Rais)	Cost of soil inspection (baht/ each inspection)	Total area cultivating tapioca (rai)	Cost of soil inspection (baht /each time)
Cooperative 1	170,000	13,600,000	136,920	10,953,600
Cooperative 2	20,000	1,600,000	10,000	800,000
Cooperative 3	72,395	5,791,600	15,712	1,256,960
Cooperative 4	126,000	10,080,000	6,300	504,000

## 2. Required supports factory would offer

### 2.1 Operational Funds

cooperative	baht / rai	Baht/year
Cooperative 1	2,000	273,840,000
Cooperative 2	3,000	30,000,000
Cooperative 3	3,000	47,136,000
Cooperative 4	3,000	18,900,000

## Chapter I

The alternative crops grown by tapioca growers

Besides growing tapioca, after or during the waiting time for harvesting farmers also grows other crops and do any cultural activities as follows:

1. field crops : corn, sugar cane
2. Orchard : mangoes, custard
3. Cattle: milk cow, beef cow

. The reasons why farmers of each cooperative would rather grow tapioca than other crops are:

1. **Cultivated geography** - Geographical condition of sandy soil and reddish soil (laterite), and very few soils are salty soil and clay. Because tapioca can be grown in almost every kind of soil, thus it's preferable to farmers of every cooperative to grow tapioca.
2. **Insufficient water** - Water needed for cultivations is insufficient because there's no water from artesian wells farmers is merely dependent on rain. Tapioca needs little water for growing. With easy maintenance and give higher amount of production compared to other crops, tapioca is suitable to be grown.
3. **Climate/ Weather** - Because there's little moisture together with long drought, the factors are considered as the proper condition for growing tapioca ( it's tolerable to such climate of Nakornratchasrma )
4. **Choosing a proper time for harvesting** – In harvesting season, farmers stock tapioca production and sell it until high buying price offered. Farmers can leave tapioca in plant beds waiting for the proper time to sell. This is another advantage of growing tapioca compared to other crops that have to be harvested and stored for sometime before selling. (The stored crops will be damaged or lost quality with this storing process.)

### **Corn growing information of each cooperative**

#### **Cooperative 1**

Corn cultivated areas (rai)	6,000
percentage of the total area	3.53 %
Amount of products (kg./rai)	1,000
Obtained products (kg./yearly)	6,000,000
Costs (baht/rai)	2,900
Prices (baht/kg.)	6.7
Profit (baht/yearly)	22,800,000
Profit (baht/rai/yearly)	3,800

#### **Cooperative 2**

Corn cultivated areas (rai)	400
percentage of the total area	2 %
Amount of products (kg./rai)	800
Obtained products (kg./yearly)	320,000

Costs (baht/Rai)	2,800
Prices (baht/kg.)	6
Profit (baht/yearly)	800,000
Profit (baht/rai/yearly)	2,000

### Cooperative 3

Corn cultivated areas (rai)	*35,000
percentage of the total area	48.35 %
Amount of products (kg./rai)	800
Obtained products (kg./yearly)	28,000,000
Costs (baht/rai)	2,200
Prices (baht/kg.)	6
Profit (baht/yearly)	91,000,000
Profit (baht/rai/yearly)	2,600

### Cooperative 4

Corn cultivated areas (rai)	5,000
percentage of the total area	3.97 %
Amount of products (kg./rai)	1,000
Obtained products (kg./yearly)	5,000,000
Costs (baht/rai)	2,800
Prices (baht/kg.)	4.5
Profit (baht/yearly)	8,500,000
Profit (baht/rai/yearly)	1,700

\*The farmers of cooperative 3 have grown corn from generations to generations so there are large areas of corn cultivated areas but the areas tend to be reducing in numbers because the farmers choose to grow tapioca that will need little costs and maintenance and give a lower risk than growing corn.

### Growing corn

1. Farmers spend 3 months for growing corn (from July – September each year)
2. While there's a high cost of growing, corn gives low selling price that's now 5 – 6 baht per kg.
3. Farmers have to fertilize corn twice, once when the corn is blooming, and again when the corn is growing ears.
4. The soils used for corn cultivation have not yet been checked for the appropriate condition. Farmers still have old methods and knowledge of corn growing after harvesting tapioca and old knowledge of fertilization.
5. When blooming, corn flowers will be growing into ears of corn that will later produce seeds. If there is an excess of rain at this time, the corn will partly wilt and fall. That causes a problem for the stamen and pistil blending and if so, corn will be damaged. Corn ears and seeds will be crippled.
6. Harvesting corn needs a lot of workers and it cost very high. There are many harvesting processes and activities, for example, plucking corn, transferring corn to mills, hiring trucks to carry corn from mills.
7. Selling corn when farmers feel satisfied with any rate of price won't be possible sometimes because corn mills are unable to mill a lot of corn overwhelming then. This problem will cause the delay for selling corn at the time high price offered. (Tapioca

are different concerning this problem because farmers can leave tapioca in plant beds until they want to sell)

Average cost for growing corn is about 2,800 baht/rai as following details:

• Land rental costs	600	baht/ Rai
• Rough prowling number 3	150	baht/ Rai
• Rough prowling number 7	130	baht/ Rai
• Corn seeds costs	300	baht/ Rai
• Seed dropping labor	150	baht/ Rai
• Corn regeneration costs	100	baht/ Rai
• Fertilizer costs (Formula 1 6 – 16 – 8)	600	baht/ Rai
• Corn plucking costs	300	baht/ Rai
• Mill costs + milling labor	350	baht/ Rai
• Transportation labor	120	baht/ Rai

**For sugar cane, chili, and custard, they are only grown by farmers of some cooperatives while most farmers grow tapioca. The details of growing other crops can be seen as follows:**

#### **Growing sugar cane**

Sugar cane is partly cultivated in areas of cooperative 3 and cooperative 4. Sugar cane can be grown there because the soil condition (black soil) of the two cooperatives is suitable.

The life cycle of each sugar cane is 5 years. Farmers can harvest sugar cane once a year. The limitation for annual selling is the buying duration of sugar factories is of 3 – 4 months (during December 20 – April 20). If farmers can harvest the sugar canes on time they can sell it, if not they will have to wait until the next year.

Sugar cane growing costs are very high and need a lot of workers. The tough cultivated areas are difficult to access. The minimum costs for transportation is 250 baht.

#### **Growing chili**

Chili cultivated areas are that of cooperative 1 some farmers who are the members of the cooperatives grow chili, as additional crop, on the areas that are not suitable to grow tapioca. The soil on cultivated areas (clay) is used to be grown Chinda chili, Yodson chili. The chilies are for making dried chili or chili peppers.

However growing chili causes high costs, difficulty in maintenance, and risk for very low amount of production. In addition chili stems will be wilt if there's plenty of water while little amount of water causes low quality in production.

#### **Growing mangoes and custard**

Mangoes and custard are grown on cooperative 4 land. The area has more water than that of other cooperatives? With higher moisture and wetter conditions because of the area is situated near Lamthakong river and Khao Yai water resource, there is sufficient water from seasonal rain that is enough for growing any kind of crop.

## Chapter II

### 1. The difference of each cooperative

#### Number of the members and cultivated areas

Cooperatives	Total number of the members	Total cultivated areas
Cooperative 1	6,839	170,000 Rai
Cooperative 2	771	20,000 Rai
Cooperative 3	2,826	72,395 Rai
Cooperative 4	2,350	126,000 Rai

#### Membership

Cooperatives	Admission fees	Income from membership fees
Cooperative 1	<b>Initial membership fees cost 150 baht for new members.</b> <ul style="list-style-type: none"><li>Initial fees 100 baht / person</li><li>Share holding fees (10 baht each)</li></ul> one member holds 5 shares 50 baht	1,025,850 baht
Cooperative 2	<b>Initial membership fees cost 50 baht for new members.</b>	38,550 baht
Cooperative 3	<b>Initial membership fees cost 250 baht for new members.</b> <ul style="list-style-type: none"><li>Initial fees 50 baht / person</li><li>Share holding fees (10 baht each)</li></ul> one member holds 20 shares 200 baht	706,500 baht
Cooperative 4	<b>Initial membership fees cost 570 baht for new members.</b> <ul style="list-style-type: none"><li>Initial fees 50 baht / person</li><li>Document fees 20 baht / person</li><li>Initial funeral payment costs 500 baht/person</li></ul> (First 500 baht for 10 funerals – 50 baht for each funeral. If there will be more funeral, the members have to pay 50 baht for each funeral.)	1,339,500 baht

#### Growing tapioca

Cooperatives	Number of the farmers who grow tapioca	Tapioca cultivated areas (Rai)	Tapioca products (ton/Rai)	Tapioca products (ton/year)
Cooperative 1	4,530	136,920	3	410,760
Cooperative 2	400	10,000	3	30,000
Cooperative 3	374	15,712	5	78,560
Cooperative 4	1,200	6,300	5	31,500

Cooperatives	Tapioca cultivation cost (baht/Rai)	Selling prices (baht/kilogram)	Income (baht/Rai)	Profit (baht/Rai)	Profit (baht/year)
Cooperative 1	3,200	1.20	3,600	400	54,768,000
Cooperative 2	3,400	1.20	3,600	200	2,000,000
Cooperative 3	3,750	1	5,000	1,250	19,640,000
Cooperative 4	2,880	1.20	6,000	3,120	19,656,000

### **Tapioca production process**

#### **Species used**

Cooperative 1	Kasetsart, Rayong 5, Huoybong 60, Rayong 72
Cooperative 2	Kasetsart and Huoybong
Cooperative 3	Kasetsart, CMR 35, Rayong 9 and Huoybong
Cooperative 4	Kasetsart, CMR 35, Rayong 9, Rayong 60 and Saidiew

#### **Species - selection method / technique**

All four cooperatives use the same method for species selection. The method is learning and recollecting the knowledge from previous growing experiences and exchanging the knowledge among tapioca farmers.

Cooperative 1 is the only cooperative that has received some advices for species collection from Houybong tapioca research center.

#### **Soil checking for tapioca growing preparation**

All four cooperatives have soil doctors (soil checkers) who were trained from district cultivation department, and can basically check soil quality.

Cooperative 1 is the only cooperative that was trained and has got some advices from Houybong tapioca research center.

## Institutes or organizations who give advice about tapioca production

Cooperative 1	District Agriculture department and Houybong tapioca research Center
Cooperative 2	There no institutions or organizations who's responsible for this.
Cooperative 3	
Cooperative 4	Local administration organization

## Buying point of each cooperative

Cooperative 1	3 tapioca piling grounds
Cooperative 2	1 tapioca piling ground
Cooperative 3	2 tapioca piling grounds
Cooperative 4	3 tapioca piling grounds

## Cooperative requirement for funds offered from ethanol factory

Cooperative 1	2,000 baht/Rai
Cooperative 2	3,000 baht/Rai
Cooperative 3	
Cooperative 4	

## 2. Problematic issues farmers confront with in the growing process

Topic	Problematic issues
<b>Technology</b>	
<b>species/soil</b>	<ol style="list-style-type: none"> <li>Selecting species that's suitable for soil condition</li> <li>Soil checking</li> </ol>
<b>planting / harvest</b>	<ol style="list-style-type: none"> <li>require species that give high yield per rai and high starch content</li> <li>qualified tapioca stocks for next regeneration</li> <li>maintenance tapioca stems for example, fertilization for soil nourishment and using pesticides</li> </ol>
<b>capital</b>	<ol style="list-style-type: none"> <li>Funds resources that offer lower rate of interest compared to general interest rate :- <ul style="list-style-type: none"> <li>Ago - cultural bank and cooperatives ( 9-10 % per year)</li> <li>Cooperatives (6-7.5 % per year)</li> <li>Private loan such as starch factory , tapioca piling ground (3-5% per month)</li> </ul> </li> <li>Fund resource that is able to provide enough loan for farmers so much that they don't have to take on loan from many resources</li> </ol>
<b>Working structure</b>	
<b>planting / harvest</b>	Tapioca growing techniques that give high yield per rai
<b>marketing</b>	<ol style="list-style-type: none"> <li>present selling prices determined by the factory</li> <li>Farmers don't have any knowledge about starch content. Starch checking technique is offered by the factory.</li> </ol>

### 3. Opportunities and alternatives exploited to resolve the problems farmers confront with in growing tapioca

#### Technology

<b>Problematic issues</b>	<b>Large cooperative</b>	<b>Small cooperative</b>
<b>Species /soil</b> 1. Selecting species that's suitable for soil condition	Receiving advices for soil checking from Houybong tapioca research center	N/A
2. Soil checking	1. Soil checking is offered by soil doctors in communities (villages) who were trained by district agricultural department and Houybong tapioca research center. 2. improving soil quality using hard soil breaking machine to reduce the high compress that harden cultivated soils and help keeping dampness in soil. The machine can work on digging soil for 15 rai per day and it can dig the soil about 50 – 60 cm. in depth.	3. Soil checking is offered by soil doctors in communities (villages) who were trained by district agricultural department.
<b>planting / harvest</b> 1. require species that give high yield per rai and high starch content	There is an ongoing experiment of growing tapioca with water dropping technique in the cultivated areas (2 rai).	N/A
2. qualified tapioca stocks for next regeneration	N/A	N/A
3. maintenance tapioca stems for example, fertilization for soil nourishment and using pesticides	Farmers use chicken drops to fertilize soil before growing tapioca reducing the frequency of adding fertilization in soil.	N/A

#### Capital

<b>Problematic issues</b>	<b>Large cooperative</b>	<b>Small cooperative</b>
1. Funds resources that offer lower rate of interest compared to general interest rate	N/A	N/A
2. Fund resource that is able to provide enough loan for farmers so much that they don't have to take on loan from many resources	N/A	N/A

### Working structure

Problematic issues	Large cooperative	Small cooperative
<p><b>planting / harvest</b> Tapioca growing techniques that give high yield per Rai</p>	Getting some advices from Houybong tapioca research center and district agricultural department	One cooperative (C4) is supported by Local administration organization in term of bringing technician from district agricultural department for giving advices to farmers.
<p><b>Marketing</b> 1. Selling prices are set up by the factory.</p>	N/A	N/A
<p>2. Farmers don't have any knowledge on the technique for starch content checking offered by the factory.</p>	Farmers will sell tapioca in mixed grade without starch checking process.	Farmers will sell tapioca in mixed grade without starch checking process.

### **Chapter III**

#### **The number of starch factories in Nakornratchasima and in nearby provinces**

•Nakornratchasima	27 factories
•Kara sin	8 factories
•Kornkhan	2 factories
•Roi - Ed	1 factory
•Mahasarakham	1 factory
•Chaiyaphoom	5 factories

#### **The conclusion from the discussion with tapioca farmers between 22 – 23 March 2007**

#### **On 22 March 2007**

#### **3 representatives from Cooperative 2**

1. Now tapioca farmers haven't planted CMR 35 yet. If the factory could offer CMR 35, the farmers are willing to use the species in planting.

2. There are no any standard or measure in tapioca selling process between farmers and the factory except starch content inspection.

3. Workers from the factory are responsible for starch content inspection. When selecting tapioca for making measurement, if any worker often select sample tapioca that give a high content of starch, he will possibly be dismissed.

4. Approximately 5 kg. of tapioca will be selected from a truck containing 12 – 14 tons of tapioca. The sample tapioca will be twice measured to indicate starch content and then will be calculated for the mean of all tapioca.

5. In starch inspection process, some factories take the middle and the rear part of tapioca root to measure starch content in stead of the front part, because the front part gives a high content of starch most.

6. The soil condition of the areas are mostly sandy. The soil (top soil) will be washed away easily by rain, and it is not quite good at keeping water or humidity. This kind of soil is, thus, not suitable to use for other crops but tapioca.

7. Farmers usually use chemical fertilizer to fertilize soils because growing tapioca deteriorates the soils. Chemical fertilizer is needed in this case because it can add more nutrients to deteriorated soil.

8. Tapioca farmer are very interested in learning new methods or techniques of increasing tapioca production per each rai from any organization or institution.

9. In the present cooperative 2 has tapioca drying ground for farmer who will take stripped tapioca to be dried there.

10. Stripped tapioca gives a higher price than that of fresh tapioca. Selling stripped tapioca, however, is not popular among tapioca farmers because stripping tapioca is a time consuming process and selling fresh tapioca is more convenient.

11. Stripped tapioca that is dried will lose half its weight to the fresh tapioca. It has to be dried for 2 – 3 days before selling.

12. At the present, because farmers hire contractors for the harvest, the farmers require the factory to offer them harvesting tractors, which can partly reduce harvest costs.

13. Tapioca farmers usually buy soil and tapioca pill from the Ethanol producing factory (100 baht / ton).

They bring this material to fill the top of the planted soil. If the factory offers harvesting tractors, the tractors will leave tapioca pill in the areas that will be serve as free fertilizer.

14. If the durations of growing tapioca last all year round, farmers will grow tapioca to feed the factory all year round.

15. Tapioca farmers have no supports from any institutions except cooperatives.

16. Tapioca farmers and cooperatives are pleased if there will be tapioca drying factory in cooperative areas.

### **On 23 March 2007**

#### **2 representatives from cooperative 1**

1. Until now tapioca farmers haven't planted CMR 35 as yet. If the Ethanol producing factory could offer CMR 35, the farmers are willing to use the species in planting.

2. The soil condition of the areas is mostly sandy. The soil is not quite good at keeping water or humidity. Rain is primarily the source of water for tapioca growing. Thus tapioca is seemed to be more suitable crop than others because tapioca is tolerate to drought.

3. Member cards are required by tapioca farmers who, in coordination with their cooperatives, sell their tapioca production to the Ethanol producing factory so that they can control the amount of tapioca sold to the factory each year.

4. In the present farmers add a sack of fertilizer for 2 rais of planted areas.

5. Most of the farmers who are the members of cooperative 1 have their own land for growing tapioca.

6. The Ethanol producing factory is now responsible for the starch content inspection with the cooperation of the District Agricultural Extension Office, which controls the inspection process and tries to keep it fair for the farmers. This also reduces problems of starch inspection.

7. In the areas responsible by cooperative 1, there are 2 factories (Huaybong) that are situated 40 kilometers far from the cooperatives.

8. The cooperative working should be described as providing tapioca species that is suitable to be grown in the area, and there should be demonstrating planted tapioca beds that are categorized into types of soils (to be suitable for each species).

9. If the duration of growing tapioca lasts all year round, farmers will grow tapioca to feed the Ethanol producing factory all year round.

## I. Itineraries

**The German Technical Cooperation (GTZ)  
Project of Sustainable Supply of Tapioca for Ethanol Production  
Implemented by Southeast Asian Consult & Resource Company Limited (SEA-C.R.)  
at cooperative 3  
October 19, 2006**

### **Rationale**

The policy to promote renewable energies in Thailand is aimed at advocating the use of efficient renewable energy to its fullest. In present the sustainable and low-cost supply of tapioca and sugarcane to produce bio-fuels is the key factor that influences investors' decisions. At the same time, the sustainable and low-cost supply also provides farmers a good income and entails the provision of alternative energy resources for our nation.

In regard to the concepts and requirements on promotion of the use of renewable energies at national level, the Government then promotes the eco-efficiency in agricultural industry. The objective is to reach the maximum level of efficiency in using renewable energies. As the important principle in ethanol production, the sustainable supply of tapioca to feed ethanol factory continually as well as ecologically friendly processes are emphasized. This will, furthermore, provide sustainable economic advantages to both the Ethanol producing factory and farmers.

### **Objectives:**

1. To represent the results obtained from small discussion groups,
2. To represent the cooperation system between farmers and the Ethanol producing factory
3. To provide an opportunity for relevant stakeholders to express their opinions and propose suggestions.

### **Meeting attendants:**

- Interested farmers as well as representatives from the four Cooperatives.
- Officers from Thai-German Programme for Enterprise Competitiveness (GTZ)
- Officers from Southeast Asian Consult & Resource Company Limited (SEA-C.R.)

**The agenda of the meeting to determine the cooperation  
between farmers and the Ethanol producing factory**

9.00 –9.30 a.m.	Registration for attendants at the meeting in Lamtakong Co operative
9.31– 11.00 a.m.	Open the meeting and proceed to the meeting agenda: <ul style="list-style-type: none"><li>- present the results obtained from small discussion groups,</li><li>- present the cooperation system between farmers and the ethanol producing factory and</li><li>- Receive opinions and suggestions from relevant stakeholders (attendances).</li></ul>
11.00-12.00 a.m.	Summarize the results and end the meeting

**The German Technical Cooperation (GTZ)**  
**Project of Sustainable Supply of Tapioca for Ethanol Production**  
**Implemented by Southeast Asian Consult & Resource Company Limited (SEA-C.R.)**  
**at Cooperative 5**  
**November 14, 2006**

**Background**

Based on the past interviews and meetings with the project target group Ethanol producing factory, the representatives of four cooperatives from the Nakornratchasima area a number of groups with similarities of vision have been identified for a cooperation model between the cooperatives and Ethanol producing factory. We, that is Southeast Asia Consult & Resource Company Limited, now wish to invite you to a follow-up meeting of all five target groups together in Korat.

During that meeting we hope to forward the outlines of a cooperation model based on the target groups' vision as developed from our last meetings. Some currently open issues for the cooperation model still need additional input from all participants in order to proceed to the next step of selecting a committee formulating details of a memorandum of understanding for cooperation between stakeholders.

**Objectives:**

1. Introduce summary of findings from the last round of talks to serve as a draft for a cooperation model outline
2. Agree on a definite common framework for future cooperation
3. Elect a committee that elaborates details of the common framework in a number of future meetings

**Participants:**

1. Representatives of the four cooperatives from the Nakornratchasima area
2. Representatives of Ethanol producing factory.
3. Representatives of Thai-German Programme for Enterprise Competitiveness (GTZ)
4. Southeast Asian Consult & Resource Company Limited (SEA-C.R.)

**The German Technical Cooperation (GTZ)**  
**Project of Sustainable Supply of Tapioca for Ethanol Production**  
**Implemented by Southeast Asian Consult & Resource Company Limited (SEA-C.R.)**  
**29 November – 9 December 2006**

**Objective:**

1. To study the vision, goals, needs and expectation from the agricultural sector
2. To understand the value chain of tapioca.
3. To increase the production and profit of tapioca without negative effects on the environment
4. To provide a continuing supply for the Ethanol producing factory with an acceptable price for both farmers and factory.
5. To increase the production of raw material and enhance the value costs of the raw material.
6. To use the results of the workshops on objectives 1-5 to initiate integrated methods of managing the value chain that will benefit both sides for the sustainable Supply of Tapioca to create an Ethanol Program.

**Schedule table for fieldwork data collecting**

<b>Dates</b>	<b>Time</b>	<b>Activities</b>	<b>Place</b>
November 29,2006	09.00 – 12.00	Making an appointment with the representative of Ethanol producing factory. in order to talk in detail about collecting data from the factory	Bangkok
November 30 ,2006 – December 1,2006	09.00 – 16.00	Making an appointment with the representative from cooperative 1 in order to talk in detail about collecting quantitative data from the farmers	Cooperative 1
December 2 – 3 ,2006	09.00 – 16.00	Making an appointment with a representative from cooperative 2 in order to talk in detail about collecting quantitative data from their farmers	Cooperative 2
December 4 – 5 ,2006	09.00 – 16.00	Making an appointment with the representative from Cooperative 3 in order to talk in detail about collecting quantitative data from their farmers	Cooperative 3
December 6 – 7 ,2006	09.00 – 16.00	Making an appointment with the representative from cooperative 4in order to talk in detail about collecting quantitative data from their farmers	Cooperative 4
December 8 ,2006	09.00 – 16.00	Reserving time in case of the necessity to collect more information from farmers	Nakornratchasima
December 9 ,2006	09.00 – 16.00	Making an appointment with the representative of Ethanol producing factory in order to talk in detail about collecting data from the factory	Bangkok

**The German Technical Cooperation (GTZ)**  
**Project of Sustainable Supply of Tapioca for Ethanol Production**  
**Implemented by Southeast Asian Consult & Resource Company Limited (SEA-C.R.)**  
**December 6, 2006**

**Objectives:**

The objectives of the meeting are to find some alternative agreements in principle for the agreed price in selling and buying tapioca products between the ethanol producing factory and cooperatives. The agreed prices should be acceptable to both parties.

**The meeting attendances**

Representatives from SME Bank, SEA-C.R. Co., Ltd. and GTZ.

**The German Technical Cooperation (GTZ)**  
**Project of Sustainable Supply of Tapioca for Ethanol Production**  
**Implemented by Southeast Asian Consult & Resource Company Limited (SEA-C.R.)**  
**At Amphur Srikiew Nakornratchasima**  
**December 14, 2006**

**Objective:**

1. Discussion about the pattern of cooperation between the factory and the cooperatives

**Meeting attendants**

Representatives from five cooperatives Ethanol producing factory representatives, SEA C.R. authorities and the representatives from GTZ.

**The meeting is involved with main issues that are:**

1. The type of tapioca species used in cultivation
2. Planting times
3. Harvesting times
4. Other issues

**The German Technical Cooperation (GTZ)**  
**Project of Sustainable Supply of Tapioca for Ethanol Production**  
**Implemented by Southeast Asian Consult & Resource Company Limited (SEA-C.R.)**  
**December 19, 2006**

**The meeting attendants:**

Representatives from SME Bank, SEA-C.R. Co., Ltd. and Ethanol producing factory.

**The two main issues of the meeting are:**

1. An effort to try to establish the concept of cooperation in the future between Ethanol producing factory and the SME bank
2. An effort to try to establish the policies, strategies, perspectives for the loan system of each cooperatives that will work hand in hand Ethanol producing factory.

**The German Technical Cooperation (GTZ)**  
**Project of Sustainable Supply of Tapioca for Ethanol Production**  
**Implemented by Southeast Asian Consult & Resource Company Limited (SEA-C.R.)**  
**December 21, 2006**  
**At Amphur Srikiew Nakornratchasima**

**Objectives:**

1. To review the agreement of the meeting on December 14, 2006
2. To find a cooperative working between the factory and the cooperatives

**The meeting attendances**

The representatives from four cooperatives, Ethanol producing factory representatives and SEA C.R. authorities

**The main issues of the meeting were:**

1. reviewing the understandings of the meeting on December 14, 2006
2. the cooperative working structure between the factory and the cooperatives
3. other issues

**The German Technical Cooperation (GTZ)**  
**Project of Sustainable Supply of Tapioca for Ethanol Production**  
**Implemented by Southeast Asian Consult & Resource Company Limited (SEA-C.R.)**  
**At Nakornratchasima**  
**22-23 March 2007**

**Rational**

Based on past interviews with the project's target group's representatives, the four cooperatives from the Nakornratchasima area and the working team are developing a cooperative working structure between the cooperatives and Ethanol producing factory. However the team understands the necessity of gathering more information; firstly about the cultivation process from the farmer's representatives on the four cooperatives, then secondly, how to develop a sustainable working cooperation between the Ethanol producing factory and the farmer's cooperatives.

**Objective:**

1. To discuss with the farmers as well as representatives from the four cooperatives in Nakornratchasima area about more information on tapioca cultivation and the cooperative working structure.

**Participants:**

- a. Individual farmers as well as representatives from the four cooperatives in Nakornratchasima area.
- b. Representatives of Thai-German Programme for Enterprise Competitiveness (GTZ)
- c. Working team from Southeast Asian Consult & Resource Company Limited (SEA-C.R.)

**The agenda of the meeting with farmers  
At Nakornratchasima  
22-23 March 2007**

<b>Time</b>	<b>Program</b>
<b>22 March 2007</b> 12.00-15.00	Discussions with individual farmers as well as representatives from cooperative 2
17.00-20.00	Discussions with individual farmers as well as representatives from cooperative 4
<b>23 March 2007</b> 12.00-15.00	Discussions with individual farmers as well as representatives from cooperative 1
17.00-20.00	Discussions with individual farmers as well as representatives from cooperative 3

## II. TOR

# Development of Concept for Sustainable Supply of Tapioca for Ethanol Production

## TOR for Local Consultant

### Draft

#### 1. Background

The Government of Thailand has set ambitious targets to promote renewable energy and energy efficiency. This includes the production of biofuels from tapioca and sugar as well as biodiesel from palm oil. To secure a long term supply of raw materials at affordable prices is a major concern of each investor in biofuel production. To increase the income of farmers and to increase the energy security of the country by substituting costly oil imports through renewable resources like bioethanol are the main interests of the Thai government.

The E3Agro Project ("Energy and Eco-Efficiency in Agro-Industry") supports the Thai Government in reaching its biomass energy and energy efficiency targets. The Project is part of the new Thai-German Programme for Enterprise Competitiveness (TG-PEC) which is supported under a grant from the "German Federal Ministry for Economic Cooperation and Development (BMZ)". The Project is jointly implemented by the Thai Department of Alternative Energy Development and Efficiency (DEDE) under the Thai Ministry of Energy and German Technical Cooperation (GTZ). The E3Agro Project is closely cooperating with the business development & financial services component and the eco-efficiency component of the Programme to improve the value chain in the tapioca sector under economic and ecological aspects.

The E3Agro Project has been approached by the company Koratec Ethanol Co. to cooperate in the field of sustainable production of ethanol from tapioca. Fields of cooperation include efficient generation and utilization of biogas from waste material at the ethanol factory and sustainable supply of raw material to the factory.

Koratec Ethanol Co., Ltd. is a joint venture company between Thai and Australian investors to produce ethanol from tapioca with the installed capacity of 300,000 tons/day. The production requires the regular supply of tapioca at 1,500 tons/day. To secure the regular supply of tapioca, there is a need for fruitful partnership between the tapioca farmers and the factory. The factory will be located in Korat province. Two meetings between representatives of the Tapioca Farmers Cooperatives, Koratec and GTZ took place to clarify objectives and roles within this cooperation.

While Koratec will start with the implementation of certain short term measures like field trials of new tapioca varieties bearing higher yields, it has been agreed

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that the E3Agro Project will develop a concept for sustainable production of ethanol from tapioca, covering the value chain from farmers to factory, addressing economic, social and environmental issues. Both sides, the tapioca farmers cooperatives and Koratec have accepted that GTZ takes on the role of an independent mediator. On the plantation side the main issue is increasing the yield and income from tapioca farming without negative impact on the environment. On the factory side the main issue is to secure a long term supply of tapioca at affordable prices.

The concept shall be developed with participation of all key stakeholders to build up mutual understanding, ownership and trust and to come forward with a solution where benefits and risks are fairly shared between the interest groups.

To develop the concept E3Agro is looking for a local consultant experienced in a multi stakeholder participatory approach. The consultant has to provide and coordinate a team of experts with the following key qualifications:

- 5 years experience in social environmental and economic development projects
- 5 years experience in mediation and multi stakeholder participatory approach
- experience in working with farmers
- expertise in tapioca growing, yield etc
- agricultural extension services
- fluent in Thai and English
- Good reporting skills

The concept is seen as a pilot case for sustainable ethanol production. Implementation of the whole concept or of certain measures will be up to Koratec and the Tapioca Farmers Cooperatives. In this case the E3Agro Project would be willing to provide impact monitoring through an independent consultant at a later stage.

It is intended to provide backstopping services to the local consultant through an intern consultant who is experienced in lifecycle analysis of biofuels.

## **2. Objective**

The overall objective of this study is to develop a concept for the sustainable supply of tapioca to an ethanol factory for biofuel production which is accepted by the ethanol factory and the farmers. The concept should be developed with participation of all stakeholders and should find wide consensus in order to be implemented by the stakeholders without further support from the E3Agro Project beyond monitoring the implementation process and its impact.

The concept should line out the role of the various stakeholders, describe the measures which they are going to implement and how the cooperation between the stakeholders shall work. The concept shall serve as a pilot case for sustainable ethanol production and after successful implementation by the stakeholders is intended to become a role model for further dissemination.

### **3. Methodology**

The local consultant will develop the concept in a participatory approach with all stakeholders. This includes individual discussions as well as joint meetings with various stakeholders to foster mutual understanding, ownership and trust and to come forward with a solution where benefits and risks are fairly shared between the interest groups.

The local consultant will cooperate closely with the E3Agro-Project, the PFS Project (Promotion of Financial Services), other Projects under the TG-PEC and with respective institutions and associations in the field of tapioca for further dissemination.

The local consultant will cooperate with an international consultant in the field of life cycle assessment of biofuel production.

### **4. Scope of work**

- Prepare work plan for concept development, including data to be collected, institutions and stake holders to be involved
- Review available information, on site data collection and evaluation
- Plan, conduct and carryout meetings and workshops with stakeholders
- Present findings to project and stakeholders, present alternative solutions, facilitate discussions, mediate between stakeholders
- Present draft final report to the Project and stakeholders
- Incorporate comments and revise report
- Prepare final concept and present to all stakeholders

### **5. Deliverables**

- Work plan to carry out concept development
- Data collection, analysis and presentation of findings
- Draft concepts addressing most important issues including various options for further discussion with stakeholders (by 24 November 2006)
- Final concept (about 50 pages)
- Monthly progress reports (brief)
- Agendas and reports on stakeholder workshops

The final concept has to include:

- Pricing system for tapioca which is fare to farmers and ethanol factory and accepted by both
- Implementation plan for the ethanol factory outlining measures, costs, benefits
- plan for tapioca farmers association outlining measures, costs, benefits
- model plan for typical farmer outlining measures, costs, benefit

PN 2003.2139.8-005.00 TOR Sustainable Supply of Tapioca for Ethanol Production.doc 08 .09.2006 4/4

- brief scenario if the proposed concept would be implemented Thailand wide what would be its economic social environmental benefits, risks
- recommendations for Thai government regarding biofuel promotion from ethanol (eg zoning, permits for production, price guarantees etc)

The following issues should be addressed in the final concept:

- analysis of present situation of farmers in respective areas, reasons for low yield or growing other crops
- potential for yield and income improvement from tapioca growing
- how to increase of starch yield per rai (costs, benefits)
- increase of income for farmers, other needs
- best practice farming and harvesting technology
- financing for saplings, fertilizers, machines
- services (training, consultancy, research, supply etc...)
- transport, logistics
- chipping, drying, quality issues
- long term supply security for factory at affordable prices
- supply demand issues, impact on farmers and factory, competition for tapioca supply, scenarios, recommendations
- recycling/ reuse of waste products from factory for farmers as fertilizer, animal feed etc
- life cycle assessment (with support of international consultant)
- social and environmental standards, corporate responsibility, green label
- expected social, environmental and economic impact

## **6. Period of assignment**

September 2006 to March 2007