

Application of GIS to Model the Palm Oil Supply Chain
in the Pakpanang River Basin
and Adjacent Area in Nakhonsithammarat.

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Abstract: The study area of this research focused on two areas of Nakhonsithammarat, including the Pakpanang River Basin (the east area of Nakhonsithammarat mountain range) and the area of 18 districts located in the northern province of Nakhonsithammarat. The objectives of this study composed of presenting the database of the current palm oil supply chain through GIS and studying the optimum model of palm oil supply chain in order to support the expansion of palm oil plantation in the area of Pakpanang river basin.

The method of this study is to survey the area of palm oil plantation, oil palm trading ground and crushing mills through GPS; to build the database area through GIS by overlaying the data (Overlay Technique) Layer of the spatial database. Including the distribution of oil palm trading ground to build the new supply chain model. There are three major stakeholders of palm oil supply chain including: (1) Farmer, (2) oil palm trading ground; (3) crushing mills. The factor affecting stakeholder decision to sell palm oil is the transportation distance, followed by the price.

This study found that the farmer always sell the palm oil to the nearest area of the oil palm trading ground. Then the oil palm trading ground will send the consolidated palm oil to the nearest crushing mill. However, the remote distance between the oil palm trading ground will affect the quality of palm oil. Finally, we find that there are not enough buying capacity. Therefore, we should build more crushing mill in a position south of Amphur Muang which overlap with Amphur Muang, Amphur Phaphom and Amphur Pak Panang, for solving the monopoly problem, supporting of the expanded palm oil plantation, and also increasing demand of palm oil.

INTRODUCTION

Nowadays oil palm becomes initial raw material for several kinds of industrial product and it is popular industrial crop. From the past until today oil palm industrial is gradually growing and expanding. Oil palm cultivated area is all over among the country especially in the southern part as it is the most suitable area for the plant. The highest cultivated area for oil palm is in particular province such as Krabi, Chumporn and Suratthani, they have the percentage of oil palm cultivating up to 80 percent of all oil palm cultivated area in Thailand. The oil palm cultivate has expanded to the nearby province which Nakhonsithammarat is one of the place where the number of oil palm plant is increase by looking at its planting area and the outcome of products. Even the planting area of oil palm in Nakhonsithammarat is mostly along the border line between Krabi and Suratthani where the location is the west part of Nakhonsrithammarat Mountain range. Main business of oil palm was dealing mostly within Krabi and Suratthani as a main market. In the east part of Nakhonsithammarat mountain range it has the same continually increase as in the west but there's a problem on eastern area about cost management and the market as the transportation is not convenience because of the mountainous geography as a barrier, also there is not much buyer where is effect to the expansion of the market. Even on the east part of Nakhonsithammarat has divided into two parts which the main part is low land in Pakpanang river basin area and the upper part of Pakpanang river basin, but in that following areas are considered as a good place to plant and there is possibility to expand as well.

The research area has divided into 2 parts which is Pakpanang river basin and nearby area in Nakhonsithammarat province comprises of 18 districts is 1.) Pakpanang river basin consists of eastern coast side where it covered the area of Nakhonsithammarat, Pattalung and Songkhla provinces. The total area is 1.9 million Rai included 13 districts consist of Pakpanang, Cha-uad, Ronpiboon, Chianyai, Lanska, Chulaporn, Chalermprakiat, Praprom, Hua-sai, and Muang district in Nakhonsithammarat district plus Kuankanoon and Paprapayom district in Pattalung province and Ranode district in Songkhla province 2.) The nearby area of Nakhonsithammarat province, specifically in the east side of Nakhonsithammarat mountain area where excluded from Pakpanang river basin with 5 districts consist of Khanom, Sichon, Thasala, Noppitam and Promkiri district Nakhonsithammarat province.

The purpose of the research is to present the basis information of Oil palm supply chain at the current time through geography information. And to study and find the suitable Oil palm supply chain that could support the expansion of Oil palm cultivation in Pakpanang river basin and nearby area in Nakhonsithammarat province.

METHODS AND EQUATION

Due to the fact that the person who is involved with Oil palm supply chain in Pakpanang river basin and nearby area in Nakhonsithammarat province is scattered in different area which it is necessary to know the location of those people who are involved in: farmer, oil palm trading ground, and crushing mills. One of the main reasons of Oil palm plantation is distance. From the interview of oil palm trading ground, found that distance does effect to the decision making of seller to choose crushing mill as well.

The GIS becomes part of this research that support the presentation of spatial information and thematic map for palm oil supply chain where it helps to show spatial pattern data in study area so the accurate location and distance in GIS data is important. This reflects and clears up the distance issue. Its capability supports the supply chain analysis in order to find the most suitable way and descriptor for spatial distributions.

GIS is the tool that helps to show the connection of the resources factory and customer where it goes through the basis information that could tell distance of transportation and the involver in supply chain.

The digital map consist of 5 levels

1. The information of administrative district level
2. The information of route level
3. The information of Oil palm plantation level
4. The information of oil palm trading ground and buyers' market level

5. The information of Oil palm crushing mill level

The instruction to use ArcGIS program by bring all the information to synthesize to make a map where it is easier to understand and to present the following information

1. Oil palm plantation area
2. Oil palm trading ground and buyers' market of agriculturist location
3. Oil palm crushing mills location
4. Route of transportation

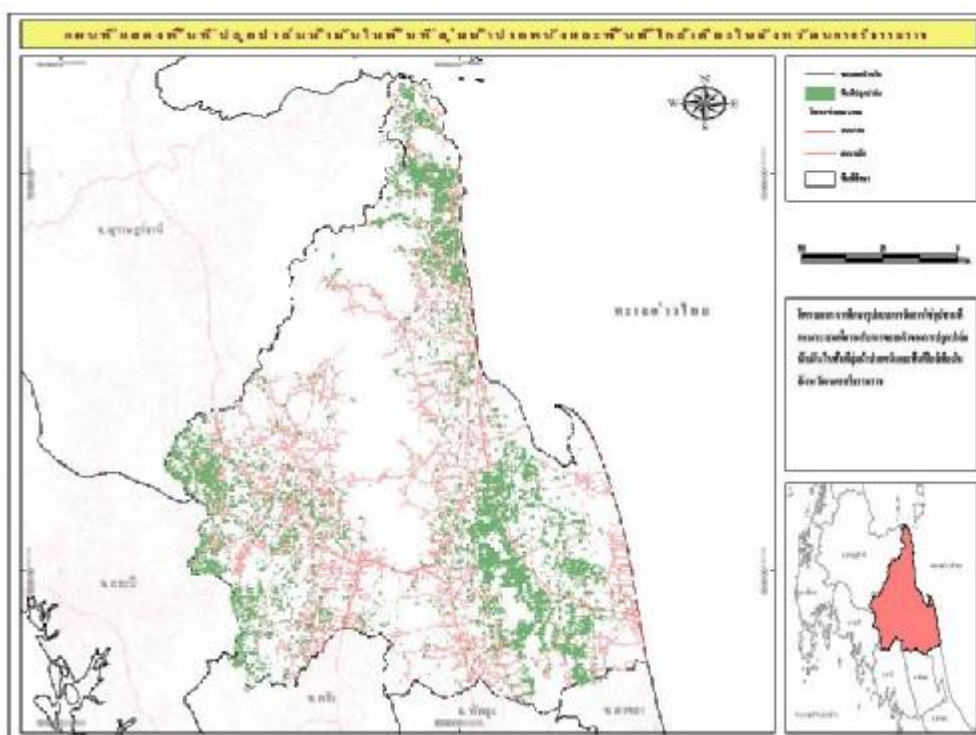
The location was surveyed of oil palm plantation of Pour court's location and crushing mills is done by GPS and have built up the location primary base by Geographic Information System(GIS) by Overlay technique and Measures for Centrality(Mean Center) between layer of location primary base. There's the study of the scattered of oil palm trading ground to analyze for suitable supply chain and the collaboration of ABC Cluster plan into supply chain reproduction to build up the new supply chain.

RESULTS

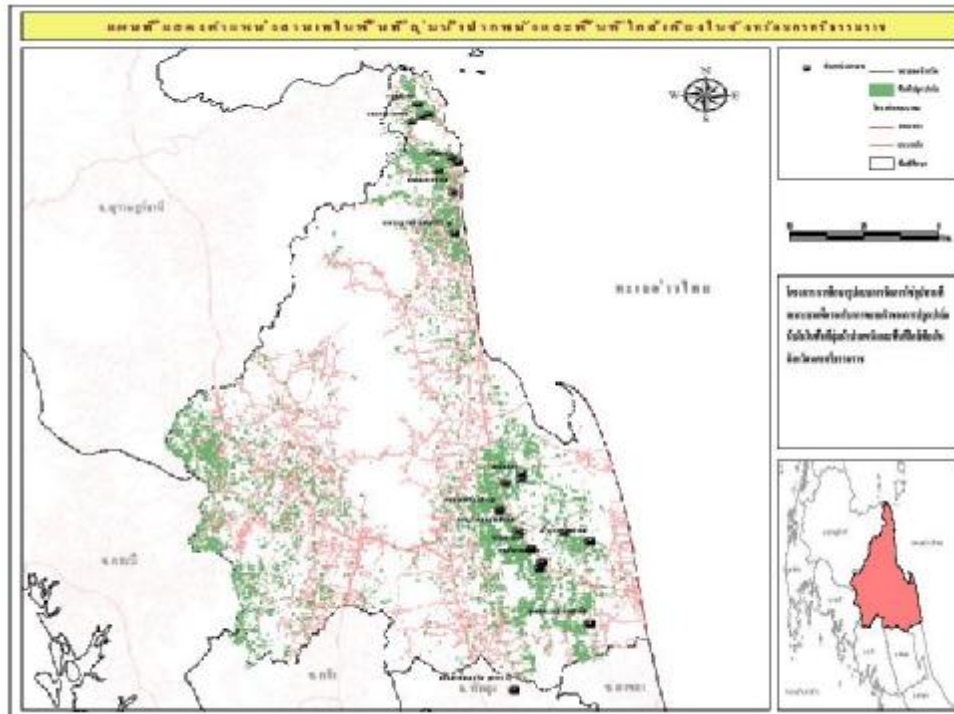
In Oil palm industry in Pakpanang river basin and nearby area in Nakhonsithammarat province, there are 3 connections in 3 levels which are 1.) Oil palm farmers (the resources of water source production) 24,155 farmers were registered 2.) Oil palm trading ground (the gatherer) 91 people 3.) The raw oil crushing mills there are 2 factories where it supports oil palm products from farmer and oil palm trading ground then it transferred to crushing mills (downstream industry) where at the moment they have it but outside of the study area then it has sent to consumer and some other factories such as vegetable oil, instant noodle, sweetened condensed milk, etc... also it has sent to Biodiesel factory to be an alternative energy.

The picture show the location and the journey and distance of oil palm plantation, oil palm trading ground and crushing mills from picture 1-3.

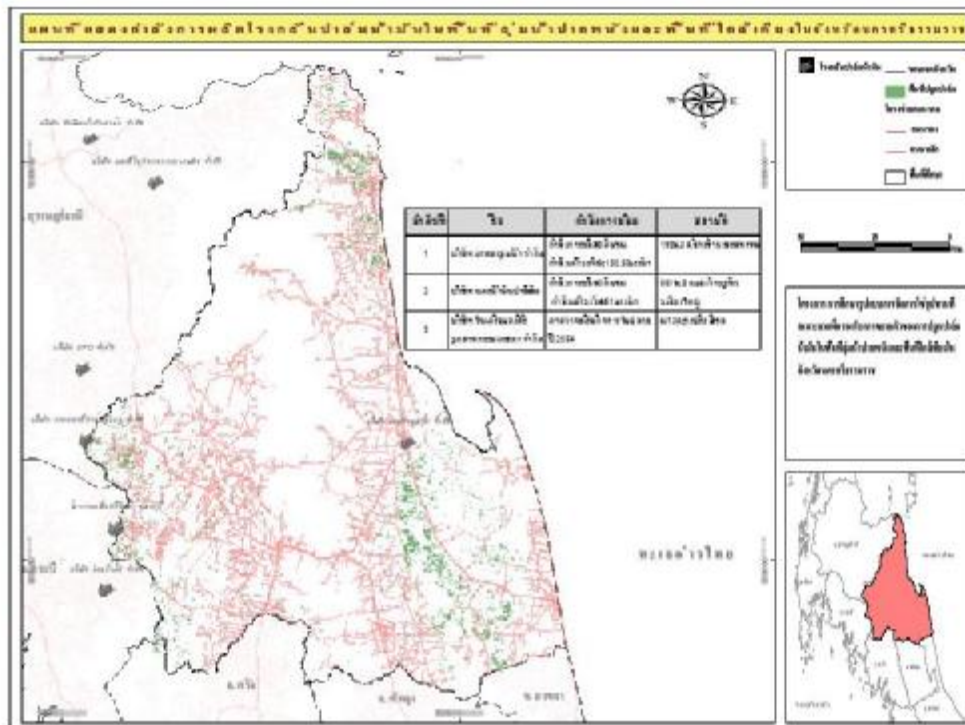
From the picture (1) it shows the current geographic picture of oil palm plantation. This reflects the increase number and the density in area 3. Part of Nakhonsithammarat province is northern south eastern and south western where this research only made in the northern and south eastern part.



Picture 1: the picture show the density of oil palm plantation under the amount that had registered with Nakhonsrithammarat agricultural office.



Picture 2: this show the number of the sample group of oil palm trading ground in Pakpanang river basin and nearby area in Nakhonsrithammarat province.



Picture 3: this show the number of the crushing mill where located in oil palm trading ground in Pakpanang river basin and nearby area both inner and outer Nakhonsithammarat province.

According to the examination from picture of GIS has reflect the area of oil plantation that has scattered in different area depend on the suitability of the place. Part of oil palm trading ground has located along the transportation line where it close to the plantation area where it is easy for the farmer to get to and easy access for oil palm trading ground.

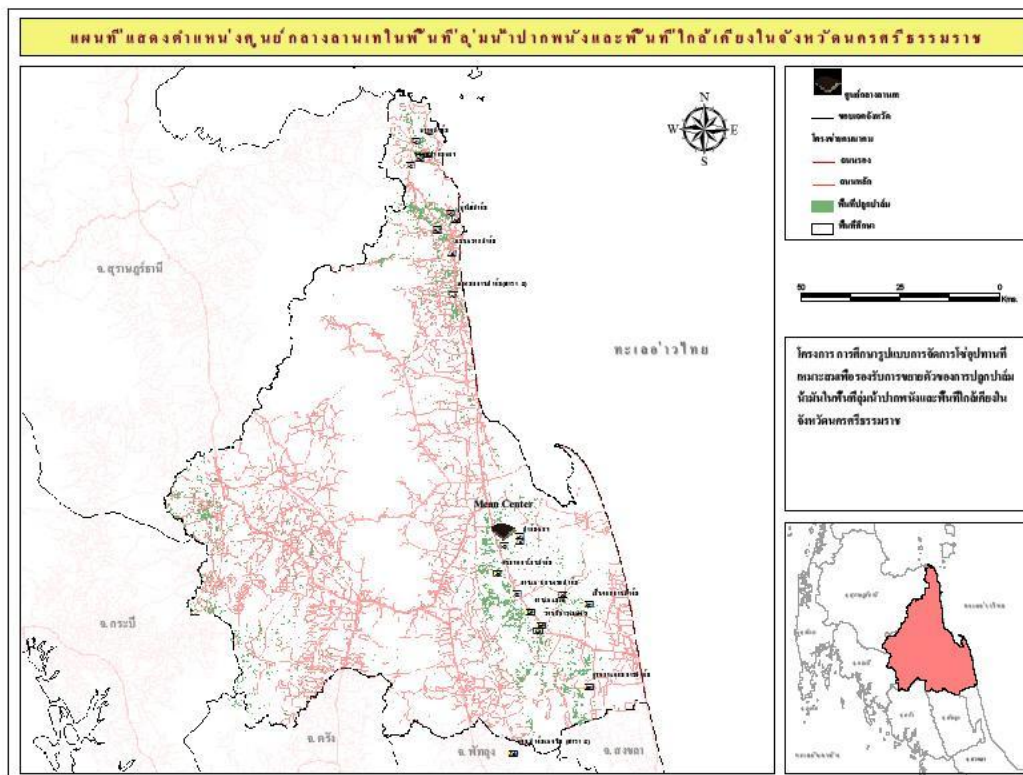
DISCUSSION

Part of the database and the presentation through the map, there is some remarkable point which is about the distant issue that affects to supply chain procedure from farmer till crushing mills. The quality does get a big effected from distant issue. So every part at get involved in supply chain has to think about location of business to make it worth most for their investment.

CONCLUSIONS & RECOMMENDATIONS

The supply chain have emphasized in the vertical structure in part of crushing mills. Since it has designed in the vertical structure so the number of member has been add up in each level. In this case it presents the crushing mills in vertical structure. Structure 1) remaining the former crushing mill, only one factory, but has increased in production line. Structure 2) add up a larger crushing mills within the area. Structure 3) add up more of crushing mills in the small and medium size within the area where this can be done in 2 characters: 1. Open up the new face 2. Adapt old business such as mill into crushing mills. Structures 4) add up more small and medium size of crushing mills and turn it to the cooperation system.

As a result of the most suitable supply chain that support the expand of oil palm plantation, according to the research and the analysis, the crushing mills will build up under structure 2.



Picture 4: the map shows suitable area for crushing mill location.

The farmer prefers to send their oil palm to nearby oil palm trading ground and they will gather and send oil palm to the nearby crushing mills as well. But the big issue at the current time is that some oil palm trading ground is located too far

from the crushing mills where it gives a big affect to the oil palm that the quality became decreased if it takes too long in the transportation. And there are only 2 crushing mills that running the business right now where it is not enough. As the consequence this cause the monopoly business in the market that make the farmer and oil palm trading ground losing their power of negotiating. So the oil palm trading ground sends the product to outer crushing mill where this has increased the transportation cost. Hence, the new crushing mill is needed to build up to be able to support the products. Like in Pakpanang river basin that definitely need more crushing mills and it should be in the southern area of Muang district where it is in between Praprom and Pakpanang district.

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