Gis Site Selection Application For Energy Crop In Kanchanaburi

การใช้เทคโนโลยีภูมิสารสนเทศเพื่อการศึกษาหาพื้นที่เหมาะสมกับการปลูกพืชพลังงานทดแทน

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Abstract

Development of alternative energy in biofuel to reduce requirement on petroleum that are always a problem of price fluctuations and productivity. While biofuels can be produced from various agricultural products, including cassava, sugarcane, palm oil, soybean oil and corn, but vice versa. Agriculture in the field of renewable energy has now become a major problem in the world. The area used for the production of crops for human consumption, directly or as feed, as well as raw materials for agriculture. In analyzing the areas suitable for the replacement crops, the primary areas to be analyzed are the priority areas for expansion, including lowland areas, degraded forest areas, acid sulphate soils, rubber plantations, and abandoned areas. Kanchanaburi province is one of the largest cassava area of Thailand, from the suitable analysis study, the most suitable area for cassava are 460,456.25 rai of cassava or 14.7%. The average suitable area for cassava are 143,118.75 rai of cassava or 12% and there are 7,012.5 rai of abandoned land with not suitable and medium for cassava. The most suitable area for sugarcane are 788,681.25 rai or 22.9%. The average suitable area for sugarcane are 188,693.75 rai or 12.3 and there are 52,775 rai of abandoned land with not suitable and medium for sugarcane.

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การพัฒนาพลังงานทดแทนในเชื้อเพลิงชีวภาพเพื่อลดความต้องการใช้ปิโตรเลียมที่เป็นปัญหาความผันผวนของราคาและผลผลิต แม้ว่าเชื้อเพลิงชีวภาพสามารถผลิตได้จากผลิตภัณฑ์ทางการเกษตรต่างๆเช่นมันสำปะหลังอ้อยน้ำมันปาล์มน้ำมันถั่วเหลืองและข้าวโพด แต่ในทางกลับกัน การเกษตรในสาขาพลังงานหมุนเวียนได้กลายเป็นปัญหาสำคัญในโลกแล้ว พื้นที่ที่ใช้ในการผลิตพืชเพื่อการบริโภคของมนุษย์โดยตรงหรือเป็นอาหารสัตว์รวมทั้งวัตถุดิบเพื่อการเกษตร ในการวิเคราะห์พื้นที่ที่เหมาะสำหรับพืชทดแทน พื้นที่หลักที่จะนำมาวิเคราะห์เป็นพื้นที่สำคัญสำหรับการขยายพื้นที่ ได้แก่ พื้นที่ที่ราบลุ่มพื้นที่ป่าเสื่อมโทรมกรดซัลไฟต์สวนยางพาราและพื้นที่รกร้าง จังหวัดกาญจนบุรีเป็นแหล่งปลูกมันสำปะหลังที่ใหญ่ที่สุดแห่งหนึ่งในประเทศไทย จากการวิเคราะห์ความเหมาะสมของการใช้ที่ดิน พบว่ามีพื้นที่ความเหมาะสมกับการปลูกมันสำปะหลังมากที่สุดคือปลูกมันสำปะหลัง 460,456.25 หรือ 14.7% พื้นที่ที่เหมาะสมปานกลางแก่การปลูกมันสำปะหลังมีการปลูกมันสำปะหลัง 143,118.75 หรือ 12% และมีพื้นที่รกร้าง 7,012.5 ไร่ ที่ไม่เหมาะสมกับการปลูกสำปะหลัง และจากการวิเคราะห์ความเหมาะสมของการใช้ที่ดิน พบว่ามีพื้นที่ความเหมาะสมกับการปลูกอ้อยมากที่สุดคือปลูกอ้อย 788,681.25 หรือ 22.9% พื้นที่ที่เหมาะสมปานกลางสำหรับการปลูกอ้อยมีการปลูกอ้อย 188,693.75 หรือ 12.3% และมีพื้นที่รกร้าง 52,775 ไร่ ที่ไม่เหมาะสมกับการปลูกอ้อย

Key Words: Alternative energy, energy crop, site selection, biofuel

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Introduction

In the present, the focus is on developing more than renewable energy, especially biofuels, to reduce dependence on petroleum. This is always a problem of price fluctuations and productivity. While biofuels can be produced from various agricultural products, including cassava, sugarcane, palm oil, soybean oil and corn. Agriculture in the field of renewable energy has now become a major problem in the world. It is the area used for the production of food for human consumption either directly or as animal feed, as well as feedstock for agricultural industries. It is divided into various alternative energy crops. This is because the demand for energy crops for biofuels has increased, causing global concern over the crisis. Thailand has a role as a major agricultural producer, with the potential and readiness to produce alternative energy crops, especially palm oil, tapioca and sugarcane. The process of ethanol production is can produced from the agricultural plat such as sugar, flour and rice straw (Department of Alternative Energy Development and Efficiency, 2017). To increase the proportion of

alternative energy use, the oil palm is used in biodiesel production. Thailand still has less potential oil palm production than Malaysia and Indonesia. The government is working to expand its palm plantation, as the world's largest palm oil exporter. In Thailand for cassava and sugarcane can be used to produce ethanol, to reduce the use of petroleum by converting cassava and sugarcane into ethanol. Ethanol plant, most of the raw materials used in sugarcane molasses. However, alternative energy crops from tapioca, sugarcane and palm oil in Thailand especially in Kanchanaburi in figure 1. Still, the problem of volatile output is due to uncertain weather conditions and rising supply and demand both domestically and internationally. Therefore, the solution to the problems that the government has to accelerate is to accelerate the expansion of cultivation area and increase the efficiency of crop production. The division of zones in each crop, especially the growing of plants with food. Planting crops for renewable energy in order to be able to apply biotechnology to optimize energy crops and expand cooperation with other countries. In the region to invest in growing crops in neighboring countries in the form of contract farming more to be able to effectively manage material risks. The analyze of areas suitable in Kanchanaburi for the replacement crops, the primary areas to be analyzed are the priority areas for expansion, including abandoned areas, abandoned areas, lowland areas, degraded forest areas, acid sulphate soils, rubber plantations, and abandoned areas. This study used to analyze the suitable area for cassava and sugarcane, the data are taken from the land development department and compare with the existing land use in Kanchanaburi. To find the suitable area for cassava and sugarcane that are using for the other purpose. Under conditions of economic return, it must be better than the original crop production, the suitability of soil and geographical conditions, the possibility of modifying farmer behavior and the yield of the planted area should be not far from processed plant. In tracing a production or conversion facility, the costs of the raw materials represent an important portion of the whole costs of manufacturing the end product. In a high-volume, low-profit-margin process, a small difference in raw material costs can determine whether a plant will be profitable or not. the ethanol plant in Kanchanaburi, it is shown in figure 2, one is Kon Kaen Ethanol plant and the other is Namtal Thai Ethanol Co,.Ltd.

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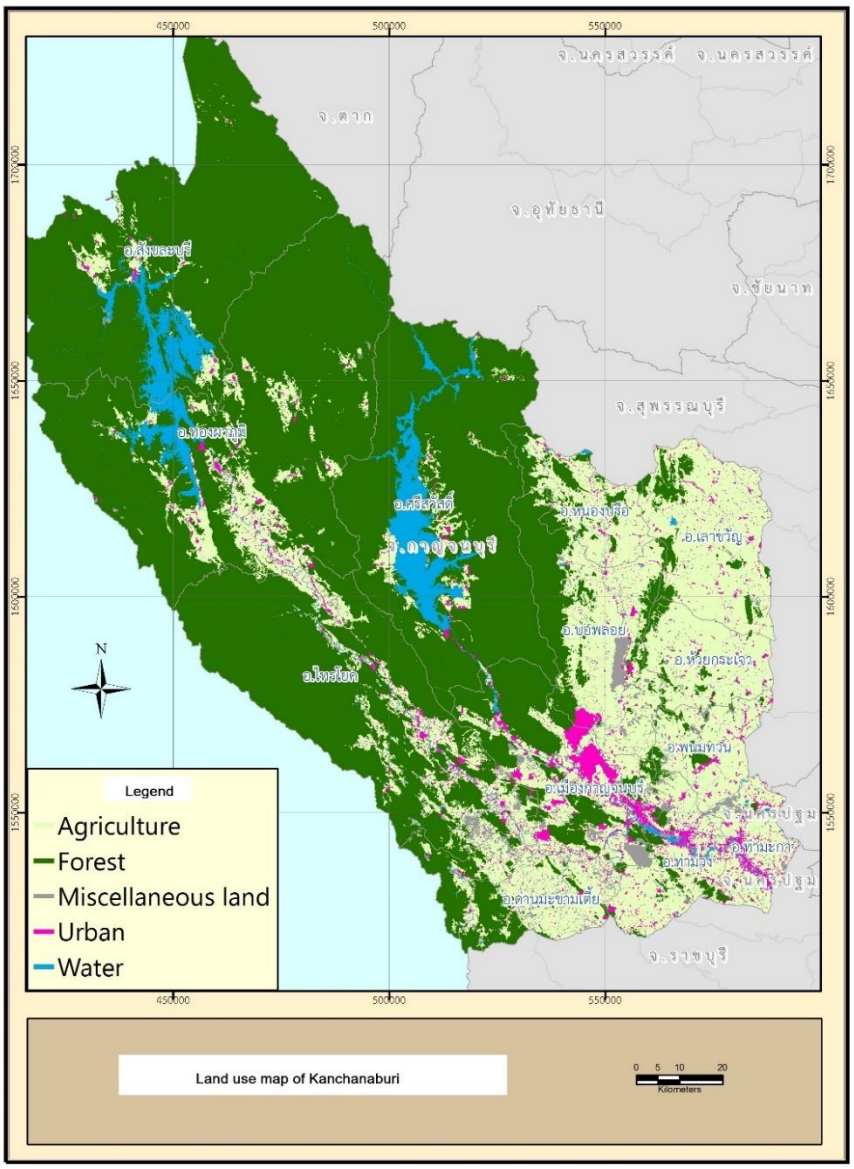

Figure 1 Landuse map of Kanchanaburi

Objective

1) To study unused areas and other non-suitable areas for potential plantings to grow suitable crops as energy substitutes.

2) To assess the potential of renewable energy production and increase the output per rai of energy crops, and to develop efficient production processes by using a variety of raw materials to avoid over-reliance on one type of raw material and in line with price. And the demand for raw materials.

3) To divide zoning areas for each energy crops in Kanchanaburi.

Methods

1) Analyze the requirement of each energy crops by using geographic data to find suitable areas for energy crops to be appropriately and cost-effectively to obtain a productive area, data in figure 3, the landuse data is from Land development department, Thailand.

2) Analyze suitable areas for energy crops, with an emphasis on Abandoned land, deserted forested areas, deteriorated in figure 3, under conditions of economic return, it must be better and not far from the processing plant. The data is from Land development department, Thailand.

Figure 2 Ethanol factory in Kanchanaburi

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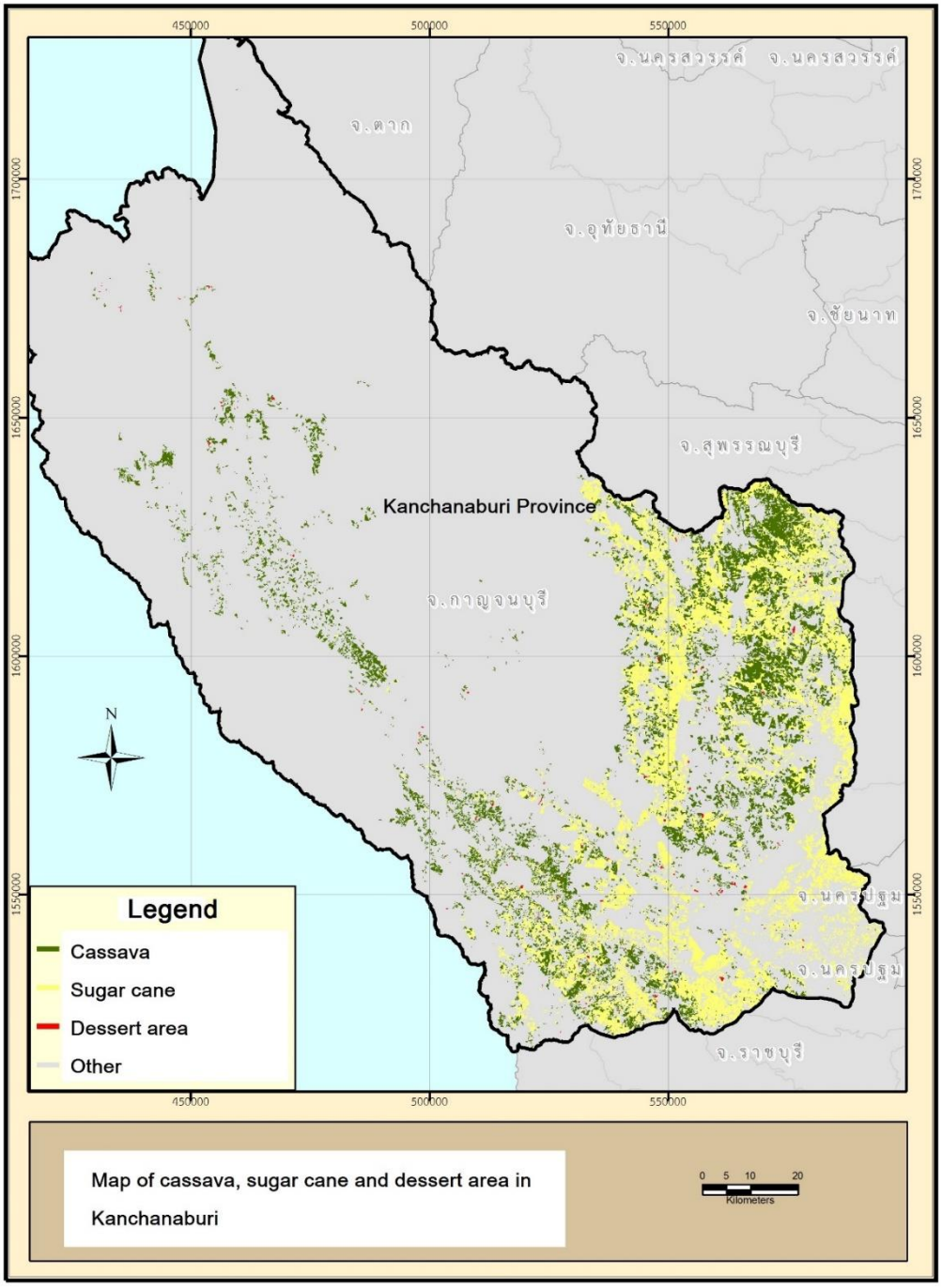

Figure 3 Map of cassava, sugarcane and dessert area in Kanchanaburi

Results

Cassava: from the study of soil suitability for cassava cultivation, as shown in Figure 4, Table 1 shows the suitability of cassava soil and land use. It was found that in Kanchanaburi, the soil was very suitable for planting. The cassava was 3,122,412.5 rai. The soil was moderately suitable, amounting to 1,194,675 rai. The land was unsuitable for planting 7,663,625 rai and another 36,550 rai were not available. It was found in Kanchanaburi province. The most suitable are for growing cassava, there are a number of cassava cultivars. 460,456.25 rai or 14.7 %. Cassava is 734,393.75 rais or 23.5 %. It is an area of 5,106.25 rai or 0.2 % of the cassava. Other areas are 1,922,456.25 rai or 61.6 %. In areas of medium suitability with cassava planting, cassava was planted at 143,118.75 rai or 12 %. Cassava was planted at 108,981.25 rai or 9.1 % of the total land area of 1,906.25 rais or 0.2 % and other areas of 940,668.75 rai or 78.7%. **There are 7,012.5 rai of deserted area with very suitable and medium soils for tapioca cultivation.**

Table 1 Suitable area for Cassava

ID	Suitable area	Area (Rai)					Percentage				
		Cassava	Sugarcane	Dessert area	Other	Total	Cassava	Sugarcane	Dessert area	Other	Total
1	Most suitable	460,456.25	734,393.75	5,106.25	1,922,456.25	3,122,412.50	14.7	23.5	0.2	61.6	100
2	Moderate	143,118.75	108,981.25	1,906.25	940,668.75	1,194,675.00	12.0	9.1	0.2	78.7	100
3	Not suitable	119,237.50	162,368.75	3,012.50	7,379,006.25	7,663,625.00	1.6	2.1	0.0	96.3	100
4	NO	162.50	56.25	-	1,575.00	1,793.75	9.1	3.1	-	87.8	100
5	NS	1,281.25	14,681.25	43.75	34,975.00	50,981.25	2.5	28.8	0.1	68.6	100
	Total	724,256.25	1,020,481.25	10,068.75	10,278,681.25	12,033,487.50	6.0	8.5	0.1	85.4	100

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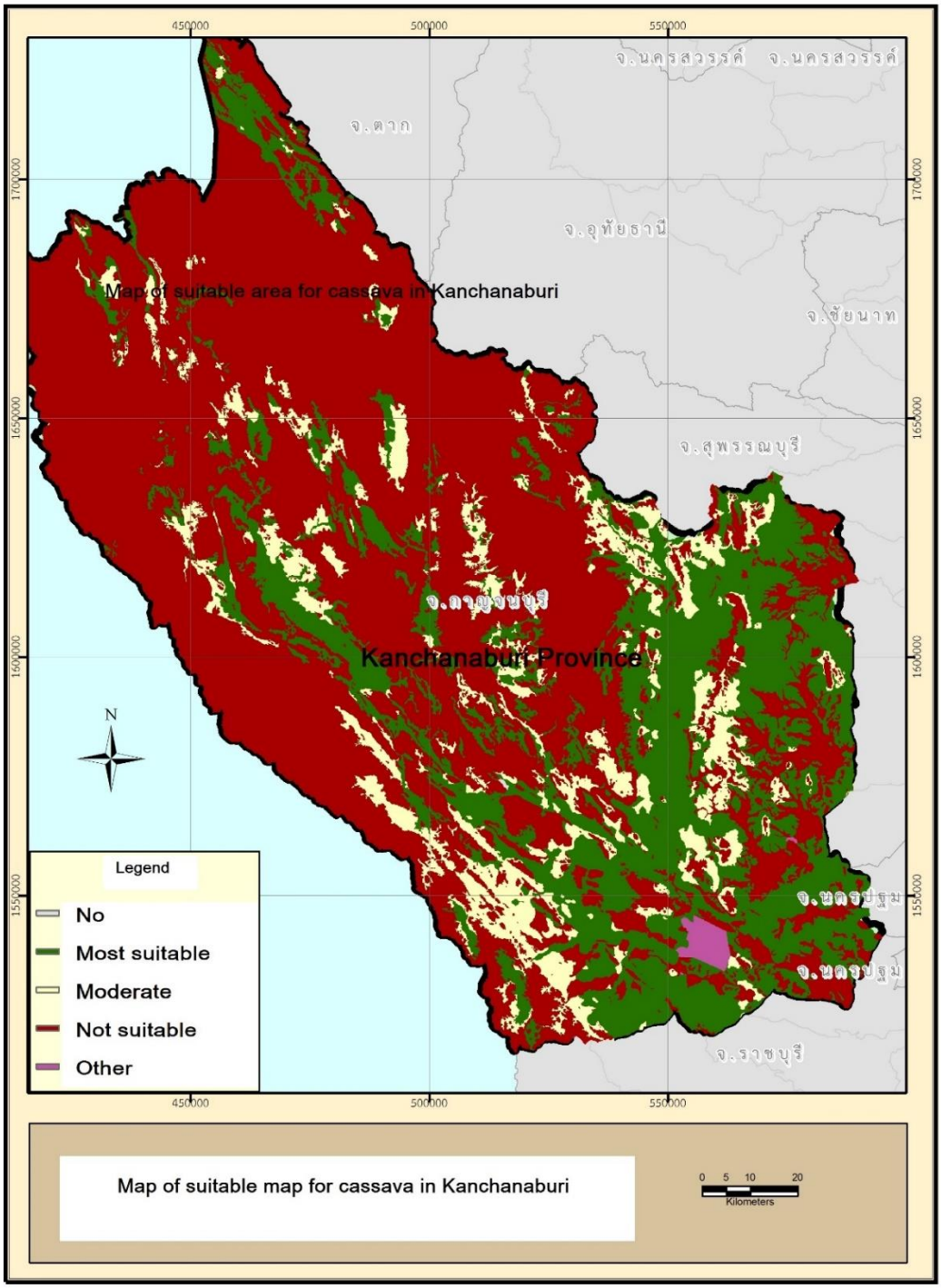

Figure 4 Suitable map for cassava in Kanchanaburi

Sugarcane: from the study of soil suitability to sugarcane cultivation, as shown in Figure 5, Table 2, shows the suitability of sugarcane cultivars and land use. In Kanchanaburi, suitable soil for sugarcane cultivation was 3,441,075 rai. The soil was moderately suitable with 1,531,100 rai Soil is not suitable for planting 7,008,531.25 rai and another 1,575 rai. There is no data. At present, the land use data in Kanchanaburi province. In the most suitable area for cane planting, sugarcane production was 788,681.25 rai or 22.9%. Cassava was 479,893.75 rai or 13.9%. The area was deserted 5,993.75 rais or 0.2%. Another area is 2,166,506.25 rai or 63%. The 188,693.75 rai of sugarcane were planted in moderate suitable. Sugarcane cultivars were 178,037.50 rais or 11.6%, representing an area of 3,018.75 rai or 0.01 %. The other area is 6,914,212.5 rai or 75.9 %. **There are 9,012.5 rai of deserted area with suitable and medium soils to grow sugarcane.**

Table 2 Suitable area for sugarcane

ID	Suitable area	Area (Rai)					Percentage				
		Cassava	Sugarcane	Dessert area	Other	Total	Cassava	Sugarcane	Dessert area	Other	Total
1	Most suitable	479,893.75	788,681.25	5,993.75	2,166,506.25	3,441,075.00	13.9	22.9	0.2	63	100
2	Moderate	178,037.50	188,693.75	3,018.75	1,161,350.00	1,531,100.00	11.6	12.3	0.2	75.9	100
3	Not suitable	64,843.75	28,450.00	1,025.00	6,914,212.50	7,008,531.25	0.9	0.4	0.01	98.7	100
4	NO	162.5	56.25	-	1,575.00	1,793.75	9.1	3.1	-	87.8	100
5	NS	1,281.25	14,687.50	43.75	34,968.75	50,981.25	2.5	28.8	0.1	68.6	100
	Total	724,218.75	1,020,568.75	10,081.25	10,278,612.50	12,033,481.25	6	8.5	0.1	85.4	100

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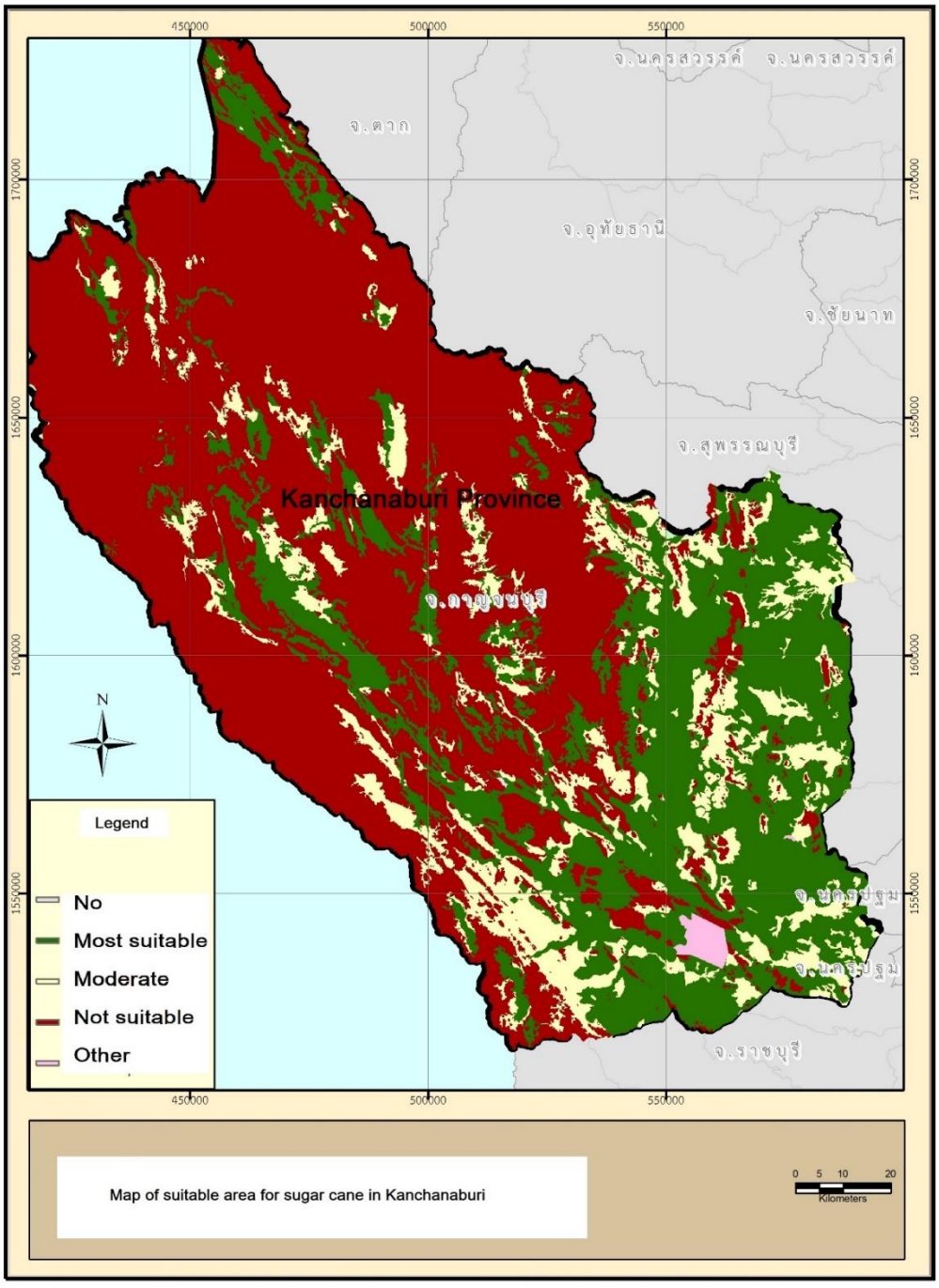

Figure 5 Suitable map for sugarcane in Kanchanaburi

Deserted areas should be planted to ethanol plants: there are 7,012.5 rai of suitable area for cassava cultivation, which is currently deserted. Therefore, it should be used for cassava cultivation. And the results of study 9.3) found that there are 9,012.5 rai of suitable area for sugarcane plantation, which is now deserted area. And the sugarcane planting data show that in Kanchanaburi, there are 730,863 rais of sugarcane plantations (cultivated area and sugarcane yield of 2558/59 (Office of commission sugarcane and brown sugar, 2015)), with a yield of 9.07 tonnes per rai. Compared with other provinces in the central region. Sugarcane production showed that yield per rai in Kanchanaburi was not very high. It should be used as a guideline for sugarcane cultivation in Kanchanaburi to increase productivity per rai. to higher yields.

Zoning of renewable energy crops, from the stand zone to the cultivation of renewable energy crops. It can be classified into 3 zones, most suitable, moderate and non-suitable area as shown in Figure 6.

Productivity improvement, from the study of cassava cultivation and ethanol production, it was found that in Kanchanaburi there were 470,854 rai of cassava. (Cassava plant data: meat yield, yield and yield per rai, 2015-2060 (Office of agriculture economics, 2016), with yields of about 3,100-3,400 kg / rai compared with other provinces. It is found that the yield per rai in Kanchanaburi province is not high. The Bureau of Biofuels Development, Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy The increase in yield per rai is greater than the increase in production area. According to data (Office of agriculture economics, 2016), the average yield per rai of the whole country in 2015, the average yield of the whole country was 3,611 kilograms per rai. In Kanchanaburi, the yield per rai was lower than the average per rai of the country. Therefore, the increase in yield per rai should be used as a guideline for sugarcane cultivation in Kanchanaburi. The increase in tapioca yield depends on many factors, including the use of good varieties suitable for soil conditions. The use of quality varieties. Soil Improvement and soil preparation choose the right planting distance. Seasonal planting, fertilizing, watering, weeding and insect pests. To get higher yield of tapioca root It must be encouraged to educate farmers. Organize local knowledge conferences. Or have government officials go into how to manage. To adapt to their own cassava plantation. It is a problematic area with drought, humidity, and insufficient moisture to grow cassava. This is an important factor for the plant to thrive and grow. Water management is needed to be study in this area and finding water resources.

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Conclusion

Kanchanaburi province is one of the largest cassava area of Thailand. From analyzed, in the most suitable for cassava, there are 460,456.25 rai of cassava or 14.7%. The average suitable area for cassava there are 143,118.75 rai of cassava or 12%. There are 7,012.5 rai of abandoned land with very suitable and medium for cassava in figure 6.

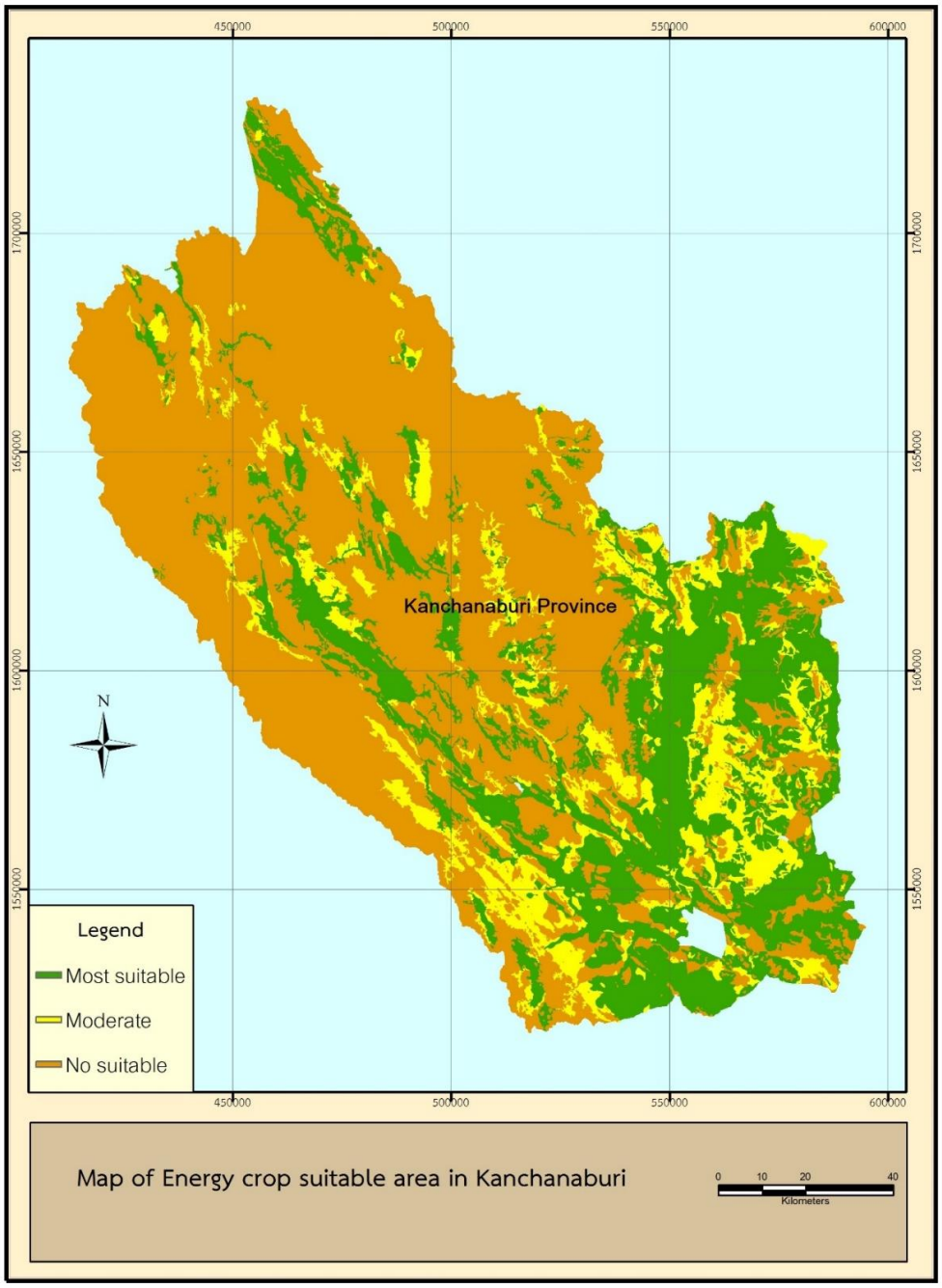

Figure 6 Map of the suitable for energy crop in Kanchaburi

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