ASSESSMENT OF NIPA PALM USING GIS: A CASE STUDY IN BANGPAKONG RIVER, THAILAND

[1]PITCHAYASINEE ARIYATANAKATAWONG, [2]WATCHARAKORN PHAHANICH, [3]JAKRIT CHAIYANET, [4]PANNAVICH ARIYATANAKATAWONG

[1]Rajabhat Rajanagarindra, [2]Silpakorn University Thailand
E-mail: [1]pitchayasinee.ari@gmail.com, [1]phahanich@hotmail.com [1]lenghucong@hotmail.com, [2]apannavich@gmail.com

Abstract- The assessment of Nipa Palm population using THEOS Thailand Earth was carried out on Bangpakong river in the area of Chachoengsoa province Thailand for the purpose of planning for conservation and utilization the natural resources along mangrove forests.The result found that there were 2,907 Rai of Nypa Plam in Chachoensoa Province which can classified to the area with low dense distribution, medium dense distribution and high dense distribution, were 196, 1,056 and, 1,655 and Rai, respectively. Amount of 3 dense distribution group there were divided into utilization and non utilization group according to the farmer. The utilization group belonging to 4,651,424 square meter, which were three density level. The high density area compose of 1,787,124 clump per rai which were 4,664,101 leaf stalk, 41,016 flower and 41,016 compound fruit per rai.

Index Terms- Gis, Nipa Palm, Assesment.

I. INTRODUCTION

Nipa palm (Nypa fruticans) is believed to be one of the oldest and previously most extensive palm of the world, It is found in the upstream estuarine zone in low, mid, and high intertidal regions [1]. It forms extensive belts along brackish to tidal freshwater creeks and rivers. It is very fast growing, especially in fresh water, and is a competitive species. The spread of Nipa palm ranges from Sri Lanka and the Ganges Delta through to the west Pacific. In South and South-East Asia it is found in Bangladesh, Brunei Darussalam, Cambodia, China (Hainan Island), India, Indonesia, Japan (the most northern distribution is Iriomote Island), Malaysia, Myanmar, Singapore, Sri Lanka (where it also has a range extention due to planting), Thailand, and Viet Nam. In Australasia, it is found in northwest and northeast Australia, the Federated States of Micronesia, Guam, Palau, Papua New Guinea, Solomon Islands. [2]. The largest natural nipa stands are found in Indonesia (700 000 ha), Papua New Guinea (500 000 ha) and Philippines (8 000 ha) Nipa palms can also be found in Nigeria as it was introduced in 1906 to curb coastal erosion. The widespread occurrence of nipa palms made rural communities to grow these palms in agriculture fields for limited use; e.g. sap from inflorescence stalk is used to make toddy, vinegar or boiled down to sugar and the fruits are used as local dessert or made into alcoholic beverage [3]. Conversely, nipa palm leaves are a major source of thatching material, which is extensively used, by the poorer section of rural population in southwest Bangladesh but most parts of the nipa palm are left to decompose at its habitat. This species has a very dynamic population. It has experienced general declines due to localized threats throughout its range. As this species prefers more freshwater environments, hyper-saline conditions and strong wave action (including that caused by passing ships) can threaten this species. Although local estimates are uncertain due to differing legislative definitions of what is a 'mangrove' and to the imprecision in determining mangrove area, current consensus estimates of mangrove loss in the last quarter-century report an approximately 20% decline in mangrove areas in countries within this species range since 1980 [5]. Sea level rise is a major threat, especially to back mangroves that have no area in which to expand. Mangrove species with a habitat on the landward margin may be particularly vulnerable to sea-level rise if owing to coastal development their movement inland is blocked. In the Sunderbans Delta of India, for example, which has a relatively high rate of sea-level rise, provides insight to what may be common elsewhere as global sea levels rise). There, Nypa fruticans is blocked from inland migration owing to coastal development, and its area and occurrence has been declining. All mangrove ecosystems occur within mean sea level and high tidal elevations, and have distinct species zonations that are controlled by the elevation of the substrate relative to mean sea level. This is because of associated variation in frequency of elevation, salinity and wave action [4]. With rise in sea-level, the habitat requirements of each species will be disrupted, and species zones will suffer mortality at their present locations and re-establish at higher elevations in areas that were previously landward zones [3]. If sea-level rise is a continued trend over this century, then there will be continued mortality and re-establishment of species zones. However, species that are easily dispersed and fast growing/fast producing will cope better than those which are slower growing and slower to reproduce. In addition, mangrove area is declining globally due to a number of localized threats. The main threat is habitat destruction and removal of mangrove areas. Reasons for removal include cleared for shrimp farms, agriculture, fish ponds, rice production and salt pans, and for the development of urban and industrial areas, road construction, coconut plantations, ports, airports,

and tourist resorts. Other threats include pollution from sewage effluents, solid wastes, siltation, oil, and agricultural and urban runoff. Climate change is also thought to be a threat, particularly at the edges of a species range. Natural threats include cyclones, hurricane and tsunamis. In Thailand, the population of Nipa palm was also declines due to localized threats and sea level rise throughout margin of the River. There are no conservation measures specific to this species. Thus, continued monitoring and research is needed to be information for conservation and managing for utilization.

II. MATERIAL AND METHOD

A. Accuring Georeferenced fine resolution

A Pan-Sharpened image acquired on 2014-2015 in the Georeferenced fine resolution (SGF) format was purchaed from Geo-Informatics and Space Technology Development Agency (Public Organization). It ground resolution is of 2x2 m. This image coverage 5 major city name Bangkla, klongkean, Mueng, Banphoe and Bangpakong of Chachoensoa Province Thailand. This image was ground range, system correcting, Image processing for adjust data error, disturb noise by radiometric collection and geometric collection technique.

B. Calculating the distribution of forests

The images (Pan-Sharpened) was translate to find the distribution of forests by using visual interpretation techniques. Elements of interpretation are: Color, Shape, Size Texture, Pattern, Site, and association.

C. Fragmentation accuracy test

The verify forest fragmentation accuracy from the interpretation data was check with the actual area. In cases where the forest is fragmented from a non-conformable state, the WGS 1984 UTM coordinates are captured using a GPS device to correct the situation.

Establish forest status survey points based on density levels. The survey area is not less than 4% of the forest area. There are 2 sizes of 8 x 8 m/ plots for exploration of low dense distribution, medium density distribution and 10 x 10 m, plot for high dense distribution.

III. RESULT AND DISSCUSION

To assesment the distribution of Nipa palm, the image processing from satellite was obtained from the Geo-Informatics & Space Technology Development Agency (GISTDA). The interpreting color from photographs and then converting them into color bands representing the density of trees from the Bang Pakong River in the Chaoensoa Province.

The density can be classified into 3 levels, with yellow indicating less density. The light green bands represent a moderate density. And dark green represents a very high density from the beginning of Bangpakong river. The result found that Nipa palm along Bangpakong river has total length of about 64 km and the distance from the margin of the Bang Pakong River does not exceed 10 m.

Bang Khla District by the Bang Pakong River runs through
distance of about 40 km. There were about 14 km of Nipa palm forest and was classified to low density 25.43 rai, the moderate density is 20.70 rai and the high is 9.39 rai.

Mueng District by the Bang Pakong River runs through a distance of about 18 km. There were about 15 km of Nipa palm forest and was classified to low density 24.64 rai, the moderate density is 18.11 rai and the high is 14.43 rai.

Ban Phoe District by the Bang Pakong River runs through a distance of about 28 km. There were about 19 km of Nipa palm forest and was classified to low density 22.53 rai, the moderate density is 29.70 rai and the high density is 28.70 rai.

Bangpakong District by the Bang Pakong River runs through a distance of about 28 km. There were about 19 km of Nipa palm forest and was classified to low density 5.85 rai, the moderate density is 6.38 rai and the high density was not found in this area.

The overall of the four districts show the distribution of Nipa palm along the Bang Pakong River. Found that the less density was highest area of 78.45 rai, the modersate density was 74.89 rai and the high density was 52.51 rai

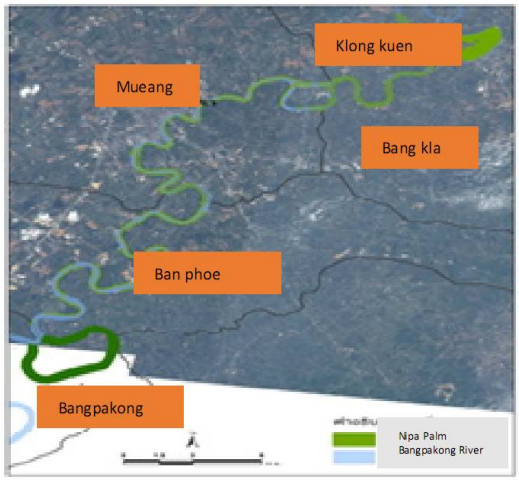


Fig.1 Distribution of Nipa Palm by jurisdiction along Bangpakong River in Chachoensoa Province Thailand

It can be seen that the distribution of Nipa Palm along the margin of Bangpakong river in 4 districts is different in density distribution. By the Geographycal, angpakong district was the first district where connect to the sea gulf of Thailand) which has less distribution of Nipa palm of 12.23 Rai while Ban phoe district was the highest density level of 80.94 Rai following by Mueng, and Bang khla district, respectively

.Which is agree with [5]. As Nipa palm is a salt tolerlant plant and this species prefers more freshwater environments, hyper-saline conditions and strong wave action. Thus the plantation promote of Nipa palm should be consideration saline level and should be avoid the period of sea level rise ที่แ suah as November to April which is dry season and fresh water in the river was lower than the sea level cause high salinity in the area which near the sea.

Location	Density level (Rai)			Total
	less	moderate	high	
Bangkla,	25.43	20.70	9.39	55.52
Mueng	24.64	18.11	14.43	57.18
Banphoe	22.53	29.70	28.70	80.94
Bangpakong	5.85	6.38	-	12.23
total	78.45	74.89	52.51	205.86

Table. 1 The distribution of Nipa palm in Bangpakong River Thailand

It is evident that suitable areas for planting Nipa palm for conservation and utilization in the Margin of Bangpakong River are the Banphoe district Meueng district and Bangkla district, where the Nipa palm is still. commercial utilized. But in this area lack of systematic management. In addition, farmers lack of knowledge in management which different in the Philippines, There are heavily managed plantations of Nipa palm. [2]

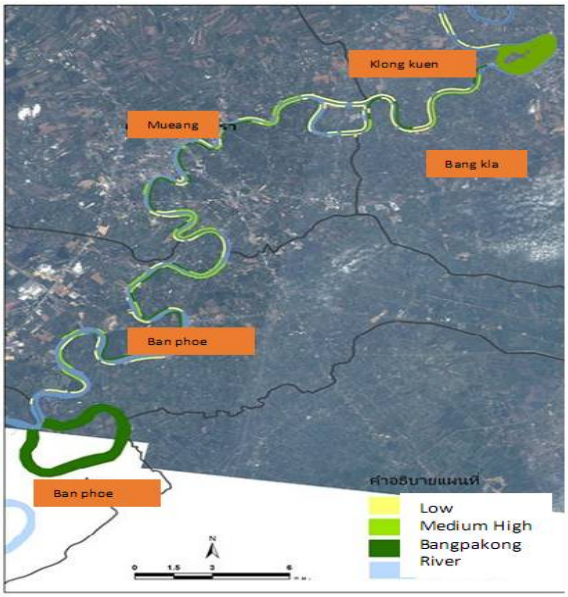


Fig.2 Distribution of Nipa Palm by density : low dense distribution, medium density distribution along Bangpakong River in Chachoensoa Province Thailand

Utilization part	Density Distribution (no./Rai)			Total (no./Rai)
	High density	Medium density	Low density	
Clump	2,648,458	1,689,143	313,823	3,594,677
Complete leaves	1,787,124	1,522,788	284,765	3,603,127
Young leaves	1,675,795	1,593,169	334,163	2,246,949
Top roll leaves	1,177,744	1,030,121	235,367	2,443,232
Oldest leaves	752,936	531,056	17,435	1,301,427
Flowers	41,016	31,991	5,812	78,819
Compound fruit	41,016	38,390	-	79,406

Table 2.The composition of Nipa Palm in utilization group

Utilization part	Density Distribution (no./Rai)			Total (no./Rai)
	High density	Medium density	Low density	
clump	243,166	134,364	37,775	415,305
Complete leaves	166,994	63,983	55,210	286,186
Young leaves	210,939	204,745	26,152	441,836
Top roll leaves	155,275	95,974	26,152	277,401
oldest leaves	67,383	19,195	-	86,578
flowers	-	-	-	-
Compound fruit	-	-	-	-

Table 3.The composition of Nipa Palm in utilization group



Fig.3 Distribution of Nipa Palm at Banpho District along Bangpakong River in Chachoengsoa Province Thailand

IV. CONCLUSIONS AND RECOMMENDATION

The trend of Nipa palm forest in the area of Bangpakong River in Chachoengsao Province Thailand is decreasing rapidly. The important threat

comes from salinity intrusion and land use along the river to meet the needs of the industry and service sector. For the conservation, the government and steak holder should accelerate conservation by declared a conservation area and promote the managing of Nipa palm forest as commercial and conservation forest. In addition, the encouraging awareness of the value of Nipa palm forest will be a way to increase income, farmers and communities in the area Furthermore, It is beneficial the utilization, conservation and management of forests, including the planning of forest restoration to suit the conditions of the area and sustainability.

ACKNOWLEDGMENTS

We acknowledge the Higher Education Research Promotion and National Research University Project, Office of the Higher Education Commission, Thailand, for funding, Rajabhat Rajanagarindra University, Chachoengsao, Thailand for support publication.

REFERENCES

[1] Robertson, A. I., Alongi, D. M. (eds.) (1992) Tropical Mangrove Ecosystems. Coastal and Estuarine Studies 41. American Geophysical Union, Washington, DC, p. 329.

[2] Ellison, J., Koedam, N.E., Wang, Y., Primavera, J., Jin Eong, O., Wan-Hong Yong, J. & Ngoc Nam, V. 2010. Nypa fruticans. The IUCN Red List of Threatened Species 2010: e.T178800A7610085. http://dx.doi.org/10.2305/IUCN.UK.2010-2.RLTS.T178800A7610085.en. Downloaded on 01 April 2017..

[3] Ellison, J.C. 2005. Holocene palynology and sea-level change in two estuaries in Southern Irian Jaya. Palaeogeography, Palaeoclimatology, Palaeoecology 220: 291-309

[4] Duke, N. C., Ball, M.C. and Ellison, J.C. 1998. Factors influencing biodiversity and distributional gradients in mangroves. Global Ecology and Biogeography Letters 7: 27-47

[5] FAO. 2007. The World's Mangroves 1980-2005. FAO Forestry Paper 153. Forestry Department, Food and Agriculture Organization of the United Nations (FAO), Rome.

★★★