

# Application of Geo-Informatic Technology in Studying of Land Tenure and Land Use for Cultivation of Cash Crops by Local Communities in the Local Administration Organizations of Phailuang and Maepoon in Lublae District, Uttaradit Province

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**Abstract**—Application of Geo-Informatic technology in land tenure and land use on the economic crop area, to create sustainable land, access to the area, and produce sustainable food for the demand of its people in the community. The research objectives are to 1) apply Geo-Informatic Technology on land ownership and agricultural land use (cash crops) in the research area, 2) create GIS database on land ownership and land use, 3) create database of an online Geo-information system on land tenure and land use. The results of this study reveal that, first; the study area is on high slope, mountains and valleys. The land is mainly in the forest zone which was included in the Forest Act 1941 and National Conserved Forest 1964. Residents gained the rights to exploit the land passed down from their ancestors. The practice was recognized by communities. The land was suitable for cultivating a wide variety of economic crops that was the main income of the family. At present the local residents keep expanding the land to grow cash crops. Second; creating a database of the geographic information system consisted of the area range, announcement from the Interior Ministry, interpretation of satellite images, transportation routes, waterways, plots of land with a title deed available at the provincial land office. Most pieces of land without a title deed are located in the forest and national reserve areas. Data were created from a field study and a land zone determined by a GPS. Last; an online Geo-Informatic System can show the information of land tenure and land use of each economic crop. Satellite data with high resolution which could be updated and checked on the online Geo-Informatic System simultaneously.

**Keywords**—Geo-Informatic Technology, Land Tenure, Online Geo-Informatic System, Land Use of cash crops.

## I. INTRODUCTION

IN 2009, flood and mudslide occurred in the lower north area particularly Phee-pannum Mountains, Klong Maephong in Phailuang and Maepoon sub-districts, Lublae district and nonetheless, Uttaradit province. The impacts from the disaster were house damage, loss of agricultural areas and erosion from steep slopes, deposit of mud and sand on the rice fields and road destruction. These damages brought together the responsible organizations both inside and outside province to

support the utilities and the infrastructures. However, it is not a sustainable solution yet [1].

Lublae District is located on Phee-pannam Mountain. Settlement history of this community started from Sukhothai period, which was named "Muang Tungyung" where people migrated from Chiangan district, Chiang Rai province. This area has high slope and is not appropriate for agricultural activities, so people adapted the area by using integrated farming systems [2]. The farming system that the community is using actually responds to the economic and the conservation of agriculture pattern for long term sustainability of food supply in the three adjoining boundaries of the provinces affected by the natural catastrophe (Phrae, Sukhothai, Uttaradit). The present activities by the people corresponds to their way of life, how people sustainably produce their food supply, although not owning the land by law but evidence shows improvements on the nature such as presences of large fruit trees, transportation of fruits from the agricultural area traversing through the creek and rules practiced within the community regarding land use. However, after the landslide incident that majorly affected agricultural areas, farmers in the area still are able to cultivate cash crops and are capable of producing more than other areas [3]. This is because of the unique taste of the produces therefore cash crops are widely cultivated on mountain area and become the main cash crops of the province [4]. Examples of famous produces can be named as follows: they are Longlublae Durian, Linlublae Durian, Montong Durian, Longong, Langsat and Shallots. The current land use for cultivation in total is 70,000 rai and the most planting area is in Lublae district, Uttaradit province. Farmers have generated income of more than 600 million baht a year [5].

At present, the government has introduced a policy to promote and support Government Agencies, Education Institutes, and Private sectors including the centre, regional and local ones to use Geo-Informatic data. It is used to manage natural resources, environment and disasters, therefore, by closely monitoring and having the correct data will benefit in the long run as it can be used to respond to today situation. Geo-Informatic Technology is new which can be applied and planed the use of local resources extensively.

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Geo-Informatic Technology consists of Geographic Information Systems (GIS), Remote Sensing (RS), and Global Positioning System (GPS). Applying Geo-Informatic Technology can answer questions about spatial condition both directly and indirectly such as the flood disaster, drought, land use and land cover change, land tenure, the growth of cash crops, changes of physical resources, tax mapping and growth of the community and industry [6].

Application of Geo-Informatic technology with land tenure and land use on the cash crop, is use to facilitate sustainable land use, possibly success to the area, and produce food to meet the demand of the community. Using the social tools with Geo-Informatic technology such as mapping, GIS, GPS, survey, satellite high resolution and Aerial photogrammetry are defined to position the land plot level. Furthermore community and relevant agencies will be involved in determining the terms and conditions such as ownership histories, type of property and land use. The research conducted in collaboration with communities and relevant agencies by which the research focus on ownership histories and land use, how cash crops were cultivated in the past until the present, how cultivated cash crops affect the food security of people in the area and the combination approach Geo-Informatic technology with land tenure and cash crops can bring sustainable land, sustainable food, and sustainable resources and equity.

## II. OBJECTIVES

- 1) Apply Geo-Informatic Technology on land ownership and land use in the research area.
- 2) Create GIS database on land ownership and agricultural land use focusing on cash crops.
- 3) Create an online database of Geo-information system on land tenure and land use.

## III. METHODOLOGY

Researcher has developed a conceptual framework for this study. The application of Geo-Informatic technology (Fig. 1) is focused on land tenure and land use to show sustainable food for people in Phailuang and Maepoon sub-districts, Lublae District, Uttaradit Province.

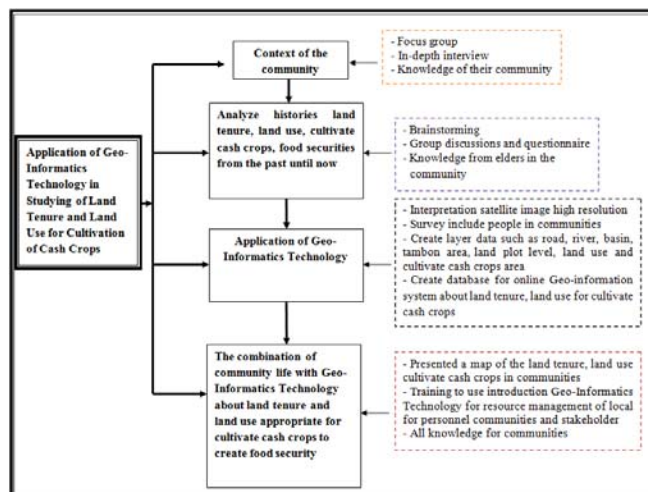


Fig. 1 Conceptual Framework

The research method was modeled on quantitative and qualitative approaches. Quantitative research is based on spatial data such as road, basin, river, elevation and sub-district boundary.

Land use data were interpreted from high resolution satellite image, which is Geo-Eye with 0.5 meters resolution recorded on 16 January 2012. It has a scale 1:4,000 and was obtained from the provincial land office of the Uttaradit Agricultural Land Reform Office. Tracing of cash crops locations was setup by using a GPS. The scale of topographic map is 1:50,000 (map sheet 5044III, 5044IV sheet L7017 and L7018 in Thailand). All spatial data are used to overlay for analyzing land tenure, land use, and cash crops including the correct positioning monitoring with a GPS on ground survey.

Data collection is divided into three parts. First part, the data are collected from document, books, websites, and related research documents. Second, the data are received from in-depth interview or informal interview and group discussions or focus group about land tenure history of people from the past and present and questionnaire from focus population. Target population is staff in the local administration organizations, staff from agencies involved in the area and people in the study area. Data analyze is GIS data about land tenure, land use 2012 and data layer cultivated cash crops area from satellite images high resolution bring output presented on online Geo-information system. Qualitative approach is about analyzing the history of land use, land tenure and cash crops by interviewing method. Interviewed groups included community leaders, local organizations, and private agencies. Part three is about statistical analysis and presented data can be shown on maps and tables including overlay of spatial data, frequency, percentage, and online Geo-information system.

## IV. CONCLUSION

Land use for cultivating cash crops such as Durian, Longong, Langsat, shallots and rice depends on interpretation of high-resolution satellite images and monitoring positioning correct with a GPS by ground survey. It was found that land use in Phailuang and Maepoon can be divided into 10 classes

(Table I). Total area is 122,749.05 Rai (48,530.84 Acre), the main type of land use is mixed forest with crops planting, which accounts for 42,929 Rai (34.97 %), Durian 41,552 Rai (33.85 %), Shallots 13,207 Rai (10.76%), Longong 11,701 Rai (9.53%), respectively (Fig. 3).

Fig. 3 shows that the main land use is for durian and longong which are grown on high slope, mixed patterns are found both on high mountains and valleys. So interpretation of land use is overview of the area. Geo-information technology is online about land tenure and land use of cash crops (Fig. 4). Land use from online Geo-information system, land tenure is the main subject used for planning and resource management in the local area. Both local and agencies are involved with the spatial management. They have to use the database about land tenure and other data and search related to management in each local area (Fig. 4).

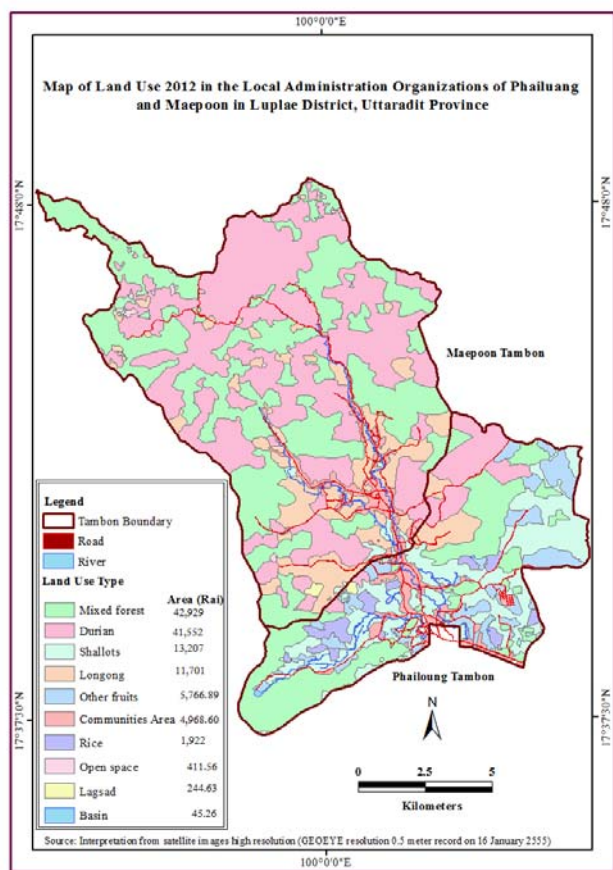


Fig. 3 Land Use Map in 2012 from interpretation of high resolution satellite images (2.53 Rai = 1 Acre)

TABLE I  
 THE CLASSIFICATION OF LAND USE FROM HIGH RESOLUTION SATELLITE IMAGE

Order	Satellite image	Land use type
1		Durian
2		Longong
3		Langsat
4		Other fruits
5		Rice
6		Shallots
7		Mixed forest
8		Basin
9		Village/ Village mixed tree fruits
10		Open space

Online Geo-information system is managed by using open sources program about land tenure for cash crops to enhance the spatial management. The main observation uses the online Geo-information system about management of the cash crops. It is necessary to obtain the cooperation from the villagers ownership, agencies involved and stakeholders according into the fact data about the area, type of cash crops, cash crops products and total product. The local people and agencies are involved as well. So, it can be up to date and efficient use in the future. Another way, online Geo-information system will have staff to check and edit for an up-to-date influence data easier and expedient to use.

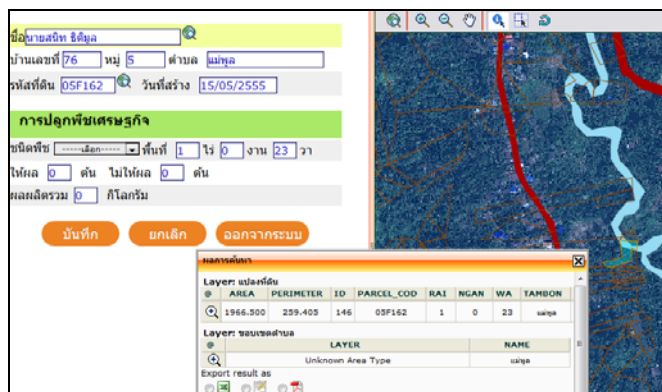


Fig. 4 Applications Online Geo-information Program

However, the power expansion and the rights can be controlled by means of a state law in claiming rights over resources. The land is mainly under fallen in the forest zone as specified in the Forest Act 1941, which is the National Reserve Act 1964 and under the Coordinating Center for Forest Uttaradit province. The main cash crops area is located on high slope which is more than 35% (Fig. 5) So, this land use is not accomplished a title deed yet. The villagers hold to one's principles ownership inherited from ancestors. So that the villager's acknowledge in the community by holding land close to streams, big tree range, ridges range and forest range. Although this area in the community is not a title deed by law, the trading area by holding to sale of used rights for another people and used rights has been accepted by the community.

Solution to solve the problem about overlapping area between legal rights and ownership rights which inherited from ancestors of villagers. Villagers and academicians in the area present their ideas about using community deed and tried to push guidelines about spatial co-management for solving the problem about land tenure and sustainable land use in the future.

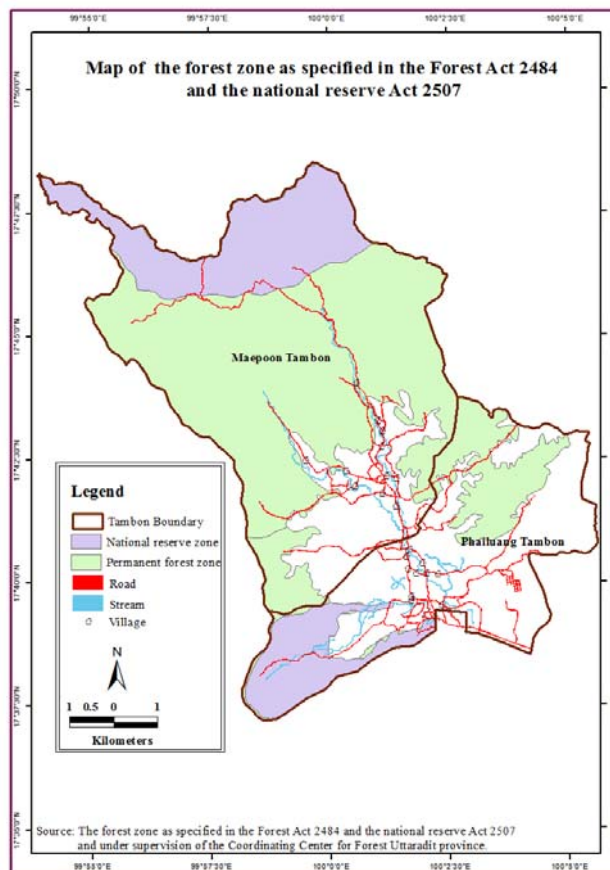


Fig. 5 The forest zone in the Forest Act 1941 and the national reserve Act 1964

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