

Mapping Mekong River Basin Land Cover to Support Food Production

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Abstract : The Lower Mekong Basin (LMB) where rice cultivation is dominant is one of the very important agro-based regions of the world. Over 60 million people are extensively engaged in agriculture and freshwater fishing activities in LMB. But, due to the population increase, heavy commercialization of rice crop, environmental degradation of the river basin, and floods and drought, food production of LMB is facing a threat which even affects the global market. If these risk factors are spatially mapped, a GIS, based on detailed land cover mapping can be used to estimate potential risks in food production. This study initially investigates the value of the detailed land cover data of LMB in assessing fluctuations in food production.

Keywords : Lower Mekong Basin, land cover map, rice cultivation, food production

1. Introduction

Mekong river basin stretches from central-west China to Vietnam covering 805,604 km² of area. The Lower Mekong Basin (LMB) (figure 1), covers about 795,000 km² area and feeds well over 60 million people. About 90% of this population is based on agricultural activities of the fertile land. Regardless to the natural disaster threats, the LMB was historically renowned for its rice based over 6,000 years old agricultural civilization⁹. Today, rice cultivation in LMB makes the area the global leader in production. Yet, the total rice export compare to the production is only 6.78%, due to the high local consumption². A significant portion of LMB is belongs Thailand and Vietnam, the first and second biggest exporter of the rice in the world. Rice fields are not only a key source of food, but serve many other functions such as flood mitigation, soil erosion control, and fishery production. The prolong drought occurred in Australia in 2006 and the increase of world oil prices have shaken the stability of rice prices and production in recent years.

Apart from rice, the freshwater fishing of the LMB has a massive annual commercial value of US\$2 billion and contributes about 80% of the animal protein consumed by those living there⁸. According to information in world Fish center data publication, in 2007, LMB produced 2.06 million tons of fish per year². The per capita consumption of fish within the region in 2002 was 36 kg/person/year. This is a significant volume compare to average consumption in EU countries, which was 26 kg/person/year in 2005^{1,4}. This paper investigates the value of well-established land cover data of LMB for its agricultural (crops and fisheries), economic planning, and sustainability of the environment.

3. The population, land pressure, and food

Thousands of years old traditional agricultural practices have dramatically changed in last 100 years due to the population increase and political, social, and economic as well as environmental changes. With the growing population which is estimated to increase up to between 75 to 90 million by 2025, LMB is facing many challenges to maintain its biodiversity while feeding the huge population⁵. The increase of the population of the river basin has expanded the rice growing area dramatically, especially in Thailand and Vietnam Mekong⁶. The figure 2 graph shows how the rice production capacity of the Mekong delta became relatively stagnate since early last century. Population of the region increased in last decade, but Mekong Delta showed a lower phase; i.e., 16.6 million in 1997, 17.3 million in 2011. Many studies have found a positive relation between the increase of agricultural production and the reduction of poverty. However, in LMB,

about 20% of the population is still living below the poverty line. The numerous environmental changes including dam construction, strong chemical and high use of fertilizer for crops, and other profit oriented farming practices have degraded the land cover in LMB in recent years. While environmental changes are threatening to food production security, annual occurrences floods are further hampering the life, environment, and infrastructures. Under this context, the correct and efficient use of land cover information for food production planning is a vital need for sustainability of LMB.



Figure 1 The Lower Mekong Basin.

3. Land cover of LMB

The LMB land cover map was produced under separate project in previous years and published in international conferences and in a journal⁷. The 250m resolution map is based on 2005 to 2008 MODIS satellite images and high resolution images for ground truth data and produced with 80% accuracy. The production steps will not be discussed in this paper in details, since the object is only the use of map for a food production strategy.

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3. Land cover of LMB

The important role of land cover data in food production planning is discussed in this section. There are number of factors affecting the crop yield and sustainability, but building a strong relation among those facts through spatial identity based on GIS (Geographic Information Systems) is vital. Figure 4 presented the concept we present in this paper with regard to this inter-relationship.

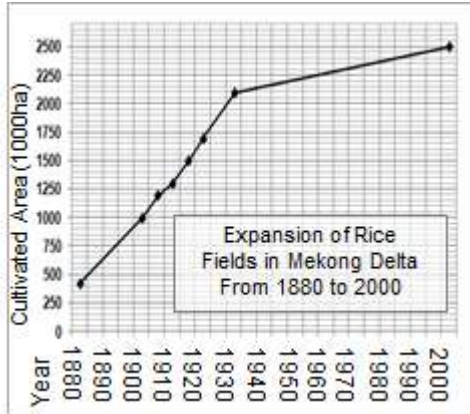


Figure 2. In Delta, land under rice is becoming saturate.



Figure 3. Land cover map of LMB.

Though present food production in LMB shows a sufficiency, environmental degradation and potential natural disasters may alter this situation drastically. In the land cover map used in this study, three classes were allocated to rice paddy, which is the backbone of the agriculture in LMB. The prime object of this study is to estimate the affected land area under each

contributing country in LMB in flood and drought condition. Apart from that land spatial distribution of other food production controlling factors can be incorporate into the land cover map based GIS to refine the food production estimations and forecasts.

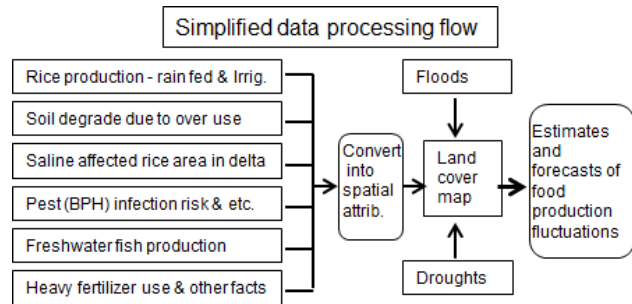


Figure 4. A simplified flow of data processing. Not all possible data types are included in this diagram.

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