GeoS4S Module Commercial Plantation Potential Modelling

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Abstract
Commercial Plantation Potential Modelling (Comm_plant) is a module that provides basics and understanding on commercial plantation potential issues through various case studies. It will address the concepts and methods in GIS and Remote sensing in agriculture applications. In the module, various GIS and Remote sensing techniques will be applied for preparing and analyzing in some factors such as climatic, soil & water and land-use & topographic factors to obtain the potential modelling. Multi-criteria decision analysis (MCDA) will be added into the analysis method. Finally, there is a self – module project which student need to design and analyze commercial plantation potential modelling by their own selection for completing the module.

Key Words: Commercial Plantation Potential Modelling, GIS, Remote sensing, MCDA

1. Introduction

Agriculture land suitability analysis is necessary and is the basic information for decision making. An important part of this process is the determination of the criteria that affect the suitability and potential of the land. Currently, GIS and Remote sensing has been applied in a wide variety of agriculture situations for planning and management. The module will provide various concepts and methodologies for analyzing desirable commercial plantation evaluation using GIS and Remote sensing techniques. This module will be useful for student who wish to learn how to assess the suitability or potential of agriculture land using these modern technologies.

1.1 Module Description

A commercial plantation, on the other hand, is a cultivated area whose species and structure have been simplified dramatically to produce only a few goods, whether lumber, fuel, resin, oil, or fruit. With global demand strong and rising for many agricultural products, modelling in commercial plantations both positive and negative issues can be useful for serving many perspectives such as socio-economics, or environmental for planning monitoring and management. As plantations are not forests. Therefore, land-use/land cover may change time to time in both positive and negative ways. The changes may affect people and their livelihoods, and this in turn affects to the surrounding environment as well. The use of spatial analysis techniques is well established for local regional and global monitoring planning and assessment of agricultural crops.
The module, basically, will provide how to analyze the potential of the area for cultivating the commercial plantation (e.g. oil palm, Para rubber, rice, tea) using spatial analysis techniques including remote sensing and Geographic information system.

1.2 Learning Outcomes

- To understand characteristics of selected crop plantation and their growing criteria.
- To understand important theoretical concepts in spatial analysis and modelling.
- To able to choose and apply of appropriate methods for plantation potential analysis.
- To able to formulate a research problem in a topic area of the selection.

2. Module Structure

2.1 Module Overview

This module consists of 14 lessons in total which amounts to a minimum of 90 hours of effort required for studying the core material. Most of the lessons equal to about 4 to 5 hours, excluding exercises, assignments, reading material and mini project. Some other lessons are more challenging and for the study or their core

material more time (~ 5 -10 hours each) is required. Students must complete 3 exercises, 4 assignments and a self-module project designed to provide practical experience with the Remote Sensing and GIS software while simultaneously illustrating and reinforcing theoretical concepts in commercial plantation modelling.

2.2 Summary of Lesson Content
This section briefly presents the content and goals of each lesson.

- *Lesson 1: Basic concept of agriculture geography* - This lesson explains the concept and theoretical based on agriculture geography and the plantation system.
- *Lesson 2: Characteristics and crop growing criteria* - This lesson describes the characteristics of agriculture plantations i.e. Rice, Para rubber, Logan, Tobacco etc. and the growing factors and criteria for each crop plantation.
- *Lesson 3: Concept of plantation potential modelling and analysis* - This lesson explains concepts of agricultural land suitability evaluation and basic concept of plantation potential modelling and analysis.
- *Lesson 4: Data sources and types for plantation modelling analysis* - This lesson describes the sources and types of data and how to archive all required dataset for plantation potential modelling.
- *Lesson 5: GIS & RS in plantation modelling* - This lesson explains the concept of GIS & Remote sensing in plantation modelling. It also gives some examples of GIS & RS applications in plantation modelling.
- *Lesson 6: Advanced GIS & RS* - This lesson explains on how to implement GIS & Remote sensing techniques such as multi-criteria analysis, image processing etc. and apply for plantation modelling.
- *Lesson 7: Climate factor analysis acquisition and analysis* - This lesson explains not only the nature of climatic data, but also the sources and how to analyze the climatic data using GIS & Remote sensing techniques.
- *Lesson 8: Soil & water factor acquisition and analysis* – In this lesson, students will learn the nature of soil & water data, how to get data sources of soil & water data and also methods to analyze the soil & water data using GIS & Remote sensing techniques
- *Lesson 9: Land-use & Topographic factor acquisition and analysis* - This lesson explains nature of land-use & topographic data, sources of land-use & topographic data and how to analyze land-use & topographic data using GIS & Remote sensing techniques.
- *Lesson 10: Case study I: Rice* - This lesson gives a practical work based on a rice plantation potential modelling case study by applying remote sensing and GIS techniques.
- *Lesson 11: Case study II: Para rubber* - In this lesson, students will practice about the Para rubber plantation potential modelling using remote sensing and GIS techniques.
- *Lesson 12: Case study III: Longan* – In this lesson, student will get more practical work based on Longan case study using remote sensing and GIS techniques.
- *Lesson 13: Case study IV: Tobacco* – In this lesson, student will learn how to apply remote sensing and GIS for tobacco plantation potential analysis.
- *Lesson 14: Mini project: selected plantation* - This lesson will give student a self- module project work. Student needs to explore the characteristics and factors for their selected commercial plantation by integrating remote sensing and GIS techniques in project-based.

3. Hands-on Sessions
The module provides some exercises, assignments and various case studies to supplement the lecture content, deepen students' understanding, and develop their practical skills. Many of these activities are part of the module evaluation scheme. The list below is the list of exercises and assignment in the module;

Exercises list:
Exercise 1: Climate data processing (lesson 7)
Exercise 2: Soil & water data processing (lesson 8)
Exercise 3: Land-use & topographic data processing (lesson 9)

Assignment list:
Assignment 1: Reviewing GIS & RS applications in crop potential modelling (lesson 5)
Assignment 2: Case study I: Rice plantation potential modelling (lesson 10)
Assignment 3: Case study II: Para rubber plantation potential modelling (lesson 11)
Assignment 4: Case study III: Logan plantation potential modelling (lesson 12)

Assignment 5: Case study IV: Tobacco plantation potential modelling (lesson 13)
Self-module project: Selected commercial plantation potential modelling (lesson 14)

This module requires some basic Remote sensing and Geographic Information System (GIS) understanding.

4. Teaching and Learning System

This module will provide students a project – based learning (PBL) with the mix of technical skills, practical experience and theoretical understanding on commercial plantation potential modelling using remote sensing and geographic information system. To complete the module, students must complete 3 exercises, 4 assignments and a self-module project by modelling the selected commercial plantation and find out how much of the potential in the interested area.

5. Evaluation System

Performance evaluation for this module involves two components: a self-module project (40%) and four assignments (60%).

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