PRECISION AGRICULTURE USING REMOTE SENSING TECHNOLOGY, GEOGRAPHICAL INFORMATION SYSTEM AND GLOBAL POSITIONING SYSTEM (GPS)

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Introduction

Precision agriculture technology has being claimed to serve as a tool for crop production management, especially in production input resource evaluation. The objectives of this study are two-folds; to quantify and map the soil nutrient variability (N, P, K) of two paddy growing areas and UPM pasture farm using remote sensing/GIS technology for allocating optimum input of fertiliser and to predict the paddy yield. The lack of knowledge about soil nutrient properties and variability has led paddy farmers and range managers to a non-systematic fertiliser application practice. As a result, the paddy and pasture farm areas are probably over-fertilised and the use of the allocated subsidised fertilisers has not been fully optimised. This technology should be able to predict future crop yield.

Materials and Methods

LANDSAT Thematic Mapper data (path/row 128/56) integrated with GIS and GPS (Trimble GeoExplorer™ II) was taken on 27 February 1997. Digital data processing and analysis was performed using a PC-base PCI EASI/PACE Version 6.2. Other auxiliary data includes: (1) Topographic map from Department of Survey and Mapping Malaysia (JUPEM), (2) Land use cover map from Department of Agriculture, Malaysia, (3) Soil series map from MADA, Kedah, KADA, Kelantan and UPM, Malaysia, and (4) Semi-detailed soil map from MADA, Kedah, KADA, Kelantan and UPM, Malaysia. Soil sampling was conducted and geostatistics analysis was performed to produce the soil nutrient variability map.

Results and Discussion

Diagnosis remote sensing data from satellite technology can provide useful information on monitoring and assessing nutrient variability of paddy area and pasture farm (Kamaruzaman and Norazmi, 1997; Kamaruzaman and Mohd Yusof, 1997; Kamaruzaman; 1998; Kamaruzaman and Dayang Amenozima, 1998). Using Geostatistic Programme, the soil nutrient variability map of an individual nutrient was developed. The soil nutrient variability map of UPM pasture farm showing K values ranging from 4.602 to -1.390 was produced within ±20 metres of mapping accuracy. Different range of values were produced for other nutrients such as N and P and K for the KADA Paddy area in Kelantan which ranged from 93.27 to 62.12 ±20 metres of mapping accuracy. By integrating with the individual soil nutrient maps produced by Geostatistic Program, GIS, database management and GPS, a current status of soil nutrient variability map (N, P, K) can be generated for further analysis by the field and crop experts to make a major decision on the field management. Using the current status soil nutrient variability map, future yield on the same area can be predicted.

Conclusions

Using Precision Agriculture System based technology, precise estimation and future yield prediction is much easier, which was traditionally done by endless inventories, inaccurate randomised soil sampling and field survey that consumes longer time.

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