MPOB GEOSPATIAL PRODUCTS AND MAPPING SERVICES FOR OIL PALM PLANTATION MANAGEMENT

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Geospatial technology of global positioning system (GPS), remote sensing (RS) and geographic information system (GIS) is widely used in mapping. Geospatial data as remotely sensed imagery and other raster formats are increasingly collected in finer resolution. Interpreting and visualizing information from the data has become an essential element in natural resources management, environmental planning and decision-making (Arvanitis *et al*., 2000). GIS and computer-aided visualization are recognized as the main components in visualizing the information as the end-product to the public.

A geographic database (geodatabase) is used to store the integrated collection of geospatial data. The integration of heterogeneous geospatial data offers possibilities to manually and automatically derive new information not discernable from only a single data source. Furthermore, it allows for consistent representation and updates from one data set to the next. A geodatabase can manage large volumes of data - every basic geodata type including simple feature vector data (point, lines and polygon), attribute tables and raster datasets as well as more advanced features that use rules for defining relationships, topologies and behaviour of features. The geodatabase can also manage feature attributes, feature-linked annotation, terrains, survey measurements, addresses, 3D objects, CAD drawings and images. The spatial representations in geographic data sets are stored as either vector features or raster. These geometries are stored and managed in attribute columns along with traditional tabular attribute fields (ESRI Arc News, 2005).

Integration of geospatial data from the geodatabase of the GIS environment is more than just overlaying different data sets on each other; the integration process must also make the relations between the individual objects in the different data sets explicit. Even with fusion of the geospatial data, the original data sets remain usable in their own right. This criterion is a common requirement as agencies usually want to maintain control over the data that they are responsible for and which they are maintaining (Butenuth *et al*., 2007).

MATERIALS AND METHODS

In MPOB, Oil Palm Resource Information System (OPRIS) was developed based on GIS specific functionality to allow complete spatial data management workflows. OPRIS is purposely developed for scientific investigation, resource management and development planning for the oil palm industry. It is managed using the ArcGIS software, and is able to store and retrieve virtually any type of spatially referenced data. The OPRIS geodatabase comprises multiple layers, such as administrative boundaries base map, infrastructure layers, water bodies and river networks, soil type, agro climatic information, topographic and agricultural land use. *Figure 1* shows the structure of OPRIS.

Combination of the multiple datasets in OPRIS creates a new dataset that offers useful information to the oil palm industry. Integration of the soil and agro-climatic layers will give oil palm land suitability area classes. Based on the characteristics of the soils that influence oil palm growth and production (*Table 1*), the areas are classified into 'suitable', 'marginal' or 'unsuitable' for oil palm cultivation. Meanwhile, the agro-climatic combination that comprises rainfall and soil water content also influences oil palm growth and production. The agro-climatic information determines the number of moist (rain + soil moisture = pan evaporation), wet (rain + soil moisture > pan evaporation) and dry months (rain + soil moisture < pan evaporation) for each area based on the annual rainfall and soil type (soil water holding capacity). *Tables 2* and *3* show the

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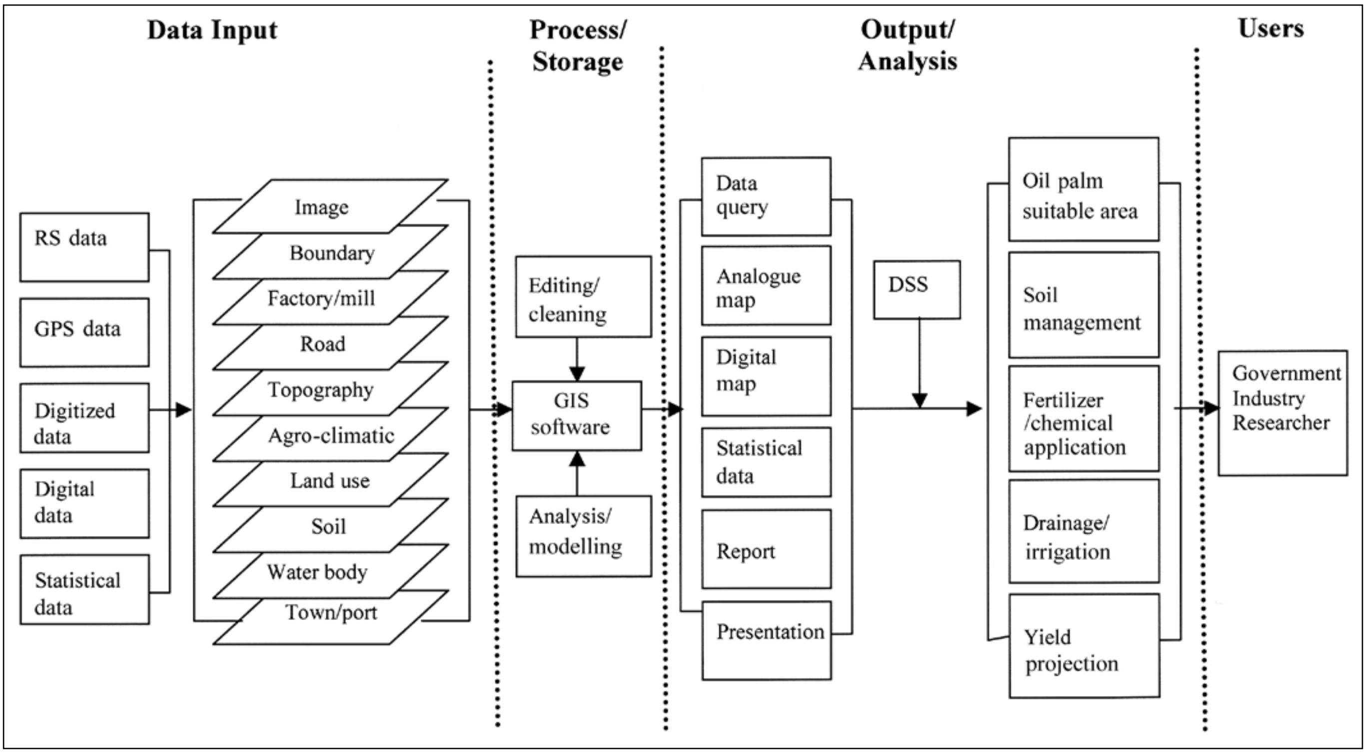

Figure 1. Structure of OPRIS.

TABLE 1. SOIL SUITABILITY CHARACTERISTICS OF OIL PALM

Parameter	Suitable	Marginal	Unsuitable
Slope	0° - 12°	12° - 20°	>20°
Drainage	Imperfect to well	Somewhat excessive and poorly drained	Very excessive and poorly drained
Effective depth	> 100 m	50 – 100 cm	< 50 cm
Texture and structure	Sands and massive clays	Massive clays	Structureless sands
Salinity	<2 mmhos	2 – 4 mmhos	> 4 mmhos
Depth to acid sulphate layer	> 50 cm	25 – 50 cm	< 25 cm
Organic horizon thickness	<75 cm	75 – 300 cm	> 300 cm
Stoniness	<25% and uniformly distributed, or occurring below 75 cm depth	25% - 75% and uniformly distributed, or occurring below 75 cm depth	>75% occurring within 100 cm depth
Nutrient imbalance (CEC)	> 24 cmol and without excessive micronutrients	16 - 24 cmol and without excessive micronutrients	< 16 cmol or with excessive micronutrients

Sources: Wong (1986); Paramananthan (2000).

TABLE 2. TEMPERATURE AND RAINFALL SUITABILITY CHARACTERISTICS OF OIL PALM

Climatic factor	Suitable	Marginal	Unsuitable
Temperature (°C)	23 -32	32 – 34 20 – 23	> 34 < 20
Rainfall (mm yr^{-1})	1 700 – 3 000	3 000 – 4 000 1 100 – 1 700	> 4 000 <1 100

Source: Goh (2000).

TABLE 3. AGRO-CLIMATIC SUITABILITY CLASSES OF OIL PALM

Highly suitable	Suitable	Marginal	Unsuitable
10 – 12 total wet/moist months/year	7 – 9 total wet/moist months/year	5 – 6 total wet/moist months/year	< 4 total wet/moist months/year

Source: Malaysian Meteorological Service (1993).

temperature and rainfall suitability characteristics for oil palm and the agro-climatic suitability classes for oil palm, respectively. The information are combined to produce oil palm land suitability maps for the country as the final output of the MPOB geospatial product, which is very useful for identifying suitable areas for oil palm cultivation.

GEOSPATIAL PRODUCTS AND MAPPING SERVICES

MPOB geospatial products are maps of oil palm areas, soils, agro-climate, land suitability for oil palm and oil palm site yield potential. The information can be examined by specific districts and sub-districts of the administrative boundaries. Apart from its geospatial products, MPOB also offers various mapping services to cater to the requirements of oil palm growers. The client might want to identify suitable areas to plant oil palm or to obtain the site yield potential (SYP). From the data already in the MPOB databank, delineating the areas of different suitability to oil palm and SYP can be done.

COST

The costs of the map(s) will vary depending on the data storage size required, and whether single or multiple datasets are required to produce them.

BENEFITS

MPOB geospatial products are necessary tools for efficient oil palm management and resource planning. They give reliable information to decision-makers and researchers to manipulate different data sets into meaningful information through interactive GIS solutions.

CONCLUSION

The geodatabase comprises geospatial information which is very useful for oil palm plantation management and planning. Geospatial technologies can provide good reliable information at less time and low cost as compared to conventional methods.

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