GEOSTATISTICS FOR MONITORING *Ganoderma* OUTBREAK IN OIL PALM PLANTATIONS

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The basal stem rot (BSR) disease of oil palm is widespread, occurring in major oil palm-growing regions of the world. The disease is caused by a few species of *Ganoderma*, a basidiomycete fungus (Idris *et al.*, 2000a, b). The effects of *Ganoderma* infection on productivity decline in oil palm crops have been of considerable concern ever since the replanting of oil palm began in Southeast Asia, especially in Malaysia and Indonesia (Turner and Gillbanks, 2003). BSR disease outbreak in oil palm naturally infected by *Ganoderma* can be monitored using geostatistical techniques. Geostatistical techniques, originally developed for use in mining, have also been applied in plant pathology to quantitatively characterize the spatial pattern of disease or a pathogen population in space and over time (Nelson *et al.*, 1994; Larkin *et al.*, 1995). The study of spatial and temporal patterns can provide quantitative information on population dynamics, aid in the design of epidemiological studies and of sampling programmes for disease or pathogen monitoring, and can be used to generate hypotheses about underlying ecological processes.

PROCEDURES

A summary of the processes involved is presented in *Figure 1*. Data can be obtained from a disease census in oil palm blocks in a plantation assisted by geographical positioning system (GPS) equipment. The BSR disease of oil palm caused by *Ganoderma* must be confirmed. BSR census data are plotted into a geographical information system (GIS) map for spatial and geostatistical analyses. The analyses are carried out using a modelling procedure by producing an interpolation map, a prediction model and disease hotspots (*Figures 2* and *3*).

SERVICE OFFERED

The BSR disease outbreak monitoring service is offered to anyone who is interested. A report on the results will be given together with recommendations on subsequent actions to be taken. Apart from that, the service also offers the mapping of the sites and the mapping of BSR disease incidence to cater to the needs of the oil palm growers.

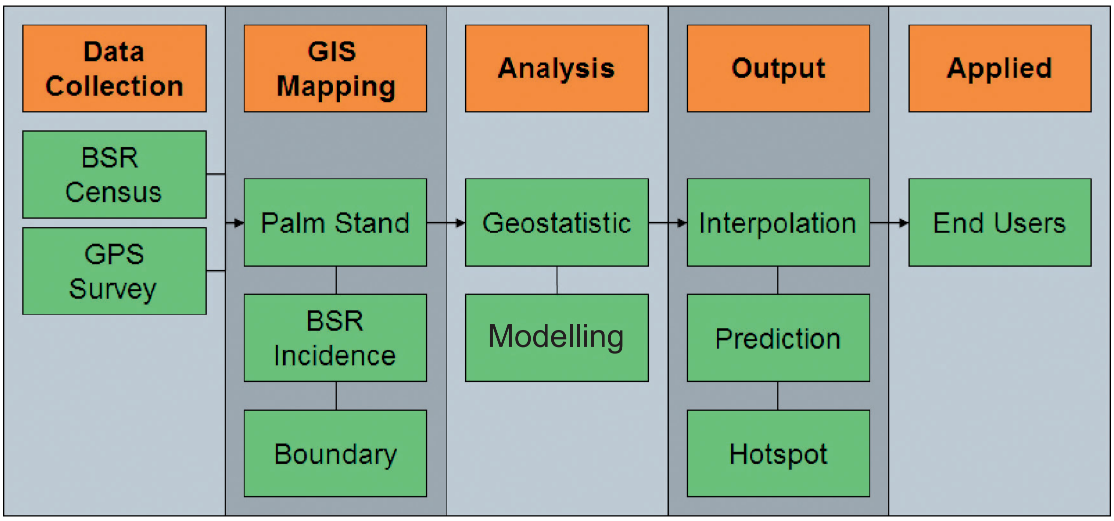

Figure 1. Overall process of using geostatistical techniques for monitoring Ganoderma *outbreak in oil palm.*

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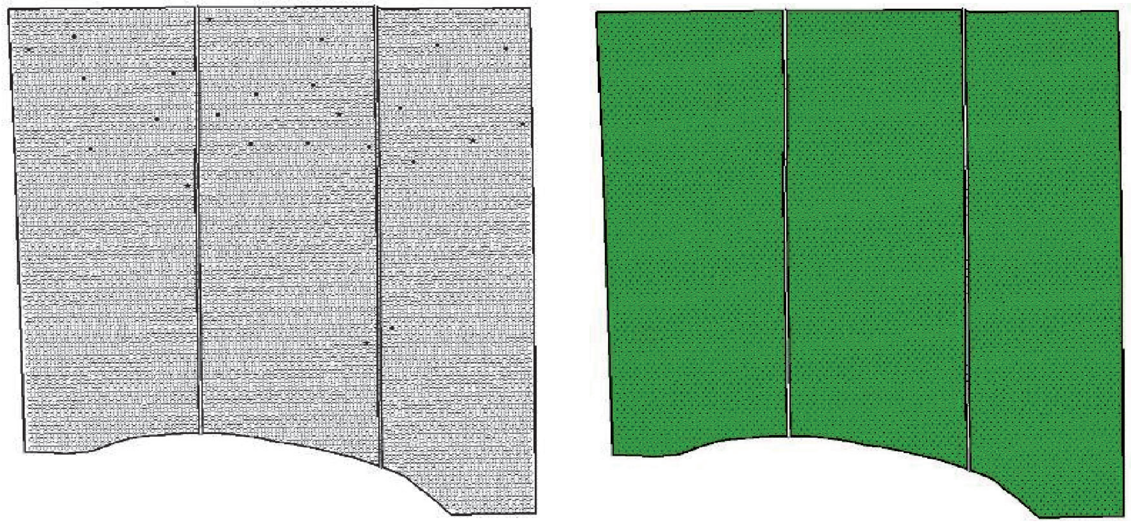

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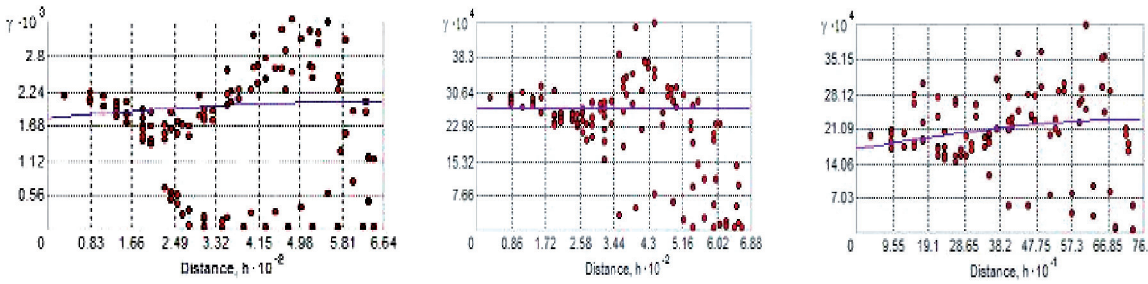

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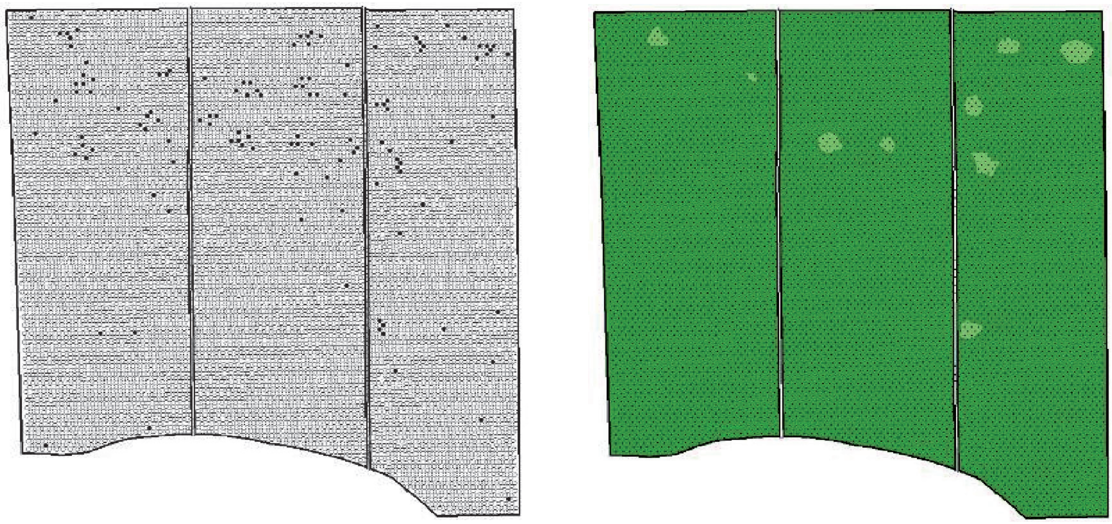
i. Palm age: 10 years after planting.



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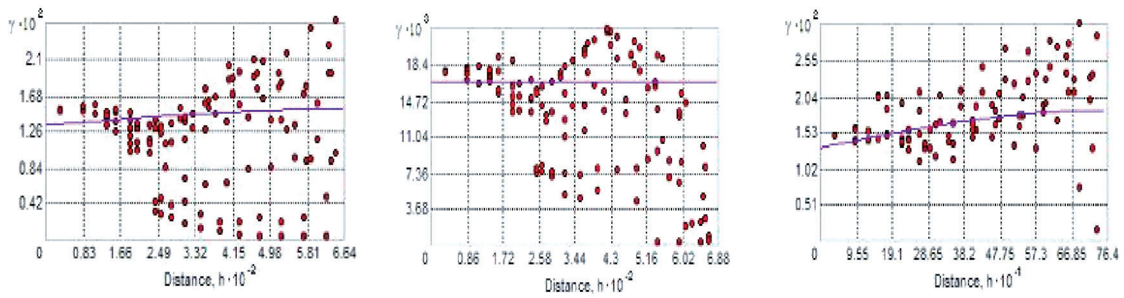

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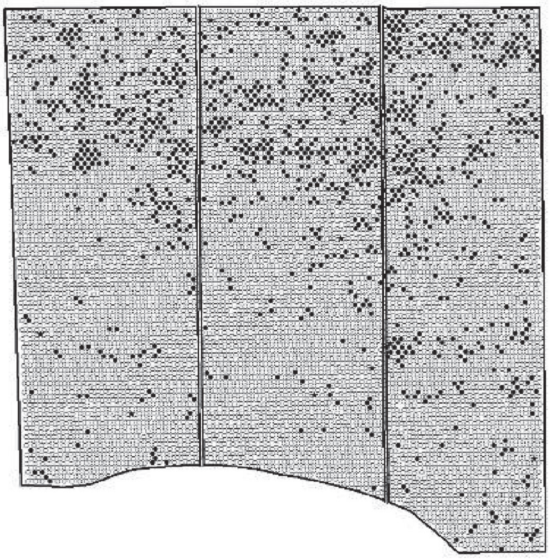
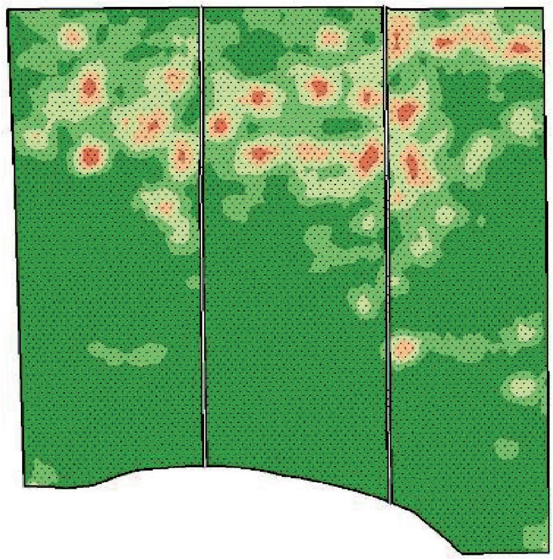
ii. Palm age: 15 years after planting.





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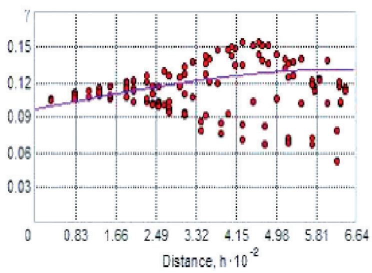

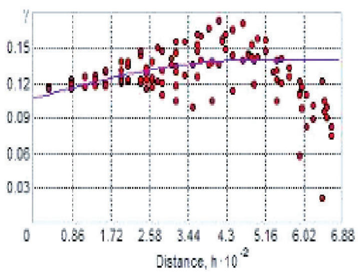

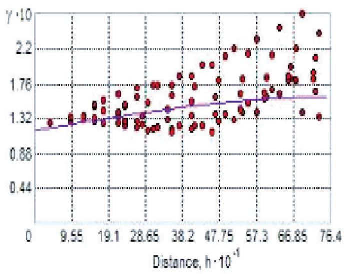

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iii. Palm age: 20 years after planting.

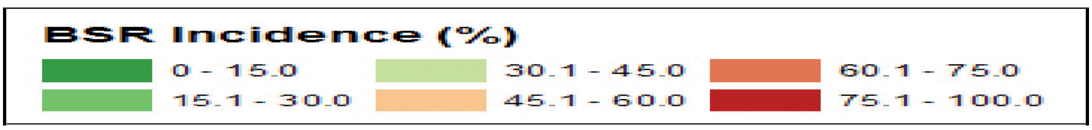

Figure 2. An example of a basal stem rot (BSR) disease incidence map, an interpolation map and a semivariogram model to determine areas infected with Ganoderma *at 10, 15 and 20 years after planting.*

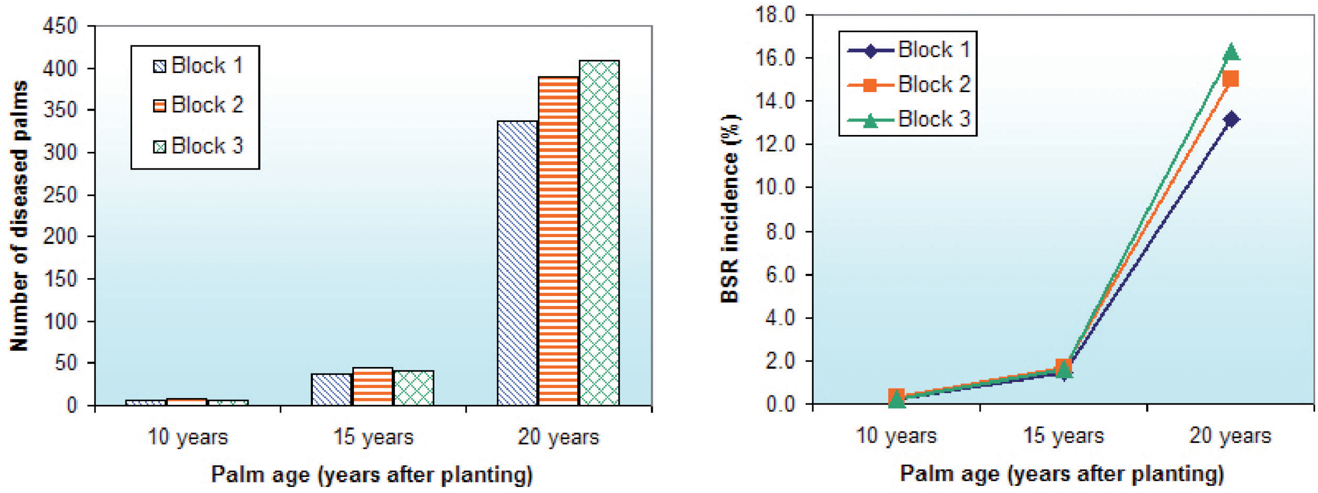

Figure 3. Progress of basal stem rot (BSR) disease incidence in oil palm at 10, 15 and 20 years after planting.

BENEFIT

Geostatistical analysis is very useful in oil palm plantation management. The estate management can get an overall view of the plantation, identify the exact location of infected oil palms, and estimate the implications on yield. All these will allow for the plotting of the pattern of disease spread in the field, estimates of future revenue losses and disease treatment cost, and calculations of expected yield after treatment.

COST

The cost of the services will vary pending on the data storage size required, type of analysis, and whether single or multiple datasets are required in the process.

REFERENCES

IDRIS, A S; ARIFFIN, D; SWINBURNE, T R and WATT, T A (2000a). The identity of *Ganoderma* species responsible for basal stem rot (BSR) disease of oil palm in Malaysia – morphological characteristics. *MPOB Information Series No. 102*. 4 pp.

IDRIS, A S; ARIFFIN, D; SWINBURNE, T R and WATT, T A (2000b). The identity of *Ganoderma* species responsible for basal stem rot (BSR) disease of oil palm in Malaysia – pathogenicity test. *MPOB Information Series No. 103*. 4 pp.

LARKIN, R P; GUMPETZ, M L and RISTAINO J B (1995). Geostatistical analysis of *Phytopthora* epidemic development in commercial bell pepper fields. *Phytopathology*, *85*: 191-203.

NELSON, M R; FELIX-GASTELUM, R; ORUM, T V; STOWELL, L J and MYERS, D E (1994). Geographic information systems and geostatistics in the design and validation of regional plant virus management programs. *Phytopathology*, *84*: 898-905.

TURNER, P D and GILLBANKS, R A (2003). *Oil Palm Cultivation and Management*. The Incorporated Society of Planters, Kuala Lumpur, Malaysia.

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