Agricultural Monitoring

Current systems

- Agricultural inputs have increased dramatically over the past century to improve yields.
- Monitoring programmes rely heavily on measuring the environmental conditions around the plant.
- An advance from ‘insurance’ use of pesticides to control pest and disease, is the use of networked weather forecasting in combination with strategic chemical application and the use of gene deployment strategies.
- Organic farming represents one solution against excess farm chemical inputs, but is only 5% of the current market.
- Genetic engineering offers some solutions but concerns over transgenes means that genetically modified crop production remains at 10% of the global amount.
- Research into alternative chemical pesticides is ongoing and ‘bio pesticides’ are also actively being investigated and tested.

The market pull and research push now encourage research into new ways of managing agriculture towards greater sustainability.

Forecasting disease involves the use of on-farm weather stations. These weather stations may be networked to achieve regional management programmes which have significantly reduced the number of spray applications, e.g. in the case of potato late blight.

Remote sensing

- Remote sensing (RS), based on analysis of the spectral emissions of crops, offers new possibilities for crop monitoring and management of regional irrigation schemes.
- RS can detect between - and within - field variation in crop type, growth and yield prediction.
- Detection of water stress by RS, in combination with computerised variable delivery systems, permits supply of water to restricted areas rather than using general broadcast applications.

However the practical limitations of using remote sensing are threefold:

- The technology is expensive;
- The data may not be available in real-time; and
- The resolution may not be sensitive enough to detect the early stages of disease development.

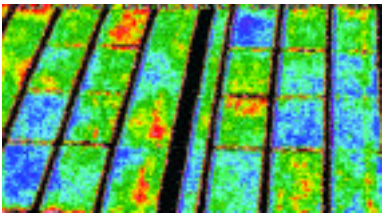
Proximal Remote Sensing

Proximal (close-up) Remote Sensing (PRS) of plant parameters such as temperature and chlorophyll fluorescence can be used to give real time data - an advantage over RS. Proximal remote sensing is being used in the PLANTS project within a society of communicating plants and artefacts for implementation for ultimate dissemination within precision agriculture.

Precision agriculture is a move from monitoring the environment to determining the needs of the crop, thereby delivering inputs to those plants in need of attention. It can be combined with:

- Conventional plant breeding and genetic engineering for stress tolerance;
- Strategic use of fertilisers;
- Gene deployment and the controlled use of pesticides; and
- Biological control and elicitor sprays for the maintenance of crop yields.

A reduction of pesticide, fertiliser and water inputs through the development of precision agricultural systems contributes to more sustainable crop production.



Remote Sensing between - and within - fields reveals differences in crop temperature: blue indicates the crop is unstressed; yellow highlights moderate drought stress; and red shows high drought stress. (Image available at URL: www.uswcl.ars.ag.gov/epd/remsen/irrweb/thindex.htm)

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