POSTER SUMMARY

APPLICATIONS OF REMOTE SENSING IN SUGARCANE AGRICULTURE

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Summary

“Remote sensing is the determination of a quantity by detecting it from a distance. A common application of remote sensing is the use of satellite-borne instruments to determine the location and amount of resources on the surface of the Earth.” (Anon, 2005). The Landsat 7 Enhanced Thematic Mapper Plus (ETM+) satellite was launched on 15 April 1999, and has an altitude of 705 km and a spatial resolution of 30 m for the multi-spectral channels, 15 m for the panchromatic channel and a 60 m resolution for the thermal channel. The overhead re-visit time is 16 days (Irish, 2000). This is highly advantageous in agricultural applications as potentially two images can be captured per month, cloud cover permitting.

The results presented in this poster are summarised from the research of Gers (2004), that was conducted during the 2001/02 milling season using for the case study the Umfolozi Mill Supply Area (MSA), which extends from 27.85°S, 32.00°E to 28.57°S, 32.40°E. Results presented are based on the analysis of Landsat 7 ETM+ data. Four satellite images were obtained over the 2001/02 milling season. All images were orthorectified and normalised for the seasonal variations in illumination and earth-sun distances using the COST method described by Chavez (1996).

Four experiments are presented in this communication, each will be discussed in turn.

The first experiment investigated using remote sensing techniques for the measurement of the thermal age of sugarcane. Four pseudo phenological stages of sugarcane growth were identified. These stages were based on the changes in sugarcane stalk population density over the crop cycle. Multi-variate analysis techniques were applied to the data. The results showed that remote sensing techniques were able to distinguish between three (pseudo) phenological stages in growth, namely pre-emergence, tillering and tiller stabilisation.

The second experiment investigated whether or not remote sensing techniques were able to identify sugarcane cultivars. Multi-variate analyses were conducted on the spectral reflectance values for different sugarcane cultivars. The results showed that Landsat 7 ETM+ data were not able to distinguish between cultivars of the same age.

The third experiment investigated how accurately remote sensing could map sugarcane areas for large and small-scale growers. A hierarchical unsupervised (isocluster) classification method was employed to map large-scale and small-scale growers separately. The accuracy for mapping small-scale grower fields was 63%, and 76% for large-scale growers.

The last experiment investigated the potential of remote sensing techniques to measure the percentage of the MSA harvested throughout the milling season. This approach combined remote sensing classification techniques and accurate field boundary information to determine the status of sugarcane in each field. The agreement between the mill crush figures, which were the best approximations of the areas harvested throughout the milling season, and the harvest areas measured by remote sensing, was good.

At present, remote sensing technologies alone are unlikely to deliver a significant advantage over the traditional methods employed in sugarcane supply chain management in the South African sugar industry. Remote sensing techniques have the potential to increase operational efficiencies within the agricultural sector when incorporated within the existing management structures. The incorporation of information such as accurate field boundary data is required to facilitate accurate and reliable results. It is recommended that remote sensing techniques be integrated within the existing management structures of the sugarcane supply chain to exploit the benefits.

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