

**Introduction:**

Geographic Information System (GIS) technology is designed to help analyze relationships and patterns not recognized by viewing lists or paper maps. By incorporating Global Positioning Satellite (GPS) technology with GIS, an entirely new strategy for sugar beet production is being developed at Holly Sugar Corporation. Digital maps are generated showing highly detailed geographic information and linked with information in the Agricultural Information System database. These spatial data make it possible to relate numerous input and environmental factors to sugar beet yield at the regional level. They have sufficient statistical power to build robust agronomic models and decision support systems. By utilizing the technology at the regional level, the relative value of various precision agriculture technologies can be assessed for the field level.

**Discussion:**

The availability of powerful computers, sensors, and controller technology and the incorporation of GPS technology are providing the sugar beet grower and processor with new ways to measure and manage variability in the field. It provides for an entirely new strategy for crop production. However, the data generated by this technology are usually very large and exactly how to interpret and distribute these data is not well understood. Little science is available for optimizing a grower's return using this technology to modify input factors such as fertilizer, pesticides, seed depth and plant spacing.

To develop the technology necessary to optimize sugar beet production based upon GPS and GIS technology, Holly Sugar Corporation is assembling geographical data relating numerous input and environmental factors to sugar beet yield and quality. Sugar beet fields in eight of the company's twelve sugar beet producing regions are being mapped and monitored with aid of GPS and GIS technology. Differentially corrected GPS devices are used to accurately map and account for acreage, while ArcView GIS software is utilized to combine the geographic data to data collected in the field. Data collected include basic grower information, input factors, pests and pesticide information, yield and quality results, and weather variables, and economic factors.

Spatial interpretation of these large datasets that are geographically tied to these fields helps to build accurate and robust computer models for sugar beet production. These models are used to alert agricultural staffs and growers to production challenges including pest and disease outbreaks. When combined with remote sensing technology, the models can be used for yield forecasts, climatological purposes, and for monitoring crop condition. These data also have sufficient statistical power to help enable a grower's financial return to be optimized. The grower benefits because these data help fine tune prescriptions to optimize inputs leading to less costs and improved production. The processor benefits through optimized production and higher quality. Additionally,

the data provides useful information regarding the relative value each of the technologies currently being employed in precision agriculture.

**Summary:**

By utilizing GPS and GIS technology on a regional basis, data is being collected that is helping Holly Sugar better access and measure the factors impacting sugar beet yield and quality. Spatially interpreted data obtained by linking geographic data with various agronomic data helps build accurate and robust models for sugar beet production. These models are used to help optimize financial returns for the grower and the processor. Data collected from a regional level also helps to assess the value of various technologies used in precision agriculture at the field level.