

23. Development of model for yield estimation of orange using geospatial techniques

Aim

To develop model for estimation of orange fruit yield using remote sensing imagery

To predict attainable fruit yield of orange using remote sensing imagery

Scope

The successful prediction of crop yield is largely based on the ability of sensors or imagers to detect various canopy variables (biophysical and biochemical) such as leaf area index (LAI), leaf chlorophyll content, or leaf nitrogen content, which each are significantly associated with crop yield. Previous studies on the application of remote sensing for yield estimation and mapping were mainly performed on field crops. Few studies on the usefulness of remote sensing of orchard crops have been reported. Perennial crops exhibit greater variability in canopy structure and fruit yield than annual crops, and this is attributed to the internal mechanism of alternate bearing in individual plants. Field observations of citrus trees have shown that there is a wide variability in the numbers of new leaves and floral buds during the earlier growing seasons, as well as wide variability in fruit yield. The differences in canopy structure and their spectral variability among trees during different seasons can provide information on their fruit production level, and can be assessed using high-resolution hyperspectral imagery (UAV/airborne).

Different multispectral/hyperspectral remote sensing data has the potential for reflectance data for estimation of several canopy variables related to biophysical, physiological or biochemical characteristics from spectral analysis and indices. Various vegetation indices derived from multispectral wavebands can be used to assess and study crop growth conditions using different tools for model development. Furthermore, various canopy variables derived through the analysis of very high-resolution multispectral and hyperspectral imaging (both satellite and UAV platforms) has the ability in the modelling of fruit production/yield within an orchard.

Current constraints / Challenges

- Fruit drop and alternate bearing is main constraint in yield modelling of Citrus.
- Rigorous ground truthing and frequent field inspection is very much required.
- Availability of multi-temporal hyperspectral data of required spatial resolution is a major constraint to operationalize such studies for larger areas.

Expected outcome

- Model for orange yield estimation from citrus orchards.
- Predicted and validated orange yield from the model developed.

- Upscaling the model for citrus yield/production assessment in other Citrus growing areas of the country.

Timeframe

2022 – 2025