EARTH OBSERVATION SYMPOSIUM (B1)
Earth Observation Applications and Economic Benefits (5)

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LEVERAGING MACHINE LEARNING AND SATELLITE IMAGERY TO DEVELOP SOLUTIONS FOR MIXED CROP FARMING DONE ON SMALL FARMS IN INDIA

Abstract

The application of satellite based remote sensing for agriculture is not new. It has been in practice for several decades for estimating crop health, crop damage and predicting droughts. However, several factors have hampered the role of satellites in developing sustaining solutions. The major factors being cost, complexity, spatial resolution and temporal frequency of data. This has confined the applications to pilots and research work. On large scale, work has been done on crops grown in big farms. But in a country like India crops are often grown in small size farms in a mixed cropping pattern which are difficult to classify. Further, horticultural crops like tomato and onion are subjected to severe price fluctuations as the supply-demand cycle is not well understood. Steep fall in crop prices are one of the many causes for farmers committing suicide in India.

A number of commercial EO (Earth Observation) constellations are coming online in the next 12 to 24 months. That and the growing Sentinel constellation from the European Space Agency (ESA) has created an opportunity to revisit the problem of crop acreage estimation, supply projection and price forecasting. In addition to cheaper, high-quality, more frequent data feeds, we can leverage the advances in Machine Learning and Artificial Intelligence. State of the art algorithms for signal decomposition and deep learning will be applied in addition to the classical approaches.

This paper proposes the development of a tool consisting of 3 models to provide a reliable, affordable and user-friendly platform for farmers, social businesses and government organizations. The first model will perform area crop acreage estimation. The second model will implement a crop supply projection, using ancillary data such as weather, seed sales, and fertilizer sales. The third model will take into account exogenous factors to predict crop prices. The problem will be spilt into two seasons: Rabi (non-cloud) and Kharif (monsoon with cloud cover), owing to the effect of clouds on sensor choices. The tool will have multiple benefits:

- It will forecast the price for the crop the farmer has planted.
- It will recommend a set of alternative crops in case there is a fore-casted drop in price.
- It will help farmers to prepare well in advance for the worst case scenario.
- It will help the government to plan help for affected farmers and release financial aid in a timely manner.