

Acreage Estimation using SAR Data

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ABSTRACT

Often, during most of the crop season, agricultural areas are principally the soil on which crop will grow later on. From the analysis of optical multi-spectral images, it is a general agreement, that it is not possible to identify on-going field preparations such as ploughing / re-ploughing, sowing, the earliest stages of plant emergence, and the harvested area. Hence, first estimates of the actual cultivated area are not available earlier than crop start developing their plant structure, assuming that weather conditions are favourable to the data acquisition. Nevertheless, the specific sensitivity of Synthetic Aperture Radar (SAR) to important soil properties, such as roughness and moisture content can be exploited. These properties of soil as well as the evolution over time are not casual, as far as agricultural surfaces are concerned. In fact, knowledge of crop calendar, land practices, and precipitation data, multi-temporal SAR data offer valuable information (complementary to optical multi-spectral images) to determine at the earliest stage of the crop season, when and where fields are prepared, and later, the phenological crop's status such as flowering, plant drying and harvesting.

Based on this principle, tailored made products based on the utilisation of ENVISAT ASAR, ERS-2 SAR, and RADARSAT-1 data have been developed. At present time, this methodology has been applied:

- To determine rice acreage at emergence time and to monitor rice growth in South East Asia.
- To monitor field preparations, detect plant emergence, flowering, plant drying and harvest time for maize and sun flower in South Africa.
- To detect crop emergence time and corresponding cultivated extent/areas in some African countries.

In general, from the above mentioned experiences, it has been recognised that SAR systems (in particular, if complemented by optical-multispectral products) play a relevant role. *Conditio sine qua non* for the successful applicability of the proposed approach, is that satellite acquisition times-series and related acquisition modes are selected according to the specific crop calendars and land practises – in order to be able to capture the field activities and the different growing stages – but also, that an appropriate processing is performed.