



BRS TECHNICAL BULLETIN NLU-201103
REGIONAL LAND USE MAPPING USING SATELLITE AVHRR DATA.

The requirement for regional land use mapping (both historical and current)

Land use mapping has many applications relevant to national scale issues that include:

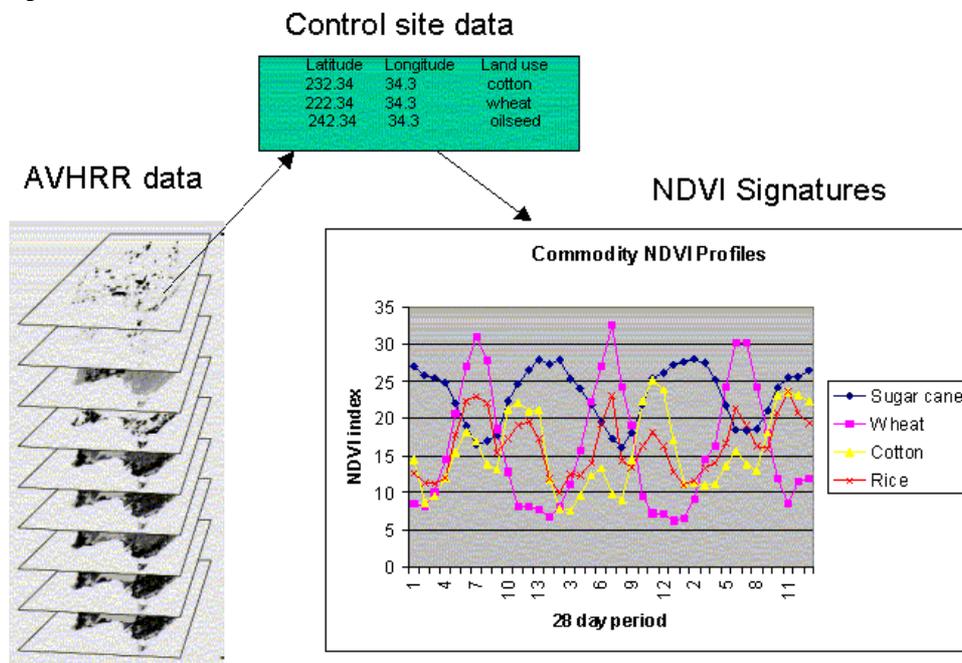
- Supporting information on diversity of environment and related patterns in economic use of land (e.g. risk assessment of land use with climate reliability projections; relating land use to social factors)
- Strategic industry-based planning
- Integrating with other data sets to allow multi-objective assessment on land use and land use change
- Background information products to inform decision-making and assist in the presentation of policy proposals

Method for regional land use mapping

National agricultural statistics and time-series satellite NOAA-AVHRR data is being used as a primary input for a method of generating regional land-use maps across Australia. The method is designed to be a cost effective means of integrating available data sources on land use. The method can be briefly summarized in the following steps:

1. Acquisition of time series cloud-free AVHRR composites for continental Australia
2. Compile known field sites (approx. 1000) for commodity NDVI signatures
3. Masking non-agricultural land
4. Statistical method to allocate likely land-use classes based on known total areas (census data) for local areas

AVHRR NDVI profiles



Masking non-agricultural land

Non-agricultural land use tends to be well mapped, because it is often stable over time. A number of Australian national data-sets can be combined to generate GIS layers of all non-agricultural land uses and these can be used to mask out areas from further processing as shown below:

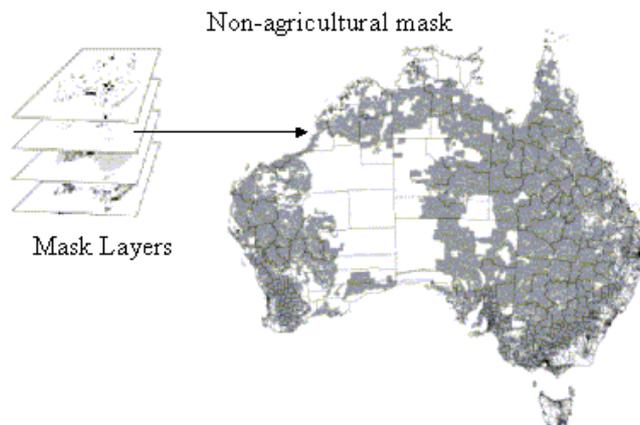
Mask layers include:

Topographic features (e.g. lakes, urban)

Protected areas, indigenous lands

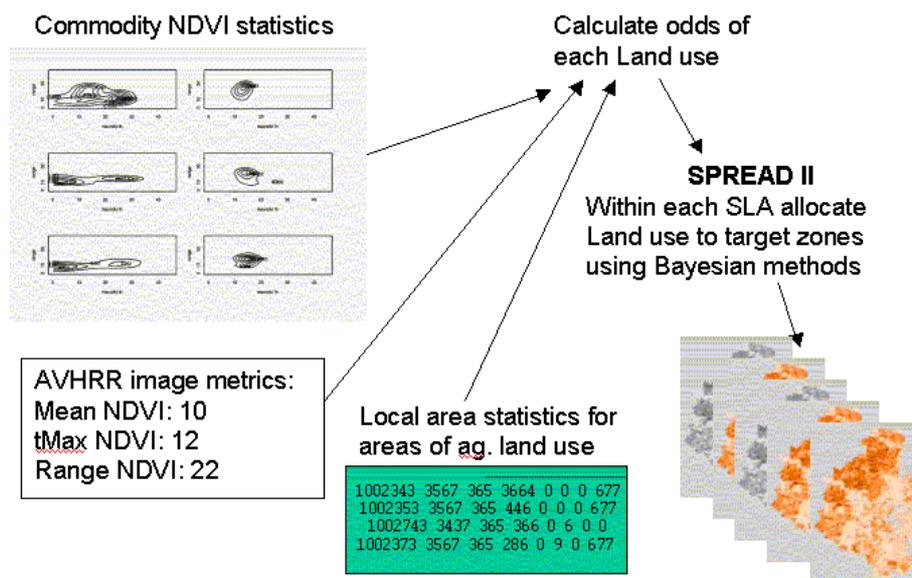
Native and plantation forests

etc



SPREAD II Probability allocation method

A Bayesian probability method is used to allocate likely land-use classes based on (1) statistical characteristics of AVHRR NDVI for commodities defined by the field site data, (2) the time-series AVHRR NDVI data for the continent, and (3) census data about the amount of individual land uses for statistical local areas (SLA's) (see diagram below). The resultant grid cell data layers represent probability surfaces for each mapped commodity or land use type. A single layer is also produced which contains a most likely land uses based on the individual probabilities of all types mapped.



Limitations and improvements

The method has limitations in that some crop types and agricultural land uses are impossible to distinguish with NDVI profile data alone. Where possible other information such as slope, rainfall is used to improve the probability analysis. Future developments will be in (1) the reduction of noise in both control site and image profile data (2) the additional use of surface-temperature data and (3) the use of higher resolution MODIS data.

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