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## Model for the Estimation of *Acacia senegal* Volume using NDVI Data

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### Abstract

This study has been conducted to produce a model for the estimation of the stand volume of *Acacia senegal* using the Normalized Difference Vegetation Index (NDVI) and a field inventory. The study has been carried out during 2007–2008 in the southern Kordofan state in Sudan where this species has a great economic and environmental importance ranging from gum Arabic production to soil reclamation.

The study used NDVI values produced from the Terra ASTER satellite imagery data and normal forest inventory data. A stratified random sampling design has been used for the collection of the field data to estimate the *Acacia* stand volume (tree height and diameter), in order to calculate the volume for each sample plot. The satellite data were used to produce NDVI maps and to calculate the pixel value for each sample plot. Finally the calculated stand volume has been correlated with the NDVI values using SPSS. An algorithmic model has been produced to estimate the stand volume of *A. senegal* from the NDVI value:  $\text{Volume} = a_0 + a_1 \cdot \ln(\text{NDVI})$  with  $a_0 = .420$ ;  $a_1 = .750$ ;  $\ln$  = the natural logarithm; NDVI = Mean NDVI for sample plot of 0.36 ha.

The model will help to quickly estimate the standing volume for *A. senegal* which could assist the forecast for gum Arabic production and the estimation of tree damage by insects, fire or other factors. This study also showed the possibility to use remotely-sensed data of medium resolution together with field inventory for providing data for forest management. This study could be an initiative for replication and production of models for other (tree) species.

**Keywords:** *Acacia senegal*, modelling, NDVI