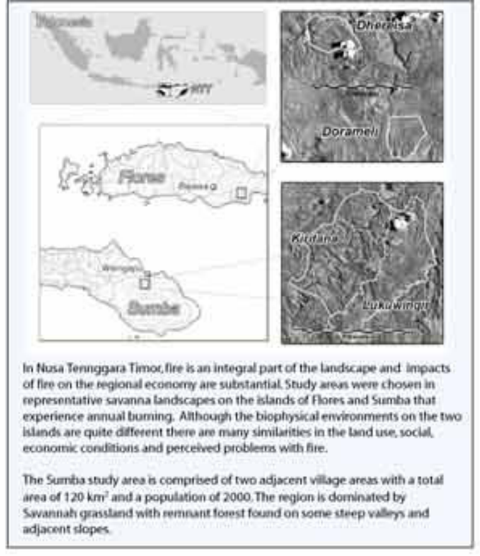
Impacts of fire and its use for sustainable land management in Northern Australia and Indonesia.

GIS for fire mapping and monitoring in Eastern Indonesia.

In Eastern Indonesia (NTT), the breakdown of traditional fire management practices has, in many areas, contributed to declining land productivity through direct impacts on plantations and crops, soil loss and nutrient depletion, forests loss and associated water catchment degradation. There is a need for the development of sustainable fire management practices and appropriate fire policies that provide incentive for improving fire management on the ground. A key issue is that there is currently inadequate data and official appreciation on the real extent of burning eastern Indonesia. To address this, an ACIAR project is implementing, in tandem with social and policy research, fire mapping and analysis methodologies developed in northern Australia.

This poster presents some of the acquired and derived spatial data used for the Sumba study site. Also presented are some initial results from the data analysis.

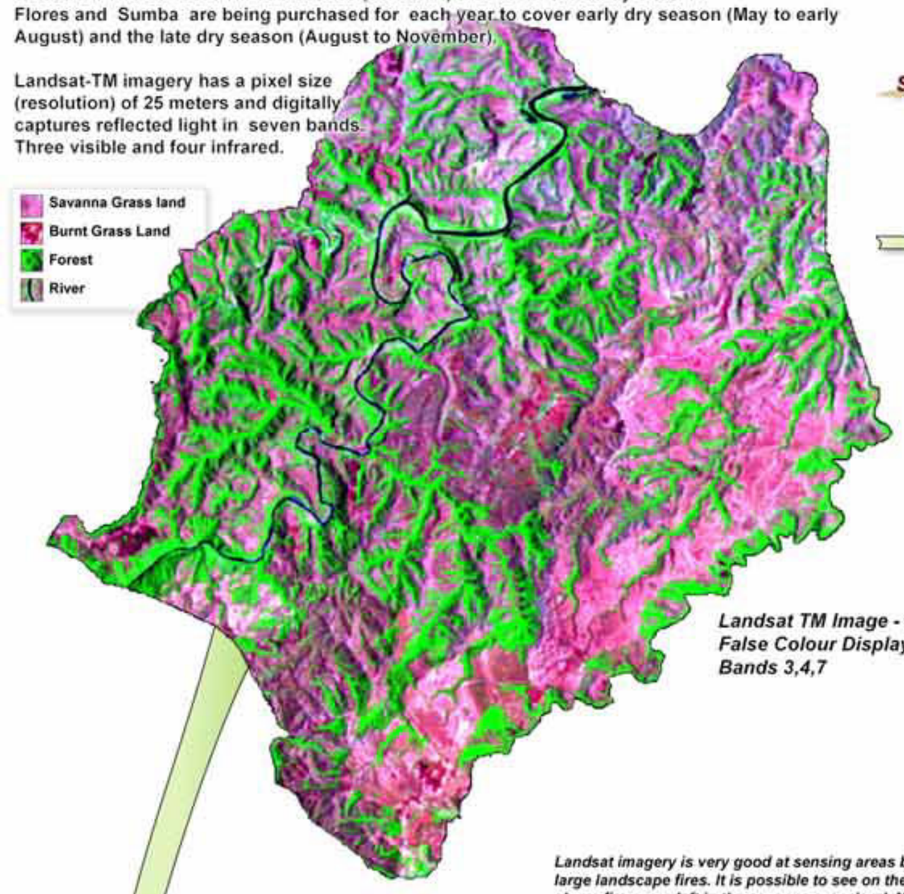


In Nusa Tenggara Timor, fire is an integral part of the landscape and impacts of fire on the regional economy are substantial. Study areas were chosen in representative savanna landscapes on the islands of Flores and Sumba that experience annual burning. Although the biophysical environments on the two islands are quite different there are many similarities in the land use, social, economic conditions and perceived problems with fire.

The Sumba study area is comprised of two adjacent village areas with a total area of 120 km^2 and a population of 2000. The region is dominated by Savannah grassland with remnant forest found on some steep valleys and adjacent slopes.

Satellite Imagery is being used for fire mapping, land cover mapping and land cover change detection. Two Landsat-TM sub-scenes (60x60km) that cover the study sites in Flores and Sumba are being purchased for each year to cover early dry season (May to early August) and the late dry season (August to November).

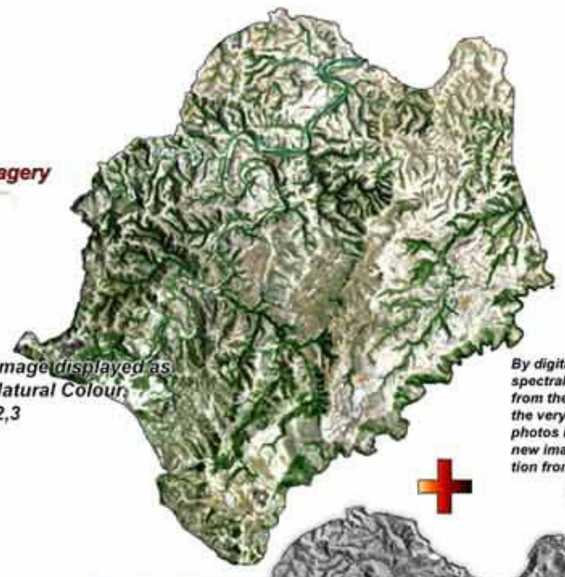
Landsat-TM imagery has a pixel size (resolution) of 25 meters and digitally captures reflected light in seven bands. Three visible and four infrared.



Landsat TM Image - 28/10/2003
False Colour Display.
Bands 3,4,7

Landsat imagery is very good at sensing areas burnt by large landscape fires. It is possible to see on the image above fire scars left in the savanna grassland. Mapping these fires multiple times through a year over a number of years will build a picture of the local fire regime.

Satellite Imagery



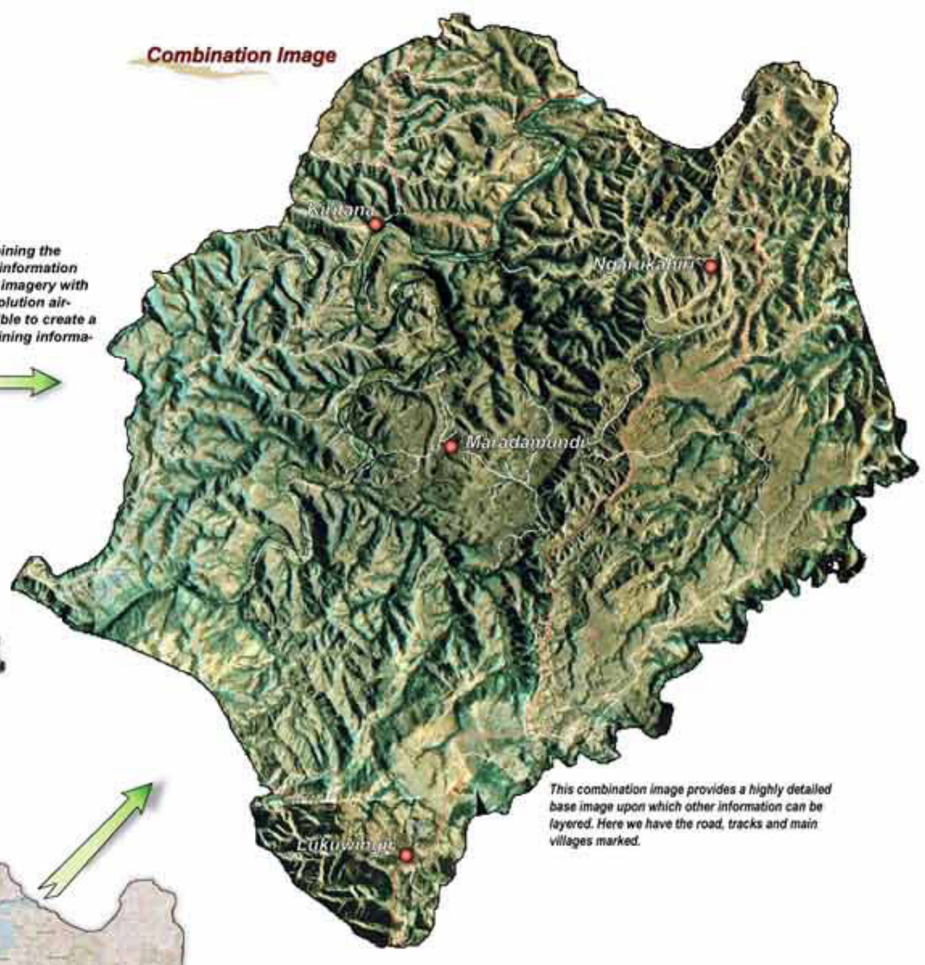
Landsat Image displayed as Pseudo Natural Colour. Bands 1,2,3

Air Photo Mosaic

Air photos were scanned and geo-rectified to the topographic map sheets. Four air photos from 1992 were mosaiced together to cover the study area.

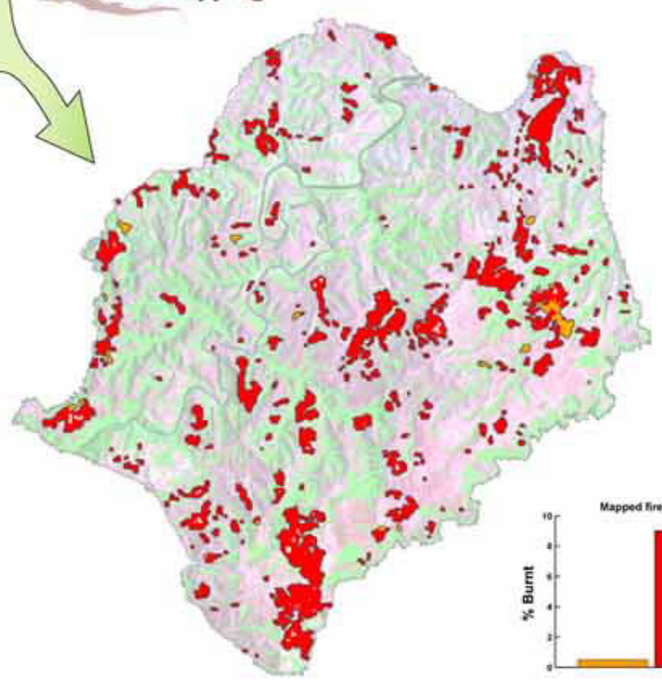
By digitally combining the spectral (colour) information from the satellite imagery with the very high resolution air-photos it is possible to create a new image containing information from both.

Combination Image



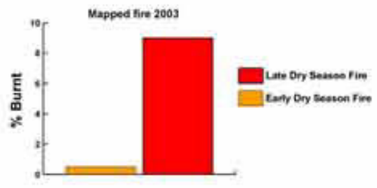
This combination image provides a highly detailed base image upon which other information can be layered. Here we have the road, tracks and main villages marked.

Fire Scar Mapping

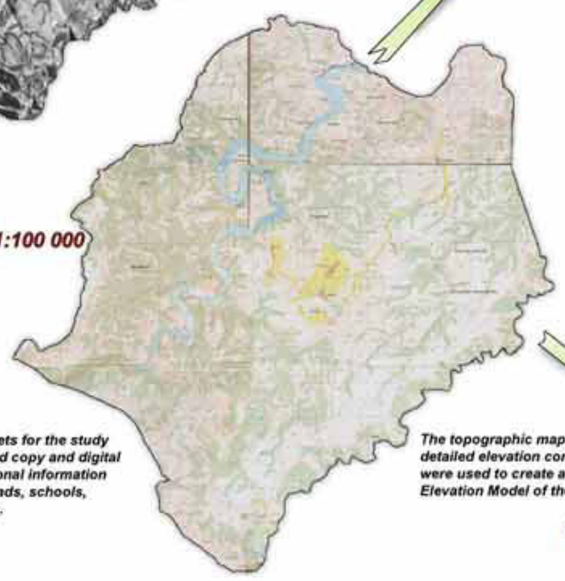


This fire mapping from 2003 was derived from two satellite image dates. The first was from Early in the dry season (May) and the second from late in the dry season (October). By mapping multiple dates we are able to increase mapping accuracy and produce a picture of the timing of burning.

Late dry season fires are considered to be potentially more destructive as they are often larger and hotter. We can see from this mapping that most of the fires occur later in the dry season.

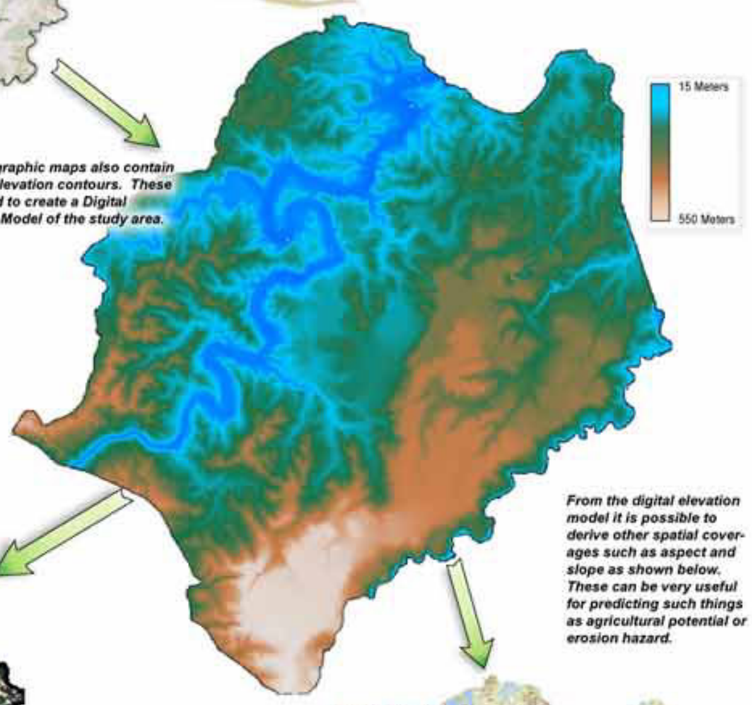


Topographic Map 1:100 000



The topographic map sheets for the study sites were obtained in hard copy and digital form. They Provide additional information such as infrastructure (roads, schools, villages) and place names.

Elevation Model



The topographic maps also contain detailed elevation contours. These were used to create a Digital Elevation Model of the study area.

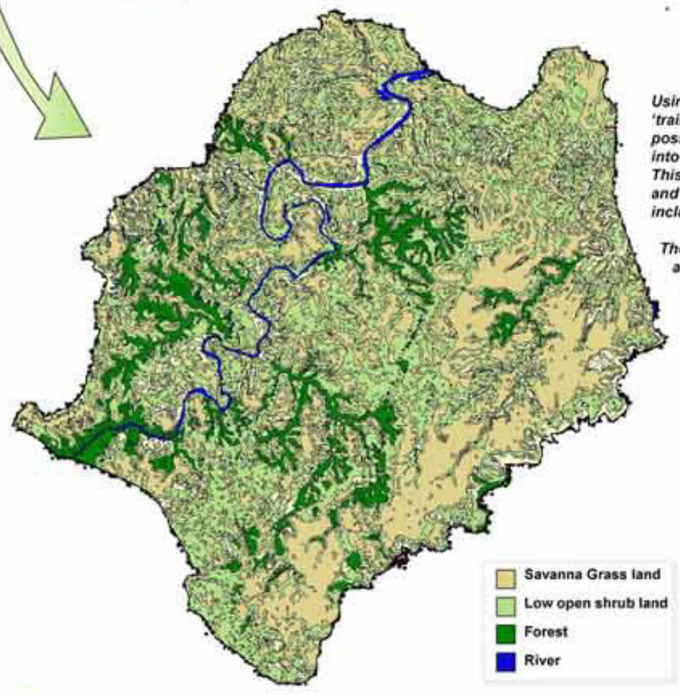
Derived 3D Visualisation

By overlaying imagery on the digital elevation data it is possible to create 3D terrain models such as this. These landscape models are useful for visualising topography, and the relationship between land cover and terrain. They are also useful in developing communication products describing landscapes and landscape processes.

From the digital elevation model it is possible to derive other spatial coverages such as aspect and slope as shown below. These can be very useful for predicting such things as agricultural potential or erosion hazard.

Slope Model

Land Cover Mapping



Using local knowledge and ground based 'training' sites, acquired with a GPS, it was possible to classify the satellite imagery into distinct land-cover (vegetation) types. This map is being refined using air photos and further on-ground surveys which will include land use information and species list.

The land cover mapping will assist in analysing the impact of the local fire regime.

Ngarukahiri village garden.

Forests and gardens are confined predominantly to valleys with the savanna grasslands on the hills given over to pastoralism.

Hill slopes after wild fires in 2002.

Large hot fires such as these devastate pastures and often burn gardens and houses.

Ngarukahiri farmers learning how to create fire breaks during a field training day with experts from the Northern Territory Bush Fires council.

Proyek Pengelolaan Kebakaran - NTT
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