

Evaluating the Impact of Refugees on Natural Forests at Semi-Arid Lands, using Remote Sensing- Um Rakuba Camp-Gedaref State

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ABSTRACT

Gereref State is an important area for Ethiopian and Eritrean refugees, because of proximity and availability of security, food and different natural resources. The influx of refugees was high during the previous forty years. Approximately the number of refugees at Um Rakuba camp reached 49000 persons from different tribes. The camp located in Elgalabat province, Gedaref State. It lies on Latitude 13 29 N and longitude 35 40 E. The objective of the study is to assess the impact of refugees on natural forest in the area where their activities are concentrated. Different methods were used such as point-centered quartered method (PCQ). This method was used for measuring the density of trees per hectare in the demarcated area. Also satellite imagery covering the area of 30 October 1987 was used and carefully studied. The image was introduced to computer for processing, enhancing, analysis and classification. The results give good comparison between the changes of natural forest that has been placed over the years in forms of percentage and area in ha. The results show that the rate of change in degradation of natural forests is very cleared after the settlement of refugees at Um Rakuba. The results show that the density of trees is 46 trees/ha. This means that the number of trees in the total area demarcated for research is equal to $46 \times 4041 \text{ ha} = 185886 \text{ trees}$. If this number of trees divided by 720 trees/ha (Tom, 2004) gives the equivalent of 258.2ha from the total area occupied by trees which is equal 6.4% of the total area in 2006. In 1987 the area occupied by trees was 577.8 ha which is equal 14.3% of the total area. The results explained that, there is grading deterioration in the natural forest around Um Rakuba camp.

Keywords: Cover, density, reception, refugees, satellite

1. INTRODUCTION

Um Rakuba Camp was located in El Galabat province to the south of Gedaref town. The camp is 412 kms from Khartoum and 71 km south of Gedaref and 7 km west of Doka. Map (1). It lies on latitude $13^{\circ} 29' N$ and longitude $35^{\circ} 40' E$. Its elevation is 586 m above sea level (Fangama, 2006). The camp comprises three settlements, the old camp, and reception 1 and reception 11. Refugees had come to the area at different times (Table 1). The soil is heavy clay and is reasonably fertile, but it is difficult to cultivate without mechanical preparation. It also has low nitrogen content and has to be left fallow after three or four years of use (Berhane, 1989). Generally, the vegetation consists mostly of *Acacia seyal* – *Balanites aegyptiaca* Savannah (Harrison and Jackson, 1958).

According to the department of agriculture's census (1985), the total livestock owned by the people are 1395 heads including cows, sheep, goats, donkeys and camels (Table 2). Berhane (1989) mentioned that, the number of livestock increased by 20% in the first year of their arrival. The total area for cultivation was 2500 ha (6000 fed).

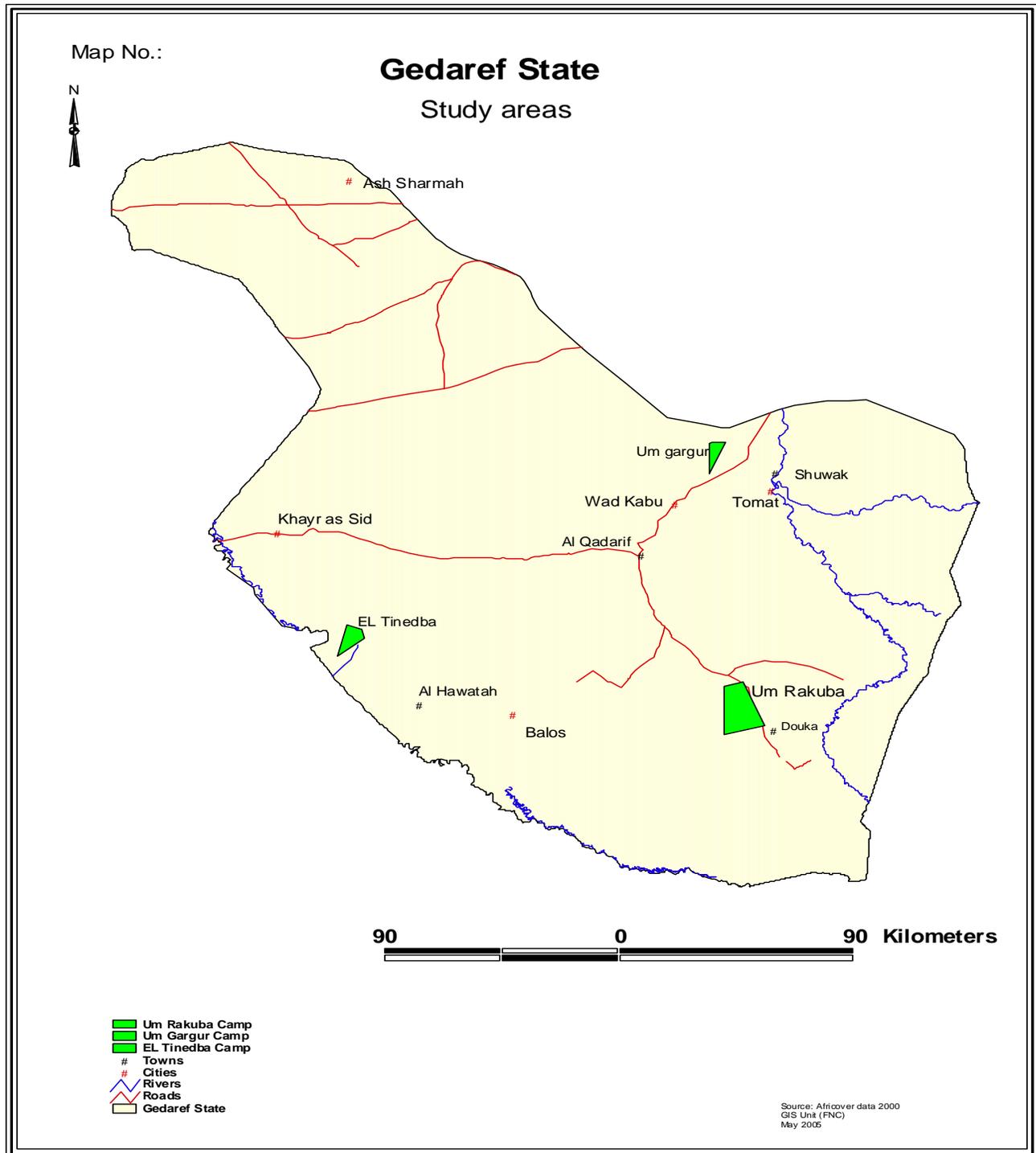
The natural forests were dense during the arrival of refugees. The forests were removed for their settlement and farms. They cut trees and large quantities of tall grasses. At

the first years of arrival, refugees were completely depended on the natural forest nearby. Their activities concentrated in the area of 4041 ha (9698.4 fed). In this area refugees were cutting trees for firewood and charcoal making, livestock grazing and fencing. They were cutting trees for cultivation and building of houses. Amhara tribes have a traditional conception of accumulating and heaping firewood around their houses, because they consider that it shows that they are precious and kind towards their guests. Also they feel secure of having wood around their houses and ready when needed.

2. METHODOLOGY

2.1 Demarcation of the Study Area

The area utilized and exploited by refugees was demarcated. Such activities were land cultivation; animals grazing lands, firewood collection, cutting trees for building materials and charcoal production. The global positioning system (GPS) was used for demarcating the study areas. It provided useful data including coordinates, altitudes of the sea level and the distances of the three areas from the capital of the State.



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Map 1: Um Rakuba Refugee Camp (Gedaref State)

Table 1: Description of the settlements at Um Rakuba Camp

Description	Settlements		
	Um Rakuba old	UmRakuba Reception I	UmRakuba Reception II
Status	Agricultural	Reception center	Reception center
Establishment	1975		
Population	19089	19450	10461
No. of household families	3818	3890	2092
Ethnic composition	Amhara, Tigrayan	Amhara, Tigrayan	Asawrta, Tigrayan
Area of agricultural land allocated	2500/ha (6000 Fed)		
Total per family	2.1ha (5 Fed)		
Total cultivated area (1987)	1527/ha (3665 fed)		
Crops	Dura, Sesame Vegetable		
Livestock	1082 heads	122 heads	191 heads
Water supply	Ground water one bore hole.	Ground water two bore holes.	Ground water three bore holes.
Area of housing	6 km ² -600 ha (1440 fed)		
No. Of huts	3818	3890	2092

Source: Refugees Settlement Administration (1989) Showak.

Table 2: Kind and number of livestock of refugees at Um Rakuba camp

Kind of livestock	Settlements			
	Um Rakuba old	Um Rakuba Reception I	Um Rakuba Reception II	Total no. of animals
Cows	345	45	55	445
Sheep	420	55	103	578
Goats	137	10	21	168
Donkeys	180	12	12	204
Total	1082	122	191	1395

Source: Department of Agriculture's Census (1985)

2.2 Measurements of Natural Forests

The Point-Centered Quarter (PCQ) method was used to measure the natural forest stands (Cattam and Curtis, 1956). Some equipment for natural forest measurement was used, such as tapes, compass, ranging rods, arrows, data sheets, pencils, rubbers, and hand calculator. The Point-Centered Quarter (PCQ) is an efficient method (Lemmon, 1957). The measurements started by randomly locating a point at each stand. Then the meter tape was stretched to its full length, going through the randomly located point. Then sample points were located at 10-m intervals along the tape. At each sample point, four quadrants (NE, SE, SW, and NW) were defined and then the following parameters were taken on each one: -

- a. Types of tree species.
- b. The distance from the sample point to the nearest tree.

A total sample size of 10 points (40 trees) in three representative stand of each forest type were measured according to Mueller and Ellen beg (1974). After the collection of data, the density of all trees was calculated using the following formula:

$$\text{Density / ha} = \frac{10000 \text{ m}^2}{(\text{Distances})^2}$$

Where, 10000 m² equal one hectare

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(Distances)² = Mean distances from random points to trees.

The PCQ method was used.

Area: multiplying spaces between trees which mean the area occupied by each tree.

Measurements of natural forests and plantations using ground survey were compared with satellite imagery of Africover (2000), FAO (1987, 1996, and 1999), and other studies of SUAS (1990) and SKAP (1992) to know the deforestation now and then, consider the different impact as an impact of refugees activities.

2.3 Imagery Data

One image was used for studying; assessing and producing maps of land cover change. Franklin (2001) reported that the Land sat and Spot satellite remote sensing data were related to forest cover. The historical images of a Land Sat TM source acquired in 1987 obtained from the Internet. Remote sensing technique was used to process the images by computer through ERDAS IMAGINE.

According to Perymann (1996), ERDAS IMAGINE is a modern program used to apply the remote sensing technology, through the analysis and the interpretation of satellite imagery.

2.4 Image Processing, Enhancement and Classification

The study used map for illustration. From image map was formed to show the situation of forest-tree cover of the study area. Maps were processed using the following steps:

- a. Image was fed to the computer and displayed on the screen using Erdas imagine program.

- b. The map location defined carefully by row, path coordinates and ground control points (G C P).
- c. The image was resized to their original dimensions and rectified.
- d. Then a section was drawn and enhanced through the selection of the appropriate colours to show the different components of the maps.
- d. The image was classified using unsupervised classification, and named as forest, agricultural land and rangeland.
- e. Area of each class was calculated.
- g. The following information were also added to the map including, name, suitable lengths, spacing, scale bar, north arrow, legend, text editing, source of image and date.

Then the ERDAS IMAGINE program was used to analyze data collected and classified the image. Results obtained from the analysis were presented in the form of tables, and map.

3. RESULTS AND DISCUSSION

Table (3), shows that, the natural forest at Um Rakuba site was 14.3% in 1987, while the agricultural and rangeland covered up to 85.7 % of the site.

Table 3: Um Rakuba-TM-3.10.1987-P171/R51-Band 432

Class	Pixel	Area /Fed	Area /ha	%
Agriculture	1053584	7525.6	3135.6	77.6
Forest	194152	1386.8	577.8	14.3
Rangeland	109984	785.6	323.3	8.1
Total	1357720	9699.4	4041	100

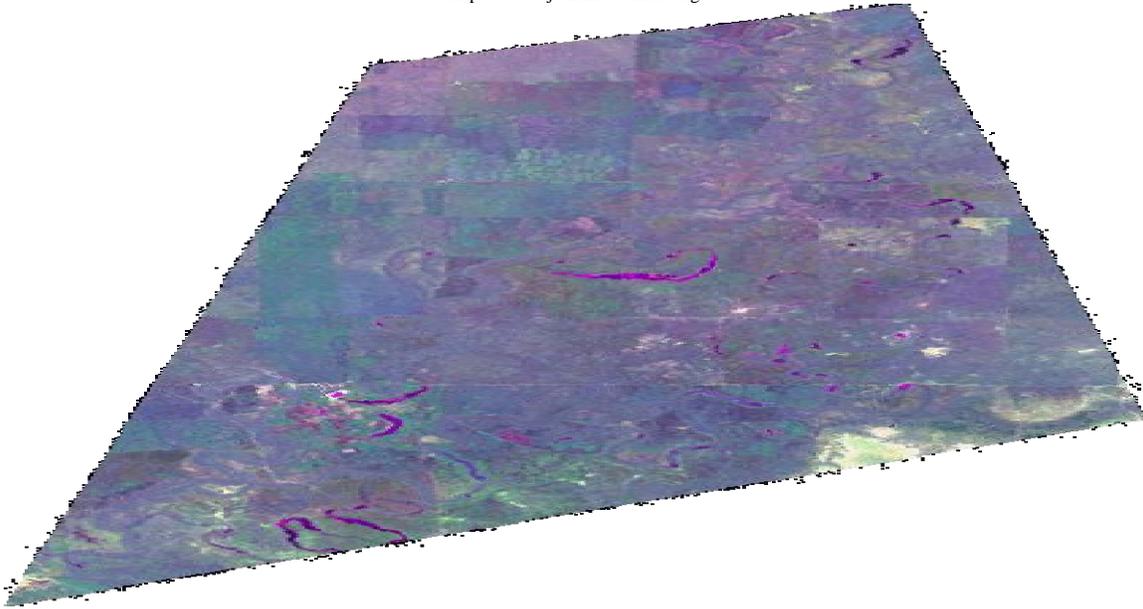
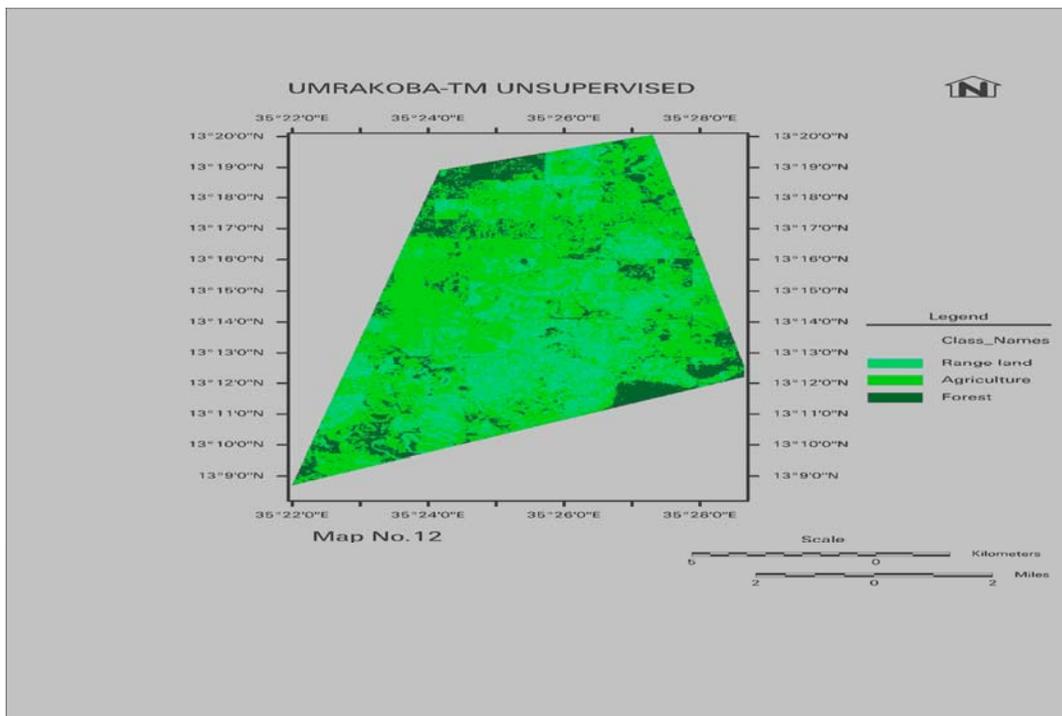


Fig 1: Um Rakuba land cover site -1987
Unsupervised classification of Um Rakuba TM of the date: 03/10/1987
P 171/R51-BAND 432.

Looking at this map we can see a quite fair forest-
tree cover, represented by dark green color. It was

surrounded by vegetation cover of other type, agriculture
and rangeland.



Map 2: Um Rakuba land cover site -1987
Unsupervised classification of Um Rakuba TM of the date: 03/10/1987
P 171/R51-BAND 432.

Looking at this map we can see a quite fair forest-tree cover, represented by dark green color. It was surrounded by vegetation cover of other type, agriculture and rangeland.

3.1 Natural Forest Degradation

The destruction grading impact of forest cover and land changes are clear when comparing the condition of forest cover in the previous year of 1987 with the ground survey carried out 2004. The ground surveys in 2004 found that, the density at Um Rakuba is 46 trees per ha. These changes are reflecting the severe damage of forest- tree

cover of large area in the site. We find that, there is a significant negative change in the forest-tree cover at the site. The forests area have been entirely converted to bare land, and the smallest areas left will absolutely disappear in the coming few years, even if some measures have been taken.

The continuity of degradation of forest-tree cover is also ensured by previous survey carried out by FAO (1985) and SKAP (1992). Table (4) shows the rate of degradation during the period 1987 to 2004.

Table 4: Percentage and rate of change (R.O.C) of forest-tree cover during (1987 to 2004) at the three sites

Year Site	1987	2004	R.O.C
Um Rakuba	14.3	6.4	-2.8

From Table (4), it is clear that, the rate of change of forest-tree cover at Um Rakuba site was 6.4 % in 2004. This reduced the amount of fuel wood consumption, and they use other alternatives such as gas and gasoline. Also sometimes they illegally fetched their fuel wood from a reserved forest at SrafSaad 25 km away from their residence.

4. CONCLUSION AND RECOMMENDATIONS

The study found that the native people suffered a lot from the refugees' behavior towards the natural forest. The provision of firewood around their houses is assign of pride and hospitality. This culture enforces them to continue to cut trees, and the absence of forest protection in such areas encouraged them to misuse the forest, while the cutting of trees in their home country is forbidden. The deterioration was so severe that the reclamation done by organizations through small forest projects at the settlement areas may not be significant to deal with this problem. At Um Rakuba site the density of trees per ha is 45 trees. The degradation of forest-tree cover occurred during the settlement of refugees in the sites through the thirty years ago from 1975 to 2005. It is obvious that there is a gradual degradation and decrease in forest-tree cover areas and number of trees at all sites. The virgin forest deteriorated due to the continuous malpractices of farms clearance, cutting trees for building materials and firewood, over grazing and wildfires.

- a. Before establishing any refugee's camp, studies should be carried out pertaining to the situation and attitudes of the refugees

towards the environment. Camps should be located in areas close to the borders. Camps should be established far away from fragile areas such as transitional zones and the residence of local people.

- b. To raise the environmental awareness and predict the scale of damage that may occur around the areas settled by refugees.
- c. Strict enforcement of laws and regulations that control cutting of trees in refugees' areas.
- d. UNHCR has the responsibility of availing funds for supporting afforestation programs through community participation and the government should encourage the participatory approach during the rehabilitation of such deteriorated areas.
- e. Establishment of large plantations in refugee's areas to provide them with the necessary fuel wood and building materials.
- f. Other energy resources should be introduced into refugees' camps after proper training and improvement of the cooking stoves.

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- g. UNHCR has a responsibility of availing funds for supporting afforestation programs through community actions and the governments should promote and provide opportunities for the participation of stake holders including local communities of laborers, non-governmental organizations, individuals and women in the development. In addition to implementation and planning of the future rehabilitation of such deteriorated areas.

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