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Causes and Effects of Deforestation in Sudan, Case of Kunduwa Reserved Forest- South Darfur State

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ABSTRACT

This study was conducted at kunduwa forest, Nyala locality, South Darfur State, Sudan, during the year 2017. The main objective of this study was to know the causes and effects of deforestation at kunduwa forest. Primary data were collected by using a questionnaire, meetings and interviews. A questionnaire was distributed to farmers in Kunduwa village and to some refugees in Kalma Camp. Secondary data was obtained from reports, records and related studies. The study showed that education level and environmental awareness is low at the study area, and the income is mainly from agriculture, also the respondents mention that the main causes of deforestation at Kunduwa forest were due to cutting trees for fuel, housing and urbanization, civil war between farmers and pastoralists and the illegal cutting of trees for commercial purposes. The study found that the types of trees found there were *Azadirachtaindica, Khayasenegalensis and Eucalyptus micorotheca.* These were the most important timber species found at the study area. Leaves, roots and fruits are the main tree parts used in medicine or as fodder and in industry field. Kunduwa forest creates good environment for animals and acts as a source of fodder for them. Also showed that other activities at the study area were farming and grazing, and the main tree species consumed during summer was *Acacia mellifera*. The study found that the source of income during drought and summer was through grass selling. The study revealed that there were conflicts between farmers and pastoralists. Also showed that energy source was from firewood and charcoal. Kunduwa forest was well stocked before refugee's settlement. The study revealed that the forest had been used for recreation. The study also showed that people participation in extension work was low. It also revealed

that there was legislation for forest protection though they are suitable for that purpose, but they were not applied effectively. The study recommended that adequate fund should be made available to rehabilitate the destructed forest .Kalma camp of refugees should be shifted far away from the forest. This is in addition to provision of security services so as to implement the extension and plantation programmes.

INTRODUCTION

Sudan has various types of natural forests as well as plantation forests. Forests cover much of the planet's land area. They are extremely important to humans and the natural world. For humans they have many aesthetic, recreational, economic, historical, cultural and religious values .Also soil and watershed protection, hunting, biological conservation and other goods and services. Timber and other products of forests are important economically both locally and as exports. They provide employment for those who harvest the wood or products of the living forest. Herbalists, rubber tappers, hunters and collectors of fungi, nuts, bamboo and berries are able to utilize such resources. Other non-wood forest products come in the form of medicinal compounds, dyes gums, fodder, food and fabrics. There are many people who are dependent on forestland for their livelihoods. One-third of the world's people depend on wood for fuel as a significant energy source (Dudley*etal.*, 1995).

Forests affect the climate and are an important source of oxygen (O_2), although they Trees protect the soil against erosion, and reduce the risk for landslides and avalanches. They may increase the rate that rainwater recharges groundwater, as well as control the rate that water is released in watersheds (FAO, 1993).

Deforestation occurs for multiple reasons: trees are cut down to be used or sold as fuel (sometimes in the form of charcoal) or timber, while cleared land is used as pasture for livestock and as farms for grazing crops. The removal of trees without sufficient substitution has resulted in a severe damage environment, biodiversity loss and aridity.

Deforestation has thus many causes, population pressures, profits, and internal social and political forces can also all push up the rate of forest loss. Generally the removal or destruction of significant areas of forest cover has resulted in a degraded environment with reduced biodiversity *(*Kauppi, 2006).

Trees illegally removed from forests are used as fuel. Some other common reasons are: To make more land available for housing and urbanization, to harvest timber to create commercial items such as paper, furniture and homes, to create ingredients that are highly prized consumer items, such as the oil from palm trees and to create room for cattle ranching(Alina,2018) .

Deforestation includes not only the conversion to non- forest, but also degradation that reduces forest quality, the density and structure of the trees, the ecological services supplied, the biomass of plants and animals, the species diversity and the genetic diversity.

Deforestation results from removal of trees without sufficient reforestation and usually results in a significant loss of biodiversity (Grubbler, 1990).

People destroy or degrade forests because, for them, the benefits seem to outweigh the costs. Underlying causes include such issues as poverty, unequal land ownership, education and to some extent, population. Immediate causes are often concerned with a search for land and resources, including both commercial timber and fuel wood. In many areas, rural households rely solely on fuel wood collected from the forest for their domestic energy supply (Wallma and Jacobson, 1998).

In the tropical forests of the world, the clearing of land for agriculture and livestock are the primary activities resulting in deforestation (Anderson, 1990).

The cutting of woods by pastoralists and cultivation are also major causes of deforestation in the Sudan. Vegetation is harvested for feed, to build homes and enclosures for animals and for fuel. In the absence of the forests, the micro-climate is invariably more arid the dry season more accelerated with a probable reduction in the total rainfall. Overgrazing occurred in the Sudan for centuries but it assumes a wide scale and acute intensity only during the past few decades (Khairalseed, 2015).

Harrison (1987) attributed the environmental degradation in the Sahel to two main factors. These were:

- Tree removal for agricultural and fuel purpose s.
- Increase in human and livestock numbers.

So the clearance of forest was carried out for the purpose of agriculture and fuel with- out much thought to the consequences. As a result,cropped area has been expanded, and the fallow period has been progressively reduced to the point where it can no longer restore soil fertility or yield sufficient wood or grazing (Koko,2002).

As mentioned earlier, at the beginning of the previous century, natural forests area was covering about 40% of the Sudan's total area. During the preceding decades, trees and shrubs were intentionally cleared in vast areas (4.5 million feddans), mainly in the central Sudan semi-arid zones. Namely, bush clearance programmes covered wide areas of Gezira, Rahad, West Sinar, and White Nile State(Abdalla,2006).

Consequently, and as a direct result of tree removal, local people in those highly populated areas (human and animals) are now suffering from the shortage in their daily needs from forest products such as building materials, fire wood, and fodders .Moreover, due to the excessive cultivation process, soil fertility was significantly reduced and crop yield drastically decreased

.

So far, more efforts to strike the balance between man and nature through growing Eucalyptus trees in the form of block plantations or forest plantations (Koko, 2002).

MATERIALS AND METHODS

The basic materials chosen to achieve the objectives of this study are the site of research and the population living in and around the site (farmers, refugees in Kalma Camp.

Methods: Site of the Study: The study was conducted at Kunduwa reserved forest which is Located in the Southern East of the city of Nyala. It is bordered by the railway and on the east by Blail locality, on the south by Al Salam Locality and in the middle of by Burley valley .Also at the north-east of the forest exist Kalma camp. The location of the forest make it very accessible to people.

Kunduwa is a reserve forest and its area is about 3299 acres. This area includes a kreb area which is suitable for planting trees and the area is generally suitable for Acacias

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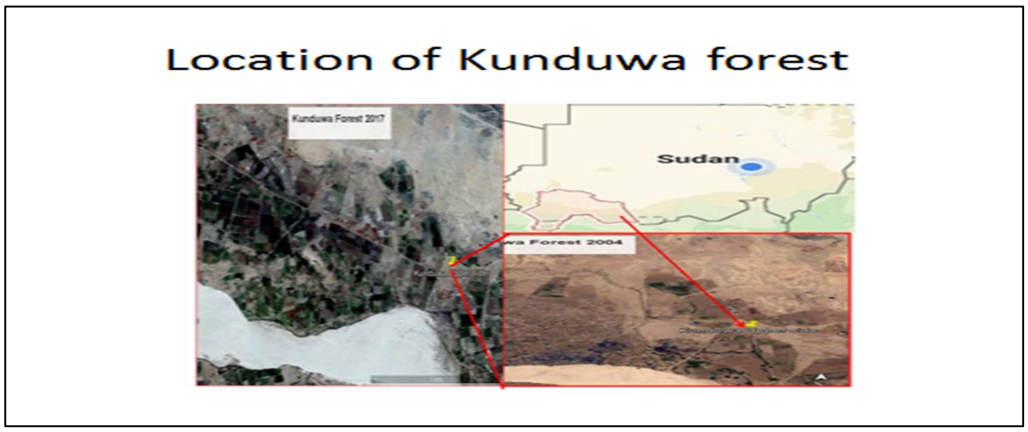

Map 1: Location of Kunduwa reserved forest

Source: Forest National Corporations (FNC), South Darfur State- Sudan, 2017

Data collection: Primary data were collected by using a questionnaire, meetings and interviews. A questionnaire was distributed to farmers in Kunduwa village and to some refugees in Kalma Camp. The selection of the target group was random, so it's varied in the ages, genders, jobs and educational levels. The questionnaire contained 29 questions and 60 respondents who were chosen randomly. Secondary data were collected from recent references, annual reports, literature review and from the internet.

Data analysis: collected data was coded, summarized, tabulated, and processed. Analysis was conducted by using (SPSS) computer programme; the results were presented in the form of frequency and percentage.

RESULTSAND DISCUSSION:

Table No (1) showed that 72% of the respondents were males, while 28% of them were females.

Table (1) Sex of respondents

Sex	Frequency	Percentage%
Male	43	72
Female	17	28
Total	60	100

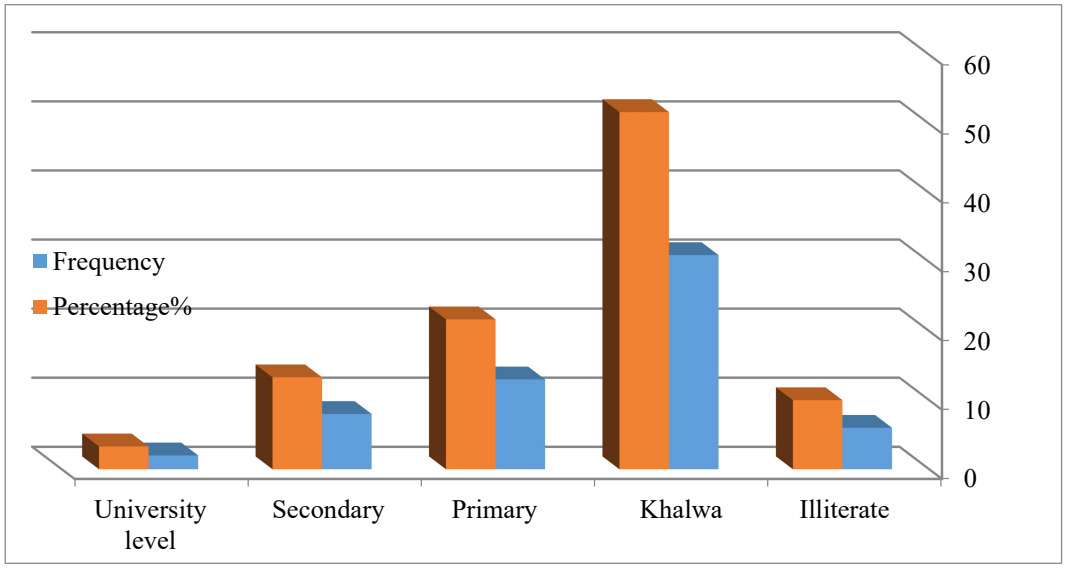

Figure 1: Education level in the study area of Kunduwa

Figure (1), Showed the low level of education in the study area, illiterte10%, khalwa(51.7 %). The results of the study indicated that the level of education of the people in the study area was low, either for their poverty condition or for displacement due to the civil war in that part of the country. The low level of education in addition to displacement made people totally rely on forest products without any care to what will happen in the future.

Table (2) Sources of income

Sources of income	Frequency	Percentage%
Agriculture	58	96.7
Grazing	1	1.7
Trade	1	1.7
Total	60	100

Table (2) showed that the people at the study area depend on agriculture in their sources of income which is equals to about 96.7% of the total respondents. Income generated from agricultural crops is very limited and at the same time it is seasonally. This can be considered as another reason which leads people to rely on the forest products.

Table (3)Causes of Deforestation in Kunduwa Forest

Causes of deforestation in Kunduwa forest	Frequency	Percentage%
Cutting down trees for fuel wood	18	30
Housing and urbanization	15	25

Cutting timber of commercial purposes	9	15
Fire	2	3.3
Farming(Traditional cultivation)	5	8.3
The civil war	10	16.7
Others	1	1.7
Total	60	100

Table (3) showed that 30%of the respondents mentioned that the main causes of deforestation at Kunduwa forest were due to cutting trees for fuel wood, while 25% of them said for housing and urbanization, and 16.7% for civil war between farmers and pastoralists, and 15% of them said from the illegal cutting of trees for commercial purposes. The civil war and conflicts between farmers and pastoralists led to displacement of people and this in turn imposes great pressure on the limited resources in Kunduwa forest and the adjacent places. The status of kunduwa forest before displacement settlement was well stocked.This is agreed with (Dudley etal.,1995).

Table (4)Deforestation at Kunduwa forest

Do you consider that the study area had been affected by deforestation?	Frequency	Percentage%
Yes	59	98.3
No	1	1.7
Total	60	100

In Table (4),98.3% of respondents mentioned that Kunduwa forest was deforested .This due to settlement of displacement inside the forest. This caused soil degradation and water erosion. This was the same (Kauppi, 2006). Since the forest is very close to the villages and it was severely attacked as a result of tribal conflicts and displacement camp, in the early 2000s that led to complete disappearance of trees; this had affected the environment and caused soil degradation and water depletion.

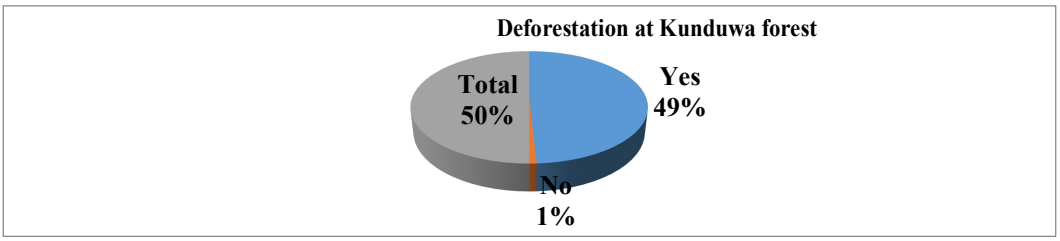

Figure 2: Deforestation at KunduwaReserved Forest

Table (5) The most important trees at the study area

Most important trees	Frequency	Percentage%
Mahogany (*Khayasenegalensis*)	27	45.0
Neem (*Azadirchtaindica*)	29	48.3
Ban (*Eucalyptus spp*)	4	6.7

Total	60	100

Table (5) showed that the most important trees at the study area were *Azadirchtaindica* (48.3 %) and *Khayasenegalensis* (45%), the types of species dominating the forest were *Khayasenegalensis*(Mahogany*),* *Azadirchtaindica* (Neem), *Eucalyptus spp* (Ban) and *Dalbergiasissoo*(Sissoo). These species are considered valuable timber trees which encouraged people to cut them down for their domestic uses and for selling in Nyala market which is adjacent to the forest as a source for generating additional income .This agreed with (Khairalseed2015).

Table (6)Uses of tree parts

Parts of tree used	Frequency	Percentage%
Leaves	28	46.7
Fruits	13	21.7
Root	19	31.7
Total	60	100

Table (6) and Figure (3), Showed the use of parts at the study area and showed that leaves uses was (46.7%) and roots (31.7%). It was also found that people in Kunduwa area use all parts of the tree such as leaves, roots, and fruits especially for medicinal purposes.

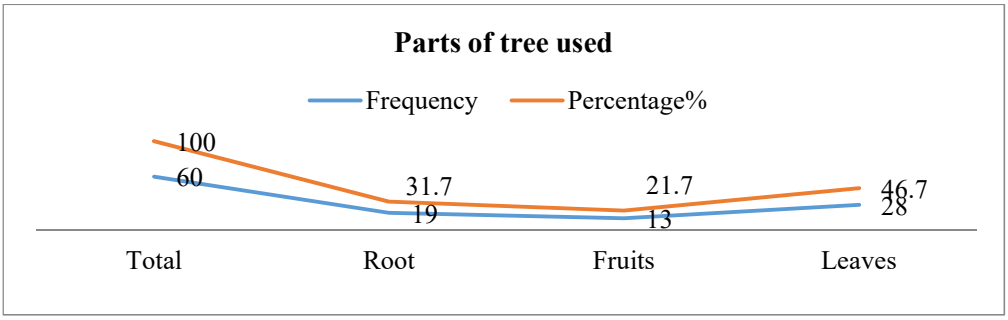

Figure 3: Parts of tree used at Kunduwa forest

Table (7)Types of using the parts of Tree

Types of trees uses	Frequency	Percentage%
Industry	1	1.7
Fodder	29	48.3
Medicinal	30	50
Total	60	100

Table (7) showedthat (50%) of respondents used parts of trees for medicinal uses,while 48.3% of them said the use parts of trees as fodder , this result agreed with (Dudley, 1995).

Table (8) Forests Benefits

Forests benefits	Frequency	Percentage%
Source of income	1	1.7
Feeding and habitat place for animals	50	83.3
Recreation	9	15

Total	60	100

Table (8) showedthat the benefits of trees were feeding and habitat place for animals, (83.3%) of the respondents stated that, while 15% of the respondents said for recreation this as the results of (Dudley*etal.*, 1995).

Table (9)Source of income during drought and summer

Income resources during summer	Frequency	Percentage%
Wood materials selling	1	1.7
Grasses selling	44	73.3
Trading	15	25.0
Total	60	100

Table (9) showed the source of income during drought and summer, was selling grasses by (73.3%). Kunduwa reserved forest acts as one of the main sources of grass in the area. A large number of citizens keep using forests products and grasses as building materials and the main source of these material is the forest , farms and from the market.

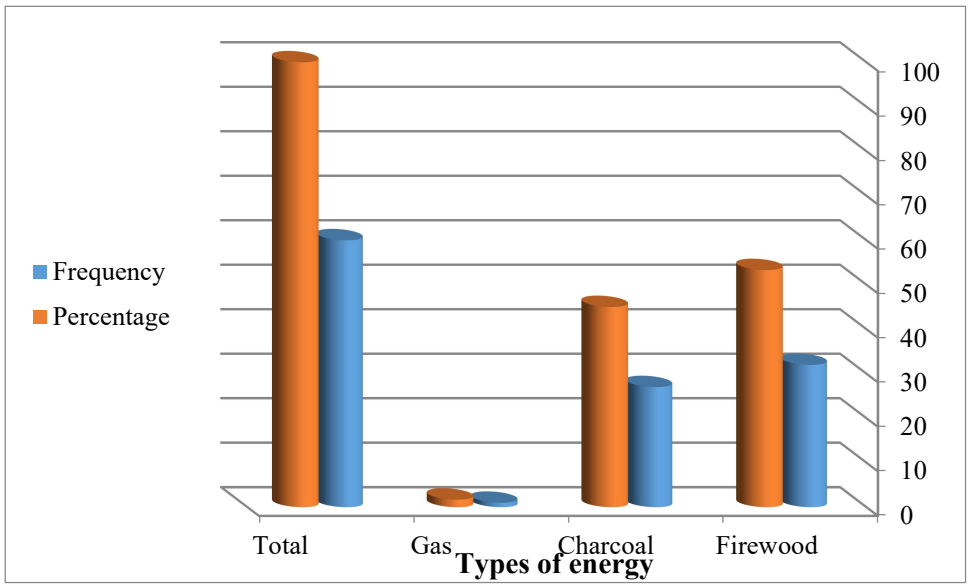

Figure 5: Types of energy used in the study area

Figure (5), showed the types of energy used at the study area were mainly firewood (53.3%), while 45% depended on charcoal. People settled near the forest and started to cut down trees for timber, as mentioned before, and this agreed with (khairalseed, 2015) a great damage of the forest was experienced and consequently leads to complete deforestation of the forest. Awareness of people about the importance of the forest is very low. They were no programmes to raise the awareness of people; in addition to that people did not participate in the management of the forest.

Efforts of Forest National Corporation (FNC) for Kunduwa forest reforestation: Kunduwa forest was very dense during the period (1969-2000) but it began to deteriorate after

attacks by the displacements. Main benefits of Kunduwa forest are to protect Nyala city from natural disasters, wind erosion, maintain soil fertility, a place for recreation and provides livelihoods for poor families and combat desertification. Other benefits include firewood and fuel such as *Faidherbiaalbida*, Ziziphus*spina- christi*. Before deforestation the forest as a range land for animal feeding inside it, but after deforestation this source of fodder was lost due to harmful activities by refugees.

The main role and great efforts done by FNC at the study area is the protection and restoration of the destroyed forest. Reforestation was done through seeds and planting of seedlings on the eastern part of the forest.But this did not succeed due to agriculture activities by farmers. After this failure the forest administration adopted taungya system so as displacements can participated in the management of forest. The restoration of the Kunduwa forest had started by farmers since 2005 using taungya system. Trees were planted at different distances depending on the type of trees, such as 8-10m for *Khayasenegalensis*, 6-8m, for *Azadirchtaindica* and *Dalbergiasissoo*, *Eucalyptus spp* trees were used as windbreakers. There were a number of guards for forest protection, against illegal cutting of trees, Photo (1).

Photo (1): Damage of trees at Kunduwa reserved forest by displacement people, 2017

Source: Field survay, 2017.

CONCLUSION:

From the results of the study it is apparent that deforestation is increasingyear after year at the study due to the settlement of displaced persons inside the. The study revealed that Kunduwa reserved forest was well stocked before settlement of the refugees. The main species which are existing at that time were *Khayasengalensis*, *Azadrichtaindica*, *Dalbergiasissoo* and *Eucalyptus spp*. These species are considered valuable commercial timer species which attract people for felling them

RECOMMENDATIONS

The study recommended that as follows:

- Raise the awareness between people about the importance of forest.
- Replanting the damage forests through taungia system.
- Kalma camp of refugees should be shifted far away from the forest

REFERENCES

Anderson, A (1990). Alternatives to Deforestation: Steps toward Sustainable Use of the Amazon Rain Forest. New York.

Abdalla, Y.Y. (2006). Assessment of Some Environmental and Socio-economic Factors of Rahad Forest plantations (Case study of ElFaw shelterbelt).Ph.DThesis,College of Forestry and Range Science,Sudan University of Science and Technology.

Alina, B. (2018). Deforestation: Facts, Causes and Effects. Live sciences

Dudely, N; Jeanrenaud J; Sullivan, F (1995).Bad Harvest?The Timber Trade and Degradation of World's Forests. Oxford:Blackwell Publishers.

Food and Agriculture Organization of the United Nation (1993).The Challenge of Sustainable Forest Management: What Future for the Worlds Forest

Grubbler, A. (1990) "Technology". In The Earth as Transformed by Human Action.

Harrison, P. (1987). The Greening of Africa.Breaking through in Battle of Land and Food. London, Earths can.

Kauppi, P. E. (2006).“Returning Forests Analyzed with the Forest identity”.

Koko, I.A. (2002). Strategies to Promote Growing Trees on farms, with Reference to Rahad Agricultural Corporation (RAC). Sudan. Ph.D Thesis, College of Forestry and Range Science, Sudan University of Science and Technology.

Khairalseed, A.R.(2015). Desertification in Sudan, Concept, Causes and Control, Journal of Science and Technology.Vol 5.No 2.

Wallma, K.,and Jacobson, S. K. (1998).A Social and Environmental Evaluation of Fuel-Efficient Cook-Stoves and Conservation in Uganda.Environmental Conservation 25.