Quantification of Driver of REDD+ Activities

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بسم الله الرحمن الرحيم

إستهلال

(رَبِّ قَدْ آتَيْتَنِي مِنَ الْمُلْكِ وَعَلَّمْتَنِي مِنْ تَأْوِيلِ الْأَحَادِيثِ فَاطِرَ السَّمَوَاتِ وَالْأَرْضِ

أَنْتَ وَلِيِّي فِي الدُّنْيَا وَالْآخِرَةِ تَوَفَّنِي مُسْلِمًا وَأَلْحِقْنِي بِالصَّالِحِينَ)

(101)

Dedication

To the one who gave me life (my dear mother).

What from my success is due to his prayers (dear father)

To my sin in this life, my brothers (Muhammad, Ahmed, Marwa)

To my dear mothers, Maria, Meryim .

To my other half (my husband) .

To My teachers for their kind response .

To My colleagues, my friends.

Acknowledgment

Thanks and praise is due to alight Alla, who provide me to do this study the success and final outcome of this study required a lot of guidance and assistance from many people and I am extremely privileged to have got this all along the completion of my study. All that I have done is only due to such supervision and assistance and I would not forget to thank them.

I respect and thank ***Dr. Sayeda Ali Khalil*** *for providing me an opportunity to do the study work in REDD+ Sudan / National Coordinator.*

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Also, last but not least like to thank my family, my parents and to my brothers and sister for supporting me spiritually throughout writing this thesis and in all my life in general.

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Abbreviation

DDFD: Driver of Deforestation and Forests Degradation

FRA: Forests Report Assessment.

FCFP: Forests Carbon Facilities Partners.

FNC: Forests National Corporation.

GHG: Green House Gases.

GDP: Gross Domestic Product.

IPCC: Intergovernmental Panel on Climate Change.

NFI : National Forests Inventory

RoS: Republic of Sudan.

REDD: Reducing Emissions Form Deforestation and Forests. Degradation.

SFM : Sustainable Forests Management .

SBSTA: Subsidiary Body for Scientific and Technological Advise .

UNFCCC: United Nations Framework Convention Climate Change.

UNEP: United Nation for Environment Program.

WB: World Bank.

خلاصة البحث

تهدف هذه الدراسات إلى تحديد حجم المنطقة المتأثرة بدوافع إزالة الغابات وتدهورها في السودان خلال عام 2019 م ونوقشت مسألة التخفيف من آثار تغير المناخ من خلال تجنب إزالة الغابات، وأُثير مفهوم خفض الانبعاثات الناجمة عن إزالة الغابات على المناقشة الدولية بشأن السياسات المناخية في إطار العديد من مؤتمرات الأطراف في إطار الأمم المتحدة، وتم الاتفاق على النظر في آليات خفض الانبعاثات الناجمة عن إزالة الغابات وتدهورها كتدبير من تدابير السياسة العامة للحد من الانبعاثات من قطاع الغابات.

ومن أجل الحد من الانبعاثات الناتجه من قطاع الغابات وتعزيز مخزونها الخشبي، من المهم فهم ومعالجه أهم العوامل المهدده لإزالة الغابات وتدهورها. وبدون تحديد كمي قوي لتلك المهددات ستتاثر القدرة علي تحقيق نتائج ملموسه النتائج.

يعد تقييم دوافع إزالة الغابات وتدهورها ضروريًا لتصميم وتنفيذ سياسات لإبطاء إزالة الغابات وتدهورها في البلاد لمعالجة دوافع إزالة الغابات وتدهورها، تهدف معظم البلدان إلى تركيز سياساتها وخطتها الوطنية على:-

- المشاركة الفعالة لأصحاب المصلحة الرئيسيين خاصة في القطاعات غير الحرجية.
- تقييم الفوائد الاجتماعية والاقتصادية المحتملة والمخاطر التي يمكن أن تنجم عن السياسات والتدابير المختلفة.
- تحديد أولويات مراقبة الغابات والإبلاغ عنها والتحقق منها .
- الحصول على معلومات عن الظروف الوطنية لتحديد وتعديل المستويات المرجعية (الانبعاث) للغابات.

صاغ السودان برنامجه الوطني لخفض الانبعاثات الناجمة عن إزالة الغابات وتدهورها في عام 2012 م والذي يشير إلى ضرورة تحديد دوافع إزالة الغابات وتدهورها على المستوى الوطني ومستوى الولايات والمستوى المحلي لإعلام إصلاح السياسات وتدخلات الحفظ والجدوى المالية لخفض الانبعاثات الناتجة عن إزالة الغابات و تدهور الغابات.

تشمل الأسباب المباشرة لإزالة الغابات وتدهورها ، وهي أنشطة بشرية أو إجراءات فورية تؤثر بشكل مباشر على غطاء الغابات وتؤدي إلى فقدان الكربون في السودان ، الهبوط والزراعة التجارية ، وتطوير البنية التحتية ، والتوسع الحضري ، واللاجئين والمشردين داخليًا ، والتنقيب عن البترول والتعدين.

تشمل دوافع تدهور الغابات الاستخراج القانوني وغير القانوني للأخشاب (قطع الأشجار) حرائق الغابات، والرعي الجائر للماشية، وجمع حطب الوقود، والتعرية، والجفاف، والحشرات والأمراض، والفيضانات .

تتكون الدوافع الغير المباشرة من تفاعل معقد من الجوانب والعملية الاجتماعية والاقتصادية والسياسية والثقافية والتكنولوجية، وهي تشمل سلوك السوق (العرض والطلب) لكل من المنتجات الغابية وغير الغابية مثل الطلب على المحاصيل الزراعية الأخرى (الكركدي ، سمسم ... إلخ) والمحاصيل الغابية (الصمغ العربي) ، والسياسات التي تفضل استخدامات الأراضي غير الغابيه وسوء الإدارة والأمن الغذائي وسلوك سبل العيش وضعف الإدارة والمؤسسات والفقر والذي يعد من العوامل البالغة التأثير والأهمية .

في إجراء الدراسة تم تبني منهجية استشارية وتفاعلية وتشاركية. تضمنت المنهجية مزيجا من جمع البيانات الكمية والنوعية من المصادر الثانوية وكذلك المصادر الأولية. كانت البيانات الأولية لاستكمال وسد الثغرات المحددة في البيانات الثانوية.

ضمنت مصادر البيانات الأولية استبيانًا وتم تصميم النماذج الميدانية وملؤها للبيانات التي سيتم جمعها مباشرة من خلال الزيارات الميدانية إلى مواقع إزالة الغابات وتدهور الغابات، والاجتماعات الافتراضية التشاورية مع مسؤولي الغابات الرئيسيين والمخبرين الرئيسيين بما في ذلك قادة المجتمع والقبائل والمحليين.

شملت المصادر الثانوية التقارير والدراسات التاريخية والمعاصرة ذات الصلة من قبل المنظمات والهيئات الوطنية والإقليمية والدولية. وفقًا للنتيجة التي تم الحصول عليها فإن معظم الغابات متوسطة الكثافة بنسبة 39.1%

- 38.6% من الغابات حالة التجديد الطبيعي جيدة.
- الزراعه والرعي تمارس داخل الغبات بنسبة 50%.
- التمدد او التوسع الزراعي يعتبر اول مهدد لإزالة الغابات يقدر بحوالي 940. 319.فدان من مساحة الغابات المختارة بنسبة 51%.
- الرعي الجائر باعتباره من اول مهدد لتدهور الغابات يقدر بحوالي 631,589.31 فدان يقدر بحوالي 34%.

- القطع الجائر احدي المهددات التي تساهم في تدهور الغابات يقدر بحوالي 60,058,00 فدان بنسبة 0.03% .
- التعدين من النشاطات التي تمارس حديثاً يقدر بحوالي 7.575.00 فدان بنسبة 0.04%.
- استخراج البترول يوجد فقط في أماكن محدودة يقدر بحوالي 95.00 فدان بنسبة 0.01%.
- البنية التحتية واحده من اهم المهددات التي تؤدي الي إزالة الغابات تقدر بحوالي 11,539,00 فدان بنسبة 0.6%.
- التوسع الحضري أحد المهددات يقدر بحوالي 9,505,25 فدان بنسبة 0.5%.
- حرائق الغابات التي تحدث بفعل النشطات البشرية وتقدر بحوالي 43,388,20 فدان بنسبة 2%.
- الآفات والحشرات تقدر بحوالي 43,388,20 فدان بنسبة 2%.
- الجفاف إحدى مسببات التدهور تقدر بحوالي 31,509,000 فدان بنسبة 2%.
- الفيضانات تقدر بحوالي 25.394.00 فدان بنسبة 1.4%.
- الهدام يقدر بحوالي 12.052.00 فدان بنسبة 0.6%.
- التعرية تقدر بحوالي 52,414,65 فدان بنسبة 3%.

المهددات الغير مباشرة هي خليط من العوامل الاقتصادية، الاجتماعية والبيئة مثل سلوكيات السوق مثل العرض والطلب اذا كانت سلعه المحاصيل الزراعيه مثل (السمسم والكركدي) اعلي من سعر الصمغ ، يؤثر سلباً علي المزارعين بحيث يتم إزالة أشجار الغابات واستبدالها باشجار المحاصيل الأكثر ربحيه.

Abstract

This studies aims at the quantification of the area affected by the drivers of deforestation and forest degradation in Sudan during 2019.

Climate change mitigation through avoidance of deforestation was discussed and the concept of reducing emissions from deforestation was brought up to the international climate policy discussion under many Conferences of Parties (COPs) of the United Nations Framework and it was agreed to consider mechanisms on Reducing Emissions from Deforestation and Forest Degradation (REDD) as a policy measure to reduce emission from the forestry sector

In order to reduce emission from the forest sector and enhance carbon stock storage, it is important to understand and address the most important drivers of deforestation and forest degradation. Without a solid quantification of the areas affected by the drivers, the capacity to achieve tangible REDD + results and to access result based payment will be compromised.

Assessing drivers of Deforestation and Forest Degradation is essential to design and implement policies to slow down deforestation and forest degradation in the country.

To address the drivers of deforestation and forest degradation, most the countries aiming to focus their polices and National Plan to: -

- Effective engagement of key stakeholder especially in non-forest sectors.
- Assess the potential socio – economic benefits and risk that could be resulted from different policies and measures.
- Define the priorities for forests monitoring, reporting and verification (MRV).
- Gain information on national circumstances to construct and adjusting their forest reference (emission) levels.

The Sudan formulated its National REDD-plus program (SNRP) in 2012 which indicates that drivers of deforestation and forest degradation need to be identified at national, State and local level to inform policy reform, conservation interventions and financial feasibility of reducing emissions from deforestation and forest degradation ($REDD^{+}$).

Direct/Proximate causes of deforestation and forest degradation which are human activities or immediate action that directly impact the forests cover and lead to carbon loss in Sudan includes subsidence and commercial agriculture, infrastructure development, urban expansion, Refugees and IDPs, petroleum exploration and mining.

Drivers of forests degradation includes legal and illegal timber extraction (logging) forest fire, livestock over-grazing, fuelwood collection, erosion, drought, insect and disease, flooding.

The in direct drivers consist of a complex interaction of social, economic, political, cultural and technological aspects and process. These include the market behavior (supply and demand) for both forest and non-forest products such as demand of the other agricultural crop (Karkadi , semsim ….etc.) and forest crop (Gum Arabic), policies that favor non forests land uses , poor governance, food security and livelihood behavior, weak governance and institution and poverty which considered to be critical drivers .

In conducting the study, a Consultative, Participatory, Interactive Methodology adopted. The Methodology encompassed a mix of quantitative and qualitative data collection from secondary as well as primary sources. The primary data was to complement and bridge identified gaps in secondary data.

The primary data sources included questionnaire and field forms were designed and filled for data to be directly to be collected through field visits to deforestation & forest degradation sites, consultation virtual meetings with key forestry officers and key informants including community, tribal and local leaders.

1. The secondary sources encompassed historic and contemporary relevant reports & studies by national, regional & international organizations and bodies. According to the result obtained the most of the forest are medium density with ratio 39.1%.
2. 38.6% regeneration of the forests were good .
3. The most activates were practice in the forests is agriculture and grazing, 50%.
4. Goat is most of animal grazing in the forest 48.3% are: goat, camels, caws and sheeps.
5. The agriculture expansion is very important drivers represented by 51% with the total area 940,319.85 fedan.
6. Over grazing represented by 34% with the total area 631,589.31 fedan.
7. Human activities were the main reason that causes degradation to forest through un legal cutting is the third drivers which caused a great disappearance of a certain tree species mostly utilized in domestic uses (cooking and fuel) estimated by 60,058.00 represented by 0.03%.
8. Surface mining is recent activities can not practice in the most of the forests estimated by 7,575.00 represented by 0.4%.
9. Most of the forests with high ratio of absence of an extraction petroleum 0.01% estimated by 95,00 fedan.
10. Most of the infrastructure has not effect on the forests area except some forests estimated by 11,539.00 fedan represented 0,6%.

11. Human settlement the result was shown that the cannot found human settlement such as (compound refugee, village and house) estimated by 13,543,00 fedan with ratio 0.7%.
12. Most of the forests located in the high medium of fire 2% estimated by 43,388.20 fedan.
13. The insect and disease as natural factor driver showing that the poor of presence in the forests with ratio 1.1% estimated by 19,735.25 fedan.
14. Drough result can be caused by human activities or natural represents poor ratio in the forest 2% with total area 31,509.00.
15. We can find the flooding in medium ratio in the forests.1.4% estimated by 1.4%.
16. River bank erosion is shown as medium ratio .06%i n the forests estimated by 12,052.00 fedan.
17. The presence of the soil erosion is medium estimated by 3% with 52,414.65 fedan.

CHAPTER ONE

INTRODUCTION

CHAPTER ONE

INTRODUCTION

1.1 General: -

The forest sector offers significant potential for mitigation of greenhouse gases (GHG) emissions. To capture that potential, the parties to the United Nations Framework Convention Climate Change (UNFCCC) developed in 2005 an approach known as Reducing Emissions Form Deforestation and Forests Degradation in developing countries (REDD). This subsequently evolved to become REDD^{+}, as forest- based climate change mitigation approach that aims to provide positive incentive for developing countries to reduce emissions from deforestation and forest degradation to sustainably manage their forest and conserve and enhance forest carbon stocks.

In Sudan as one the parties, REDD^{+} started in 2015 with a collaborative initiative between Forests Nationals Corporations (FNC), Forests Carbon Facilities partner (FCFP) and world Bank Group (WB).

The REDD+ programme in Sudan was proposed to be implemented in three Phase:

- Readiness phase.
- Implementation phase.
- Investment phase.

1.2 Problem statement and justification

Sudan is experiencing concurrent processes of changes. There are many driving forces behind this change among which are the rapid human and animal population growth, climatic changes and its consequences, conflicts, displacement, migration and urbanization. The consequences of these changes are many however, all of these have major impacts on livelihoods and accordingly, local communities develop various forms of coping strategies. Depending on natural resources and in particular forest resources is a short cut that communities option to it. Sudan suffers from most if not of these driving forces, the forests are diminishing every day, we might not exactly know the quantification of this drivers, we might also not be able to indicate the contribution of natural and artificial regeneration in offsetting the this degradation**.**

The current study is an attempt to understand quantification of the driver of $REDD^{+}$.

1.3 Research objectives: -

1.3.1 General objectives:

Quantification of the area affected by the drivers of deforestation and forest degradation in Sudan during 2019.

1.3.2 Specific objectives: -

- To analyzed main quantification, natural and the anthropogenic factors that causing deforestation and degradation of REDD+ in Sudan.
- To assess the contribution of the drivers in polices and measure.

CHAPTER TWO

THE STUDY AREA

CHAPTER TWO

THE STUDY AREA

The Republic of Sudan

1. Geographic Characteristics:

The study covered the whole Sudan which located in North Eastern Africa, The Republic of Sudan (RoS) is bound by Egypt, The Red Sea, Eretria, Ethiopia, Republic of South Sudan (RoSS), Central African Republic, Chad and Libya. (Maps 1, 2,3). The total area is 1, 886,068 km².

Map 1. Geography & Natural Features the Republic of Sudan.

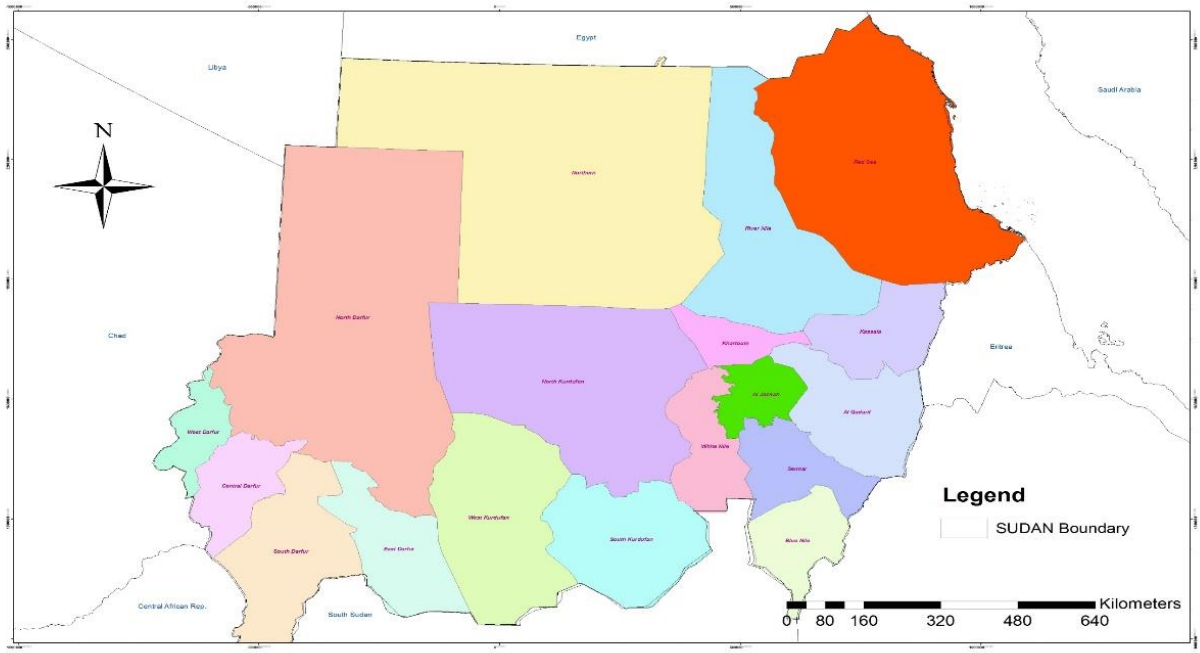
2. Population:

Total population is estimated by 35 .1 million ,30% of the population live in urban areas and 63% in rural areas. The remaining 7% live a nomadic lifestyle.

3. Administrative Structure and land use system:

3.1. Administration:

As of 2017, Sudan is administratively arranged into 18 States (Wilayat; singular Wilayah). Wilayat are further divided into localities (provinces).



Map (2) RoS Wilayat (States) 2017. Source: World Atlas, courtesy Dr. T.M.S. Ganawa.

Table (2-1). Regions and States of RoS 2019

Region	State	Capital
Khartoum	Khartoum	Khartoum
Central	Gezira	Wad Medani
	Sennar	Singa
	White Nile	Rabak
	Blue Nile	Ed Damazine
Kordofan	North Kordofan	El Obeid
	South Kordofan	Kadugli
	West Kordofan	El Fula
Darfur	North Darfur	El Fasher
	West Darfur	El Gineinah
	South Darfur	Nyala
	Central Darfur	Zalingi
	East Darfur	Ad Daian
Eastern	Red Sea	Port Sudan
	Kassala	Kassala
	Gadaref	Gadaref
Northern	Northern	Dongola
	River Nile	Ed Damar

4. Soil and geology: -

The soil in about 60% of the country, particularly in the northeast, north and northwest is predominantly sandy. Heavy cracking clay soils form a triangular in the central eastern plain which makes some 25% of the country. Red soils of different Types are characteristic of the remaining south-western portion.

5. Temperature: -

Sudan has tropical climate summer temperature often exceed to exceed 43.3 degrees Celsius (110 degrees Fahrenheit), in winter exceed to 15 degrees.

6. Rainfall

The rainfall varies from zero in the northern desert to more than 1,200 mm in the High Rainfall Woodland Savannah (HRWS) in the south-western portion of the country.

7. The ecological classification:-

The vegetation of the Sudan has been ably described by Harrison and Jackson (1958) and the following account is largely based on this work with some modifications based on several works such as Agriculture in the Sudan, Arabic version (Anon 1999), a study on sustainable modern technologies for Forest Resources Development in the Arab Region, Arab Organization for Agricultural Development (AOAD 1998), and Wickens (1991).

Now the vegetation can be divided into five principal types which in general follow the isohyets and form consecutive series from north to south: 1. Desert; 2. Semi-Desert; 3. Low rainfall savannah 4. Forests and woodland vegetation 5. Riverine vegetation according to the last result of National Forests Inventory (NFI2019) table (2-2) .

Table (2-2) Total area by FRA classes and per Stratum (1000 ha).

Stratum		FRA classes	Area (1000 ha)	% of stratum's area
N°	Description			
1	Deserts	Desert	67,266.076	35.74
2	semi-desert ecosystems	Other Land	30,359.771	16.13
		Other Wooded Land	8,625.489	4.58
3	Low rainfall woodland Savannah	Forest	6,860.423	3.65
		Other Wooded Land	13,059.080	6.94
		Other Land	15,992.118	8.50
		Inland Water	60.690	0.03
4	Forest and woodland vegetation	Forest	23,958.911	12.73
		Other Wooded Land	3,996.949	2.12
		Other Land	15,008.835	7.97
		Inland Water	181.224	0.10
5	Riverine vegetation	Forest	213.764	0.11
		Other Wooded Land	150.321	0.08
		Other Land	2,231.380	1.19
		Inland Water	233.769	0.12
TOTAL			**188,198.800**	**100.00**

8. The common trees species: -

There are many trees species in the Sudan, table (2-3) (2-4) show the main species in Sudan and regeneration count.

Table (2-3) main species and regeneration.

List of main species	Regeneration count (N/ha)
Acacia tortilis subsp. spirocarpa	884.850
Ziziphus spina-christi var. spina-christi	730.000
Ziziphus spina-christi var. microphylla	574.600
Hyphaene thebaica	466.670
Lannea sp.	430.770
Others	424.260
Combretum sp	390.930
Dalbergia sp.	383.740
Acacia mellifera	336.960
Butyrospermum paradoxum	333.330
Ziziphus sp.	333.330
Albizia sp.	303.900
Acacia seyal var. seyal	300.280
Ziziphus mauritiana	299.280
Acacia seyal	244.440
Acacia senegal	226.730
Terminalia sp.	218.840
Acacia tortilis f. raddiana	211.900
Balanites sp	205.150
Sterculia africana	200.000
Acacia gerrardii var. gerrardii	187.650

Anogeissus sp.	180.000
Acacia tortilis subsp. tortilis	166.670
Sclerocarya birrea	157.140
Anogeissus leiocarpus	133.330
Ziziphus spina-christi	111.110
acacia seyal.var.fistula	100.000

Source: NFI result 2019.

CHAPTER THREE

LITREATURE REVIEW

CHAPTER THREE

LITREATURE REVIEW

3.1 Forest resource assessment:

One of the key biophysical indicators for assessing forests and wood land is the tree canopy cover which allows the characterize the forests and tropical savannas ecosystem, estimate woody biomass production and monitor carbon emission/sequestration balance in the context of global environmental change (Hellen, 1987). The food and agriculture organization of the United Nations (FAO) has been assessing the worlds Forest Resources at regular intervals, its Global Forest Resources Assessments (FRA) are based on data provided by individual countries, using an agreed global definition of forest which includes a minimum threshold of the height of trees at 5m and at least 10% crown cover(canopy density determined by estimating the area of ground shaded by the crown of trees) and a minimum forest area size of 0.5 hectares. Urban parks, orchards and other agriculture tree crops are excluded from this definition such as are agro-forestry systems used for agriculture. According to this definition there are at present just under 4 billion hectares of forest in the world, covering in all about 30% of the world land area (FAO, 2006a). reached a reliable and acceptable definition of the land cover and the extent of forest and other wooded lands of Sudan, which includes five main categories: forest, other wooded lands, other lands, other lands with tree cover and island water bodies table (3-1). the crown cover threshold and land use criteria are, in most cases, the most critical factors defining forests. The 10% threshold of crown cover encompasses both open and closed forests. The term closed forest refers to area where tree cover exceeds 40% while the term open forest refers to areas where tree cover is between 10% and 40%.

Table (3-1) Forest Resource Assessment Definitions(FRA) for 2005

Category	Definitions
Forest	Land spanning more than 0.5 hectares with trees higher than 5m and canopy cover of more than 10% or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use.
Other wooded land	Land not classified as forest spanning more than 0.5 hectares; with trees higher than 5m and a canopy cover of 5-10%, or trees able to reach these thresholds in situ or with a combined cover of shrubs, bushes and trees above 10%. It does not include land that is predominantly under agricultural or urban land use.
Other land	All lands that is classified as forest or other wooded land
Other land with tree cover (subordinated to other land)	Land classified as other land spanning more than 0.5 hectares with a canopy cover of more than 10% of trees able to reach a height of 5m at maturity.
Inland water bodies	Inland water bodies generally include major rivers, lakes and water reservoirs.

Source: (FAO, 2006a)

In order to assess the state of worlds closed forests, the United Nations Environment Program (UNEP) has recently employed other definition criteria including a minimum crown cover of 40%. It has also used remote sensing ensure compatibility

across countries. Forest is defined as ecosystem with a minimum of 10% crown cover of trees and/or bamboos, generally associated with wild flora, funa and natural soil conditions and not subject to agricultural practices (Elamin and Cesar 1994). Vegetation cover in terms of types, forms and density depend on the environmental and geomorphologic conditions, the vegetation cover occurring in the form of growth form of trees, shrubs and herbs. More generally it is referred to as distribution and abundance of vegetation.

Vegetation extent is defined as all plant life in a given area (Thackeray and lesslie, 2005). Reported that, terrestrial vegetation is an important factor in the radiation balance of the earth, and in numerous biogeochemical cycles related to climate maintenance and climate change. Forest ecosystems are frequently characterized in terms of their species and genetic composition (Hunter, 1999).

In literature several definitions of vegetation condition are being used for different purposes and at different scales and this largely depends on the management objectives. In general, as vegetation is subject to modification by natural cycles and trends, and by human activities. A reliable estimate of the past and present status and distribution of vegetation, in form of which is accessible, manageable and applicable to a variety of trees at the study area is necessary. (FAO,2011).

3.2 The vegetation of the world:

Worldwide, in 1994 more than 26100 plant species were threatened (Dallmerier, 1998) the total area covered by forests is approximately 3869 million hectares, almost one-third of worlds land area, of which 95% in natural forest and 5% in plantation forest; out of this 17% is in Africa, 14% in Asia, 27% in Europe, and 14% in north and central America and 23% in south America and 5% in Oceania (FAO, 2001a). the five most forest-rich countries (Russian federation, Brazil, Canada, The

United State Of America and China) account for more than half of the total forest area. Ten countries or areas have no forest at all and an additional 54 countries have forest on less than 10% of their total land area. In 2010, the estimated total growing stock in the worlds forest amounted to about 527 billion m3, this corresponds to an average of 131m3 per hectare. The highest level of growing stock per hectare were found in central Europe and some tropical areas (FAO, 2010).

3.3 Sudan Forests

Sudan forest area had been declined from 21.83 million hectares to 18.74 million hectares in 2012 (about 9.97% of Sudan area) .The annual removal rate declined from 207.86 thousand hectares to 174 thousand hectares during the period (2011 – 2015). The total of the reserved forest area in Sudan is 12.6 million hectares (6%) of Sudan area. About 22.5% of Sudan area that targeted to be reserved according to forest policy, for this condition it had been necessary to planting forest cover reach to the targeted percentage (20% of Sudan area) according to the current policy.

(about 37.8 million hectares). (FNC reports. 2014).

Table (3-2) Forests area and annual removal rates.

Year	1990	2000	2005	2010	2015
Annual Removal rates (1000 hectares)	989	589	271	271	174
Forests areas	76.38	70.49	70.22	69.95	19.21

Table (3- 3) - Total area of Sudan by Land Use Classes (1000 ha) (source NFI 2019)

	Area		
	('000 ha)	%	Error % (se)
Forest	31,033.099	16.49	6
Other Wooded Land	25,831.839	13.73	9
Other Land	130,858.179	69.53	11
Inland Water	475.683	0.25	21
TOTAL	188,198.800	100.00	46

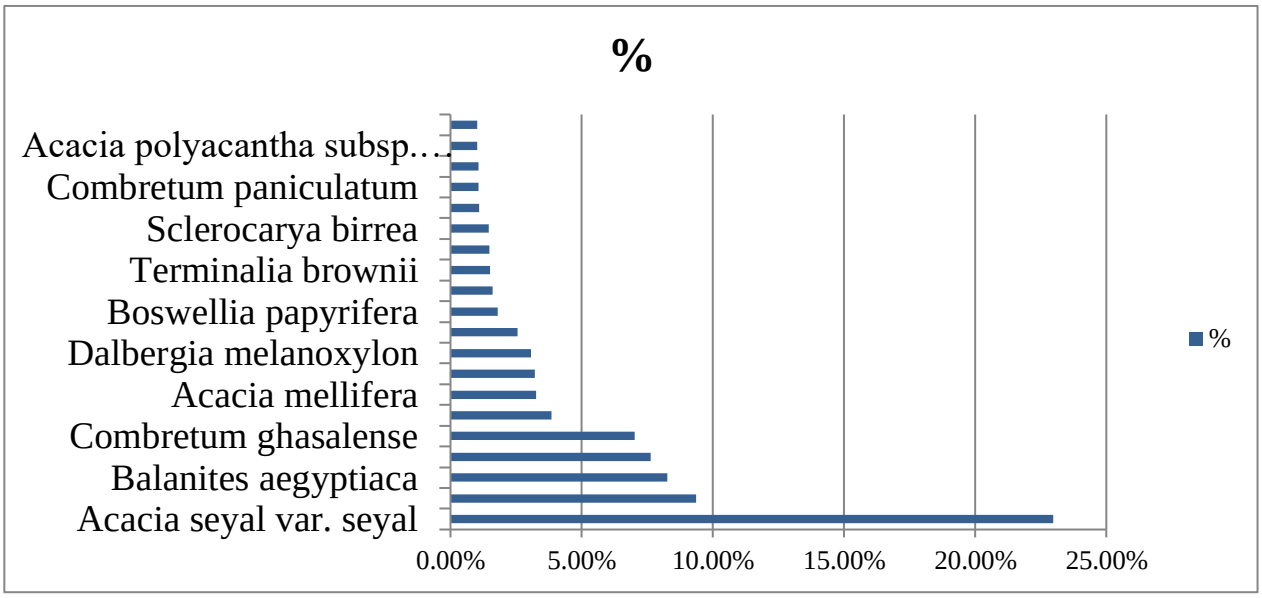
3.4 Vegetation of Sudan

Five distinct vegetation zones have been identified in the Sudan and indicated to correspond with latitudes and annual rainfall (Harrison and Jackson 1958). This classification before Sudan divided in 2011, while the forestland decreased by 30%. The desert zone lies between latitudes 16ºN and 22ºN, while Harrison and Jackson (1958) stated that it represents the southern limit of the desert zone. This may indicate that; the desert has moved southward by 1%. The reported advance of the desert lowers the yield capacity of the land and deprives the population, in the affected area, of their nutritional basis. It is nutritional process, which slowly destroys, the regenerative capacity of the vulnerable ecosystem in arid and semi-arid dry regions with land use methods, which are not adapted to natural conditions. The dry land region south the desert is characterized by thorn buns land vegetation zone where nomadic camel herders and sedentary millet farming are the main economic activities (Badi, 1989). Considering the vegetation of the whole country, the classification is based on latitudinal variation associated with changes in rainfall, soil texture and topography. The semi-arid zone of Sudan extends between latitudes

14 º and 17 º N, the low woodland savannah extends between latitudes 10 º, and 14 º N these two zones are the most densely populated zones and the most vulnerable to drought and desertification Over-cultivation, over-grazing and extensive clearance of forests increase the vulnerability of the ecosystem to desertification process. The consequences of desertification in the Sudan distressed the local communities.

3.5 Species and biodiversity:-

15 most abundant tree species by frequency in Sudan (Source (NFI result FAO 2019.)



3.6. Status of Sudan forests:

Sudan is considering as a poor forests region after cessation of South Sudan (2011), while there were two important regions lost (Deciduous high woodland savannah and tropical rain forests).

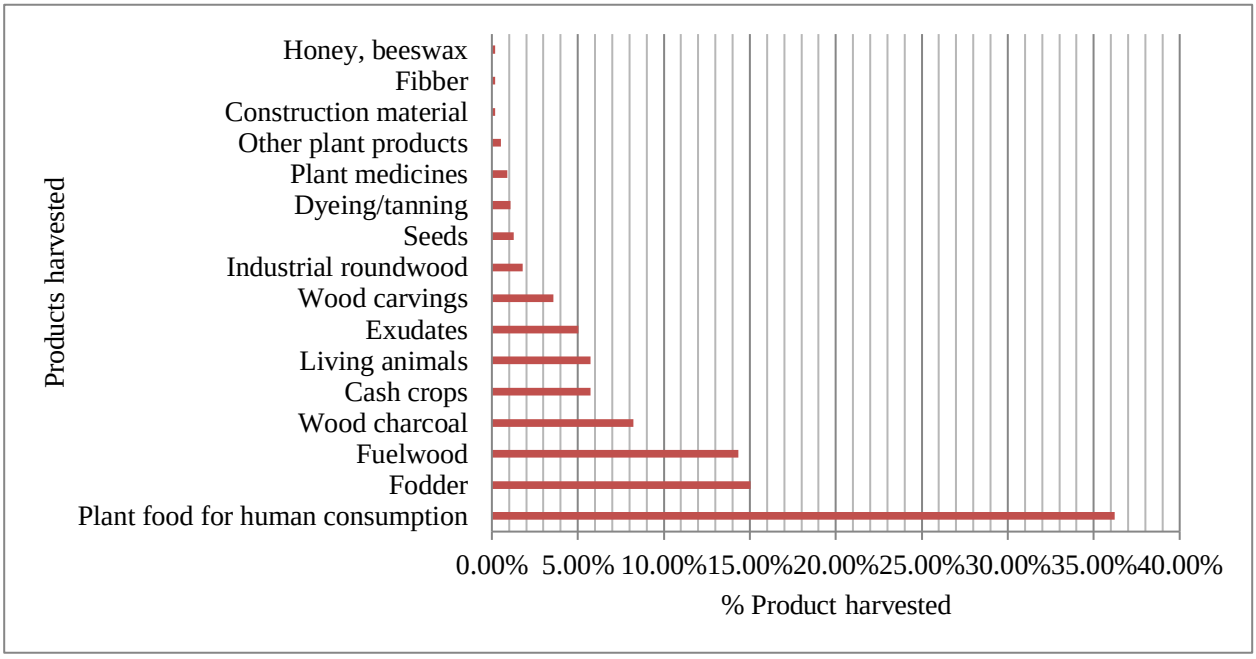
Table (3-5) Vegetation Cover in Sudan.

	Percentage of forests cover	**Vegetation cover / feddan / mill**
South of Sudan	109.62	68 %
North of Sudan	51.96	32 %

Source: FNC (2011)

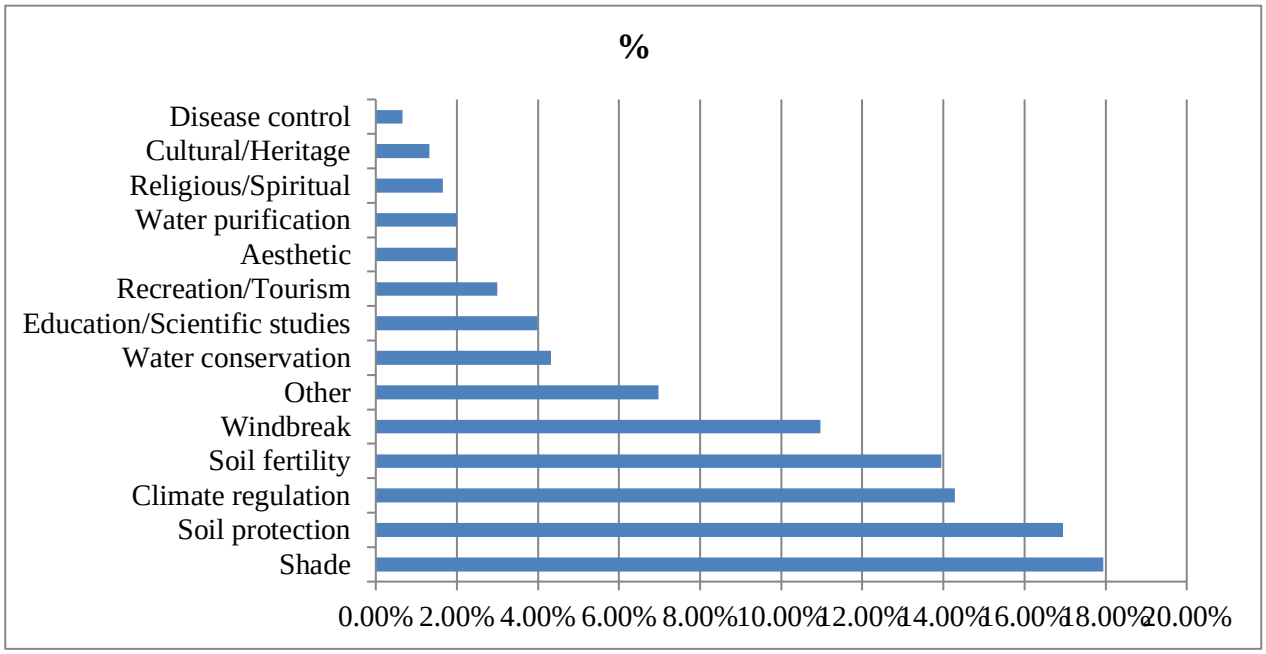
3.7 Major Forests products: -

Source (NFI result FAO 2019.)



3.8 Major surface from the forests: -

Source (NFI result FAO 2019.)



3.9 The importance of quantification of Drivers of forest: -

In order to reduce emission from forest and enhance carbon stock storage it is important to understand the address the most important drivers. Without a solid quantify of the drivers the capacity to achieve tangible REDD + result and to access result based payment is compromised.

Countries aiming to focus their polices and National Plan to: -

- Effectively engagement key stakeholder specially in the non-forest sectors.
- In order to assess the potential socio – economic benefits and risk that could be result from different polices and measure.
- Define the priorities for forests monitoring and MRV.

- Gain information on national circumstances for adjusting forest reference (emission) levels.

3.10 Causes of forest drivers:

Drivers is process or action that result in deforestation and forests degradation.

Deforestation is action or process of converting forest land to another land according to the six land use categories identification by the Intergovernmental Panel on Climate Change (IPCC) (forests land, crop land, grass land, settlement, wet land and other land).

Degradation is the process of losing carbon stock from forest land - the land use remains forest, but the amount of carbon stock in the forest is reduced. Drivers can be separate into:

3.11 Direct drivers: -

Also called a proximate cause i.e. human activities or immediate action that directly impact forests cover and lead to the loss of carbon stock, deforestation direct subsidence and commercial agriculture, infrastructure development and urban expansion and surface mining.

Forests degradation: - legal and illegal timber extraction (logging) forest, fire, and livestock grazing forests, fuelwood collection and charcoal production, Erosion, drought, insect and disease, flooding, Haddam, refugee mining and extraction petroleum.

3.12 In direct drivers: -

The complex interaction of social , economic, political , cultural and technological process that is bring about direct drivers , At the national level market behavior (supply and demand) such as demand of the other crop (Karkadi , semsim ….etc.) against forest crop (Gum Arabic) fluctuation in commodity price , fluctuation in currency exchange rate, policies that favor non forests land uses , poor governance, food security change in household behavior weeking governance and institution , poor cross sectoral coordination , week law enforcement and poverty as critical in direct drivers .

3.13 Agriculture expansion:

The agriculture sector is the most economic sector in the country the sector contributed on average about 34% of the country on Gross Domestic Product (GDP) from 2009 to 2013 while ranging from 32.2 % to 34.4 % over that period. (Source study of DD).

There are four type of agriculture in Sudan: -

- Rained or traditional agriculture about 25% total area of Sudan, which is depends on rainfall.
- Irrigated agriculture depends on industry irrigation and occupies an area estimated by 25% of the total area of the country which is separated into.
- Stream irrigation that draws water from reservoir and dam such as (Elrosurs and khasm elgarbs).
- Flooding irrigation depends on periodic flooding such as (Dalta Elgash) .
- Mechanical agriculture uses mechanical agriculture used machine .
- Traditional agriculture practice by small farmer around the forests.

At the global agriculture (commercial and substance) is estimated to drive about 80% of deforestation worldwide, large – scale commercial agriculture is seen as biggest drivers in Latin America. Accounting for two – thirds of total deforestation, while in Africa and sub-tropical Asia commercial agriculture is regarded as the driver for one third of total deforestation substance agriculture account for a similar proportion in each region. (source Kissinger et al.2012).

Agriculture expansion is the one of the prominent drivers of REDD $^{+}$ Sudan

3.14 infrastructure development: -

Infrastructure is a basic physical and organizational structure and facilitates e.g. (building, road, transportation, power supplies) need for the operation of a society.

This infrastructure can be established in the forests land that can be cause deforestation such as affected of the reviern forests by the top of ELrosiurs dam estimated by (17) forests with the (36000 fedan) located in blue Nile state at Gisan and Rosuris .

3.15 Urban expansion

Sudan like other third world witness the urban high rate of population that can be cause the urban expansion. The five census (1955/1956 – 1973 - 1983- 1993-2008) shown that the number of urban people in constantly increasing (source Central Agency for Statistics and information and the united Nation Population Fund 1999), The effect of the urban expansion in the change land use that can be cause deforestation.

3.16 Forests Degradation: -

3.16.1 Livestock grazing forests (over grazing): -

Overgrazing is putting too many animals on the grazing land (the carrying capacity of the grazing is small than animal).

Over grazing is biggest drivers of REDD+ activities, because the absence of the range land in Sudan, the effect of animal grazing in the forest can be effect on the mechanical of the soil, dead the small seeds and cause degradation of green stock of the forests.

3.16.2 Legall and illegal timber extraction (logging) forest: -

Illegal timber extraction (illegal cutting) can be cause be people live around the forests collect the timber for domestic uses (building, cooking and production of Charcoal).

3.16.3 Fire: -

Fire can be cause natural such as lightning or by human being such as not putting out a campfire or dropping a lit cigarette, about 80% of the forests fire caused by human activities.

3.16.4 Erosion: -

Erosion is a process by which the surface of each get worn down, the key erosion can be caused by natural element such as wind and water.

3.16.5 Drought: -

Drought is reduction in precipitation over extended period. This rain shortfall creates a water shortage which damages forests, livestock and other human activates.

3.16.6 flooding: -

Flood is a body of water that covers land which is normally dry, and destroy house, building and forests.

3.16.7 Surface mining: -

Mining is extraction of mineral and other geological material of economic value from deposits on the earth, surface mining was start recently in Sudan.

3.16.8 refugees: -

Refugees are people who have fled war, violence, conflict or persecution and have crossed an international border to find safety in another country.

3.16.9 extraction petroleum: -

Is the recent activities being practice in the forests land.

3.16.10 Haddam (sedimentation): -

Is the natural phoumena in the course of Nile course.

CHAPTER FOUR

MATERIALS AND METHODS

CHAPTER FOUR

MATERIALS AND METHODS

4.1 General:

This chapter include the description of the types of data used, the sampling technique used and the tools of data collected (questionnaire) in terms of its construction, organization of questions and per-testing as well as the permission for data collection, procedures and methods employed for data analysis.

4.2 Primary data

Primary data which include the original data, were collected through questionaries' and technical forms (quantities & qualitative data) Information about the forests include: -

1. general information about the forests name, state, circle, locality.
2. Forest specific information including type of forests (natural or plantation forests) total area by fedan, ecological zone, type of soil, tree species and dominant species in the forest, natural generation and the status of the tree density.
3. Population and livelihood (farming, grazing, forest products collection) including number of village around the forests and the total population, livelihood, type of livestock.

4.3. Secondary data:

Secondary data were gathered from reports, website and documents, papers, books, scientific journals and previous researches to support the primary data. Such data covers:

- Basic country information.
- Drivers of deforestation and forest degradation
- Forest policies and laws.
- Findings of previous forest inventories.

4. 4 Data collection: -

Data was collected through following methods: -

1. Field survey and observation was conducted with support from the FNC formal staff at the state and locality levels
2. Personal communication with community leaders and key persons

4.5 Statistical analysis:

The statistical analysis was commenced through exploratory manipulations of data obtained in the study area. This process was accomplished by critically examining the through the use of simple statistical techniques of analysis. The main tools are the construction of simple tables and selected cross-tabulation which allows obtaining simple statistical results according to the answers obtained from the interviewees. Statistical package for social science (SPSS) was used to analyze the data.

4.6 Selection criteria: -

Criteria for site selection for investigation:

- Ecological zones (cover all ecological zones)
- Government Reserve (gazetted)

- Level of deforestation and forest degradation
- People livelihood.

Three hundred fifty Forests (350) were selected all over Sudan with a total area of **8,027,754.24** Fedans.

CHAPTER FIVE

RESULTS AND DISCUSSIONS

CHAPTER FIVE

RESULTS AND DISCUSSIONS

5.1 General:

This chapter discusses the data and information collected. The results composed of questionnaire comparisons of the results found with other relevant previous findings, so a through descriptive discussion will be carried out in this chapter.

Table (5-1) the density of the tree in the forests

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	poor	38	10.9	10.9	10.9
	medium	137	39.1	39.1	50.0
	good	124	35.4	35.4	85.4
	very high	51	14.6	14.6	100.0
	Total	350	100.0	100.0	

The analysis of the density of the trees in the forests show that the39.1% of respondent were in a medium density, while the 35.4% in a good density, 14.6% very high density and the 10.4% were in poor density. This is might due to the deferent activates were practice in the forests such as (un legal cutting, over grazing and agriculture) that may be cause the density of the the trees of forests low.

Table (5-2) the regeneration of the tree in the forest respondents.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	poor	82	23.4	23.4	23.4
	Medium	97	27.7	27.7	51.1
	good	135	38.6	38.6	89.7
	very high	36	10.3	10.3	100.0
	Total	350	100.0	100.0	

The analysis of the regeneration of the trees in the forests show that the38.6% of respondent were in a good regeneration, while the 27.7% in a medium regeneration, 23.4% poor regeneration the 10.3% were in very high. This is might the natural cause such as (insect, disease, and drought) or anthropogenic activities such as (fire, legal cutting, over grazing and expansion of agriculture).

Table (5-3) the activities were practice in the forest respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agriculture	36	10.3	10.3	10.3
	Grazing	101	28.9	28.9	39.1
	agriculture and grazing	175	50.0	50.0	89.1
	wood collect	37	10.6	10.6	99.7
	Other	1	.3	.3	100.0
	Total	350	100.0	100.0	

The analysis of the activities were practice in the forest respondents show that the50.0% of respondent were in a practice activity is a agriculture and grazing the high proportion, while the 28.9% were practice grazing, 10.6% practice wood collect, the 10.3% practice agriculture and .3% practice other activities. This is might due to number of population of the village around the forests or number of the village around the forests.

Table (5-4) the animal we find in the forests

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	goat	169	48.3	48.3	48.3
	camel	43	12.3	12.3	60.6
	sheep	98	28.0	28.0	88.6
	caw	40	11.4	11.4	100.0
	Total	350	100.0	100.0	

Table (5-3) describe the animal we can find in the forests, goat is a most animal in 48.3%, sheep 28%, camel 12.3% and caw 11.4 % the variation of the animal due to the location and the culture of the different state.

5.2 Quantification result: -

This part include the result obtain from technical form. Three hundred fifty Forests (350) were selected all over Sudan with a total area of **8,027,754.24** Fedans shown in table (5-1)

Table (5-1) the number of sample forests in each state.

State	Number of forest
Gaziera	29
Khartoum	5
Northern	4
River Nile	13
Blue Nile	16
Sinnar	20
White Nile	30
North kordofan	8
South kordofan	43
West kordofan	53
North darfour	25
South darfour	16
Central darfour	16
West darfour	17
East darfour	8
Gaderif	25
Kassala	7
Red Sea	15
total	**350**

Table (5-2) The total area of the forests was selected, total area were affected by drivers and the ration between them.

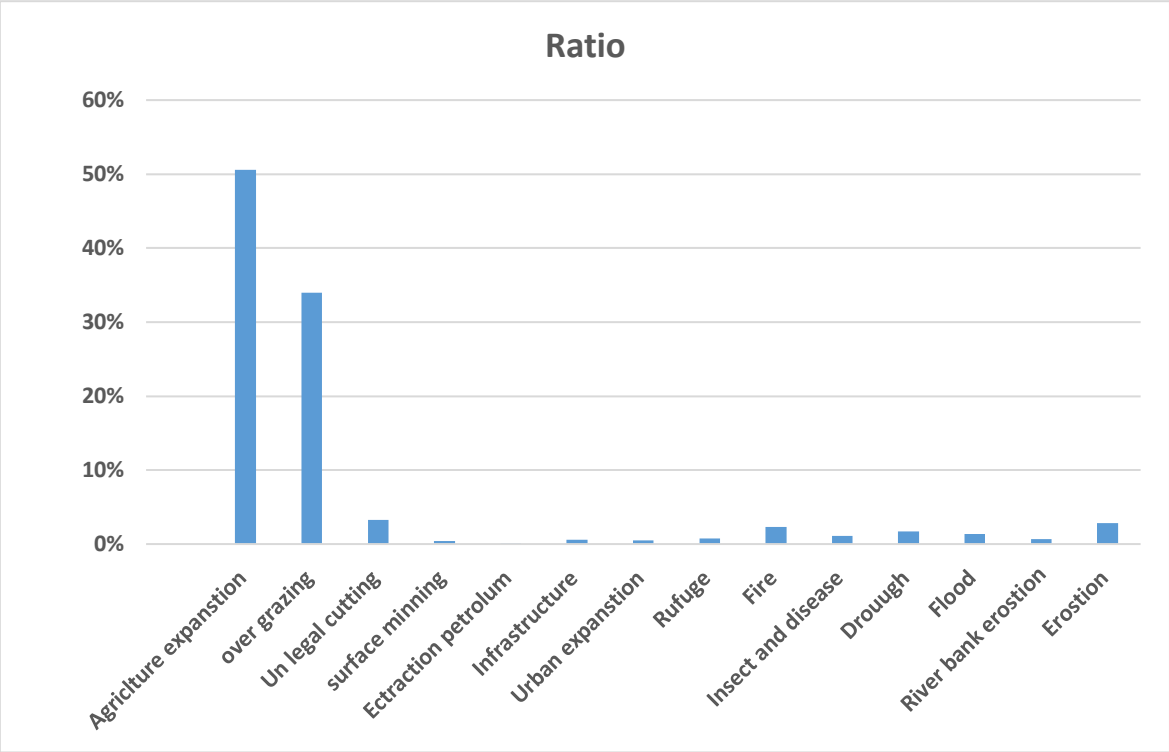
state	the total area	Total area were affected	Ratio
Gaziera	658,437.00	255,604.30	39%
Khartoum	11,061.00	2,373.00	21%
Northern	2,604.00	80.00	3%
River Nile	30,554.00	17,310.00	57%
Blue Nile	781,523.00	315,949.01	40%
White Nile	257,465.00	55,207.38	21%
Sinnar	852,713.00	192,567.25	23%
North kordofan	64,842.00	23,742.87	37%
South kordofan	403,523.00	45,742.00	11%
West kordofan	1,758,273.00	321.00	1%
North darfour	70,296.00	22,177.00	32%
South darfour	1,129,984.24	3,134.50	0.3%
Centeral darfour	214,069.00	110.00	0.1%
West darfour	113,177.00	4,162.00	4%
Eeast darfour	418,505.00	89,415.00	21%
Gaderf	1,064,585.00	314,160.00	30%
kassala	104,710.00	427,000.00	25%
Red sea	91,433.00	30,870.00	34%

Table (5-4) the total quantification of drivers by area / fedan

No	Drivers	Area / Fedan
1	Agriclture expanstion	940,319.85
2	Over grazing	631,589.31
3	Un legal cutting	61,808.80
4	Minning	7,575.00
5	Exteraction of petrolum	95.00
6	Infrastructure	11,539.00
7	Urban expansion	9,505.25
8	Refuge	13,543.00
9	Fire	43,388.20
10	Insect and disease	19,735.25
11	Drough	31,509.00
12	Flood	25,394.00
14	River bank erosion	12,052.00
15	Erosion	52,414.65
	total	1,860,468.31

Table (5-3) shown the quantification of drivers which was quantity by area/ fedan affected by targeting drivers (15drivers), the total area affecting by all drivers estimated by **1,860,468.31** fedan.

Histogram (5-5) the ratio of the Drivers.



Histogram (5-5) shown that the biggest ratio we found in the agriculture expansion 51% and the lower ratio is extraction petroleum estimated by 3%.

Table (5-6) ranking the drivers.

No	Drivers	Area / Fedan
1	Agriculture explanation	940,319.85
2	Over grazing	631,589.31
3	Un legal cutting	61,808.80
4	Fire	43,388.20
5	Drough	31,509.00
6	Flood	25,394.00
7	Insect & disease	19,735.25
8	Refuge	13,543.00
9	River bank erosion	12,052.00
10	Infrastructure	11,539.00
11	Mining	7,575.00
12	Extraction petroleum	95.00

As we shown in the tables above: -

1- agriculture expansion is firsts drivers represented 51%. with total area **940,319.85** fedan.

2- Second drivers is over grazing is second drivers represented 34% with total area **631,589.31** fedan**.**

3- Third drivers is un legal cutting represented 0.03%, 61,808.80 fedan.

4- Erosion estimated by **52,414.65** fedan.

5- Fire estimated by **43,388.20** fedan.

6- Drought estimated by **31,509.00** fedan.

7- The presence of flood 25,394.00 fedan .

8- The presences of insect and disease is estimated by 19,735.25.

9- The presence of refuge (compound) estimated by 13,543.00 fedan.

10- The presence of river bank erosion estimated by **12,052.00** fedan.

11- The infrastructure (airport , road , bridge) estimated by 11,539.00 fedan.

12- The presence of urban expantion 9,232.00 fedan.

13- The presence of mining estimated by 7,575.00 fedan.

14- Finally, the last drivers are extraction of petroleum estimated by 95.00 fedan.

CHAPTER SIX

CONCULOSIONS & RECOMMENDATIONS

CHAPTER SIX

CONCULOSIONS AND RECOMMENDATIONS

6.1 Conclusions:

- According to the result obtained the most of the forest are high density.
- The regeneration of the forests were good status.
- The most activates were practice in the forests is agriculture and grazing, grazing, wood collect and other activates simuntainously.
- Most of the animal were grazing are: goat, camels, caws and sheeps.
- The agriculture expansion is the most deforestation drivers of $REDD^{+}$ activates.
- Over grazing is the most drivers of $REDD^{+}$ activities for degradation and deforestation.
- Human activities were the main reason that causes degradation to forest through un legal cutting which caused a great disappearance of a certain tree species mostly utilized in domestic uses (cooking and fuel).
- Surface mining is recent activities can not practice in the most of the forests.
- Most of the forests with high ratio of absence of an extraction petroleum.
- Most of the infrastructure has not effect on the forests area except some forests.
- Human settlement the result was shown that the cannot found human settlement such as (compound refugee, village and house).

- Most of the forests located in the high medium of fire.
- The insect and disease as natural factor driver showing that the poor of presence in the forests.
- Drough result can be caused by human activities or natural represents poor ratio in the forest.
- We can find the flooding in medium ratio in the forests.
- Hadam is shown as medium ratio in the forests.
- The presence of the soil erosion is medium.

6.2 Recommendations:

The study recommended the followings:

- Helping the communities to enhance agriculture production, reduce shifting cultivation and process of market behavior.
- Promoting alternative source of livelihood for the community e.g. by employing young people as forests range technical skills, supporting cooperative loans and improving education.
- Training on sustainable management practice such as management of nurseries.
- Raising awareness within the communities on forest conservation and related state law.
- FNC should encourage establishment of community forests with the objective of domestic needs and hence will reduce dependency of people up on natural forests.

- Different extension programs should be introducing through Radio, TV, and workshops is very useful to raise people's awareness about the importance of trees.
- Population distribution is necessary to avoid pressure made over natural resources.
- Fire management unit should be established to control the fire in the all state (18) state with capacity building and training of the staff.
- Encourage researcher to research in the field of disease and insect that can cause the degradation deforestation in the forests.

Annex

University of Khartoum

Institution of Environmental Science (IES)

Questionnaire for quantification of drivers of REDD $^{+}$ activities

This questionnaire was made to assess reasons of quantification drivers in Sudan. The information will be utilized in research for M.Sc. degree and will not use for other purposes. Please answer the following questions as accurately as possible. Your answer will be strictly confidential.

Put a tick in the place of the estimated answer:

General information: -

1- The state ……. Locality ……circle ……..

2- Name of the forests …… total area (fedan) ……. ..……

3- Type of the forests …… type of the soil …….. …….

4- Tress species in the forests ……..

5- Dominant trees in the forests……...

6- Number of village around the forests ……. Population …….

7- The density of the forests:

a- Poor ( ) b- medium ( ) c- good ( ) d- very high ( )

8- The status regeneration of the forests :

a- Poor ( ) b- medium ( ) c- good ( ) d- very high ( )

9- The activities were practice in the forests:

a- Agriculture ( ) b- grazing ( )

c- agriculture and grazing ( ) d- wood collect ( )

8-The animal we find in the forests:

a- Camel ( ) b- goat ( ) c- sheep ( ) d- caw ( )

9-The agriculture expansion:

a- No ( ) b- yes poor ( ) c- yes medium ( ) d- yes very high. ( )

10- Over grazing in the forests:

a- No ( ) b- yes poor ( ) c- yes medium ( ) d- yes very high. ( )

11-Illegal cutting:

a- No ( ) b- yes poor ( ) c- yes medium ( ) d- yes very high ( )

12-The extraction of petroleum**:**

a- No ( ) b- yes poor ( ) c- yes medium ( ) d- yes very high ( )

13-The infrastructure:

a- No ( ) b- yes poor ( ) c- yes medium ( ) d- yes very high ( )

13-Surface mining:

a- No ( ) b- yes poor ( ) c- yes medium ( ) d- yes very high ( )

14-The presence of disease and insect:

a- No ( ) b- yes poor ( ) c- yes medium ( ) d- yes very high ( )

15- Urban expansion: -

a- No ( ) b- yes poor ( ) c- yes medium ( ) d- yes very high ( )

16- The presence of fire:

a-No ( ) b- yes poor ( ) c- yes medium ( ) d- yes very high ( )

17- The presence of flooding:

a-No ( ) b- yes poor ( ) c- yes medium ( ) d- yes very high ( )

18-The presence of hadam:

a-No ( ) b- yes poor ( ) c- yes medium ( ) d- yes very high ( )

19-The presence of soil erosion:

a-No ( ) b- yes poor ( ) c- yes medium ( ) d- yes very high ( )

20- Other:

Specific ……..

Drivers	The states						
	Khartoum	**Northern**	**River Nile**	**Gazeria**	**Blue Nile**	**White Nile**	**Sinner**
Agriculture expansion	2,373.00	0	3,190.00	1,148.30	94,626.50	6442.05	168,800.00
Grazing	0	0	4,650.00	47,305.00	194,724.00	30190.21	20,500.00
Cutting	0	0	3,260.00	1,750.80	6,503.51	398.02	1,445.00
Mining	0	0	0	0	1,000.00	0	0
Extraction petroleum	0	0	0	0	0	0	0
Infrastructure	0	0	500.00	0	4,095.00	170	15.00
Urban	0	0	0	807.00	4,150.00	0.05	100.00
Refuge	0	0	0	0	2,570.00	0	1,050.00
Fire	0	70.00	910.00	640.20	2,000.00	53	27.00
Insect	0	0	0	824.00	0	7312	163.25
Drough	0	0	4,800.00	1,451.00	0	210	3.00
Flood	0	0	0	620.00	6,268.00	930	285.00
Hadam	0	0	0	51.00	12.00	9117	30.00
Erosion	**0**	10.00	0	1.007.00	0	385.05	129.00

Table (1 ,2,3) drivers and area / Fedan in the state .

Drivers	The state							
	North kordofan	South Kordofan	West Kordofan	North Darfur	South Darfur	West Darfur	East Darfur	Central Darfur
Agriculture expansion	250.00	9.550.00	1.000.00	1.840.00	60.500.00	1.350.00	18.670.00	19.180.00
Over grazing	16.539.10	13.014.00	47.320.03	10.590.00	92.502.00	6.102.00	1.170.00	409.323.00
Un legal cutting	3.452.97	6.896.50	9.861.94	2.200.00	31.076.00	11.320.00	0	83.595.00
Mining	0	4.500.00	10.00	165.00	0	0	0	0
Extraction petroleum	0	0	95.00	0	0	0	0	0
Infrastructure	0	2315.00	19.00	580.00	8.00	175.00	0	0
Urban	2.293.20	1.220.00	150.00	625.00	1.760.00	160.00	0	0
Refuge	100.00	1.203.00	1.000.00	115.00	38.745.00	270.00	5.730.00	0
Fire	600.00	10.925.00	8.310.00	5.138.00	4.50	15.00	25.100.00	0
Insect	0	1.271.00	14.722.00	55.00	50.00	415.00	3.845.00	100.00
Drough	145.00	1.456.00	6.175.00	474.00	62.50	190.00	4.815.00	10.00
Flood	0	2.463.00	1.00	66.00	15.00	110.00	0	7.735.00
Hadam	362.60	819.50	0	70.00	0	270.00	0	0
Erosion	0	2.761.00	46.000	259.00	0	165.00	30.085.00	0

Drivers	The state			
	Kassala	Gaderif	Red Sea	Total
Agriculture expansion	330,000.00	295,730.00	6,500.00	**945,319, 85**
Over grazing	68,800.00	4,390.00	23,775.00	**631,589,31**
Un legal cutting	11,700.00	7,430.00	16,502.00	**60,058.00**
Mining	0	0	1,900.00	**7,575.00**
Extraction Petroleum	0	0	0	**95.00**
Infrastructure	500.00	855.00	0	**9,232.00**
Urban	0	0	0	11.256.25
Refuge	2,000.00	205.00	400.00	**14,543.00**
Fire	5,600.00	400.00	0	**98,133.20**
Insect	1,000.00	4,150.00	0	**34,371.75**
Drough	3,500.00	1,000.00	13,600.00	**37,724.00**
Flood	1,000.00	0	13,506.00	**25,456.50**
Hadam	500.00	0	400.00	**19.019.50**
Erosion	2,400.00	0	14,850.00	**52.414.00**

Table (3)

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