

Dedication

To my parent

To my brother Khaled

To my husband Abdelwahab

To my Family

Acknowledgment

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Acronyms and Abbreviations

BIRD	BI-spectral Infra-Red Detector
CO2	Carbon dioxide
ENVI	ENvironment for Visualize Image
EVI	Enhanced Vegetation Index
EW	Early Warning
FAO	Food and Agriculture Organization
FNC	Forest National Corporation
GIS	Geographical Information System
GOFC/GOLD	Global Observation for Forest and Land Cover Dynamics
GPS	Global Positional Systems
IPCC	Intergovernmental Panel On Climate Change
IR	Infra Red
LP DAAC	Land Process Distributed Active Archive Center
MODIS	MODerate-resolution Imaging Spectrometer
NASA	National Aeronautics and Space Administration
NDVI	Normalized Difference Vegetation Index
RPA	Range and Pasture Administration

RS	Remote Sensing
SAFNet	South African Fire Network
UNDP	United Nation Development Program

Abstract

The rangelands areas in Sudan are estimated as 117 million hectare. The vegetation composition and distribution over the predominant ecological zones are entirely attributed to the actions and interactions of the prevailing environmental factors such as climate, soil, topography and the common human and animal activities

Wildfires are among the main reasons that cause great loss of rangelands annually, especially when incidences increase as a result of human related factors. Fire contributed to loss of about 30-60% of plants annually in the low rainfall savanna, while limited efforts are taken in this respect. This situation requires an effective means of protection mainly firelines establishment.

Determination of optimum timing for firelines establishment is very important because it contributes to minimize the incidence of fire occurrence and hence reduces damage to vegetation and seed bank.

This study was conducted in Albaja area western Eldueim town in White Nile State, the main objective of it was to investigate the use of remote sensing tools for determination of optimum timing for firelines establishment. Sampling carried out on eight sites, in each site four

(1m ×1m) quadrates were located 50 m apart and perpendicular to the 5th central quadrate. The biomass at each quadrate clipped, and oven dried in order to determine the moisture content. 16 readings were taken within the period from 13/9/2007 to 22/10/2007.

MODIS NDVI images 250mX250m spatial resolution were used in order to make correlation between NDVI and moisture content and between NDVI and dry biomass weight. The minimum values of fuelload expressed in biomass and maximum moisture content values (at one day before fire occurrence) for areas burned previously were used as critical values to trace areas of maximum vulnerability. When the two factors (areas of equal or less than the maximum moisture content and of equal or more than the minimum fuelload) overlapped indicate fire occurrence because the enough burnable dry fuel is available. The starting of the appearance of areas of overlapping of the two values of fuelload and moisture content indicates the possibility of fire occurrence and hence the time to establish firelines.

The study recommended that, remote sensing techniques can be used as an effective mean for determination of timing of firelines establishment and areas more subjected to fires.

Also Remote sensing data and other related tools are promising for wildfire monitory and rangeland management hence they are in continuous development.

ملخص الدراسة

تقدر مساحة المراعى الطبيعية فى السودان بحوالى 117 مليون هكتار. مكونات وتوزيع الغطاء النباتى داخل الاقاليم المناخية يتفاعل مع العوامل البيئية السائدة مثل المناخ-التربة-الطبيوغرافيا-الانشطة البيئية وأنشطة الإنسان و الحيوان. الحرائق واحدة من الاسباب الرئيسة التى تودى الى تدهور اراضى المراعى سنويا خاصة الحرائق التى تتعلق بالنشاطات البشرية. تودى الحرائق الى فقدان حوالى 30-60% من النباتات سنويا فى مناطق السافانا الفقيرة، هذا الوضع يتطلب وسائل فعالة تقود للحماية من ضمنها التأسيس لفتح خطوط النار .

تحديد الوقت المناسب لفتح وتأسيس خطوط النار ذو أهمية فعالة وذلك لمساهمتها فى تقليل قابلية حدوث الحرائق وبالتالي تقليل التأثير السلبى على الغطاء النباتى ومخزون البذور فى التربة.

اجريت هذه الدراسة بمنطقة الباجا غرب الدويم بولاية النيل الابيض والهدف الرئيسى منها هو استخدام وسائل الاستشعار عن بعد فى تحديد الوقت المناسب فى التأسيس لفتح خطوط النار.

تم اختيار ثمانية مواقع بمنطقة الدراسة باستخدام جهاز تحديد المواقع و تم اخذ عينات من الكتلة الحية داخل كل موقع بواسطة عدد خمسة كوادرات مساحة الواحد 1×1 متر. تم حصد الكتلة الحية فى كل كوادرات وتم تجفيفها فى الفرن للحصول على المحتوى المائى والوزن الجاف للكتلة الحية. تم اخذ حوالى 16 قراءة فى الفترة ما بين 13/9/2007م الى 22/10/2007م .

استخدمت مرئيات معدل تغير الغطاء النباتى ، المعتمدة على بيانات القمر الصناعى MODIS ذو القدرة التمييزية المكانية (250×250م) لدراسة العلاقات الارتباطية بين معدل تغير الغطاء النباتى وكل من الوزن الجاف والمحتوى المائى. أعلى قيمة للمحتوى المائى واقل قيمة للكتلة النباتية الحية

(قبل يوم واحد من حدوث الحرائق) داخل منطقة الحرائق أستخدمت كقيم قياسيـه لتحديد المناطق الأكثر عرضه للحرائق (المناطق التى تقل أو تساوى أعلى قيمه للمحتوى المائى والمناطق التى تزيد عن أو تساوى اقل قيمه للكتله النباتيه). بداية ظهور المناطق التى تتطابق فيها القيم القياسية للكتله الحيه والمحتوى المائى داخل منطقة الحرائق استخدمت كمؤشر لإمكانية حدوث الحرائق عليه يمكن تحديد الوقت المناسب لفتح وتأسيس خطوط النار. أوصت هذه الدراسة بان تقنيات الاستشعار عن بعد ذات فائدة فى تحديد الوقت المناسب لفتح وتأسيس خطوط النار وايضا فى معرفة المناطق المعرضه لحدوث الحرائق.

نظام الاستشعار عن بعد يمكن الاعتماد عليه أكثر لانه فى تطور مستمر ويمكن ان تتحسن أكثر النتائج التى يمكن الحصول عليها فى مجال مراقبة الحرائق وإدارة المراعي.