

BUSITEMA UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

An automatic sugarcane fire detection and extinguishing system

BY

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Declaration

I **Mugisa Moses** Registration Number **BU/UP/2015/344** hereby declare that this project is my original work except where explicit citation has been made and has never been published and/or submitted for any other degree award to any other university or institution of higher learning for any academic award.

Signature

Date:

Approval

This is to certify that the project under the title “**an automatic sugarcane fire detection and extinguishing system**” has been under my supervision and is now ready for examination.

Signature.....

Date.....

Mr. Ocen Gilbert

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Dedication

I dedicate this report to my lovely Father Mr. Tulikurungi Joseph, Mother Mrs. Kwikiriza Jane, and Mother Mrs. Kwikiriza Yesita. I am very grateful for the support and endeavors you have done for me throughout my entire academic journey. **May the Almighty richly reward you.**

Acknowledgement

I thank the Almighty God for life and knowledge that helped me through this project.

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Abstract

The conventional methods used in Uganda like perching, and fire lookouts, and existing technologies of sugarcane fire detection that is satellite-based systems because of their long scanning cycle and low resolution are unreliable. Early warning and immediate response to a fire breakout are the only ways to avoid great losses and environmental damages. Hence, an advanced system for sugarcane fire detection and extinguishing using wireless sensor network is developed which overcomes the demerits of the existing technologies of sugarcane fire detection. This project consists of an Atmel chip the 8-bit ATMega328PU microcontroller in 28 pin DIP packages, water pump, Rf modules, sensing elements these include smoke sensor and infrared flame sensor; the smoke sensor to detect smoke that occurs in sugarcanes and infrared flame sensor to detect and respond to the presence of a flame and GSM module to send notification message to the firefighting station based on the nearest node. The objective of the project is to provide automatic detection and extinguishing on sugarcane fires. The system is real time, automatic, locates sugarcane fire points, deploys multiple sensor nodes and extinguishes fire.

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List of Acronyms or Abbreviations

RF: Radio frequency

GSM: Global system for mobile communication

SMS: Short messaging service

SIM: Subscriber identification module

USB: universal serial bus

LED: light emitting diode

FTDI: Future Technology Devices International

MODIS: Moderate resolution imaging spectroradiometer system

NASA: National Aeronautics and Space Administration

ICSP: In -circuit serial programming

PWM: Pulse width modulation

IDE: Integrated development environment

GIS: Geographical information system

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CHAPTER ONE: INTRODUCTION

This chapter comprises of the background of the study, problem statement, objectives of study, justification of project and project scope.

1.1 Background of the study.

Uganda is landlocked country located in East of Africa occupying a total area of 241 550 km², of which 18 percent is open inland waters and wetlands, and 37.8 percent is arable land, endowed with ample fertile land and regular rainfall[1]. Besides, perennial crops occupy 36% of the total area under cultivation, However, sugarcanes cover 1.18% of the perennial land area[2].

Sugar cane is a domestic consumption crop in Uganda, currently domestic production of sugar is approximately 200,000 tons and imported volume is approximately 40,000 tons, with reduced transportation and tariff costs and enjoys a competitive advantage over regional imports and is protected by a 100 percent tariff on sugar imports from outside of the East African Union[3].

Growth in sugarcane cultivation in Uganda is driven by the increased demand for sugar and related by-products, annual sugar consumption in Uganda is estimated at 9 kg per capita with a predicted per capita annual consumption increase by 1 % over the next 15 years[4]. In Uganda, recent times have witnessed the central government encouraging farmers to invest in commercial agricultural enterprises as one of the efforts for poverty alleviation and wealth creation[5].

Sugarcane cultivation has been highly preferred relative to other more traditional crops like coffee and cotton as it is perceived to be more profitable and economically valuable. sugarcane growing, increases household income, thus indirectly addressing food security, in spite of the increased commercial sugarcane cultivation in various regions of Uganda ostensibly results in improved household incomes and road infrastructure[5].

Despite all these initiatives, Uganda's sugarcanes production is faced with continuously worsening trends through sugar cane fires[6]. The problem with sugarcane fires is that sugarcane plantations are usually full with dry canes and burning leaves that act as a fuel source.

These elements form a highly flammable material and represent the perfect context for initial-fire ignition. The fire ignition could be caused through malicious fires, lightening, electricity short circuits, smoking, accidental cane fires, and land management practice to clear land for cultivation and in the process, fire gets out of hand to the canes. These cane fires are commonly observed only

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