FACULTY OF ENGINEERING

DEPARTMENT OF AGRICULTURAL MECHANIZATION AND IRRIGATION ENGINEERING

BSc. AGRICULTURAL MECHANIZATION AND IRRIGATION ENGINEERING

DESIGN &CONTRUCTION OF AFOUR ROW TRACTOR DRAWN IRISH POTATO HARVESTER

By

WANUNDU CEDRICK KEITH

Reg. No.: BU/UP/2016/139

Email: wanunducedrickkeith@gmail.com

Tel:0774492057

Supervisor: Mr ODONG SAMUEL ATOCHON

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ABSTRACT

Irish potato (Solanum tuberosum) is one of the most important a root vegetable grown in Uganda. It is a rich source of carbohydrate, used all over the country. Harvesting is one of the most important operations in Irish potato cultivation. However, it is one other most difficult task which accounts for the considerable share of costs involved in an agricultural production. The commonly used methods in Irish potato harvesting include; use of hand hoe, curved sticks, ox-plough potato lifter,garden forks and others

Harvesting of Irish potato is a major challenge in Uganda due to lack of appropriate technology and funds inspite of its high economic potential in the country. Small and medium scale Irish potato growers mostly use long and tedious methods which involves the use of human muscles. These methods are labor demanding, time consuming, compromises the quality of Irish potato. The proposed study is therefore intended to design a tractor drawn Irish potato harvester which simultaneously separates Irish potato, soil and plant residue in a single process to present the above challenges.

Different components of the machine were designed which include; the hopper, seperator, main shaft and idle shafts, digger blade, main frame, driving mechanism and analyzing forces acting on the components to prevent failure. From the designs, seperator operates at a speed of 90 rpm with a total maximum transmitted power requirement of 50.04HP, though 65HP can run the system with the same results

After fabrication, the performance and economic analysis of the machine were performed in terms of field efficiency resulted into 76%. Machines total cost; Ugx.1.8M, monthly income; Ugx. 1.56M and pay back-period of 1.2years

Owing to the performance and economic analysis of the machine, it achieves all its design purposes hence it is recommended for commercialization and adoption by the target groups.

DECLARATION

I WANUNDU CEDRICK KEITH, hereby declare to the best of my knowledge that this project report is an outcome of my original work and that it has not been presented to any institution of learning for an academic award.

DATE ……...

SIGNATURE……...

REG NO…….

APPROVAL

This project report is submitted to the Faculty of Engineering for examination with approval of my supervisors and the contents are satisfactory for the award of the degree

Supervisor

MR. ODONG SAMUEL ATOCHON

SIGNATURE ……..

DATE ……..

DEDICATION

This report is dedicated to my beloved sisters **Ms. Mutoni Janet** & **Miss Iryn Mutesi** in appreciation for their selfless care and parental support provided to me since childhood, and for the mentorship of hard work and determination delivered to me, which attributes I have cherished with firmness and which have transformed me to this level.

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ABBREVATIONS AND ACRONYMS.

MPD- multipurpose potato digger

PTO- Take power off

SR- Soil resistance

Pd- Draft power requirement

KW- kilo watt

SR- soil resistance

FAO – Food and Agricultural Organization

HP – Horse Power.

NPV - Net Present Value

GDP- Gross Domestic Product

ASTM – American Society for Testing and Materials

ASME – American Society of Mechanical Engineers.

$\boldsymbol{\rho}$ - Density

T - Torque

ω – Angular Velocity.

g – Acceleration due to gravity