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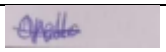
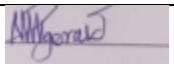
FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF AGRICULTURAL MECHANIZATION AND IRRIGATION ENGINEERING

DESIGN AND FABRICATION OF A FOOT WATER PUMP FOR SMALL SCALE IRRIGATION SYSTEMS

FINAL YEAR PROJECT REORT

BY

S/N	NAME	REGISTRATION NUMBER	SIGNATURE
1.	ATTO PROSCOVIA	BU/UG/2020/0257	
2.	OKELLO RAYMONDO	BU/UG/2019/0035	
3.	ANYARUA GERALD ADRIKO	BU/UG/2019/0131	

SUPERVISOR: PROF TITUS BITEK WATMON

A final year project report submitted to the Department of Agricultural Mechanization and irrigation engineering in partial fulfillment of the requirements for the award of Bachelor's degree in Agricultural Mechanization and irrigation engineering Busitema University

DECLARATION

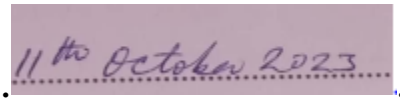
We the members of this group declare to the best of our knowledge that all the information regarding this report is as a result of our research and effort and has never been presented or submitted to any institution or university for such an academic award.

APPROVAL

This project has been submitted for examination with approval from our supervisor:

PROF. WATMON TITUS BITEK

SIGNATURE……  **……**

DATE ……  **……**

DEDICATION

ATTO PROSCOVIA

With great appreciation, I dedicate this final year project report to my mother Auma Josephine, my siblings Denis, Faith and Gladys for unconditional love and support they have rendered to me.

ANYARUA GERALD ADRIKO

In a special way, I dedicate this final year project report to my beloved father Mr. Alutu Leo Robert and my mother Afekuru Milka.

OKELLO RAYMONDO

With gratitude I dedicate this final year project report to my beloved mother Angee Hellen and my brother Oyet Jimmy.

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We would like to thank the Almighty God for the wisdom, knowledge, grace, rich health, and protection He offered unto us.

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We also want to acknowledge the unending financial and material support from our parents Ms. Auma Josephine, Mr. Okello Denis, Mr. Alutu Leo Robert, Ms. Afekuru Milka, Ms Angee Hellen and Mr. Oyet Jimmy.

ABSTRACT

Irrigation farming is becoming more essential today because of the climate change which is evidenced by prolonged droughts in most parts of the country. Many farmers now depend on irrigation practices to produce crops and citrus fruits. The study looked at foot water pump being cheap and affordable for small scale farmers. The materials were sought locally, and the design and fabrication was done at Busitema University Faculty of Engineering workshop. The project had three objectives as stated below;

i. To analyse design requirements for foot water pump for irrigation system.
ii. To fabricate and assemble foot water pump for irrigation system for small to medium size farmers.
iii. To evaluate the performance of the pump. The study was guided by the following research questions;
    a) What are the best design specifications for a foot water pump components?
    b) What manufacturing processes to follow for the pump assembly?
    c) What is the capability and performance of the pump?

The first two objectives were all met and the perform of the foot water pump was carried out. Impressive results were obtained. In the first objective, it was discovered that the water discharge of the foot pump decreased with increase in suction depth, secondly, the discharge in the foot pump is not determined by the weight of the operator but by the number of cadence an operator is able to make. In conclusion, the use of a good seal and fast closing valve minimizes both internal and external leakages of pressure thereby increasing discharge and head of the foot pump.

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CHAPTER ONE

1.0 Background

The foot pump is a beautiful foot-operated human-powered water lifting device that draws water up to the ground surface from a depth of 0 to 8 meters in rivers, swamps, reservoirs, and shallow wells (hand-dug) for use by farmers for irrigation, domestic use, and other uses. Even a young kid, a woman, or an elderly person can operate the pump by shifting their body weight between two foot pedals, also known as foots, while supporting themselves by clutching a wooden frame. Foot pumps often cost less than other types of pumps, like those operated by electricity or fuel. Because of this, they become a more viable choice for small-scale farmers who might not have the financial resources to invest in more expensive equipment. Foot pumps are also less expensive, which makes them easier to fix and maintain. This can help to increase their lifespan and guarantee that they continue to deliver dependable irrigation for many years. Overall, foot pumps are a realistic option for small-scale irrigation in rural regions due to their affordability.

The current population of Uganda is 48,582,334 in 2023, with an annual increase of not less than 2.8% every year. The growth in population has continued to demand for more food production and irrigation has been a significant option due the changes in climate, various water pumps like the dynamic and submersible pumps have been made to curb this challenge but still can’t be afforded by poor communities due to the costs incurred to achieve them.

The agriculture sector in Uganda is dominated by small holder farmers who own on average 1-2 hectares of farmland. Women dominate farm employment in a sector that has limited mechanization and heavily dependent on rain and relatively fertile soils whose productivity is also declining due to over cultivation and low fertilizer application. Overall per capita agriculture production has been declining due to high population growth rate of (inasmuch as it dropped from an average 3.2% - 3.0% per annum) leading to annual food production deficits (UBOS 2014).

As the impact of climate change emerges as a serious challenge evidenced by prolonged droughts and severe flooding in most parts of the country, emergent response was required to put in place a policy framework on irrigation as core public investment to mitigate these effects and prevent the agriculture sector from further loss. It is against this background that Government of Uganda through the Ministry of Agriculture, Animal Industry and Fisheries and the Ministry of Water and

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