FACULTY OF ENGINEERING

DEPARTMENT OF AGRICULTURAL MECHANISATION AND IRRIGATION

FINAL YEAR PROJECT

DESIGN & FABRICATION OF A MOTORIZED GROUNDNUT SHELLING MACHINE

By

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A final year project proposal report submitted to the Department of Agricultural Mechanization and Irrigation engineering in partial fulfillment for the award of the Bachelor of Science in Agricultural Mechanization and Irrigation degree of Busitema University,

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ABSTRACT

The traditional way of removing kernel from groundnut is to crack it with hand but when a large amount of groundnuts have to be work on this method is time consuming so a Sheller machine has to be used. In Uganda due to heavy demand of groundnut there is a need of shelling the groundnuts and obtaining the peanuts in safe, fast and economic form. There are different methods of shelling ground nuts, different machines have been designed and fabricated to shell ground nuts.

The manual ground nut shelling machine designed and constructed by Wafula Simon peter an APE student in 2015 had efficiency of 81%, shelling capacity of 100 kg/h with shelling loss of 8.6%. His machine is laborious in terms of operation since the machines requires manual energy to shell the groundnuts , his machine cannot meet commercial demand when large amount of groundnuts are to be shelled ,the shelled groundnuts have to be winnowed which is time consuming and slows groundnut processing

This research project aimed at improving manually operated groundnut shelling machine designed and constructed by Wafula Simon Peter. To motorized with a blower that separates groundnut seeds from the chaff to eliminate time wasting due to winnowing. The motorised shelling machine meets commercial market demand, easy to operate, less laborious and fast as compared to manual groundnut shelling machine

The motorized shelling machine has adjustable shelling blades to reduce on breakage or damage of the groundnut seeds

The motorized ground nut shelling machine designed and fabricated consists of components like frame, motor, blower, shelling unit, concave sieve, chaff outlet, seed collecting point. Design and sizing of the various components of the motorized ground nut shelling machine was carried out by analysing forces acting on the components that lead to proper selection of materials. The materials selected are those that withstand the applied forces in order to avoid failure of the components during machine operation. Machine shelling capacity of 66kg/hr, efficiency of 54% and mechanical seed damage of 45% was obtained after testing the prototype. The cost evaluation of the designed and fabricated prototype was carried out. After carrying out economic analysis, the prototype was found to be very viable to the farmer since its ROCE value is positive. The machine is affordable to farmers and can be fabricated from any workshop since it’s made up of readily available materials.

Machine operation recommendations are discussed in this report that include changing the sieve depending on the diameter of the grain seed diameter a mong others. Key areas for future improvements are also discussed at the end of this report that include increasing the size of the hopper for accommodate larger amount of groundnuts during shelling operation

DECLARATION

I IGIRA EZEDEKIA declare to the best of my knowledge that the piece of this project proposal is as a result of my research and effort and it has never been presented or submitted to any institution or university for an academic award.

DATE ……...

SIGNATURE ……...

APPROVAL

This Final research project has been submitted for examination with approval from the following supervisors:

Mr. ASHABAHEBWA AMBROSE

SIGNATURE ……

DATE ……

Mr. OKIRIA MARTIN

SIGNATURE ……

DATE ……

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LIST OF ACRONYMS

APE - Agro-processing Engineering

Ha – hectares

HQCF – High Quality Cassava Flour

MAAIF – Ministry Of Agriculture, Animal Industry and Fisheries

MD – Managing Director

NARL – National Agricultural Research Laboratories-Kawanda

NARO – National Agricultural Research Organization

PMA - Plan for Modernization of Agriculture

PPD – Post-Harvest Physiological Deterioration

UBOS – Uganda Bureau of Standards

Kgs – Kilograms

Kgs/h – kilograms per hour

mm – millimeters

KW – Kilo watts

g – grams

(ICRISAT) -International Crops Research Institute for the Semi-Arid Tropics

Kg/m3 – kilogram per cubic meter

CHAPTER ONE

1.0 Background

Groundnut (*Arachis hypogaea* L.), also known as peanut,is the second most important legume after beans(*Phaseolus vulgaris L.*) in Uganda. The traditional groundnut varieties are of the red Valencia type, but of a very mixed nature ranging from large seeded manyema group, Roxo to small seeded group, Red Beauty (Bulafu, 2006) . In 2005, Uganda produced 140,000 metric tons of groundnuts from 250,000 ha with most of the crop being grown in the eastern and northern part of the country (Warren, 2005)

Groundnut seeds contain 40 - 50% fat, 20 - 50% protein and 10 - 20% carbohydrate depending on the variety. With the costs of animal protein becoming increasingly prohibitive, groundnut is becoming an even more important source of protein. Groundnut seeds are also a nutritional source of vitamin E, niacin, falacin, calcium, phosphorus, magnesium zinc, iron, riboflavin, /thiamine and potassium (Savage and Keenan, 1994). A pound of groundnuts is high in food energy and provides approximately the same energy value as 2 pounds of beef, 1.5 pounds of Cheddar cheese, 9 pints of milk, or 36 medium-size eggs (Woodroof, 2007)

Groundnut is consumed raw, roasted, blanched, as peanut butter, crushed and mixed with traditional dishes as a sauce or as *binyebwa*, a cooked paste. Groundnut is an excellent source of oil for cooking and groundnut cake and haulms (straw stems) are commonly used as animal feed. Groundnuts thrive under low rainfall and as a legume; groundnuts improve soil fertility by fixing nitrogen. Therefore, the crop generally requires few inputs, making it appropriate for cultivation in low-input agriculture by smallholding farmers (Smartt, 2006). As a cash crop, it gives relatively high returns for limited land area and is well adapted to the hot, semi-arid conditions of Uganda.

These multiple uses of groundnut make it an excellent cash crop for domestic markets as well as for foreign trade. The returns for groundnuts greatly surpass those reported for soybeans and are less uncertain than those of sunflower (Laker-Ojok, 2005) . A number of factors contribute to this. First, the area planted in groundnut far exceeds that of soybeans and sunflower. This increases the potential for large scale national benefits. Secondly, the markets for groundnuts are better established. Groundnuts are highly valued on the domestic market and its export market has been flourishing in recent years. Uganda can therefore save a lot of foreign exchange from the imports of sunflower and soybean vegetable oils if it can turn to wide scale oil extraction from groundnuts. Currently, vegetable oil extraction is mainly from sunflower

REFERENCES

1. Abubakar, M., and Abdulkadir, B. H. (2012). Design and Evaluation of a Motorised and Manually Operated Groundnut Shelling Machine. International Journal of Emerging Trends in Engineering and Development, 4(2): 673-682.
2. Adedeji, O. S., and Ajuebor, F. N. (2002). Performance Evaluation of Motorised Groundnut Sheller. Journal of Agricultural Engineering, 39(2): 53-56.
3. Akcali, I. D., Ince, A., and Guzel, E. (2006). Selected Physical Properties of Groundnuts. International Journal of Food Properties, 9(1): 25-37.
4. Amoah, F. (2012). Modification and Evaluation of a Groundnut Cracker for Cracking Jatropa curcus Seeds. Unpublished Master`s Thesis, Kwame Nkrumah University of Science and Technology, Department of Agricultural Engineering.
5. Amadu, N. (2012). Development and Performance Evaluation of an Improved Soybean Thresher. Unpublished Master's Thesis, Ahmadu Bello University, Zaria Nigeria, Department of Agricultural Engineering.
6. Anantachar, M., Maurya, N. L., and Navaravani, N. B. (1997). Development and Performance Evaluation of Pedal Operated Decorticator. Journal of Agricultural Sciences, 10(4): 1078-1081.
7. Armitage, D., and Wontner-Smith, T. (2008). Grain moisture-Guidelines for Measurement. HGCA-F unded Project, Caledonia House 223 Petronville Road London NI9HY.
8. Aslan, N., and Cebeci, Y. (2006). Application of Box-Behnken Design and Response Surface Methodology for Modeling of some Turkish Coals. Cumhuriyet University, Mining Engineering Department, Turkey.
9. Balami, A. A., Adgidzi, D., Kenneth, C. A., and Lamuwa, G. (2012). Performance Evaluation of a Dehusking and Shelling Machine for Castor Fruits and Seeds. Journal of Engineering (IOSR JEN), 2(10): 44-48.
10. Unpublished lecture notes, Course No. M05-010 Continuous Education and Development, Inc; 9 Creyridge Farm Court, Story Point, NY 10980.