BUSITEMA UNIVERSITY
Pursuing Excellence

P.O. Box 236, Tororo, Uganda
Gen: +256 - 45 444 8838
Fax: +256 - 45 4436517
Email: info@adm.busitema.ac.ug

www.busitema.ac.ug

FACULTY OF ENGINEERING

DEPARTMENT OF CHEMICAL AND PROCESS ENGINEERING FINAL YEAR PROJECT REPORT

DESIGN AND CONSTRUCTION OF A MOTORIZED SOLAR POWERED FEED PELLETIZER

SUPERVISOR: PROF KANT KAYARUSOKE

GROUP MEMBERS

SN	NAMES	REG NO.
1	ASUMINI WANA	BU/UG/2019/0128
2	OKOT JOHN PAUL EMMANUEL	BU/UG/2019/0129
3	KANYAGO GRACE	BU/UP/ 20191022
4	ASIIMWE LYNET KANYERE	BU/UG/2019/0033
5	NUWAHEREZA BENSON	BU/UG/2019/0125
6	TURYAMUHAKI BENJAMIN	BU/UG/2019/0127

"A Project Proposal Submitted as a report to the of Department of Chemical and Process

Engineering as partial fulfillment of the requirement for the award of Bachelors of science in Agro Processing Engineering."

DECLARATION

We, hereby certify and confirm that the information in this report is out of our own efforts, research and it has never been submitted in any institution/university for any academic award.

Name	Signature
Turyamuhaki Benjamin	.....
Asumini Wana	.....
Okot John Paul Emmanuel	.....
Asiimwe Lynet Kanyere	.....
Kanyago Grace	.....
Nuwahereza Benson	.....

APPROVAL

This report on **Design and Construction of Motorized Solar Powered Feed Pelletizer** has been written under the supervision of;

Supervisor: Prof. Dr. Eng. Kant Kanyarusoke Ateenyi

Signature:.....

Date :20/03/2024.....

DEDICATION

We dedicate this report to all the individuals who have played a significant role in its realization and success. To our families, whose unwavering support and encouragement have been the foundation of our journey. Your encouragement and faith our abilities have constantly motivated us to strive for excellence.

To our supervisor and dear lecturers, whose guidance and expertise have been invaluable throughout the course of our study, your mentorship and insightful feedback have shaped our understanding and pushed us to achieve new heights.

Lastly, we would like to express our sincere appreciation to our University, Busitema University Main campus for resource provision; for example, Internet resource that enabled us to successfully conduct our research for this project report.

ACKNOWLEDGEMENT

We first of all thank the Almighty God who in all the work rendered to us good health, courage, strength and knowledge in both our course study, and compiling all the required information concerning the report.

We would also like to acknowledge the guidance received from our Supervisor, Pro.Dr. Eng. Kant Kanyarusoke Ateenyi, throughout the duration of this project development. His expertise and valuable insights, discussions and suggestions have significantly contributed to the successful completion of this endeavor.

More so, we are deeply thankful to the entire faculty and staff, for their exceptional guidance, unwavering support, and invaluable insights throughout the project. Their expertise and encouragement have been instrumental in shaping the direction and outcomes of this endeavor.

Additionally, we strongly appreciate the teamwork within ourselves. The willingness of each one of us to invest time and provide constructive feedback has been immensely valuable in project proposal development as we head on to its implementation.

Finally, we would like to express our gratitude to all the sources and references that have been cited in this report. The works of researchers, authors, and scholars in the field of feed pelleting and related domains have been pivotal in expanding our knowledge and understanding of the subject matter.

We are indebted to all these individuals and organizations for their contributions, both big and small, which have played an integral role in the journey covered so far concerning the Motorized solar powered feed pelleting machine project.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

PV – Photovoltaic

DC – Direct Current

HEP - Hydro Electric Power

ILIRI – International Livestock Research Institute **ABSTRACT**

This Final Project Report offers a thorough design development and assessment of A MOTORIZED SOLAR-POWERED FEED PELLETING MACHINE. The assessment of the viability and possible advantages of using solar energy to power a feed pelleting machine in the agricultural industry, livestock farming, in particular, was the main goal of this study. Chicken feed pellets were the major products of focus in this design and implementation study. Relevant data through undertaking an in-depth examination of current literature and other valuable sources was obtained and compiled as stated in the subsequent chapters. The article describes the motorized solar-powered feed pelleting machine's design and development process, including the selection of relevant components and the integration of the solar powering system. An economic study is also used to examine the solar-powered machine's economic viability and environmental sustainability. According to the conclusions of this paper, our motorized solar-powered feed pelleting equipment provides numerous advantages.

Key words; Motorized solar powered Feed Pelleting Machine, Pellets.

CHAPTER ONE: INTRODUCTION

1.0 Introduction

This chapter is the general overview of the entire research study and it elaborates the background of the study, problem statement, objectives, justification and scope of the study.

1.1 Background

The animal feed industry accounts for a sizable portion (70%) of the Agro-Processing (Agricultural) industry. The pelleting process, which transforms loose feed into compacted pellets, is an important step in animal feed manufacturing (Uganda, 2015). Unlike loose feeding, the pelleting method increases the nutritional value of animal feed, decreases feed waste, and improves animal performance. In most developing nations, including Uganda, farmers who raise livestock run short of appropriate feeds that can meet their flocks' nutritional needs at the appropriate times and in the right quality and affordable prices (Chikwado 2013). From time to time, considerable changes have occurred in the structure of animal agriculture. The general shift from on-farm or small cooperative type feed processing operations to larger industrial-type feed manufacturing facilities has made processing technologies, such as pelleting, more economically feasible.

Farmers are encouraged to make their own feed to reduce the cost of production on animal feeds, which account for a larger portion of the cost of raising livestock (Okolie et al., 2019); the pelleting process has become a standard feed processing technique that involves compression of feed ingredients into compact pellets that are easier to handle, store, and transport, and can also provide more precise nutrient ratios to animals than traditional feed. Uganda's adoption of pellet feeds for livestock has been on the rise. According to a study by the International Livestock Research Institute (ILRI), the use of pellet feeds in Uganda has led to significant improvements in animal health, weight gain, and milk production though being limited by the high cost of the current feed pellets and pelleting machines in Ugandan Markets.

Currently, most pelletizing devices are operated manually or electrically (by hydropower or fossilfuel engines). The screw conveyor in a manually operated pelleting machine is moved or rotated using a handle; this is a slow and tiring task while in electrically powered pelletizers, an electric motor (primary mover) is used, which is costly in terms of recurring electrical bills.

2. Anon. 2016. “The Pelleting Process. California Pellet Mill Co; Http://; Www.Cpm.Net/ (Accessed on 7 September 2016).”
3. Behnke, K. C. “Feed Pelleting Reference Guide.Section 5: Pellet Durability.Chapter 19: Factors Affecting Pellet Quality.” *Maryland Nutrition Conference. Dept. of Poultry …*.https://www.wattagnet.com/ext/resources/uploadedFiles/WattAgNet/Feed_Pelleting_Guide/Section_5/5-19,_Factors_affecting_pellet_quality.pdf.
4. Behnke, K.C. 1990. “An Evaluation of Wheat as a Pellet Quality Enhancer.”
5. Bhattacharya, S. and. (2018). *Evaluational analysis of electrically operated animal feed pelletizers. Agricultural Engineering International.*
6. Bobde, Saurabh A. 2017. “‘A Review on Solar Operated Agri-Cutter.’ International Journal for Innovative Research in Science and Technology 3.09.”
7. Bongomin, Ocident, and Patrick Nziu. 2022. “A Critical Review on the Development and Utilization of Energy Systems in Uganda.” *Scientific World Journal* 2022.
8. Chikwado, Ugwu Kenneth. 2013. “Development and Performance Test of Poultry Feed Mixing and Pelleting Machine.” *International Journal of Science and Research (IJSR) ISSN (Online Index Copernicus Value Impact Factor* 14(6): 2319–7064.
9. D. J. Shrinivasa1, and S. M. Mathur. 2020. “Compound Feed Production for Livestock; Department of Farm Engineering, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi 221 005, India 2 Department of Farm Machinery and Power Engineering, College of Technology and Engineering, Maha.”
10. Hammond, D. (1977). … and No. *Anthropology News*, *18*(1), 2–2. https://doi.org/10.1111/an.1977.18.1.2.2
11. Kepner, R. A., Bainer, R. and Barger, E. L. (2005). *Principle of Farm Machinery, CBS Publishers and Distributors Pvt Ltd, New Delhi, 2005, 3rd edn, p. 361. tle*.
12. KEITH C. BEHNKE, PHD. 1990. “Factors Affecting Pellet Quality.”
13. Kizza, J.M., Ssewannyana, E., Ndumu, D.Muwonge, A., & Bazeyo, W. 2017. “Livestock Feed Resources and Feed Management Practices in Smallholder Dairy Farming Systems in Uganda. Tropical Animal Health and Production, 49(6), 1133-1140.”

14. Leaver, R.H. 1982. “The Pelleting Process.”
15. Maphosa, V., Nyoni, O., & Moyo, S. 2019. “The Impact of Feed Pelletizing Machines in Enhancing Livestock Farming in Africa: A Review. Journal of Agricultural Extension and Rural Development, 11(9), 204-214.”
16. Mathew, Mpeeka. 2012. “DESIGN AND FABRICATION OF AMANUALLY OPERATED.” (May 2016).
17. Mogaji, P. B., Kehinde, J. I., & Jimoh, A. M. (2020). *DEVELOPMENT OF AN IMPROVED FISH FEED PELLETIZING MACHINE*. *11*(3), 198–213.
18. Of, C. E. (n.d.). *SOLAR PV SYSTEM DESIGN*. *8000*.
19. Ojango, J.M.K., Mrode, R.A., and Kahi, A.K. 2017. “Challenges and Opportunities of Livestock Production Systems in Uganda: A Review. Sustainable Agriculture Research, 6(3), 15-28.”
20. Okolie, P. C., Chukwujike, I. C., Chukwuneke, J. L., & Dara, J. E. (2019). Design and production of a fish feed pelletizing machine. *Heliyon*, *5*(6), e02001. https://doi.org/10.1016/j.heliyon.2019.e02001
21. Oladiran, D. O., & Babalola, O. A. 2019. “Design and Fabrication of Manually Operated Feed Pelletizing Machine. Agricultural Engineering International: CIGR Journal, 21(3), 183-191.”
22. ole, O. T. and Igbeka, J. C. 2016. “Agric. Eng. Int. CIGR J.Effect of Some Operating Para_meters on the Performance of a Pelleting Press.” : 18, 326–338.
23. Orua Okon Antia, Ubong Edet Assian, & Youngson N. Ukaru. (2021). Design and fabrication of a modified fish feed pelletizing machine. *Global Journal of Engineering and Technology Advances*, *7*(2), 01–011. https://doi.org/10.30574/gjeta.2021.7.2.0063
24. Pressure and Die Speed on the Pelleting Process.”
25. R.S. KHURMI, J. K. G. (2005). *AText Book of Machine Design*. EURASIA PUBLISHING HOUSE (PVT.)LTD.
26. Science, E. (2019). *IOP Conference Series : Earth and Environmental Science Design and Performance of a 1 . 5 axis Sun tracking Concentrated Photovoltaic System Design and Performance of a 1 . 5 axis Sun tracking Concentrated Photovoltaic System*.

https://doi.org/10.1088/1755-1315/354/1/012008

27. Shardul, Vipul J., Prof. Arun M. Kulkarni, Prof. Amol S. Dayma, and Prof. Anvesh Virkunwar. 2018. “Design , Fabrication of Solar Operated Biomass Pelletizing Machine and Study of Biomass Pellet.” *International Research Journal of Engineering and Technology (IRJET)* 5(7): 1524–35.
28. Solar, R., & Development, M. (2015). *Solar PV Training & Referral Manual*.
29. *SOLAR SYSTEMS AND APPLICATIONS*. (n.d.).
30. Stevens, C.A. 1987. “Starch Gelatinization and the Influence of Particle Size, Steam
31. Turyagyenda, L. F., Kizito, E. B., Kibirige, E. J., Kanyesigye, C., & Mugisha, A. 2021. “Comparative Evaluation of Locally Fabricated and Commercially Available Poultry Feed Pelletizers in Uganda. Journal of Agriculture and Rural Development in the Tropics and Subtropics, 122(1), 101-109.”