IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 6, March 2025

The Golden Gavel: A Foldable Grain and Grain Bag Collection Trolley

Ankita Khokalea, Kundan Suryawanshia, Rohit Ahirea, Vipul Ahirea
Department of Mechanical Engineering
Guru Gobind Singh Polytechnic, Nashik

Abstract: *This paper presents the design and development of "The Golden Gavel," a novel, fully mechanical grain collection and transport system. This system, comprising a foldable trolley with a detachable dustpan, aims to enhance efficiency and reduce manual labour in agricultural harvesting. The design prioritizes user-friendliness, cost-effectiveness, and sustainability, offering a viable solution for small-scale farmers by minimizing physical strain and reducing post-harvest losses*

Keywords: Grain harvesting, post-harvest losses, agricultural mechanization, ergonomic design, sustainable agriculture

I. INTRODUCTION

Agriculture remains a cornerstone of the global economy, and efficient handling of agricultural produce is essential to ensure both quality and productivity. Grains, such as wheat, rice, and corn, are among the most vital crops, yet their handling after harvest often involves labour-intensive and time- consuming processes. Farmers typically face challenges in collecting, transporting, and storing grains, which can result in significant physical strain and potential losses in both yield and quality. These manual operations often require considerable effort, are inefficient, and may expose the grains to damage or contamination.

This project addresses these challenges by designing and developing a Material handling Equipment aimed at streamlining the process of collecting and transferring grains into storage. The proposed system utilizes mechanical structures to semi-automate the collection of grains and transfer them into storage bags with minimal struggle and strain. By incorporating mechanical devices such as large dustpan, bagging mechanisms and transfer system, the project seeks to reduce the physical burden on farmers and enhance the efficiency of the post-harvest process.

The primary goal is to create a user-friendly, cost-effective, and reliable solution that can be easily adopted by farmers, particularly in small to medium- scale agricultural operations. By simplifying grain handling, this system not only helps to mitigate the physical struggle of farmers but also contributes to reducing post-harvest losses and increasing the overall efficiency of grain storage. Ultimately, this project aims to empower farmers with a mechanical solution that enhances their productivity and promotes sustainability within the agricultural sector.

II. NEED OF THE PROJECT

The conventional methods of grain collection and transportation in agriculture present several significant challenges:

• High Labour Demand : Manual handling of grains is extremely labour-intensive, requiring considerable physical effort from farmers, especially during harvesting seasons. This can lead to fatigue, injuries, and reduced productivity.

• Inefficiency : Traditional methods are often time-consuming and inefficient, hindering timely storage and potentially leading to delays in subsequent agricultural operations.

• Post-Harvest Losses : Manual handling increases the risk of grain spillage, contamination, and damage, resulting in significant post-harvest losses that impact both the quantity and quality of the harvested produce.

• Ergonomic Concerns : The repetitive and strenuous nature of manual grain handling can pose significant ergonomic risks to farmers, potentially leading to long-term health issues.

• Dependence on Manual Labour : Reliance on manual labour can be challenging due to factors such as labour availability, seasonal fluctuations in labour demand, and increasing labour costs.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 6, March 2025

III. KEY FEATURES

• Foldable Trolley : Compact storage and easy transportation.
• Detachable Dustpan : Efficient grain collection and transfer.
• Durable Construction : Robust materials for longevity.
• Ergonomic Design : Minimizes physical strain on the operator.
• Mechanical Advantage : Reduces manual effort through efficient mechanisms.
• Sustainable Solution : Eliminates reliance on external power sources.
This project contributes to advancements in agricultural engineering by providing a practical and sustainable solution to improve harvesting practices and enhance the livelihoods of farmers.

IV. METHODOLOGY

The project followed a structured methodology encompassing project selection, concept development, data collection and analysis, final design, material collection, production, testing, documentation, and costing.

V. DESIGN

"The Golden Gavel" consists of two main parts: a foldable trolley and a detachable grain collection pan (dustpan).

VI. WORKING PRINCIPLE

1. Unfolding and Assembly: The operator unfolds the trolley frame and attaches the detachable dustpan using a latching mechanism.
2. Grain Collection: The operator pushes the trolley with the attached dustpan, collecting spilled grains via the sloped edge of the dustpan.
3. Grain Transfer: Once the dustpan is full, it is detached from the trolley, and the collected grains are transferred into waiting bags.
4. Bag Transportation: Filled bags are secured onto the trolley using adjustable hooks or straps. The operator then transports the loaded trolley to the storage area using the ergonomic handle.
5. Storage and Folding: Bags are unloaded, the dustpan is detached, and the trolley is folded for compact storage.

VII. ADVANTAGES AND LIMITATIONS

Advantages: Reduced physical strain, increased efficiency, reduced post-harvest losses, improved ergonomics, cost-effectiveness, sustainability (no external power source), and versatility.
Limitations: Initial investment, terrain limitations (uneven or sloped terrains), maintenance requirements, limited capacity, and dependence on operator skill.

VIII. APPLICATIONS

The system is applicable to small- scale farms, family farms, community- based farming, agricultural extension programs, disaster relief efforts, and research and development. Key benefits include increased efficiency, reduced physical strain, reduced post-harvest losses, improved ergonomics, cost- effectiveness, and sustainability.
• Small-scale farms : Ideal for farmers with limited resources and labour, enabling them to efficiently handle grain harvesting and reduce post-harvest losses.
• Family farms : Provides a practical and ergonomic solution for family members involved in agricultural activities, minimizing physical strain and improving overall efficiency.
• Community-based farming : Can be utilized by community farming groups to collectively improve grain handling practices and increase productivity.
• Agricultural extension programs : Can be used as a demonstration tool in agricultural extension programs to educate farmers on improved harvesting techniques and the benefits of mechanization.
• Disaster relief : Can be employed in post-disaster situations where manual labour may be limited or inefficient, allowing for rapid and efficient grain collection and transportation.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 6, March 2025

• Research and development : Can serve as a platform for further research and development in agricultural mechanization, leading to advancements in other areas of grain handling technology.

Key Benefits :

• Increased efficiency : Reduces time and labour required for grain collection and transportation.
• Reduced physical strain : Minimizes the physical burden on farmers, improving their working conditions and reducing the risk of injuries.
• Reduced post-harvest losses : Minimizes grain spillage and contamination, leading to higher yields and improved quality.
• Improved ergonomics : Promotes better working postures and reduces the risk of musculoskeletal disorders.
• Cost-effectiveness : Offers a relatively low-cost solution for improving grain handling practices.
• Sustainability : Eliminates the need for external power sources, making it an environmentally friendly option.

By addressing the critical needs of small- scale farmers and promoting sustainable agricultural practices, this innovative grain collection and transport system has the potential to significantly impact the agricultural sector.

IX. CONCLUSION

This project successfully demonstrates the design and development of a novel, fully mechanical grain collection and transport system. The system effectively minimizes physical strain, enhances efficiency, and reduces post-harvest losses. The foldable design allows for easy storage and transportation. The elimination of external power sources promotes sustainability. This solution has the potential to significantly improve the livelihoods of small-scale farmers. Future research will focus on refining the design, optimizing material selection, and conducting field trials to assess performance and user acceptance in real- world settings.