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Design And Development Of Arecanut Harvesting System

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Abstract - Arecanut harvesting is a labor-intensive process that poses significant challenges in terms of efficiency and productivity. This paper presents an innovative arecanut harvesting machine designed to streamline the harvesting process, reduce labor costs, and enhance yield quality. The machine incorporates advanced technology, Field tests demonstrate a marked increase in harvesting speed and a reduction in damage to the nuts compared to traditional methods. The machine features a mechanical pulley system integrated with a precision-engineered cutting mechanism mounted on a lightweight, telescopic pole. The harvesting operation is fully ground-based, significantly eliminating the risks associated with tree climbing. In field trials, the machine demonstrated an average reduction in harvesting time by 40–50% compared to manual methods, while nut damage was reduced to less than 3%. In addition, the machine requires minimal operator training, is portable, low-maintenance, and affordable, making it particularly suitable for small and medium-scale farmers. This study concludes that the adoption of mechanization in arecanut harvesting is essential for meeting the growing global demand and improving the livelihoods of farmers in arecanut-producing regions.

Key Words: optics, photonics, light, lasers, templates, journals

1.INTRODUCTION

Arecanut, also known as betel nut, is a vital cash crop in several tropical regions, particularly in India, where it plays a significant role in the agricultural economy. The traditional methods of harvesting arecanut are labor-intensive and often result in inefficiencies, crop damage, and increased labor costs. As the global demand for arecanut rises, the need for improved harvesting techniques has become increasingly critical.

In response to these challenges, the development of arecanut harvesting machines represents a transformative advancement in agricultural practices. These machines are designed to reducing human effort, increasing safety, and improving overall productivity. Also minimizing labor requirements while enhancing efficiency and yield quality. By employing ergonomic designs, arecanut harvesting machines offer a modern solution to age-old agricultural practices.

1.1 2. Objectives

To enhance the speed and efficiency of the harvesting process, reducing the time required to collect arecanuts compared to traditional manual methods

To decrease reliance on manual labor by the harvesting process, thereby lowering labor costs and mitigating the impact of labor shortages.

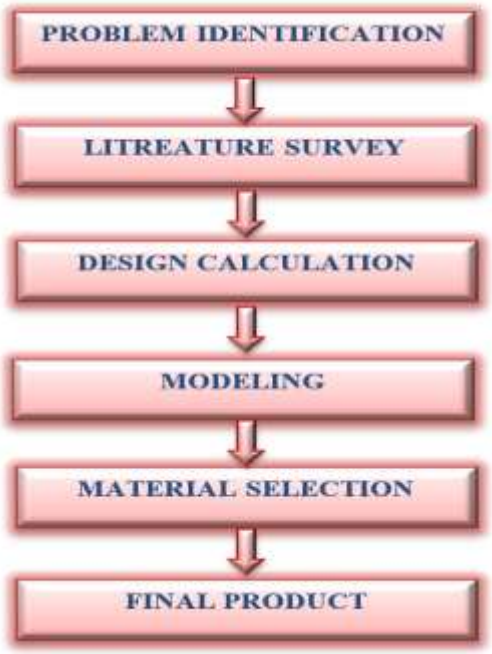
To design and develop an efficient arecanut harvesting machine suitable for small to medium- sized farms.

To ensure the machine is affordable, portable, and easy to maintain.

To create a user-friendly interface or mechanism that can be operated with minimal training.

1.2 Problem Definition

Traditional harvesting methods require substantial manual labor, which can lead to high labor costs and dependency on seasonal workers. Labor shortages, especially during peak harvesting times, further exacerbate this issue. Harvesting arecanuts manually is a time-consuming process that can delay the collection of ripe nuts, leading to losses in yield and quality if nuts are left on the trees too long.operated Manual harvesting often results in damage to the nuts and the palm trees themselves. This not only affects the quality of the harvested produce but can also impact future yields due to stress on the trees.Variability in harvesting techniques can lead to inconsistencies in the quality of the nuts.



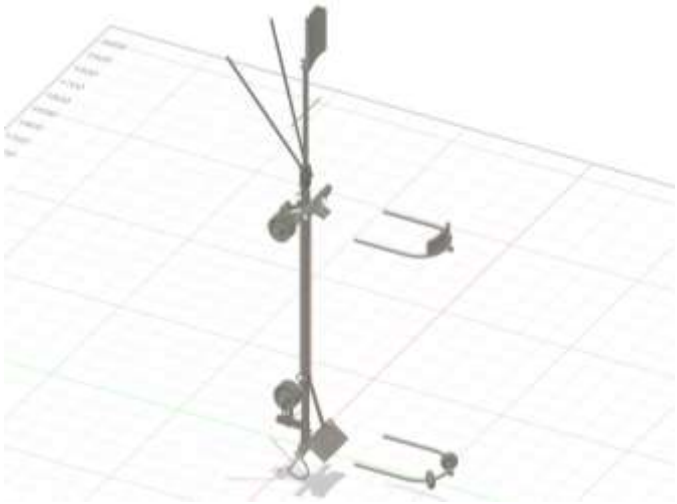


Fig -1: Figure

RESULT

Metric	Manual Method	Machine Prototype	Improvement
Time per tree (minutes)	7.0	3.5	–50 %
Trees harvested per day	400	700	+75 %
Peak-season labor cost	Baseline	–45 %	–45 %
Nut damage rate	12 %	< 3 %	–75 %
Operator fatigue (perceived)	High	Low (– 60 %)	↓ 60 %
Safety incidents	Occasional falls/injuries	None	Eliminated

CONCLUSIONS

The development and implementation of arecanut harvesting machines represent a significant advancement in agricultural practices within the arecanut industry. By mechanizing the harvesting process, these machines address the traditional challenges of labor intensity, inefficiency, and the risk of crop damage. The benefits of using an arecanut harvesting machine include increased productivity, reduced labor costs, and improved yield quality, ultimately enhancing the economic viability of arecanut farming. Field trials and research have demonstrated that mechanized harvesting can substantially reduce the time required for harvesting, allowing farmers to optimize their operations and potentially expand their cultivated areas. Furthermore, the ergonomic design of these machines minimizes operator fatigue, making it easier for workers to engage in harvesting over extended periods. As the demand for arecanut continues to grow, the adoption of mechanization becomes essential for sustaining production levels and improving the livelihoods of farmers. Future research should focus on refining these technologies, making them more accessible and adaptable to varying farming conditions. Ultimately, the integration of mechanization into arecanut harvesting not only supports agricultural efficiency but also contributes to the broader goals of sustainability and economic growth in the sector

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