"DEVELOPMENT OF LOW-COST SOLAR OPERATED SELF-PROPELLED PADDY HARVESTER"

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Keywords:

Low Cost, Self-Propelled, Paddy Harvester.

Introduction:

Oryza sativa, commonly known as rice, is a fundamental staple crop that is cultivated year-round in India across the Kharif, Rabi, and Zaid seasons. It is primarily grown in flooded paddy fields, typical of southeastern Asia, where wet-rice farming supports large rural populations despite occupying small land areas. Originating around 3500 BC, rice spread across fertile deltas, floodplains, and terraced valleys, and remains dependent on irrigation, river flooding, or monsoon rains, with water levels maintained at 10 to 15 cm. While rice cultivation outside India often relies on traditional farming practices with family labour, India is the world's largest producer and exporter of rice. Rice is grown across six key regions in India, including West Bengal, which leads in production, and spans from the northern Gangetic plains to the southern peninsular plateaus.

Rice cultivation in India faces challenges that affect productivity and sustainability, primarily due to small and marginal farmers working on fragmented land, which limits efficiency and income. Traditional, labour-intensive harvesting methods and the high cost of mechanized equipment further hinder the adoption of modern technology. Additionally, fragmented landholdings and climatic and economic

pressures prevent scalability, particularly in regions with difficult terrain, such as Karnataka’s hill zones, where conventional harvesting is challenging.

Rice cultivation is vital to India's economy and culture, supporting millions of rural farmers and ensuring food security in key regions. Sustainable solutions are needed to enhance productivity, reduce fossil fuel reliance, and address labour shortages during peak harvest times to maintain the sector's growth.

Objectives:

1.To develop the solar operated self-propelled paddy harvester.

2.To study the performance evolution of solar operated self-propelled paddy harvester.

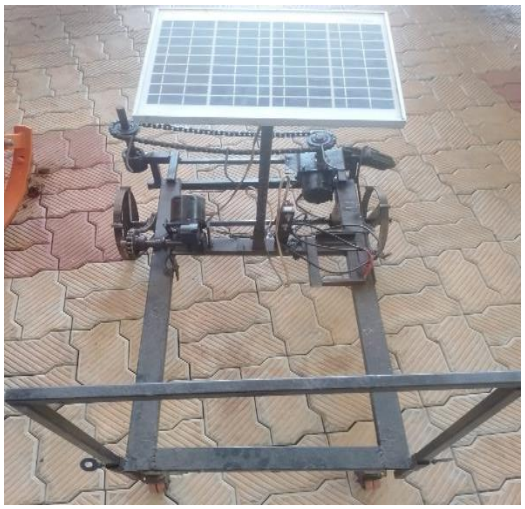
3.To study the cost effectiveness of the solar operated self-propelled paddy harvester.

Methodology:

A solar-powered harvester operates through a combination of mechanical and electrical components working together to efficiently harvest crops. The solar panels, which serve as the primary energy source, capture sunlight and convert it into Direct Current (DC) electricity using the photovoltaic effect. This energy is stored in a rechargeable battery, ensuring a continuous power supply, even on cloudy days. The 12V DC motor converts the stored electrical energy into mechanical energy, driving the cutting blade and other moving parts. The motor’s shaft is connected to the blade, causing it to rotate and cut crops. A sprocket and chain system transfer the motor's rotational motion to the cutting blade and wheels. The wheels, powered by the motor, provide mobility, and are attached to a sturdy frame that supports the entire machine. Electrical connections, including wires and cables, link the solar panels, battery, and Motor, ensuring proper power flow and protection from environmental factors like moisture and dust.

Sr. No.	Particulars/Parts	Dimensions/Details
1	**Cutter bar**	
	Material	Mild steel
	Weight	400g
	Totle cutter bar length	39cm
	Effective blade length	33cm
	Battery	12V 8AH
	Battery type	Sealed lead acid type rechargeable battery
	No of knives	24
2	**Conveyor chain**	
	Chain length	60cm
	Battery	12V 8AH
	Conveyor sprocket	16 teeth
	Conveyor motor sprocket	16 teeth
3	**Front wheel (Drive wheel)**	
	Wheel dimension	30cm
	Wheel shaft	24mm
	Battery	12V 8AH
	Wheel sprocket	16
	Motor sprocket	18
4	**Rear wheel**	
	Wheel diameter	30cm dia.
	No of castral wheel	2
5	**Solar panel**	
	Size of panel	35*30cm

Figure 1: Specification of the machine parts.



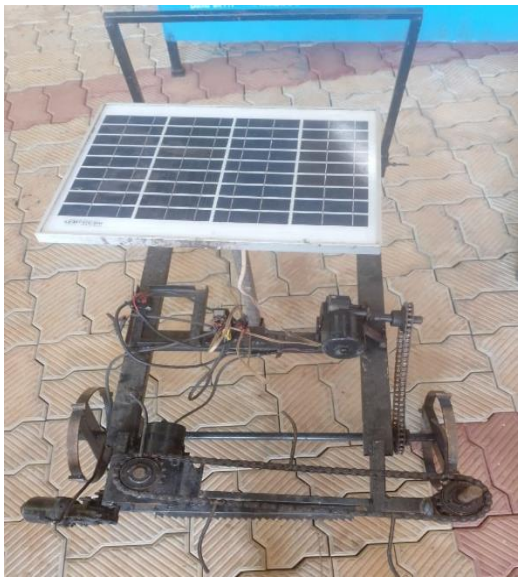


Figure 2: Working Machine Model

Result and Conclusion:

The device demonstrates a theoretical field capacity of 0.12 hectares per hour, allowing for efficient operation within a reasonable time frame. With an operating time of one hour per use, it can effectively cover substantial areas in a single session. The machine is priced at 17,000, making it an affordable option for farmers seeking a cost-effective solution. Additionally, the device is designed for long-term use, with a durability range of 10 to 12 years, ensuring a solid return on investment over its lifespan. This combination of affordability, efficiency, and durability makes it an appealing choice for modern agriculture, offering both short-term and long-term benefits.

In conclusion, the low-cost solar-operated self-propelled paddy harvester represents a revolutionary step toward sustainable, efficient, and cost-effective farming. By integrating solar technology into paddy harvesting, this device addresses critical challenges in agriculture, including high fuel costs, environmental impact, and labour inefficiencies. With its minimal operating costs, quick return on investment, and low maintenance requirements, it offers a practical solution for small and medium-scale farmers, empowering them to increase productivity while reducing their carbon footprint. The device's potential for further innovation and improvement ensures that it can evolve alongside the needs of modern agriculture, making it not only a valuable tool but also an economically viable and environmentally responsible choice for the future of farming. With the right commercial strategies and widespread adoption, this harvester has the potential to reshape the agricultural landscape, driving both economic growth and sustainable practices across the globe.

Future Scope:

The future scope of this project includes:

1. **Advancements in Technology:** Opportunities for improvements in solar panel efficiency, battery performance, ergonomic design, blade technology, and integration with automated crop monitoring systems.
2. **Increased Operational Efficiency:** These enhancements would improve performance, increasing the device's appeal to a broader market by addressing specific agricultural needs.
3. **Scalability and Adaptability:** Its design allows for adaptation to a variety of agricultural contexts, making it suitable for different farm sizes and types of crops.
4. **Commercial Potential:** With effective marketing, education, and demonstration of long-term savings, the device could gain widespread adoption and become an indispensable tool in modern farming.
5. **Market Appeal:** The device’s combination of cost-effectiveness, sustainability, and technological integration makes it an attractive option for the global agriculture community.

Note: Working Model