Electric Sugarcane Harvester and Leaf Cleaner

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***Abstract*—The second-largest producer of sugarcane is India. Harvesting sugarcane required a lot of labor and energy, which raised crop costs and decreased farmers' profit margins. The majority of farmers prefer to manually cut sugarcane and clean leaves; nevertheless, during this procedure, the pesticides employed on the crop are also hazardous to their skin. We have created leaf cleaning equipment and an electrically powered sugarcane harvesting system to address this problem. This electrically powered device will be extremely helpful for median and small formers on the Indian subcontinent. By using renewable energy sources to charge the battery rather than non-renewable ones, this electrically powered device lowers pollution and the greenhouse effect.**

***Index Terms*—Harvesting Equipment, harvesting system, Low cost cutting machine, renewable energy sources to charge the battery.**

I. INTRODUCTION

In India, the most important agro-industrial crop is sugarcane and the second number one industry after the cotton textiles industry. As we know, sugarcane is the oldest crop and cutting takes a lot of money, labours and time consuming.

There are many issues like Shortage of skilled labor during peak harvesting seasons, High labor costs for manual harvesting, Socio-economic pressures, Physical strain and health hazards for laborers, some physical health issues like backpain by lifting and carrying heavy loads etc. faced by the Indian farmer during the harvesting of sugarcane through the traditional techniques and methodology.

Sugarcane harvesting through electrical technology provides an eco-friendly solution to agricultural sustainability. Using electrical appliances increases efficiency and reduces environmental impact. As we envision the future transition to solar-powered systems, this research explores innovative approaches to making sugarcane harvesting more efficient, cost-effective, and environmentally friendly.

II. METHODOLOGY

Hardware Requirement—

- Body Frame
- Wheel Ring
- Wheel Tire
- Throttle
- BLDC Motors
- Controller
- Lithium-ion Battery
- Cutting Blade
- Conveyor Belt

Machine Requirements—

- Battery Charger
- Welding Machine
- Rode Cutting Machine

III. CIRCUIT DIAGRAM EXPLANATION

A) Wheels— 4 wheels are used in this machine and run by the 750 watts BLDC motor.
B) Blade— Blade is used to cut sugarcane and it is operated by the 250 watts BLDC motor.
C) Leaf Cleaner— Leaf cleaner machine is used to remove the leaves from the sugarcane.
D) Lithium-Ion Battery— 48-volt li-ion battery is used to give the power supply for the machine, it may be used as battery backup in home appliances.
E) Battery Charger— A 2000 watts charger is used to charge the li-ion battery within 2 -3 hours.
F) Controller— It is used to control all connected equipment.

IV. BLOCK DIAGRAM

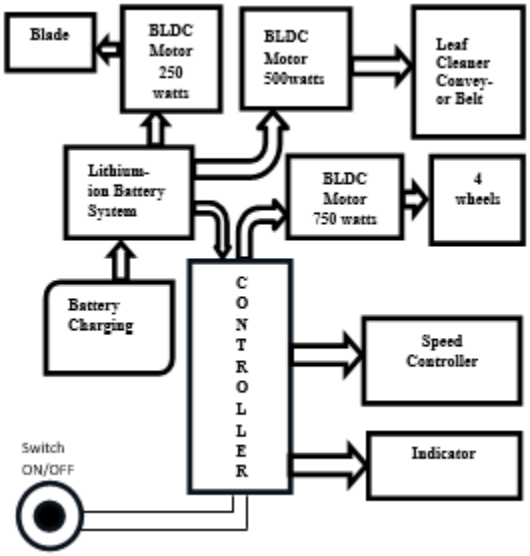

Figure 1: Block Diagram

Sugarcane harvester and leaf cleaner is an electric machine which works on DC supply. It has four wheels powered by a controller to move forward and reverse direction. The wheels are connected with a BLDC (500 watts) motor which is controlled by the controller. This machine has another BLDC motor (750 watts) having a circular blade to cut the sugarcanes stalk. This motor also be controlled with the help of the controller and the forward and backward wheels frame are connected with a conveyer belt to take the sugarcane stalks from front to back. this process has to go through the leaf cleaner poles to clean the waste leaf. The leaf cleaner is run by a BLDC motor (250 watts) which is controlled by the controller. The whole supply is given by the 48 volts battery backup.

V. BLOCK DIAGRAM EXPLANATION

The Power Supply Block

The controller and every motor receive power from the 48V Li-ion battery, which serves as the main power source. When the battery and the 2000W battery charger are connected, the battery may be quickly recharged in two to three hours.

Control System Block

The battery is attached to the controller, which controls how power is distributed among the various parts. In order to guarantee synchronous functioning, it takes inputs and transmits orders to the motors.

Cutting System

The Blade, which slices the sugarcane stalks, is driven by the 250W BLDC Motor, which is managed by the Controller.

Leaf Cleaning System Block

The Leaf Cleaner, which removes leaves from sugarcane, is powered by a 500W motor. The Controller additionally controls this motor to make sure it functions in tandem with the cutting mechanism.

VI. PROTOTYPE MODEL

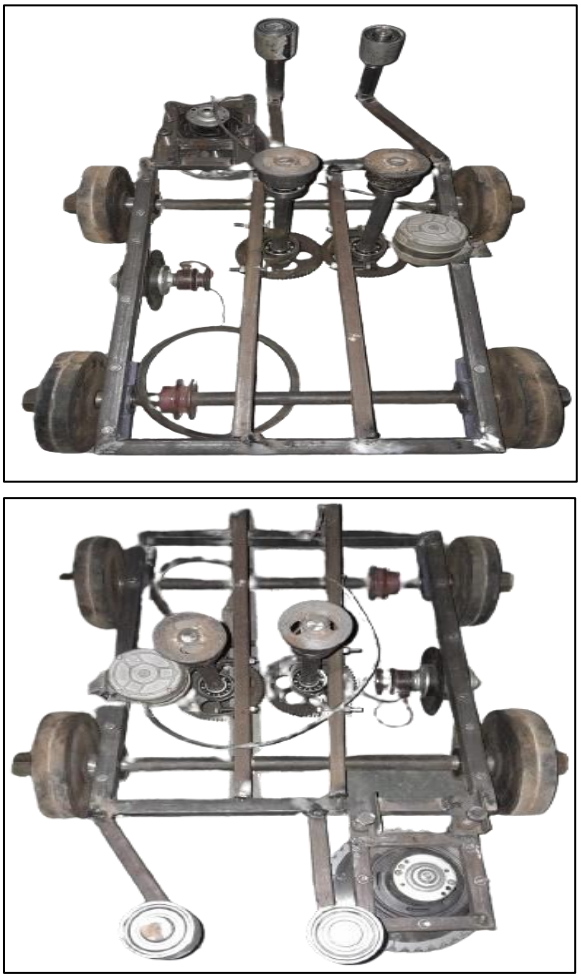

Figure 2: Prototype Model

In this model used 4 wheel which are connected with two iron axles. In Prototype Model has the frame size. own frame size. Front frame has the 75 cm height and

width is 60 cm and model is consisting of the two Single phase A.C. Motor and one is D.C. Series Motor. One A.C. 1-phase Motor Connected with the iron gear which is controlled the Belt. The second motor is connected with pully which is connect with the back axle of the model. D.C. Series Motor connected with the blade which is cutting the Sugarcane. All motors are Connected with the single phase, A.C Supply and Model has the height is 60 cm.

VII. CHALLENGES FACED IN DESIGN PROTOTYPE MODELS

1. First of all, challenges face components not available in our area Chandpur and but available of components is high costly.
2. In the prototype model we used a single DC motor with 80-watt power and two AC motors with 80,100-watt power. There is no sufficient space in the prototype model to fix BLDC or PMSM motor. Also, the usage of Li-ion battery cannot be done due to the insufficient space.
3. The making of prototype challenge face of market is longer distance than going and coming in high money waste the vehicle.
4. Li- ion battery not used because the AC power supply of motor given then Li- ion battery is very high costly.
5. This type of prototype makes this type of model not available in market the not reference and guidance not available and this type of project making difficulty faced.
6. This prototype is high costly making and welding of prototype the very challenging face then All group members discussion after used low power supply motor used then not taken load and not operator/ run of our project.
7. The prototype making to heavy weight of sugar cane harvester machine.

CONCLUSION

The objective is to make a machine for sugarcane gathering that will lower costs and save time. This machine will offer assistance increment generation effectively and successfully, whereas too tending to the issue of labours shortages. This electrically fueled gadget diminishes contamination and the greenhouse impact by utilizing renewable energy sources to charge the battery instead of non-renewable energy.

FUTURE WORK

As we know, sugarcane is the oldest crop, and it takes more money, effort, and time to harvest it. With this sugarcane harvester, we will be able to harvest sugarcane easily, because it is more efficient than manual harvesting, however ours is based on electric supply and we will create renewable energy based on solar energy in the future. In this way, we will be able to harvest sugarcane easily without harming the environment. It can be also used as commercial vehicle in daily life for the farmers.

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