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Design and Fabrication of Sugarcane Node Cutting Machine

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ABSTRACT:In today's world, sugarcane accounts for 80% of sugar produced worldwide. The sugarcane industries just borrow the sugarcane stalks as a whole from the farmers who actually grows it and is further processed in a conventional sugar processing machine without actually separating the planting material it's known as Bud (which acts as a seed), thus wasting it by crushing it or maybe in some other ways. What we actually intend to do is to solve the above-mentioned problems by creating an automated machine which will be employed to separate the bud and the furrow part of the sugarcane so that they can be used in future for sugar processing and obtaining the planting material. These bud chips are less bulky, easily transportable and more economical seed material. The left-over cane can be well utilized for preparing juice or sugar or jiggery. In sugarcane inter node cutting operation, sugarcane is cut at its nodal part in small pieces and bud is separated from the sugarcane for seedling purpose. The existing (traditional) tools used for bud cutting of sugar cane are unsafe, messy and need skill and training. The risk of injury is also too high this necessitates the development of a bud cutting machine for sugar cane. The specially designed blades are prototyped using stainless steel Material attached to the hub. Hub is mounted to the shaft which is driven by the worm gear through chain drive. The bud chip technology holds great promise in rapid multiplication of new cane varieties. The prototype was tested and the initial results indicated that equipment has reduced the manual effort, as required for generating the sugar cane buds as compared traditional tools. The whole equipment is simple with additional safety measures.

KEYWORDS: Sugarcane Node Cutting, Agricultural Semi-automation, Sugarcane cutting.

I. INTRODUCTION

The production of sugar is the second largest agro-processing industry in the country, after cotton and textiles. India has more than 566 sugar mills. About 4 million sugarcane farmers and a large number of agricultural labourers are involved in sugarcane cultivation and auxiliary activities, constituting 7.5% of the rural labour force. In addition, the industry provides employment to 500,000 skilled and semi-skilled workers in rural areas. It is easy for management and gives high yield. It uses two eyed sets and planting is done by keeping 4 to 6 cm distance between two sets. This type of planting needs 2 to 2.5 MT seed per hectare. In Spaced Transplanting (STP) method single eyed sets are used for planting. In this method sets are directly grown in field or grown in polythene bags in nurseries that are transplanted into the field after 50 to 55 days from the date of plantation. The STP method needs 750 kg to 1MT seed per hectare is required, which saves seed. Sugarcane planting with traditional method is costly, time-consuming, requires great human force and high volume of sugarcane stalk per hectares. Now a days sugarcane planting machines are used to reduce the human force and time. However, these machines do not have control on cutting location. In uncontrolled cutting process 3 to 6 buds set may get planted instead of single bud.

II. RELATED WORK

The concept of image painting was first introduced by [1] Dipak U Adharpure et.al, These bud chips are less bulky, simply moveable and additional economical material. The bud chip technology holds nice promise in speedy multiplication of recent sugarcane varieties. The problem of the establishment and initial growth may be self-addressed by application of applied plant growth regulators and essential nutrients. Construction of the sugar cane eye cutter is easy pedal operated machine is used during this sugarcane bud. Based method proposed by Suraj S Magdum et.al. [2] A hemisphere chipping knife and a roller follower with a simple harmonic motion belt drive used for the speed reduction. Most of the machines accessible within the market are using flat cutters that separate the node fully.

However, during this project using the two hemispheres chipping a knife that provides the gentle cutting of a node without an additional loss of sugarcane throughout the sowing. Cutting Blades are using to chop the buds. In [3], When the motor starts pulley rotates which is connected to the 2-inch pulley which drive to the 16-inch pulley. 16-inch pulley drives 25 mm shaft on which the circular cam is mounted. Cam drives the shafts which slide in the pedestal bearing and guide bush Shafts another end cutting blade is connected. This project is we worked under by the cam and follower mechanism. The mechanism converts the rotary motion into the reciprocating motion. The machine has the prime mover at the bottom of the machine. The motor and pulley are connected with one V-type belt. [4]. In [5], Suraj S. Magdum et. al.Sugarcane is a fast growing field of agriculture.Sowing of sugarcane buds in field is laborious and time consuming. Not maintaining uniform distances between the buds and varying the depth while sowing manually, may result in less productivity. In this technique, the germination is almost 95% while in direct vegetative seed cane planting in the field, the germination hardly 40-50%. These pre germinated shoots in polybags are ready for transplanting in the field 30 days after planting by which time they attain 4-5 leaf stage.The authors in [6]A. S Putteswar et. al.The existing (traditional) tools used for bud chipping of sugar cane are unsafe, messy and need skill and training. But our research in this direction, literature survey, patent search, market survey and concept generation were carried out. Among the different concepts developed, we are using to the best concept was selected based on concept selection strategy. The punch torque tube was swaged to reduce the cross section of the tube. The punch tool was machined using lathe. The prototype was tested and the initial results indicated that equipment is complicated, as required for generating the sugarcane buds as compared traditional tools. In this arrangement we are using crank rocker mechanism and cam follower. The cutter works in reciprocating motion. In this arrangement we are using crank rocker mechanism and cam follower.

III. METHODOLOGY

The methodology used in this project involves several steps, including design, fabrication, and testing. The main objective of the project is to design and fabricate a semi-automated machine that can separate the sugarcane bud from the stalk in a form that can be utilized for sugarcane plantation with ease.

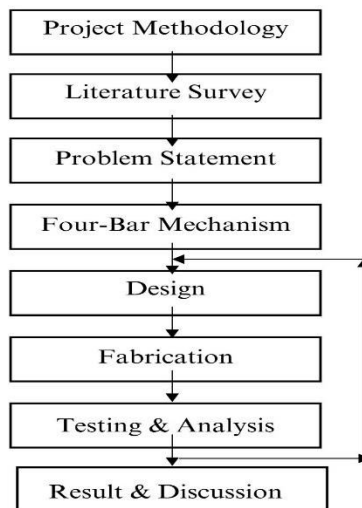


Fig. 2. Project Methodology Workflow

Using refined cutting mechanism works on crank-four bar mechanism where rotary of motion of prime mover (Here we have used high torque dc motor of 12-volt 3 amp, and 110 kgcm torque.) is converted into oscillating motion cutter arm. Once the design is complete, the next step is to fabricate the machine. This involves assembling all of the components according to the design specifications. The cutting blade should be prototyped using stainless steel material attached to a hub mounted on a shaft driven by a worm gear through chain drive. After fabrication is complete, it's time to test the machine. This involves checking whether all components are working correctly and whether safety features are functioning as intended. Testing should be done under various conditions to ensure that it works efficiently and effectively.Once testing is complete and any necessary adjustments have been made, it's time to

implement the machine into sugarcane farming operations. Finally, regular maintenance of the machine should be performed to ensure that it continues to function correctly over time.

IV. EXPERIMENTAL RESULTS

The final result of this work is the fabrication and assembly of a semi-automated sugarcane bud cutting machine that can effectively reduce manual labour while increasing productivity and minimizing wastage during sugarcane farming operations. The outcome of the fabricated machine is to separate the buds from the sugarcane stalk. In the traditional way of plantation nearly 3 tons of sugarcane is used for plantation per Acre.



Fig. 2.Final Assembly of Sugarcane Bud Cutting Machine

The sugarcane with 2 to 3 buds known as seed is planted continuously. In this traditional method nearly 1.5 tons of useful sugarcane stalk is being wasted per Acre for plantation. With the help of the sugarcane bud cutting machine the internodes bud cutting is made possible so that nearly 1.8 tons of sugarcane stalk per acre can be saved which can be used for juice extraction and jiggery making. The cost of sugarcane bud chipping machine is reduced by 68% when compared to available machines, so that small farmers can afford this easily. When compared to the traditional sugarcane bud chipping tools the newly designed and developed sugarcane bud machine is Economical also, this new machine has totally eliminated the manual effort required in punching the sugarcane machine.

V. CONCLUSION

After designing and fabrication of “sugarcane seed cutting mechanism” we have concluded as follows. After the completion of this project, following conclusions were made, i.e., the semi-automated sugarcane bud chipping machine is fabricated and assembled as per the proposed design. Through the development of sugarcane bud cutting machine, slicing the inter-node is made possible, so that nearly 1.8 tons of sugarcane stalk can be utilized which is considered as wastage in traditional method.

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