A Review Paper on Design of Sugarcane Transplanter Machine

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Abstract— Sugarcane is a vegetative propagated Crop. In India, for conventional system of sugarcane cultivation, about 6 – 8 tones seed cane /ha is used as planting material, which comprises of about 32,000 stalk pieces having 2-3 buds. Cane cuttings with one, two or three buds known as sets are used as seed. The planting, cultivation and harvesting of sugarcane is highly energy, time and labour intensive. This project aims to design and fabricate sugarcane planting machine for sugarcane plantation to reduce farmer's effort and to increase production of agricultural products.

Key words: Furrow, Agriculture Products, Design, Production, Fertilizer, Sugarcane, Labour, Planter, Modeling

I. INTRODUCTION

In India agriculture has facing serious challenges like scarcity of agricultural labour, not only in peak working seasons but also in normal time. This is mainly for increased nonfarm job opportunities having higher wage, migration of labour force to cities and low status of agricultural labours in the society.

In conventional method of planting sugarcane sets are planted manually in furrows, opened manually followed by conveying manually. This is then covered manually or by animal operated planters. Thus, the process is very much time consuming and labour intensive.

Many Tractor operated sugarcane planters have been developed. But the sugarcane planters which are currently available in the market are large in size and operated with the help of heavy tractor. So, they can't be operated in smaller lands.

The machine is a compact Sugarcane Planter which can be operated in smaller lands by 2-3 labors, thus reducing the labour cost and speeding up the plantation process. This manually operated sugarcane planter will cut the sugarcane into equal parts and will plant them at equal distance.

Machine consists of furrow opening unit, C.I sett cutting unit, fertilizer application unit, chemical application unit, sett covering unit and seed box. For the operation, two laborers sitting on the machine feed completes sugarcane one by one into the sett cutting unit by picking from the seed hopper. The rotating blades cut the sets automatically before dropping into the furrows. Fertilizer and chemicals are also applied simultaneously long with the sets before covering of furrows. The furrow-opening unit has two riders mounted on the frame for opening the furrow. The machine has two-set cutting units one for each row. Each sett-cutting unit consists of rotating blades, which cut the cane interred size before dropping into' furrows. Fertilizer metering action is of gravity type. Chemical application is through nozzles.[10]

II. LITERATURE SURVEY

A brief summary of the vast amount of material that has been published on transplanter machine would be well beyond the scope and intention of this paper. Instead, attention is focused on a few key aspects of transplanter machine that are considered important and relevant.

Mr. Rohit J. Masute, Dr. Sharad S.Chaudhari, Prof .S. S. Khedkar [1] aims to design and fabricate small scale sugarcane harvesting machine for sugarcane harvesting to reduce farmer's effort and to increase production of agricultural products. The machine is helpful for both whom having small or big farms. After testing small scale sugarcane harvester in the field it is found that steams can be cut at ground level. The cost of the machine is about Rupees 28,000 and if the farmer buys this machine. It makes the process faster hence reduces most of the harvesting time and labor required to operate the machine is also less so, it reduces the labour cost.

Murilo Aparecido Voltarelli,Univ Estadual Paulista [2] studied on the operational performance of sugarcane machinery, in particular the mechanized planting system, are still incipient in Brazil, requiring greater efforts to increase the quality of agricultural operation. The variables evaluated were: displacement speed, engine rpm, engine oil pressure, engine water temperature, effective field capacity, and hourly and effective fuel consumption. The coefficient of variation is greater for the alignment of the tractor at night shift, while the coefficients of skewness and kurtosis are higher during day shift. Displacement speed, engine rpm, engine oil pressure, hourly and effective fuel consumption, and effective field capacity showed no influence over the shift operation.

Umesh S. Patkar,Rajesh W. Lanjewar [3] presented The planting, cultivation and harvesting of sugarcane is highly energy, time and labour intensive. Suitable techniques, systems and implements have therefore to be developed to minimize the above. Most of the sugarcane planters developed so far are tractor i.e. PTO driven planters, which has certain advantages and disadvantages also. The main drawback of PTO driven planter is that when tractor is stopped during planting, the planter still feeds few extra canes at the same place, which is undesirable. In this paper, a single row sugarcane planting mechanism, the planter stops the planting of cane when the tractor stops moving, i.e. the velocity of the tractor is zero. The planter feeds nearly the same length of the cane as the distance traveled by the tractor and is independent of the speed of PTO. The planting interval of the canes is uniform all along the cane planting length.

Ningappa H Kuri, Prof. Reddy Naik J. [4] experimented Sugarcane is a vegetative propagated Crop. In India, for conventional system of sugarcane cultivation, about 6 – 8 tones seed cane /ha is used as planting material. This large mass of planting material poses a great problem in transport, handling and storage. One alternative to reduce the mass and improve the quality of seed cane would be to plant excised auxiliary buds of cane stalk, popularly known as bud chips. These bud chips are less bulky, easily transportable and more economical seed material. The

existing (traditional) tools used for bud chipping 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 chipping machine for sugar cane. The best concept was then prototyped using 25mm by 25mm hallow steel bar joined together by arc welding. 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 has reduced /totally eliminated the manual effort, as required for generating the sugar cane buds as compared traditional tools. The whole equipment is very compact and simple with additional safety measures.

H.A. Abd El Mawla, B. Hemida, W.A. Mahmoud [5] investigated transplanting technique has been applied in several countries for reducing the duration of sugarcane production season. The technique also achieves several advantages such as saving seed quantity, labor power and total costs of sugarcane production. Farmers have been facing problems concerning trans-plating cane seedlings in the main field. Manual transplanting of sugarcane seedlings in the dry soil of the field is slow, inaccurate, costly and tedious task. The current research devoted to study the application of transplanting cane seedlings including nursery growing and mechanical transplanting to facilitate easy application of the technique. A mechanical trans-planter that developed especially for sugarcane seedlings was used. Seedlings sizes, germination, missing hills and died seedlings were determined. Germination was completed within 3 weeks and seedling sizes were variable because of the variation of germination period.

Vaibhav V. Randive, Siddharam V. Birajdar, Varuneshwar R. Rathod and Bhushan R. Kotkar [6] discussed about India is a major producer of the sugarcane in the world and during 2009-10 it produced 18.9 million tons of sugar, which was nearly 11.8 % of the total sugar production of the world. So there is large space for development in sugarcane plantation. In conventional method of planting sugarcane sets are planted manually in furrows. This process is very much time consuming and labour intensive. So we developed the new machine which cuts the sugarcane and feeds into furrow as well as feeding of fertilizer and spraying pesticide is done automatically. Due to this there is loss of farmer so we develop mechanism which feeds the fertilizer in uniform quantity. So after all processes leveler spreads the soil on pieces of sugarcane in the furrow.

Javed Ali [7] studied sugarcane is an important cash crop and cultivated between 320N to 320S latitude covering more than 90 countries of the world.. In India sugarcane is cultivated in 4.86 million hectares with annual production of 324.91 million tons in the year 2010-11.The average yield of sugarcane is about 67 tons per ha, which is lower than the average productivity of Australia, Indonesia, Colombia etc. The major producing states are Uttar Pradesh, Maharashtra, Tamilnadu, Karnataka, and Gujarat. The energy consumption in production of sugarcane is highest as compared to many other crops such as potato, maize , wheat ,paddy, sorghum etc. Use of machinery helps in labour saving and timeliness of operations, reduces drudgery, helps in improving quality of work, reduces cost of operation and ensures effective utilization of resources. In India considerable R & D work for design and development of agricultural implements and machinery for few operations have been developed. Therefore it is necessary that concentrated efforts be made for adoption, development and popularization of sugarcane machinery for various operations.

Rohit J.Masute, S. S. Chaudhari, S. S. Khedkar, B. D. Deshmukh [8] investigated that there is a need for faster rate of production of agricultural products. Agriculture is the backbone of India. In India almost all farmers facing problems of labour shortage. Day by day labour wages are increasing and in the same way demand of agriculture products. And also today's world need faster rate of production of agriculture products. This review paper is a small work towards analyzing sugarcane harvester machine aspects for economical harvesting which will help to minimize the working fatigue and to reduce labour cost.

Murilo Aparecido Voltarelli, Rouverson Pereira da Silva, Vicente Filho Alves Silva, Fabio Alexandre Cavichioli & Ariel Muncio Compagnon [9] studied on the operational performance of sugarcane machinery, in particular the mechanized planting system, are still incipient in Brazil, requiring greater efforts to increase the quality of agricultural operation and aimed to evaluate the operational performance of sugarcane mechanized planting in two operation shifts. The mechanized planting was conducted in the municipality area of Monte Alto – São Paulo (SP), Brazil. The statistical design was completely randomized, totaling 80 sampling points, from which 40 points for daytime operation and 40 points for nighttime operation. The variables evaluated were: displacement speed, engine rpm, engine oil pressure, engine water temperature, effective field capacity, and hourly and effective fuel consumption. The coefficient of variation is greater for the alignment of the tractor at night shift, while the coefficients of skewness and kurtosis are higher during day shift. Displacement speed, engine rpm, engine oil pressure, hourly and effective fuel consumption, and effective field capacity showed no influence over the shift operation.

Sompot Khomkaew, Pracha Bunyawanihakul and Isara Chaorakam [10] discussed about the performance of a sugarcane planter at the Agricultural Machinery Center, Kasetsart University resulting a slippery sliding rate (slip %), drawbar pull, drawbar power and PTO power as varied by the different densities of residues at 0, 2, 4, and 6 ton/ha and 2 depth levels of soil at 10 cm and 20 cm. The test was done over one and two rounds in the crop field, after the final sugarcane harvesting, with a moisture content of 22.115% (bulk density) and 19.202 % (bulk density) . It was discovered that the fuel consumption rate of the sugarcane planter was at125 m/l at a tractor velocity of 3.2616 km/hr, the slippery sliding rate at 4.44 %, the draft (pulling) of lower link and top link at 8.30 kW, PTO power at 16.56 kW .The performance and total power of the sugarcane planter with minimum tillage resulted from the depth level of the soil opener and the different densities of the sugar cane leaf residues at 0 2 4 and 6 ton/ha and depth level of the soil to affect performance of the sugarcane planter. Therefore, the angle of subsoil opener should be reduced to less than 31 degrees to reduce the effect of soil resistance.

Adarsh J Jain, Shashank Karne, Srinivas Ratod, Vinay Thotad and Kiran P. [11] discussed about the design

and fabricate small scale sugarcane harvesting machine for sugarcane harvesting to reduce farmer's effort and to increase production of agricultural products. Machine consists of petrol engine and different mechanisms are used in this machine. When compare to manual harvesting by using this machine has a capacity to cut canes in faster rate and it is economical. The machine is helpful for both whom having small or big farms.

III. CONCLUSION

From the review of literature it analyzed that:

- Sugarcane transplanting technique has been recommended to achieve advantages which are necessary for indian agriculture. The application of transplanting technique to replace traditional planting of sugarcane saves up two months of the crop production season.
- The attachment of this machine to any driving vehicles like tractors so furrow making and planting takes place simultaneously.some additional accessories to this machine like fertilizer and pesticides feedings which raises its advantages.
- Mechanization of sugarcane cultivation has yet to play its role in India. Traditional tools and equipments are still common in use for Sugarcane cultivation.Butthe cost of planting with sugarcane planting machine would be reduced to one third of the existing rates of manual planting.
- Depth of planting can be adjusted in the mechanical device in accordance with the soil condition. There is no doubt these pieces of equipments are labour and cost saving and will definitely make sugarcane cultivation more profitable besides reducing human drudgery.

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