



“MULTI PURPOSE LEAF HARVESTER”

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ABSTRACT

The main objectives of the project are to modify the existing design of the tea leaf harvesting machine and fabricate the modified one. An existing machine is procured from lona lawn movers pvt ltd and a case study is done. Several problems are identified with the machine like excess weight only tea leaves can be trimmed. A design was developed which has unique leaf collection unit which is less cumbersome than any existing designs. An experiment is conducted to find out the velocity of air required to carry the leaves. This model was analysed and a demo model of this design is fabricated and tested.

I. INTRODUCTION

Agricultural field activities had always been vulnerable to immediate fatigue with very less control over work environment. Tea cultivation is not exception for it. Activities starting from field preparation to harvesting are tedious and very much prone to physical and/or mental weariness.

Tea in India has a long history of consumption as well as application in traditional system of medicine. India and China are the largest producers as well as the consumers of tea. About 77% of tea produced in India is consumed in India itself Tea industries are playing a vital role in the economic development of tea growing states, and tea production is increasing over the years. However, this increase in production is largely due to the adaptation of advanced cultural practices and to a lesser extent due to the marginal increase in the area under tea cultivation. Moreover, number of tea estates are increased, however labour strength has not increased in proportion; conversely it has been reduced.

The primary reason may be the drudgery involved in the work; especially during harvesting operation labour has to work under extreme conditions. This altogether resulted in shortage of labours and increase in the wages. In turn, it is resulting in big loss, since tea leaves are not harvested on time. Consequently, tea industries inducted mechanization of tea leaves harvesting to overcome labour scarcity problem and increase the harvesting capacity. Some of the south Indian tea estates have adopted locally manufactured shear cutters, while researchers have introduced motorized shear cutters to ease tea-harvesting and increase productivity of the labour. Primary observations of the labours using these devices indicated increased harvesting capacity of individual labours. However, scientific evaluation of human performance is necessary for the rightful adaptation of this mechanization. Harvesting of tea leaves is a vigorous process that requires hard work and perseverance in order to coax the most out of tea plant. Leaves are either plucked manually or by using machinery. Using machinery reduces labour requirements and improves the efficiency. The emphasis is on reducing cost of



harvesting without compromising with the plant's life. Hence an efficient user friendly portable machine is necessary. The existing tea leaf harvesting machines have several drawbacks and this project aims at tackling some of those problems and introducing a new method for easier leaf collection.

II. LITERATURE REVIEW

- **“Mechanical harvesting of tea leaf in south and central Africa: Martin”**

Argentina started mechanizing of tea harvesting in early 1970's. shortage of labour lead to mechanizing of tea harvesting among the member countries of Tea Research Foundation of Central Africa. South Africa was the first amongst them to start using machine. Since in the most of the region the tea harvesting machine is in its infancy simpler types of machines were used.

- **Tea Leaf Harvesting- An Ancient Art Form: Steve Greens**

The right amount of rain and sun of the sub-tropical climate as well as the mountains terrain along with the acidic sand provides the distinct flavor of the tea. Picking of tea has to be done by hand to preserve the integrity of the leaves before harvesting. Hand plucking involves plucking of leaves without damaging the stem. Using of machine increases the amount of bruising and number of stems included in the harvest and will result in poor quality of tea.

- **Commercial Crop Technology Horticulture Science: Alice Kurian**

Countries like japan and Russia have started mechanical harvesting in order to reduce the labour costs during plucking. Now INDIA is also trying this. South INDIA has a distinct cropping pattern with alternate high cropping and low cropping period. One of the serious problems in tea harvesting is the unavailability of adequate number of labour. This problem can be solved to an extent with the help of integrating machines for harvesting. Mechanized harvesting helps in reducing the man hour. These machines require additional worker for leaf collection and keeping the bags properly. The output for mechanical harvesting is 1000 kg/ 8 hr. compared to 25-40 kg plucked by the operator. Machine harvesting cannot be done in closely spaced section.

- **The Biography of Tea: Carrie Gleason**

The tea leaves of new plant are ready for harvesting in 5 years. The growth of the [plant is not uniform throughout the year. The environment where the plant is growing as a great in influence in the plant for the production of new buds and leaves and also the number of harvesting.

- **Factors in Ergonomic Hand Tool Design: Sarah**

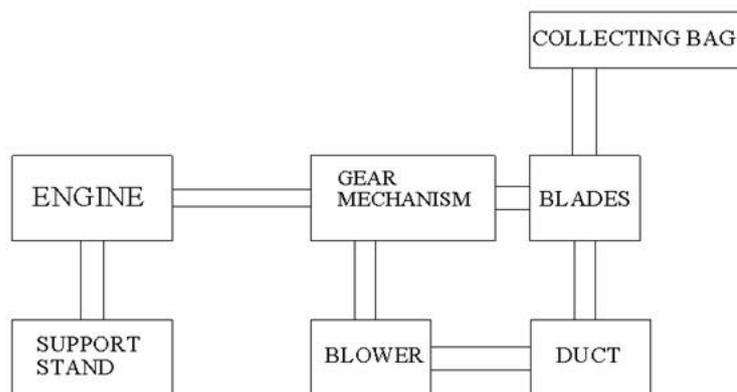
Handle design have great influence efficiency as well as safety in all kinds of daily activities. The handle diameter should be thick enough to separate the finger tips from palm. the power grip the length of the handle should be 10-15 cm and diameter should be 3-4 cm.

III.DESIGN LAYOUT

The proposed design includes cutting unit for cutting the tea leaves, collecting unit for collecting and storing the tea leaves and a pneumatic conveying system that carries the leaves from cutting blades surface to the collecting bag. Tea leaves are cut by the reciprocating trimmer blades and blown by the blower and stored in the collecting



bag. The collecting bags can be removed when it is full. The pneumatic conveying system is realized by the use of a blower which deliver air at the required flow rate.



IV. Major Components

- ✓ Blades: This is used to trim/cut the leaves of any required plants, bushes etc.
- ✓ Centrifugal Blower: This is used to blow the air which is required for collecting the cutted leaves.
- ✓ Gear Box: This is used for the controlling the speed of the blades and trimming process.
- ✓ Engine: This is used to run the shaft which is further connected to the gear box. It is of 2stroke petrol engine.
- ✓ Connecting Shaft: This is used to connect the gear with the motor/engine which is covered by a duct.
- ✓ Duct: This is the covering which is used to protect the shaft and is with flexible in nature.
- ✓ Supporting Stand: This is designed in such a way that it should hold all the model setup which reduces the risk of human and also with the option adjustable height. And this stand is fixed with wheels for the easy movement of the machine.

Components details

Table 1

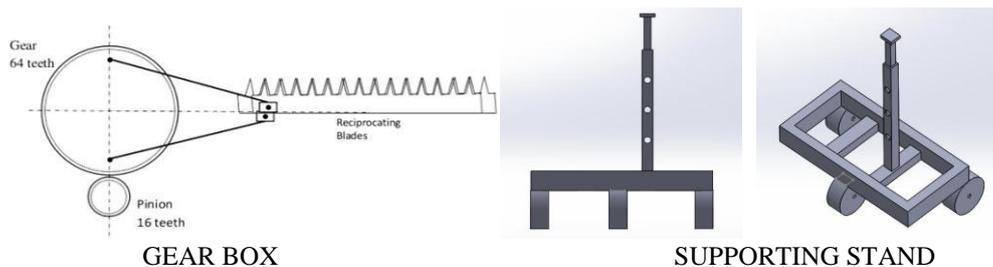
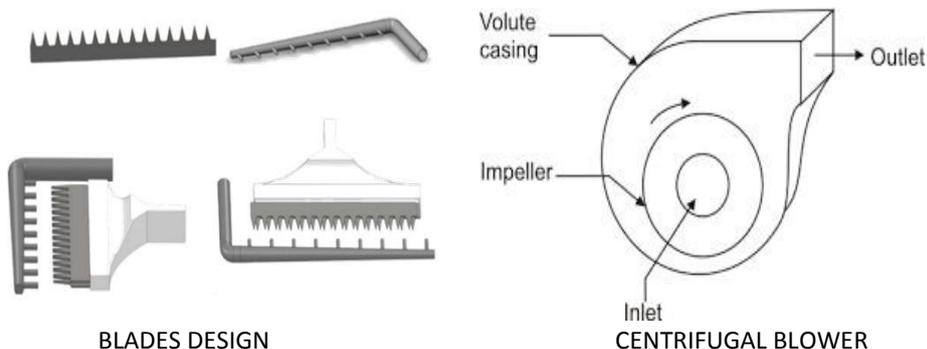
Components	Specifications	Remarks
Blower cover	Poly-carbonate alloy+ Aluminium	Connect motor to blade gear
Blower blades	Aluminium	Inner part of the centrifugal blower

Table 2

Components	Specifications	Remarks
Fasteners screws and nuts	Any available material	To fix all the components to the assembly

Table 3

Components	Specifications	Remarks
Trimmer blades	High Speed Steel	600 mm---tooth
Main Handle	Aluminium tube	For holding the machine
Small handle	Aluminium tube	For holding the machine
Flue pipe	Polyethylene	For blowing leaves into the collecting bag





Collection unit

The leaves which are cut through the cutting blades are blown away by the blower at the front end of the machine by the flue pipes. The collection bag is attached at the rear end of the machine. The blower blows the air at very high speed which carries the cut leaves along with the air. The leaves thus get collected into the collection bag. As the bags gets filled it is detached and a new bag is attached.

V.APPLICATIONS

- These are used in any small scale estates.
- These are use in cutting leaves or bushes in schools and college primases.
- These are used for altering the bushes size and can used to give the shape for the bushes.
- These can be used by any person i.e., either a skilled or unskilled person can use it.
- These can be utilized for maintaining gardens infrontof their houses, etc.,

CONCLUSION

In this project, a study is conducted n the tea leaf harvesting machine available in the world market and the best among them is identified. A tea leaf harvesting machine is acquiring from Harrison Tea Malayalam Ltd. This particular machine is examined thoroughly and all the flaws in mechanism are identified. A design is developed which can be realized by modifying this machine and is analysed. An experiment is conducted to determine the critical velocity of air required for the leaves to be conveyed with the air flow. Flow analysis is done on the design using solid works for checking the workability of the model. Design is slightly altered for easy manufacturing without compromising n functioning of the machine. Then a model is manufactured by assembling the procured components and fabricating new components. This model was tested for workability and all flaws in the design and fabrication are identified. Suggestion were given for future improvement.

The use of leaf collection mechanism demonstrated in this project improves the productivity of the harvesting machine because of its user friendliness and ease of use. The process of tea leaf harvesting will become more efficient and less costly compared to previous design. In this design there is no need to carry the engine on the back of the farmer due to which there is no back problem to the farmer. The assembly is completely placed on the wheel base and it is just pushed and harvesting is done.

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