

# Conceptual Development of Onion Planting Machine

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**Abstract:** *The agricultural sector holds significant importance within the Indian economy. In today's age, there is a steadfast momentum towards the rapid development of both the agricultural and industrial sectors. The agricultural sector plays a vital role in providing employment opportunities for a significant portion of the country's workforce. In 1999, the agricultural sector employed around 38 percent of the entire workforce. Releasing the workforce from agriculture and channelling them into other sectors is crucial for the country's development. Onion holds significant importance as a commercially cultivated vegetable crop that occupies a substantial area in India. Importation of onion will lead to drain out the economy of the country. To provide food to growing population is a huge challenge. So, to achieve the goal of the future food demands & reduction in processing cost, the farmers have to implement the new techniques which will increase the overall crop production rate also. The differentiation between the traditional onion planting method and the our proposed machine is it can do a number of operations at a time and has more number of advantages. The main focus to make this machine is to reduce the human effort as well as problem of availability of labor & there cost of work. Mechanization of agriculture sector will lead to higher productivity with releasing of work force to other sectors. So, on surveying the recent need of techniques involvement in agriculture field it is found that there is scope of development in onion transplanting So project constraints help to design the projects. The objective of this project is to design an onion transplanting mechanism to transplant onion seedlings by small scale farmers in the country.*

**Keywords:** Onion, Onion Planting Machine, Onion Planting, Onion Saplings, Planting machine, Crank and lever mechanism, digger.

## I. INTRODUCTION

Basically, area of Maharashtra state where most of the people are farmers & onion production is on large scale. In our surrounding there are two techniques of planting as planting in dry soil & planting wet depends on environment conditions, soil type & content. On studying the techniques of transplantation of onion the major factor observed was that most of the farmers use a common method of planting of onion saplings in muddy land. When study is focused on planting in muddy soil, we observed that major of the problem is associated with lack of advanced technique & machines which will reduce the processing cost of onion. Accordingly, we get the problem statement.

**Problem Statement :** The wet region is more biologically economical than dry in our state. So, develop such mechanism which will fulfil all the requirements, constraints & conditions of onion planting technique in wet soil. Major challenge is to find solutions of problems such as motion of mechanism in mud, digging of sidling's, planting with geographical & plants geometrical constraints in order to reduce human efforts & production cost.

### Project Constraints

Plant is flexible not a rigid.

Dig a single plant in soil.

Distance between two planted crops should be in range.

Mechanism assembly should move easily in mud.

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### Objectives

- Reduce human efforts
- Reduce labour cost & production costs.
- Reduce the time needed for planting per hectare.
- Develop a simple mechanism for planting.
- Reduce the Waste of Saplings.

## II. LITERATURE REVIEW

Initially onion planting is done by broadcasting method. This method prepares with a ploughing linear cut in series. The field is then seeded by throwing the seeds over the field, the result was a field planted roughly in rows, but having a large number of plants. After that dribbling method was used for onion planting. It consists of making small holes in the ground, seeds are put in the holes, and they are then covered with the soil. other method of planting the seeds in soil is with the bamboo tube with a funnel placed on it to a plough. As plough moves in field it keeps leaving seeds with designated depth and space. The sowing methods have some disadvantages as less control over the depth of seed placement, less uniformity in the distribution of seed placement, seeds loss, labour needs more, more time needed for planting. The common method of onion planting is making seedlings by broadcasting method and then planted in muddy region. This method requires more labour & time; planting is difficult in muddy region but it is effective method for onion planting. In 2006 tractor drawn semi-automatic onion planting machine was developed in India which is run in dry soil. The machine plants six seedlings in a row at a time. It requires six labours for separate and put one by one seedlings and. He failed to separate single seedling and pick and plants it. In 2009 the manually operated rice planting machine was developed in China which runs in muddy region but it requires continuous circular motion to handle by which mechanism is actuated. In 2011 tractor operated onion planting Trans planter is developed in China but it useful for bed system. In 2012 engine operated one man driven fully automatic rice planting machine was developed. Machine consists of tray of seedlings from which arm having pick and put mechanism is used to plant seedling. It works in muddy region but planting techniques of rice and onion are different. So, we are developing such machine which will impact effect on new generation of onion planting machine and it will be put a step forward in development in agricultural field.

## III. METHODOLOGY

### 3.1 Components

- Chain Drive
- Digger
- Crank and Lever Mechanism
- Tray
- Wheel
- Frame
- Hopper

### 3.2 Operating Procedure

Operator drops the plant into hopper then it descends through pipe & receive by digger. At the time digger is at top most position so it is closed, therefore plant is hold in it. Digger along with plant in it moves downward & penetrates into soil. This vertical motion of digger is achieved by crank & lever mechanism. As soon as digger penetrates into soil it gets opens into soil due to spring action & pivoted pin at center of digger. Digger has two slots at its bottom because of that as it gets opens, soil enters into digger through slots and it covers the plant so plant stands into soil when released. After release of plant, digger comes upward at its initial position & ready to receive another plant. In this way, plant is digged into soil with the help of this mechanism.

### 3.3 Working

#### 1. Bundles

Bundles of Saplings Initially immature small plants with buds are made using seeds sowed in soil. These small plants of onion are generally 3 mm to 6 mm dia. & 12 mm to 20 mm length and approx. 100 to 150 no. of plants are bunched together to form a bundle. These bundles are washed in water and cut the apex and then are ready to planting.

#### 2. Spreading of Plants in Tray

A bundle of plants is spread over a tray in horizontal position so that a person can take sapling easily. A tray is located at such a position that one can easily take plants in hand to drop into hopper. Requirement is that there should be single plant dig into soil at a time. One by one sapling is separated from bundle and drop into hopper.

#### 3. Hopper and Manual Indexing

Plants from tray are taken by person and put it into both conical hoppers one by one so that at one place only one seedling is planted. The person is walk at left side of assembly. There are two no. of conical hoppers both hoppers receive plants in each step. These plants flow through pipes and reached to the respective digger mechanism.

#### 4. Driving a mechanism

Manpower is provided to drive the mechanism. The operator rotates the handle, or it can pull the assembly & then on rotation of handle, shaft 1 gets rotated through chain transmission. As shaft 1 gets rotated it helps the vehicle to move forward. Here in set I transmission speed get reduced.

Then from the shaft 1 motion is transferred to intermediate shaft where speed is reduced further using chain drive and finally to output shaft to get required reduction ratio approximately 6. Here due to this kind of mechanism speed of movement of digger i.e., plantation of plants is directly depending on the vehicle speed or speed of wheels rotating. We have achieved reduction as single rotation of shaft 1, output shaft rotate 6 times.

On the output shaft there is crank plate, it is rigidly connected to output shaft and rotate with same speed of output shaft. One lever is connected to crank plate & another lever succeeding to first one is connected to digger at rear end. When one revolution of wheel is completed digger oscillates 6 times and 6 no. of seedlings are digged into soil.

#### 5. Operation of Digger Cycle

This process of penetration or digging of plant is achieved with help of digger or caser/clip mechanism whose motion is given by crank and lever mechanism and spring. Its motion forms a penetration cycle which consists of

##### 5.1 Receiving the plant-

Operator drops the plant into hopper then it descends through pipe & receive by digger. At the time digger is at top most position so it is closed, therefore plant is hold in it.

##### 5.2 Moves downward & penetrate into soil-

Digger along with plant in it moves downward & penetrates into soil. This vertical motion of digger is achieved by crank & lever mechanism.

##### 5.3 Opens into soil release the plant-

As soon as digger penetrates into soil it get opens into soil due to spring action & soil enters into digger through slots and it covers the plant so plant stands into soil when released.

##### 5.4 Moves upward & comes to initial position.

After release of plant, digger comes upward at its initial position & ready to receive another plant. In this way, plant is digged into soil with the help of this mechanism.

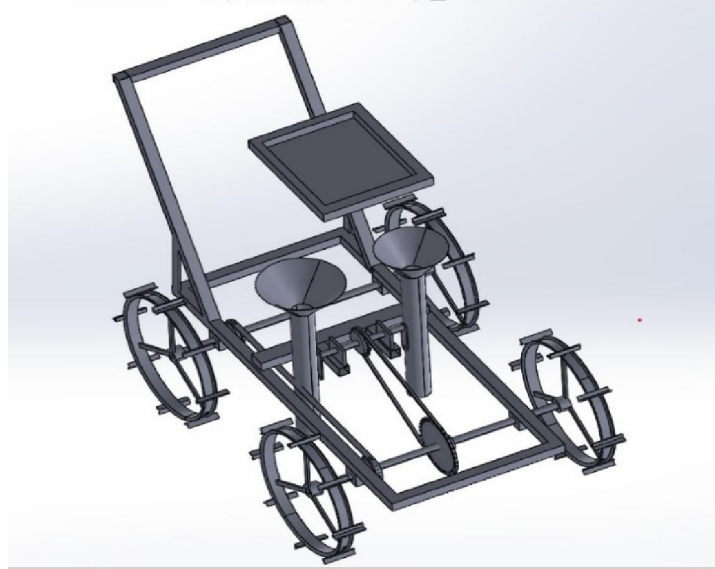


Fig. 01 Conceptual diagram of onion planting machine.

#### IV. RESULT & DISCUSSION

In the result we can see that we can easily plant the onion seedlings with the help of this machine. Here we used the reduction ratio 1:2, but we proposed actual as 1:6 to keep distance between two adjacent seedlings near about 150-200 mm, but this is a prototype and reduction of 1:6 takes more space. Here we used wheel Diameter of 300 mm. This model helps small scale farmers to plant onion seedling without wastage, with less time per hectare and with less man power leads to less production cost per hectare.

#### V. CONCLUSION

In day-to-day life, onion is necessary in food and it is basic need in meal so there is need of largescale production of onion. On considering onion planting in wet soil by traditional method there is requirement of large no. of labour, more effort, more time and cost so there is need to develop a mechanism which successfully satisfy all requirements of onion planting technique. Our idea is to develop conceptual mechanism which can be handling easily, maintain the row spacing with control sapling rate without wasting it, maintain the depth of plant, saves labour requirement, labour cost and can be affordable for the small-scale farmers. With the help of this mechanism, we can develop actual onion planting machine which will fulfil the necessity of such technique.

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