

Review on Onion Plantation Mechanism

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ABSTRACT

The onion (*Allium cepa* L.) is one of the important commercial vegetable crops grown on a large area in India and abroad for local consumption as well as export purpose. Onion growers are facing lot of problems in transplanting of onion seedlings with the shortage of farm laborers during transplanting seasons. Therefore, efforts were made to develop power operated semiautomatic onion transplanter. The elemental uses for small scale cropping appliances are, they should be suitable for small farms, simple in design and technology and versatile for use in different farm operations. This reduces the labor requirements which have been the principal motivating force in mechanization. This paper provides guidelines for developments in onion Transplanters used in India. Onion planting is very old method from many years ago & having long history since many years & their methods of onion planting are changed in this decade. Use of onion Transplanter machines is new trend but current machines having high cost of purchase. So the main focus of this project is to minimize the cost of that machine. In the agricultural field, onion planting operation is very time consuming in farming process. Also more labors are required for onion planting. Hence the total cost of the farming increases. The conventional onion transplanting machines requires more onions and quantity of onions per unit area increases and this affects the yield. But to reduce the risk of draught due to unpredictable rainy season and for irrigation purpose farmers accepts ridge and furrow method. Here in this study efforts are taken to design and develop a onion planting machine which is suitable for ridge and furrow method.

Keywords: Onion, Mechanical Transplanter, Chain Transplanter, Power Operated Transplanter.

I. INTRODUCTION

Onion is one of the most important commercial bulbous vegetable crop grown in India from ancient times. The area under onion is about 7 per cent of total area under vegetables in the country (Anonymous 2004-05). In terms of area, India ranks first in the world with over 0.48 mha accounting for around 21 per cent of the world area planted with onion. Globally, the country occupies the second position after China in onion production with a production share of around 14 per cent. Productivity, however, is around 11.72 t/ha, which is lower than the world average of 18.45 t/ha as well as

Asian average of 16.80 t/ha. The production share of different vegetables in 2004-05 shows a wide variation. The potato with share of 28.8 % had maximum contribution whereas pea had minimum contribution of 1.9% in vegetable production. The onion crop contributed 7.4 % in total vegetable production thus, had an important place in vegetables. In India, the top ten onion producing states contribute about 90 per cent of total production. Maharashtra is the largest onion producing state followed by Gujarat and Bihar.

Traditional Methods: Traditional methods include broadcasting manually, opening furrows by a country plough and dropping onions by hand and dropping

onion seed in the furrow through a bamboo/metal funnel attached to a country plough. For sowing in small areas dibbling i.e., making holes or slits by a stick or tool and dropping seeds by hand, is practiced. Multi row traditional seeding devices with manual metering of seeds are quite popular with experienced farmers.

II. PROJECT COMPONENTS

- 1.Supporting frame
- 2.Drive system
- 3.Metering mechanism
- 4.Onion-set placement mechanism
- 5.Furrow openers
- 6.Covering devices.

Table 1. SPECIFICATION OF COMPONENTS

Sr. No.	Name of Component	Specification of	Quantity
1	Chain	Pitch=15 mm Width between inner plate=10mm	1
2	Sprocket	Diameter=10 inch and 3 inch	2
3	Shaft	Diameter= 20mm and 25 mm	2
4	Wheels	14-15inch dia.	2

III. III. MATERIALS USED

- 1) Sprocket- The material used for sprocket is mild steel due to its tensile strength and modulus of elasticity
- 2) Shafts- The material used for shafts are mild steel also because of high tensile strength and durability
- 3) Chain- The material used for chain using is mild steel.

DESIGN OF EXPERIMENTAL SETUP

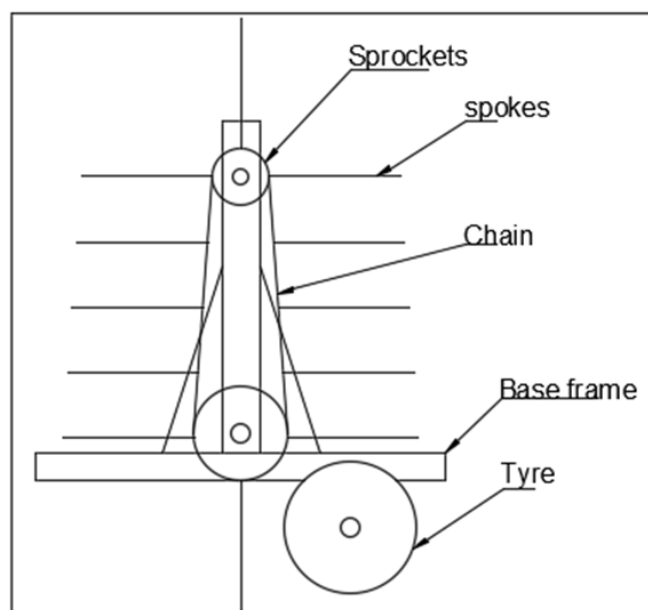


Figure 1

The purpose of the onion-set planter is to plant sets evenly in a furrow. To do this in the desired manner, the planter must perform a number of important functions. The planter must:

- (1) Open the furrow to the proper depth.
- (2) Meter the sets.
- (3) Deposit the sets in the furrow in an acceptable pattern.
- (4) Cover the sets with soil, and
- (5) Compact the soil around the sets without physical damage to the sets.

IV. USEFUL FORMULAE

1) Center distance:

$$= \frac{1}{8} [2 - (+) + \sqrt{ (2 - (+))^2 - 8 / 2 \cdot (-)^2 }]$$
 in inches

2) Chain length in pitches:

$$L = (2C/p) + ((N+n)/2) + ((P((N-n)/2 * 3.14)^2)/C$$

3) Shaft diameter:

$$D = P / \sin(\tau/2) \text{ PCD}$$

Where,

C = center to center distance

L = chain length in pitches

P = pitch of chain

N = number of teeth on large sprocket

n = number of teeth on small sprocket

IV. METHODOLOGY

1. Literature Survey & its review.
2. Study of different inversion of four bar mechanism.
3. Design of suitable mechanism for conversion of rotary motion into oscillatory motion.
4. Strength analysis of proposed planting mechanism.
5. Cost estimation of project.
6. Frame manufacturing and mechanism creating.
7. Final design and fabrication of different parts.
8. Experimental set-up design & Experimental testing.
9. Verification of results.

V. DESIGN CRITERIA

1. Use of pregraded onion-sets
2. Uniform rate of planting and uniform distribution of sets
3. Free gravity flow of onions
4. Easy adjustment of all components of the planter to control the planting rate, width, and depth
5. Opening the furrow
6. Covering the onion-sets with soil
7. Firming the soil without damaging the sets
8. Avoid injury to onion-sets throughout the planting

operation

9. Design simplicity

10. standardization

11. Product safety.

ORGANIZATION OF DISSERTATION

1. To design mechanism for plantation of onion plants.
2. Analysis of the mechanism.
3. Design the parts of system including frame on the strength basis.
4. Testing the setup of actual use.
5. It should helpful in farming operations at lower cost.

TYPES OF PLANTERS

Planting and seeding equipment may be divided into four major types:

1. Row crop planters - used for planting crops such as corn or grain sorghums
2. Grain drill and air seeders - used for planting small grain
3. Broadcast seeders - used for planting grains and grass
4. Specialized planters.

VI. OBJECTIVES

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SCOPE OF STUDY

Onion production is not always profitable for farmers owing to certain risks associated with it. National Horticulture Research and Development Foundation data shows that between 2008-13 farmers sold more than a third of their onions at a price below their cost of production, incurring losses for most of the year. On the other hand, during the same period, the

cost of input material for farming took a huge jump. While the cost of seeds shot up by around 300 percent, fertilizers, weed killers and insecticides also became expensive.

VII. REFERENCES

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