

## ONION HARVESTER CONVEYOR

**P. T. Wandhekar** <sup>1\*</sup>

Mechanical Engineering  
Shri Chhatrapati Shivaji Maharaj College of Engineering,  
Ahmednagar, India  
E-mail- wandhekar1997@gmail.com

**S. D. Pataskar** <sup>2\*</sup>

Mechanical Engineering  
Shri Chhatrapati Shivaji Maharaj College of Engineering,  
Ahmednagar, India  
E-mail- psuhas109@gmail.com

**P. M. Bande** <sup>3\*</sup>

Mechanical Engineering  
Shri Chhatrapati Shivaji Maharaj College of Engineering,  
Ahmednagar, India  
E-mail- pratikbande11@gmail.com

**H. B. Pawar** <sup>4\*</sup>

Mechanical Engineering  
Shri Chhatrapati Shivaji Maharaj College of Engineering,  
Ahmednagar, India  
E-mail- er.hbpawar@gmail.com

**Abstract-** Onion harvesting machine is based on reduction in effort required for harvesting of onion as well as for saving cost required in harvesting, specially for small scale farming. Our purpose of designing and fabrication of such small equipment is that it fulfills requirements of harvesting and reduces the cost of it. The main aim of the study is to determine optimum design and operational parameters of tractor drawn onion harvester. The tractor drawn onion harvester has two main working units e.g. digging unit and separating unit consisting of conveyer. The machine intends to lift the lodged crop, dig the bulbs, lift the dug bulbs and finally windrow the crop after separating the soil. Onion harvesting machine contains simple mechanisms with effective reduce need only human efforts for operations. The purpose behind this project is to develop a system which can easily attach to any tractor (more than 40 HP). Due to use of this mechanism we can reduce harvesting cost of onion and the farmer can get more output & income specially considering small scale farming.

**Keywords:** *Onion Harvester, conveyor, shaft, sprocket, bearing etc.*

### INTRODUCTION

Agriculture is the back-bone of Indian economy as over 75% of its population is directly or indirectly engaged in this profession. Beyond the traditional agriculture, new trends in cropping pattern have been recognized for changing the status of rural community. In the recent years, the importance of consuming vegetables for the maintenance of normal health has been realized in all parts of the world. The production of fruits and vegetables at present is 6.0 million tons and 7.0 million tons respectively and will be enhanced to 9.4 million tons and 10.0 million tons, respectively in 2014-15. India is the second largest producer of onions next to China, with an annual production of 5.46 million tones. It accounts for more than 60 % of the total export of fresh vegetable crops.

Traditionally, the bulbs are left in the field after digging for about a week for drying after which the tops are

removed and the crop is left in the shade again for curing for about a week. Drying and curing are two important processes in harvesting of onion. The purpose of drying the onions with the top after pulling from the ground is to remove excess moisture from the outer skin and necks of the onion in order to reduce the infection of disease causing organisms while minimizing the shrinkage caused by removal of moisture from the interior. If tops of onion bulbs are cut too close, the neck does not close well and decay organisms have easy access to the bulb. One of the main reasons for low productivity is the high labor requirement, which can be overcome by increased mechanization. Also, there are high post-harvest losses, which are due to unawareness of the farmer's with appropriate technologies for post-harvesting management. Harvesting of onion at the stage of maturity is a very important factor in deciding storage life of the onion, as the bulbs may be stored for six months.

### LITERATURE SURVEY

Onion (*Allium Cepa* L) 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 2014-15). 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, Table 1.1. The production share of different vegetables in 2014-15 as given in Fig. 1.1 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. Onion is a native crop of Asia and introduced in

India by Palestine. Centre of origin of onion is Iran and Pakistan. Onion belongs to family of Amaryllidaceous and genus Allium which contains about 300 species widely distributed in Northern temperate regions as biennials and perennials. It is one of the important underground bulbous, commercial vegetable and spice crops grown on a fairly large area in India and abroad for local consumption by common masses round the year. It is predominantly grown as rabbi season crop but kharif and late kharif crop are also cultivated in Maharashtra. Onions are classified into two groups viz. green and dry green.

### 1.1 PROBLEM STATEMENT

Onion separating and unloading operation is tedious, time consuming and labours intensive which increases cost of operation.

1. Design of separating and unloading system for onion harvesting.
2. Design of power transmission system to drive conveyor.

### 1.2 OBJECTIVE

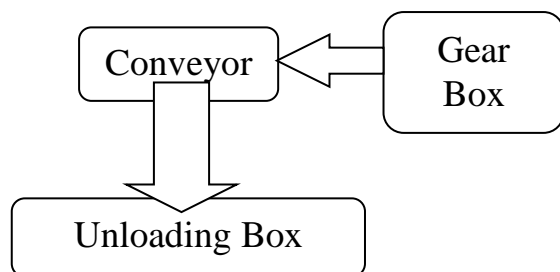
1. To reduce cost and time required for harvesting of onions.
2. To avoid the damage of bulbs.
3. To develop light weight of conveyor.
4. To avoid time consumption

### 1.3 SCOPE

1. Correct conveying of onion due to small distance in two pipes (upto 20mm).
2. Portable system and reduce labour dependency.
3. Accurate storing of onion to avoid time consumption
4. Reduce in damage of onion bulbs due to wrong handling.

### 1.4 DESIGNING AND ANALYSIS OF MECHANISM

Separating system consist of conveyor which include pipes are connected to chain. Chain are attach to sprocket which is mounted on shaft support on bearing.



### 1.5 METHODOLOGY

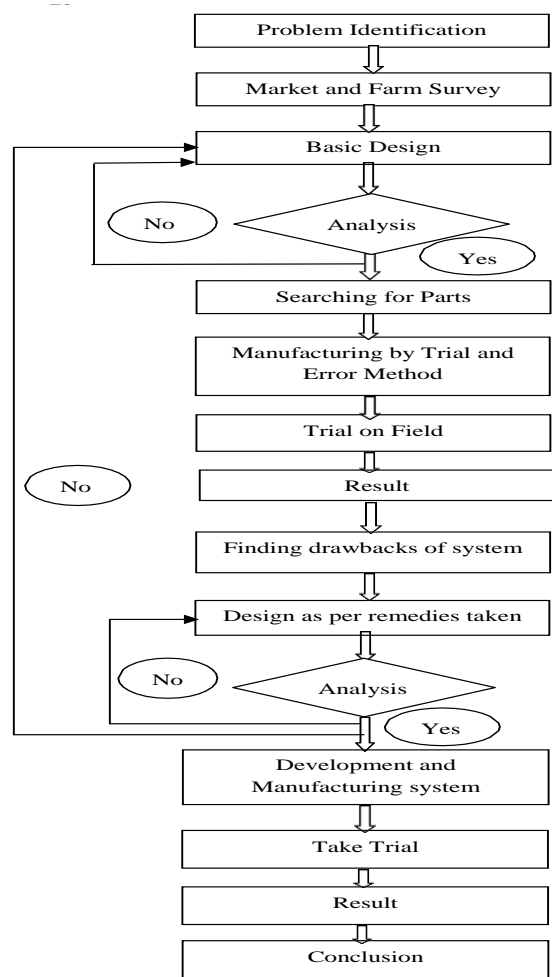


Fig. 1.4 Methodology

#### 1.4.1 Problem Identification

The onion harvesting is time consuming, requires higher man power. There is no any machine attachment is available in agriculture sector which easily attach and de-attach for onion harvesting. For minimizes time as well as cost, we design the separating system for separate soil form onion and store into unloading box.

#### 1.4.2 Survey to Farm and Industry

The onion harvester mechanism is developed by doing survey to the farms, industry and meet farmer and industrial expert. We find out that the digger system is available but at the rear side of tractor so it damage onion bulbs, so we decide for making system with conveyor and unloading box.

#### 1.4.3 Basic Design and Analysis

We design the system as per requirement and analysis it. According to fig.1.5 we design our system.

Name of the Components

1. Chain
2. Shaft
3. Bearing
4. Chain Drive

## 5. Unloading Box

### 1.4.4 Searching for parts

We have visited to Gupta Spare Parts Center, Apex industry for searching parts.

### 1.4.5 Manufacturing

We decided to manufacture the system according to basic design and doing the fabrication work. After manufacturing our system shown as fig.1.5

### 1.4.6 Trial

After manufacturing we take a trial in the farm and take results.

### 1.4.7 Results

We have find performance of our system

### 1.4.8 Finding Drawbacks

After taking trial we find out the drawback of the each unit of system.

### 1.4.9 Finding Remedies to Overcome Drawbacks

When drawbacks are identifying, then we find out solution to overcome the drawbacks and make system efficient.

### 1.4.10 Design and analysis According to Remedies Decide

We doing the design and analysis of parts with considering remedies that we take.

### 1.4.11 Manufacturing and Development

We are decides to rework on system to nullify the drawbacks for making our system more efficient.

### 1.4.12 Trial

We will take trial according to new system after changing design.

### 1.4.13 Result

After taking a trial we will get the better results

### 1.4.14 Conclusion

According to the result we will conclusion for our system.

## ADVANTAGES

### 1. Innovative Concept

### 2. Financial

Requires less cost than manual harvesting of the onions

### 3. Easy to attach and de-attach

It is easy to attach and de-attach to any tractor.

### 4. Time

Reduces overall time requires for harvesting as compared to manual harvesting

### 5. Reduces Human Fatigue:

Harvesting onion requires one operator and one helper.

## EXPECTED OUTCOME

1. Less number of labour requirement for separating and unloading operation.

2. Reduction in time for separating and unloading operation.

3. The damage of onion bulbs is reduce.

4. Reduces cost of harvesting.

5. Easy to attach and de-attach and light weight.

## REFERENCES

1. Zhonglai Thai, Ylan Zhao, Yongxing Sui, Jialin Hou, Chong Wong, Zhenyou Wang and Ling Zhao , “Design and experiment of a replant crops separating garlic harvester”,Open Mechanical Engineering Journal,12 2018.pg.67-80.
2. Abdalla .N.O.Khairy , Amgad Elssir, Abbas E. Rahma, Mysara Ahmed Mohamad, Elnogomi a.Omer, Hu Jian Dong, Yuan Liwei, “Effect of operation variables of potato digger with double chain conveyors on crop handling and machine performance”, International Journal of Environmental and Agriculture Research (IJOEAR) , vol-4,2018 .pg. 87-101.
- 3 .Mahesh chand singh, “Development and performance of a digger for harvesting onion”, International Journal of Environmental and Agriculture Research ( IJOEAR),vol-7,2014.pg.391-394.
4. Sungha hong ,Kyoseung Lee, Yongjin Cho, Wonyeop Park, “Development of welsh onion harvester for tractor”, Journal of Biosystems Engineering (JBE),2014.
5. Jaffer Massah Ahmad Lofti, Akbar Arabhosseini, “Effect of blade angle and speed of onion harvester on mechanical damage of onion bulbs”, Agriculture Mechanization in Asia, Africa and Latin America-June2012.pg.60-64.
6. Khura.T.K.and Indra Mani, “ICAR Design and development of tractor-drawn onion”, International Journal of Environmental and Agriculture Research (IJOEAR) ,June 2011.pg.44-48.