A Review paper based on Design and Development of An Onion Harvesting Machine

Dandekar Indraja Joshi Ajkhilesh Patil Vishal Patil Amarsingh Dandekar Ashutosh
Student T.Y.B.Tech Student Assistant Assistant Professor Assistant Professor
T.Y.B.Tech Assistant Professor PVPIT-Budhgaon PVPIT-Budhgaon PVPIT-Budhgaon PVPIT-Budhgaon

Abstract

India is the region that depends on Agricultural sector. As per the report of financial express in 2018, The contribution of Agriculture sector in GDP is 17 to 18%. Also it provides the employment to nearly 50% population. Still agriculture is the main source of livelihood of many families. Despite of all these facts farmers are facing many problems on the fronts of infrastructure and technology. There are much prospects in the Agrofield for the implementation of technologies to reduce the efforts of farmers. Various researches are working in this area for the developments of designs, machines which are adoptable by the farmers. Onion harvesting is one of the thrust area in the Agrosector in which people are contributing. This article reviws the proposed technologies and modifications in to it, by various technocrats and researcheres in the Onion Harvesting machines.

**Keywords:** - Onion Harvestors, Technology in Agriculture, Review of Onion Harvestor, Onion Harvesting Machine

1) INTRODUCTION

From seeding to harvesting, there are various operations in agriculture field which are laborous; and consuming much manual efforts. With the help of the technology the efforts of farmers can be reduced up to the great extent. Already in some areas like irrigation, people have started to use the modern techniques and equipments. Some operations like harvesting provides significant scope for the development of technologies due to its nature. Because in the case of harvesting there are two types
1) Harvesting of underground crops
2) Harvesting of the crops attached to the trees

Onion harvesting is always a challenge for the farmers, due to the following reasons
1) Onions grows unerground; hence it is laborous to harvest it.
2) Labour shortages have been there for this kind of work.
3) Cutters and Trimmeres can be used, but it consumes much time.
4) In the case of Manual Harvesting, damage is possible.
5) Onion harvesting machines are available in the market. But it can be used only after cost analysis.

Hence various people are working on the development and modification in the onion harvesting machines. Let us discuss the work of some researchers.

I) WORK OF VARIOUS RESEARCHERS

1) V.I. Pasare, et-al explained their approach about steering and braking system for self propelled onion harvester. Their main objective is, the machine should move with minimum turning radius, and it should stop at minimum distance after applying brake. For steering mechanism they have selected Ackerman geometry, ultimately managed to keep minimum turning radius 20859m. Also maintained desirable values of caster and camber. As per the conclusion their harvester is simple, compact, efficient and low cost. It also provides effective directional stability and efficient braking.

2) Akshay Ghule, et-al have proposed manually operated harvesting machine. The objective of their project is to develop a small and handy harvesting machine in lower cost. As per their theory the current machines used for the harvesting purpose are heavy and hence difficult to handle. Also their cost is unbearable for common farmers. They used simple components like v belt pulley, v belt, bevel gears, bearing for the building of machine. The frame is of MS material. The main features of their model is, it is compact and portable. As per their conclusion this machine is useful for the small farmers and affordable for them.

3) Amogh Parab, et-al considers an important aspect in his research. While harvesting there are certain habits and traditions of the farmers according to the region or locality. Considering this fact the researcher has developed manually operated Onion harvestor, which is useful in the country India. They also conducted the study of static force analysis and ground penetration testing.

4) HF Gavin, et-al have developed Power Triller Driven Onion Harvester. The objective of his project work is to provide the Onion harvesting machine for both, flat and raised beds. An important thing he has considered about the size of digger blades. As per his opinion it should be fit the majority size of farm plots. He considered Philippine as the geographical region. Hence he has suggested the manufacturing should be only with the locally available materials. As per his conclusion there is considerable reduction in the man hours (57 Hrs) due to his machine.
5) T.D. Mehta, et-al tabled the performance of tractor operated onion harvestor in his article. There harvester is suitable for varying row spacing. It is designed to minimize the damages to onion bulbs, while digging. Also their objective is that, it should be easily repairable in the local area and simple for maintenance purpose. Durability and economics are another important factors as per their opinion. They calculated the desired speed in between 2-4 Km/Hr for the safe operation. Also they advised to use main frame of any existing tractor for reduction in cost. The important point they mentioned, in the blade design, the blade should be designed in such a way that there should be minimum soil extraction during the operation. Shaking assembly is designed to break up the soil lifted by the blade. The significant description in this article is about the economical comparison of Manual and Mechanical cum Manual harvesting method. As per their conclusions there is 2.16 increase in overall net realized profit due to manual cum mechanical harvesting method with the efficiency around 95%.

6) In case of Onion Harvesting machine, it is equivalent to off-road vehicles. Ergonomics consideration is more important factor. Because harvester is always subjected to jerks and vibrations. Harsh Agarwal, et-al have suggested some valuable solutions regarding the ergonomics of the off-road vehicles. As per their instruction the off-road vehicle should be designed by keeping rough condition of soil in mind. They considered seat inclination, roll cage member adjustment, legroom space adjustment, accelerator, brake, clutch placement, size adjustment for the ergonomic design. Also they have discussed some points regarding off-road vehicle.

7) Sungha Hong, et-al have developed an an onion harvestor that can be mounted on mid-range tractors. There are five main components of this device. Soil destruction device, Welsh onion collecting device, Soil-separating device, Welsh onion feeding device, Loading and belt conveyor feeding device. As per the conclusion, they have made research about operating efficiency, harvest rate, damage rate, and residual soil. They are claiming their harvest rate is around 100% irrespective of the speed of the tractor.

8) Mahesh Chand Singh, et-al described a particular component i.e, digger in his research work. As per their conclusion blade is main component of the onion harvesting machine and effectiveness of the machine depends on blade and digger. The digger assembly consist of blade, shank, frame and cross member. As per their study the blade angle should be kept in between 14 to 20 degrees for cutting purpose. Various parameters used for the performance evaluation of digger are i) Operational speed of the digger ii) time iii) depth iv) weight of onion lifted etc. They have also calculated the digger efficiency and yield. In their conclusion they mentioned the digger speed should be maximum up to 4 Km/Hr. As per their conclusion their is 58% saving in labour 49% saving in cost due to Mechanical harvesting.
9) Ashwini Talokar, et-al have developed a cost effective onion harvester. To reduce the cost of harvesting and safety is their main objective of the research. As per their opinion harvesting depends on the type of bulb. For the experimentation purpose they used the crops that are growing in Vidarbha region of Maharashtra state. The harvester consists of simply welded rectangular frame to which the three bar linkage could be easily attached. For the blade they have used mild steel. The blade size is kept optimum to overcome the problem of bending. The blades are attached to the inner side of the web. While designing they have also considered the soil load on the harvester, power requirement and the bending moment. As per their conclusion proper harvesting can be done with the speed of 3Km/hr for safe working.

10) Jafar Massah, et-al proposes the Onion Harvesting machine based on the following factors 1) Mechanical damages of the onion bulb and 2) The mechanism to change the harvesting depth. They have developed a simple system which consists of a power screw, copulative arms, slider and blade to change the angle and depth of the blade. The basic mechanism is the four bar chain mechanism. The entire system is mounted on a chassis. As per their conclusion, vehicle speed and blade angle is contributes significantly in the proper harvesting of the onions. As per their outcome the vehicle velocity 2.4Km/hr and 20 degree provides lesser damage to the onions.

11) TAPAN KUMAR KHURA, et-al have conducted the research about Design and development of tractor-drawn onion (Allium cepa) harvester. An important aspect discussed in this article is about vibrations of the vehicle. Another aspect discussed in this article is the relation between the digging efficiency and speed ratio and the relation between separation index and length of conveyor. Also there is an analysis of damage percentage with respect to speed ratio. In the conclusion they have suggested v shaped blades. And damage of onion bulbs is only 5% during the operation of their machine. There is cost saving of 44%.

**Conclusion**

After reviewing the Articles on the Onion Harvesting Machines, it can be concluded that technocrats are constantly taking the efforts to make the process easier and to reduce the efforts of the farmers. The structure of the Machine is common, like main frame and its attachments. But modifications in various components like blades are improving the results. Most of the people are pressing on the factors like damage of the onion bulbs, Soil extraction, operational safety etc. Most common point observed in this study is the blade operation speed should be 2 to 4 Km/Hr for safety purpose. Another important point is damage of crop during the harvesting process. Then after economical consideration is the another important point. Most of the researchers came out with the results, that shows Mechanisation of harvesting process is economical though the initial cost of the machine is high. Vibration is the important but, rarely discussed factors in the entire research. Also aesthetics and ergonomics are important in this case; as these types of vehicles are
exposed to environment and running on rough soil. After all there is scope for modifications and improvement by using electrical and electronics systems with mechanical devices.

References