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Development of Potato Harvesting Model

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Abstract – *This study aim to develop a potato harvesting machine, which help farmer to separating and shipping of potato with minimum losses within a specific time by reducing the human effort as compared to manual effort. This paper is designed based on speculative data. The future work is also considered for the development or it can be connect to any vehicle that can drive easily that upturns the productivity of the product and diminishes the human effort.*

Key Words: Potato Harvesting, Agricultural, harvester chain speed, new system Development, Mechanical Harvesting

1. INTRODUCTION

Agriculture plays a dynamic role in Indian economy. So any development in the productivity related task help to escalation Indian farmer's status and economy. Although agro industry is accreted of lingering peace. The sole culprit for slogging in pace of accretion (in agro industry) is dependency on customary approaches and equipment. In Brazil, harvesting is usually performed manually or semi-mechanized, and share responsibility for the high cost of production. In the semi-mechanized harvesting, diggers are used, coupled to a tractor, which degrade the furrows and expose the tubers. Later, the collection is done manually by men or young women who also carry out a preliminary selection field. However, self-propelled harvesters have been used in advanced countries for potato culture. The trend toward mechanization of the total harvest is related to the availability and cost of manpower. These harvesters chop the furrows apart and collect the potatoes, in two or more rows, directing them to the carrier trucks. They are larger machines, which require elongated rows to avoid maneuvers and frequent loss of time, which reduce the operational capability of the machine. The process of mechanized harvesting of potatoes can represent a great advance for the producing regions, mainly to optimize the production process, with increased production area, faster removal of tubers from the ground when free risk of attack from pests and diseases, and stronger compliance with delivery dates of production. However, the decision to invest invariably involves risks, which must be provided when one decide to invest in certain equipment.

2. LITERATURE REVIEW

Potato is one of the main human alimentary resources. It was the sixth alimentary product in the world after sugar cane, maze, rice and paddy, wheat and milk (FAO, 2011) and the third product in Iran after wheat and sugar cane (Ministry of agriculture, 2011) There are problems regarding potato cultivation and storage in Iran. Early potato diggers were in the form of spinners, diggers, and potato plows. The harvesting process, though mechanically assisted by the late 1800s, still relied on hand pickers to collect the crops, and continued to do so until the mid-20th century. The first mechanical potato diggers were developed in England in the late 19th century. The first such machines were similar to plows, with a flat share in place of a moldboard, and a row of prongs, angled to bring the potatoes to the surface. Vasta *et al. (*1993) made a potato digger with oscillatory sieves and studied effects of blade shape, advance seed and sieve vibration on potato digger operation. The best results were related to V shape blade with 99.23% intact potato and minimum cut damages of 0.65% and zero bruise

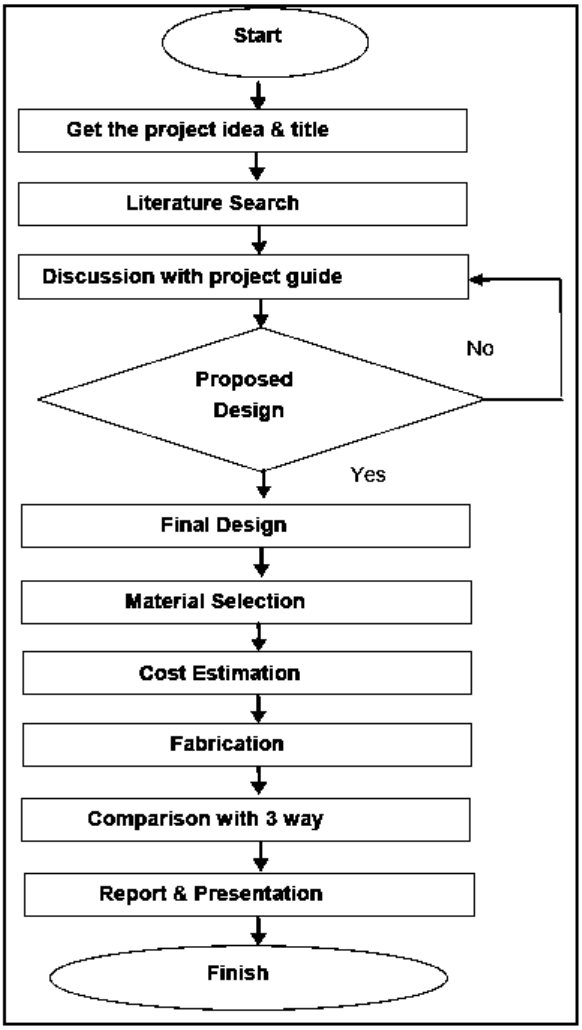
According to Muhhamad *et al., (*2003), The Mechanical harvest of potato relative to manual harvest causes 65% frugality at harvest time and 45% at harvest costs. These numbers result show importance of activities in the field of agriculture.

Ibrahim. M. M.; Amin. E, and A Farag had explained multipurpose digger for harvesting root crops (potato and peanut), separating and transporting them over soil surface with minimum losses, mechanical damage and cost. Root crops digger was developed by adding a successful vibrating separating mechanism that should base on separating root crops with minimum losses and damage. The developed digger was tested at three levels of forward speeds (1.8, 2 and 2.6 km/h), for potato, (1.4, 1.8 and 2.3 km/h), for peanut and three different tilt angles (12° and 24°). The experiments were carried out during two successful agricultural seasons of 2007 for peanuts at El Assasin country, El Sharkia Governorate and 2008 for potato at Manzala city, El Dekahlia governorate

Wakchaure, et al. (2017) made a potato harvesting machine and tested in field and the result shown is in 1acre farm we required 20-25 labours but by implementing this machine in 3 hours one labour has complete that work. From this machine we save time as well as cost of the labour and reduces the much mannual effort. Now there is a new potato harvesting machine and it`s different parts, mechanism simulation, performance and efficiency should be studied. The aim of this study is to probe these factors.

3. CONSTRUCTION

3.1. Methodology



3.2. Component Design

The different types of part that have be assembled to fabricate the Potato Harvesting Device are viz.

i. Frame
ii. Wheel
iii. Shaft
iv. Lead screw
v. Chain sprocket
vi. Conveyor mechanism
vii. Spur gear

3.3. Frame

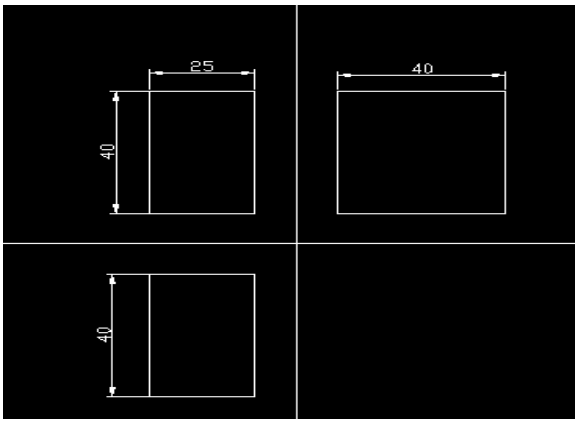


Fig 1: Frame Dimensions

The raw material used for fabrication of frame is mild steel square pipe dimension of 25 mm x 25 mm x 5 mm. The length of frame is 40 inch, and its width is 25 inch, height is 40 inch. Channel for the hopper is made on the upper side of the frame. Arrangements are made for holding transmission shaft on top portion of the frame. Two vertical bars are welded on the front side of the frame for holding the base wheel.

3.4. Hopper

The under script is the procedure for fabrication of the hopper of Metering Device .The raw material for fabrication of hopper is mild steel sheet of 20 gauges.

Hopper is made up in following steps.

Material: - Mild steel sheets of following dimension.
Length – 15 inch
Width – 12inch
Depth – 12 inch

3.5. Wheel

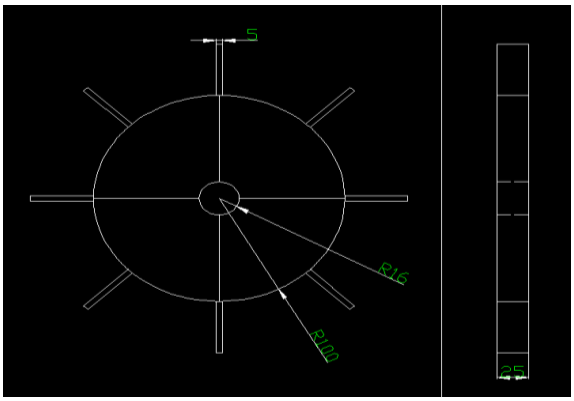


Fig 2: Rear Wheel

Wheel is made up of mild steel plate, the plate is bent into a circular arc of dia 8 inch which is welded after rolled. The wheel has no. of teeth's made of same plate. The length of the teeth is 2 inch. The overall diameter of the rear wheel is 12 inch.

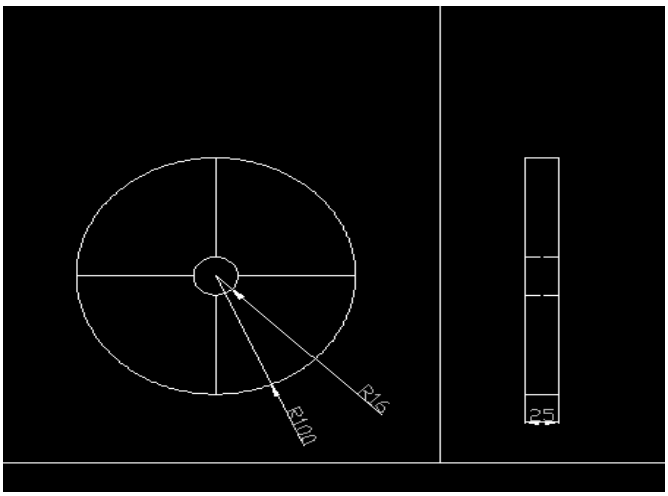


Fig 3: Front Wheel

3.6. Selection of Bearing

As load acting on bearing consist of two components Radial & Thrust. So we have used single row deep groove bearing. This bearing has high load carrying capacity & suitable for high running speed.

Table 1: Selection of Bearing

Principle Dimension			Basic load Rating in N		Designation
D	D	B	C	C_o	
12	32	10	6890	3100	6201

Where,

d = Inner diameter of bearing in mm
D = Outer diameter of bearing in mm
B = Axial width of bearing in mm
C = Dynamic load capacity in N
C_o = Static load capacity in N

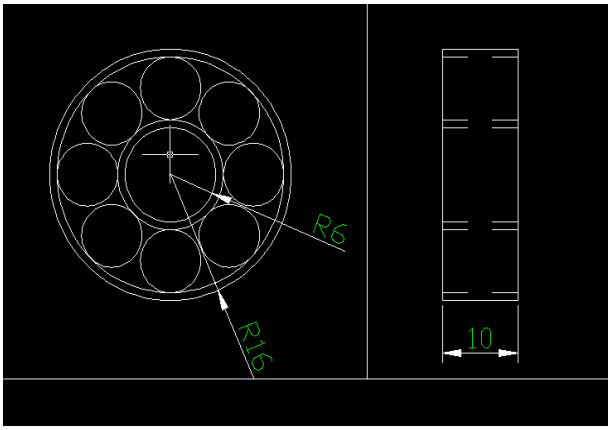


Fig 4: Bearing

4. WORKING

As harvesters move through rows of potato crops, adjustable steel discs cut any debris or foliage that may block the mouth of the elevator. These discs can be set to cut soil away from the sides of a row's ridges in order to reduce soil uptake by the elevator. Harvesters comprise a digging share, fixed in front of the elevator and attached to its frame, which must be set to cut beneath the lowest potatoes. Once the digging share has undercut and loosened the lowest level of potatoes, the soil and crop is moved onto the elevator web. Soil and debris then fall through the chain web, while the potatoes conveyed rearward to the top of the harvester; this is the primary separation process.

Once at the peak of the harvester, the tops of the potatoes are taken off by an elevator with fitted bars, and carried away; the potatoes fall through the web onto another cross-web conveyor, often consisting of rubber-covered bars. They are transferred to two additional web conveyors in order to remove soil before reaching an adjustable separator. This separator, an endless rotating belt, can be lifted or lowered at the end nearest to the potato conveyor. Potatoes roll down the separator toward a potato conveyor, while other flat or rough objects remain on the separator to be transported onto a stone and trash conveyor. Once fully separated, the potatoes are transferred to a loading conveyor of adjustable height, and moved to a trailer traveling alongside the harvester.

5. CONCULSION

This paper presents theoretical aspects of potato harvesting machine. In this work we considered all the effort taken by human being that has to be reduce. In that future work is smooth moving and optimization of size. We improve the design world marked demand and customer requirement is quality product within time in a low cost. The present works only included the design of components. We can also modify this design for two row harvesting as well as reduce the

height as well as system loads by increase wheel size and by modifying in design.

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