



## Research Article

# POWER OPERATED TURMERIC HARVESTER MACHINE

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**Abstract:** Power operated turmeric harvester machine is an important harvesting device of turmeric increasingly considered an alternative to traditionally harvesting because of reduced labour, time saving, drudgeries, higher profit and comparable yields. In the conventional method of harvesting, the rhizomes are dug manually with the help of hand tools. This method of harvesting is highly labour intensive, tedious and time consuming. The labour costs of harvesting turmeric account for well over 30 to 40 percent of the total cost of production. Yet harvesting by hand digging leads to some avoidable damages. The better performance of power operated turmeric harvester in terms of damage percentage, digging efficiency, field efficiency and saving in operational cost over traditional method.

**Keywords:** Turmeric harvester, Field capacity, Field efficiency, Digging efficiency

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## Introduction

Harvesting is an important agricultural operation in turmeric spices crop. Harvesting is performed by generally manual method with the help of hand tool i.e., special fork type of spade pick axe bullock drawn and power operated devices and by using traditional diggers drawn tractors or power tillers. Traditional method of harvesting in turmeric crop is more time consuming and drudgeries work. Turmeric is also called as "The Golden Spice" and Indian Saffron [1].

Turmeric contains appreciable quantities of proteins (8.6 %), fats (8.9 %), mineral matters (6.8 %), carbohydrates (63.0 %), vitamin A (175 IU/100 gm), Sodium (0.01 %), potassium (2.5 %) and fibre (6.9 %) [2]. Main turmeric producing region in India are the southern region of Telangana, Andhra Pradesh, Tamil Nadu and Karnataka, the eastern region of Orissa and West Bengal and the Western state of Maharashtra. During 2020-21, the country produces 1101.920 Thousand tonnes of turmeric from an area 294.542 Thousand ha [3].

## Turmeric Harvesting Machine

Shahare *et al.*, (2011) [4] developed tractor mounted turmeric digger at Dr. B.S. Konkan Krishi Vidyapeeth, Dapoli. The developed tractor mounted turmeric digger consists of mainframe and digging unit. The main frame was made of standard mild steel L-section of size 65 x 65 x 06 mm. The size of the main frame was 2400 x 640 mm. The half sweep blades were welded to the shank at the bottom and the shank was fitted to the main frame with the help of nuts and bolts. The sharpened blades were attached with nut and bolts to the shank bottom of size (50 x 15 mm) and 650 mm height fixed on the main frame separately. The rhizomes damaged by the newly developed turmeric digger were found to be 3.85 % which was 69.2 % reduction in damage than the existing (12.5 %) machine.

The digging efficiency was found to be 97.85 % which is 22.31%, improvement over the existing (80 %) machine. The field efficiency was found to be 62.96 %, which is 12.42 % better than the existing (56 %) machine. The cost of operation of the unit is Rs. 2751 per hectare, which gives the saving in cost of Rs. 1329 per hectare (32.57 %) over traditional methods.

Annamalai *et al.*, (2013) [5] studied the performance of power tiller mounted turmeric harvesters in Tamil Nadu state. It was evaluated at the optimum crop and operational parameters by the power tiller (12.06 hp) mounted turmeric harvester

joint with chisel type single digger blade for digging one row turmeric crop. The rake angle (20°) of the digging blade and conveying speed (4.5 km/h) of the rubber type conveyor were optimized by experimentation. The mechanical harvester performed better with rhizome harvesting efficiency of 98 % at soil moisture of 15.5 % (d.b.) with damage of 2 % with an effective field capacity of 0.08 ha/h. The average harvesting efficiency of traditional method of manual digging was found to be 90.50 % and damage caused to rhizomes was 7.1 %. Harvesting by mechanical harvester as compare to manual harvesting, the saving in cost was 59.82 %. The payback period was obtained half year and breakeven point was 16 % of annual for the power tiller turmeric harvester. Better result by mechanical harvesting as compare to traditional method and less damage was found in the mechanical harvesting.

Khambalkar and Thakare (2014) [6] developed a machine for turmeric harvesting at Dr. Panjabrao Deshmukh Krishi Vidyapeeth, India. Uprooting of turmeric rhizomes from the soil is a very crucial operation. Traditionally it requires more labour and time. The cost of harvesting turmeric by traditional operation is very high. The total work load of soil and the mass of turmeric was determined and found to be 0.5984 N/cm<sup>3</sup>. At which the power (PTO) estimated to work the machine properly was 7.16 hp and draft needful for the speed (2 km/h) selected was worked out to be 4.583 KN. The field capacity turmeric harvester was found to be 0.129 ha h<sup>-1</sup>. The depth of operation was found to be 20.2 cm. The digging efficiency of the machine was found to be 98.82 % and the percentage of damaged rhizome was found to be 1.32 %. The field efficiency of the machine was found to be 80.57 %. The cost of operation was worked out and found to be 1913 /ha with 33.21 % saving over the traditional method of harvesting.

Khadake (2015) *et al.*, [7] developed a turmeric harvester operated small size tractor (18-24 hp) by three-point linkage was tested at PDKV, Akola and at farmers field. The machine is operated on a forward or pulling force principle to disturb the soil mass effectively. The soil cutting blade of the trapezoidal section is inclined at an angle of 25° with horizontal surface of ground, which penetrates into the soil up to the depth of 18-20 cm with the effective working width of 600mm. The soil mass and rhizomes uprooted by the blade passes over the web which is having an inclination of 10° with upper surface of soil cutting blade and a length of 500 mm.

The loosen soil mass and the turmeric rhizomes after travelling at 270 mm raised height at the end of the web fall on the ground surface. The uprooted turmeric rhizomes are easy to collect from the field. The average digging efficiency of the tractor mounted turmeric harvester was found to be 98.82 % and average damage percentage was found to be 1.32 %.

Deshvena *et. al.* (2019) [8] was a developed a tractor drawn turmeric digger cum separator at Department of Farm Machinery and Power Engineering College of Agricultural Engineering, Parbhani, V.N.M.K.V. Parbhani (Maharashtra State) India. The tractor drawn turmeric digger cum separator consisted of a main frame, digging blade, depth gauge wheel, power transmission system and conveying mechanism. The performance evaluation of machine was tested at Khanapur village Parbhani district of Maharashtra State. The experiment was undertaken in black cotton soil; the range of observed moisture content was 12.23 to 16.28 per cent moisture content (db) at the time of harvesting. Prabhakaran (2020) [9] results show that designing the small scale turmeric harvester for the crop with low cost will help the cultivators to cultivate with less labour charge and reach the industries on time [10].

## Conclusion

A power operated turmeric harvester is an important machine which is time saving, fulfillment of labour shortage and higher profit as compared to the traditional method. The developed turmeric digger has shown better performance for turmeric digging in terms of rhizomes damage percentage, digging efficiency, field efficiency, draft requirement, fuel consumption and substantial saving in operational cost over the traditional method.

**Application of research:** This research paper will help for better designing for the development of new power turmeric harvester machine. This is a knowledge full information for new develop power operated turmeric harvester machine.

**Research Category:** Farm Mechanization in Agriculture

Abbreviations: KN- Kilo Newton, d.b.- Dry basis

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**Cultivar / Variety / Breed name:** Turmeric

**Conflict of Interest:** None declared

**Ethical approval:** This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

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