

Farm Mechanization of Agricultural Farms

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SUMMARY

Agricultural mechanization is an important input to agriculture for performing timely farm operations; reducing the cost of operation; maximizing the utilization efficiency of costly inputs (seeds, fertilizer, plant protection chemicals, water and agricultural machinery); improving the quality of produce; reducing drudgery in farm operations; improving the productivity of land & labour and for improving the dignity of labour. Currently, the overall agricultural mechanization level in the country is around 47% which is lower than that of other developing countries such as China (59.5%) and Brazil (75%). The panel has noted that contribution of agricultural mechanization in India leads to saving in seed (15%-20%), fertilizer (15%-20%), cropping intensity (5%-20%), increase in crop yield (13%-23%), improvement in germination rate (7%-25%), and labour cost (20%-30%). The strategy for mechanization in different regions will be different depending on the conditions and resources of that region. Mechanization of farming has allowed an increase to the area that can be planted and has contributed towards increased yields, mainly due to the precision with which the crop husbandry tasks can be accomplished. In fact, most farmers in developing countries experience a greater annual expenditure on farm power inputs than on fertilizer, seeds or agrochemicals.

INTRODUCTION

Farm tools and implements are needed for timely completion of various agricultural operations and precise application of inputs to have higher productivity and profitability and also to reduce the drudgery of farm workers including women. 80% of farm holdings in India are less than one hectare and source-wise, current power use is 65% mechanical, 21% electrical, 8% animal and 6% human, respectively. Appropriate and selective mechanization is needed for production agriculture, post-harvest management and value addition using a proper blend of conventional and renewable energy sources to achieve higher income. While mechanization would augment the agricultural production by 10-15%, post-harvest management could add 5-10% more by reducing losses. The potential for value addition to agro-produce including by-products is immense, 250-400%, depending upon the commodity and the level of processing. The farm power availability during different periods is given in Table 1. It is clear from the table that farm power availability in the country is increased from 0.28 kW/ha in year 1960-61 to 2.761 kW/ha in year 2020-21. Share of human and animal power is less on total farm power availability in the country where medium to high levels of mechanization as compared to the area that have less mechanization level in term of farm power availability.

Table 1. Farm power availability in the country during different periods

Periods	Power, kW/ha	Source
1960-61	0.28	Singh <i>et al.</i> 2014
1971-72	0.32	Singh, 2006
1981-82	0.471	De, 2005
1991-92	0.759	
2001-02	1.231	
2005-06	1.502	
2009-10	1.724	ICAR, 2013
2011-12	1.92	Singh, 2019
2016-17	2.24	Mehta <i>et al.</i> 2019
2018-19	2.49	https://agricoop.nic.in/en/MechanizationDiv#gsc.tab=0
2020-21	2.761	Singh and Singh, 2021

Few important farm tools and equipment for mechanization of agricultural production operations are as given as:

Important farm tools and equipment for mechanization of agriculture

Rotavator: Rotavator is used for seedbed preparation, weed control, mixing of soil with crop residue and fertilizer and puddling of the soil. It saves times (30-35%), water (30%) and cost of operation (20-25%) as compared to tillage by cultivator and harrow.

Sub Soiler: It breaks soil hard pan up to a depth of 60 cm and is used for rain water retention and suitable for dry land farming areas. Use of this implement results in increased yield up to 30% and the cost of operation is 1000/ha.

Zero Tillage Machine: Zero-Tillage Machine Use of ZTM for direct sowing of wheat after rice saves time (50%) and cost (40%) as compared to the conventional practice of seedbed preparation and sowing. It costs ` 18,000-22,000 depending upon the size of the drill and the cost of operation is about ` 1,500/ha.

Happy Seeder: It combines two units, one for straw management and the other one is for sowing wheat after paddy. Machine cost is ` 60,000 and the cost of operation is ` 1,750-2,000/ha. Green gram can also be sown in summer after wheat in standing stubble which helps in moisture conservation and soil temperature regulation.

Raised Bed Former: This equipment has been developed to facilitate Furrow Irrigated Raised Bed (FIRB) cropping system for wheat after soybean or maize. It reduces tillage requirement and the subsequent crop can be sown directly on the beds without field preparation. The benefits of the machine are saving of cost of operation (20-30%), seeds (25%), fertilizer (25%) and irrigation water (20-30%). The cost of the machine is ` 45,000.

Ridger Seeder: The ridger seeder is suitable for dryland farming. It forms ridges and furrows and does sowing on the ridge or at side of the ridge or in the furrows, as desired. For Kharif crops seeding is done on the ridges in paired – row system and for rabi crops seeding is done in furrows. It is suitable for planting maize, ragi, gram, pearl millet, etc. There is increase of about 15% in the yield compared to conventional method of sowing. It costs ` 20,000 and cost of operation is ` 1,050/ha.

Automatic Potato Planter: It is a two-rows or three rows equipment to plant potato tubers of 20-40 mm size at 250-400 mm plant spacing. It can also be used for intercultural and earthing operation. Its field capacity is 0.40 ha/hr, cost is ` 25,000 – 30,000 and the cost of operation is ` 1,050/ha.

Self propelled vertical conveyor reaper: It is suitable for harvesting and windrowing cereals and oilseeds crops. This machine costs ` 60,000 and the cost of operation is ` 1,500/ha compared to ` 2000/ha by conventional methods. It saves 50% labour and cost of operation and 75% operating time. The equipment gives negligible losses for paddy crop and within permissible limit for wheat.

Wheat Straw combine: This machine cuts and gathers the left over straw from the combine harvested field and chops it into fine straw and blows it into a trailer. The capacity of the machine varies from 0.4 – 0.5 ha/hr and it recovers 55-60% of straw in addition to 75-100 kg of grains / ha resulting into an average net saving of ` 1,750/ha.

High capacity multicrop thresher: It is suitable for threshing wheat, maize, sorghum, gram, pigeon pea, soybean, sunflower and other crops. It costs ` 75,000 and cost of operation is ` 5/q. Output capacity is 550 – 2890 kg/ ha depending on the crop being threshed. It saves 50% labour and time of operation.

Pressurized Irrigation System (Sprinkler & Drip): It consisting of sprinkler and drip systems help to increase yield by 40-50% and also achieve water saving of 30 – 70% depending upon the crop. Sprinkler irrigation can be adopted for almost all crops (except rice and jute) and in various soils and topographic conditions. Drip irrigation is more effective in horticultural crops, cotton and sugarcane.

CONCLUSION

Special attention is needed for increasing mechanization in low mechanized areas by enhancing the use of various farm operations by tractor, power tiller, electric prime movers etc. There is need to concentrate on

mechanizing the areas with farm power availability of less than 1 kW/ha and up to 1.75kW/ha. Tractor population in the country has increased 1216.6 times to 9.733 million and the annual domestic sale during 2022-23 increased to 1074.2 times of the year 1961. There is increasing trend of 41- 50hp tractors from 31-40hp tractors from 2014-15. There is a tractor for every 14-ha net sown area.

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