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Impact of farm mechanization on crop productivity in Vidarbha

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Abstract

Agricultural mechanization is the use and servicing of all types of agricultural tools, equipment, and machines. Farmers of India like their counterparts in other countries are interested to improve their income. The present study was conducted in Vidarbha region of Maharashtra for the period 2000-01 to 2015-16 which was divided into 4 (four) time stages i.e. 2000-01, 2005-06, 2010-11, 2015-16 from all 11 districts of the Vidarbha region. The district- wise secondary data on indicators of agricultural mechanization and productivity of crops will be collected from various publications. To study the relationship between farm mechanization and productivity analyzed by using regression analysis. It observed that the year 2010-11 have the highest and lowest significant effect of agricultural mechanization indicators on productivity. It concludes that the year 2015-16 have an average significant effect of agricultural mechanization indicators on productivity.

Keywords: Mechanization indicators, crop productivity, regression analysis, and significant effect, Vidarbha region

Introduction

Agricultural mechanization is the use and servicing of all types of agricultural tools, equipment, and machines. Various types of agricultural operations performed on a farm seedbed preparation, cultivation, harvesting, transportation, silage cutting, feed grinding, threshing, winnowing and lifting of irrigation water, etc. Agricultural machinery is a general term used to describe tractors, combines, implements, machines and any other device more sophisticated than hand tools which are animal or mechanically powered. Agricultural equipment generally refers to stationary mechanical devices such as irrigation pump-set. Farm mechanization is very closely related to the shortage of human labor and industrial development in the country. Drudgery and physical exertion are typical of much Indian agriculture today. Farmers of India like their counterparts in other countries are interested to improve their income. Timeliness of operation, the precision of operation, improvement of the work environment, enhancement of safety, reduction of the drudgery of labor, reduction of loss of crops and food products, increased the productivity of land, increased economic return to farmers, improved dignity of farmers and progress and prosperity in rural areas. Increasing productivity by updating executive operations to gain more power, increasing the level of cultivated land, moving toward industrialization and strengthening the market for rural economic growth and ultimately improving the livelihoods of farmers are the goals of farm mechanization.

Objective

To study the relationship between farm mechanization and productivity of selected crops.

Methodology

The present study was conducted in Vidarbha region of Maharashtra for the period 2000-01 to 2015-16 which was divided into 4 (four) time stages i.e. 2000-01, 2005-06, 2010- 11, 2015-16 from all 11 districts of the Vidarbha region. The district-wise secondary data on indicators of agricultural mechanization and productivity of crops will be collected from various publications.

The following indicators will be selected purposely to study the farm mechanization.

I. Indicators of farm mechanization

1. No. of ploughs / 100 hectare of net cultivated area
2. No. of disc harrows / 100 hectare net cultivated area
3. No. of rotavators / 100 hectare net cultivated area
4. No. of cultivators / 100 hectare net cultivated area
5. No. of puddlers / 100 hectare net cultivated area
6. No. of levelers/ 100 hectare net cultivated area
7. No. of sowing devices / 100 hectare net cultivated area
8. No. of sprayers/ 100 hectare net cultivated area
9. No. of electrical and diesel pumps / 100 hectare net cultivated area
10. No. of threshers / 100 hectare net cultivated area
11. No. of tractors / 100 hectare net cultivated area
12. No. of harvesters / 100 hectare net cultivated area

II. Crops selected

The following crops were selected purposely based on contributing each selected crop more than 80 percent area from the gross cropped area for the study.

1. Cotton
2. Soybean
3. Paddy
4. Wheat
5. Gram

Analytical tools

Relationship between farm mechanization and productivity were studied using regression analysis and the best fit was decided based on R2 and significance of coefficients.

Results and Discussion

The study has been intentionally planed in Vidarbha region for the period 2000-01 to 2015-16 in all the 11 districts. Data on number of ploughs, number of disc harrow, number of rotavators, number of cultivators, number of puddlers, number of levelers, number of sowing device, number of sprayers, number of electrical and diesel pumps, number of threshers, number of tractors and number of harvesters has been recorded in various publications at four times stages 2000-01, 2005-06, 2010-11 and 2015-16. It was observed that the farm mechanization the developmental status of the districts played an important role in the productivity of selected crops for the study. The result of the different regression equation fitted was given below table 1 to 4.

Table 1 presents the relationship between farm mechanization and productivity in the year 2000-01. It is indicating that the R2 value with respect to cotton, soybean, rice, wheat, and gram were 0.28, 0.24, 0.23, 0.40 and 0.25 respectively which is recorded that the indicators of farm mechanization explained 28 percent, 24 percent, 23 percent 40 percent and 25 percent variation in productivity of these crops. It indicates this year have a lower significant effect of farm mechanization indicators on crop productivity.

Table 1: Relationship between farm mechanization and productivity (2000-01)

Sr. No.	Crops	Equation fitted	Value of coefficient			r	R2
			a	b	c		
1	Cotton	Quadratic	-1384.83	6035.90	-5277.27	0.53	0.28
2	Soybean	Power	7.04	0.39		0.49	0.24
3	Rice	Power	6.30	-0.74***		0.48	0.23
4	Wheat	Linear	2105.49	-1702.95**		0.63	0.40
5	Gram	Linear	660.69	-322.72***		0.50	0.25

** 5% level of significance and ***10% level of significance

In table 2 indicated the relationship between farm mechanization and productivity in the year 2005-06. The result for farm mechanization and productivity highest value of R2 was observed in cotton crop i.e. 0.55 followed by wheat and rice 0.40, gram 0.33 and soybean 0.24. This means that the variation in productivity explained by the indicators of

farm mechanization was 55 percent, 40 percent, 33 percent, and 24 percent were cotton, wheat, and rice, gram and tur respectively. It concludes that the year 2005-06 has a significant effect of farm mechanization indicators on selected crop productivity.

Table 2: Relationship between farm mechanization and productivity (2005-06)

Sr. No.	Crops	Equation fitted	Value of coefficient					r	R2
			A	b	c	d	e		
1	Cotton	Polynomial	11838.96	- 125435.77***	459969.91***	- 688008.91***	360804.25***	0.74	0.55
2	Soybean	Quadratic	-154.82	5084.15	-5636.74			0.49	0.24
3	Rice	Linear	-468.53	2611.31**				0.63	0.40
4	Wheat	Quadratic	607.12	3421.01	-4468.67***			0.64	0.40
5	Gram	Linear	971.80	-652.04***				0.58	0.33

** 5% level of significance and ***10% level of significance

Table 3 presents the relationship between farm mechanization and productivity in the year 2010-11. Agricultural mechanization and productivity of selected crops gave the highest R2 value in case of cotton crop i.e. 0.73 followed by gram 0.42. In wheat and rice, the R2 value was same i.e. 0.37 whereas in soybean lowest R2 value was observed i.e. 0.31. It means the agricultural mechanization and productivity of

selected crops explained the variation in productivity of cotton, soybean, rice, wheat, and gram at the extent of 73 percent, 31 percent, 37 percent, 37 percent, and 42 percent respectively. It concludes that the year 2010-11 have the highest and lowest significant effect of agricultural mechanization indicators on productivity.

Table 3: Relationship between farm mechanization and productivity (2010-11)

Sr. No.	Crops	Equation fitted	Value of coefficient					r	R2
			A	b	c	d	e		
1	Cotton	Polynomial	27704.08	- 255175.98**	843937.95**	- 1167783.27**	574335.92**	0.85	0.73
2	Soybean	Power	6.93	-0.42***				0.56	0.31
3	Rice	Linear	-854.69	2903.21**				0.61	0.37
4	Wheat	Linear	2488.36	-1896.19**				0.61	0.37
5	Gram	Linear	1496.99	-1126.70**				0.65	0.42

** 5% level of significance and ***10% level of significance

Table 4 observed the relationship between farm mechanization and productivity in the year 2015-16. Agricultural mechanization and productivity of selected crops gave the highest R2 value in case of rice crop i.e. 0.46 followed by cotton 0.43, wheat 0.39 soybean 0.38 and gram 0.35. It indicates that the farm mechanization and productivity explained 43 percent, 38 percent, 46 percent, 39 percent and 35 percent variation in productivity of these crops. It concludes that the year 2015-16 have an average significant effect of agricultural mechanization indicators on productivity. Hole (2006) ^[2] observed the effect of resource

imbalance on the cost of production with the help of regression analysis was R2 value with respect to cotton, jowar, soybean, and tur were 0.19, 0.12, 0.22 and 0.23 respectively which indicated that the variables of natural resource profile explained 19 per cent, 12 per cent, 22 per cent and 23 per cent variation in cost of production respectively and with respect to production resource profile, variation in cost of production explained by the variables were 13 percent, 11 per cent, 17 per cent and 34 per cent respectively.

Table 4: Relationship between farm mechanization and productivity (2015-16)

Sr. No.	Crops	Equation fitted	Value of coefficient					r	R2
			A	b	C	d	e		
1	Cotton	Cubic	-5198.86	40516.55***	-85168.41***	55333.50***		0.66	0.43
2	Soybean	Polynomial	18947.75	- 166758.11***	525570.70***	- 697410.62***	331747.30***	0.62	0.38
3	Rice	Linear	-2816.22	7421.32**				0.68	0.46
4	Wheat	Polynomial	- 15941.77	146002.05	-442068.68	566656.72	-262776.49	0.62	0.39
5	Gram	Quadratic	139.67	2508.76	-2839.76***			0.59	0.35

** 5% level of significance and ***10% level of significance

Conclusions

It indicates this year have a lower significant effect of farm mechanization indicators on crop productivity. The year 2005-06 have a significant effect of farm mechanization indicators on selected crop productivity. It observed that the year 2010-11 have the highest and lowest significant effect of agricultural mechanization indicators on productivity. It concludes that the year 2015-16 have an average significant effect of agricultural mechanization indicators on productivity.

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