

**EFFECT OF TECHNOLOGY ADOPTION ON ONION PRODUCTION IN MAHARASHTRA**

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**ABSTRACT**

The 486 onion growers from nine agro - climatic zones of Maharashtra were interviewed in order to study the impact of technology adoption of vegetable production . The level of adoption in case of use of FYM , fertilizer application and plant protection measures have been analyzed . The data on input use , output and their prices were collected from adopters and non-adopters through the specially designed schedule . Multiple regression analysis has been carried out in order to know that to what extent the adoption of technology is affecting the cost and return structure. The study suggested that there is need to educate the vegetable growers by extension agencies for adoption of recommended doses of fertilizers and plant protection measures , as the recourse use and net income of adopters of improved technology was observed for better than non-adopters . Also , adoption of technology has affected significantly the yield of onion.

**KEYWORDS:** adoption of improved technology, Onion, Vegetable production

**INTRODUCTION**

The total sample comprised of 486 onion growers from 54 villages of 18 tahsils in nine agro – climatic zones of Maharashtra were studied . Besides 324 adopters, 162 non-adopters were also considered for the study. Per hectare input use levels and output produced of onion and farm as a whole were estimated to know the differential in costs and returns for local and improved technology. The costs and returns of aggregate crop production activities on per hectare basis and farm as a whole were estimated. The simple method of tabular analysis was followed in estimation of costs and returns of individual’s farms. Cost A, Cost B and Cost C were estimated by following the standard cost concepts.

**The production function form**

The production function describes the transformation of set of inputs to output. In general the Cobb Douglas production function used and which is written as

$$Y = a X_1^{b_1} X_2^{b_2} X_3^{b_3} \dots \dots \dots X_n^{b_n} e^n$$

Where,

- Y=Dependent variable
- X<sub>i</sub>s = Independent resource variable
- a = Constant, representing intercept to production function
- b<sub>i</sub>s = Regression coefficient of the respective resource variable

**Adoption of improved vegetable production technology of sample farms**

Awareness about improved production technology is a pre requisite for its adoption, but the only awareness is not sufficient for adoption. The next step to awareness is acceptance by the onion growers followed by acquisition of required inputs and actual use as per the recommendation. The information on level of adoption of improved onion production technology by the sample farmers is presented in Table 1.

The level of adoption of improved onion production technology with respect to variety, seed rate, FYM application, fertilizer use and plant protection measures of onion grown in Maharashtra revealed that, the adoption rate of improved variety above 75 per cent was found 79.80 per cent. As regards the seed rate used the adoption rate was above 75 per cent in case of 91.92 per cent onion grower. The level of adoption above 75 per cent in case of FYM use was found in case of 24.28 per cent of onion growers. The maximum number of onion grower’s level of adoption of fertilizer application was in the range of 50 to 75 per cent i.e.58.25 per cent. Similar trend was observed in case of level of adoption of plant protection measures.

**Table 1 Adoption of improved vegetable production technology on onion farms**

Sr. No.	Crop(N) Technology	Level of adoption							
		Below 25 percent		25-49 per cent		50-75 per cent		Above 75 per cent	
		No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
1.	Variety	60	20.20	00	00	00	00	237	79.80
2.	Seed rate	24	8.08	00	00	00	00	273	91.92
3.	FYM	11	3.70	98	33.00	115	38.72	73	24.28
4.	Fertilizers	00	0.00	37	12.46	173	58.25	87	29.29
5	Plant protection	53	17.84	74	24.92	143	48.15	27	9.09

**Resource use structure of onion adopters and non-adopters**

The resource use structure of onion revealed that adopters have used maximum number of male and female labour (63.62 male and 176.45 female days ) as compared to non-adopters (56 and 156.16 man days respectively ).Non adopters have utilized more bullock labour than the adopters. The non-adopters have used least seed (10.85kg/ha.) as compared to adopters (11.41kg/ha).The adopters have used maximum quantity of manures and it was four times more than non-adopters (11.62qtls).As regards the fertilizers, adopters have used N P K fertilizers twice than non-adopters and the maximum quantity of nitrogenous fertilizers has been used as compared to phosphatic and potassic fertilizer. The adopters are nearer to recommended dose of fertilizers; however non-adopters have used less than half of the recommended dose of fertilizers. (Table 2).

**Table 2 Resource use structure of selected vegetables on sample farms (ha.)**

Sr.No.	Technology	Adopters	Non-adopters
1.	Total human labour (days)Male	63.62	56.00
2.	Female	176.45	156.16
3.	Bullock labour (Pair days)	8.73	11.48
4.	See(Kg)	11.41	10.85
5.	Manure(qtls)	49.59	11.62
	Fertilizers(Kg) N	89.72	49.93
	P	40.22	23.40
	K	39.92	23.40

**Cost of cultivation and returns of onion grown on sample farms**

The cost of cultivation of improved onion production technology in case of adopters and non-adopters was Rs.40068.14/ha and Rs.27449.97/ha, respectively, indicating additional expenses of Rs.12618.17 for technology inputs at the overall level. The per hectare additional expenses for technology adoption at working cost level consist of manure(Rs.1909.95), plant protection (Rs.1390.06), fertilizers (Rs.1107.71), etc. In case of human labour use, increase in hired component by Rs.2434.40 and decline in family labour by Rs.1444.70 was notable indicating rush for particular operation. This also spells out that, there is potential of employment opportunities with adoption of improved production technology. It can be seen from the Table.3 that the share of human labour in cost ‘C’ was 21.15 per cent for adopters and 27.27per cent for non-adopters.

The average gross returns of onion were Rs.176802/ha for adopters and Rs.106230/ha for non-adopters. The per hectare net returns ranged from Rs.136734 for adopters to RS.78781 for non-adopters. The B:C ratio ranged from 4.41 for adopters to 3.87 for non-adopters.

**Table 3 Per hectare Cost of Cultivation of Onion**

Sr. No.	Items of cost	Adopters		Non-Adopters	
		Cost	Percent	Cost	Percent
1.	Hired human labour				
2.	Male	2115.50	5.28	1050.00	3.83
3.	Female	4378.20	10.93	3009.30	10.96
4.	Bullock labour	820.80	2.05	1377.60	5.02
5.	Machine labour	822.00	2.05	0.00	0.00
6.	Seed	4025.92	10.05	4050.71	14.76
7.	Manure	2491.06	6.22	581.11	2.12
8.	Fertilizer	2177.63	5.43	1069.92	3.90
9.	Irrigation	1534.21	3.83	1473.60	5.37
	Stalking				
10.	Plant protection	1541.33	3.85	151.27	0.55
11.	Incidental charges	237.81	0.59	177.22	0.65
12.	Depreciation of implements	956.06	2.39	872.73	3.18
13.	Land revenue	39.27	0.10	39.76	0.14
14.	Int. on. W.C	458.03	1.14	301.57	1.10
15.	Cost 'A'	21597.82	53.90	14154.79	51.57
16.	Rental value of land	12416.09	30.99	5693.96	20.74
17.	Int. on fixed Capital	4073.43	10.17	4175.72	15.21
18.	Cost 'B'	38087.34	95.06	24024.47	87.52
19.	Family labour charges				
20.	Male	1065.50	2.66	1750.00	6.38
21.	Female	915.30	2.28	1675.50	6.10
22.	Cost 'C'	40068.14	100.00	27449.97	100.00
	Gross returns	<b>176802</b>		<b>106230</b>	
	Net profit	<b>136734</b>		<b>78781</b>	
	B:C ratio	<b>1:4.41</b>		<b>1:3.87</b>	

**Production Function Analysis**

The results of production function analysis for adoption of improved production technology of onion on sample farms are presented in Table 4. The results are described as below.

**Table 4 Results of production function of Onion**

Categories of sample householders	Area under crop (ha)	Human Labour man days	Bullock Labour pair days	Manure Qtls.	Fertilizers (Kg)			Plant protection Rs.	Tech. Adoption Index	R <sup>2</sup>
					N	P	K			
	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	X <sub>7</sub>	X <sub>8</sub>	X <sub>9</sub>	
<b>Adopters</b>	1.0546 ** (0.1686)	-0.2120 (0.1598)	-0.0170 (0.0188)	0.0048 (0.0021)	-0.0177 (0.0856)	0.0587 (0.0308)	-0.0344 (0.0168)	0.0090 (0.0461)	0.8876** (0.4178)	0.87
<b>MVP</b>	- 142109.6	-77.637	-17.1612	2.6304	-7.5519	30.7483	-18.514	-2.3676	--	--
<b>Non-Adopters</b>	3.8371 (2.6590)	0.0031 (0.2513)	0.2104** (0.0657)	0.6489** (0.1919)	-9.7088 (8.2012)	0.2345 (0.1920)	9.8905* (8.3173)	-0.0290 (0.0810)	0.6296*** (0.3137)	0.88
<b>MVP</b>	20750.28	0.9001	131.35	242.68	- 4579.94	110.62	- 62075.74	-1678.15	---	---

The total variation in yield of onion explained by the variables included in the model for non-adopters was 88 percent followed by 87 percent in case of adopters. The coefficients of area, manure, phosphate fertilizer, potash fertilizer and technology adoption ( $X_1$ ,  $X_4$ ,  $X_6$ ,  $X_7$  and  $X_9$ ) recorded positive values for technology adopter farms, means increase in the use of these inputs would result in better yield. Among the significant variables, only phosphatic fertilizers ( $X_6$ ) recorded positive marginal value product indicating economic potential for expanding its use in order to increase the production of onion in case of adopters. In case of non-adopters, coefficients of area, bullock labour, manure, and phosphate fertilizers ( $X_1$ ,  $X_3$ ,  $X_4$  and  $X_6$ ) recorded positive values of marginal value product.

## CONCLUSIONS

The level of adoption of improved varieties was above 75 percent of nearly 50 to 75 percent of vegetable growers and as regards the seed rate, the adoption rate was above 75 percent of about 54 to 92 percent of vegetable growers, respectively. The adoption in case of use of FYM was above 75 percent of only 17.20 to 46.28 percent of vegetable growers. The maximum number of vegetable growers' level of adoption of fertilizer application was in the range of 50 to 75 percent and similar trend was observed in case of level of adoption of plant protection measures. This suggests that, there is a need to educate the vegetable growers by the extension agencies for adoption of recommended doses of fertilizer application and to popularize the use of plant protection measures by concluding the result demonstrations. Also the subsidy on fertilizers needs to be increased to increase the level of adoption.

The cost of cultivation of major vegetables in adopters of improved vegetable production technology was relatively more than the non-adopters but the return structure i.e. profit earned of adopters was far better than the non-adopters. Thus, the adoption of improved vegetable production technology has played a very significant role in improvement of productivities of vegetables grown in Maharashtra which needs to be popularized. Also, efforts need to be made for solving the difficulties in its adoption and if required suitable location specific modification should be made by the four agricultural universities in Maharashtra.

The results of production function analysis for selected vegetable onion indicated that the total variation explained by the variables ranged from 87 to 92 percent for adopters and 88 percent for non-adopters. The significant positive coefficient showed potential for area expansion and technology adoption for above vegetable crops. The fertilizer application may be expanded up to recommended levels.

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