

Impact of zero tillage technique on wheat productivity and economy of Gorakhpur, India

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ABSTRACT

A case study of Gorakhpur district was under taken regarding impact of zero till technology on wheat productivity and economy. The study was conducted in 13 blocks out of 19 blocks in Gorakhpur district. The study explores that zero till technology reduced the cost of cultivation Rs. 2391/ha with increase in yield by 4.4% in timely sown wheat and 9.30 percent in late sown wheat. Higher net return and benefit cost ratio was also recorded with zero till wheat compared to conventional method of wheat sowing. It was clear from the data that less number of weeds/m² found in wheat sown with ZT machine compared to wheat-sown with conventional method. Time advancement in sowing of wheat by 6 to 9 days, saving of pumping hrs for irrigation and less use of seed (kg/ha) was also recorded with zero till wheat. Highest number of farmers sown wheat with the machine provided by KVK Gorakhpur. The survey reveals that farmers belong to upper caste adopted ZT in higher (78.2) per cent. The farmers of age group of 30-40 years, having education of intermediate and having other source of income adopted zero till technology maximum. The farmers whose income is in range of Rs.1500-6000/- month and belong to nuclear family with holding size of 2-4 ha adopted zero till technology more interestingly.

Key words : Zero tillage technique, Wheat, Economy.

INTRODUCTION

Gorakhpur is an important district of U.P. having total cultivated land 264828 hectare out of which 188780 ha under wheat and 155395 ha under rice producing about 80% of total food grain production of the district. Rice-wheat cropping system very popular occupying 80% area of total cropped area in the district facing a gradual decline or stagnation in the productivity. Farmers of Gorakhpur having small holding with low net return from this cropping system. A new low cost technology called zero till technology is promoted in Eastern U.P. The zero till technology was introduced in Gorakhpur during 2001 to reduce the cost of cultivation and better utilization of fertilizers. Several experiments and demonstration showed that zero till technology reduced the cost of cultivation without affecting the productivity specially in wheat crop. With the use of this technology wheat seed sown with a zero till machine without any ploughing of the field after harvesting of rice crop. 24 machines were incorporated in Gorakhpur district during 2004-05. Zero till cum ferti seed drill machine sow the seed in line with a standard row distance which placed the fertilizer below the seed. There is no need for ploughing the field before sowing of wheat crop. Hence a study was made to find out the impact of zero till technology on farmers economy in Gorakhpur district with the objective (i) Inquire about the condition in which zero till technology has been

adopted (ii) Effect of zero till technology on productivity (iii) Reducing weed population (iv) Examine the impact on reducing the cost of cultivation and net return.

MATERIALS AND METHODS

During 2004 October, KVK Gorakhpur provided 8 machines to the farmers of 8 block for sowing rabi crop using ZT technique. The machine were provided on custom higher basis with a target of 200 acre area must be sown with a machine. A team of KVK Belipar, Gorakhpur conducted a Participator Rural Appraisal from Feb. to April 2005. The team conducted focus on group discussions with farmers of different villages to understand the impact of using zero till technology in sowing wheat by zero till cum ferti seed drill which revealed the changes in farmers economy by reducing the cost of cultivation. Thirteen blocks of Gorakhpur district were covered in survey to locate the zero till technology adopter with the area & productivity. A total of 776 farmers of 90 villages were sampled. The head of the family interviewed in his villages with other farmers adopted zero till technology. The data on area sown, productivity, cost of cultivation and other information were collected by structured questionnaire developed for this purpose. Yield and yield attributes data were collected by visit of the farmer field.

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RESULTS AND DISCUSSION

Distribution of holdings:

In Gorakhpur district 84% holdings were less than 1 hectare out of which 63% were less than 0.5 hectare size. 63% farmers having only 24% area of agricultural land while 21% farmer of size 1 hectare covered 24.4% area of land (Table 1).

number of adopter belongs to low income, which indicating that capable farmers with well education adopted more interestingly this technique. Nuclear family more (60%) adopted this technology compared to joint family. Survey also revealed farmers having holding size of 2-4 ha adopted this technique maximum percentage 41% (table-3).

Table 1 : Particulars of farm holding in Gorakhpur Distt.

S.No	Size of holding	No. of holdings	Area
1	0-0.5 ha	293143	64673
2	0.5-1.0 ha	100141	65654
3	1.0-2.0 ha	45378	61484
4	2.0-4.0 ha	19230	51001
5	4.0-10.0 ha	4167	22351
6	10.0 and above	225	3279
Total		462284	268472

Source: progress report of Ag. Department of Gorakhpur.

Modes of acquiring zero till cum ferti seed drill :

More than half of the farmer (59.53 percent) had acquired their zero till machine on custom higher basis from KVK Gorakhpur provided in USAID project. 27 percent of the farmer had bought zero till machine using their own capital, indicating their interest in this new technology. The ZT machine was provided by Agro on subsidy. KVK Gorakhpur provided two types of ZT machine 11 tines normal ZT and 6 tine ZT traffic control machine for sowing of wheat in the district. (Table-2).

Effect of zero tillage technology :

Wheat yield :

Among the thirteen blocks highest yield 36.3 q/ha was recorded with ZT at Sardarnagar block followed by Pali block (35.6 q/ha). Khajani block wheat yield data revealed marginal low yield compared to conventional method of wheat. Average yield of 13 blocks with timely sown wheat recorded 4.4 per cent higher grain yield compared to conventional method while yield advantage in late sown wheat by ZT was 9.30 per cent over

Table .2 : Modes of acquiring zero till cum ferti seed drill.

S.No.	Modes of acquisition	No. of farmer	Percent
1.	Borrowed from KVK on custom higher basis	462	59.53
2.	Bought by farmer	210	27.06
3.	From DASP	65	8.37
4.	From Ag. Deptt. & NGO	39	5.04
Total		776	100.0

Factors affecting the adoption of ZT :

Out of 776 farmers adopted ZT, 93% belongs to Hindu Community out of which 78% were belongs to upper caste. Among the adopters maximum farmers were under age group of 30-40 years. Maximum farmers adopted this technology were educated being highest of intermediate (23.45%). Maximum adopters income were come in the group of Rs.1500-6000/- month while lowest

conventional method of wheat sowing. Singh & Brar (1994) recorded similar yield both in Zero tillage and conventional tillage condition. Higher number of grains/panicle and better test weight was also recorded with ZT wheat. (Table-4 & 5).

Cost of cultivation:

Average cost of cultivation was 15.5% less with ZT

Table 3: Characteristics of the farmers adopted ZT timely.

S.No	Particulars	No. of farmers adopted (n=776)	Percentage
A.	Religion		
	Hindu	724	93.30
	Muslim	52	6.70
B.	Caste		
	Upper	607	78.22
	Backward	149	19.20
	Schedule	20	2.58
C.	Age		
	20 – 30 years	95	12.24
	30 - 40 years	319	41.10
	40 – 50 years	251	32.34
	50 – above	111	14.30
D.	Education		
	Illiterate	114	14.69
	Upto Junior High School	156	20.10
	High School	169	21.78
	Intermediate	182	23.45
	Graduate	155	19.97
E.	Occupation		
	Pure farmers	326	42.01
	Farming + Other occupation (where one member of family in service)	450	57.99
F.	Income		
	Low Income (less than 1500)	101	13.01
	Middle (1500 – 6000)	462	59.54
	Higher income (6000 and above)	213	27.45
G.	Family Type		
	Nuclear	465	59.9
	Joint	311	40.10
H.	Family size		
	Upto 5	508	65.46
	6 and above	268	34.54
I.	Size of farm holding		
	0-1 hectare	51	6.57
	1-2 hectare	179	23.07
	2-4 hectare	365	47.04
	4-10 hectare	138	17.78
	10 and above	43	5.54

Source: Field survey by author 2005-06.

compared to conventional method. It was owing to no expenditure on ploughing for field preparation and less pumping hrs. for irrigation. Similar results on reducing the cost of cultivation was reported by Tripathi *et al* (1999).

Net saving :

A sum of Rs.2391/ha was recorded in net saving in sowing of wheat with ZT over conventional method of sowing.

Net return :

Wheat sowing with ZT recorded 96% higher net profit of Rs.7520.7/ha compared with Rs.3837/ha in conventional method.

Benefit cost ratio :

Average B:C ratio was also higher with ZT (1.57) compared with conventional method (1.23).

Table 5: Comparison yield and yield attributing characters of ZT wheat and conventional method of sowing wheat.

Characters	ZT wheat	Conventional wheat
Yield (q/ha)		
Timely	34.40	32.95
Late	30.43	27.84
No. of fertile shoots/m ²		
Timely	327	325
Late	308	302
No. of grains/spike		
Timely	37.5	30.9
Late	32.3	28.8
Test weight:		
Timely	36.4	34.2
Late	35.7	32.3

Table 6: Impact of ZT technology on economics and other performery parameters.

Item	Zero till wheat	Conventional wheat	Difference
Time advancement (Days)			
Timely sown	6	-	6
Late sown	9	-	9
Seed used (kg/ha)			
Timely sown	86.4	100	13.6
Late sown	106.4	125	18.6
Weed Population (m ²)	18.5	32.8	14.3
Irrigation (hrs/ha)	57.3	63.69	6.38
Cost of cultivation (Rs./ha)	13025.70	15417.07	2391.00
Gross return (Rs./ha)	20546.50	19254.00	1292.50
Net return (Rs./ha)	520.70	3837.00	3683.70
B:C ratio	1.57	1.23	0.34

Time advancement :

Sowing of wheat with ZT recorded 6 days advancement of timely sown wheat while 9 days advancement was recorded in late sown wheat compared to conventional method of wheat sowing.

Seed saving :

Sowing of wheat with ZT reduce the use of seed from 100 kg in timely sown wheat to 86.4 kg while in late sown wheat it was reduced from 125 kg to 106.4 kg (Table-6). Thus reduced seed rate was an incentive for farmers to adopt ZT.

Weed population/m² :

The difference in weed population/m² recorded in thirteen blocks of districts showed a clear picture that

wheat sown with ZT machine recorded less no of weeds/m² (18.5) compared to conventional method (32.8). Similar results were reported in Annual Report (2001-02). This might be due to non opening of upper surface of the field which reduced germination of weeds.

Saving in pumping hrs. for irrigation :

On an average 6.38 pumping hrs./ha was saved in irrigation when wheat was sown with ZT machine compared to conventional method. It was clear from the data that less amount of irrigation water is required for irrigation in ZT sown wheat.

Conclusion :

It was concluded the zero till technology reduced the cost of wheat production with a benefit in yield which

ultimately reflect into net return and B:C ratio. It was also clear from the study that in Gorakhpur district zero till technology is very useful for improving the economic condition of farmers. The advantage of zero till technology over conventional method of wheat sowing will accelerate the rate of adoption this technology in near future.

REFERENCES

Annual report (2001-02) A.I.C.R.P. on Cropping System, NDUAT, Kumarganj, Faizabad.

Singh, G. and Brar, S.S. (1994). Tillage and nitrogen requirement of wheat (*Triticum aestivum*) sown after rice (*Oryza sativa*). *Indian Journal of Agronomy*, **39 (1)**: 162-163.

Tripathi, S.C., Nagrajan, S. and Chauhan, D.S. (1999). Evaluation of zero tillage in wheat (*Triticum aestivum*) under different method of rice (*Oryza sativa*) Transplanting., **44 (2)**: 219-222.

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