



Study on participatory zero tilled wheat in rice based cropping system of eastern Uttar Pradesh

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ABSTRACT

An on farm trial was conducted during 2013-14 and 2014-15 at farmers field of district Siddharthnagar, Mahrajganj, Gorakhpur, Basti, Azamgarh and Ambedkarnagar of EUP to study the productivity and economics of sowing wheat {Triticumaestivum (L)emend.Paol&Fiori} by zero tillage technique (ZT) under rice wheat cropping system. The experiment was laid down in randomized block design with 10 replications in farmer participatory mode.The planting data showed that wheat sowing can be advanced 8-13 days in timely sown and 15-20 days in late sown conditions with the introduction of zero tillage technology in rice wheat cropping system of Indo-Gangetic Plains of EUP with an increase in yield ranging from 1.22 to 3.27 q/ha. The data further reveals that there was 13 days advancement in timely seeding of wheat due to moisture content in prevailing heavy soils. Comparative performance of wheat sown under ZT and CT has been evaluated and found that emergence of wheat seed took about 2 days less time in ZT sown wheat compared to conventional tillage (CT) sown wheat. Germination of Phalaris minor under ZT reduced by 51, 49 and 54 % and 47, 41 and 44% in late sown wheat over other sowing methods. An advantage in grain yield due to adoption of ZT was 2.85 q/ha in timely sowing while in late sown condition it was 4.25 q/ha. Saving of Rs. 6600/ha on account of land preparation, weed control, saving of irrigation pumping hours, seed rate and water requirement/ha. Highest net return and B:C ratio was also recorded with ZT sown wheat in both the sowing condition.

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INTRODUCTION

Rice-wheat cropping system (RWCS) is the most important cropping system supporting more than 600 million people of the region. Under this system, farmers grow rice in the monsoon summer followed by wheat in the dry winter season. Farmers use this system on approximately 12 million ha in South Asia and 10 million ha in China. The NARS and IARS have been pursuing aggressive strategy to maintain the momentum of yield growth in this cropping system. Accelerated growth of food output is necessary to reduction in mass poverty as happened in the developed countries before 1900 and in the developing countries since 1950. As part of green revolution, the evolution of varieties of wheat and rice, which were more responsive to external inputs like fertilizer and irrigation, led to this accelerated growth in food output. The most ultimate impressive gain was witnessed in terms of decline in food prices thus benefiting the poorest of the poor. In the absence of such development, we would have needed two times more additional land to produce same quantity of wheat (Paroda, 2004). Rice-wheat is a dominant cropping system in the eastern part of Uttar Pradesh. About 2.70 lakh ha of land is occupied under the sequence in existing three important agro climatic zones viz. North Eastern Plain Zone (NEPZ), Eastern Plain zone (EPZ) and Vindhyan zone (VZ) with varied ecosystems. Despite continuing scientific advances, the yield growth in cereals has fallen since 1980s. Similarly, the investment in agriculture for scientific development has tumbled. If green revolution was a turning point for progress of Indian agriculture, sustaining it would need radical reforms in management of natural resources and the way we conduct research and extension (Ladha *et al* 2003). The management practices employed in one crop will have bearing on the performance of other crop in rotation. RWCS has distinct identity and the respective successes of rice and wheat are deeply interdependent. Both crops are so interdependent that commodity approach for research in these crops is meaningless. Since each crop exercises its influence on other crop, we need to take into account the management options available for both rice and wheat. "Accelerating the Adoption of Resource Conservation Technologies for Farm Level Impact on Sustainability of Rice-Wheat Systems of the Indo-Gangetic Plains". Implementation of the project at each site went smoothly enough

and therefore farmers in Haryana, Punjab, Uttar Pradesh, Uttaranchal and Bihar tossed away the past practice of frequent tillage and adopted the new concept in the form of zero tillage (Hobbs et al 2003). The productivity of wheat is low due to delayed sowing, following late harvesting of medium to long duration rice varieties resulting in sub-optimal crop establishment of wheat. Thus keeping the above points in view, on farm participatory trials have been conducted to accelerate the sowing of wheat after harvest of rice under zero tilled condition at district Maharajanj (U.P.).

MATERIALS AND METHODS

An on farm trial was conducted during 2013-14 and 2014-15 at farmers field of district Siddharthnagar, Mahrajganj, Gorakhpur, Basti, Azamgarh and Ambedkarnagar (E.U.P.) to study the productivity and economics of wheat sowing {*Triticumaestivum* (L.) emend. Fiori&Paol} by zero tillage technique in rice wheat cropping system. The experiment was laid down in randomized block design with 10 replications in each district in farmer participatory mode considering a farmer as one replication. The soil of the experimental site was loamy sand in texture, having pH 7.8 to 8.5 , available nitrogen (207.8- 250 kg/ha),low in available P(10.2 -12 kg/ha) and medium in available potassium (250.4-275 kg/ha). The treatment consisted of four tillage practices and crop establishment technique viz. Conventional tillage sowing with broadcast method, zero tillage sowing with ZT machine, Conventional tillage sowing with ferti cum seed drill method and reduced tillage sowing with broad cast method. Wheat variety HD 2967 was used for sowing with recommended fertilizers for the area. The N P K was applied in the form of the urea, di ammonium phosphate and muriate of potash, respectively @ 150:60:40 kg/ha. Seed rate of wheat was used @ 100kg/ha in broad cast method and in zero till machine seed were adjusted as per need of the plot. Timely sown wheat was sown between 15-20 November and late sown was on 15 to 20 December in both the years of study. Data of all the location was analysed and presented here as mean of two years.

RESULT AND DISCUSSION:

Effect of crop establishment: Different methods of wheat sowing varied in days to germination. Zero till sown wheat recorded 2 -3 days earlier germination compared to other methods of sowing. Zero tillage technique for wheat sowing advanced the sowing by 8-13 days in timely sown wheat while in late sown wheat it was recorded 8-20 days advancement (Table -1). Sowing by zero cum ferti seed drill or ferti cum seed drill saved 10 kg seed /ha over broad cast method. Sowing wheat by ZTtechnology reduced the germination of *Phalaris minor* by 51, 49 and 54 % over Conventional tillage sowing with broadcast method, conventional tillage sowing with ferti cum seed drill method and reduced tillage sowing with broad cast method, respectively in timely sown wheat while in late sown wheat it was 47, 41 and 44%, respectively,.

Table:1.Effect of tillage practices on different aspects of crop establishment(mean of 2 years)

Treatments	Days to germination	Days to advancement in sowing	Saving in seed (Kg/ha)	Population of <i>Phalaris minor</i> (/m ²)
Timely Sowing				
CT+ Broad cast	8	-	-	68
ZT+ ZT machine	6	13	10	33
CT+ seed drill	8	-	10	65
RT + Broad cast	8	8	-	72
Late sowing				
CT+ Broad cast	13	-	-	72
ZT+ ZT machine	10	20	10	38
CT+ seed drill	12	-	-	65
RT + Broad cast	12	08	-	68

Yield and yield attributes:Highest effective tillers was recorded with sowing of wheat by ZT technology which was significantly higher than sowing of wheat with conventional tillage and broad casting of seed during timely sowing while in late sown condition ZT sowing recorded significantly higher effective tillers than rest of the tillage practices and sowing method used. Highest grain /ear and test weight was also recorded with ZT sowing which was significantly superior to rest of the sowing method tested in both the sowing condition. Significantly higher grain yield (51.07 and 44.50 q/ha) was recorded with ZT sowing in timely and late sowing condition than rest of the method tested (Table 2). Sowing of wheat with ZT technique recorded 5.64,3.73,and 5.29 percent higher grain yield than wheat sowing with conventional tillage +broad casting, conventional tillage +seed drill and reduced tillage +broad casting of seed under timely sowing condition. While in late sown condition it was recorded 10.5, 8.1 and 10.4 percent higher, respectively. Results are in close conformity with the earlier findings of Tomar *et al* 2007.

Table : 2. Effect of tillage practices and sowing methods on yield and yield attributing characters of wheat (mean of 2 years)

Treatments	No. of effective tillers /m ²	No. of grain/ear	Test weight(g)	Grain yield (q/ha)
Timely Sowing				
CT+ Broad cast	341	41	39	48.34
ZT+ ZT machine	412	46	44	51.07
CT+ seed drill	400	42	42	49.23
RT + Broad cast	389	40	38	48.50
CD (P=0.05)	34	04	01	02.30
Late sowing				
CT+ Broad cast	302	38	36	40.25
ZT+ ZT machine	395	44	41	44.50
CT+ seed drill	367	42	38	41.20
RT + Broad cast	352	37	35	40.30
CD (P=0.05)	22	05	01	2.75

Economics: Highest net return (Rs. 41732 and 41591/ha) and lowest cost of cultivation was recorded with sowing of wheat using ZT technology followed by reduced tillage combined with sowing by broad casting of wheat (Figure 1). Owing to low cost of cultivation and better yield in this treatment. Highest B:C ratio 3.59 and 2.69 was also recorded with ZT sowing (timely and late sowing) followed by reduced tillage combined with broadcasting of seed in both sowing timely and late sown condition respectively (Figure 3). Pathak, et al (2003) also reported higher B:C ratio with ZT sown wheat after rice.

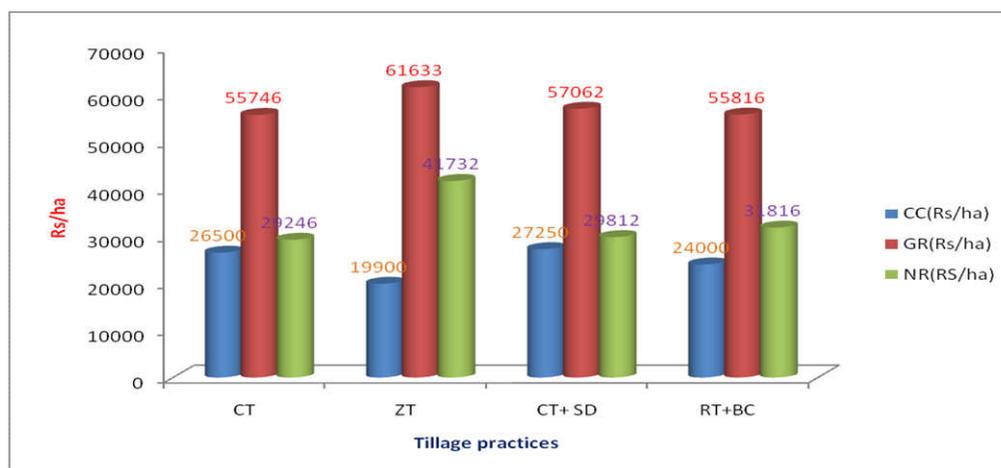


Fig.:1. Effect of tillage practices on Economics of timely sown wheat production

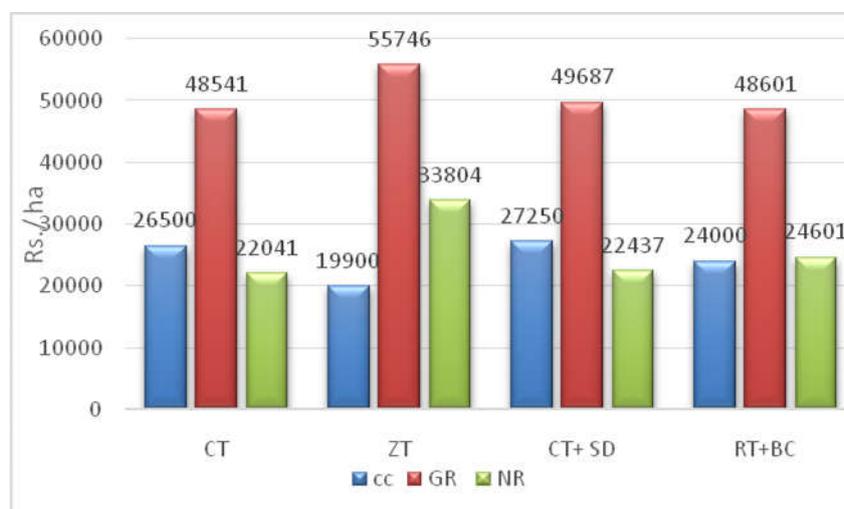


Fig.:2. Effect of tillage practices on Economics of late sown wheat production

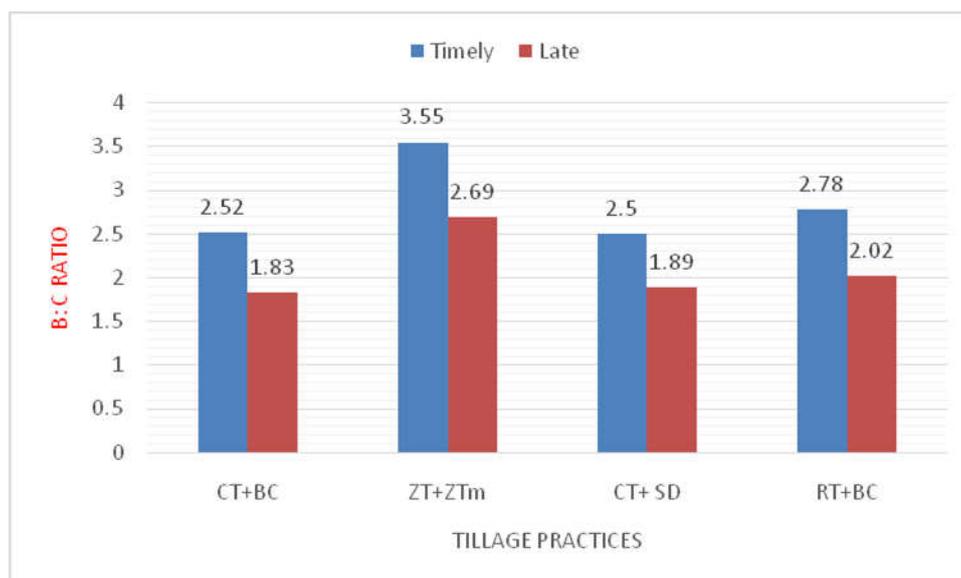


Fig. 3. Effect of Tillage practices on B : C ratio of wheat

CONCLUSION

ZT technology was found to be cost effective. It sustained productivity and proved to be as alternative to conventional tillage in wheat sowing after rice. The overall profitability gains for ZT attracted the farmers for adoption of technology on large scale in eastern U.P.

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