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Zero Tillage Technology - An Opportunity for Small Farmers to Enhance Livelihood

Zero tillage can be a way to minimize the cost of cultivation in wheat crop. Sri Ram Jeewan Pandit, from Sakrauli village in Cheriya Bariyarpur block of Begusarai district, is a small land holding farmer. In 2019, frontline demonstration programme on “sowing of wheat by zero tillage method” on 0.74 acre land of Sri Ram Jeewan Pandit has been demonstrated by KVK Begusarai. In zero tillage method more production was observed than traditional method of cultivation. The production was 23q/acre and 20q/acre in case of zero tillage and traditional method respectively, correspondingly the total income in case of zero tillage was Rs. 39,100 which was found 15 percent more than traditional method. Similarly overall benefit in case of traditional method was Rs. 22,920 and in case of zero tillage technology was Rs. 32,260.

INTRODUCTION

Zero Tillage technology found “sowing without tillage”. In this method sowing of wheat has been done without ploughing of soil. After harvesting of kharif crop direct sowing of wheat has done. It is widely adopted by the farmers of tarai region. The most widely adopted resource conserving technology in the Indo-Gangetic Plains (IGP) of South Asia has been zero-tillage (ZT) wheat after rice, particularly in India (RWC 2004). Zero tillage (ZT) is also known as zero till, no till, direct seeding and direct drilling (Erenstein *et al.*, 2008b). The typical ZT drill has inverted-T openers and opens a number (6–13) of narrow

slits for placing seed and fertilizers at the depth of 7.5–10 cm into the soil (Mehla *et al.*, 2000). Tillage is the mechanical manipulation of soil to provide favorable condition for crop growth. Surface of earth remain hard and compact which is unfavorable for the sowing of seed. Soil tillage consists of breaking the compact earth surface to a certain depth and loosening the soil mass to enable the roots of the crop to penetrate and spread into the soil. Tillage creates the favorable condition for the plant growth. It is the first operation for the crop production and requires higher amount of energy as well as it is a high cost operation. Primary tillage and secondary tillage are required for the complete seedbed preparation. The main objective of primary tillage is to open up the upper compact earth surface of cultivable land. It is the first major soil working operation to reduce the soil strength, to turn crop residue. Implements used for the primary tillage are Mould board plough, Indigenous plough, sub soil plough, chisel plough and similar implements. Primary tilling implements may be animal drawn or tractor drawn. Secondary tillage is the lighter and finer operation and performs after primary tillage operation. It includes different types of implements like Disc harrow, cultivator, levellers, and similar implements. The main objectives of secondary tillage operations are

- To break the clods of soil which are left after primary tillage and pulverize the soil
- To make the field surface uniform for the sowing operation.
- To destroy weeds and seeds left on the surface of soil

Both tillage operations are required for complete seedbed preparation which is costly for the farmers.

PROPOSED SOLUTION

Zero tillage is the technology in which wheat can be sown without tillage operation just after paddy. Zero Tillage consist two boxes on the top is seed box and another is fertilizer box, fluted roller, seed tube, furrow opener, frame structure, ground wheel, chain & sprocket mechanism, seed and fertilizer adjusting lever etc. By seed and fertilizer adjusting lever seed rate and fertilizer rate is adjusted. For the control of depth of operation depth controlling mechanism is also given in zero tillage.

Sri Ram Jeewan Pandit, from Sakrauli village in Cheria Bariyarpur block of Begusarai district, is a small land holding farmer. He cultivates 1.48 acre of land out of

which 0.74 acre is occupied on the lease basis. His main source of income is agriculture. Sri Ramjeewan Pandit is practicing agriculture for 22 years. He mainly grows paddy, maize, wheat, some spices and vegetable crops like potato, cauliflower, cabbage etc. In Rabi season, he mainly grows wheat for domestic purpose as well as income purpose. In Traditional method he firstly prepared seedbed before sowing. During seedbed preparation two pass of cultivator and one pass of rotavator were done. He hires the tractor along with implements for these operations. The hiring charges are given below-

Table 1. Hiring charges of different implements along with tractor in Begusarai

Machine/ implements	Hiring Charges (Rs/Acre)
Tractor with Rotavator	1620
Tractor with Cultivator	945
Tractor with Zero Tillage	810
Self-Propelled Reaper Cum binder	2025

The total cost of tillage operation in traditional method was found Rs. 4,050/acre. Application of fertilizer and seed was done by broadcasting method. Due to this operation increase in application rate of NPK, non-uniformity in fertilizer application and increase in crop lodging due to western wind was observed. So total input was high in this method as well as output was less due to risk of crop lodging, attack of insect pest (Late sowing of wheat) etc. Total cost of cultivation of wheat in traditional method was found approximately Rs. 11,080/acre and more losses were observed in this method.

Under frontline demonstration programme on "sowing of wheat by zero tillage method" in the year 2019 on 0.74 acre land of Sri Ram Jeewan Pandit has been demonstrated by KVK Begusarai. Sowing of wheat has been done by the zero tillage technology. Due to short stubble and absence of weed application of weedicide was not done. Directly sowing of seed as well as application of fertilizer (except potash) was done by the Zero Tillage in a single pass. Application of potash was done before sowing as it creates problem of clogging in seed metering mechanism of zero tillage. First irrigation was given in 15 days after sowing. In this method the cost of tillage was completely saved. Total cost of cultivation has been mentioned below in table-2.

Table 2. Cost of cultivation of wheat in both traditional method and zero tillage technology

Particulars	Traditional Method (Rs/Acre)	Zero Tillage Technology (Rs/Acre)
Weedicide cost	0	540
Fertilizer cost(NPK)	955	765
Tillage and sowing cost	(2 cultivator + 1 Rotavator) 4050	810
Irrigation cost (hiring Rs 1350/ Acre)	4050	2700
Harvesting cost	2025	2025
Total	11,080	6840
Production	20 q/acre	23 q/acre

**Figure 1. Sowing of wheat by zero tillage machine under FLD by KVK Begusarai****Figure 2. Stages of wheat sown by the Zero tillage machine**

In zero tillage method more production was observed than traditional method of cultivation. The production was 23q/acre and 20 q/acre in case of zero tillage and traditional method respectively, corresponding to the total income in case of zero tillage was Rs. 39,100

which was found 15 per cent more than traditional method. Similarly overall benefit in case of traditional method was Rs. 22,920 and in case of zero tillage technology was Rs. 32,260.

CONCLUSION

Zero tillage technology is beneficial and helpful for increasing income generation especially for small farmers. As early and timely sowing is possible due to mechanization, so beneficial effect of early sowing on grain and straw yields of wheat may be obtained by zero tillage technology. It maintains the soil moisture, so by adopting this technology a farmer can increase his benefit approximately by 40 percent.

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