

Profitability of zero tillage wheat in rice fallows under national innovation on climate resilient agriculture project at Chhattisgarh Plaine zone Durg in India

Abstract

The research evaluated the economics of producing wheat under national innovation on climate resilient agriculture adopted village named karga using zero tillage and conventional method, and it evaluated how much technology and inputs contributed to the higher productivity brought over by zero tillage (ZT). The study found that zero tillage technology is able to increase farmers' profitability and aid in resource conservation. The difference in gross returns between zero tillage and conventional tillage approaches has been divided into 45% related to zero tillage and the remaining due to changes in input costs. This shows that zero tillage practices resulted in better performance in Rabi 2022- 2023 seasons, with an average yield increase of 7.7%. Net income per ha was Rs. 12475 with a reduced cost of cultivation due to reduced number of irrigations and lessened sowing operations cost. Higher yield is due to timely sowing, healthy crop growth, good plant population and less effect of climatic hazard.

Key Words – Zero tillage, Cost reduce, Conventional tillage, Seed drill and Climate

Introduction –

“India is the world's second-largest wheat producer” (S ramadas,2019) With an average yearly production of 80 Mt (million tonnes), It produces about 11.79 percent of the wheat grown worldwide (FAO, 2011). “In financial year 2021, over 248 thousand metric tons of wheat was produced in the northern state of Chhatisgarh in India. Increasing productivity and profitability of wheat production in the state is the main challenge. Many farmers raise late-maturing, fine-grained types of rice, which causes wheat to be sown later than usual. The grain production gradually decreases if planting is delayed by each additional day beyond the third week of November” (Ali et al., 2010; Irfaq et al., 2005; Sharma, 1992). Hence, farmers have started implementing resource-saving technologies like zero tillage and surface seeding in the production of wheat in order to avoid planting delays and reduce costs of production (Gupta and Seth, 2007). “Due to the use of zero tillage in the cultivation of wheat, savings in input costs, fuel usage, and irrigation water use have been reported” (Malik et al., 2003; Bhushan et al., 2007)

Due to a lack of field labour and rising fuel expenses, farmers favour this technology. In order to compare the economics of producing wheat using zero tillage and traditional methods and to quantify the impact of technology and inputs to the predicted productivity differences due to zero tillage, the current study was done.

Material and Methods

A climatic intervention was laid out in the village namely karga, Durg district of Chhattisgarh in 2022-2023 by KVK Pahanda, Durg under the national innovation on climate resilient agriculture (NICRA) project. Under this the weather data are recorded from digital rain gauge unit which installed at demonstrated village karga and the recorded weather data during crop season 2022 is presented in fig 1. These demonstrations were laid in irrigated silty loamy soils where farmers adopted normal wheat cultivation whereas zero tillage wheat is taken as improved technology. “In this technology, after the harvest of kharif rice, one more crop could be taken up with no tillage for effective utilization of residual moisture by the second crop (wheat). Zero tillage wheat practice was demonstrated to minimize the cost of cultivation & for effective utilization of residual moisture, nutrients. The rice stubbles of 15-20 cm height were left in the field after the harvest. Sowings were started from November last week 2022 in order to capture the residual moisture from rice fields”. [1] Chhattisgarh 1029 Kanishka variety of wheat which is Late sown, heat tolerant and contain 12 % of protein. Seed (40kg/ac) are taken for zero tillage with 45 kg of di ammonium phosphate. Sowing was done with zero seed cum fertilizer drill provided by national innovation on climate resilient agriculture (NICRA) custom hiring center.

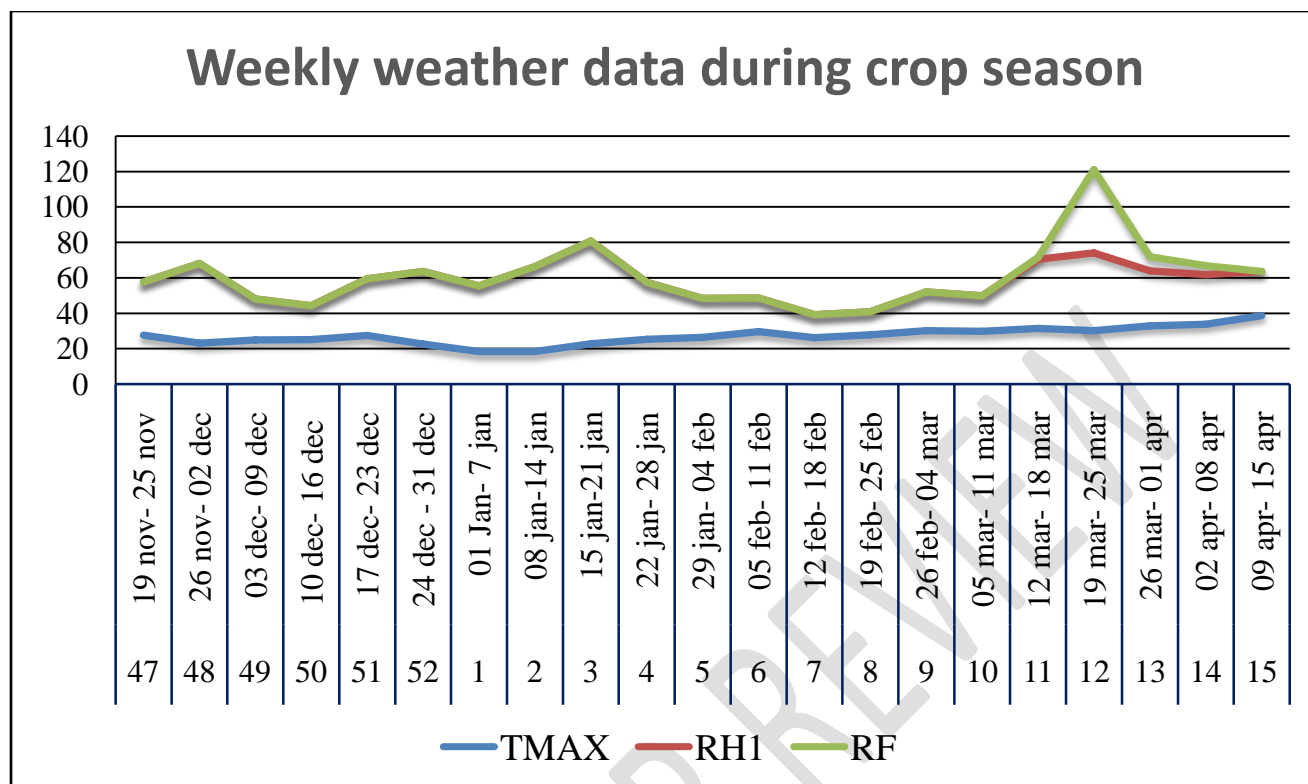


Fig 1- Weekly weather data during crop season 2022

Results and Discussion

The climatic intervention demonstrations were conducted in nicra villages karga of Durg district in Rabi 2022- 2023 seasons. The zero tillage practices resulted in giving better performance which results are depicted in table 2 where an average number of total number of tillers per plant average 7.5 when compared to farmers practice wheat which gave average 5.5 tillers per plant with numbers of irrigation required for zero tillage wheat was 4 whereas at farmers practice taken 6 numbers of irrigation. On an average the percent yield increase of demo plots over check was 7.7 % 2022-23 depicted in table 4. In these years if we observe the yield of demo practice was 1550kg/hac whereas farmers practice observed 1438.75 kg/ hac, thus enhancing the net income per ha was Rs 12475 with a reduced cost of cultivation of Rs.3250/ha depicted in table 2 and 3. This reduction in the costs was due to reduced number of irrigations and lessened sowing operations cost. Thus, zero tillage wheat earned good net income with an impressive B:C ratio of 1.47 as compared to normal wheat cultivation in rabi seasons of year 2022 (table 3). Higher yield in zero tillage wheat is a result of a greater number of productive tillers and filled grains which is

due to timely sowing, healthy crop growth, good plant population and less effect of climatic hazard.

Table 1. Comparison between demonstrated climatic intervention and traditional farmer's practice of wheat cultivation

| S. No. | Interventions | Zero tillage Wheat | Conventional wheat |
|--------|------------------|--------------------------------|-----------------------|
| 1 | Soil | Silty Loamy | Silty Loamy |
| 2 | Cropping System | Zero seed cum fertilizer drill | Farmer's method |
| 3 | Time of sowing | 15 Nov to 5 December | 10 Dec to 25 December |
| 4 | Seed Rate | 40 kg per acre | 50- 60 Kg per acre |
| 5 | Method of Sowing | Line sowing | Broadcasting |
| 6 | Plant Protection | Not used | Used |
| 7 | Weed Management | Used (vesta) | Used (vesta) |

Table 2. Yield parameters of demonstrations on zero tillage wheat conducted in Rabi 2022-2023

| 2022-23 | Number of tillers | Number of irrigations | Disease observed | Rainfall/ Temperature effect | Yield (kg/hac) | % Increase |
|--------------------|-------------------|-----------------------|------------------|---------------------------------------|----------------|------------|
| Zero tillage wheat | 7.5 | 4 | No | No (Harvested before rainfall) | 1550 | 7.7 |
| Farmer's practice | 5.5 | 6 | Black rust | Yes (Affected by rain at maturity) | 1438.75 | |

Table 3. Economic analysis of zero tillage wheat productivity vs Normal conventional wheat cultivation during 2022-2023

| Treatments | Seed yield | Cost of cultivation | Gross return | Net Return | B:C ratio |
|-------------------|------------|---------------------|--------------|------------|-----------|
| Zero tillage | 1550 | 26275 | 38750 | 12475 | 1.47 |
| Farmer's practice | 1438.7 | 29525 | 35950 | 6425 | 1.21 |

Table 4. Benefit particulars demonstrations on zero tillage wheat conducted in Rabi 2022-2023

| Particulars | Rabi wheat 2022-23 |
|--------------------------------|--------------------|
| % Increase in yield | 7.7 |
| Cost of cultivation reduced by | 3250/- |
| Net return increased by | 6050 |
| No. irrigation reduced by | 02 |

Conclusion-

The study evaluated the status of zero-tillage technology in the rice-wheat zone of Chhattisgarh, which was necessary to understand the current status of technology as well as collect feedback from farmers' fields regarding its impact on wheat yield and farm incomes. The study indicates that the total wheat acreage sown with zero-tillage technology will increase rapidly in the rice-wheat zone. Zero tillage practices resulted in better performance, with 7.5 tillers per plant compared to farmer's practice. Zero tillage wheat earned good net income with an impressive B:C ratio of 1.47 compared to normal wheat cultivation in 2022-23, due to reduced irrigations and lessened sowing operations cost.

References-

1. Amarajyoti, P., Mounika, B., Kumar, G., N., Naidu, D., C. and Babu, G., C., (2022), Profitability of zero tillage maize in rice fallows of north coastal Andhra Pradesh, *The Pharma Innovation Journal*; SP-11(7): 3615-3616.
2. Chahal G., B., S., Sood, A., Jalota, S., K., Choudhury, B., U., Sharma, P., K., (2007) Yield, evapotranspiration and water productivity of rice (*Oryza sativa* L.)–wheat (*Triticum aestivum* L.) system in Punjab (India) as influenced by transplanting date of rice and weather parameters, *Agricultural water management* 88 14–22
3. Erenstein, O., Farooq, U., Malik, R., K., Sharif., M., (2008) On-farm impacts of zero tillage wheat in South Asia's rice–wheat systems, *Field Crops Research* 105 240–252
4. Iqbal, M., Khan, M., A. and Anwar, M., Z., (2002) Zero-tillage Technology and Farm Profits: A Case Study of Wheat Growers in the Rice Zone of Punjab, *The Pakistan Development Review* 41:4 Part II pp. 665–682.
5. Kumar, D., Kumar, N. and Bisht, H., (2020), Costs and returns of wheat production of different categories of farmers in Udham Singh Nagar district of Uttarakhand, *Journal of Pharmacognosy and Phytochemistry*; Sp 9(5): 277-282.
6. Tahir, M., A., Sardar, M., S., Quddus, M., A. and Ashfaq, M., (2008) economics of zero tillage technology of wheat in rice- wheat cropping system of Punjab- Pakistan, *J. Anim. Pl. Sci.* 18(1).
7. Tripathi, R., S., Raju, R., and Thimmappa, K., (2013) Impact of Zero Tillage on Economics of Wheat Production in Haryana, *Agricultural Economics Research Review* Vol. 26(No.1) January-June pp 101-108.