



Economic Performance of Zero Tillage Technology in Maize under Agency Tracts of Andhra Pradesh

V. Govardhanrao^{1*} and P. Venkata Ramana¹

¹*Dr. YSR Horticultural University, West Godavari Dist., Andhra Pradesh, India.*

Authors' contributions

This work was carried out in collaboration between both authors. Author VG designed the study and performed the research work at KVK. Author PVR performed the statistical analysis, wrote the protocol, wrote the first draft of the manuscript and managed the analyses of the study. Both authors read and approved the final manuscript.

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ABSTRACT

The research work mainly concentrated on economic performance of zero tillage in maize under agency tracts of Andhra Pradesh during five continuous years from 2011 to 2016 at different farmers' field locations of Andhra Pradesh. The improved research variety DHM-117 with improved technology like zero tillage, spacing, recommendeddose of fertilizers etc, revealed that mean grain yield (9.30 t.ha^{-1}) and increased yield over control (39.80%) which recorded US\$ 924.56 ha^{-1} (Ninehundred twenty four US\$) and a B:C Ratio of 3.53 when compared to local check.

Keywords: Maize; zerotillage technology; economics.

*Corresponding author: E-mail: vgrao2007@gmail.com;

1. INTRODUCTION

Maize has been cultivated in Andhra Pradesh for over two decades with an increased acres of 62.2 M.ha in Kharif and 44.1M.ha in *Rabi* with average productivity of 46.73 M.T in cumulative of both Andhra and Telangana state. However the final estimates of 2014-15 have indicated an increase in maize production the last two years and it has touched 24.35 million tonnes, which is the highest so far in the history of maize production in India. The trends in last three years indicate that area under maize cultivation expanding not only in rabi but also kharif season. The major increase in the area has occurred during recent past in the states of Maharashtra, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Tamil Nadu and West Bengal. On the other hand, area under maize cultivation is showing declining trends in Rajasthan, Gujarat, and Uttar Pradesh in recent past. The productivity of maize is also increasing in recent years both during rabi and kharif season. The productivity increased in the states of Haryana, Bihar, Chhattisgarh, Jammu & Kashmir, Jharkhand, Madhya Pradesh, Odisha, West Bengal and Andhra Pradesh.

An average grain yield of 5285 kg/ha was recorded which showed an increase of 105% over all India average yield of maize with improved technologies. This highlights the potential of further enhancing the yield levels of maize across India.

2. MATERIALS AND METHODS

The demonstrations were laid out in 11 Agency Mandals of East Godavari District of Andhra

Pradesh from 2011-12 to 2015-16. In demonstration fields, they strictly followed zero tillage practice to minimize the cost of cultivation, effective utilization of residual moisture and nutrients.

As these demonstrations were laid out in rice fallows of red soils, sowings were taken up during October using seed marker possessing pegs at distance of 30 cms. Women family labour worked on seed marker for placing seed and fertilizers in adjacent holes made by drill. Pre-emergence weedicides were sprayed to control weeds that might arise from rice stubbles. Other regular management practices such as top dressing, plant protection were similar.

3. RESULTS AND DISCUSSION

Improved practice result the better performance when compared to the farmers practice in number of cob per plant and 1000 grain weight (221- 250 gr.) under demonstration compared to the farmer's practice (186-211.5gr.) (Table-2) which ultimately resulted in higher grain yield of 8.44 t.ha⁻¹ (Table-3).

On an average, maize grain yield under front line demonstration was higher by 40.66 per cent as compared to farmer's practices (6.04 t.ha⁻¹) (Table 3). The results indicated that the demonstration has given good impact in terms of yield and income. Similar yield enhancement in different crops in front line demonstration has amply been documented [1,2,3,4&5].

Economical impact of the technology revealed that the net returns (US\$ 924.56ha⁻¹) increased by 55.86 per cent over the farmer's

Table 1. Comparison between demonstrated package and existing farmers' practice of maize production

Sl. no.	Intervention	Demonstrated package	Farmers' practice
1	Farming situation	Rainfed, red loamy soils, agency area,	Rainfed, red loamy soils, agency area,
2	Cropping system	Paddy fallow	Pulses
3	Variety	DHM 117	Local
3	Seed treatment	Seed treated with thiram 75% WP@3gr.kg ⁻¹	Nil
4	Time of Sowing	15 th to 30 th October	1 st to 10 th November
5	Method of Sowing	Line sowing with proper crop geometry. Paddy fallows with zero tillage	Broadcasting
6	Seed rate	18 to 20 kg.ha ⁻¹	20-25kg.ha ⁻¹
7	Fertilizer dose	100:50:40 (NPK kg.ha ⁻¹)	100:40:0
8	Plant protection	Need based application of carbofuran 3G@ 10 kg.ha ⁻¹ to protect against stemborer	Nil
9	Weed management	Atrazine @2.5 kg.ha ⁻¹ as pre-emergence, Paraquat 2.5 lit.ha ⁻¹ as post-emergence followed by one hand	One hand weeding at 30-35 days after sowing

weeding at 30 days after sowing

Table 2. Yield attributes obtained under demonstration versus farmers practices

Sl. no.	Parameters	Demonstration	Farmers practice
1	No. of cobs per plants	2	1
2	No. of kernels rows	20-25	16-18
3	Length of cob (cm)	18-21	15-19
4	Thousand grain weight (gr.)	221-250	180-211.5

Table 3. Economics of maize cultivation under FLD and farmers practice

Sl. no.	Year	Cost of cultivation (Rs.ha ⁻¹)		Gross returns (Rs.ha ⁻¹)		Net returns (Rs.ha ⁻¹)		BC Ratio		Grain yield (t.ha ⁻¹)	
		IP	FP	IP	FP	IP	FP	IP	FP	IP	FP
1	2011-12	334.50	301.50	1275.00	900.00	940.50	598.50	3.81:1	2.99:1	9.36	6.61
2	2012-13	348.30	323.10	1282.50	937.50	934.20	614.40	3.68:1	2.90:1	9.42	6.88
3	2013-14	367.50	335.25	1147.50	802.50	780.00	467.25	3.12:1	2.39:1	8.43	5.89
4	2014-15	372.00	324.75	1320.00	960.00	948.00	635.25	3.55:1	2.96:1	9.70	7.05
5	2015-16	374.25	336.90	1305.00	930.00	930.75	593.10	3.49:1	2.76:1	9.5	6.80
	Mean	355.58	324.30	1266.00	906.00	906.69	581.70	3.53	2.80	9.30	6.70

practice (US\$ 593.17 ha⁻¹). During the years, 2011-12, 2012-13, 2013-14, 2014-15 and 2015-16 the benefit cost ratios were recorded from 3.12:1 to 3.81:1 where as in farmers practice it was ranged from 2.29:1 to 2.99:1 [6].

However, Zero tillage rabi maize resulted higher net returns when compared to conventional tillage grown *rabi* maize. Studies reported variability in net returns from high to low depending to cost of inputs and variations in crop yields [7].

Farmers find significant change in yield levels and this technology has demonstrated much yield increase by gains in Net returns by reduction of tillage cost is around 152.96 US\$ to 91.77 US\$ form attractive proposition to adopt this technology in future [8].

Farmers assessed savings on cost of tillage operations in comparison to conventional practice, as rice fallow sown by paddling in last season and residual tillage maintained under irrigated condition. Minimum of 6 ploughs required to break hard clods amounting to cost escalation around 91.77 US\$ to 152.96 US\$ per acre in conventional tillage. This was found to have reduced in zero till crop. In this technology the field usually not ploughed and soil is opened up for sowing with seed drill and fertilizer is placed in adjacent slot made with same seed drill. A seed drill specially designed for the purpose actually facilitated in sowing which to a large extent constituted the success factor of technology adoption [9].

Only family labor was utilized throughout all farm operations and incurred less of labor cost compared to conventional tillage method. Weedicides were used mainly to control weeds and prevent rice stubbles emergence.

4. CONCLUSION

Technological interventions like demonstration of maize cultivation in agency area of Rampachodavaram under the operational area of KVK, Panadirimamidi, noted drastic improvement in the cropping pattern by zero tillage maize production in paddy fallows in *Rabi* season. The continuous demonstrations on maize shown better production, productivity and farm income also increased. Farmer attitude was changed. The trend may be followed in future. Now the technology came to the pipeline of Dept. of Agriculture and other line departments.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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