



Successful Zero Tillage Maize Cultivation Through Farmers Field School programme – A Case Study

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ABSTRACT

Pidiseela is a village in Gajapathinagaram mandal of Vizianagaram district in Andhra Pradesh. The water available in the village tank was insufficient to grow maize crop in total area of rice fallows during rabi season. Under this situation, District Agriculture Advisory and Transfer of Technology Centre (DAATTCentre), Vizianagaram motivated and educated farmers of the village to cultivate maize under zero tillage condition, instead conventional maize cultivation through conducting Farmers Field School (FFS) programme and proved its worthiness. Thirty farmers were selected as participants of FFS and one among them was selected to serve as collaborator in whose field the FFS was conducted. The FFS participants were trained on zero tillage maize cultivation by involving them in FFS sessions conducted at a fortnightly interval from sowing to harvest during crop period. As a result of efforts by DAATTCentre scientists along with extension staff, the collaborator of FFS harvested 80.87 quintals of maize per hectare and secured net income of Rs. 72,044/- per hectare with the B: C ratio 2.88 besides saving 33 percent irrigation. As against the zero tillage maize crop, the comparative economics of conventional maize cultivation during the same period in the village indicated that the net income of Rs.58,432/- and B:C ratio of 2.12 clearly showed that zero tillage maize is economically profitable as compared to conventional maize cultivation. In 2007, 2008 and 2009 around 775 farmers adopted the system and zero tillage maize cultivation now covers an estimated 420 ha out of 9,861 ha maize cultivation.

Key words : Case study, FFS, Maize, Zero tillage.

Maize has emerged as important crop in the non-traditional regions i.e., peninsular India as the state like Andhra Pradesh which ranks 5th in area (0.79 m ha) has recorded the highest production (4.14 mt) and productivity (5.25 t ha⁻¹) in the country. The productivity in some of the districts of Andhra Pradesh is more or less equal to the USA. To sustain production and ensure food security new adaptation strategies have to be developed and upscaled.

Maize is cultivated in rice fallow system and it takes one month time for proper land preparation. This resulted in delayed sowings and the crop was subjected to hot weather at grain filling stage that needs more irrigations. Maize can successfully be grown without primary tillage under no-till situation with less cost of cultivation, higher farm profitability and better resource use efficiency.

Agricultural research is a bedrock of generation of new knowledge that could be transmitted to the farming community for application on their farms to secure higher agricultural production and income leading to improvement in

their livelihoods. Development of human resource, more particularly in respect of farmers/farm women appears paramount importance to upgrade their knowledge and skills associated with the latest agricultural technologies through various extension education programmes. Farmers field school play a vital role in their endeavour.

Farmers field school is a non-formal education and learner centred educational process. It seeks to empower farmers to solve field level problems actively by fostering participation, self confidence, dialogue, joint decision making and self determination. Farmers learn by carrying out themselves various activities related to particular training technology they want to study and learn about. Pidiseela is a village in Gajapathi nagaram mandal of Vizianagaram district in Andhra Pradesh. Maize is cultivated in rice fallows. Rice fallow field being hard, takes one month for proper land preparation. This resulted in delayed sowings upto first fortnight of January and crop was subjected to hot weather at grain filling stage which is underisable. More irrigations are needed in hot

weather period. The water available in the village tank was insufficient to grow maize crop during rabi in rice fallows. Low rainfall and insufficient irrigation water forcing farmers to adapt to different management practices. Under this situation, DAATT Centre, Vizianagaram motivated and educated farmers of the village to cultivate maize under zero tillage condition instead of conventional maize cultivation through conducting farmers field school (FFS) programme and proved its worthiness. Zero tillage cultivation is practiced in crops like wheat and is an age – old practice having very less scientific data to provide to the farmers and policy makers to adopt the technology.

MATERIAL AND METHODS

Farmer's field school is powerful instrument for participatory research and knowledge management. DAATT Centre, vizianagaram motivated and educated farmers of Pidiseela village to cultivate maize under zero tillage condition instead of conventional maize cultivation through conducting Farmers Field School (FFS) programme and proved its worthiness during rabi, 2007. Thirty farmers and me one coordinator were selected as participants of FFS in the field of coordinator. The FFS was conducted. The FFS participants were trained in zero tillage maize cultivation by involving them in FFS sessions conducted at a fortnightly interval from sowing to harvest during crop period.

Simultaneously, field trials were conducted at four locations covering four mandals and four villages in vizianagaram district during 2007, 2008 and 2009 rabi seasons in farmers fields under bore well irrigated conditions to study the performance of zero tillage maize and to know the perception of farmers on the system with regard to crop growth, water saving, time saving, cost saving and yield improvement. Zero tillage maize was compared with conventional method of maize cultivation by following recommended management practices.

Zero tillage cultivation does not require ploughing which includes some of critical operations to be performed manually viz., making holes with peg marker in lines for sowing maize as zero tillage in rice fallows; dibbling the seed in holes and simultaneously basal application of fertilizers in between the holes where seed was dropped; Soil application of weedicide (Atrazine @ 1-1.5 kg/acre) at 2 days after sowing and formation of ridges and

furrows at 50 days after sowing. Weed growth is high in zero tillage cultivation and farmers have to use pre emergence herbicide to overcome the problem.

RESULTS AND DISCUSSION

Economic parameters for conventional maize cultivation and zero tillage maize were compared and the average grain yield in FFS plot of zero tillage maize was 80.87 q/ha while in conventional method it was 78.1 q/ha. Average percent increase in yield in zero tillage maize over conventional maize cultivation was 3.52% and secured net income of Rs. 72,044/- per hectare with the B: C ratio 2.88 besides saving 33 percent irrigation. As against the zero tillage maize, the comparative economics of conventional maize cultivation during the same period in the village indicated the net income of Rs. 58,432/- and B:C ratio of 2.12 clearly showing that zero tillage maize is economically profitable as compared to conventional maize cultivation.

Zero tillage maize allows for a drastic reduction in tillage intensity, resulting in significant cost savings as well as potential gains in maize yield through early sowing of maize. Maize farmers who adopted zero tillage could enhance their farm income by about Rs. 13,612/- per ha.

Zero tillage maize cultivation reduces the number of field operations from an average of four to one translating into 5-10 hours per hectare saved in tractor time; farmers can save 25 litres of fuel per hectare of land over conventional maize cultivation. There is considerable saving of irrigation by 33% over conventional maize cultivation. The cost saving towards irrigation, land preparation for sowing and weed control makes zero tillage profitable and is the main driver behind its spread. Direct sowing maize in rice fallows in zero till condition advances the crop by one month. Apart from reducing cultivation costs, zero tillage method increases maize harvests by 3.52%, largely facilitates timely maize sowing and price advantage due to earliness in marketing. The effectiveness of the technique is clearly shown by getting bumper yield and by increase in B:C ratio from 1:2.12 to 1:2.88.

Apart from reducing cultivation costs, zero tillage method increases maize harvests by 3.52%, largely facilitates timely maize sowing and price

Table 1. Comparison on economic parameters for conventional maize cultivation and zero tillage maize.

S.no	Particulars	Conventional maize cultivation.	Zero tillage maize	Difference
1.	Cost of sowing (Rs./ha)	2750/-	2000/-	750/-
2.	Cost of weeding (Rs./ha)	850/-	450/-	400/-
3.	Cost of irrigation (Rs./ha)	1800/-	1200/-	600/-
4.	Cost of cultivation (Rs./ha)	26,750/-	25,000/-	1,750/-
5.	Grain yield (q/ha)	78.12	80.87	2.75
6.	Gross returns (Rs./ha)	85,932/-(Rs.1100/- quintal price)	97,044/- (Rs.1200/- quintal price)	11,112/-
7.	Net profit (Rs./ha)	58,432/-	72,044/-	13,612/-
8.	Benefit cost ratio	2.12	2.88	

Table 2. Comparison on various parameters for conventional maize cultivation and zero tillage maize.

S.no	Particulars	Conventional maize cultivation	Zero tillage maize.
1.	Number of field operations	4	1
2.	Working with tractor (@ 5-10 hours per ha.)	7 hours	0 hours
3.	Consumption of fuel per ha.	25 litres	0 litres
4.	Saving of fuel per ha.		25 litres
5.	Number of irrigations	6	4
6.	Saving in irrigation		33%

advantage due to earliness in marketing. As a result, it is estimated that zero tillage has increased incomes by Rs.13,612 per ha. The bulk of this is from increased yield due to timely sowing. The prime driver for farmer's adoption of zero tillage wheat is monetary gain, not water savings or natural resource conservation (Erenstein et al., 2008). No till wheat is the significant and cost saving practice that makes adoption profitable and the yield advantage is closely associated with enhanced timeliness establishment after rice (Erenstein et al., 2007). Zero tillage maize reduced the cost of cultivation by 6.54% (Rs.1750/- per ha) compared to conventional maize cultivation. The cost saving effect primarily reflects the drastic reduction in tractor time and fuel for land preparation and sowing weeding and irrigation (Table 2). Erenstein et al., (2007a) reported that 15-16 percent saving on operational costs in zero tillage wheat cultivation.

Zero tillage saves irrigation water through the combined effect of allowing maize to be planted without pre-irrigation and shortening the duration

of first irrigation, as surface irrigation water flows faster across a non tilled field. Labour requirement for land preparation, weeding and irrigation was low in zero tillage maize compared to conventional maize cultivation requirement. For small farmers, cash benefits per unit of land may not be most important measure labour productivity (Ekboir et al., 2001; 2002) and risk reduction are likely more important factors. Zero tillage was originally perceived as potentially generating higher yields at a lower production cost, while being an environmentally friendly practice that saves water and soil (Hobbs and Gupta 2003).

Many factors contributed to the successful spread of zero tillage in Vizianagaram district. A key one was local made wooden peg marker helps in making holes in lines for sowing maize as zero tillage in rice fallows. Manual dibbling the seed in holes and simultaneously basal application of fertilizers in between the holes where seed dropped was done in zero till condition. Weedicide application at 2 DAS and formation of ridges and furrows at 50 DAS to

avoid lodging are the critical operations performed manually in zero tillage contributed better yields. Rapid adoption of zero tillage maize in vizianagaram district began during rabi, 2007. During 2007-2009, around 775 farmers adopted the system and zero tillage maize cultivation now covers an estimated 420 ha out of 9865 ha maize cultivation. Innovative partnerships among DAATTCentre scientists, farmers and extension staff in organising farmer's field school and field trials have enabled the adoption of zero tillage to sow maize after rice in rice fallows resulted in increasing farmer's income, fostering more sustainable use of soil, water and providing platform for crop diversification and the introduction of other resource conserving practices.

The impact achieved resulted from efforts involving zero tillage maize promotion and testing with farmers, training and motivation about practices and development of affordable, locally manufactured peg marker for sowing.

Apart from reducing cultivation costs by 6.54 %, zero tillage method increases maize harvests by 3.52%, largely facilitates timely maize sowing and price advantage due to earliness in marketing. Direct sowing maize in rice fallows in zero till condition advances the crop by one month. This saves number of irrigations, cost involved in land preparation and weed management. Plant population was more in zero tillage and the crop was more vigorous and higher yields were recorded in zero tillage plots compared to conventional method of sowing. The success of zero tillage and the farmer's participatory approach helped to overcome resistance to new practices among researchers and farmers. During 2007, 2008 and 2009 around 775 farmers adopted the system and zero tillage maize cultivation now covers an estimated 420 ha out of 9,861 ha maize cultivation.

At present, rabi maize under zero tillage condition was covered in four maize growing mandals (Pusapatirega, Gajapathinagaram, Saluru, Pachipenta) in vizianagaram district and in future farmers get motivated for rabi maize cultivation under zero tillage condition. Farmers field school farmers are interested to continue zero tillage maize in the coming seasons. This may be due to less dependence on irrigation, labour resulted in less cost of cultivation and higher maize yields. The present

study had clearly indicated the superiority of zero tillage maize as a sustainable method of maize cultivation.

The success of zero tillage in Vizianagaram highlights the importance of extension support for a technological opportunity to materialize. The success of zero tillage maize has much to do with development of an effective mechanical tractor mounted seed drill that can seed maize into a untilled rice field. The success of zero tillage and the participatory approach through which it was promulgated has helped to overcome resistance to new practices among researchers and farmers. Zero tillage impact has been achieved through an intervention that has proven attractive and implied the need for change.

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