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Short Communication

Assessment of in-situ Moisture Conservation Technologies on Productivity and Profitability in Rainfed Crops

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Climate change, population growth, over-exploitation of natural resources, environmental degradation and instability in yield of crops are major challenges in rain fed agriculture of our country. Agricultural productivity in rainfed areas is sensitive to two broad classes of climate induced effects viz., direct effects from changes in rainfall, temperature and carbondi-oxide concentrations and indirect effects through changes in soil moisture and frequency of infestation by pest and diseases. Among the major climate change variables, rainfall, temperature and relative humidity play a significant role to achieve sustainable production in these regions.

The productivity of rainfed crops depends upon the quantity and distribution of rainfall and duration of intermittent dry spells experienced during different growth stages of the crop. Castor in Kurnool district (Andhra Pradesh), cotton in Nalgonda district (Telangana State), pigeonpea and hybrid maize in Aurangabad and maize in Nandurbar districts of Maharashtra are the important crops grown under rainfed environment. These crops experience erratic distribution of rainfall in their crop growth periods leading to marked yield reduction and crop failures. In this context, various NRM based climate resilient technologies were evolved to minimize the effect of drought on rainfed crops. Among these, *in-situ* moisture conservation technologies like conservation furrows, ridges and furrows and off-season land treatments are helpful in conserving moisture in dryland farming regions. There is need to popularize these technologies among the farmers for increasing the productivity of rainfed crops against climatic risks like drought.

Demonstrations on *in-situ* moisture conservation technologies like conservation furrows, and ridges and furrows were organized along with local farmers' practice in selected NICRA centers in Andhra Pradesh, Telangana and Maharashtra states as a part of National Innovations in Climate Resilient Agriculture (NICRA) initiated by Indian Council of Agricultural Research (ICAR) from 2011.

The steps followed in selection of each site includes: analysis of climatic constraints of village based on long term data, assessment of natural resources, identification of major farming situations, constraints of crop production, climatic vulnerabilities, yield gaps and opportunities for climate change adaptations. Action plans to demonstrate appropriate *in-situ* moisture conservation technologies were prepared on participatory mode with the help of scientists and participating farmers.

The programme for each site was implemented with the help of programme coordinators (PI) and Subject Matter Specialists (Co-PI) of KVK in respective districts during cropping seasons of 2011, 2012 and 2013. The demonstrations were conducted in an area of 20 ha covering 50 farmers in crops of castor and cotton at Kurnool and Nalgonda districts, respectively. Similarly in Maharashtra these were conducted in an area of 49.6 ha with 124 farmers in crops of pigeonpea and maize. The yields of improved technology (*in-situ* moisture conservation) and local practice were recorded through crop cutting surveys at harvest. The economic analysis of costs and returns was also worked out to quantify the benefits accrued from these technologies.

Castor

In vertisols of Yagantipalle village in Kurnool, conservation furrows@1.3 m interval in castor (PCH-111) enhanced the bean yield by 14.7, 16.5 and 15.5% over farmers' practice (Table 1). The castor bean yields with farmers' practice were 856, 1056 and 1156 kg/ha in 2011, 2012 and 2013, respectively. On an average, conservation furrows in castor gave higher bean yields of 159 kg/ha and net income (₹ 3232/ha) than non-conservation furrow. The increased castor bean yields with conservation furrows was attributed to enhancement of yield components such as spike length, number of capsules, weight of capsules and also test weight of beans. Similarly, conservation furrows in castor contributed 16% higher bean yield over non-conservation furrows in on-farm studies in Ranga Reddy district (TAR-IVLP, CRIDA, 2005).

Cotton

Adoption of conservation furrow for every ten rows in cotton (Bt) in Nandyalagudem village of Nalgonda district gave higher seed yields by 170, 320 and 250 kg/ha over farmers' method of non- conservation furrows in 2011, 2012 and 2013, respectively. On an average, this practice contributed higher yield by 246 kg/ha than non-conservation furrows (Table 2). Improved practice of conservation furrow gave increased net income by ₹ 4030, 11190 and 7500 per ha over farmers' practice in 2011, 2012 and 2013, respectively. On an average, conservation furrows accrued higher net income of ₹ 7573/ha than non-conservation furrows. Nagdeve *et al.* (2011) reported that the seed yield was significantly influenced due to opening of furrow after every two rows of cotton. Similar results were reported by Mahadeva Reddy *et al*. (2005) in castor.

Pigeonpea

Conservation furrow for every four rows in pigeonpea (BDN-711) at Aurangabad registered additional seed yields by 325 kg/ha and an increase of net income by 29% (Table 3). Similar advantage was noticed with conservation furrows made at 1.2 m interval even with local varieties in sorghum and pigeonpea cropping system in Ranga Reddy district of Telangana state (TAR-IVLP, CRIDA, 2005).

Table 1 : Assessment of In-situ moisture conservation technologies on productivity and profitability in castor

Kurnool, Area: 10 ha, No. of farmers: 25								
Parameters	**2011**		**2012**		**2013**		**Mean**	
	F.P	**I.P**	**F.P**	**I.P**	**F.P**	**I.P**	**F.P**	**I.P**
Bean yield (kg/ha)	856	982	1056	1230	1156	1335	1023	1182
Cost of cultivation (₹/ha)	11772	12272	14478	14978	14478	14978	13576	14076
Net income (₹/ha)	7916	10314	9810	13312	13266	17062	10331	13563
B:C ratio (₹/ha)	1.67	1.84	1.68	1.89	1.92	2.14	1.76	1.96
C.D (P=0.05) for bean yield							59.12	

F.P: Farmers' practice I.P: Improved practice

Table 2 : Assessment of in-situ moisture conservation technologies on productivity and profitability in cotton

Nalgonda, Area: 10 ha, No. of farmers: 25								
Parameters	**2011**		**2012**		**2013**		**Mean**	
	F.P	**I.P**	**F.P**	**I.P**	**F.P**	**I.P**	**F.P**	**I.P**
Seed yield (kg/ha)	1250	1420	2600	2920	2350	2600	2067	2313
Cost of cultivation (₹/ha)	32750	34500	39350	39380	38500	40500	36867	38127
Net Income (₹/ha)	9750	13780	51650	62840	50800	58300	37400	44973
B:C ratio (₹/ha)	1.30	1.40	2.31	2.60	2.32	2.44	2.01	2.18
C.D (P=0.05) for seed yield							122.48	

F.P: Farmers' practice I.P: Improved practice

Table 3 : Assessment of in-situ moisture conservation technologies on productivity and profitability in pigeonpea

Aurangabad Area: 23.6 ha, No. of farmers: 59								
Parameters	**2011**		**2012**		**2013**		**Mean**	
	F.P	**I.P**	**F.P**	**I.P**	**F.P**	**I.P**	**F.P**	**I.P**
Seed Yield (kg/ha)	1832	2320	1800	2125	1040	1200	1557	1882
Cost of cultivation (₹/ha)	17200	18000	12800	13200	13100	14900	14367	15367
Net Income (₹/ha)	23104	33040	28600	35675	14980	17500	22228	28738
B:C ratio (₹/ha)	2.34	2.84	3.23	3.70	2.14	2.17	2.55	2.87
C.D (P=0.05) for seed yield							95.23	

F.P: Farmers' practice I.P: Improved practice

Table 4 : Assessment of *in-situ* moisture conservation technologies on productivity and profitability in maize

Aurangabad , Area: 21.2 ha, No. of farmers: 53								
Parameters	**2011**		**2012**		**2013**		**Mean**	
	F.P	**I.P**	**F.P**	**I.P**	**F.P**	**I.P**	**F.P**	**I.P**
Seed Yield (kg/ha)	5340	6460	5460	6500	2710	3277	4503	5412
Cost of cultivation (₹/ha)	15320	16250	13000	13300	13000	14800	13773	14783
Net Income (₹/ha)	37012	42058	57980	71200	24940	31078	39977	48112
B:C ratio (₹/ha)	3.41	3.59	5.46	6.35	2.92	3.10	3.93	4.35
C.D (P=0.05) for seed yield							239.76	

F.P: Farmers' practice I.P: Improved practice

Maize

At Aurangabad, conservation furrow for every four rows in hybrid maize contributed for higher seed yield by 1120, 1040, 567 kg/ha over non-conservation furrows in 2011, 2012 and 2013, respectively (Table 4). On an average, conservation furrows contributed 909 kg/ha of more seed over the control.

At Nandurbar (Maharashtra), ridges and furrows in maize enhanced the seed yields by 341 and 266 kg/ha and realizing more net income of ₹ 3935 and 3074/ha than flat sowing in 2012 and 2013, respectively (Table 5). The perception of farmers on performance of this technology was that it is simple in operation and can be performed by simple equipment like plough which is available with most of the farmers. Allolli *et al*. (2008) also reported similar results with ridges and furrows in dryland clusterbean. Pathak *et al*. (2009) also observed that raised bed and ridges and furrows across the slope enhanced the water use efficiency, reduced the runoff, soil loss and nutrient losses, enhanced the soil moisture content in soil profile and increased the water and crop productivity significantly.

Table 5 : Assessment of *in-situ* moisture conservation technologies on productivity and profitability in maize

Nandurbar, Area: 4.8 ha, No. of farmers: 12						
Parameters	**2012**		**2013**		**Mean**	
	F.P	**I.P**	**F.P**	**I.P**	**F.P**	**I.P**
Seed yield (Kg/ha)	2505	2846	2125	2391	2315	2619
fodder yield (kg/ha)	7000	7000	6500	7000	6750	7000
Cost of cultivation (₹/ha)	13000	13500	15650	16300	14325	14900
Net Income (₹/ha)	19565	23500	14100	17174	16833	20337
B:C ratio (₹/ha)	2.50	2.74	1.90	2.05	2.20	2.40
C.D (P=0.05) for seed yield					157.63	

F.P: Farmers' practice I.P: Improved practice

References

Allolli TB Hulihalli UK and Athani SI. 2008. Influence of *in-situ* moisture conservation practices on the performance of dryland cluster bean. Karnataka Journal of Agricultural Sciences, 21(2): 250-252.

Mahadeva Reddy K. 2005. Ph D Thesis submitted to Acharya N.G.Ranga Agricultural University, Hyderabad.

Nagdeve MB, Giri MD and Ganvir MM. 2011. Effect of potassium application and moisture conservation practices on yield of cotton (*Gossypium hirsutum).* Indian Journal of Dryland Agricultural Research and Development, 26 (1):21-25.

Pathak P, Mishra PK, Rao KV, Wani SP and Sudi R. 2009. *Best-bet options on soil and water conservation.* In: Best-bet Options for Integrated Watershed Management Proceedings of the Comprehensive Assessment of Watershed Programs in India, 25-27 July 2007, ICRISAT, Patancheru, Andhra Pradesh, India.

TAR-IVLP, CRIDA, 2005, Assessment and refinement of technologies in southern Telangana zone of Andhra Pradesh, NATP, CRIDA, Hyderabad, Technical bulletin: 1-54.

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