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Water Management Practices to Enhance Productivity in Rainfed Conditions

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A B S T R A C T

Rainfed agriculture is widely practiced in Agra district due to high dependency on rainfall. The productivity of dry land crops is very low. On farm trials were conducted to evaluate improved water management practices. Higher crop yield were obtained by adopting various water management techniques for different crops in comparison to farmer's practice. Improved water management practices resulted in overall increase in crop yield as well as net returns and B:C ratio.

Introduction

In every region of the world it is necessary to find or develop appropriate techniques for agriculture. A large part of the surface of the world is arid, characterized as too dry for conventional rainfed agriculture. Yet, millions of people live in such regions and if current trends in population increase continue, there will soon be millions more.

In many cases the most suitable techniques for a particular region may be those already developed by the local inhabitants. In some cases it will be difficult to improve the local techniques, but at times even simple and inexpensive innovations may be almost revolutionary.

Out of the total geographical area of 328.73 m ha in India, only 143 m ha is under cultivation. Even after realizing the complete irrigation potential of the country, 50% of the cultivated area will continue to depend on the rainfall. In the past four decades, the rate of growth of food production has more or less kept pace with the population growth mainly due to the productivity gains from irrigated area following the green revolution. The average productivity in rainfed areas is only 0.7 to 0.8

t/ha according to Singh and Venkateswarlu (1999). About 70 per cent of the cultivated land is rainfed which depends on natural precipitation for crop production (Mahipal, 1996) and rainfed agriculture accounts for 45 per cent of cereals and 75 per cent each of pulses and oil seeds (Hazra, 1998).

The objective for developing technology under these conditions should be therefore, for improvement in yield and stabilization of crop production, but these areas are marked by erratic and unpredictable rainfall, creating an atmosphere of high risk, insecurity and very low yields. The main crux of the problems for increasing agricultural production in any area is to increase the output per unit of input. The farm returns depend not only in the crops grown, but also how efficiently the available resources are utilized.

All these are pointers to indicate that the land resources should be utilized to the optimum extent possible. Since the available land area is limited and finite, the necessity to improve the productivity of the land and to increase the income of the farmers has become important. This is therefore, necessary to introduce technologies in dry land farming to increase production.

Materials and Methods

Trials were conducted in six year during 2011-2016 at the village *Nagla Dulhe Khan* & *Faziyatpura* tehsils Kheragarh, Distt. Agra, Uttar Pradesh under NICRA. *Nagla Dulhe Khan* is situated in the South-Western part of Agra and lies between 26°55’ to 26°56’ North latitude and 77°40’30” to 77°42’30” east longitude, its distance from Agra city is about 65 Km. The results have been analyzed in randomized block design by using the number of farmers as replications. The annual rainfall received during 2011-12 to 2016-17 varied from 418.8 to 1119.4 mm with the average value of 762.9 mm which was 14.8 per cent more over the mean normal rainfall. The rainfall received during *kharif* season (June-September) ranges from 313.4 to 942.1 mm with mean value of 650.1 mm and during *rabi* season (October- March) ranges from 32.0 to 204.1 mm with mean value of 94.1 mm. The major soil types are sandy loam to loamy sand. The major crops in *kharif* under rainfed are pearl millet, pigeon pea, green gram, black gram, sesame and sorghum (for fodder purpose). Major crops in *rabi* are mustard, barley, chickpea, lentil, linseed in rainfed conditions. Wheat and potato are also grown under assured irrigated conditions. The source of irrigation is bore well covering 30% of cultivated area.

Results and Discussion

Initially an attempt should be made to retain as much rain water could be stored in the soil where it falls, so as to provide a favorable moisture regime to the crop. The excess rain water that exceeds the infiltration and storage capacity of soil may be harvested nearby in the same field or at another convenient point in the watershed for life saving irrigation to crops.

Ridge sowing of pearl millet

It was observed that ridge sowing of pearl millet gave higher grain yield, net returns and B:C ratio over the broadcasting of pearl millet. Grain yield varied from 1320 to 2934 kg/ha by ridge sowing method with average value of 2457 kg/ha. The increase in the average yield was 33.17 per cent over broad casting method. Increase in the yield might be the favorable soil conditions created by ridges such as more moisture and nutrient uptake and better root development. Channapa and Ashoka (1992) reported that there was 11.67 per cent increase in yield of ragi in the ridge & furrow system over the flat method of sowing. Hadvani

(1993) studied the effect of different methods of sowing yields of groundnut and reported that there was 40.80 percent higher yield of pod in the ridge furrow method than the flat bed sowing system. Gupta (1997) investigated the effect of in situ moisture conservation in yield of maize-mustard cropping system and reported that significant improvement in yield resulted from ridging and furrowing. Vaidyanathan (1998) conducted a study on the effect of moisture conservation practices on the yield of rainfed castor and the results revealed that sowing of castor in ridges and furrows has recorded higher yields by 17.69 per cent than the flat bed system field. Gul *et al.,* (2015) investigated that ridge method of sowing with NPK levels of 75:50:30 kg/ha in maize gave better performance in growth, yield and yield attributes over the others (Table 1).

Compartmental bunding in Pearl millet

Compartmental bunding gave higher grain yield, net returns and B:C ratio over when bunding was not practiced. The grain yield with compartmental bunding varied 1075 to 2848 kg/ha with the average yield o 2287 kg/ha. Average 28.70% increase in the yield was observed by this practice. Adoption of compartmental bunding reduces runoff, soil and nutrient losses. On account of higher soil water content in the soil profile of fields with compartmental bunds, early sowing can be done. Katyal (1992) stated that compartmental bunds converting the inter bund area into square parcels of 10 x 10 m or 15 x 15 m were useful for temporary impounding of water for improving the moisture status of the soil. More (1994) reported that compartmental bunding increase the grain and fodder production of *rabi* sorghum by 38 and 50 per cent respectively. More (1996) assessed the use of compartmental bunding (6 x 6 m spacing) as a moisture conservation measure and concluded that compartmental bunding increased mean sorghum grain yield from 0.69 to 0.96 t/ha and mean fodder yield from 1.20 to 1.79 t/ha. (Table 2).

Deep tillage in summer in mustard

Grain yield, net return and B:C ratio were recorded higher when deep ploughing practice is done in the summer. The grain yield with deep tillage in summer varied from 1010 to 2347 kg/ha with average value of 1748 kg/ha which was 25.75 per cent higher over the average value of grain yield when deep ploughing practice in summer was not done in mustard. Deep tillage improves soil structure and soil moisture content. Summer deep ploughing kills pests due to exposure of pupae to hot sun. Sriram (1982) reported that deep tillage was superior in producing higher crop yield over shallow tillage. Khan (1989) studied the effect of deep tillage on the yield of bengal gram and wheat and concluded that in bengal gram subsoiling + Gypsum and subsoiling + saw dust treatments significantly increased the soil moisture content (Table 3).

Effect of tillage after each effective rainfall on mustard

Tillage after each effective rainfall gave higher grain yield, net return and BC ratio over the conventional tillage. The grain yield with tillage after each effective tillage varied from 1065 to 2426 kg/ha with average value of 1779 kg/ha. This average yield was 26.35 higher over conventional methods of tillage This activity improves soil condition by altering the mechanical impedance to root penetration, hydraulic conductivity and holding capacity, which in turn affects plant growth (Dexter, 1989). Present study indicated that by adopting different improved water management technologies in different crops farmers can achieve higher productivity and profitability on sustainable basis and ensure food and nutritional security at household level (Table 4).

Table.1 Effect of ridge sowing on pearl millet yield

Treatments	Grain yield (kg/ha)						Average	Average Net return (Rs./ha)	Average B:C ratio
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17			
Ridge Sowing	2934	2723	2232	2920	1320	2615	2457	22567	2.53
Broadcasting	2074	2216	1890	2090	1008	1795	1845	14775	2.06
Rainfall (mm)	--	757.8	787.3	239.0	273.0	396.5	--	--	--

Table.2 Effect of compartmental bunding on pearl millet yield

Treatments	Grain yield (kg/ha)						Average	Average Net return (Rs./ha)	Average B:C ratio
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17			
Compartmental Bunding	2848	2685	2062	2795	1075	2260	2287	19695	2.35
No Bunding	1853	2325	1777	2060	958	1690	1777	13204	1.68
Rainfall(mm)	--	757.8	787.3	239.0	273.0	395.5	--	--	--

Table.3 Effect of deep ploughing in summer on mustard yield

Treatments	Grain yield (kg/ha)						Average	Average Net return (Rs./ha)	Average B:C ratio
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17			
Deep ploughing in summer	2232	2347	1603	1010	1098	2202	1748	55699	4.64
Without deep ploughing	1583	1855	1390	890	848	1775	1390	42213	4.00

Table.4 Effect of tillage after each effective rainfall on mustard yield

Treatments	Grain yield (kg/ha)						Average	Average Net return (Rs./ha)	Average B:C ratio
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17			
Tillage after each effective rainfall	2303	2426	1595	1110	1065	2177	1779	56330	4.59
Conventional tillage	1590	1964	1385	860	887	1799	1408	42941	4.05

The per cent increase in yield was highest with adoption of ridge sowing (33.17), followed by compartmental bunding (28.70), tillage after each effective rainfall (26.35) and by deep ploughing in summer (25.75). Results of demonstration of adoption of improved water management technologies at farmer's field clearly indicated that improved technologies were helpful over farmer's practices in increasing yield and additional net returns. Study suggested that the productivity and profitability could be enhanced considerably at farmer's field by adopting suitable improved water management technologies during various seasons in NICRA village Agra.

References

Channapa, T.C. and Ashoka, H. G.(1992). Indian J. Soil Conserv., 20: 1-8.

Dexter, A. R. and Braunack, M. V. (1989). Soil aggregation in the seed bed: a review. Soil and tillage research 14(3), 281-298.

Gul, S., Khan, M.H., Khanday, B.A. and Sabeena, N. (2015). Effect of sowing methods and NPK levels on growth and yield on rainfed. Scientifica, http://dx.org/10.1155/2015/198575

Gupta, D.K. (1997) Indian J. Soil Consev., 25: 133-135.

Hadvani, R.G. (1993) Indian J. Agron., 38: 325-327.

Hazra, C.R. (1998) Agric. Situat. India, 55:120-127.

Katyal, J.C. (1992) Rainfed Agric. Res. Newsletter, 1: 15-20.

Khan, M.A. (1989) Ann. Arid Zone, 28: 277-283.

Mahipal, M.S. (1996) Indian Journal Dryland Agric. Res. Dev., 11: 103-107.

More, S.M. (1994) Indian Journal Dryland Agric. Res. Dev., 11:103-107.

More, S.M. (1996) J. Maharashtra Agric. Universities. 21:129-130.

Singh, H.P. and Venkateswarlu, B. (1999) The Hindu Survey Indian Agric., pp. 25-27

Sriram, C. (1982) A Decade of Dryland Agric. Res. in India (1971-80). AICRPDA, Hyderabad.

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