

Water management technologies for *Rabi* crops: Adoption pattern and constraints

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ABSTRACT

Irrigation is prime requirement for crop production. Presently farmers are facing water scarcity problems in the country side. In case of scarce water supply, water management technologies developed by the research institutes proved to be very effective in efficient utilization of available water resources. Present study was undertaken to assess the suitability of water Management technologies and problems faced by the cultivators in using them in their field conditions (Khajuria and Sharma, 2003). Under the study a sample of 50 farmers was taken from two blocks of Sriganganagar district namely Sadulshahar and Ganaganagar. The study revealed that 48 per cent of the respondents have medium level of adoption of W M Practices followed by low level (38 per cent). Only 14 per cent farmers belong to high category under the study adopted water management techniques. Under the study, crop wise extent of adoption revealed that in wheat crop, majority of the farmers followed the W M Practices. However, farmers reported that irrigating crop at critical stages was not possible. This may be due to the supply of water in canal may not coincide with critical stages of the crop. Further, the study found that farmers were not using sprinkler method in irrigating the wheat crop. In mustard crop, majority (65 per cent) of the farmers adopted recommended irrigation methods but half of the selected farmers applied irrigation at critical stages. The study revealed that farmers were not adopting sprinkler method for irrigating the mustard crop. The extent of adoption of W M Practices in gram crop was found to be high (82 per cent) regarding irrigation method, irrigation at critical stages and number of irrigations. The study found that inadequate supply of canal water and lack of storage tank (diggi) were the constraints faced by the farmers in adopting sprinkler system of irrigation and application of irrigation at critical stages. The study recommended that supply of water in canal should be based on the prior assessment of the acreage under different crops along with their sowing times by the canal authorities in coordination with district agricultural officials.

Key words : Water management, *Rabi*, Wheat, Mustard, Gram, Barley, Constraints

INTRODUCTION

Water is one of the essential inputs in today's practiced intensive agriculture. Timely and efficient utilization of available irrigation water is the prime requisite for sustaining agricultural production. The North West Plain Zone 1B of Rajasthan is fed by three canal system of the State (Anonymous, 2008). Here the water availability is considered as sufficient for cultivating the land suited for production. But there is deficient water situation may be due to mismanagement of canal water or due to faulty practices of irrigation used by the farmers. Improved irrigation technologies have been developed under Water management project of ARS, Sriganganagar. These technologies has been tested on farmers' fields and found suitable for saving irrigation water as well as increasing crop production (Katkar and Ahire, 2006). A study of this kind will be useful in assessing the suitability of water Management technologies generated over the period of 27 years of research work at ARS, Sriganganagar and problems faced by the cultivators in using them in their field conditions (Yadav, 2006). Feedback generated of this study could be useful for making further refinement of these techniques so that they can be applicable in field condition on larger scale. On this background a study have been undertaken with the following objectives : to study the water management

practices adopted by the farmers and to find out the constraints faced by the farmers.

MATERIALS AND METHODS

The study was conducted in two blocks of Sriganganagar namely Sadulshahar and Sriganganagar by taking a sample of 50 farmers. 25 farmers from each block were selected by using proportionate random sampling technique. The selected irrigation technologies have been assessed v/s irrigation practices followed by the cultivators. Under this all the research technologies developed by Water Management Project for irrigating *Rabi* crops have been documented. The data were collected through personal interview method with the help of interview schedule especially structured for the purpose. Collected data were analyzed and farmers were categorized on the basis of adoption quotient. To measure the constraints faced by the farmers in adopting recommended W M technologies, a simple perceptual analysis was done based on appropriateness, feasibility and adoptability of the technologies.

RESULTS AND DISCUSSION

The findings of the present study have been presented in the following sub heads:

Farmer's profile:

The background information of the selected respondents under the study has been presented in the Table 1. This table revealed that majority of the respondents were young (58 per cent), having matric level education, possessing medium to large size land holding and having medium level of extension contact (54 per cent).

Adoption pattern of water management technologies:

In the Table 2, extent of adoption of water Management technologies have been presented which revealed that 48 per cent of the respondents have medium level of adoption of W M practices followed by low level (38 per cent). Only 14 per cent respondents under the study have high level of adoption of W M Practices. The study found that inadequate and untimely supply of canal water not coinciding with various critical stages of irrigation of *Rabi* crops leads to low level of adoption of W M practices. However, there was no significant difference between extent of adoption in two selected blocks.

The study also studied the crop wise extent of adoption of various recommended water management Technologies. The crops were wheat, barley, mustard and gram.

Table 3 presented the distribution of farmers on the basis of adoption of W M practices which revealed that majority palewa (100 per cent), border strip method (100 per cent) and no. of irrigations (72 per cent) of the respondents adopted the recommended W M practices. The study found that 54 per cent of the respondents given irrigation in wheat crop at critical stages. This may be due to the supply of canal water could not coincide with the critical stages of the crop. The extent of adoption of cut off ratio was low (46 per cent) due to supply of canal water in night. Further the study found that no farmer has taken wheat crop on sprinkler system due to lack of storage structure at their farms.

From the Table 4 the adoption pattern reveals the same trend as that of wheat crop. Regarding cut off ratio 36 per cent farmers followed the recommendation. This is due to in later stage of the crop and in nights, it was difficult to farmers to trace the flow of water.

Table 1: Back ground information of the respondents			N=50			
Variables	Category	Criteria	Sadulshahar		Ganganagar	
			Frequency	percentage	Frequency	Percentage
Age	Young	Up to 35 years	16	64	13	52
	Middle	36 to 50 years	7	28	8	32
	Old	Above 50 years	2	8	4	16
Education	<Matric		17	68	14	56
	Intermediate		6	24	8	32
	Graduate		2	8	3	12
Family type	Nuclear	Up to 4 member	8	32	11	44
	Joint	>4 members	17	68	14	56
Land holding	Small	<2 ha.	4	16	5	20
	Medium	2to 4ha.	11	44	10	40
	Large	4to 10 ha.	7	28	6	24
	Very large	>10 ha.	3	12	4	16
Extension contact	Poor		8	32	6	24
	Medium		13	52	14	56
	Good		4	16	5	20
Social participation	Poor		10	40	11	44
	Medium		13	52	12	48
	Good		2	8	2	8

Table 2 : Distribution of respondents based on extent of adoption of WM techniques N=50							
Sr.No.	Category	Blocks					
		Ganganagar		Sadulshahar		Overall	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1.	Low	8	32.00	11	44.00	19	38.00
2.	Medium	12	48.00	12	48.00	24	48.00
3.	High	5	20.00	2	8.00	7	14.00

Table 3 : Distribution of respondents based on extent of adoption of WM techniques/ practices in wheat crop							N=50
WM Technologies	Blocks				Overall		
	Ganganagar		Sadulshahar		YES	NO	
	YES	NO	YES	NO			
1. Palewa (10 cm)	25	-	25	-	50(100)	-	
2. Irrigation- 5 (6cm)	16	9	18	7	34(68)	16 (32)	
3 Method-border strip	25	-	25	-	50(100)	-	
4. Irrigation at critical stages	19	6	16	9	35((70)	15 (30)	
5. Border strip width (8-10 m)& length 50m	20	5	17	8	37(74)	13 (26)	
6. Border strip cut off ratio (85-90 percent)	10	15	13	12	23(46)	27 (54)	
7. Sprinkler in wheat	No farmer taken wheat on sprinkler						

Figures in parenthesis indicates percentages

The extent of adoption of W M practices has been presented in Table 5. The adoption of W M practices was found to be higher than other *Rabi* crops. This was found as application of palewa (68 per cent), border strip method (100 per cent), no. and time of irrigations (86 per cent) and irrigation at critical stages (82 per cent), respectively.

The adoption of water management practices in mustard crop has been presented in the Table 6. Majority (88 per cent) of the farmers sowed their crop after palewa. Regarding application of irrigation, 46 per cent of the farmers irrigated their crop at critical stages. The study revealed that farmers were not using sprinkler method for irrigating their mustard crop.

An attempt has been made to work out the comparative adoption pattern of water management

technologies in respective selected *Rabi* crops- wheat, barley, gram and mustard. The comparative analysis has been presented in Table 7. This is clear from the Table 7 that sowing of *Rabi* crops is done after having pre-sowing irrigation (PALEWA) *i.e.* 68 per cent in gram crop to 100 per cent in wheat and barley crops. Regarding number of irrigations applied in different crops, 60 per cent to 86 per cent farmers applied the required number of irrigations. This might be due to canal closure or less supply of irrigation water. Almost all the farmers (100 per cent) have used border strip method in irrigating their *Rabi* crops. However, the adoption of keeping length and breadth and cut off ratio of border strips was low to medium. The reason cited by the farmers that size of farms are not fixed and maintaining cut off ratio is difficult in standing crops and in night time. The study found that

Table 4 : Distribution of respondents based on extent of adoption of WM techniques/ practices in barley crop							N=50
WM Technologies	Blocks				Overall		
	Ganganagar		Sadulshahar		YES	NO	
	YES	NO	YES	NO			
1. Palewa (10 cm)	25	-	25	-	50 (100)	- (0.00)	
2. Irrigation- 4 (6cm)	20	5	16	9	36 (72)	14 (28)	
3 Method-border strip	25	-	25	-	50 (100)	- (0.00)	
4. Irrigation at critical stages	15	10	12	13	27 (54)	23 (46)	
5. Border strip width (8-10 m)& length 50m	10	15	13	12	23 (46)	27 (54)	
6. Border strip cut off ratio (85-90 percent)	8	17	10	15	18 (36)	32 (64)	

Figures in parenthesis indicates percentages

Table 5 : Distribution of respondents based on extent of adoption of WM techniques/ practices in Gram crop							N=50
WM Technologies	Blocks				Overall		
	Ganganagar		Sadulshahar		YES	NO	
	YES	NO	YES	NO			
1. Palewa (10 cm)	18	7	16	9	34(68)	16(32)	
2. irrigation- 2(6cm)	22	3	21	4	43(86)	7(14)	
3 Method-border strip	25	-	25	-	50(100)	-	
4. Irrigation at critical stages	20	5	21	4	41(82)	9(18)	
5. Border strip cut off ratio (85-90 per cent)	10	15	13	12	23(46)	27(54)	

Figures in parenthesis indicates percentages

Table 6 : Distribution of respondents based on extent of adoption of WM techniques/ practices in Mustard crop N=50

WM Technologies	Blocks				Overall	
	Ganganagar		Sadulshahar		YES	NO
	Yes	No	Yes	No		
1. Palewa (10 cm)	20	5	18	7	44 (88)	6 (12)
2. Irrigation- 3 (6cm)	14	11	16	9	30 (60)	20 (40)
3 Method-border strip	25	-	25	-	50(100)	-
4. Irrigation at critical stages	10	15	13	12	23 (46)	27 (54)
5. Border strip cut off ratio (85-90 per cent)	14	11	13	12	27 (54)	23 (46)
6. Sprinkler irrigation	No farmer taken mustard on sprinkler					

* Figures in parenthesis indicates percentages

Table7 : Adoption pattern of WM techniques/ practices in different crops N=50

W M technologies	Crops							
	Wheat		Barley		Gram		Mustard	
	Adopted	Not Adopted	Adopted	Not Adopted	Adopted	Not Adopted	Adopted	Not Adopted
1. Palewa (10 cm)	50(100)	-	50 (100)	- (0.00)	34(68)	16(32)	44 (88)	6 (12)
2. Irrigation- 5 (6cm)	34(68)	16 (32)	36 (72)	14 (28)	43(86)	7(14)	30 (60)	20 (40)
3 Method-border strip	50(100)	-	50 (100)	- (0.00)	50(100)	-	50(100)	-
4. Irrigation at critical stages	35((70)	15 (30)	27 (54)	23 (46)	41(82)	9(18)	23 (46)	27 (54)
5. Border strip width (8-10 m)& length 50m	37(74)	13 (26)	23 (46)	27 (54)	-	-	-	-
6. Border strip cut off ratio (85-90 per cent)	23(46)	27 (54)	18 (36)	32 (64)	23 (46)	27 (54)	27 (54)	23 (46)
7. Sprinkler in wheat	0 (0.00)	50 (100)	Not recommended		Not recommended		0 (0.00)	50 (100)

Figures in parenthesis indicates percentages

adoption rate was lower in irrigating crops at their critical stages. This ranged from 46 per cent in mustard crop to 82 per cent in gram crop. Only 54 per cent farmer irrigated their wheat crop at critical stages. This might be due to non availability of canal water at the critical stages of the crops. The pressurized irrigation system – sprinkler recommended by the research scientists have no adoption at the farmers' fields due to non availability of storage structure(diggi) at farmers fields and they also considered it as labour intensive and costly than flood method of irrigation.

Constraints faced by the respondents in adoption of WM technologies :

Under the study major problems were identified based on the farmer's perception and extension officials and they were put on to respondents to score them as per their intensity because of that they were not adopting the recommended W M technologies. Based on their weightage score, mean scores were calculated and ranked accordingly.

Table 8 shows that inadequate and irregular supply of canal water (rank-1), Supply of canal water did not

match with critical stages of the crops (rank-II) and lack of storage tank (Diggi) (rank-III) were the main constraints faced by the farmers in adopting water management technologies recommended by the university. Since, the area is mainly fed by canal system and supply of irrigation water is depend on the availability of the water in dams and regulations of the canal authorities farmers are not in position to apply irrigation as per the recommendations. The study recommended that supply of water in canal should be based on the prior assessment of the acreage under different crops along with their sowing times by the canal authorities in coordination with district agricultural officials.

Conclusion :

Present study has made an assessment of adoption pattern of recommended water management technologies of the university by the farmers of Sriganganagar district of the Rajasthan which have supply of irrigation water from three canal system *i.e.* Indira Gandhi canal, the Gang canal and the Bhakhra system The study documented the water management technologies developed by the agricultural Research Station, Sriganganagr. Adoption

Table 8 : Constraints faced by the farmers in using W M technologies

Sr. No.	Constraints particulars	Mean	Rank
1.	Inadequate and irregular supply of canal water	1.89	I
2.	High initial cost of sprinkler system	1.34	IV
3.	Lack of storage tank (Diggi)	1.54	III
4.	Maintaining cut off ratio required higher labour and difficult in standing crops	1.17	V
5.	Length & breadth of border did not suite to size of fields	1.9	VI
6.	Inadequate supply of electricity	0.93	VII
7.	Supply of canal water did not match with critical stages of the crops	1.72	II

pattern of important irrigation technologies shows that farmers have low to medium level of adoption of the major irrigation technologies. Regarding sprinkler technologies which have a fair amount of water saving, did not use by the farmers for irrigating field crops. The study identified inadequate and irregular canal water supply, lack of storage structure and non availability of irrigation water at critical stages of the crops as the major problems faced by the farmers of the area and suggested for prior assessment of acreage under different crops along with their sowing times by the canal authorities in coordination with district extension officials and water users associations.

REFERENCES

Anonymous (2008). Packages of practices for *Rabi* crops for Zone 1 b of Rajasthan. Agricultural Research Station, Sriganaganagar.

Katkar, B.S. and Ahire, M.C.(2006). A study of knowledge level of farmers regarding drip system of irrigation in maharashtra. *Internat. J. Agric. Sci.*, **2** (1) : 148-150.

Kajuria, R. and Sharma, F.L. (2003). Constraints in adoption of Sprinkler system. *Rajasthan J.Extn.Edu.*, **11** : 41-45.

Yadav, B.S. (2006). Enhancing water use efficiency in arid and semi arid areas for sustainable agriculture. Summer school compendium organiesed by ARS, Sriganaganagar (2006).

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