

IMPACT ASSESSMENT OF ADOPTION OF WATER SAVING IRRIGATION INTERVENTIONS ON THE SOCIO- ECONOMIC DEVELOPMENT OF SMALL FARMERS IN DISTRICT FAISALABAD

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ABSTRACT

The irrigation water-saving technologies mainly include watercourse improvement, improved farm layout, laser land leveling and bed planting of wheat. To evaluate the impact of adoption of water saving irrigation interventions on the socio-economic development of small farmers at small farms, Faisalabad district was selected as study area. It consists of five tehsils: Faisalabad, Jaranwala, Samundri, Chak Jhumra and Tandlianwala out of which three tehsils (Jaranwala, Samundri and Chak Jhumra) were randomly selected. A list of 25 watercourses where maximum water saving interventions were applied, was separately prepared from each tehsil. A sample of ten improved watercourses where maximum water saving irrigation interventions (5 or 6 out of 10) were applied, were selected using randomizer.com pathway from each tehsil. Thus a total of 30 improved watercourses were taken. From these 30 watercourses, 9 small farmers (having landholding < 12.5 acres) were selected randomly: 3 each from head, middle and tail, respectively. So a sample of 270 respondents was selected. Quantitative data were collected during the year 2010 and analyzed using the statistical package for the social sciences (SPSS). Descriptive statistics, including frequencies percentages, means and standard deviations, were used to summarize different variables. Overall results showed that adoption of water saving interventions affected the socio economic status of farmers. Further, the extent of observed changes after using water saving interventions in increase in income, better care of child health, increase in cattle, more entertainment for children, more use of fruit and increase in electricity bill was above an average extent with 69.6, 67.0, 65.2 and 59.3, 59.3 and 58.1 percent respectively, and use of taxi for traveling, better living standard and use of gas cylinders are on average extent with 54.8, 51.5 and 50.7 percent respectively.

KEYWORDS: Water courses; water conservation; small farmers; innovation adoption; Faisalabad; Pakistan.

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INTRODUCTION

Various natural resources of the world such as land, water, minerals, oil and gas are God gifted. Luckily, Pakistan is situated at a place where these resources are abundant. Pakistan has fertile land and a huge amount of water. The estimated amount of water resources is 142 million acre feet (MAF) where only 42 MAF is available for agricultural production. A huge quantity of water is wasted in our inefficient irrigation system and management. Pakistan's irrigation system consists of barrages, headworks, main canals, branch canals, distributaries, minors and watercourses. (18). Concluded that approximately 37 MAF water is lost in watercourses alone. In view this huge water loss, the government launched an On Farm Water Management Project in 1977.

Agriculture accounts for nearly 21 percent of Pakistan's national income (GDP) and employs 45 percent of its workforce (2). Agriculture also supplies raw material to Pakistan's industries, notably the textile industry, which is the largest industrial sub-sector of the economy. Most importantly, 67.5 percent of the rural population is directly or indirectly dependent on agriculture for their livelihood. Given its importance to the national economy, the Government attaches high priority to raising agricultural productivity with a view to promoting faster agricultural growth and hence, raising farmers income (2). Pakistan's agriculture has been suffering, off and on, from a severe shortage of irrigation water in recent years, against the normal surface water availability at canal heads of 91.8 million acre feet (MAF). Relatively speaking, rabi season faced more shortage of water than kharif during these periods. During fiscal year 2008-09, the 66.9 MAF water was available for kharif season (for crops such as rice, sugarcane and cotton) and with 24.9 MAF for rabi season. Pakistan having the mighty Indus River System flowing with its tributaries, has a great amount of variability in terms of water availability in time and space. The Indus is more a snow-fed river, while its other tributaries viz. Jhelum, Chenab, Ravi and Sutlej rivers depend primarily on rainfall. In the Punjab, important canals include Upper Sutlej, Lower Sutlej, Shahpur, Chenab and Indus Canals (12). Most of the annual flow may come as a single flood following snowmelt or heavy rains and unless captured by reservoirs, the water flows to the sea, at times, causing seasonal flooding in the plains (11). Munir (17) reported that 7 years inflow data of River Indus reveal that water productivity is far below due to inadequate and untimely availability of water causing stress at critical stages of the crop growth, water conveyance.

Mukhtar (16) suggested that more water can be stored for crop irrigation by constructing dams, reservoirs, barrages and link canals. Water losses can also be controlled by water course improvements. He emphasized the need to construct bricks water courses at farm level. Bajwa *et al.* (5) concluded that in adoption of extension methods group discussion, lectures and literature were commonly used. Shoukat *et al.* (19) concluded that farmers are conscious about extensions services and show maximum interest in the adoption of extension methods. The extension worker is a key figure in showing how the latest technologies can be managed and applied.

The present study was conducted to determine the impact of adoption of water saving irrigation interventions on the socio-economic characteristics of small farmers.

METHODOLOGY

District Faisalabad was selected for this study, which consists of five tehsils; (Faisalabad, Jaranwala, Sammundri, Chak Jhumra and Tandlianwala). Three tehsils i.e. Chak Jhumra, Jaranwala and Sammandri were selected randomly using simple random sampling technique. To evaluate implications of water saving irrigation interventions a tehsil-wise list of improved watercourses was collected from District Officer Water Management Faisalabad and with his coordination water saving irrigation interventions applied on each improved water course were worked out. A list of 25 watercourses was separately prepared duly authenticated by Water Management Officer where maximum water saving interventions were applied. Thus ranking was made and 10 improved watercourses where maximum water saving irrigation interventions (5 or 6 out of 10) were applied, were selected using randomizer.com pathway from each tehsil, making the total of 30 improved watercourses, From these 30 watercourses nine small farmers (having landholding < 12.5 acres) were selected randomly, three each from head, middle and tail, respectively. Thus 270 respondents were selected randomly and uniformly from head, middle and tail. The data were collected during 2010 from the randomly selected respondents with help of well-educated agriculture graduates, through validated interview schedule. Quantitative data were analyzed using the statistical package for social sciences (SPSS). Descriptive statistics including frequencies, percentages, means, standard deviations and rank orders were used to summarize different variables.

RESULTS AND DISCUSSION

Land holding

Land holding plays an important role in decision making for any farm adoption. So information regarding size of land holding of the respondents was collected (Table 1.).

Table 1. Distribution of respondents according to size of land holding.

Size of land holding (acres)	No.	Percentage
Up to 4	46	17.0
5-8	107	39.6
9-12.5	117	43.4
Total	270	100.0

Mean = 8.17 S.D. = 3.66

The data show that 17 percent of respondents had land holdings upto 4 acres followed by 39.6 and 43.4 percent who had between 5-8 and 9-12.5 acres, respectively. The overall mean farm size was 8.17 acres and overall standard deviation of farmer's land holding was 3.66. It shows that farm size was directly proportional to the adoption of water saving interventions. The results are similar to those of Hawkkins *et al.* (7). Lionberger (15) also observed a positive relationship between farm size and adoption of improved farm practices. In another study (9) it was concluded that the bigger the size of land holding of farmers, the higher the adoption level of modern technologies.

Total annual income

The respondents were asked about total income they earned from farming and all other sources. The respondents were divided according to their total annual income i.e. upto Rs. 200,000, Rs. 2,00,001- 3,00,000, Rs. 3,00,001-4,00,000 and above Rs. 4,00,000 per annum (Table 2).

The data show that 31.5 percent of respondents had annual income from all sources of less than Rs. 200,000, whereas only 22.5, 31.0 and 14.1 percent respondents had annual incomes of Rs.200,001-300,000, Rs.300,001-400,000 and above Rs.400,000 respectively.

The overall mean of respondents annual income was Rs. 324,844, whereas means from agriculture and other sources were Rs. 281,214 and Rs. 96,507, respectively. The results are also supported by Idrees and Ibrahim 10 who concluded that income is essential for agricultural inputs. So the total income

Table 2. Distribution of respondents according to their annual income from all sources.

Annual income of respondents from agriculture (Rs.)	No.	Percentage
Up to 200000	90	33.3
200001-300000	68	25.2
300001-400000	81	30.0
Above 400000	31	11.5
Total	270	100.0
Annual income of respondents from other sources (Rs.)	No.	Percentage
Up to 50000	72	26.7
50001-100000	30	11.1
Above 100000	24	8.9
No income	144	53.3
Total	270	100.0
Total annual income of the respondents from all sources (in Rs.)	No.	Percentage
Up to 200000	85	31.5
200001-300000	61	22.5
300001-400000	86	31.9
Above 400000	38	14.1
Total	270	100.0

from any farm enterprise plays an important role in smooth and timely running of that farm enterprise, which entirely depends upon the production of any farm, that how many income a farm enterprise earns in a year. More income from any farm will result in better living standard and timely purchases of inputs for next crop.

Changes in socio- economic characteristics of respondents

The respondents were distributed according to the changes experienced after using water saving irrigation interventions. The data (Table 3) show that 100 percent of respondents experienced changes with regards to increase in income, increase in overall resources, better living standard, better food intake, more use of fruit and increase in children's education, better selection of school, better care of child health, better selection of clothes, participation in social works, participation in political affairs, more entertainment for children, having bricks home and increase in electricity bill. Khan (14) has reported similar results.

As far as extent of changes is concerned above-average level of changes were recorded for increase in income (69.6%), better care of children health (67.0%) increase in cattle number (65.2%), more entertainment for children (59.3%), more use of fruit (59.3%) and higher electricity bills (58.1%). There were average level increases for taxi use (54.8%), better living standard (51.5%) and use of gas cylinders (50.7%). These results are almost supported by Khan (13) in socio- economic uplift of farmers.

Table 3. Distribution of respondents according to experienced changes in their socio-economic living standards and extent of changing level after using water saving techniques.

	Changes experienced in socio-economic characteristics										Extent of changing level											
	1		2		3		4		5		1		2		3		4		5			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Increase in income	270	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Increase in overall resources	270	100.0	-	-	2	0.7	-	-	6	2.2	-	-	74	27.4	112	41.5	188	69.6	150	55.6	2	0.7
Better living standard	270	100.0	-	-	-	-	-	-	4	1.5	-	-	139	51.5	-	-	105	38.9	-	-	22	8.1
Better food intake	270	100.0	-	-	-	-	-	-	-	-	-	-	119	44.1	-	-	149	55.2	-	-	2	0.7
Better use of egg and meat	264	97.8	6	2.2	1	0.4	11	4.1	11	4.1	4	1.5	91	33.7	156	57.8	5	1.9	5	1.9	5	1.9
More use of fruit	270	100.0	-	-	6	2.2	4	1.5	4	1.5	97	35.9	160	59.3	3	1.1	160	59.3	3	1.1	3	1.1
Better selection of school	270	100.0	-	-	1	0.4	9	3.3	9	3.3	90	33.3	156	57.8	14	5.2	156	57.8	14	5.2	14	5.2
Increase in children education	270	100.0	-	-	3	1.1	12	4.4	12	4.4	94	34.8	154	57.0	7	2.6	154	57.0	7	2.6	7	2.6
Better care of child health	270	100.0	-	-	2	0.7	5	1.9	5	1.9	76	28.1	181	67.0	6	2.2	181	67.0	6	2.2	6	2.2
Better selection of clothes	270	100.0	-	-	3	1.1	12	4.4	12	4.4	87	32.2	146	54.1	22	8.1	146	54.1	22	8.1	22	8.1
Increase in cattle	268	99.3	2	0.7	-	-	1	0.4	1	0.4	83	30.7	176	65.2	8	3.0	176	65.2	8	3.0	8	3.0
Participation in social works	270	100.0	-	-	1	0.4	18	6.7	18	6.7	133	49.3	99	36.7	19	7.0	99	36.7	19	7.0	19	7.0
Participation in political affairs	270	100.0	-	-	5	1.9	6	2.2	6	2.2	135	50.0	120	44.4	4	1.5	120	44.4	4	1.5	4	1.5
More entertainment for children	270	100.0	-	-	-	-	-	-	11	4.1	95	35.2	160	59.3	4	1.5	160	59.3	4	1.5	4	1.5
Use of mobile phone	269	99.6	1	0.4	2	0.7	6	2.2	6	2.2	94	34.8	102	37.8	65	24.1	102	37.8	65	24.1	65	24.1
Use of gas cylinder	268	99.3	2	0.7	7	2.6	10	3.7	10	3.7	137	50.7	109	40.4	5	1.9	109	40.4	5	1.9	5	1.9
Having brick home	270	100.0	-	-	-	-	-	-	10	3.7	134	49.6	120	44.4	9	3.3	120	44.4	9	3.3	9	3.3
Increase in electricity bill	270	100.0	-	-	-	-	-	-	2	0.7	111	41.1	157	58.1	-	-	157	58.1	-	-	-	-
Use of taxi for traveling	269	99.6	1	0.4	2	0.7	9	3.3	9	3.3	148	54.8	96	35.6	15	5.6	96	35.6	15	5.6	15	5.6

1 = Some extent, 2 = Below an average extent, 3 = An average extent, 4 = Above an average extent and 5 = High extent.

Generally, socio-economic characteristics such as age, education, farm size and land holdings play a pivotal role in the adoption process. The data relating to these aspects (Table 4) show that socio-economic characteristics like use of mobile phone, increase in income, increase in cattle, better care of child health and better selection of school, were ranked as 1st, 2nd, 3rd, 4th and 5th with weighted score of 1029, 996, 995, 994 and 983, mean of 3.83, 3.69, 3.71, 3.68, 3.64 and standard deviation of 0.85, 0.52, 0.52, 0.59 and 0.65, respectively. Socio-economic characteristics like use of gas cylinders, participation in political affairs and use of taxi for traveling ranked in the bottom among others with weighted score of 899, 922, 923; means 3.35, 3.41, 3.42 and standard deviation of 0.71, 0.66 and 0.68, respectively.

Table 4. Mean, standard deviation, weighted score and rank order of occurring changes in socio-economic living standards after using water saving techniques.

Socio-economic living standards	Weighted score	Mean	Standard deviation	Rank order
Use of mobile phone	1029	3.83	0.85	1
Increase in income	996	3.69	0.52	2
Increase in cattle	995	3.71	0.52	3
Better care of child health	994	3.68	0.59	4
Better selection of school	983	3.64	0.65	5
Better selection of clothes	982	3.64	0.74	6
Increase in overall resources	968	3.59	0.58	7
More entertainment for children	967	3.58	0.60	8
Increase in electricity bill	965	3.57	0.51	9
Better food intake	963	3.57	0.51	10
More use of fruit	960	3.56	0.66	11
Increase in children education	960	3.56	0.68	12
Better living standard	955	3.54	0.67	13
More use of eggs and meat	945	3.58	0.62	14
Having bricks home	932	3.45	0.61	15
Participation in social works	927	3.43	0.74	16
Use of taxi for traveling	923	3.42	0.68	17
Participation in political affairs	922	3.41	0.66	18
Use of gas cylinders	899	3.35	0.71	19

Almost similar results have also been reported by Khan (14). Hassan *et al.* (6) found a significant relationship of age and education of respondents with the adoption of improved production technologies. In a recent study Bajwa (4) argued that personality characteristics of small farmers in relation to their adoption attitude and motivation varied greatly with respect to each of practice. Farmers demonstrated patterns of positive, negative and mixed attitudes towards the adoption of different practices. However, Hossain (8) found no relationship between age and adoption, but education, and farm size were positively associated with adoption of improved farm practices in

Bangladesh.

CONCLUSION

This study concludes that 100 of respondents experienced changes such as increase in income, increase in overall resources, better living standard, better food intake, more use of fruit and increase in children education, better selection of school, better care of child health, better selection of clothes, participation in social works, participation in political affairs, more entertainment for children, having bricks home, increase in electricity bill. Efficient and judicious use of water leads to grow more crops per drop of water. It is, therefore, suggested that increase in water pricing will realize its value for the farmers. Farmers should be advised to shift from conventional to modern irrigation practices by arranging farmers meetings at farm level. Farmers can be motivated towards the indigenous nature of present initiatives. Use of local resources and involving the beneficiaries particularly small farmers, would be essential for long-term impact of any project.

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