



Factors Associated with Adoption of Drip Irrigation System by the Farmers in Bikaner District of Rajasthan

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Authors' contributions

This work was carried out in collaboration between both authors. Author HLV designed the study, performed the statistical analysis and wrote the first draft of the manuscript. Author SKS edited the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

Water is a most precious natural resource and vitally important for agricultural development and day-to-day living. In order to use such a precious natural resource economically, drip irrigation would be a possible solution which minimizes the losses of water and fertilizer as well as increase the yield of crops. The present study was conducted in four panchayat samities (out of six) in Bikaner district of Rajasthan on the basis of highest area and large number of beneficiary farmers under drip irrigation system. From the selected four panchayat samities, a total of 234 respondent farmers having drip irrigation system were selected randomly for the study purpose. The data were collected by personal interview method with the help of interview schedule. The collected data were classified, tabulated and statistically analyzed. The findings revealed that majority of the respondents (64.53%) were in middle age group, belonging to other backward and general caste (85.47%), agriculture work as their main occupation (72.22%), educated can read and write up to primary and middle levels (55.99%), member of one or more organizations (56.84%), having medium land holding

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(76.07%), had mansion type house (57.69%), medium farm power possession (61.97%), good account of farm implements (64.53%) & material possession (63.67%), member of joint family (61.11%) and having medium annual income of family (71.79%). Further it was observed that Knowledge, education, social participation, annual income, economic motivation and mass media exposure were found positively and significantly associated with the adoption of drip irrigation by the farmers, while size of land holding, experience in farming and irrigation potentiality were found non-significantly associated with the adoption of drip irrigation by the farmers.

Keywords: Factors; association; drip irrigation system.

1. INTRODUCTION

India's prosperity depends on growth and development of agriculture. Consequently, the agricultural production plays a very crucial role in the national economy. The increase in human population together with rapid industrial and urban development resulted in a sharp rise in the demand for agricultural products. Water is a well known basic and the most important input for agricultural production.

In this changing agricultural scenario and a shift towards precision farming, drip irrigation happens to be the technology capable of providing more efficient utilization of water. Drip irrigation is basically precise and slow application of water in the form of discrete continuous drops, sprayed through mechanical devices, called emitters in to the root zone of the plants." Singh [1] reported that by the drip system of irrigation, water reaches the roots drop by drop and hence, it is an economic method of irrigation in all seasons.

The drip irrigation system is especially, suitable for saline and alkaline soil and water use efficiency under drip irrigation system is 80 to 90%. Bahuguna [2] stated that by drip irrigation system 95% of the irrigation water can be used efficiently and by this method 30 to 50% production may be increased.

Drip irrigation system is very profitable as it saves 40-70% water as compared to surface irrigation method and reduces labour cost, protects the plants from diseases by minimizing humidity in atmosphere. Soluble fertilizer can also be applied with irrigation water. Thus, drip irrigation has become a means of hi-tech agriculture, Horticulture and Precision farming [3].

Drip irrigation is most suitable for row crops (vegetables, soft fruit), tree and vine crops where one or more emitters can be provided for each

plant. Drip irrigation is adaptable to any farmable slope and most soils [4].

In India, there has been a tremendous growth in the area under drip irrigation during the last 15 years. The Area under drip irrigation in India is around 3.38 million ha has been reached with the efforts of the Government of India, while it was only 1500 ha in 1985. The leading states of the country in respect of drip irrigation area are Maharashtra, Andhra Pradesh and Karnataka [5].

Rajasthan is such a state where water scarcity is a limiting resource, rains are uneven, drought is a reoccurring factor, sandy soils cover a major part of the state and topography is undulating type. Under such situation, it is the need of the hour to adopt drip irrigation system. But still a big section of the farmers are clinged to age-old pattern of irrigation, which causes huge loss of water. Why the farmers have less adopted this system and what are the factors which are hindering its adoption? Keeping all this in view, the present study was under taken with the following specific objectives:

1. To identify the personal profile of the respondents.
2. To determine the association between various selected independent variables and adoption of drip irrigation by the farmers.

2. METHODOLOGY

The present study was conducted in Bikaner district of Rajasthan. Out of six, four panchayat samities were selected purposely on the basis of highest area and large number of beneficiary farmers of drip irrigation system. From the selected four panchayat samities 25% farmers having drip irrigation system were selected randomly. Hence, total sample of 234 respondents was selected for the study purpose. The data were collected by personal interview

method with the help of interview schedule. The collected data were classified, tabulated and statistically analyzed.

15.81% respondents were found in old age group in the study area.

3. RESULTS AND DISCUSSION

The results obtained from the present study have been presented in following heads:

It means that half of the respondents possessing drip irrigation system fell under the middle age group, so it may be said that middle age group farmers taking more interest to adopt new irrigation technology *i.e.* drip irrigation system. The finding was in accordance [6].

3.1 Personal Profile of the Respondents

3.1.2 Caste

3.1.1 Age

The results in Table 1 indicated that 64.53% respondents belonged to middle age group, 19.66% were in young age group, whereas

Table 1 shows that 58.97% respondents were belonging to other backward caste followed by 26.50% general caste and 14.53% respondents were scheduled caste category in the study area.

Table 1. Distribution of respondents according to their personal profile (n= 234)

Profile	Categories	Frequency	Percentage
Age	Young (Below 33 years)	46	19.66
	Middle (From 33 to 53 years)	151	64.53
	Old (Above 53 years)	37	15.81
Caste	SC	34	14.53
	OBC	138	58.97
	Gen	62	26.50
Occupation	Agriculture	169	72.22
	Business	37	15.81
	Service	28	11.97
Education	Illiterate	34	14.53
	Can read and write up to primary	76	32.48
	Middle	55	23.51
	Secondary	37	15.81
	Sr. Secondary	21	8.97
	Graduate and above	11	4.70
Social participation	No. participation	68	29.06
	Member of one or more organization	133	56.84
	Office holder/public leader	33	14.10
	Small farmer(1.0 to 2.0 ha)	09	3.84
	Semi-medium farmer (Above 2.0 to 4.0 ha)	39	16.67
	Medium farmer (Above 4.0 to 10.0 ha)	178	76.07
	Large farmer (Above 10.0 ha)	08	3.42
House possession	Kuccha tiled	34	14.53
	Pucca thatched	38	16.24
	Pucca with concrete roof	27	11.54
	Mansion	135	57.69
Farm power possession	Low farm power (Score below 28)	48	20.51
	Medium farm power (Score from 28 to 44)	145	61.97
	High farm power (Score above 44)	41	17.52
Farm implements	Fair (Score below 18)	45	19.23
	Good (Score from 18 to 30)	151	64.53
	Very good (Score above 30)	38	16.24
Material possession	Fair (Score below 43)	50	21.37
	Good (Score 43 to 75)	149	63.67
	Very good (Score above 75)	35	14.96
Family type	Nuclear	91	38.89
	Joint	143	61.11
Annual income	Low income (Below Rs. 2.33 Lakh)	38	16.24
	Medium income (From Rs. 2.33 to 3.97 Lakh)	168	71.79
	High income (Above Rs. 3.97 Lakh)	28	11.97

It can be inferred that maximum number of farmers possessing drip irrigation system were belonging to other backward caste who basically farming community from long back in the study area. The findings are in conformity with the findings [7].

3.1.3 Occupation

The data in Table 1 projected that 72.22% respondents were having agriculture as occupation followed by business 15.81% and 11.97% respondents were having services as their occupation. It meant that majority of the respondents were having agriculture as their main source of livelihood which is quite natural. The results were in accordance [6].

3.1.4 Education

Table 1 revealed that 14.53% respondents were illiterate, 32.48% can read and write up to primary level educated. Similarly, 23.51, 15.81 and 8.97% respondents were in category of middle, secondary and senior secondary education, respectively. Whereas, remaining 4.70% respondents were educated up to graduate and above level in the study area.

The finding shows that majority of the respondents were having education can read and write up to primary and middle levels. It meant that the educated farming community having more awareness about benefits of drip irrigation technology because they read magazines and literature about drip irrigation technology and having more interest for adoption of drip irrigation technology. The findings are in line with the findings [6,8].

3.1.5 Social participation

The data in Table 1 clearly indicated that 56.84% respondents were member of one or more organizations and 29.06% respondents had no participation in any social organization. Remaining 14.10% respondents were either office holder or public leader of some organizations. It can be concluded that the farmers who had participated in social activities were having more exposure about new technology. The findings are in accordance with the findings [9].

3.1.6 Land holding

The data in Table 1 indicated that 76.07% respondents were medium farmers followed by 16.67% semi-medium farmers, 3.84% small

farmers and 3.42% respondents were large farmers with reference to land holding in study area. The finding shows that majority of the farmers were having medium land holding in the study area. The probable reason of this finding may be that the land is getting fragmented from generation to generation earlier there were large size of land holding in the study area which has become medium size of land holding by passing of the time as the land of the father was divided in two or three sons. The findings of the study have similarity with the findings [9].

3.1.7 House possession

The data presented in Table 1 clearly indicated that 57.69% respondents had mansion followed by 16.24% Pucca thatched, 14.53% Kuccha tiled and 11.54% farmers possess Pucca with concrete roof. It may be revealed that more than half of the respondents had Pucca/cemented or Mansion type house. The finding of the study was in line with the finding [7].

3.1.8 Farm power

The data in Table 1 indicated that 61.97% respondents had medium farm power possession followed by 20.51% and 17.52% respondents possess low and high farm power possession, respectively. The finding clearly showed that majority of the farmers having medium farm power possession. Keeping the farm power by the farmers enables him to be less dependent on labour and thereby reducing the cost of cultivation.

3.1.9 Farm implements

Table 1 indicated that 64.53% respondents had good account of farm implements, 19.23% reported that fair account of farm implements and 16.24% had very good account of farm implements. It meant the drip adopting farmers having improved or modern agricultural farm implements. This may probably due to the reason that by having improved agricultural implements, the agricultural operations becomes easier and simultaneously these are cost effective.

3.1.10 Material possession

Table 1 indicated that 63.67% respondents had good account of material possession, 21.37% reported that fair account of material possession and 14.96% had very good account of material

Table 2. Multiple regression analysis between independent variables and adoption of drip irrigation by the farmers (n= 234)

S. no.	Independent variable	b value (R. Coef.)	S.E. of b	t value of b
1	Knowledge	1.045	0.179	5.841**
2	Education	2.160	0.323	6.681**
3	Social participation	1.984	0.622	3.189**
4	Size of land holding	0.366	0.447	0.818 NS
5	Annual income	3.216	0.000	3.672 **
6	Economic motivation	0.756	0.178	4.255**
7	Experience in farming	0.073	0.358	0.204 NS
8	Irrigation potentiality	0.342	0.450	0.760 NS
9	Mass media exposure	0.863	0.228	3.785**
	Intercept constant (a)	= - 19.656		
	Coefficient of multiple Determination (R ²)	= 0.708		
	F-calculated (9, 224)	= 60.396**		

** Significant at 1% level of significance

NS = Non-significant

possession. The findings clearly showed that majority of the respondents were having good account of material possession like chair, table, electric fan television, radio, mobile, refrigerator, sewing machine etc. at their home. It may be due to the reason that farmers having drip irrigation were economically sound. The finding of the study is similar with the findings [10].

3.1.11 Family type

The data in Table 1 revealed that 38.89% respondents were living in nuclear type of family and majority of the farmers (61.11%) living in joint family. The findings revealed that more than 61% respondents were living in joint family. It might be due to fact that the farming is such a business where all the family members contribute, and it is also evident that most of the rural population were living in joint family system. Similar findings were observed by [6].

3.1.12 Annual income

The data shows that 71.79% farmers possess medium annual income of family, while 16.24% farmers belonged to low annual income. However 11.97% farmers possess high annual income of family. It indicated that majority of the drip adopting farmers were having medium level of annual income because of having medium size of land holding and with joint effect of the family members they could earn medium income from their farm. The results of the study have similarity with the findings [8].

3.2 Association between Various Selected Independent Variables and Adoption of Drip Irrigation by the Farmers

The association between adoption of drip irrigation by the farmers and selected nine independent variables *i.e.* knowledge, education, social participation, size of land holding, annual income, economic motivation, experience in farming, irrigation potentiality and mass media exposure was measured by computing 'Multiple regression technique' to know the effect of these variables separately as well as combindly and the results have been presented in Table 2.

The data in Table 2 depicts that all the nine independent variables (R² value 0.708) were jointly contributed towards 70.80% of variation in the extent of adoption of drip irrigation by the farmers. The calculated value of F was 60.396 found to be significant at 1% level of significance (at 9, 224 degree of freedom). Thus, the results implied that all the nine independent variables would account for a significant amount of variation in the adoption of drip irrigation by the farmers.

Further, the t-test of significance expressed that coefficient of regression (b-value) of variables *viz.* knowledge, education, social participation, annual income, economic motivation and mass media exposure were found to be significant at 1% level of significance. It means that these variables were more important for predicting the extent of adoption of drip irrigation among the

farmers. Whereas, coefficients of regression (b-value) were non-significant in case of size of land holding, experience in farming and irrigation potentiality.

The details are as under following heads:

1. Knowledge and adoption

It is evident from the data in Table 2 that knowledge was positively and significantly associated with the adoption of drip irrigation by the farmers at 1% level of significance.

It could be inferred that knowledge is playing a significant role in adoption of drip irrigation. The results seemed to be quite natural due to fact that for acceptance of ideas, awareness about it was a pre-requisite. Researchers have also studied this aspect and found that awareness or knowledge is the first step of adoption process. The finding of the study was in conformity with the findings [11,12].

2. Education and adoption

Table 2 revealed that education was positively and significantly associated with the adoption of drip irrigation by the farmers at 1% level of significance.

It means that farmers with higher education were subjected to adopt drip irrigation more. It depicted that education was an important and essential factor for adoption of drip irrigation by the farmers. The similar studies have also been reported by [13].

3. Social participation and adoption

The data in Table 2 reported that social participation was positively and significantly associated with the adoption of drip irrigation by the farmers at 1% level of significance.

It means that the farmers participating in social activities might be discussing the developments in respect to field of agriculture and exchange of new ideas. Similar results have also been reported by [12].

4. Size of land holding and adoption

It is apparent from Table 2 that the size of land holding was non-significantly associated with the adoption of drip irrigation by the farmers.

It means that the size of land holding did not make any significant difference in adoption of drip irrigation by the farmers. The finding seemed to be quite logical because of the fact that as the large size of land holding became difficult for the farmers to manage it efficiently due to lack of resources. The similar results were also reported by [14].

5. Annual income and adoption

A perusal of data in Table 2 revealed that annual income of the farmers was positively and significantly associated with their adoption of drip irrigation at 1% level of significance.

It means enhancement of annual income of farmers causes increase in the adoption of drip irrigation, because additional expenditure in the adoption of innovation can be done with higher income. It might be due to the fact that the farmers who were having good income source were inclined to take more interest to adopt new technology *i.e.* drip irrigation system. The results were in line with the findings. [8,15].

6. Economic motivation and adoption

The data reported in Table 2 revealed that economic motivation was positively and significantly associated with the adoption of drip irrigation by the farmers at 1% level of significance.

It shows that economic motivation influenced the adoption of drip irrigation in positive direction. It could be inferred that when economic motivation increases that extent of adoption also increases simultaneously and vice versa. This might be due to the fact that every farmer wants to maximize his profit. Similarly economic motivation has been certainly a factor which might have motivated the farmers to adopt drip irrigation technology. Therefore, in the present investigation also this variable might have been behind the adoption of drip irrigation system for high economic returns. The present findings draw support from the findings [12,16].

7. Experience in farming and adoption

It is evident from Table 2 that the experience in farming was non-significantly associated with adoption of drip irrigation by the farmers.

It means the experience in farming did not make any significant difference in adoption of drip

irrigation by the farmers. The results seemed to be quite logical due to the fact that the drip irrigation is of recent origin so both experienced and inexperienced farmers adopt this system. Hence, non-significant influence of experience in farming was observed over the adoption of drip irrigation system. Similar findings were also reported by [17,18].

8. Irrigation potentiality and adoption

The data in Table 2 revealed that the irrigation potentiality was non- significantly associated with the adoption of drip irrigation by the farmers.

It means the irrigation potentiality did not make any significant difference in adoption of drip irrigation. The finding seemed to be quite logical in the sense that in majority of the area the main source of irrigation was canal. Still the majority of farmers are using flood irrigation in canal area. Hence such result was obtained.

9. Mass media exposure and adoption

The data in Table 2 shows that mass media exposure was found positively and significantly associated with the adoption of drip irrigation by the farmers at 1% level of significance.

It could be concluded that adoption of drip irrigation by the farmers increased with the increase in their mass media exposure. This might be due to the fact that the mass media provides the relevant and timely information about drip irrigation system thus, enhancing their level of awareness and knowledge about the drip irrigation system. The findings could also be supported with the findings [17].

The depth analysis between dependent and independent variables portray that knowledge, education, social participation, annual income, economic motivation and mass media exposure were the most important variables among all the nine selected independent variables in the study area and there was maximum contribution for increasing the adoption of drip irrigation system among the farmers. It may also be said that these variables are predictor of adoption of drip irrigation system.

4. CONCLUSION

From the above findings it may be concluded that majority of the respondents were middle age group, belonging to other backward and general

caste, agriculture work as their main occupation, educated can read and write up to primary and middle levels, member of one or more organizations, having medium land holding, had mansion type house, medium farm power possession, good account of farm implements and material possession, member of joint family and having medium annual income of family. Further the independent variables like knowledge, education, social participation, annual income, economic motivation and mass media exposure were found positively and significantly associated with the adoption of drip irrigation by the farmers. While, size of land holding, experience in farming and irrigation potentiality were found non-significantly associated with the adoption of drip irrigation by the farmers. The study revealed that the selected independent variables were great important for predicting the extent of adoption of drip irrigation among the farmers.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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