

INFLUENCE OF FARMER'S SOCIO-ECONOMIC AND CULTURAL VARIABLES IN ADOPTION OF SPRINKLER IRRIGATION

Dr.. P. S SHEHRAWAT and Bhagwan DAS RATHORE

Department of Extension Education CCS Haryana Agricultural University Hisar-125004, India

1 INTRODUCTION

India is predominantly an agrarian country. Its economy is based on agriculture of which irrigation is a significant component. India agriculture still dependent on the mercy of the monsoon not with standing increase in irrigated area. The net area irrigated in the country has reached one-third of the net area sown on the monsoon is a cause for worry.

Rajasthan which has got about eight percent of Indian population is endorsed with only one percent of the water resources. In Rajasthan net area under irrigation by different sources is 5.2 million hectare, which is only 3% of total cultivable land. Therefore, sprinkler irrigation may prove very helpful and beneficial.

The traditional method of irrigation practised from time immemorial in the world is surface runoff and depercolation. No basic change has been taken place in surface method of water application over the years. Sprinkler system of irrigation comes into existence over 55 year back. In recent years sprinkler method of irrigation has become more popular particularly, in the areas where water is a limiting resource.

The sprinkler system of irrigation is, particularly, suited to sandy soils that have a high infiltration rate. Land leveling is not essential for irrigation with sprinkler i.e. it is suitable for irregular topography. Sprinkler distribute water better than in other method. Surface irrigation water (water runoff) can eliminated by this method of irrigation, soluble fertilizer, herbicides, fungicides can be applied in the irrigation water economically by this method, sprinkler irrigation can be used to protect crops against frost and against high temperature that reduce the quantity and quality of harvest. Labour cost is usually less and more land is available for the cropping.

Sprinkler system of irrigation is the best way of bringing more area under irrigation by economic use of water, though the initial investment in adopting the system is very high but looking to the advantages of the system, it is profitable.

Keeping in mind the importance of knowledge and attitude, factors associated with attitude and constraints in its adoption, the present study has been undertaken to study influence of knowledge and attitude of farmers towards sprinkler system of irrigation and to find out the constraints encountered by farmers in sprinkler system of irrigation

2 METHODOLOGY.

The study was conducted in Rajasthan state and a total number of 100 farmers were interviewed for the study purpose. Farmers were selected by simple random sampling technique.

An interview schedule consisting of measuring device of dependent and independent variables along with the face data of farmers was used for collecting responses of the farmers. The data were collected by personal interview method. The data so collected were tabulated analyzed and inferences were drawn after subjecting the data to statistical analysis. Correlation and regression

analysis between independent and dependent variables were worked out to know the effect of independent variables on dependent variables.

Variables and their measurements:

Dependent variables

Knowledge level of farmers, attitude of farmers and constraints encountered by farmers towards sprinkler system of irrigation were taken as the dependent variables of the study.

Knowledge:

To measure the knowledge level of farmers, a knowledge test schedule was prepared consisting of 20 items or statements by discussing with subject matter specialists, extension workers and farmers, then the respondents were asked to reply in dichotomized categories. The correct answers were then tick marked by assigning one mark for correctly answered question and zero for wrong or near about write answer. The knowledge score of each respondent was calculated. The range of knowledge score was from 0 to 20. The total score of individual respondent for all items was summed up. The mean and standard deviation of all the respondents' scores were computed for classifying the knowledge level into different categories.

Constraints: A list of common problems was prepared, formulated as well as gathered from the literature, discussion with subject matter specialists, experts, dealers and adaptor farmers. After this 20 constraints, which encountered by the farmers, were listed.

For the measurement of constraints a schedule was developed. The responses were arranged in three classes i. e., very serious, serious and not serious and scores were given as 3, 2, 1, respectively. Accordingly, the scoring was done as mentioned above. The statement wise scores of the respondents were pooled separately for categories of constraints on three-point continuum against each statement. The frequency in each response category was multiplied with the score assigned to that category and then scores were added up and divided by total number of respondents to find out the mean score of a constraint and similarly the mean scores for all the constraints were worked out and the rank ordering of the constraints was done.

3 Result and findings

Measurement of knowledge level of farmers regarding sprinkler system of irrigation

The data in Table 1 shows that majority of the farmers (62.00%) had (knowledge score ranging from 11.31 to 19.40) medium level of knowledge regarding sprinkler system of irrigation. The results arrived so might be because of less exposure of the respondents about sprinkler irrigation system by various information sources.

The Table 1 further shows that 20.00 per cent respondents had high level of knowledge (knowledge score more than 19.40) and only 18.00 per cent farmers had low level of knowledge (knowledge score less than 11.30) regarding sprinkler system of irrigation.

Relationship between selected independent variables and the knowledge gained by the farmers towards sprinkler system of irrigation

The correlation analysis (Table 2) revealed that the age of the respondents had a significant but negative relationship with knowledge level of farmers regarding sprinkler system of irrigation. This may be logical as older people are likely to be more

conservative whereas young people are more interested to acquire new ideas and knowledge. As the age of the farmers increase, their extension contact also decreases and they become less receptive. Also caste and education of the respondent had a significant and highly positive relationship with knowledge. This is also quite logical as education and caste has a positive influence on knowledge.

Respondents' land holding, economic motivation, source of information utilized, irrigation potentiality and source of irrigation were also found to have a positive and significant relationship with their knowledge level regarding sprinkler system of irrigation.

Regression analysis of independent variables and knowledge of farmers about sprinkler system of irrigation

Multiple regression analysis was worked out to know the influence of the all the eight independent variables i.e. age, caste, education, land holding, economic motivation, source of information utilized, irrigation potentiality and source of irrigation on knowledge level of farmers towards sprinkler system of irrigation.

It is evident from the Table 3 that regression coefficient of caste (0.494), education (0.693) and irrigation potentiality (0.300) were found positive and significant at 5 per cent level of significance. This indicates that one unit change in the education, and in irrigation potentiality will lead to a corresponding change of 0.693 units and 0.300 units, respectively, on the knowledge level of farmers regarding sprinkler system of irrigation. It is also found that regression coefficient of source of irrigation (-1.340) was significant but contributing negatively indicating that one unit change in the source of irrigation will negatively contributing change of -1.340 units in the knowledge level of farmers towards sprinkler system of irrigation. Rest of the variables i.e. age, land holding, economic motivation and source of information utilized had non-significant relationship with knowledge level of farmers which means that these variables had no significant impact on the variation in the farmers' knowledge level. The 'F' value for the knowledge level was found to be significant (33.75) at 5 per cent level of significance.

The Table 3 further predicted that above mentioned eight variables jointly contributing to (R^2) 74.00 per cent variation on the knowledge level of farmers about sprinkler system of irrigation and therefore, there are other variables which are responsible for contributing only 26.00 per cent variation in knowledge level of farmers towards sprinkler system of irrigation.

Distribution of farmers based on their attitude towards sprinkler system of irrigation

It is evident from the Table 4 that percentage of respondents' farmers having unfavourable attitude were only 11.00 per cent. The table further shows that majority of the farmers (74.00%) having favourable attitude. Remaining 15.00 per cent respondents showed most favourable attitude towards sprinkler system of irrigation. These two categories (i.e. favourable and most favourable) together constitute about 89.00 per cent of total adoptor respondents.

The results regarding the attitude of farmers towards sprinkler system of irrigation revealed that majority of farmers had favourable and positive attitude towards sprinkler system of irrigation.

This might be due to the fact that the farmers have realized by experience the importance of sprinkler system of irrigation or improved farm technology.

Relationship between independent variables and the attitude of farmers towards sprinkler system of irrigation

The correlation coefficient ('r' value) were computed to know the relationship between background variables of the respondents with attitude of farmers regarding sprinkler system of irrigation and these 'r' values have been presented in Table 5.

The Table 5 shows that respondents, age, land holding and irrigation potentiality were found to have significant and negative relationship with attitude of farmers regarding sprinkler system of irrigation. These findings predicted that a farmer who have large land holding and good irrigation potentiality had not shown interest to adopt sprinkler system of irrigation. Whereas caste, education, economic motivation, source of information utilized and source of irrigation were found significant and positively associated with attitude of farmers towards sprinkler system of irrigation. It means that these five variables have contributed in formulating positive attitude of farmers towards sprinkler system of irrigation like education which is positively and significantly related with the attitude of farmers, it means education is a important factor to alter the attitude of farmers towards sprinkler system of irrigation. The results arrived so might be because of the fact that as the level of formal education increased, the people get exposed to various printed media and they could read the pros and cons of sprinkler system of irrigation in various printed media which might have helped in forming the positive attitude towards sprinkler system of irrigation.

Further examination of the Table 5 shows that economic motivation influenced the attitude of farmers towards sprinkler system. This might be due to the fact that the farmers got success in agriculture in terms of profit maximization by using the credit or income received by adopting new innovation of farm technology such as sprinkler system of irrigation. Findings were quite obvious that favourable attitude of farmers towards sprinkler system of irrigation would be achieve when income of farmers was increased.

The study also revealed that source of information utilized and source of irrigation were found positive and significant relationship with attitude of farmers towards sprinkler system of irrigation. The result seen to be natural because the farmers who adopted the sprinkler system at their fields used more source of information which in terms helped in receiving more knowledge by experience and receive benefit from sprinkler system of irrigation. Hence it helped in formation of positive attitude of farmers towards sprinkler system of irrigation.

Regression coefficient between independent variables and the attitude of farmers about sprinkler system of irrigation

Multiple regression was worked out to know the influence of the eight independent variables i.e. age, caste, education, land holding, economic motivation, source of information utilized, irrigation potentiality and source of irrigation on their attitude of respondents regarding sprinkler system of irrigation as shown in Table 6.

The variables viz. age, caste, land holding, source of information utilized and irrigation potentiality were found negatively and non-significant regression effects on attitude whereas education, economic motivation and source of irrigation had positively but not significant at a five per cent level of significance. Thus study revealed that none of farmers' independent variables were found to have a significant regression coefficient with attitude at farmers regarding sprinkler system of irrigation, which indicate that all these variables had no significant influence on the attitude of farmers towards sprinkler system of irrigation. It was further established that the independent variables jointly contributed to 25.00 per cent variation in the attitude of farmers towards sprinkler system of irrigation.

Hence, it is predicted that there might be some other variables, which need to be studied for contributing to 75.00 per cent variation in the attitude for adopting the sprinkler system of irrigation.

Measurement of constraints encountered by farmers in adoption of sprinkler system of irrigation

An attempt was made to identify the constraints perceived by the farmers in adoption of sprinkler system of irrigation.

Data in Table 7 regarding constraints pertaining to sprinkler irrigation as perceived by the farmers depicts that "This system of irrigation is not suitable for those crops which required more amount of water" ranked first with mean score 2.95. The constraint "initial cost of sprinkler system of irrigation is very high that's why an average farmer can not afford to adopt it" and "subsidy is very less as compared to investment" was ranked II, III with mean score value 2.88, 2.83, respectively. The constraints "Mostly the nozzles closed by sand so that sprinkler are not properly rounded," high power motor required for topper maintenance of water pressure and "is sprinkler cause any harm to fruit at maturity?" were ranked V, VI and VII with mean score value 2.56, 2.45, 2.40, respectively. "Lack of technical guidance in using sprinkler system of irrigation" (1.88) and "Maintenance cost is also high" (1.85) were ranked XIII, XIV.

The other constraints perceived by the farmers were "sprinkler system of irrigation is not suitable in the areas where water infiltration rate is already low" (1.44) and "uneducated farmers are not able in sufficient use of sprinkler system of irrigation" (1.33) had poorest mean score value and were ranked XIX and XX, respectively. So it was also interesting to note that adopter farmers in general were less affected by these two constraints that ranked XIX and XX.

This might be due to the fact that the farmers might not be in frequent contact with the personal of Department of Agriculture, Government of Rajasthan. That's why they are facing such problems.

Relationship between selected independent variables and constraints encountered by farmers in sprinkler system of irrigation

The Table 8 shows that relationship between independent variables and constraints encountered by the farmers towards sprinkler system of irrigation. It is found that out of the eight independent variables, the variables namely, caste, education, land holding, source of information utilized, irrigation potentiality, and source of irrigation were negatively significant whereas, age and economic motivation were positively significant with constraints encountered by farmers in sprinkler system of irrigation, it implies that the farmers with higher score of caste, education, land holding, source of information utilized and irrigation source and irrigation potentiality have perceived less constraints than the others who have low score on their background variables. It is also revealed that the farmers of higher age group and economically more motivated feel more constraints than the other farmers. The data seems logical that the farmers of prominent caste of the study area have better education, land holding, source of irrigation and potentiality of irrigation etc. than the lower castes, so they feels less constraints. However, farmers of higher age and more economically motivated have more constraints, because age and economic motivation expends the responsibilities and limits to do better and more, so they feels more constraints.

Regression coefficient between independent variables and constraints encountered by farmers in sprinkler system of irrigation

The regression coefficients of independent variables with constraints encountered by farmers with sprinkler system of irrigation have been presented in Table 9. It is apparent from the data that source of information utilized and irrigation potentiality were found negatively significant. However, the regression coefficients of remaining variables did not contribute significantly. This suggested that an increase in score of respondents' source of information utilized and irrigation potentiality by one unit would lead to decrease in the constraints of farmers about sprinkler system of irrigation by -2.476 and -2.066 units respectively, provided other constraints are kept constant. The data also revealed that all independent variables jointly accounted for about 51.00 per cent of variation in constraints perceived by the farmers about sprinkler system of irrigation. The computed f-value of 12.279 (8 and 91 d. f.) was found to be significant at 5 per cent level of probability.

The data also predicted that these independent variables have explained 51.00 per cent of variation in the constraints of farmers about sprinkler system of irrigation, yet it would be worth while to look for some more variables comprising personality traits of farmers which are responsible for remaining 49.00 per cent variation in constraints encountered by farmers towards sprinkler system of irrigation.

4 CONCLUSIONS:

Majority of the respondent had medium knowledge level towards sprinkler system of irrigation.

It is noted that age of the farmer's was significant and negatively associated but caste, education, land holding, economic motivation, source of information utilized, irrigation potentiality and source of irrigation were found positive and significant association with the **knowledge** level of farmers towards sprinkler system of irrigation.

Farmers' independent variables like caste, education, economic motivation, source of information utilized and source of irrigation were found significantly and positively associated with **attitude** of farmers towards sprinkler system of irrigation.

It is also observed that no any independent variable was found to have a significant effect with attitude of the farmers. Hence, it is predicted that there might be some other variables, which needs to be studied.

It is observed that there is some important constraints perceived by farmers about sprinkler system of irrigation, these were:

- i. This system of irrigation is not suitable for these crops, which required more amount of water.
- ii. Initial cost is very high that's why average farmers cannot afford to adopt it.
- iii. Subsidy is very less as compared to investment.
- iv. High wind velocity reduces the efficiency of the sprinkler etc. These types of constraints were also arranged ranks on the basis of mean score.

It is find out that independent variables like age and economic motivation had significant and positive association, whereas caste, education, land holding, source of information utilized, irrigation potentiality and source of irrigation were significant and negatively associated with **constraints** about sprinkler system of irrigation.

It is also noted that independent variables like source of information utilized and irrigation potentiality, contributing significantly and negatively to minimize the problems, faced by the farmers in adoption of the sprinkler system of irrigation.

5 IMPLICATIONS AND SUGGESTIONS

The findings of the present study about knowledge and attitude of farmers towards sprinkler system of irrigation will be great helpful to extension agencies (Government and NGOs) where they will come to know that where the farmers are about these aspects, which one is the group of farmers where the knowledge and attitude is required to be enhanced? Undoubtedly the farmers according to the findings of the study are required to increase the knowledge from medium to higher level regarding adoption of sprinkler system of irrigation. Therefore, a planned programme should be started for knowing the farmers in the study area.

The findings of the study regarding existing attitude level of the farmers towards sprinkler system of irrigation will be also definitely help the planners, executors, researchers and administrators to know that in which segment of the farmers, the attitude is unfavourable that is to be changed in order to augment the adoption of sprinkler system of irrigation. So in order to increase the favourable attitude towards this system. Provision of more subsidized cost must be implemented or the credit facility should be made available to the farmers at lower interest rate besides these, different sources and methods of information about the sprinkler system of irrigation must be provided in effectively manner so that knowledge may be increased, favourable attitude should be developed to boost-up the adoption of technology.

The outcomes of the study about the constraints faced by the farmers in adoption of sprinkler system of irrigation in the study area, greatest help to the extension agents and to all, those who are working in favor of development of the sprinkler system of irrigation. Some of the most important constraints have been identified among the respondents; they need to be minimized so as to insure desired level of adoption of sprinkler system techniques.

Infacts, these large number of constraints responsible for slow or non-adoption of sprinkler system of irrigation. The efforts should be made in uninterested manner by proper distribution and management of the available inputs, credit and resources. To overcome the constraints and to develop the confidence among the farmers, a coordinated effort of the concerned agencies is needed to make sprinkler system more popular among the farmers in the new millennium 2000.

A comprehensive study may be conducted to explore out all possible factors, which might interplay in influencing the knowledge and attitude of recommended agricultural technology or practices. A detailed study of various constraints responsible for non-or slow adoption rate of sprinkler system of irrigation by the farmers could be made critically.

The farmers independent variables namely, education, source of information utilized, irrigation potentiality and economic motivation have found to significant with their knowledge and attitude. Therefore, trainers and master demonstrators should give due attention to increase the score of these variables so that the farmers come forward to adopt the sprinkler system of irrigation.

The judicious combination of technology transfer coupled with adequate timely supplies and services of required inputs can be the effective formula to satisfy the farming needs of cultivation by which farmers' botheration to risk and uncertainties can be lessened. The wholehearted involvement with other development departments, banks, input agencies and other organizations has to be geared up so that the satisfied farmers can be the second line change agents to activate transfer of technology process.

Table 1. Knowledge level of farmer's about sprinkler system of irrigation.

Knowledge score	Level of knowledge	Frequency	Percentage
Less than 11.30	Low	18	18.00
11.31 to 19.40	Medium	62	62.00
More than 19.40	High	20	20.00
Total		100	100.

Table 2. Correlation coefficient between farmers' independent variables and their knowledge towards sprinkler system of irrigation.

N=100

Sr. No.	Independent variables		Coefficients of correlation
1.	Age	X ₁	-0.564**
2.	Caste	X ₂	0.522**
3.	Education	X ₃	0.805**
4.	Land holding	X ₄	0.433**
5.	Economic motivation	X ₅	0.736**
6.	Source of information utilized	X ₆	0.746**
7.	Irrigation potentiality	X ₇	0.407**
8.	Source of irrigation	X ₈	0.386**

** Significant at 0.01% level of probability.

Table 3. Regression coefficient of farmers' independent variables on their knowledge about sprinkler system of irrigation.

Sr. No.	Independent variables		Total no. of respondents N=100	
			Coefficients of Regression 'b' value	't' value
1.	Age	X ₁	-0.004	1.724
2.	Caste	X ₂	0.494	2.469*
3.	Education	X ₃	0.693	2.924*
4.	Land holding	X ₄	0.180	0.562
5.	Economic motivation	X ₅	0.005	0.589
6.	Source of information utilized	X ₆	0.105	1.907
7.	Irrigation potentiality	X ₇	0.300	2.938*
8.	Source of irrigation	X ₈	-1.340	-2.219*

R² = 74
F = 33.75

• Significant at 0.05% level of probability.

Table 4. Distribution of the farmers based on their attitude towards sprinkler system of irrigation (pooled)

Mean score	Kind of Attitude	No. of farmers	Percentage
Up to 59.88	Unfavourable	11	11.00
59.89 to 67.24	Favourable	74	74.00
More than 67.24	Most favourable	15	15.00
Overall Mean score		63.56	

Table 5. Correlation coefficient between farmers independent variables and their attitude towards sprinkler system of irrigation

N=100

Sr. No.	Independent variables		Coefficients of correlation
1.	Age	X ₁	-0.441**
2.	Caste	X ₂	0.240*
3.	Education	X ₃	0.373**
4.	Land holding	X ₄	-0.340*
5.	Economic motivation	X ₅	0.352**
6.	Source of information utilized	X ₆	0.275**
7.	Irrigation potentiality	X ₇	-0.012*
8.	Source of irrigation	X ₈	0.103*

* Significant at 0.05 level of probability.

** Significant at 0.01 level of probability.

Table 6. Regression coefficient of farmers' independent variables on their attitude about sprinkler system of irrigation

N=100

Sr. No.	Independent variables		Coefficients of Regression	
			'b' value	't' value
1.	Age	X ₁	-0.007	-1.876
2.	Caste	X ₂	-0.008	-0.279
3.	Education	X ₃	0.601	1.610
4.	Land holding	X ₄	-0.595	-1.178
5.	Economic motivation	X ₅	0.193	1.376
6.	Source of information utilized	X ₆	-0.139	-1.606
7.	Irrigation potentiality	X ₇	-0.008	-0.518
8.	Source of irrigation	X ₈	0.694	0.730

$$R^2 = 25$$

$$F = 3.879*$$

*Significant at 0.05 level of probability.

Table 7. Constraints encountered by farmers in sprinkler system of irrigation

Sr. No.	Statements	Responses			Mean score	Rank order
		VS (3)	S (2)	NS (1)		
1.	This system of irrigation is not suitable for those crops which required more amount of water	95	5	-	2.95	I
2.	Initial cost of sprinkler system of irrigation is very high that's why an average farmer can not afford to adopt it	89	10	1	2.88	II
3.	Subsidy is very less as compared to investment	83	17	-	2.83	III
4.	If the area is less than 2 ha, then adoption of sprinkler system will cost higher per hectare	69	27	4	2.65	IV
5.	Mostly the nozzles closed by sand so that sprinkler are not properly rounded	56	44	-	2.56	V
6.	High power motor required for topper maintenance of water pressure	47	51	2	2.45	VI
7.	Is sprinkler cause any harm to fruits at Maturity?	45	50	5	2.40	VII
8.	Sprinkler system of irrigation is not suitable in the areas where water is highly acidic or highly salty	51	37	12	2.39	VIII
9.	High wind velocity reduce the efficiency of the sprinklers	28	65	7	2.21	IX
10.	Sprinkler set create some problem in intercultural operation	36	47	17	2.19	X
11.	It is difficult to adopt sprinkler system due to less availability of electricity	33	51	16	2.17	XI
12.	Sprinkler system of irrigation is not profitable where land is leveled and ground water is available in sufficient quantity	35	28	37	1.98	XII
13.	Lack of technical guidance in using sprinkler system of irrigation	15	58	27	1.88	XIII
14.	Maintenance cost is also high	26	33	41	1.85	XIV
15.	The spare parts needed for sprinkler system of irrigation are not easily available in the market	9	62	29	1.80	XV
16.	Due to high temperature, loss of water is comparatively more in sprinkler system of irrigation	7	65	28	1.79	XVI
17.	Since majority of farmers have not adopt the system of irrigation so farmers faced problems of unavailability of technical guidance timely	8	60	32	1.76	XVII
18.	Adoption of sprinkler system of irrigation requires high technical	10	48	42	1.68	XVIII

	competence which is very difficult for an average farmer					
19.	Sprinkler system of irrigation is not suitable in the areas where water infiltration rate is already low	5	34	61	1.44	XIX
20.	Uneducated farmers are not able in sufficient use of sprinkler system of irrigation	2	29	69	1.33	XX

Table 8. Correlation coefficient between farmers' independent variables and the constraints perceived by them in sprinkler system of irrigation

				N=100
Sr. No.	Independent variables		Coefficients of correlation	
1.	Age	X ₁	0.377**	
2.	Caste	X ₂	-0.428**	
3.	Education	X ₃	-0.627**	
4.	Land holding	X ₄	-0.435**	
5.	Economic motivation	X ₅	0.613**	
6.	Source of information utilized	X ₆	-0.650**	
7.	Irrigation potentiality	X ₇	-0.393**	
8.	Source of irrigation	X ₈	-0.431**	

** Significant at 0.01 level of probability.

VS-- Very serious, S-- Serious, NS-- Not serious

Table 9. Regression coefficients of farmers' independent variables on constraints encountered by them in sprinkler system of irrigation

					N=100
Sr. No.	Independent variables		Coefficients of Regression		
			'b' value	't' value	
1.	Age	X ₁	-0.006	0.155	
2.	Caste	X ₂	-0.128	-0.377	
3.	Education	X ₃	-0.151	-0.376	
4.	Land holding	X ₄	-0.586	-1.074	
5.	Economic motivation	X ₅	-0.009	-0.623	
6.	Source of information utilized	X ₆	-0.232	-2.476*	
7.	Irrigation potentiality	X ₇	-0.359	-2.066*	
8.	Source of irrigation	X ₈	0.340	0.331	

$$R^2 = 51$$

$$F = 12.279*$$

* Significant at 0.05 level of probability.