



ADOPTION BEHAVIOUR OF DRIP IRRIGATION TECHNOLOGY AMONG THE POMEGRANATE GROWERS OF NORTH GUJARAT

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Received: April 09, 2016; Revised: April 15, 2016; Accepted: April 16, 2016

Abstract-Drip irrigation is an effective technology and efficient method of providing irrigation water directly into the soil at root zone of plants and it limits water requirement to the consumptive use of the plants. Keeping in view the importance of drip irrigation, the present study was planned with the objectives to measure adoption behavior of the farmers about drip irrigation system. Two districts viz., Banaskantha and Sabarkantha were purposively selected because of higher pomegranate area under drip irrigation. According to area under pomegranate cultivation, 15 villages were purposively selected and from each selected village, 8 farmers were selected randomly making a sample of 120 respondents. The present study was confined to ex-post-facto research design.

The data revealed that majority of the respondents were of medium age (57.50%), educated up to primary level (43.33%), having medium size of family (59.16%). Most of them were found semi medium land holding (36.67%) with medium annual income (68.33%), medium cropping intensity (55.00%) having 76 to 100 per cent area under drip irrigation (86.67%). They were found having medium extension contact (71.66%). Their Knowledge about drip irrigation system was found to be moderate to high (60.83%). Majority of respondents (58.33%), were found having moderate to high level of adoption of management practices of drip irrigation system.

Keywords- Adoption, Respondents, Technology, Drip Irrigation, Pomegranate growers

Citation: Prajapati V.V., et al., (2016) Adoption Behaviour of Drip Irrigation Technology among the Pomegranate Growers of North Gujarat. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 8, Issue 22, pp.-1443-1447.

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Introduction

Pomegranate is one of the commercial fruit crops of India. Pomegranate is known as drought tolerant crop, yet regular irrigation is mandatory to commercial yield production, water levels and optimal irrigation regime depend on a plurality of factors such as soil type, tree size, physiological phase and potential evaporation. As a rule the tree needs little supplement irrigation. Pomegranate prefers dry climate. During fruit development, prolonged hot and dry climate is required. Pomegranate grows well under semi-arid conditions. In India Maharashtra, Gujarat, Karnataka, Andhra Pradesh, Tamilnadu and Rajasthan are the leading states of pomegranate crop. In Gujarat, pomegranate crop is grown in Bhavanagar, Ahmedabad (Dholka), Sabarkantha, Banaskantha and Kutchh districts. Now, Banaskantha and Kutchh districts are leading in Gujarat state due to semi-arid condition.

Drip irrigation is an effective technology and efficient method of providing irrigation water directly into the soil at root zone of plants and it limits water requirement to the consumptive use of the plants. Thus, drip irrigation minimizes such conventional losses as deep percolation, run-off and soil evaporation. It has been experienced that there is saving of 40 to 70 per cent of water and an additional yield of 30 to 70 per cent under drop by drop water in the rooting zone of the crop. The main idea behind this investigation is to study and describe the adoption of drip irrigation system by the farmers of North Gujarat.

Objectives of the study

1. To study personal, socio-economic, communication and psychological characteristics of the farmers
2. To measure knowledge level of the farmers about drip irrigation system
3. To study the extent of adoption of management practices of drip irrigation system by the farmers

4. To identify the constraints faced by the farmers in adoption of drip irrigation system management practices

Materials and Methods

To study and describe the adoption of drip irrigation system by the farmers of North Gujarat, the present study was conducted purposively in two districts viz., Banaskantha and Sabarkantha because of higher area under pomegranate and more adoption of MIS as compared to other districts of North Gujarat. According to area under pomegranate cultivation, 15 villages were purposively selected from the selected districts. From each selected village, 8 farmers were selected randomly making a sample of 120 respondents.

The present study was confined to ex-post-facto research design. An interview schedule was developed according to the objectives of study and the data were collected by arranging personal interview with 120 respondents.

Table-1 Area covered under Pomegranate cultivation in North Gujarat.

Sr. No.	Name of District	Area under Pomegranate (ha)
1	Banaskantha	5030
2	Sabarkantha	596
3	Mahesana	543
4	Patan	454
5	Aravalli	249
6	Gandhinagar	142

Result and Discussion

Personal, socio-economic, communication and psychological characteristics of the farmers

Adoption of drip irrigation system is influenced by different characteristics of the farmers. Some important personal, socio-economic, communication and

psychological characteristics of the farmers were selected based on past researches. The findings in these regards have been presented under following heads:

Table-2 Name of selected villages

Name selected of district	Name of selected Taluka	Name of selected villages	No. of villages selected
Banaskantha	Lakhani	Sarkari Goliya, Bhimaji Goliya, Kuda	03
	Tharad	Ganeshpura, Savpura, Bhadodar,	03
	Dhanera	Dhakha, Thavar, Anapur Chhota,	03
Sabarkantha	Idar	Suryanagar Kampa, Voravav Kampa, Isvarpura Kampa	03
	Himatnagar	Maherpura, Kishorgadh, Kanai	03
Total			15

Personal characteristics

Age

Age refers to the number of years completed by an individual at the time of interview. Age plays an important role in adoption process. The data collected from the farmers in this regard are presented in [Table-3].

Table-3 Distribution of the respondents according to their age (n = 120)

Sr. No.	Categories of age	Number	Per cent
1.	Young (up to 35 year)	20	16.66
2.	Middle (between 36 to 50 year)	69	57.50
3.	Old (above 50 year)	31	25.84
Total :-		120	100.00

The data in [Table-3] reveal that 57.50 per cent of the farmers were from the middle age group, followed by 25.84 and 16.66 per cent in the old and young age group, respectively.

Education

Education can be operationalized as the number of years of formal education attended by a farmer. Educational level of farmers is supposed to play vital role in understanding new innovations and thereby in adoption of new agricultural technologies. The data collected regarding education of farmers are presented in [Table-4].

Table-4 Distribution of the respondents according to their level of education (n = 120)

Sr. No.	Categories of educational level	Number	Per cent
1.	Illiterate	24	20.00
2.	Primary education (up to 7 th standard)	52	43.33
3.	Secondary education (8 th to 10 th standard)	28	23.34
4.	Higher Secondary (11 th to 12 th standard)	13	10.83
5.	Graduate and above	03	2.50
Total :-		120	100.00

The data presented in [Table-4] indicate that 43.33 per cent respondents were educated up to primary level. On the other hand, 23.34 per cent respondents were found having secondary education and 20.00 per cent respondents were illiterate. Whereas, 10.83 per cent respondents were having higher secondary education and only 2.50 per cent respondents were found to be graduate and above.

Socio-economic characteristics

Size of family

Family size is one of the important social characteristics of the farmers to determine the adoption behavior. The data in this regard are presented in [Table-5].

It can be observed from [Table-5] that 59.16 per cent drip owners were having medium family size, followed by 30.00 and 10.84 per cent having small and large size of family, respectively.

Land holding

Land holding was operationalized as total land possessed by the farmers at the

time of interview. Land holding plays an important role in the knowledge and adoption of an individual. The data collected regarding land holding of the respondents are presented in [Table-6].

Table-5 Distribution of the respondents according to their size of family (n = 120)

Sr. No.	Size of family	Number	Per cent
1.	Small (Up to 4 members)	36	30.00
2.	Medium (5 to 7 members)	71	59.16
3.	Large (8 and above members)	13	10.84
Total :-		120	100.00

Table-6 Distribution of the respondents according to their size of land holding (n = 120)

Sr. No.	Size of land holding	Number	Per cent
1.	Marginal (Up to 1 ha)	11	9.17
2.	Small (1.01 to 2.0 ha)	38	31.66
3.	Semi Medium (2.01 to 4.0 ha)	44	36.67
4.	Medium (4.01 to 10.0 ha)	23	19.17
5.	Large (More than 10.0 ha)	04	3.33
Total :-		120	100.00

The data presented in the [Table-6] mention that 36.67 per cent pomegranate growers were semi medium farmers, followed by 31.66 and 19.17 per cent having small and medium land holding, respectively. Only 9.17 and 3.33 per cent respondents were found to be in marginal and large land holders. Thus, it is concluded that maximum (68.33%) respondents were having small and semi medium size of land holding. The probable reason for this might be fragmentation of land among the members of the family.

Annual income

Farmers with sound economic condition can purchase necessary agricultural inputs, whenever they desire. This situation is ultimately result in higher adoption. In the present study, the respondents according to their annual income are divided into three income categories using Mean \pm SD. The data in this regard are resented in [Table-7].

Table-7 Distribution of the respondents according to their annual income (n = 120)

Sr. No.	Categories of annual income (Rs)	Number	Per cent
1.	Low (up to Rs.54,000/-)	16	13.33
2.	Medium (between Rs.54,001/- to Rs.1,90,000/-)	82	68.33
3.	High (above Rs.1,90,000/-)	22	18.34
Total :-		120	100.00

Mean: 128365.83

SD: 74368.91

The data in [Table-7] show that little more than two-third (68.33 %) of farmers had medium annual income, followed by 18.34 and 13.33 per cent of farmers had high and low annual income, respectively.

From the above discussion, it can be concluded that majority (68.33 %) of the farmers had medium annual income i.e., in between Rs. 54,001 to Rs. 1,90,000.

Cropping intensity

The term cropping intensity is the proportion of total annual cropped area to the size of operational land holding. It reflects the intensive and efficient use of cultivable land by the farmers. The data regarding cropping intensity of the pomegranate growers are presented in the [Table-8].

Table-8 Distribution of the drip owners according to their cropping intensity (n = 120)

Sr. No.	Cropping intensity	Number	Per cent
1.	Low (Up to 100 per cent)	32	26.67
2.	Medium (101 to 200 per cent)	66	55.00
3.	High (Above 201 to 300 per cent)	22	18.33
Total :-		120	100.00

The data in [Table-8] reveal that 55.00 per cent of the farmers had medium level of cropping intensity i.e., 101 to 200 per cent followed by 26.67 and 18.33 per cent having low (Up to 100%) and high level (201 to 300%) of cropping intensity, respectively.

Total area under drip irrigation system (DIS)

Drip irrigation is an advanced method of irrigation for saving irrigation water, labour for fertilizer application, increase in yield of crops and improving quality of produce. The data collected regarding total area covered under drip irrigation system by the drip owners are presented in [Table-9].

Table-9 Distribution of the respondents according to their total area under drip irrigation
(n = 120)

Sr. No.	Area under DIS	Number	Per cent
1.	Up to 25 % area under DIS	00	00.00
2.	26 to 50 % area under DIS	00	0.00
3.	51 to 75 % area under DIS	16	13.33
4.	76 to 100 % area under DIS	104	86.67
Total :-		120	100.00

It is evident from the [Table-9] that maximum drip owners (86.67 %) had 76 to 100.00 per cent of area under drip irrigation system followed by 13.33 per cent of them having 51.00 to 75.00 per cent of area under drip irrigation system. It is fortune to note that no respondent was in the category of up to 25 per cent and 26 to 50 per cent area under drip irrigation system.

From the above discussion, it can be concluded that a great majority of drip owners were having more than three-fourth of their land under drip irrigation system.

Communication characteristics

Extension contact

It refers to the contact made by the drip owners with the extension agency or extension workers in the specific period of time through which, they may gain information/knowledge and motivate themselves for adoption. The respondents according to their extension contact were divided into three categories using Mean and SD.

Table-10 Distribution of drip owners according to their extension contact
(n = 120)

Sr. No.	Level of extension contact	Number	Per cent
1.	Low (Up to 15 score)	09	7.50
2.	Medium (16 to 25 score)	86	71.66
3.	High (Above 25 score)	25	20.84
Total :-		120	100.00

Mean: 20.02

SD: 5.52

The data presented in [Table-10] indicate that majority (71.66 %) of the drip owners had medium level of extension contact while, 20.84 and 7.50 per cent drip owners had high and low level of extension contact, respectively.

It can be concluded that a large majority (92.50 %) of the drip owners were found to have medium to high level of extension contact

Psychological characteristics

Risk orientation

It may be described as the degree to which a farmer is oriented towards encountering risk and uncertainty in adopting new idea. The results in this regard are presented in [Table-11].

Table-11 Distribution of the respondents according to their risk orientation
(n = 120)

Sr. No.	Risk orientation	Number	Per cent
1.	Low (Up to 18 score)	21	17.50
2.	Medium (19 to 31 score)	77	64.16
3.	High (Above 31 score)	22	18.34
Total :-		120	100.00

Mean: 24.70

SD: 6.70

It could be seen from [Table-12] that nearly two-third (64.16 %) of the drip owners preferred medium risk, followed by 18.34 and 17.50 per cent of them having high and low risk preference, respectively.

As per findings, it is revealed that a great majority (82.50 %) of the drip owners had medium to high risk preference.

Knowledge level of the farmers about drip irrigation system

Knowledge plays an important role in covert as well as overt behaviour of an individual. Knowledge is pre-requisite to understand an idea or practice. With this in view, an attempt has been made to study the farmer's knowledge about drip irrigation system. Knowledge level of the drip adopters was measured with help of teacher made test developed by the researcher. The knowledge score for each of the drip adopter was worked out on the basis of twenty eight questions and they were categorized into four groups. The data pertaining to level of knowledge are presented in [Table-12].

Table-12 Distribution of the respondents according to their level of knowledge about drip irrigation system
(n = 120)

Sr. No.	Categories of knowledge level	Number	Per cent
1.	Low (Up to 7 score)	09	7.50
2.	Medium (8 to 14 score)	38	31.67
3.	Moderate (15 to 21 score)	53	44.17
4.	High (>21 score)	20	16.66
Total :-		120	100.00

It is evident from the [Table-12] that majority (44.17%) of the farmers possessed moderate knowledge, followed by 31.67 and 16.66 per cent of farmers possessed medium and high level of knowledge about drip irrigation system, respectively.

Hence, it could be concluded that great majority (60.83%) of farmers possessed moderate to high level of knowledge about drip irrigation system.

Extent of adoption of management practices of drip irrigation system by the pomegranate growers

Adoption is a decision to make continued and full use of an innovation, while adoption process is a mental process through which an individual passes from first hearing about an innovation to its final adoption.

The level of adoption of drip irrigation management practices was worked out by using the objective test developed for the purpose. The drip owners were categorized in to four groups according to their level of adoption.

The data in respect of drip irrigation management practices are presented below [Table-13].

Table-13 Distribution of drip owners according to their level of adoption of drip irrigation management practices
(n = 120)

Sr. No.	Level of adoption	Number	Per cent
1.	Low (Up to 6 score)	08	6.67
2.	Medium (7 to 12 score)	42	35.00
3.	Moderate (13 to 18 score)	50	41.67
3.	High (>18 score)	20	16.66
Total :-		120	100.00

It is apparent from the Table that maximum drip owners (41.67%) had moderate adoption of drip irrigation management practices. While, 35.00 and 16.66 per cent drip owners had medium and high level of adoption of drip irrigation management practices, respectively.

From the above findings, it can be concluded that majority (58.33%) of the drip owners had moderate to high level of adoption of drip irrigation management practices. This might be due to medium to high level of knowledge of drip owners towards drip irrigation system.

Further, practice-wise adoption of drip irrigation management system by the drip owners was also studied and the data in this regards are presented in [Table-14].

The data presented in [Table-14] indicate majority farmers adopted the practices viz., installation of liquid fertilizer tank for drip system (91.66%), application of

chemical fertilizers (87.50%) and cleaning of filters, nozzle etc. to remove impurities (71.66%). On the other hand, the practices namely; use of filters to avoid clogging of the system (66.66%), use of air release valve (65.00%), application of plant protection chemicals (62.50%), application of recommended

fertilizers through ventury/fertilizer tank (54.15%), drippers distance on the lateral according to the type of soil and crop water requirement (58.33%), installation sub mains and laterals and filters (55.00%) and purchasing of general parts of the system himself (54.16 %) were adopted by 50.00 to 67.00 per cent drip owners.

Table-14 Practice wise adoption of drip irrigation system in pomegranate by drip owners
(n = 120)

Sr. No.	Drip irrigation system	Number	Per cent
1.	Application of chemical fertilizer (Soluble)	105	87.50
2.	Application of plant protection chemicals (For soil borne pest/disease)	75	62.50
3.	Lateral spacing in the field on the basis of row to row distance of the crop	70	58.33
4.	Appropriate discharge rate of drippers	55	45.83
5.	Regular checking of main, sub mains, laterals and filters	50	41.66
6.	Installation of sub mains and laterals by considering slope of the field	66	55.00
7.	Dripper distance on the lateral according to the type of soil and crop water requirements	70	58.33
8.	Use of filters to avoid clogging of the system	80	66.66
9.	Clean filter, nozzle, filters etc. to remove impurities	86	71.66
10.	Use of air release valve	78	65.00
11.	Installation of liquid fertilizer tank on the drip system	110	91.66
12.	Application of recommended fertilizers through ventury/fertilizer tank	65	54.15
13.	Repair the general part of the system by farmers him self	65	54.16
14.	Use of pressure gauge to maintain the pressure in the system	54	45.00
15.	Buy spare parts of the drip irrigation system him self	65	54.16
16.	Maintain required pressure at mainline and sub mains near control valve	55	45.83
17.	Application of acid treatment and chlorination under drip irrigation system as per recommended technology	45	37.50

Constraints faced by the farmers in adoption of drip irrigation management practices

As far as the constraints confronting the farmers in adoption of drip irrigation

system are concerned, there are certain circumstances, which restrict the adoption of drip irrigation technology.

Table 15 Distribution of drip owners according to their constraints experienced in adoption and operation of drip irrigation system
(n = 120)

Sr. No.	Constraints	Number	Per cent	Rank
1.	Frequent clogging of drippers due to saline substances or other reasons	110	91.66	I
2.	Damage caused by the rats to the system	90	75.00	III
3.	Lack of technical know-how and guidance before and after adoption	95	79.16	II
4.	Lack of after sale service by the company dealers	66	55.00	VI
5.	Non-availability of spare parts when required	65	54.16	VII
6.	Non-availability of skilled workers for repairing DIS when required	70	58.33	V
7.	Clumsy procedure for getting loan/subsidy	29	24.00	VIII
8.	Maintenance cost is very high	24	20.00	IX
9.	Initially requires large investment for drip installation	80	66.66	IV
10.	Difficult to make equal distribution of water	19	16.00	X
11.	Difficulty in interculturing	17	14.00	XI

A critical look at the data in the [Table-15] bring in to focus that among all the eleven constraints, frequent clogging of drippers due to saline substance or other reasons (91.66 %) was ranked first. The constraints viz., lack of technical know-how and guidance before and after adoption (79.16%), damage caused by rats to the system (75.00%), initially requires large investment for drip irrigation (66.66%), non-availability of skilled workers for repairing DIS when required (58.33%), lack of after sale services by the company dealers (55.00%) and non-availability of spare parts when required (54.16%) were ranked second, third, fourth, fifth and sixth, respectively.

CONCLUSIONS

- Majority of the respondents were of medium age (57.50%), educated up to primary level (43.33%), having medium size of family (59.16%). Most of them were found semi medium land holding (36.67%) with medium annual income (68.33%), medium cropping intensity (55.00%) having 76 to 100 per cent area under drip irrigation (86.67%). They were found having medium extension contact (71.66%). Their risk orientation was found to be medium (64.16%).
- Knowledge of the farmers about drip irrigation system was found to be moderate to high (60.83%).
- Majority respondents (58.33%), were found having moderate to high level of

adoption of management practices of drip irrigation system.

- The major constraints faced by the drip owners in adoption of drip irrigation system were; frequent clogging of drippers due to saline substance or other reasons, damage caused by the rats to the system, lack of technical know-how and guidance before and after adoption, Initially requires large investment for drip installation and lack of after sale service by the company dealers.

Conflict of Interest: None declared

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