

Research Article

Extent of economic gain through drip irrigation system by banana growers

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SUMMARY : However, in India, 64 per cent of cultivated land is dependent on monsoons. The economic significance of irrigation in India is namely, to reduce over dependence on monsoons, advanced agricultural productivity, bringing more land under cultivation and for reducing instability in output levels. In Gujarat, only 23 per cent of the total cultivable land of the state is under irrigation, even with the fullest exploitation of the Sardar Sarovar Project. In order to inspire the farmers to maximize agriculture production at minimum cost to increase their income by adopting scientific water management technology to bring in revolutionary transformation of the agriculture scenario. The study was concerned to determine the economic gain accrued due to adoption of drip irrigation system by the banana growers. The study was conducted in Anand district of Anand, Umreth and Ankalav talukas that were having maximum number of drip sets installed for banana crop with a sample size of 120. The important aspects studied listed for the study were motivational sources for introducing DIS, saving in water, saving in fertilizers cost, saving in plant protection cost, saving in weed control expenses, saving of labour cost and increase in fruit production.

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BACKGROUND AND OBJECTIVES

For agriculture and economic development of any country, land and water are two basic inputs. However, in India, 64 per cent of cultivated land is dependent on monsoons. Irrigation water is supplied to supplement the water available from rainfall and for the contribution to soil moisture from ground water (Michael, 1978). The economic significance of irrigation in India is namely, to reduce over dependence on monsoons, advanced agricultural productivity, bringing more land under cultivation and for reducing instability in output levels. Gujarat state has a relatively lower share in the overall availability of water in India. In Gujarat, only 23 per cent of the total cultivable land of the state is under irrigation. Even with the fullest exploitation of the Sardar Sarovar Project, about 52 per cent of the state agriculture would be dependent on the mercy of monsoon, particularly

erratic, inadequate and uncertain rainfall. Hence, it is necessary to economize the use of water for agriculture to bring more area under irrigation. This could be achieved by introducing the advanced and sophisticated method of drip irrigation. Therefore, the farmers of middle Gujarat region have been attracted towards the modern method of irrigation and they have introduced drip irrigation system (DIS) with the hope of making the judicious and scientific use of irrigation water at hand on farm lands and thereby overcoming the various problems such as labour, money and water management. Any technology that is adopted, needs to be assessed periodically to suggest the effective changes for subsequent functioning and this truly holds good with drip irrigation system as quite a few years have already been passed and probably this is the high time to examine the extent of economic gain and nature of benefit of drip irrigation system accrued by the farmers.

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Generally, farmers look for a method of irrigation which is most efficient with less water, labour, fertilizers and power requirements. Drip irrigation system is such an efficient method which has the potential for substantial water savings, conveyance losses are negligible, uniformity in water application is high as compared to other irrigation methods. Irrigation efficiency in drip system is adjudged to be more than 90 per cent as compared to about 65 per cent to 70 per cent in the case of sprinkler and about 50 per cent or so in the case of conventional surface method of irrigation (Anonymous, 1994). This indicates the quantum of saving of water which is possible under the extreme water shortage conditions as occur during droughts. Hence, this technique has now been widely accepted as an ideal irrigation technique for row plantation and widely spaced crops. This system is adoptable to most crops, under most soils and particularly suited to soil under conditions of scarcity. However, the method is so far more economical and is generally most successful for orchard crops than for other crops and vegetables.

In order to inspire the farmers maximize agriculture production at minimum cost to increase their income by adopting scientific water management technology to bring in revolutionary transformation of the agriculture scenario. The consequent effects of drip irrigation system are reflected in terms of generating more income from the banana cultivation by saving of water, labour, fertilizers and plant protection measures, improving yields and quality of produce which ultimately improving the overall economic condition of banana growers.

RESOURCES AND METHODS

The study was concerned to determine the economic gain accrued due to adoption of drip irrigation system by the banana growers in Anand district of Anand, Umreth and Ankalav talukas that were having maximum number of drip sets installed for banana crop. Among these talukas nine villages were selected for the study with a sample size of 120 farmers who had installed and used drip irrigation system in their banana crop for successively three years. Seven different drip irrigation banana cultivation aspects were included in the study to find the extent of economic gain by banana cultivation through drip irrigation. To get necessary correct and complete information from the respondents, an interview schedule was prepared, keeping in view the objectives of the study. While developing the interview schedule, investigator had referred to the available related literature, research reports and guidance of the major advisor and committee members. Afterwards, the schedule was translated from English into Gujarati language. Statistical techniques used for the study were averages, percentages,

standard deviation and ranking system was used to rank the constraints and suggestions.

Motivational sources for introducing DIS :

It refers to the motivational sources that have inspired the banana growers to introduce drip irrigation system in banana crop. To find the motivation sources every respondent asked to indicate the inspirational source / sources from which they got the first motivation / inspiration of introducing DIS in banana crop. The respondents were distributed according to their motivational sources for introducing drip irrigation system with the help of percentage and ranks.

Saving in water :

To find the extent of saving of water in DIS was grouped in to four groups, No saving, Up to 50 saving, 51 to 81 per cent saving and above 81 per cent saving of water and 0, 1, 2 and 3 scores was given for each category.

Saving in fertilizers cost :

By using DIS fertilizer cost also minimized to measure the extent of fertilizer savings following scores was used 0, 1 and 2 for no saving, up to 19 per cent saving and above 19 per cent saving of fertilizer.

Saving in plant protection cost :

Along with DI plant protection practices were followed to the banana cultivation. That leads to saving of plant protection cost. It was measured using the following score. No savings, up to 16 per cent and above 16 per cent saving of plant protection cost and 0, 1 and 2 score was given, respectively.

Saving in weed control expenses :

Using DI farmers can control the weeds in banana orchids. To measure this variable following scoring technique was used, no saving, up to 34 per cent, 35 to 72 per cent and above 72 per cent with scoring of 0, 1, 2, and 3, respectively.

Saving of labour:

In DIS farmers can reduce the labour cost to some extent. This variable can be measured by categorizing in to four groups no saving, up to 43 per cent saving, 44 to 70 per cent saving and above 70 per cent saving of labour in man days/year.

Increase in fruit production :

DIS helps the farmers to increase the fruit production and its quality in all the aspects like size, color, maturity, keeping quality etc. This was measured 0, 1, 2 and 3 for No increase, up to 2 per cent increase, 3 to 20 per cent increase and above 20 per cent increase, respectively.

Extent of economic gain:

It is operationalised as the degree to which the banana growers accrued the benefits of drip irrigation system in terms of economic aspects. A list of seven aspects concerning the economic gain of DIS was prepared in consultation with agronomists, horticulturists, economists, water management scientists and irrigation engineers. Before and after approach was followed for getting information about each aspect. The scoring procedure adopted for these aspects was as under. In order to obtain overall economic gain of all the seven aspects (combined extent of economic gain) for an individual respondent, the score obtained for each aspect was summed up. The total score obtained by the respondents indicated their extent of economic gain. The respondents were classified into three categories *viz.*, low (below Mean – S.D.), medium (in between Mean \pm S.D.) and high (above + S.D.).

Constraints in adoption of drip irrigation system :

It refers to the items of difficulties faced by the banana growers in actual adoption of DIS to banana crop. For measuring the constraints in the adoption of DIS in banana crop, the respondents were asked to state the items of difficulties faced by them in adoption of drip irrigation system in banana crop. These constraints were grouped into four categories *viz.*, economic, technological, administrative and personal and socio-psychological constraints. Among the stated item of difficulties, respondents were further asked to tell which item is most important, important and less important in their opinions. The responses were recorded in three categories *viz.*, most important, important and less important and score was assigned 3, 2 and 1, respectively. Total score and mean weighted score were computed for each item and rank order was given on higher to lower score.

Suggestions for promoting the use of drip irrigation system :

Considering the constraints faced by the respondents and to overcome the same in adoption of drip irrigation system in banana successfully, they were asked to give their valuable suggestions. The suggestions offered were ranked on the basis of number and percentage of respondents who reported respective suggestion.

OBSERVATIONS AND ANALYSIS

The results of the present study as well as relevant discussions have been presented under following sub heads:

Motivational sources for introducing DIS in banana crop by farmers :

This part of the analysis deals to identify the important motivating sources that led the banana growers to introduce

drip irrigation system in banana crop on their farm. The respondents had reported more than one motivational source's for introducing the drip irrigation system in banana crop. It can be seen from the data presented in Table 1 that major motivational sources of banana growers for introducing drip irrigation system in banana crop were neighbours, friends and relatives (Rank I), followed by dealers of drip irrigation system (Rank II), literature on drip irrigation system (Rank III), progressive farmers (Rank IV), Gramsewak (Rank V), news papers (Rank VI), farmers' training centre (Rank VII), scientists of agricultural university (Rank VIII), officers of agriculture and allied departments those give subsidy (Rank IX), doordarshan programmes (Rank X) and radio programmes (Rank XI).

Table 1: Distribution of banana growers according to their motivational sources (n = 120)

Sr. No.	Motivational sources	%	Rank
1.	Gramsewak	56.66	V
2.	Scientists of agricultural university	44.16	VIII
3.	Farmers' training center	50.00	VII
4.	Dealers of drip irrigation system	67.50	II
5.	Progressive farmers adopting DIS	59.16	IV
6.	Officers of agriculture and allied departments those give subsidy	40.83	IX
7.	Neighbours / Friends / Relatives	72.50	I
8.	Radio programmes	35.00	XI
9.	Doordarshan programmes	36.66	X
10.	News papers	54.16	VI
11.	Literature on drip irrigation system	63.33	III

Saving in water :

It is apparent from the data presented in Table 2 that nearly half (45.00%) of the respondents were of the opinion that the saving in water was 26 to 50 per cent, it was followed by up to 25 per cent saving in water, 51 to 75 per cent saving in water and more than 75 per cent in water with 35.83 per cent, 10.83 per cent and 08.34 per cent respondents, respectively.

Saving in fertilizers cost :

With regard to saving in fertilizers cost, slightly more than half (50.84%) of respondents were of the opinion that there was 16 to 30 per cent saving in fertilizers cost through adoption of drip irrigation system, while 43.33 per cent of the respondents expressed that there was up to 15 per cent saving in fertilizers cost. Only 5.83 per cent of the respondents were opined that there was more than 30 per cent saving in fertilizers cost.

Saving in plant protection cost :

The data revealed that exactly half (50.00%) of the

Table 2: Distribution of banana growers according to the nature of benefits of drip irrigation system accrued by them (n = 120)

Sr. No.	Nature of benefits	Respondents	
		Frequency	Per cent
Saving in water			
1.	Up to 25 per cent saving	43	35.83
2.	26 to 50 per cent saving	54	45.00
3.	51 to 75 per cent saving	13	10.83
4.	More than 75 per cent saving	10	08.34
Saving in fertilizers cost			
1.	Up to 15 per cent saving	52	43.33
2.	16 to 30 per cent saving	61	50.84
3.	More than 30 per cent saving	07	05.83
Saving in plant protection cost			
1.	Up to 15 per cent saving	60	50.00
2.	16 to 30 per cent saving	46	38.33
3.	More than 30 per cent saving	14	11.67
Saving in weed control expenses			
1.	Up to 15 per cent saving	67	55.84
2.	16 to 30 per cent saving	27	22.50
3.	More than 30 per cent saving	26	21.66
Saving in labour utilization			
1.	Up to 25 per cent saving	02	01.67
2.	26 to 50 per cent saving	13	10.83
3.	51 to 75 per cent saving	100	83.33
4.	More than 75 per cent saving	05	04.17
Increase in fruit production			
1.	No increase	05	10.84
2.	Up to 20 per cent increase	82	61.66
3.	More than 20 per cent increase	33	27.50

respondents had benefited by saving in plant protection cost to the extent of up to 15 per cent, whereas nearly two-fifth (38.33%) of the adopters expressed 16 to 30 per cent saving in plant protection cost through adoption of drip irrigation system. While a meagre number (11.67%) of the respondents were benefitted by the saving of more than 30 per cent plant protection cost.

Saving in weed control expenses :

It was observed that slight more than half (55.84%) of the respondents had got the benefit of saving in weed control expenses to the tune of up to 15 per cent, followed by 22.50 per cent respondents with saving in weed control expenses in between 16 to 30 per cent. The percentage of respondents having more than 30 per cent saving in weed control expenses was 21.66.

Saving in labour utilization :

The data in Table 2 further bring into focus that a great majority (83.33%) of the respondents had benefited by saving in labour utilization to the extent of 51 to 75 per cent, followed by 10.83 per cent respondents with 26 to 50 per cent, 04.17 per cent respondents with more than 75 per cent and very less *i.e.* 01.67 per cent respondents were having up to 25 per cent saving in labour utilization.

Increase in fruit production :

So far as the increase in fruit production is concerned, a little more than three-fifth (61.66%) of the respondents expressed that they had availed the benefit of increase in fruit production to the tune of up to 20 per cent, it was followed by 27.50 per cent respondents with more than 20 per cent increase in fruit production. The percentage of respondents having no increase in fruit production was 10.84.

Economic gain :

It can be seen from the data presented in the Table 3 that exactly three-fourth (75.00%) of the respondents were having medium level of overall economic gain, followed by 15.00 per cent respondents with low level of overall economic gain. Only 10.00 per cent of respondents had accrued high level of overall economic gain of drip irrigation system. It can be inferred that a vast majority (85.00%) of the respondents were having medium to high level of overall economic gain of drip irrigation system in banana crop.

Table 3 : Distribution of banana growers according to extent of economic gain (n = 120)

Sr. No.	Category	Frequency	Per cent
1.	Low (Up to 12.47 score)	18	15.00
2.	Medium (12.48 to 17.68 score)	90	75.00
3.	High (Above 17.68 score)	12	10.00
Total		120	100.00

Constraints faced by the banana growers in adoption of drip irrigation system :

Constraints in adoption of drip irrigation system by banana growers are never ended. However, they can be minimized if known to policy makers and planners. During the course of present investigation, the respondents expressed many constraints which were grouped into four categories *viz.*, (i) economic, (ii) technological, (iii) administrative and (iv) personal and socio-psychological constraints. The constraints were ranked on the basis of mean weighted scores. The responses of the respondents with regard to the constraints are presented in Table 4. With regard to economic constraints, the respondents had assigned first rank to heavy initial cost for installation of DIS, followed by high cost of spare parts (Rank II), lack

of capital for covering entire area under DIS (Rank III) and requirement of additional tank (Rank IV).

Among technological constraints, the banana growers endorsed major constraints were: frequent clogging of drippers and micro-tubes (Rank I), lack of technical know-how (Rank II), cracking of laterals (Rank III), problems of water leakages in the system (Rank IV), difficulty in interculturing (Rank V) and complicated technology (Rank VI). As regarding administrative constraints, non-availability of repairing facilities in village (Rank I), non-availability of technical guidance in time (Rank II), non-availability of quality materials of DIS with reasonable rates (Rank III), lack of advice and guidance from company agents (Rank IV) and delay in sanction of loan and subsidy (Rank V) were the most important constraints mentioned by banana growers. With respect to personal and socio-psychological constraints, the

respondents had assigned first rank to lack of spirit among the farmers regarding DIS followed by lack of motivation (Rank II), resistance from family members (Rank III) and frustration due to failure of DIS in work (Rank IV). Thus, it can be concluded that heavy initial cost for installation of DIS, high cost of spare parts, frequent clogging of drippers and micro-tubes, lack of technical know-how, non-availability of repairing facilities in village, non-availability of quality materials of DIS with reasonable rates and lack of spirit among the farmers regarding DIS were the most important constraints as perceived by the banana growers in adoption of drip irrigation system in banana.

Suggestions offered by the banana growers to overcome the constraints :

An attempt was made to ascertain suggestions from

Table 4: Distribution of banana growers according constraints faced by them in adoption of drip irrigation system (n=120)

Sr. No.	Constraints	Mean weighted score	Rank
Economic constraints:			
1.	Heavy initial cost for installation of DIS	2.67	I
2.	High cost of spare parts	2.50	II
3.	Lack of capital for covering entire area under DIS	2.21	III
4.	Requirement of additional tank	1.85	IV
Technological constraints:			
1.	Frequent clogging of drippers and micro-tubes	2.57	I
2.	Lack of technical know-how	2.26	II
3.	Cracking of laterals	2.20	III
4.	Problems of water leakages in the system	2.07	IV
5.	Difficulty in inter-culturing	1.84	V
6.	Complicated technology	1.70	VI
Administrative constraints:			
1.	Non-availability of repairing facilities in village	2.43	I
2.	Non-availability of technical guidance in time	2.23	II
3.	Non-availability of quality materials of DIS with reasonable rates	2.17	III
4.	Lack of advice and guidance from company agents	2.02	IV
5.	Delay in sanction of loan and subsidy	1.83	V
Personal and socio-psychological constraints:			
1.	Lack of spirit among the farmers regarding DIS	2.19	I
2.	Lack of motivation	1.92	II
3.	Resistance from family members	1.70	III
4.	Frustration due to failure of DIS in work	1.40	IV

Table 5: Suggestions given by the banana growers overcome the constraints faced by them (n=120)

Sr. No.	Suggestions	Frequency	%	Rank
1.	Cost of components of DIS should be minimized	104	86.66	I
2.	Timely technical guidance should be provided to the farmers	93	77.50	II
3.	Spare parts of the system should be made locally available at reasonable rates	87	72.50	III
4.	Provisions of regular guidance on maintenance and free service from company agents	79	65.83	IV
5.	Training should be imparted for betterment of knowledge to use the system efficiently and effectively	74	61.66	V
6.	Increase in subsidy/loan and it should be made available timely	71	59.16	VI
7.	Quality material should be provided for drip sets	65	54.16	VII
8.	Provision of regular supervision by company agents	62	51.66	VIII
9.	Multipurpose sub-mains should be designed so as to use in different crops	43	35.83	IX

banana growers to overcome various constraints faced by them in adoption of drip irrigation system. The respondents were requested to offer their valuable suggestions against difficulties faced by them in adoption of drip irrigation system. The suggestions offered by the banana growers are presented in Table 5. The data given in Table 5 reveal that the major suggestions made by the banana growers to overcome the constraints associated with the adoption of DIS in sequential order were: cost of components of DIS should be minimized (Rank I), followed by timely technical guidance should be provided to the farmers (Rank II), spare parts of the system should be made locally available at reasonable rates (Rank III), provisions of regular guidance on maintenance and free service from company agents (Rank IV), training should be imparted for betterment of knowledge/skill to use the system efficiently and effectively (Rank V), increase in subsidy/loan and it should be made available timely (Rank VI), quality material should be provided for drip sets (Rank VII), provision of regular supervision by company agents (Rank VIII) and multipurpose sub-mains should be designed so as to use in different crops (Rank IX).

Conclusion :

On the whole, it can be concluded that a great majority (83.33 %) of the respondents were benefitted by saving in

labour utilization to the tune of 51 to 75 per cent, followed by 55.84 per cent of the respondents got benefit of saving in weed control expenses (upto 15%) and 50.84 per cent of the respondents had got benefit of saving in fertilizers cost (16 to 30%). Whereas, exactly half (50.00%) of the respondents availed the benefit in respect of saving in plant protection cost to the extent of up to 15 per cent. A considerable number (45.00%) of them could save in water to the tune of 26 to 50 per cent. More than sixty per cent (61.66%) of the banana growers expressed that the yield could also be increased up to 20 per cent. That includes increased the size, good colour, decreases the maturity time and also increase the keeping quality of banana fruit it leads to fetch the better price to the farmer in the market.

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