Contribution of Drip Irrigation System in Addressing Water Crisis of Farmers in Jaipur District of Rajasthan

Facilitated By:
Agriculture Research Institute, Durgapura

By
Daksha Yadav

Under the Guidance of
Dr. Rahul Ghai

Post Graduate Diploma in Rural Management
2012-2014

School of Rural Management
Institute of Health Management Research,
Jaipur
2014

INSTITUTE OF HEALTH MANAGEMENT RESEARCH
1, Prabhu Dayal Marg
Sanganer Airport, JAIPUR - 302 011, INDIA
Tel. : 3924700, 2791431-32
Fax : 91-141-3924738
E-mail : iihmr@iihmr.org
URL : http://www.iihmr.org
Gram : HEALTHINST

CERTIFICATE

This is to certify that **Ms. Daksha Yadav** student of PGDRM, Batch 3rd School of Rural Management, Institute of Health Management Research, Jaipur, has undergone Dissertation on the topic entitled "**Contribution of Drip Irrigation System in Addressing Water Crisis of Farmers in Jaipur District of Rajasthan**" at Agriculture Research Institute, Durgapura, from March to May 2014.

The candidate has successfully carried out the study assigned to her during dissertation and her approach to study has been scientific and analytical. This dissertation is partial fulfillment of the course requirements for the award of Post Graduate Diploma in Rural Management.

I wish her all success in all her future endeavors.

Dr Goutam Sadhu
Dean (RM)
School of Rural Management
IIHMR, Jaipur

Rahul Ghai
Associate professor
School of Rural Management
IIHMR, Jaipur

INSTITUTE OF HEALTH MANAGEMENT RESEARCH
1, Prabhu Dayal Marg
Sanganer Airport, JAIPUR - 302 011, INDIA
Tel. : 3924700, 2791431-32
Fax : 91-141-3924738
E-mail : iihmr@iihmr.org
URL : http://www.iihmr.org
Gram : HEALTHINST

INSTITUTE OF HEALTH MANAGEMENT RESEARCH, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled "Contribution of Drip Irrigation System in Addressing Water Crisis of Farmers in Jaipur, District of Rajasthan" by Daksha Yadav, Enrollment No. IIHMR/PGDRM/2012-14/03-48 under the supervision of Prof. Rahul Ghai for award of Post Graduate Diploma in Rural Management of the Institute carried out during the period from March-May, 2014 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

Daksha.

Signature

EXECUTIVE SUMMARY

Rajasthan has largest geographical area having only 1% water resource of country. Due to arid and semi-arid climate i.e. negative moisture index, poor soil quality and traditional agriculture practices, food and nutritional security, and sustainability are still a distant dream.

The objectives of the "**Contribution of Drip Irrigation System in Addressing Water Crisis of Farmers in Jaipur District of Rajasthan"** are to study constraints that limit farmers in adopting drip irrigation, to understand the contribution of drip irrigation in making agriculture economically and ecologically viable and to list critical success factors in making DIS an economically and ecologically viable option.

The study was conducted in villages of three blocks of Jaipur, namely, Chomu, Jaipur and Phulera.

In this study, issues relating to solving water crisis in agriculture by adopting drip irrigation have been studied on three parameters- knowledge level, attitude scale and constraints in installing (adoption/use) of DIS by farmers. Three sets of questionnaires dealing with knowledge, attitude and constraints in adopting drip irrigation system were used as open guiding tool for interacting with farmers. The study has been conducted with small, marginal, big farmers covering different crop regimes in the context of agrarian realities of Jaipur district.

It has been observed that after installation of DIS, production has increased and the other expenses of labor has minimized. Age of farmers was not found as a barrier in adoption of DIS.

Farmers had sufficient knowledge about different benefits of 'DIS and most of them were convinced about it. But most of them complained about not being able to handle operational

issues of DIS. Most of them complained about ‘Red Tapeism” in the Govt. system relating to timely processing of subsidies.

The constraints encountered by the farmers were categorized into six categories namely general, technical, financial, infrastructural, educational, climatic and geographical constraints. Constraints like operating DIS, regarding subsidy through government agencies, farmers face inadequate distribution net work their village and in Rajasthan water is highly saline so farmer face frequent problem of clogging and blockage in pipes.

Proper knowledge and training regarding operating DIS, timely processing of Govt. subsidy and availability spare parts at the village level were identified as some of the critical success factors for a wider adoption of DIS.

ACKNOWLEDGEMENT

I would like to acknowledge the assistance and encouragement of individuals who directly or indirectly gave me assistance and motivation in the completion of my dissertation.

My prime gratitude goes to **Prof. B.D. Yadav (Agriculture Research Institute, Durgapura)** for giving me the opportunity to "**Contribution of Drip Irrigation System in Addressing Water Crisis of Farmers in Jaipur District of Rajasthan"**

I would also express my deep sense of gratitude to my coordinator **Prof. B.D. Yadav (Agriculture Research Institute, Durgapura),** for their able guidance and continuous supervision throughout the study. I also want to thank entire staff of **Research Institute, Durgapura.**

I would like to thank **Mr. R. P Yadav (Senior Manager, Johndeer)** and other staff members for providing their valuable guidance during my field visits. I would also like to thank the people of all villages, especially the collectors and residents of all the villages I visited.

I would also thank my guide **Rahul Ghai** (*Associate Professor SRM, IIHMR*) for his guidance and motivation during the dissertation.

Last but not least, I would like to thank my parents, friends and all well-wishers for successful completion of my dissertation.

CONTENTS

Chapter 7: Findings

- **Knowledge level of Farmers about DIS**
- **Attitude of farmers towards DIS**
- **Association between knowledge level and attitude of farmers**
- **Constraints Faced by the farmers in installation of DIS**

Chapter 8: Conclusion

References

Annexure

Chapter – 1

Introduction

India is an agricultural land where more than 65% of the population depends on the same. A secure water supply is the first and foremost requisite to produce crops. Water becomes the most important aspect of development for the most populous country to be projected till 2025, so scarcity of water in a country like India is really a matter of concern for farmers as agriculture is a key sector for country. Rivers', natural and man-made canal system cover only a limited part and a large number of farmers are still dependent on timely rain during the monsoon season for irrigation.

From last two decades water table has been depleting rapidly and to compound the situation recurrent droughts add to the woes of the farmers. During summer water is available for very less time and summer crop is very important for farmer. Considering these critical conditions there is an utmost need for water saving technologies.

Water is the most precious natural resource, vitally important for agricultural development and day-to-day living. Intensive agriculture and our growing population are depleting the already scarce resource the "Water". This is challenging situation and the need of hour is to conserve 'water' and ensure its 'efficient use'.

In the changing agricultural scenario world over there has been a shift towards pressure irrigation technologies like Drip and sprinklers. These technologies more specifically Drip Irrigation System spearheads this shift towards precision farming, Drip irrigation is a technology capable of providing more efficient utilization of water. Drip irrigation is basically precise and show application of water in the form of discrete continuous drops, sprayed through mechanical devices caused emitters in to the root zone of the plants. The drip system of irrigation water reaches the root drop by drop and hence is efficient method of irrigation.

It is relatively a new concept, which has developed over last decade throughout the world. In, 1964, Symcha Blass an Israeli engineer developed the first potential Drip Irrigation System (DIS). Today India ranks 7th in terms of coverage of area under drip irrigation with an irrigated area of 3, 09,466.4 hectares after USA, Spain, Australia, South Africa, Israel and Italy. In this method water is supplied directly near root zone of plants, drop by drop, with the help of drippers. Drippers are linked with side pipe lets which are linked with main pipeline connected with water supplying source.

Rajasthan has largest geographical area having only 1% water resource of country. Due to arid and semi-arid climate i.e. negative moisture index, poor soil quality and traditional agriculture practices, the food security, nutritional security, sustainability and profitability of horticulture production system is still a distant dream in the state. The major source of water in the state is well and tube wells. Irrigation scenario of Rajasthan is characterized by erratic or scanty rainfall, dwindling ground water resources increasing alternative demand of municipal and industrial sector that means less water available for agriculture.

Chapter-2

Agriculture Research Institute

Agricultural Research Station (ARS) now called as Rajasthan Agricultural Research Institute (RARI) is a constituent of Sri Karan Narendra Agriculture University, Jobner, Jaipur. Since its inception in 1943 it has come a long way, overcoming an era of national food deficits to that of self-sufficiency with a surplus food-grains reserve. This research station was initially under the control of the state Govt., which in April 1977 transferred it along with the responsibilities of crop research to the then Udaipur University, a multi-faculty university. Later, in 1987, the first Agricultural University in the state was established with its main campus at Bikaner and this research institute thus came under the jurisdiction of the Agricultural University, presently known as the Sri Karan Narendra Agriculture University, Jobner. The Director is the In-Charge of the research institute. Three Agricultural Research Sub Stations (Diggi, Tabiji and Kotputli) come under the administrative jurisdiction of this institute, where as five KVKs (Ajmer, Banasthali, Dausa, Kotputali and Chomu) get technical information from this institute for disseminating the same to the farmers.

The valuable contributions made by the agricultural scientists of this pioneer research institute have helped the Nation in maintaining the balance between its population growth and agricultural production. In order to increase productivity, improve quality and profitability not standing with the population pressures, rigorous efforts are still on the way at this centre and the scientists are determined to achieve these goals. Being foremost in advancement of agricultural research activities in the state, today, this research centre is a pride of Rajasthan.

The Agro-met with its useful weather data bank of last 25 years is an advisory service for the farmers at this institute. This unit issues medium range weather forecast (5 days in advance) along with crop and animal advisory on every Tuesday and Friday.

Mission

To conduct research and extension activities for enhancing productivity, profitability and sustainability of agricultural production systems and to improve the quality of rural livelihood in the country in general and state of Rajasthan in particular.

Division of Horticulture

Facility Available:

- Disease free & healthy vegetable, fruit & flower seedling facility
- Protected cultivation
- BOD, Autoclave, Seed germinator
- Drip Irrigation

Thrust Area of Research

- Developing high yielding and resistant varieties of vegetables in resilience with climate change
- Testing and evaluation of different entries of vegetable crops
- Developing production and protection technologies of vegetables, fruits and flowers
- Introduction of new vegetable crops
- Agro-technology of organic farming in mandate crops.

Chapter-3

Review of Literature

To analyze the performance of micro-irrigation system a study was done in Mewat district of Haryana, which is a hot arid place and also use of water is variable. Both sprinkler and Drip have found to be significantly efficient over traditional flood irrigation method. It was also revealed they are not widely adopted in the district because of some technical, social and institutional factors. **(Mamta Mehra, Devesh Sharma, Prachi Kathuria,2012)**

Drip Irrigation has ability to contribute significantly to groundwater resources development, agriculture productivity, economic growth, and environmental sustainability. Drip Irrigation has a significant impact on resources saving, cost of cultivation, yield of crops and farm profitability. (**Agricultural Economics Research Review,2010)**

Drip method of irrigation is significantly higher. Technology of Drip Irrigation also saves electrical energy, and benefits-cost ratios with different discount rates indicate that Drip investment in sugarcane, banana, and cultivation remains economically viable even without subsidy. (**A. Narayanmoorthy,2005**)

Drip Irrigation method increased yield up to 35% and saves water 25-33% in comparison with normal surface irrigation method. Further, 10-16% more area is available for crops as channels and ridges are not required. Drip Irrigation method eliminate the loss of water. (**India Water Week 2012**)

A DIS was used to investigate the appropriate irrigation water schedules in open fields and greenhouse for different vegetables. The study investigated and analyzed different pipeline material, spacing between emitters, and soil profile, also on the effects of soil type and climate on water consumption. The result revealed that there was a significant increase in crop productivity by 18%. (**H.K.Soussa,2010**)

Chapter-4

Objectives of Study

A study on "Contribution of Drip Irrigation System in Addressing Water Crisis of Farmers in Jaipur District of Rajasthan" was undertaken with the following objectives-

- To study constraints that limit farmers in adopting drip irrigation
- To understand the contribution of drip irrigation in making agriculture economically and ecologically viable
- To list critical success factors in making DIS an economically and ecologically viable option

Research Questions

- What is the knowledge level of farmers about DIS?
- Do farmers know about agency providing subsidies and loan for purchasing drip irrigation set?
- What are the important tips which are essential to be kept in mind, for maintenance of DIS.?
- Can the liquid fertilizer, insecticides, fungicide and herbicide be applied through DIS?
- Does attitude of farmers towards DIS has a critical role in modernizing agriculture?
- How subsidy is miss-utilized in the DIS through government agencies?
- What are the different constraints that play a role in installation (adoption/use) of DIS?

Chapter- 5

Method, Process & Scope

Method

The research "A Study on DIS for Addressing Water Crisis of Farmers in Jaipur District of Rajasthan" is focuses on farmers solely, for the use of DIS. Three sets of questionnaires were prepared namely; knowledge level of farmers about DIS, attitude scale for measuring attitude of drip owners and lastly constraints in installation (adoption/use) of DIS. Semi structured interviews, informal interaction with agricultural extension staff, professors of Agricultural Research Institute and the officer from Johndeer Company and field observations were also used to collect information.

Process

The farmers from Jaipur district were interviewed. The area was recommended by the Agriculture Research Institute, Durgapura (Sh. Karn Narendra Agriculture University, Jobner), & by Johndeer (a company which install DIS) and farmers were also selected from Jaipur purposely as suggested by the Agricultural Research Institute and Johndeer. The formed questionnaires were used as the open guiding tool for the study. For collecting information regarding DIS from the farmers questionnaires were the only guiding tool and rest of the information was collected by observation.

Scope

The study has been conducted with a small set of farmers and has confined itself to the agrarian realities of Jaipur district. Farmers were not very forthright in sharing details about the economics of their farming.

Chapter -6

Observations

Case studies of small, marginal, big farmers covering different crop regimes capture main observations.

Case study I

Name- Mr. Kajor Mal

Village- Bilandarpur, Block: Chomu, Rajasthan

Land under Drip Irrigation- 1.4ha

Crop- Cauliflower

Area under crop- 1.0ha

It was the year 2010-2011 when DIS was installed at Mr. Kajor Mal farm in the area of 1.4ha. Out of 1.4 ha area 1.0 ha area was used for cauliflower crop, rest of 0.4ha is used for crops like tomato and chili under DIS. When asked what influenced him to adopt the DIS, he said "it just happened; years back he had heard of DIS but was not aware of the subsidy given by government. He came to know about it in a training program by horticulture department, so with the help of information gained at the training program, he contacted Johndeer for installation of DIS".

Main reason for adopting DIS was income; there is a lot of difference between the income under DIS and Conventional method. Though DIS installation costs a lot but enhances income and more over it saves water, drop by drop. DIS that is installed at Mr. Kajor Mal farm has life for 10 years and it costs him Rs. 5000 whereas on other hand in conventional method there is no need for any.

All of above DIS is not labor intensive like conventional method is. When DIS was compared with conventional method there was a huge difference between the incomes. Earlier, through

conventional method Mr. Kajor Mal had an income of 142388 per annum and when adopted DIS there was increase in income, now the income is 196924 per annum.

It has been observed through conversation with Mr. Kajor Mal that he is satisfied with the decision of adopting DIS, though he faced problems in the beginning in operating the DIS and in use of fertilizers through DIS.

Case study II

Name- Mr. Ram Niwas

Village- Basseri, Block-Jaipur, District- Jaipur

Land under Drip Irrigation- 2.7ha

Crop- Summer squash

Area under crop- 1.5ha

Mr. Ram Niwas at the age of 67 tried the DIS, a system which is avoided by most of the farmers of this age. The crops he grows in his farmland other than summer squash are onion, chilly and watermelon. He says years back he used to be a conventional farmer but then started cultivation under DIS, though initial cost of DIS is high but in comparison with conventional method DIS gave good returns, a good production, and good income which is what a farmer wants.

When he installed DIS at his farmland, he came across lots of problems regarding operating a DIS, as it was difficult to understand a new technique too easily, but with regular support from the company which installed the DIS he lastly came over the difficulties he used to face while operating DIS.

The chemical treatments which are used for maintenance of DIS that are; Acid treatment and chlorine treatment. He knows the ph level required in the Acid treatment of DIS for its maintenance and knows disc filters are most resistant to clogging and easier to clean through back flush.

The knowledge level regarding DIS techniques of Mr. Ram Niwas is a pleasant surprise. In addition he says, now the transportation cost has increased in comparison to the years when he was into conventional method, the reason was good production of the summer squash crop also net income has almost doubled under DIS.

Case study III

Name- Mr. Kisan Lal

Village- Teja Ka Baas, Block- Phulera, District- Jaipur

Land under Drip Irrigation- 6.65ha

Crop- Carrot

Area under crop- 1.75ha

Carrot is a crop which one if heard for once cannot believe that it can be cultivated with DIS, but it is been cultivated by Mr. Kisan Lal. There is 29.03% increase in yield with DIS over conventional irrigation method. Chilly, onion, summer squash, watermelon are also cultivated under DIS in 4.9ha.

Electricity consumption per hectare has been reduced by Rs.1000, and like above two case studies transportation cost has increased by Rs.8000. He has a huge farmland under drip

irrigation and the farm land says it all that there is increase in profit in comparison with conventional method. The crops are now not at the risk of weeds as drop by drop irrigation prevents weeds in the crop.

Rajasthan has always faced scarcity of water and DIS can be a solution to fight scarcity of water for farmers. If in an area of 6.65 ha, the conventional method will still been followed the situation will be worse in coming years, as more water will be needed for cultivation.

Mr. Kisan Lal's land sets an example for the big size farmland that cultivation can happen under DIS in big farmland and will be able to give good returns in comparison with conventional method.

Chapter-7

Findings

This part deals with the findings of the present investigation in light of specific objectives. The required information was collected from the drip set owner farmers. The observations and findings are presented under the following sections:

(1) Knowledge level of farmers about DIS.

Farmers could hardly be motivated for drip irrigation technology unless they possess sufficient knowledge level about it. Hence, it can be said that knowledge levels significantly determined behavior of farmers.

Majority of the farmers interviewed had medium knowledge level about DIS. This might be attributed to less exposure to information sources, less contact with extension personnel, lack of proper and adequate technical guidance, inconsistent and half-hearted efforts at transfer of technology by agencies involved in dissemination of DIS.

Further the farmers had extremely high knowledge level about the aspect 'DIS save the water'. This might be due to the fact that since much smaller quantity of water is applied to the soil by DIS and farmers are seemingly well convinced about it.

Farmers had no knowledge about 'techniques that help in maintaining physical conditions and structure of soil', 'the surface type and sub-surface DIS is useful for', . This might be due to less exposure or farmers could not aware about them.

From aspects like 'the installation (adoption/use) cost is higher by using DIS' farmers knowledge level is very high, due to the fact that now DIS is newly introduced.

Farmers had very little knowledge about chemicals, which are used for cleaning the DIS; those who know about the chemicals used in DIS can name only one that is Acid.

When it comes to knowledge of DIS components, farmers had extremely high knowledge level and easily name the components but when it comes to knowledge regarding number of emitters used per plant they had very little knowledge.

(2) Attitude of farmers towards DIS.

It has been proved by many researchers that attitude is a single factor, which is responsible for adoption or rejection of any new idea; experiences drawn from different studies have demonstrated that the people having favorable attitude objects reflect cumulative positive or negative affect associated with some psychological object like symbol, slogan, persona or ideas towards which people can differ in varying degree. It has been found that people generally accept all these things, which boost their age and thus from a highly favorable attitude towards the same. This, it is quite evident that attitude plays a crucial role in the adoption behavior of an individual.

The attitude of farmers towards DIS has a critical role in modernizing. This section of the investigation aims to study the attitude of the farmers towards DIS. Many of farmers have a positive attitude towards DIS as it saves water and moreover it increases about 70% extra area under irrigation.

It has found farmers have negative attitude regarding subsidy through government agencies as there is “Red Tapeism”, many of applications for installing DIS are bunged and also the installing agencies install the DIS but after check by government, farmers uninstall DIS and the installing agencies and farmers divide the share which they got from the government.

DIS preserves the nutrient of crop into the root zone, found to be a positive attitude of farmers to install DIS as it helps a crop to a healthy growth and they get a good price for their crop.

Weeding is another aspect which promotes installation of DIS among farmers as it cut down the labor cost. In DIS weeding is less because drops go directly into the crops. Also crop is prevented by many of diseases and leads to a good production.

(3) Association between knowledge level and attitude of farmers towards Drip Irrigation System

Age was not found to be a barrier in adopting new techniques of agriculture as the case study of Mr. Ram Niwas shows. The extent of knowledge of farmers about drip irrigation system was highest about 'the advantages of Drip Irrigation System' followed by 'drip irrigation system save the water as compared to other method', and attitude towards adopting the Drip Irrigation System was linked with the knowledge level they have.

The knowledge farmers have regarding Drip Irrigation System subsidy get affected as most of the farmers have attitude that subsidy is misused by the governments agencies and this was found to negative attitude of the farmers in not adopting DIS.

When in conversation with an official of Johndeer and farmers it was observed that though government provides subsidies on Drip Irrigation System but they are unable to pay that much of money as well.

(4) Identifying the constraints faced by the farmers in installation (adoption/use) of DIS.

Agriculture is undergoing rapid scientific advancement in recent days. There is no dearth of technical know-how in these days but the most complex and significant problems of our age are dissemination of new farm technology and its utilization by the farmers. There is a tremendous

gap between existing knowledge utilization and production. Hence, an attempt was made to identify and analyze the constraints perceived by the respondents in installation (adoption/use) of DIS.

To get an overview of the farmers regarding the constraints perceived by them in the installation (adoption/use) of DIS, they were divided into three strata i.e. high, medium and low level of constraints.

The constraints encountered by the farmers were categorized into six categories namely general, technical, financial, infrastructural, educational, climatic and geographical constraints.

4.1GENERAL CONSTRAINTS

The constraints like 'spacing varies from crop to crop, so it becomes difficult to change the place to lateral pipes frequency' and 'companies/dealer do not provide proper service regarding the DI sets' was found to be most important constraints by the farmers. These two constraints were found to be comparatively most important constraints from other four constraints. When it comes to 'operating the DIS by illiterate people' the severity is high. Many of farmers found it difficult to operate DIS. 'Irregular supply of electricity in the area' was found to be less severe. As observed from interviews that electricity cut is now less, as compared to past years.

The last constraint 'problem of uprooting due to shallow root technology' is found out to be not at all severe, most of the farmers.

4.2TECHNICAL CONSTRAINTS

It has been revealed that 'Non-availability of spare parts at village level', 'Regular service is not available from installing agency after sale', 'Problem of blocking the drippers due to salt or other

impurities in the water', 'High technical skill is required in operation and maintenance of DIS', 'Uneven distribution of water due to insufficient pressure of water', and 'Lack of technical know-how about DIS' were expressed as most severe constraints by the farmers. It has been found that technically farmers are weak and very little or no knowledge about DIS when it comes to technical operations of DIS. 'Problem of leakage of water in the pipe' constraint is a less severe constraint perceived by the farmers. This constraint is easily identifiable or easily understood by the farmers.

4.3 FINANCIAL CONSTRAINTS

Financial constraints like 'High initial cost of installing drip sets' was perceived as a most severe followed by 'Lack of timely availability of financial help from government', 'Diesel/electrical charges (particularly diesel) are more expensive', and 'No information about subsidy' by the beneficial farmers. Financial conditions matter the most for a farmer. Other financial constraints like 'Extra tank is needed for high pressure' and 'Procedure for getting loan from bank/societies is complicated' were found to be less severe by the farmers, whereas only one constraint 'Spare parts of DIS are costly' was perceived to be not at all severe.

4.4 INFRASTRUCTURAL CONSTRAINTS

The infrastructural constraints findings have been showed that, they are somehow responsible for the installation (adoption/use) of DIS. These constraints revealed that the 'Service by the companies is poor after sales', 'Technical staff, working in the field is not available' were identified to be the most severe constraints. 'Generally, timely spare parts are not available' also a most severe constraint perceived by the farmers. Interestingly, one constraint identified to be

less severe that is ‘Insufficient supply of electricity for irrigating fields’. ‘Inadequate distribution net work in rural areas is also a constraint that is a most severe among farmers.

4.4 EDUCATIONAL CONSTRAINTS

This constraint appeared to be a thought-provoking constraint. The sub-constraints of Educational Constraints perceived as most severe by the farmers. ‘Uneducated farmers feel difficulty in using DIS’, and ‘Lack of individual’s contact with experts related to DIS for effective adoption’ are important constraints perceived by the famers. ‘Inadequate awareness about the advantage of DIS’ and ‘Adequate numbers of demonstrations were not arranged to motivate and develop skills for its adoption’ were also perceived as most severe constraints followed by the first two. Other constraints like ‘Lack of knowledge about operating of DIS’, ‘Farmers training were not arranged for its installation’, and lastly ‘Lack of systematic campaign for popularizing the DIS have been identified constraints by the farmers.

4.6 CIMATIC AND GEOGRAPHICAL CONSTRAINTS

Climatic and geographical conditions play an important role in agriculture. The constraints ‘Unprofitable where land is leveled and ground water available in sufficient quantity’, ‘Unsuitable in the area where water if highly saline’ and ‘Inability to minimize temperature of atmosphere’ appear to be most important constraints among farmers. ‘High temperature reduces the durability of DIS’ and ‘Unsuitable to clay soil’ were perceived by the farmers as not severe constraints.

Chapter – 8

Conclusion

Based on the observations and findings above the following conclusions could be drawn regarding the critical success factors for wider and better adoption of drip irrigation by farmers.

- Timely availability of Govt. subsidy to farmers
- Proper knowledge of farmers regarding the different component parts of DIS at the time of installation
- Good quality material would ensure durability of DIS at the farm level
- Regular trainings at the farm level regarding the optimum usage of DIS, fertigation schedules for different crop regimes
- Timely availability of spare parts to farmers at village level is necessary for sustaining DIS at farm levels.

The study has sought to understand existing levels of knowledge and attitude of farmers regarding DIS. An understanding of positive and negative aspects of knowledge & attitude about DIS by the farmers can be of great value for extension workers, administrators, policymakers and exports of related field. This study also highlights the constraints that need to be addressed in order to achieve a better dissemination of DIS.

References

- **(Source: International Journal of Environment Sciences. Volume 3, No 1, 2012)**

- **(Source: Agricultural Economics Research Review, Volume 23 July-December 2010, pp265-272)**

- **(Source: A. Narayanmoorthy, Occasional Paper-45. Efficiency of Irrigation: A Case of Drip Irrigation. Department of Economics Analysis, NABARD, Mumbai, 2005)**

- **(Source: India Water Week 2012- Water, Energy and Food Security: Call for Solutions 10-14 April 2012, New Delhi)**

- **(Source: H.K.Soussa, Effects of Drip Irrigation water Amount on Crop Yield Productivity and Efficiency of water use in Desert Regions in Egypt)**

ANNEXURE

Questionnaire

(1) Knowledge level of beneficiary farmers about drip irrigation system

S.No.	Statements
1.	Do you know about installation (adoption/use) cost of drip irrigation system? if yes, please mention cost .....
2.	Do you know about agency providing subsidies and loan for purchasing drip irrigation set? If yes, name at least one agency .....
3.	Do you know about advantages of drip irrigation system? If yes, enlist at least one advantage. 1. .....
4.	Do you know about the practical irrigation efficiency possible by using this system of irrigation? If yes, please mention in %. .....
5.	Can drip irrigation system be used where irrigation water is very scarce?
6.	Does drip irrigation system control weeds in crop?
7.	Do you know that surface run-off can be eliminated by using drip irrigation system?
8.	Do you know that drip irrigation system help in maintaining physical conditions and structure of soil?
9.	Do you know about the components of drip irrigation system? If yes, mention name at least one component. 1. .....
10.	Do you know the number of emitter used for per plant? If yes mention numbering emitter .....
11.	Do you know about important tips, which are essential to be kept in mind, for proper maintenance of drip irrigation system? If yes, mention at least one important tips. 1. .....
12.	Do you agree that an additional area can be irrigated by drip irrigation system? If yes mention additional area in percent

	.....
13.	Whether drip irrigation system is useful for hilly and undulated area.
14.	Can the liquid fertilizer, insecticides, fungicide and herbicide be applied through drip irrigation system?
15.	Whether DIT is suitable for fruit plants?
16.	Can we measure the amount of water easily with drip irrigation system as compared to other methods?
17.	Is equal distribution of water possible on high wind velocity in drip system of irrigation?
18.	Is DIT helpful in the protecting the crops from diseases?
19.	Is the installation (adoption/use) cost is higher by using drip irrigation system as compared to other method of irrigation?
20.	Do you know about the soil, which is most suitable for drip irrigation system? If yes, mention type of soil. .....
21.	Do you know about the major problems in drip irrigation system? If yes, mention the one problem. 1. .....
22.	Do you know about chemicals, which are used for cleaning the drip system? If yes, mention the one chemical. 1.
23.	Do you know about the types of drip irrigation system? If yes, mention one type of drip irrigation system. 1. .....
24.	Do you know about the types of filters used in drip irrigation system? If yes, mention one type of filter. 1. .....
25.	Do you know about the instrument, used to measure the pressure of water in drip irrigation system? If yes, mention name of instrument ....
26.	Which component of drip irrigation system is used for fertilizer? If yes mention one

	fertilizer? 1. .....
27.	Do you know above saline water can be used in drip irrigation system? If yes, mention one reasons. ....
28.	Do you know about type of drippers are widely used for fruit crops in DIT? If yes, mention of drippers. .....
29.	Do you know about the surface type drip irrigation system is useful for? If yes, mention purpose. .....
30.	Do you know about the sub-surface type of drip irrigation system is useful for? If yes, mention purpose. .....
31.	Do you know about the drip irrigation system save the water as compared to other method of irrigation?.....

(2) Attitude scale of measuring attitude of DRIP owners

S.No.	Statements
1.	Drip irrigation system increase about 70% extra area under irrigation (+)
2.	Drip irrigation system creates difficulty in intercultural practices (-)
3.	Drip irrigation system maximize the utilization of available water (+)
4.	During high wind velocity equal distribution of water is impossible (-)
5.	Drip irrigation system saves the crop from frost (+)
6.	There is inadequate root development through drip irrigation system (-)
7.	Labour cost is required less when crop is irrigated by drip irrigation system (-)
8.	Spare parts of drip irrigation system are not easily available in market (-)
9.	Initial investment for installment of drip irrigation system is not bearable by farmers (-)
10.	One can measure water easily with drip system than other methods (+)
11.	Land leveling is essential if drip irrigation system used (-)
12.	Uniform water distribution through drip irrigation system (+)
13.	There may not be significant increase in yield through drip irrigation system (-)
14.	Subsidy is misutilized in the drip irrigation system through governments agencies (-)
15.	The drip irrigation system is the best method in water scarcity condition (+)
16.	Physical condition and structure of soil are distributed by continuous use of drip system of irrigation (-)
17.	Drip irrigation system is beneficial for saving water (+)
18.	Vegetable and fruit production is increased through drip irrigation system (+)
19.	Water management is difficult through drip irrigation system (-)
20.	Handling of drip set is very complex procedure (+)
21.	Drip irrigation system reduces soil erosion (+)
22.	Soil moisture is maintained through drip irrigation system around the plants root zone (+)
23.	Cropping intensity can be increased through drip irrigation system (+)
24.	Credit and subsidy facilities are adequate for drip irrigation system (+)
25.	Plant growth and plant yield decrease through drip irrigation system (-)
26.	Water application rate is high through drip irrigation system (-)

27.	Water management is easier by using drip irrigation system than surface irrigation (+)
28.	Drip irrigation system is most suitable for arid region (+)
29.	Fertilizer and chemicals cannot be applied easily though drip irrigation system (-)
30.	Drip irrigation is beneficial only where ground water is available in sufficient quantity (-)
31.	Drip irrigation system increases the cost of cultivation of crop (-)
32.	Surface runoff of irrigation water can be eliminated by drip system of irrigation (+)
33.	In drip system of irrigation, quantity of water can be controlled according to crop need (+)
34.	Water application efficiency is achieved by drip irrigation system (+)
35.	Drip irrigation system decrease the fertilizer use efficiency (-)
36.	By the use of drip irrigation system nutrient can be preserve into the root zone of crop (+)
37.	Though drip irrigation system salt is accumulated near plant root zone (-)
38.	Through drip irrigation system water application time is normally long (-)

(3) Constraints in installation (adoption/use) of drip irrigation system

S.No.	Statement	Degree of Severity		
		MS (3)	LS (2)	NS (1)
(A)	**General constraints**			
(i)	Irregular supply of electricity in the area			
(ii)	Difficult to operate the drip irrigation system by illiterate people			
(iii)	Regular maintenance is difficult			
(iv)	Problem of uprooting due to shallow root system			
(B)	**Technical constraints**			
(i)	High technical skill is required in operation and maintenance of drip irrigation system			
(ii)	Uneven distribution of water due to insufficient pressure of water			
(iii)	Problem of blocking the drippers due to salt or other impurities in the water			
(iv)	Regular service is not available from installing agency after sale			
(v)	Non-availability of spare parts at village level			
(vi)	Problem of leakage of water in the pipe			
(vii)	Lack of technical know-how about drip irrigation system			
(C)	**Financial constraints**			
(i)	High initial cost of installing drip set			
(ii)	Extra tank is needed for high pressure			
(iii)	Procedure for getting loan from bank/societies is complicated			
(iv)	Spare parts of drip irrigation system are costly			
(v)	Lack of time availability of financial help from government			
(vi)	Diesel/electrical charges are more expensive			
(vii)	No information about subsidy			
(D)	**Infrastructural constraints**			
(i)	Service by the companies are poor after sales			

(ii)	Technical staff, working in the field is not available			
(iii)	Uneducated farmers feel difficulty in using drip irrigation system			
(iv)	Lack of individual's contact with experts related to drip irrigation system for effective adoption			
(v)	Farmers training were not arranged for its installation (adoption/use)			
(vi)	Lack of systematic campaign for popularizing the drip irrigation system			
(vii)	Adequate number of demonstrations were not arranged to motivate and develop skills for its adoption			
(F)	**Climatic and geographical constraints**			
(i)	High temperature reduce the durability of drip irrigation system			
(ii)	Unprofitable where land is leveled and ground water available in sufficient quantity			
(iii)	Unsuitable in the area where water is highly saline			
(iv)	Inability to minimize temperature of atmosphere			
(v)	Unsuitable to clay soil			