Need to replace Furrow Irrigation system by Drip Irrigation system to Improve Qualitative Parameters of Cotton Crop: A Case study of Talod Taluka in Sabarkantha District in Gujarat, India

Ishani Upadhyay[1] Falguni Thakur[2] Priyank Shah[3]
[1,2] M.E. Student, Water Resource Management Department
[3]M. E. Student, Transport Engineering Department
[1,2]L. D. College of Engineering, Ahmedabad
[3]Government Engineering College, Modasa

Abstract-The Aim of this paper is to replace furrow Irrigation system by Drip irrigation system to improve qualitative parameters of cotton crop at its different physiological stages. (Germination, Initial Vegetative, Flowering, Boll development and Maturity).As we are knowing furrow irrigation system requires more water than drip irrigation system. Our region is affected with drought once in every four year. Cotton crop needs continuous water for duration of 140 to 160 days in between May to October. In month of May and June water table is going down and all Water resources are at its bottom level during season of summer.

Keywords: Plant height, Number of bolls, weight of bolls, Maturity time

I. INTRODUCTION

Irrigation is an artificial application of water to the soil through various systems of tubes, pumps, and sprays. Irrigation, defined as a system used for watering crops and plants, requires proper design and operation along with experience, science and even some art. Irrigation is one of the vital inputs of agricultural production system. In fact, with the development of irrigation and with other technological inputs the country could increase its grain production more than four times since independence. Some have estimated that as little as 15-20 percent of the worldwide total cultivated area is irrigated. Irrigation systems are often designed to maximize efficiencies and minimize labour and capital requirements. The most effective management practices are dependent on the type of irrigation system and its design. A large number of considerations must be taken into account in the selection of an irrigation system. These will vary from location to location, crop to crop, year to year, and farmer to farmer. In general these considerations will include the compatibility of the system with other farm operations, economic feasibility, topographic and soil properties, crop characteristics, and social constraints. [1]

A. Importance of Study Area:

- Talod block watershed is located in the district of Sabarkantha about 45 Km From district headquarters.
- The study area is characterized by high temperature and low rainfall
- The Talod block is characterized by Flat with varying slopes.
- Agricultural land is 70%.
- Maze and cotton is usual crop in the soil.
- Average rain fall is 876mm. (From last five year data)[2]

Fig.1. Map view of studya area

Location	
Coordinates	23.351949°N Latitude 72.953253°E Longitude
Country	India
State	Gujarat
District	Sabarkantha
Population	Total 17,472

Table.1. Details of study location

II. REVIEW OF LITERATURE

A. Water use efficiency of irrigated cotton in Uzbekistan under drip and furrow irrigation.

In this Paper study about to determine irrigation water scheduling parameters associated with optimal seed-lint yield and irrigation water use efficiency, which are poorly understood in the Central Asian Republic of Uzbekistan. Field experiment with drip irrigation in comparison to furrow irrigation was conducted on a deep silt loam soil at the Central Experiment Station of the Uzbekistan National

Cotton Growing Research Institute at Tashkent in 2003, 2004 and 2005. Crop water use, which we here define as the sum of transpiration and evaporation, was established using the soil water balance approach on a weekly basis. Soil profile water content was determined using a neutron moisture meter (NMM), which was calibrated in polyvinyl chloride (PVC) access tubes for each differing soil layer. Under drip irrigation and the optimal mode (70–70–60% of FC) of irrigation scheduling, 18–42% of the irrigation water was saved in comparison with furrow irrigated cotton grown under the same condition; and irrigation water use efficiency increased by 35–103% compared with that of furrow irrigation. Cotton yield was increased 10–19% relative to that for furrow irrigated cotton. [3]

B. Potential for Drip and Sprinkler Irrigation in India

In this Paper study the water use efficiency under conventional flood method of irrigation, which is predominantly practiced in Indian agriculture, is very low due to substantial conveyance and distribution losses. Recognizing the fast decline of irrigation water potential and increasing demand for water from different sectors, a number of demand management strategies and programme have been introduced to save water and increase the existing water use efficiency in Indian agriculture. One such method introduced relatively recently in Indian agriculture is micro-irrigation, which includes both drip and sprinkler method of irrigation. Micro-irrigation (MI) is proved to be an efficient method in saving water and increasing water use efficiency as compared to the conventional surface method of irrigation, where water use efficiency is only about 35-40 percent. Though both drip and sprinkler irrigation methods are in use over the last two decades or so, not many studies seem to have studied the potential and prospects of micro-irrigation covering different states in India. In this study, therefore, an attempt is made to (a) study the current research on micro-irrigation, (b) study the past trends in drip and sprinkler irrigated area across states, (c) analyze the efficiency of drip and sprinkler irrigation, (d) estimate the potential area for drip and sprinkler irrigation in different states and (e) study the reasons for the slow adoption of micro irrigation as well as to suggest policy/technical interventions for increasing the adoption of WSTs in the future. This study shows that the benefits of micro-irrigation in terms of water saving and productivity gains are substantial in comparison to the same crops cultivated under flood method of irrigation. Micro-irrigation is also found to be reducing energy (electricity) requirement, weed problems, soil erosion and cost of cultivation. Investment in micro irrigation also appears to be economically viable, even without availing State subsidy. Despite this, as of today, the coverage of drip (2.13 percent) and sprinkler (3.30 percent) method of irrigation is very meager to its total potential, which is estimated to be 21.01 million hectares for drip and 50.22 million hectares of sprinkler irrigation method. It is identified that slow spread of MI is not mainly due to economic reasons, but due to less awareness among the farmers about the real economic and revenue-related benefits of it. Therefore, apart from promotional schemes, the study suggests various technical and policy interventions for increasing the adoption of these two water saving technologies.[4]

States of India	Area in Ha
Maharashtra	194000
Andhra Pradesh	59500
Karnataka	58500
Tamilnadu	46500
Rajasthan	41500
Gujarat	20500
Madhya Pradesh	8800
Kerala	8500
Utter Pradesh	4500
Orissa	3900
Haryana	3400
Punjab	2200
West Bengal	800

Table. 2. Area for Drip & Sprinkler Irrigation State wise

1) Furrow Irrigation: Narrow field ditches known as furrow, Excavated between rows of plant and carry irrigation water through them.

Furrow irrigation avoids flooding the entire field surface by channeling the flow along the primary direction of the field using 'furrows,'

Water is applied to the top end of each furrow and flows down the field under the influence of gravity.[5]

Fig. 2. Photo showing Furrow irrigation

2) Drip Irrigation: Drip irrigation is sometimes called trickle irrigation and involves dripping water onto the soil at very low rates (2-20 litres/hour) from a system of small diameter plastic pipes fitted with outlets called emitters or drippers. Water is applied directly at crop root zone.[5]

With drip irrigation water, applications are more frequent (usually every 1-3 days) than with other methods and this provides a very favorable high moisture level in the soil in which plants can flourish.

Drip irrigation is the slow, precise application of water and nutrients directly to the plants' root zones in a predetermined pattern using a point source.

A drip irrigation, micro irrigation or trickle

irrigation design can be customized to meet specific needs while maintaining an optimum moisture level within the root zones, efficiently conserving water that might otherwise be lost to non-growth areas, runoff, sun or wind, and providing the proper balance of water and air needed for successful plant growth.

Drip irrigation system delivers water to the crop using a network of mainlines, sub-mains and lateral lines with emission points spaced along their lengths. Each dripper/emitter, orifice supplies a measured, precisely controlled uniform application of water, nutrients, and other required growth substances directly into the root zone of the plant.[7]

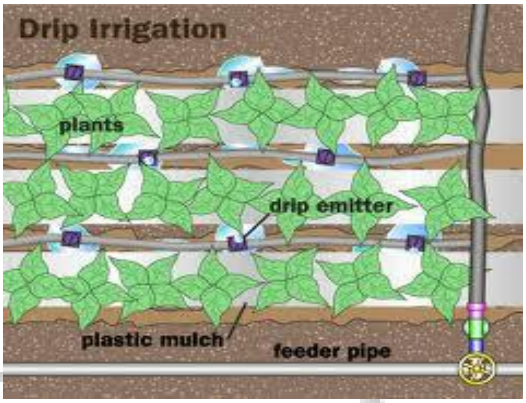

Fig.3. Drip Irrigation working arrangement

3) *Crop cotton:* Cotton is a soft, fluffy staple fiber that grows in a boll, or protective capsule, around the seeds of cotton plants of the genus Gossypium. The fiber is almost pure cellulose. Under natural condition, the cotton bolls will tend to increase the dispersion of the seeds.

The plant is a shrub native to tropical and subtropical regions around the world, including the Americas, Africa, and India. Cotton is an important fibre yielding crop of global importance, which is grown in tropical and subtropical regions of more than 80 countries the world over.

The developmental phases for cotton can be divided into five main growth stages:

i) Germination and Emergence
ii) Initial vegetative
iii) Flowering stage
iv) Boll development
v) Maturation

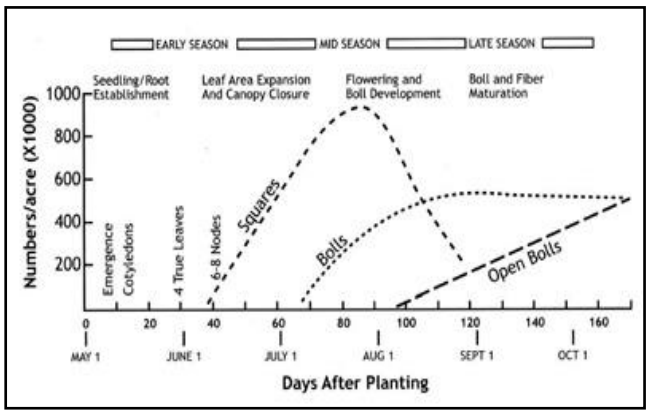

Fig. 4. Seasonal development of cotton in the Mid-South with a May 1 planting date, showing typical production patterns of squares, bolls and open bolls (Oosterhuis, 1990, with permission ASA).

The transitions between these stages are not always sharp and clear. Each stage may also have different physiological processes operating within specific requirements. [6]

– India is one of the most cotton growing countries.
– India is estimated to have a good surplus of 15.1 million bales (170 kg each). This surplus is about 3 times the closing stock for this past year ending in September 2012.
– The State of Gujarat will tie its number 1 position with the State of Maharashtra. Gujarat will have a drastic decline in cotton production over the last year.

III. DATA COLLECTION

From Cotton Agricultural University, Talod, Gujarat we are getting below mention data from different survey.

i) Seed cotton yield (Kg/ha)
ii) plant height cm at flowering stage
iii) plant height cm at flowering stage
iv) plant height cm at boll development stage
v) No. of bolls
vi) Boll weight
vii) Maturity stage in days

Furrow irrigation							
Villages	**Seed cotton yield (Kg/ha)**	**plant height cm at flowering stage**	**plant height cm at boll development stage**	**plant height cm at Maturity stage**	**No. of bolls**	**Boll weight**	**Maturity stage in days**
Motesary	2200	60	115	125	28.4	3.5	140
	1800	55	85	100	27.6	3.6	140
	2900	60	125	135	40.0	4.0	135
Antrolivas Punjaji	1750	55	100	110	34.9	3.1	140
	2100	60	100	115	25.3	1.0	145
	2350	60	105	115	29.4	4.4	140
Dadrada	1500	55	80	90	17.8	4.6	120
	2150	60	105	115	31.9	3.8	125
	1950	50	90	100	33.2	3.7	120
Mahelav	1850	50	90	100	27.3	4.0	130
	1700	40	85	95	27.0	3.6	120
	2400	55	110	120	35.4	3.8	130
Gambhirpura	550	40	50	55	14.0	2.0	120
	2150	60	105	115	30.7	3.8	130
	2700	60	125	135	41.8	3.5	140
Madhavgadh	2300	60	105	115	36.5	3.5	130
	2450	60	110	120	37.8	3.5	140
	2400	65	110	120	35.4	3.8	140
Mahiyal	1750	60	100	110	34.9	3.1	120

	2300	60	100	115	37.9	3.4	130
	2600	65	120	130	40.7	3.7	140

Table. 3. Data regarding Furrow Irrigation Experiment

CONCLUSION

From different data collection and literature review conclude that if we are going to replace method of irrigation by drip irrigation there is a improvement in all six parameters by 15 to 20 %.

We can improve qualitative parameters of cotton crop by applying drip irrigation system in study area.

FUTURE SCOPE

From test result we conclude that in case study area need to replace furrow irrigation by Drip Irrigation method. Apply drip irrigation method and improve crop parameters.

REFERENCES

[1] Irrigation & water resources engineering by S.K Garg
[2] Project Implementing Agency District Watershed Development Unit Sabarkantha
[3] www.elsevier.com
[4] Potential For Drip And Sprinkler Irrigation In India by A Narayanmoorthy
[5] Irrigation theory and practices by A.M Maikal
[6] The most critical Period in cotton production by The cotton foundation, America
[6] WWW.WIKIPEDIA.COM

