ORIGINAL RESEARCH PAPER

Engineering

KEY WORDS: Irrigation efficiency; drip irrigation; forage biomass

# A STUDY ON DRIP IRRIGATION SYSTEM INCLUDING ITS SURVEY, INSTALLATION AND DESIGN

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ABSTRACT

For enhancing irrigation system use efficiency is an important tool for intensifying and diversifying agriculture in India, resulting in higher economic yield from irrigated farmlands with a minimum input of water. Research was conducted to evaluate the effect of irrigation method (furrow vs. drip) on the productivity of nutritious fodder species during off-monsoon dry periods in different elevation zones of central India. A split-block factorial design was used.The use of drip irrigation system and design are use in recent agricultral filedt he factors considered were treatment location, fodder crop, and irrigation method. Commonly used local agronomical practices were followed in all respects except irrigation method. Results revealed that location effect was significant ($p < 0.01$) with highest fodder productivity seen for the middle elevation site, sagar. Species effects were also significant, with teosinte having higher yield than cowpea (Vigna unguiculata). Irrigation method impacted green biomass yield (higher with furrow irrigation) but both methods yielded similar dry biomass, while water use was 72-73% less under drip irrigation. Our findings indicated that the controlled application of water through drip irrigation is able to produce acceptable yields of nutritionally dense fodder species during dry seasons, leading to more effective utilization and resource conservation of available land, fertilizer and water.

## 1. INTRODUCTION

Irrigation resources are limited and the water-use-efficiency as well as agriculture. It is the most important sector of the Indian economy from the perspective of poverty alleviation and employment generation. With about hac. If our population still dependent on agriculture for most of their incomes we cannot expect inclusive growth, if we do not revitalize our agriculture. The process of modernizing agriculture primarily involves intensive use of non conventional inputs, such as quality seeds, chemical fertilizers, pesticides, weedicides, irrigation, farm machinery etc. Agriculture GDP was declining at 2 % annually but is expected to grow in the lowest single digits. This tardy performance of the Agri. sector in India can be attributed partly to counterproductive policies of the government and mainly to continued dependence on rainwater. While India accounts for 6 % of world population, 30 % of global cattle population, however, with only 2.4 % of land area but 4 % of global water resources, India has to manage itself with these major resources. Actual irrigated area is 70.64 million hectares as against 88.72 of potential.

India is the largest producer of productivity is low. Micro irrigation system (MIS) which is the most efficient method of irrigation was introduced in 1987 MIS has become popular in India and it has been adopted on 4000,000 hac.

### Drip irrigation

The aim of irrigation is to include something to complete the natural supply of water and with this people can get the required yield from the agricultural land. So, if we desire to get this aim of irrigation then an irrigation system should be advanced and this advancement includes the parameters like:

- Planning of the irrigation work
- Designing, constructing of the irrigation work and
- Maintenance, operation of the irrigation work

The parameters that oblige irrigation are as follows:

- The inadequate rainfall
- The rainfall should be distributed evenly
- Many crops should be grown in a year
- The growing of superior crops

### Why should we use Drip Irrigation

- To use water efficiently
- No water to runoff evaporation
- It reduces water contact with crops leaves , stems and fruits .
- Agriculture chemicals can be applied more efficiently.

## 2. SURVEY AND INSTALLATION OF DRIP IRRIGATION SYSTEM

### 2.1 Examine Availability of Water

To construct an irrigation project whether it is a dam or weir or barrage, first and foremost observation should be the presence of water and its availability.

The availability may be of different types, but proper examination is required before construction.

### Some important observations are:

- If there is any river flowing in that area, we should know the type of river whether it is perennial or inundation type. If it is perennial, then the water is available throughout the year.
- The river should meet the requirement of water in that area. Suitable site be available to construct an irrigation project

### 2.2 TYPES OF SURVEY

- Types of Surveys. Surveys can be divided into two broad categories: the questionnaire and the interview. Questionnaires are usually paper-and-pencil instruments that the respondent completes.
- Interviews are completed by the interviewer based on the respondent say.

## 3. INSTALLATION PROCESS

Installation of an irrigation system is very important and crucial part that greatly affect the system performance before starting work go through the design in detail and study it with regard to the legends mentioned in the design of drawing sheet. you have any problem in understanding the design get help of site engineer supervisor and clarify your doubts check if the physical situation on site meets with the dimension means and in design we need to do the installation work as per the installation guidelines and system product specification only.

### 3.1 JOING OF PIPES-FITTING

Remove burn if any from the ages of PVC pipes before applying solvent cement. Apply a thin layer of solvent cement on the surface of Pipe and Fittings rotate then slightly for even spreading and should be join immediately hold it tightly for few seconds. The Spigot end of the pipe must be pushed into the socket to the depth of entering mark Do not apply solvent cement on the threaded part (male / female) of PVC fittings and valve also

### 3.2 INSTALLATION OF VALVES

Air valves on main line should always be installed on the highest point of the pipeline or at a point of change in the slope Control valve to be installed minimum 1 feet above ground level and should be straight in position both vertically and horizontally.

Make use of teflon tape to wrap on threaded part of adopters for fitting it into the valve to avoid leakage through it avoid over tightening by pipe wrench.

### 3.3 LYING THE DRIPLINES

Drill a clean hole on PVC Sab main by using drill machine with proper size of drill bit only marking should be done on PVC pipes for drilling at a desired spacing Fix up rubber grommet in a hole in order to avoid leakage through it. insert start connector or take off into hole to the shoulder of the rubber grommet connect it with a piece of plain lateral pipe . Take a special care that the take of pipelines perpendicular to the summon and permanently remains straight in the position avoid bending of laterals near the trenches. Always lay the lateral straight on the surface along the crop grows and avoid sharp a curve .check for twist in laterals.

### 4. DESIGN OF DRIP IRRIGATION SYSTEM

These guidelines will provide you with all the information necessary to design a residential drip system for a typical yard. These guidelines are what is termed a "prescriptive standard" in the building industry. A prescriptive standard is a set of rules and/or methods that, when followed, allow you to skip the engineering calculations for a design. Obviously this saves a lot of time and effort in preparing a design.

### 4.1 Emitter Type and Flow

Use pressure compensating emitters if you have an elevation difference of over 1,5 meters (5 feet) in the area you are irrigating. For more level areas turbulent flow emitters will work great and are often less expensive. For gravity flow systems use short-path emitters, they typically work better than the others at very low water pressures. For most soil types 2,0 l/hr (0.6 gph) emitters work well and are more economical. For sandy soil use 4,0 l/hr (1 gph) emitters.

### What valve type and size to use

Use a 20mm (3/4 ) valve for most systems. Any type of valve may be used.

### 4.2 SELECTION CRITERIA OF COMPONENTS

**Current Category**

1. Selection of Dripper
2. Selection and Design of lateral
3. Selection and design of sub-main
4. Selection and design of Main line
5. Selection of pump

### 1. Selection of Dripper

The selection of type and number of drippers per plant is based on Peak water requirement of crop and soil type. Consideration for dripper selection- an ideal of perfect emitter would meet that following four objectives.

1. It should be compact, serviceable and inexpensive to keep the system cost low.
2. It should have relatively low discharge to keep the system cost low.
3. It would not vary significantly with pressure this will give good uniformity of distribution.

### 2. Selection and Design of Lateral

Lateral carries water from sub –main and feeds
to drippers. Generally one lateral for each row of orchard plant and one lateral for two rows of vegetables is used. The size and length of lateral is decided by using poly plots.

### 3. Selection and Design of Sub-main

PVC pipes of size 40 mm X 8 kg/cm2, 50 mm X 6kg/cm2, 63 mm X 4 kg/cm2 , 75 mmX 4 kg/cm2 can be used as a Sub main.

### 4. Design of Mainline

The size of mainline is decided by referring the PVC friction loss chart, All PVC pipes for irrigation are outer diameter controlled.

| Pipe mm | Size inch | Class | Flow lit/sec | Range lit/sec |
|---|---|---|---|---|
| 20 | 1/2 | 4 | 0.07 | 0.13 |
| 25 | 3/4 | 4 | 0.13 | 0.25 |
| 32 | 1 | 4 | 0.25 | 0.50 |
| 40 | 1 and 1/4 | 3 | 0.50 | 1.0 |
| 50 | 1.5 | 3 | 1.0 | 1.8 |
| 63 | 2 | 2 | 1.8 | 3.0 |
| 75 | 2.5 | 2 | 3.0 | 5.0 |
| 90 | 3 | 2 | 5.0 | 8.0 |
| 110 | 4 | 2 | 8.0 | 15.0 |
| 140 | 5 | 2 | 15.0 | 20.0 |
| 160 | 6 | 2 | 20.0 | 30.0 |
| 180 | 7 | 2 | 30.0 | 40.0 |
| 200 | 8 | 2 | 40.0 | 50.0 |

Pressure rating of pipe is determined by PVC material used and dimension ratio. They are generally available in class 1 to 4 corresponding to 2.5, 4.6 and 10 kg /cm2.

### METHOD USED

- **Drip irrigation-**Less wasteful than sprinklers. It is not only more efficient for fertilizer usage, but can also be for maximizing nutrient uptake in plants like cotton. Drip irrigation using fustigation can also increase yield and quality of fruit and flowers, especially in subsurface drip systems rather than above surface drip tape.
- **Sprinkler systems-**Increases leaf and fruit quality.
- **Continuous application-**Fertilizer is supplied at a constant rate.
- **Three-stage application-**Irrigation starts without fertilizers. Fertilizers are applied later in the process.
- **Proportional application-**Injection rate is proportional to water discharge rate.
- **Quantitative application-**Nutrient solution is applied in a calculated amount to each irrigation block.

### ADVANTAGES

- Increased nutrient absorption by plants.
- Accurate placement of nutrient, where the water goes the nutrient goes as well.
- Reduction of fertilizer, chemicals, and water needed.
- Reduced leaching of chemicals into the water supply.
- Reduced water consumption due to the plant's increased root mass's ability to trap and hold water.
- Application of nutrients can be controlled at the precise time and rate necessary.
- As water and fertilizer are supplied evenly to all the crops through fertigation there is possibility for getting 25-50 per

cent higher yield.
- Fertilizer use efficiency through fertigation ranges between 80-90 per cent, which helps to save a minimum of 25 per cent of nutrients.

Fertilizer efficiencies of various application methods

| Nutrient | Fertilizer use efficiency (%) | |
|---|---|---|
| | Soil application | Fertigation |
| Nitrogen | 30-50 | 95 |
| Phosphorous | 20 | 45 |
| Potassium | 50 | 80 |

## CONCLUSIONS

Agriculture must meet future food security challenges by increasing production while conserving important natural resources. Fresh water is an increasingly limited resource that is often mismanaged. Efforts to improve water use management and efficiencies for crop growth need to be a high priority for farmers. In India, 70% of the population works in the agriculture sector. Although water is one of the most abundant natural resources in the region, Indian farmers face water scarcity and water-related hazards as they experience unpredictable rainfall patterns, long dry seasons, and increased frequency of extreme floods. Our efforts in the present research program tested new tools and systems to increase water security and efficiency that could be readily adapted by small holder farmers. The primary finding of the research is that drip irrigation yielded similar dry forage biomass as compared to the traditional furrow irrigation method, while drastically reducing water use. Interestingly, intercropping did not yield more compared to single cropping, although intercropping can have other important agronomic values.

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