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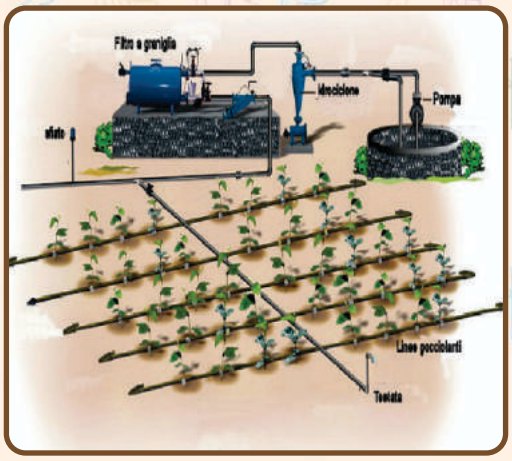
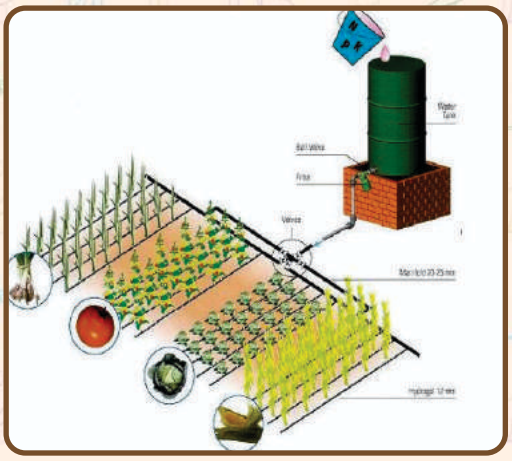
Facilitator Guide



Sector
ARGICULTURE AND ALLIED

Sub-Sector
Agriculture Crop Production

Occupation
Precision Farming

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Mirco Irrigation Technician

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Disclaimer

> Skilling is building a better India. If we have to move India towards development then Skill Development should be our mission.

Shri Narendra Modi
Prime Minister of India

About this Guide

Dear Trainer,

This Trainers Manual is intended to empower preparing for the Micro Irrgation Tenchcian Qualification Pack (QP). Every National Occupational (NOS) is spread over Unit/s. Key Learning Objectives for the NOS check the start of the Unit/s for that NOS. The images utilized as a part of this book are portrayed beneath. Micro Irrgation Tenchcian is in charge of Installation, Testing, Commissioning of Micro Irrgation Tenchcian at agriculturist's field for better water administration and increment in yield of product. The National Occupational Standards indicate the measures of execution an individual must accomplish when doing a capacity in the work environment, together with the information and comprehension they have to meet that standard reliably. These word related guidelines are appropriate both in the Indian and worldwide settings. According to these measures the Micro Irrgation Tenchcian rought not work freely, ought to be relentless and must be able to settle on operational choices relating to his range of work. The student ought to pick up clarity of work and ought to be result situated; The Trainee ought to likewise have the capacity to exhibit abilities to utilize different devices in the Micro Irrgation Tenchcian. The mentor should guide and prepare the students' in the accompanying abilities:

- **Knowledge and Understanding**: Satisfactory operational learning and comprehension to play out the required chore
- **Performance Criteria**: Pick up the required aptitudes through hands on preparing and play out the required operations inside the predetermined measures
- **Professional Skills**: Capacity to settle on operational choices relating to the zone of work

The course incorporates Trainer Guide including student handbook for the learners and coach's aide; appraisal guide; session arrangement; and syllabus for you. The course material likewise incorporates a couple of blurbs as showing helps in the classroom. The appraisal guide subtle elements the assessment system. As a mentor you will assess the learners' execution and grade them in light of the assessment parameters given in the aide. The system additionally incorporates field visit for the students where they will watch the method/operations and administrations of the Micro Irrgation Tenchcian. Chapter sare prepared to build up the expert abilities like – choices making, systematic and basic considering. We hope you will be able to impart your knowledge with our help to make this program a success and up-skill the workers to the recommended standards.

We trust you will have the capacity to confer your insight with our help to make this program a win and up-skill the workers to the suggested norms.

All the best!

Acknowledgements

We are thankful to all organizations and individuals who have helped us in preparation of this Participant manual. We also wish to extend our gratitude to all those who reviewed the content and provided valuable inputs for improving quality, coherence and content presentation of chapters. This handbook will lead to successful roll out the skill development initiatives, helping greatly our stakeholders particularly trainees, trainers and assessors etc. We are thankful to our Subject Matter Expert **Dr. Roughangiz Hayati Dahiya** who has given the content and helped us in preparation of Participant Handbook.

It is expected that this publication would meet the complete requirements of QP/NOS based training delivery, we welcome the suggestions from users, Industry experts and other stakeholders for any improvement in future.

Role of the Trainer

As a trainer, keep in mind the following guidelines:
Know your job thoroughly

The Trainer ought to first know his/her learners (the students) keeping in mind the end goal to guarantee their productive contribution in the learning procedure. Fundamentally the majority of these contemplations are guided by the reasoning of participatory preparing, which advocates that preparation, not at all like instructing, is more worried with the general improvement of the human identity.

- As a Trainer, remember the accompanying rules:
- Training is not learning
- The trainer needs to learn for himself/herself, through his/her own particular activity and movement
- The trainer can just guide the understudy movement in a way that prompts a decent learning background
- The trainer can create reasonable situations fancied to deliver a powerful learning (curricular, co-curricular and additional curricular) experience
- Trainees' response with the earth is relied upon to achieve an adjustment in conduct
- The trainer is the key component, as on him/her depends the arranging of the learning circumstance for accomplishing the sought result

Practice these common courtesies

- Greet the students
- Be warm and neighborly
- Introduce yourself
- Ask their names
- Explain the reason and objectives of preparing project
- Ask their desires
- Always make inquiries
- Listen to then quietly and answer their inquiries
- In case you can't react to an inquiry say that you will hit them up
- Respect the students
- Do not hang over them, their work, or get in their work-space
- Do not take their work or move it without requesting their consent
- Be a decent onlooker
- Offer rededication for weaker students Correct the flawed practices of learners at work before they transform into propensities
- Do not condemn
- Show gratefulness where it is expected
- Always say 'please', 'thank you', and "too bad"
- Be a tutor

Responsibilities

- The trainer has a unique position and assumes a few parts. He/she is a go between the student and administration.
- The trainer has moral and lawful duties and guarantees the expert advancement as well as the prosperity of the young. You need to counteract:
- Discrimination as a result of sexual orientation, race or nationality or some other kind
- Bullying and/or lewd behavior
- Abuse of liquor, prescription or whatever other substance
- Physical threats through mischance, air contamination, commotion or risky chemicals
- Overstepping the student's physical limit
- You likewise need to secure that time directions or other lawful controls are not infringing– neither by you nor by the disciple.

Symbols Used


Steps


Time


Tips


Notes


Objectives


Do

Ask


Explain


Elaborate


Field Visit


Practical


Lab


Demonstrate


Exercise


Team Activity


Facilitation Notes


Learning Outcomes


Say


Resources


Activity


Summary


Role Play

Example

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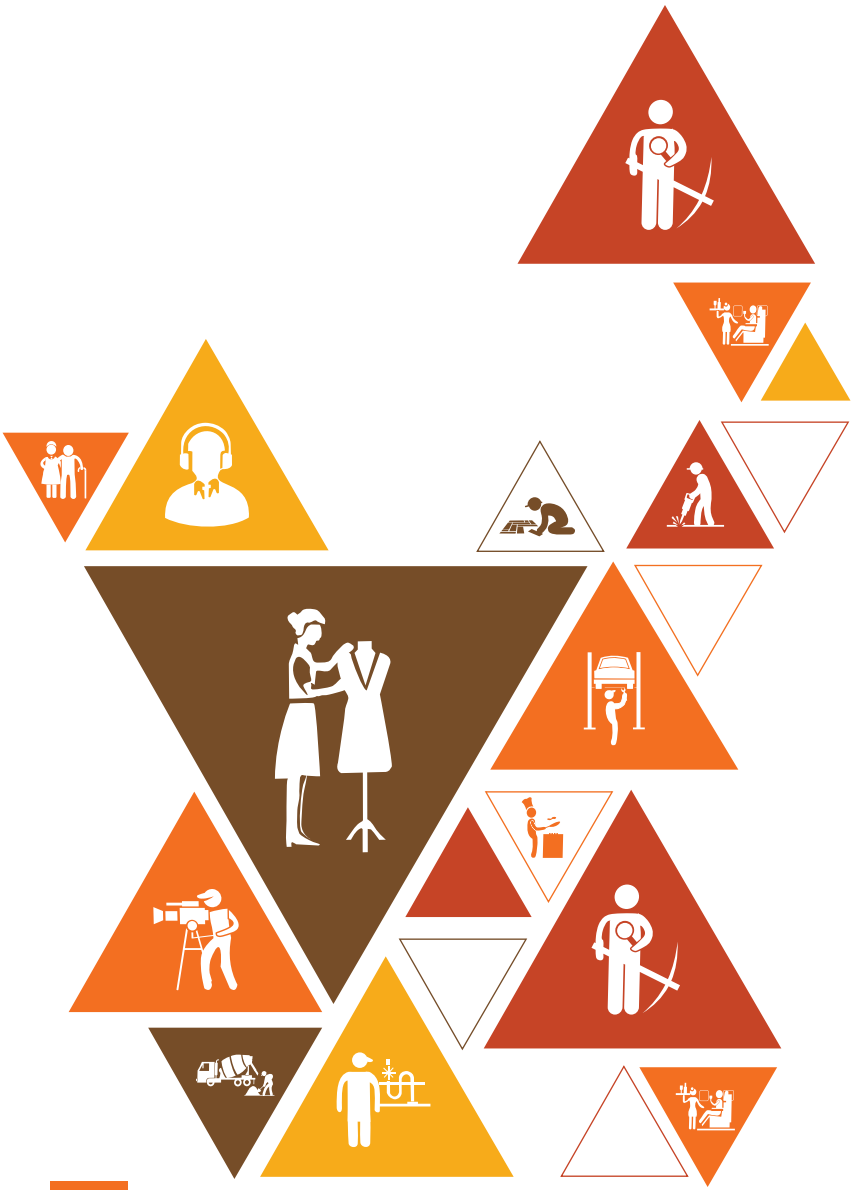

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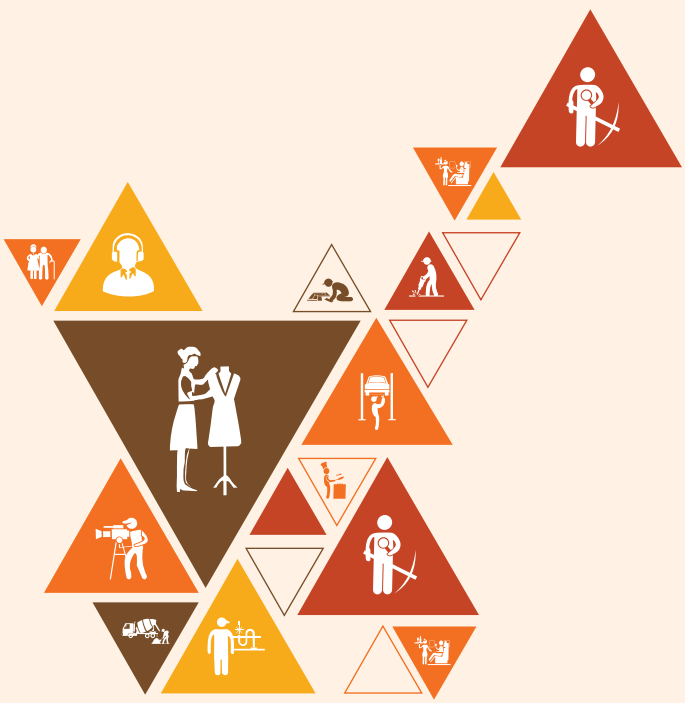
1. Introduction

Unit 1.1 – Designing of Micro Irrigation Systems

Unit 1.2 – Layout of designed Irrigation System



Key Learning Outcomes

At the end of the session the participants will be able to:

- Identify the characteristics of the soil, climatic conditions, land gradient, crop etc. essential for designing the system
- Follow Micro Irrigation Principles in the design of the Micro Irrigation System in the field
- Layout Irrigation System as per the legend used in drawing
- Handle the site deviation if required
- Take note of basics of crop cultivation such as spacing, water requirement, spacing of the crop stand, nature of rooting etc.

UNIT 1.1: Designing & Layout of Micro Irrigation Systems

Unit Objectives

After completing this session the participants will be able to:

- Designing of Micro Irrigation Systems
- Layout of designed Irrigation System

1.1.1 Designing of Micro Irrigation Systems

Ask

- How many of you know about Irrigation?

Do

- Wait for the responses and ask the next question.

Say

- Wait for the responses and ask the next question.

Do

- Do you know about the Micro Irrigation Systems and its designing?

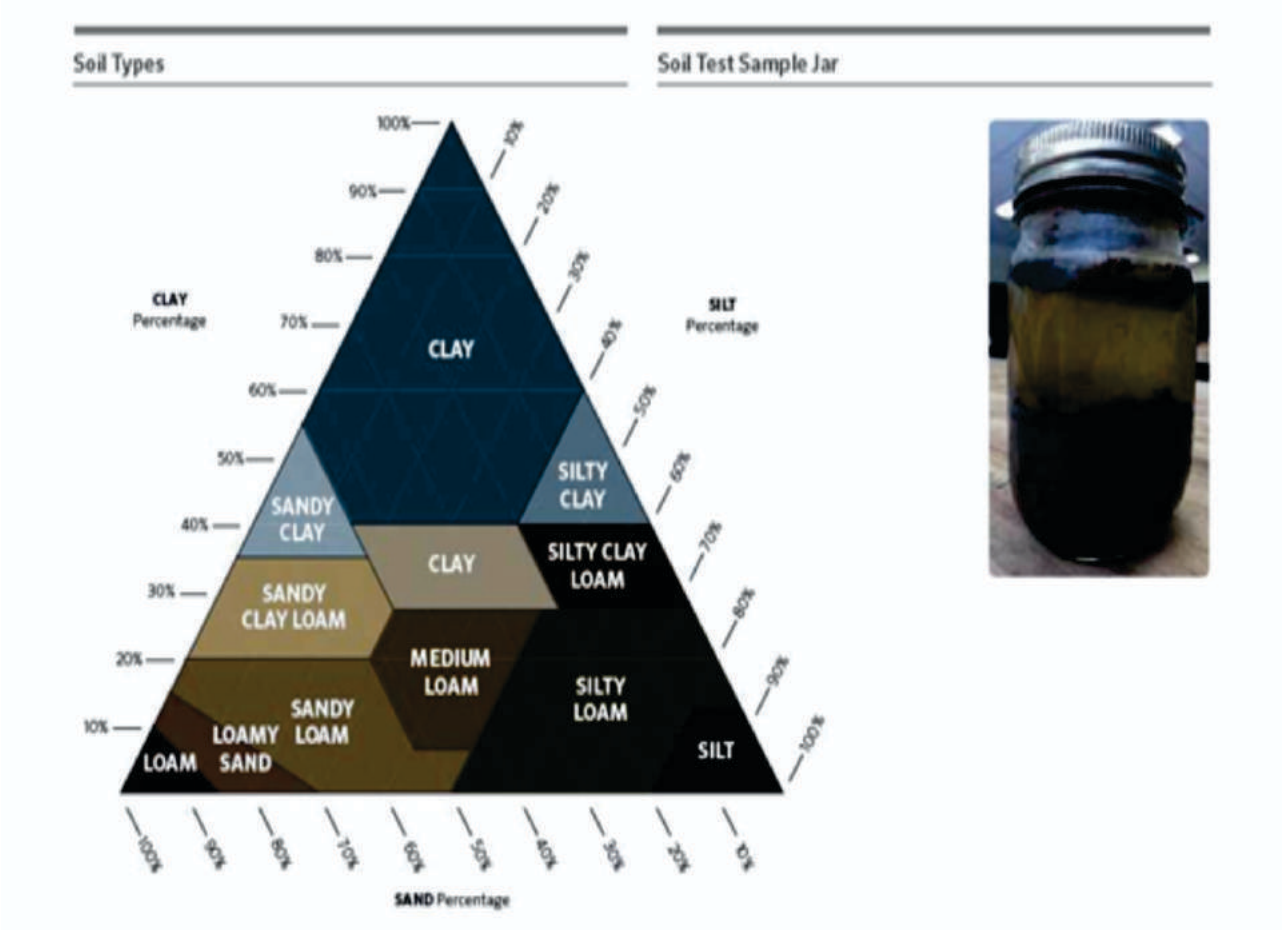
Say

Water is the most vital input in agriculture and has made a significant contribution in providing stability to food grain production and self-sufficiency. Water is supplied to agricultural land through rainfall and artificial application of irrigation water.

Irrigation is continuous and a reliable water supply to the different crops in accordance with their needs". In other way irrigation is an artificial application of water to soil by supplying sufficient soil moisture to the crop for proper growth, as the timing of rainfall is not adequate to meet the water requirement of crops. Efficient irrigation results in increased crop yields, with soil fertility maintained and water utilized economically. Whatever is the method of water application; it is essential that the system is designed to apply the right amount of water at the right time and apply it uniformly to raise the level of soil moisture in the crop root zone to its field capacity. Soil texture affects water movement. Emitter flow rate, spacing, and line spacing must be adjusted to compensate. The table below provides general guidelines. When unsure about the exact classification, use the tighter spacing. Even if the application rate exceeds a soil's expected intake rate, proper application of water can be achieved through scheduling.

Recommended Spacing For Basic Soil Types

Soil types	Clay	Loam	Sand
Emitter Flow rate	0.4 GPH	0.6 GPH	1.0 GPH
Emitter spacing	24''	18''	12''
Row Spacing	18'' - 24''	16'' - 22''	12'' - 18''



- **Micro Irrigation comprises of the following:**

	1.	Farm survey
	2.	Soil & water analysis
	3.	Design of system - customized to farmer needs
	4.	Installation & commissioning of system
	5.	Training to the farmer/user

Micro Irrigation Methods

As of the methods are concerned - Micro Irrigation Methods are the pressurized Irrigation Systems consisting of Drip & Sprinkler Irrigation. In Micro Irrigation water from water source is lifted by a pumping unit & conveyed directly to field by closed conduit piping network without any conveyance losses. With water becoming a scarce resource, Drip Irrigation is the answer to modern agricultural needs. Micro Irrigation offers a wide range of reliable & cost effective drippers & drippers line products. Micro Drip Irrigation Systems are uniquely engineered to deliver a measured quantity of water directly at the root zone of each plant at regular intervals. This is to ensure that the plants do not experience stress for water & nutrients.

Differences in recommended spacing and flow rates are due to the physical properties of soil as related to water movement. In descending order of particle size, soil is broadly classified into sand, loam, and clay. Particle size affects capillarity. As particle sizes decrease, capillary forces increase. Greater capillary force allows more water movement through the soil in all directions. Lesser capillary force limits the amount of water movement. As more water is added, gravity begins to draw water downward. The downward movement of water due to gravity is greater for soils with larger particle size.

Irrigation Water Quality Criteria

Understanding irrigation water quality is critical for sustain ability of vegetable production. In some areas of Florida, water quality impacts crop productivity more than soil fertility, pest and weed control, variety, and other factors. Irrigation water quality is determined by the following: (1) salinity hazard: total soluble salt content; (2) sodium hazard: ratio of sodium (Na+) to calcium (Ca2+) and magnesium (Mg2+) ions; (3) water pH; (4) alkalinity: carbonate and bicarbonate; specific ions: chloride (Cl-), sulfate (SO42-), boron (BO3-), and nitrate-nitrogen (NO3-N); (5) organic contaminates: oil pollutants; and (6) other factors such as heavy metals.

There are two main issues related to salinity: short term, i.e., effect of water electrical conductivity on a particular crop and long term, namely, soil sanitization. There is abundant biodiversity in crop tolerance to salinity stresses. Generally speaking, vegetable crops are more susceptible than cereal crops.

Usage of Irrigation Water

Irrigation systems have several uses in addition to water delivery for crop ET. Water is required for a preseason operational test of the irrigation system to check for leaks and to ensure proper performance of the pump and power plant. Irrigation water is also required for field preparation, crop establishment, crop growth and development, within-season system maintenance, delivery of chemicals, frost protection, and other uses such as dust control.

Field Preparation

During Field preparation water is used to provide moisture to the field soil for tillage and bed formation. The water used for field preparation depends on specific field cultural practices, initial soil moisture conditions, the depth to the natural water table, and the type of irrigation system. Drip-irrigated fields on sandy soils often require an additional irrigation system for field preparation because drip tubes are not installed until the beds are formed. Many drip irrigated vegetable fields may also require an overhead or sub irrigation system for field preparation. However, sprinkler irrigation systems can meet different water requirements.

Advantages of Micro Irrigation Systems

Micro irrigation can be one of the most efficient methods of irrigation. Little if any runoff and little evaporation occur, and deep percolation can be controlled with good water management. Water is applied at the point of use (plant transpiration). Other advantages of micro irrigation systems are:

- Systems are easily automated with soil moisture sensors and computer controlled for low labor
- requirements
-
- Soil moisture levels can be maintained at predetermined levels for start-stop operation.
- Fertilizer can be efficiently added to irrigation water. With proper water management, there is minimum waste caused by deep percolation, and less opportunity for ground water pollution.
- Much of the soil surface remains dry, reducing weed growth and soil surface evaporation.
- The soil surface remains firm for use by farm workers and equipment.
- Frequent irrigations can be used to keep salts in the soil water more diluted and moved away from plant roots. Irrigation with water of higher salinity is possible (requires a high level of management). Where salts are present, soil-water movement must always be toward the edges of the wetted bulb (away from roots). A common mistake is to shut the system down when precipitation occurs, often creating soil-water movement into the plant root zone.
- Micro irrigation can be used on all terrain and most agricultural crops and soils and is often used on steep, rocky ground that is unsuitable for other forms of irrigation.
- Low tension water availability to plants enhances growth and improves crop yield and quality.

Limitations of Micro Irrigation Systems

Micro irrigation is considered expensive to install and maintain. In general, the cost of micro systems is greater than that for sprinkle or surface systems. Frequent maintenance is essential, and a high level of management is required to obtain optimum application efficiencies. Other limitations include:

- Clogging is a major problem in all micro systems. Emitter outlets are very small, and can be easily clogged with chemical precipitates, soil particles, or organic materials. Clogging can reduce or stop water emission. Chemical treatment of the water is often necessary, and filters are almost always required. Filtration and treatment can be costly, especially where water is taken from surface sources containing sediment and debris. During installation, care should be taken to clean all construction debris from the inside of pipelines as this material can cause plugging.

- Animals, especially rodents, can damage surface (and shallow subsurface) installed plastic pipe less than 4 inches in diameter.

- With low operating pressures, poor distribution uniformity can result because of elevation differences on undulating ground. Pressure regulators or pressure compensated emitters are then necessary. However, they require about 2 pounds per square inch for operation.
-
- On steep terrain, automatic gravity draining of laterals to a low point within the field can cause low distribution uniformity, especially in low pressure, high volume systems. This problem is aggravated by frequent on-off cycles, but can be overcome by installing air-vacuum valves in a raised pipe arch (i.e., dog leg) at one or more locations in the lateral. Drains are installed just upstream of each pipe arch. This increases the number of sites affected by lateral pipe drainage, thus decreasing effects on distribution uniformity because each drain discharges less water.

Ask

- Do you know about the Designing of Micro Irrigation Systems?

Notes for Facilitation

- Arrange the Handout(s) of the above mentioned information.

Notes

UNIT 1.2: Layout of Designed Irrigation System

Unit Objectives

After completing this session the participants will be able to:

- Know how on the Layout of designed Micro Irrigation Systems Layout Irrigation System as per the legend used in drawing.
- Handle the site deviation if required.
- Take note of basics of crop cultivation such as spacing, water requirement, spacing of the crop stand, nature of rooting etc.,

1.2.1 Layout of designed Irrigation System

Ask

- How many of you know about Layout/design of Irrigation Systems?

Do

- Wait for the responses and ask the next question.

Say

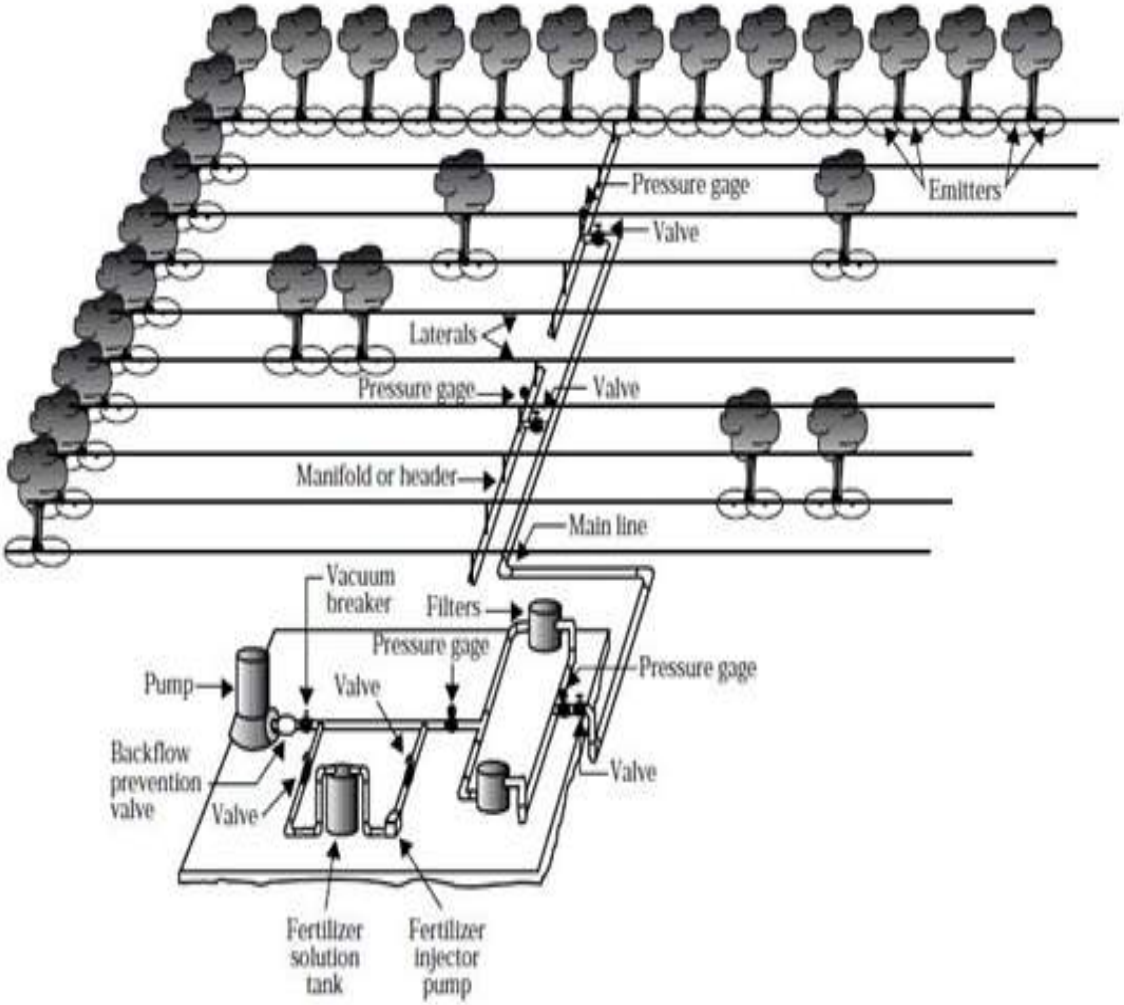
- Wait for the responses and ask the next question.

Do

- Do you know about the Layout of designed Irrigation System?

Say

Layout Design of Micro System



Crop Cultivation

Vegetables that are set as transplants, rather than direct seeded require irrigation for crop establishment in excess of crop ET. Establishment irrigations are used to either keep plant foliage wet by overhead sprinkler irrigation (to avoid desiccation of leaves) or to maintain high soil moisture levels until the root systems increase in size and plants start to actively grow and develop. Establishment irrigation practices vary among crops and irrigation systems. Strawberry plants set as bare-root transplants may require 10 to 14 days of frequent intermittent overhead irrigation for establishment prior to irrigation with the drip system. The amount of water required for crop establishment can range widely depending on crop, irrigation system, and climate demand.

Irrigation requirements necessary to meet the ET needs of a crop depend on the type of crop and growth stage, field soil characteristics, irrigation system type and capacity. Different crops vary in growth characteristics that result in different relative water use rates.

System components

System components should include the following, in order of installation starting at the water source point

1. Prescreening of debris and settling of coarse sediments if source is surface water. Need control valves and flow measuring device.

2. Provide system operating pressure of 5 to 20 pounds per square inch using pump(s) or gravity flow. Need pressure gage and control valves.

3. Chemical injector device(s) for injecting fertilizers and other pipeline cleaning chemicals.

4. Filtering system to remove fine organic, suspended sediment and chemical precipitates. Need pressure gage upstream and downstream of filter device.

5. Filter system back flush device. Need control valves.

6. Mainlines typically are buried PVC plastic pipe with control valves as necessary.

7. Sub mains typically are buried PVC plastic pipe with control valves, pressure regulators, and drains as necessary.

8. Laterals or feeder lines are either surface or buried PE or PVC plastic flexible tubing.

9. Emitter devices.

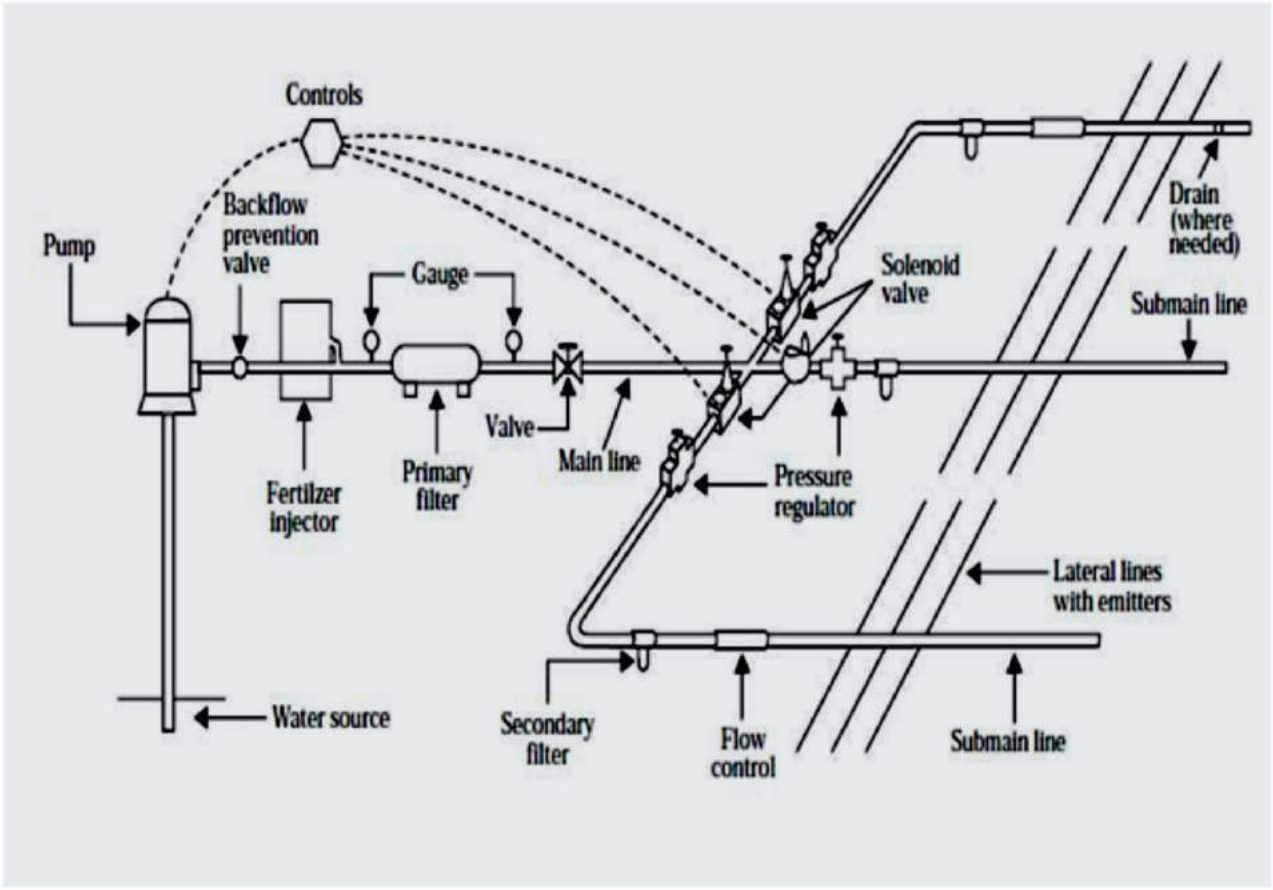
10. Appropriately placed soil moisture sensing devices. Start of irrigation can be manual, computer programmed, or with a time clock. Lateral on-off sequencing can be automated with solenoid operated valves.

A controller and electric valving can help assure proper irrigation timing to meet soil depletion and plant needs.

Planning and design considerations

(1) Water quality

Water quality is usually the most important consideration when determining whether a micro irrigation system is physically feasible. Well and surface water often contain high concentrations of undesirable minerals (chemicals). Surface water can contain organic debris, algae, moss, bacteria, small creatures, weed seeds, and soil particles. Well water can also contain sand. Various forms of algae are in almost all quiet surface water. Sunlight and water high in nutrients encourage algae growth. Algae are hard to remove from laterals and emitters once it gets established. The best way to handle algae is to prevent it from forming. Chlorine can be injected at the end of each irrigation cycle to help prevent algae buildup. Algae growth is especially a problem where sunlight aids algae growth inside white plastic pipe that is installed above the ground surface. Black pipe (PE pipe) is not affected because sunlight does not penetrate the pipe. White plastic pipe can be painted with a dark color to help prevent sunlight penetrating the pipe and provide some UV protection. Bacterial slime can plug emitters and small tubing. Conditions favoring slime growth include pH of 4.5 to 6, low oxygen level, temperatures greater than 46 degrees Fahrenheit, organic matter, dissolved iron and manganese, and hydrogen sulfide. Treatment is by injection of chlorine, sodium hypochlorite (household bleach), or calcium hypochlorite (swimming pool chloride). Continuous injection of chlorine at 1 ppm is effective. Periodic shock treatment with concentrations of 10 ppm can also be used.



Ask

- Do you know about the Layout of designed Irrigation System?

Notes for Facilitation

- Arrange the Handout(s) of the above mentioned information.

Notes

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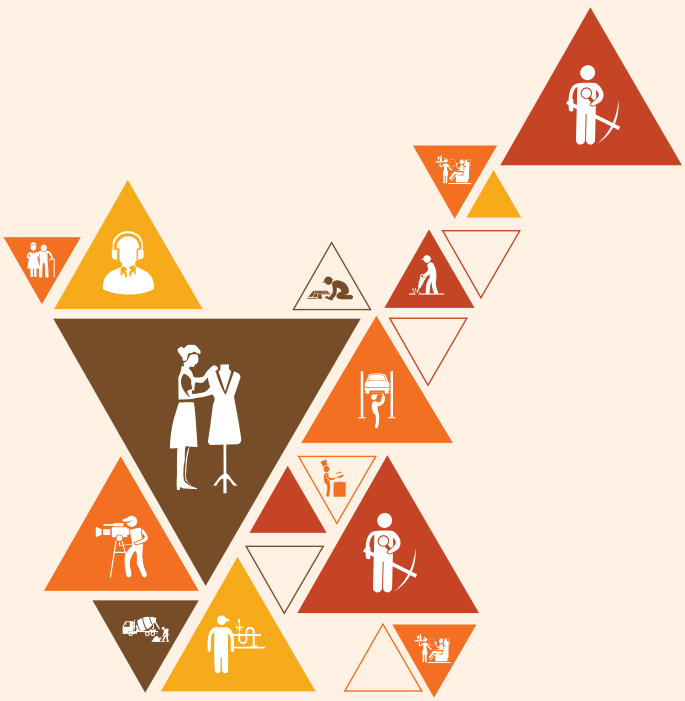
2. Installation of Micro Irrigation Systems

Unit 2.1 – Components of Micro Irrigation System

Unit 2.2 – Installation Techniques

Unit 2.3 – Training of Farmers



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Key Learning Outcomes

At the end of the session the participants will be able to:

- Identify various components of MIS
- Identify f various parts of the MI units for timely fitting and installation
- Use right components at the right place for better installation
- Do quick and error free installation of the MIS
- Test and Commission the MIS after installation
- Train farmers on using the system
- Explain farmers on how to retrieve the system after harvest and again laying the pipelines

UNIT 2.1: Installation of Micro Irrigation Systems

Unit Objectives

At After completing this session the participants will be able to:

- Components of Micro Irrigation System
- Installation Techniques
- Training of Farmers

Ask

- How many of you know about Micro Irrigation System?

Do

- Wait for the responses and ask the next question.

Say

- Wait for the responses and ask the next question.

Do

- Do you know about the Components of Micro Irrigation System?

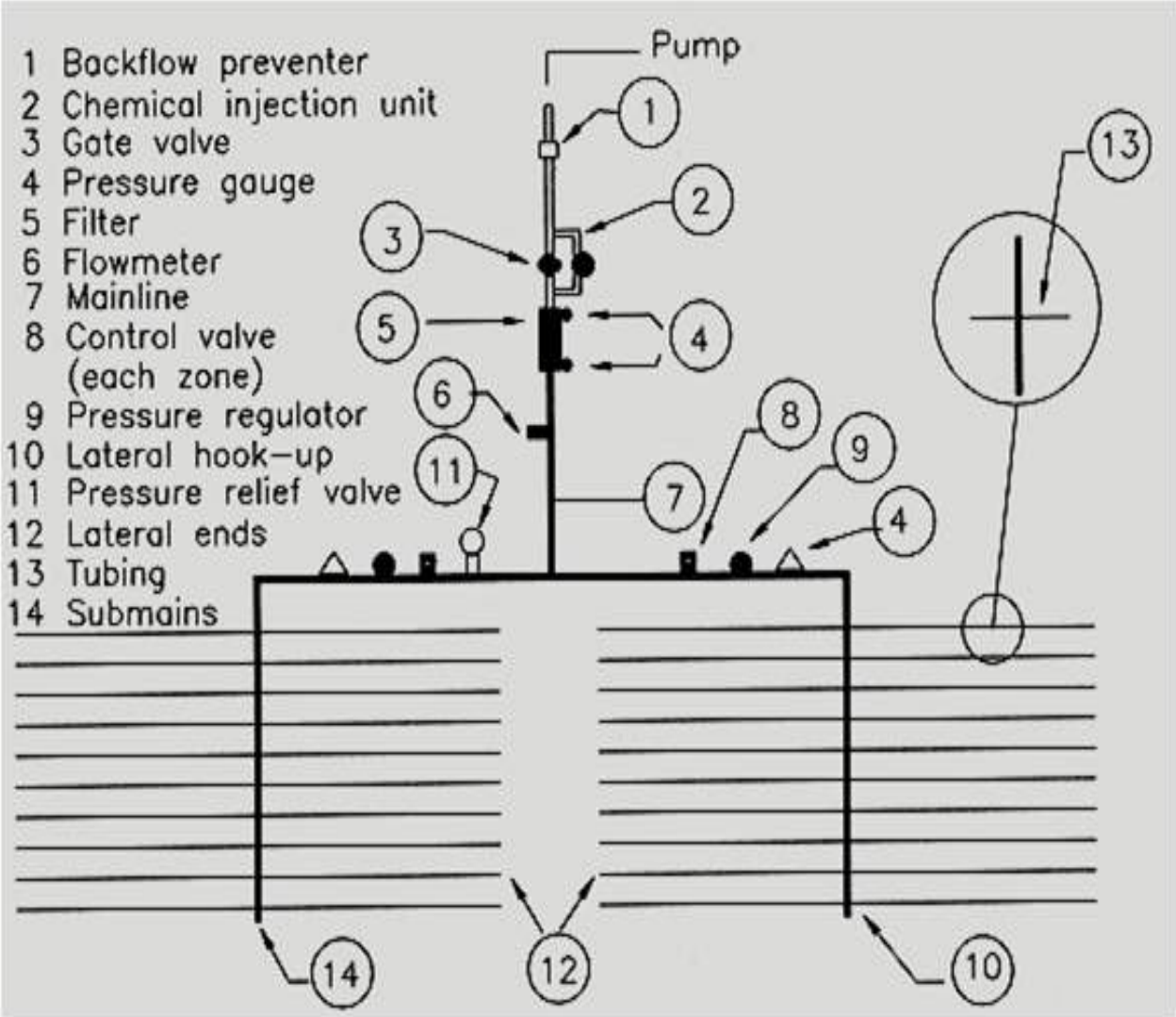
Say

Various components of MIS

Micro-irrigation includes a wide variety of low-volume, small-diameter water application devices. These include the row crop and individual emitters used in trickle or drip irrigation. It also includes the micro spray heads and micro-sprinklers that broadcast water several feet. Collectively, these devices are called micro-irrigation devices because they deliver water primarily to individual plants or small areas. The Trickle System Layout diagram illustrates a typical trickle irrigation system layout. The laterals (final distribution lines) might be in a container production area, in a field of lined out shade trees, in a field of raised beds, or in a greenhouse propagation bed.

Trickle System Layout

Typical trickle system layout showing the many components that makes up the system.



The main components of a trickle irrigation system are identified in the figure (numbers in parentheses match numbers in the figure). A pump usually provides the pressure and flow rate.

Pressure gauges (4) are the main devices showing the system is working properly. A clogged filter or a major break in the system results in pressure drops. A flow meter (6) shows the flow past its location in the system, but an accumulating flow meter is more useful. An accumulating flow meter helps the operator keep records of the amount of water used. In some areas, water permits require record-keeping. All trickle irrigation systems need a filter (5) to remove any small particles that would clog the small emitters. The water then flows to the main lines (7) and sub mains or headers (14) where the trickle laterals (tubing) (13) provide the final distribution of the water. Different types of lateral connection devices (10) and lateral closure devices (12) are available. At each zone or section of the irrigation system, a control valve (8) turns the water on or off. Often, in a small system this valve is a manual gate valve. Later, an electric solenoid valve frequently replaces the manual valve. An electric time clock (controller) controls the electric solenoid valve. A trickle irrigation system operates at a low pressure of 10 to 15 psi so a pressure regulator (9) reduces the pressure at each zone. Pressure regulation is a more important design consideration where there are elevation changes in the system. When fertilizers or other chemicals are added to the irrigation system, there will be a chemical injection unit (2) in the system. It will have a check valve or other backflow prevention device (1) installed between it and the water source.

Finally, a good system also includes pressure relief valves (11) and air vents at appropriate locations. The pressure relief valve opens to discharge water to prevent excessive pressures in the system. The air vents allow air to escape at high points where it would accumulate. They are also placed at the ends of mains to release air as the pipes fill with water. The air vent also allows air to enter the pipeline as water drains out when the system is turned off. They prevent vacuums that might cause a back flow. These components are not found on all systems, but note where they are placed and what their functions are. A well-designed irrigation system with pressure gauges in the right places gives a grower peace of mind. A quick check of the pressure gauge indicates if everything is working properly.

Various Sections of MI

For nursery and greenhouse production the emitter systems used are row crop tubing (row crop tape), individual emitters, and spray jets and stakes.

Row crop Tubing

Row crop tubing has emitters either designed into the tubing itself or welded into the tubing at regular intervals. The tubing with emitters designed into it looks like a tape because it collapses flat. The tubing with emitters welded into it is a heavier wall material with a rounder shape due to the emitter. Wall thickness of the first material runs from 4 mils (0.004 in.) to 25 mils (0.025 in.). Emitter spacing can be 2, 6, 9, 18, 24, or 36 in. The tubing wets a continuous strip of ground with an even discharge along its length. On level ground, the row crop tubing can be run several hundred feet. Only a few row crop tubing have a pressure-compensating design for use on uneven terrain or on hillsides. Usually, these are the ones with individual emitters welded inside the tubing. The row crop tubing can be placed under shrub areas, ground covers, tree plantings and irregular turf areas. In loamy to heavy clay soils, the tubing should be laid out in laterals that are spaced 16 to 24 in. apart. In very sandy soils, the laterals should be 12 to 16 in. apart. The system is ideal for a high-use area because the water is applied underground with little evaporation or runoff. There are no risers to trip over or wet sidewalks to slip on. Maintenance costs are lower because there is less risk of vandalism.

Individual Emitters

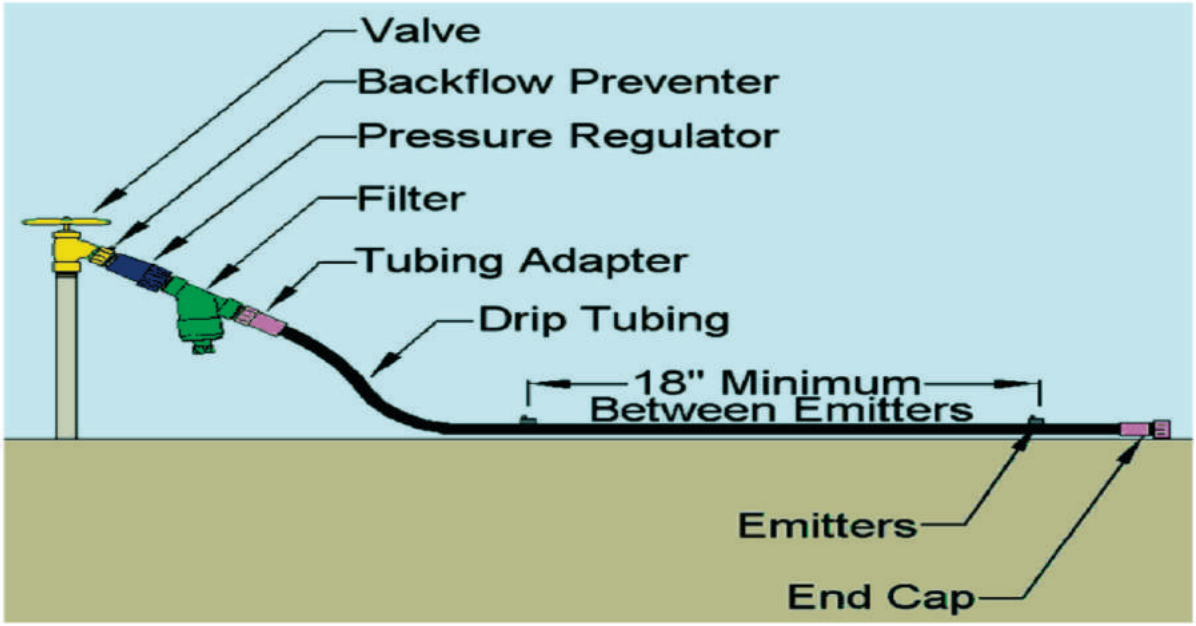
The individual emitter is another micro-irrigation device that is attached to 1/2 in. or 3/4 in. polyethylene pipe on a spacing determined by the shrub or tree spacing. The individual emitter is suggested for specimen trees introduced into the landscape, or for a series of shrubs or small trees that need watering separately from surrounding plants. There are usually one or more individual emitters per plant. Trees and shrubs have a different year-round water need than a bed of annuals and thus would have separate systems. For water conservation purposes, the system must be designed for the individual plants rather than broadcasting water over a large area to water one plant.

Spray Jets and Stakes

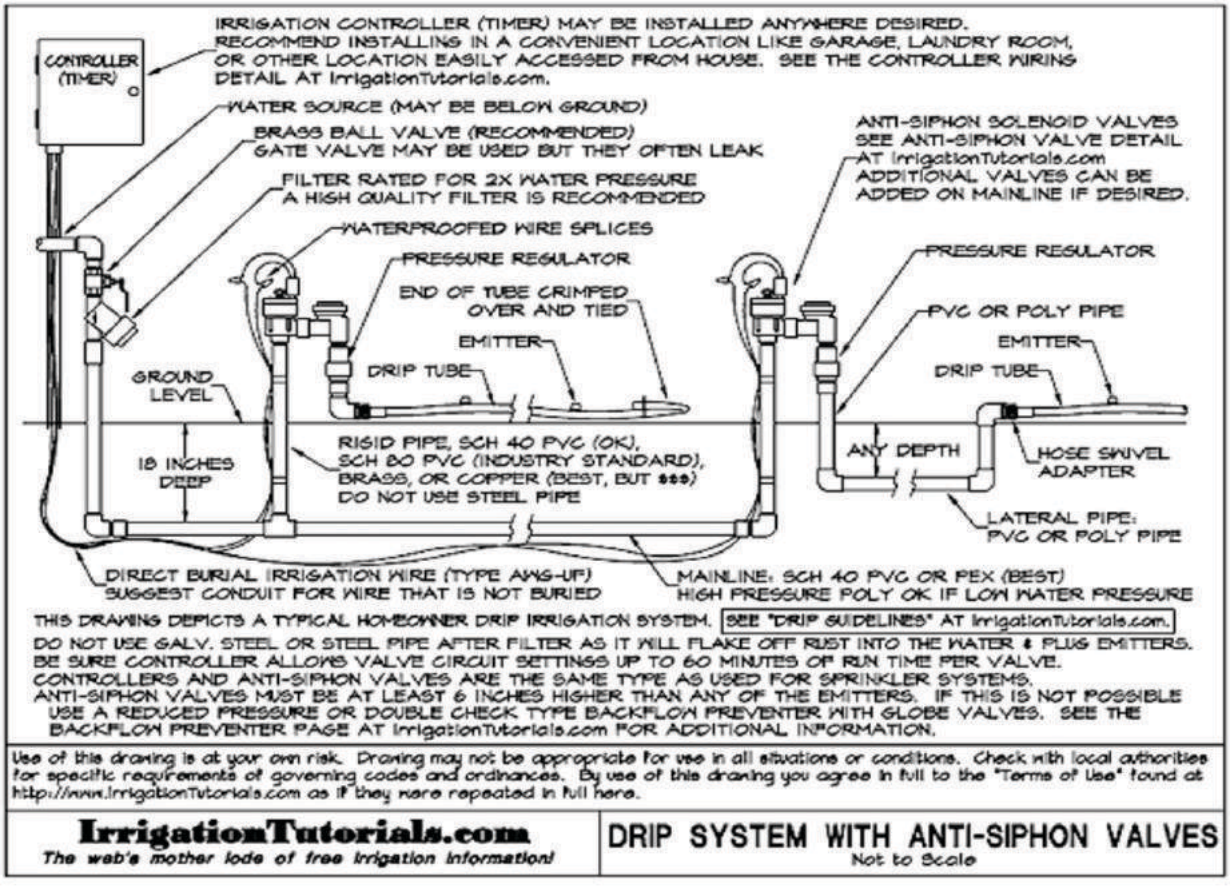
Spray jets include both micro-sprayers and micro sprinklers and work well than row crop tubing or individual emitters on certain soils. They are better on sandy soils with little water-holding capacity or on special problem soils that tend to seal over to slow water infiltration. In addition, spray jets are ideal for many landscape plants that are shallow-rooted and closely planted. Spray jets work well in large plantings of flowering annuals or under large trees - as long as the emitter is safe from vandalism.

These devices are available in a range of flow rates from 10 to 20 gph and have several distribution patterns. Spray diameters can be a few inches to several feet. Micro-sprayers emit water from an orifice onto a deflector plate. This gives a fan-type pattern that the wind or plant foliage can easily distort because the droplets are small. Micro-sprinklers have a rotating device that directs a stream or streams of water out to the plants. Wind does not distort this heavier stream so readily. Clogging can be a problem for the small emitters in row crop tubing, although the problem is not as great with the turbulent flow design now used. However, spray jets have larger emitters so debris passes through. Proper water treatment and filtration are a must; chlorine and acid treatments may be needed. A combination of irrigation systems may be needed for a landscape. Use sprinklers in the large open areas and micro-irrigation devices in heavily used or odd shaped areas near people, walkways, or parking lots.

Various parts of the MI units




(MLD-AAD) 1/2 GPH Add-A-Drippers w/ Coupler & Plug
(MLD-STA) Adjustable Dripper Stakes
(MLD-2PC2!, Pressure Compensating 2 GPH Drippers (Bulk Pack 15)
Backflow Prevention Conector
(MLT-ATE) Assorted 1/4" Vinyl Tubing Connectors
(MLD-QDT100) 1/4" In Line Drip Tubing
(MLT-BXB) 1/4" Vinyl Couplers
Irrigation Clock/ Timer
Emitter
End Or Flush Cap
Pressure Regulator
Irrigation Filter


IRRIGATION CONTROLLER (TIMER) MAY BE INSTALLED ANYWHERE DESIRED. RECOMMEND INSTALLING IN A CONVENIENT LOCATION LIKE GARAGE, LAUNDRY ROOM, OR OTHER LOCATION EASILY ACCESSED FROM HOUSE. SEE THE CONTROLLER WIRING DETAIL AT IrrigationTutorials.com.
CONTROLLER (TIMER)
WATER SOURCE (MAY BE BELOW GROUND)
BRASS BALL VALVE (RECOMMENDED) GATE VALVE MAY BE USED BUT THEY OFTEN LEAK
FILTER RATED FOR 2X WATER PRESSURE A HIGH QUALITY FILTER IS RECOMMENDED
WATERPROOFED WIRE SPLICES
PRESSURE REGULATOR
END OF TUBE CRIMPED OVER AND TIED
EMITTER
DRIP TUBE
GROUND LEVEL
18 INCHES DEEP
RIGID PIPE, SCH 40 PVC (OK), SCH 80 PVC (INDUSTRY STANDARD), BRASS, OR COPPER (BEST, BUT $$$) DO NOT USE STEEL PIPE
DIRECT BURIAL IRRIGATION WIRE (TYPE AWG-UF) SUGGEST CONDUIT FOR WIRE THAT IS NOT BURIED
ANTI-SIPHON SOLENOID VALVES SEE ANTI-SIPHON VALVE DETAIL AT IrrigationTutorials.com ADDITIONAL VALVES CAN BE ADDED ON MAINLINE IF DESIRED.
PRESSURE REGULATOR
PVC OR POLY PIPE
EMITTER
DRIP TUBE
ANY DEPTH
HOSE SWIVEL ADAPTER
LATERAL PIPE: PVC OR POLY PIPE
MAINLINE: SCH 40 PVC OR PEX (BEST) HIGH PRESSURE POLY OK IF LOW WATER PRESSURE
THIS DRAWING DEPICTS A TYPICAL HOMEOWNER DRIP IRRIGATION SYSTEM. SEE "DRIP GUIDELINES" AT IrrigationTutorials.com.
DO NOT USE GALV. STEEL OR STEEL PIPE AFTER FILTER AS IT WILL FLAKE OFF RUST INTO THE WATER & PLUG EMITTERS.
BE SURE CONTROLLER ALLOWS VALVE CIRCUIT SETTINGS UP TO 60 MINUTES OF RUN TIME PER VALVE.
CONTROLLERS AND ANTI-SIPHON VALVES ARE THE SAME TYPE AS USED FOR SPRINKLER SYSTEMS.
ANTI-SIPHON VALVES MUST BE AT LEAST 6 INCHES HIGHER THAN ANY OF THE EMITTERS. IF THIS IS NOT POSSIBLE USE A REDUCED PRESSURE OR DOUBLE CHECK TYPE BACKFLOW PREVENTER WITH GLOBE VALVES. SEE THE BACKFLOW PREVENTER PAGE AT IrrigationTutorials.com FOR ADDITIONAL INFORMATION.
Use of this drawing is at your own risk. Drawing may not be appropriate for use in all situations or conditions. Check with local authorities for specific requirements of governing codes and ordinances. By use of this drawing you agree in full to the "Terms of Use" found at http://www.IrrigationTutorials.com as if they were repeated in full here.
IrrigationTutorials.com
The web's mother lode of free irrigation information!
DRIP SYSTEM WITH ANTI-SIPHON VALVES
Not to Scale

Ask

- Do you know about the Components of Micro Irrigation System?

Notes for Facilitation

- Arrange the Handout(s) of the above mentioned information.

Notes

UNIT 2.2: Installation Techniques

Unit Objectives

At After completing this session the participants will be able to:

- Use right components at the right place for better installation
- Do quick and error free installation of the MIS
- Test and Commission the MIS afer installation

Ask

- How many of you know about Micro Irrigation Installation?

Do

- Wait for the responses and ask the next question.

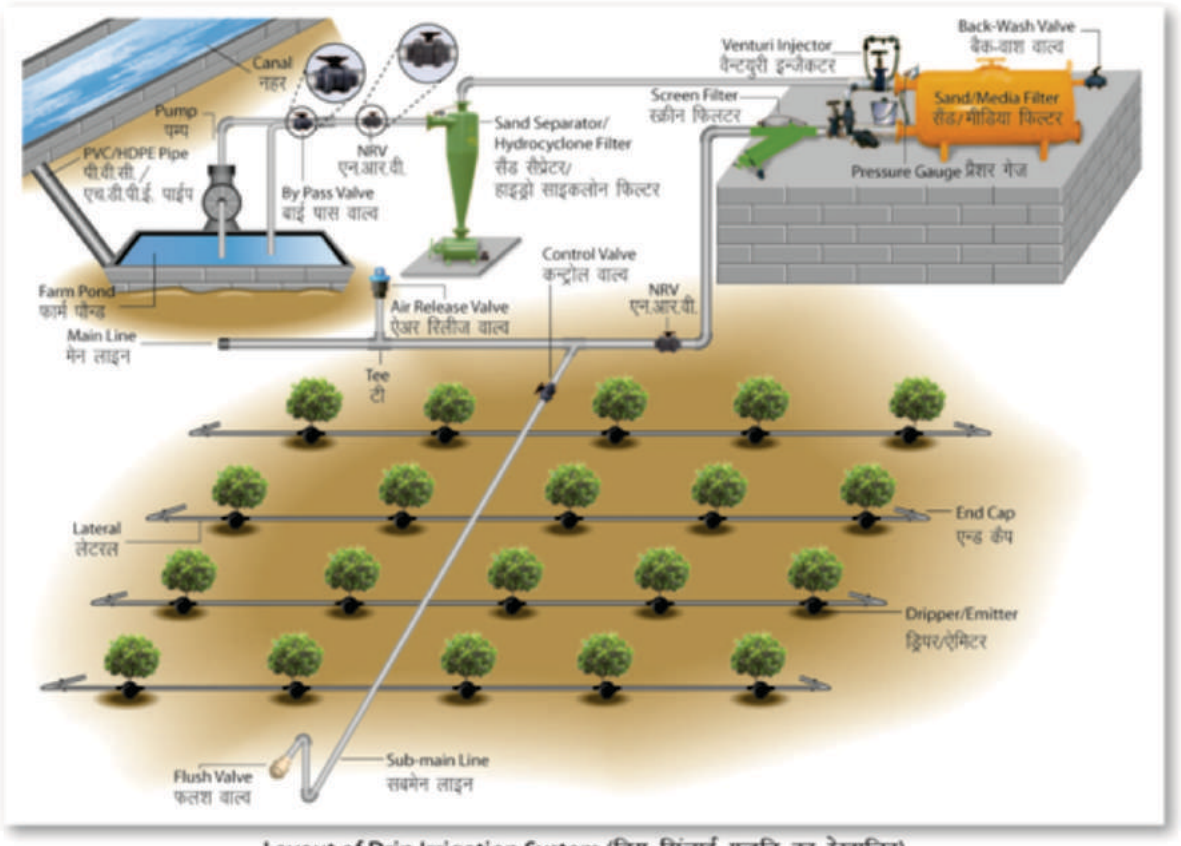
Say

- Wait for the responses and ask the next question.

Do

- Do you know about the Components of Installation Techniques?

Say



Layout of Drip Irrigation System (ड्रिप सिंचाई पद्धति का रेखाचित्र)

Planning

Divide your garden by water needs. Before you purchase your supplies, you'll need to know what exactly you need. Sketch a rough map of your garden, or the area you wish to drip irrigate. Divide the map into several regions based on one or more of the following:
Watering needs of each plant. Mark these heavy, medium, or light.

Levels of sun or shade. If most of your plants have similar watering needs, use sun exposure to divide your garden. Plants in full sun will need more water than plants in partial or full shade.

Soil types: Take this into account if your garden has major soil variation. See below for more information.

Design the irrigation layout

A typical drip tube can reach a maximum length of 200 ft (60 m), or 400 ft (120 m) if the water enters the line at its center. If you need more than one drip tube, you can connect them to a lateral line connected to the faucet. For large gardens, use a pressurized mainline instead of the lateral line. Sketch these onto your map.
Ideally, each drip tube should serve an area with similar watering needs. "Distribution tubing" is a smaller alternative to drip tubing. This can only reach a maximum length of 30 ft (9 m). Use only for potted or hanging plants to prevent clogging. Typically, the mainline runs along one length of the garden, or around the entire perimeter for large properties.

Water Delivery Method

Decide on a water delivery method for each area. There are several ways to deliver water from the drip tubing to the plant. Determine which to use for each area in your garden:
Drip emitters: The most common option, which can be punched into the drip tubing anywhere along its length. See below for information on types of emitters.
Pre-installed emitter lines: This drip tubing has evenly spaced emitters, suitable for crops, orchards, and vegetable rows.

Porous pipe: This cheap alternative to drip tubing drips along its entire length, with no way to maintain water pressure or control rate. This is easily clogged and may have a shorter maximum length.

Micro-sprinkler heads: Halfway between drip irrigation and sprinklers, these low-pressure sprinklers are less efficient but harder to clog. Consider these if your water is mineral-heavy.

Narrow down the type of drip emitter

If you decided to go with drip emitters, there are many types to choose from. Basic turbulent-flow emitters are a good default, but consider the following options in special circumstances:

Use pressure-compensating (PC) drip emitters for changes in elevation over 5 ft (1.5 m), but never in low-pressure systems. Look up product information online before buying, since the "PC" label is unregulated. Adjustable drip emitters have a dial for increasing or reducing flow rate, but have worse pressure compensation. These are recommended only for a line of plants with varying needs, or for a line that requires a small number of high-volume emitters. Turbulent-flow emitters are a good, cheap option for all other purposes. Vortex, diaphragm, and long-path emitters will all work fine, these variations are less important than the differences described above.

Plan the flow rate and spacing

Now's the time to figure out how many emitters you need. Each emitter has a certain flow rate, usually expressed in GPH (gallons per hour). Here are some general guidelines based on soil type:
Sandy soil: This soil falls apart into grains when rubbed between your fingers. Space 1 to 2 GPH (3.8 to 7.6 liters per hour) emitters about 11" (28 cm) apart.

Loamy soil: Quality soil, not too dense or loose. Space 0.5 to 1 GPH (1.9 to 3.8 LPH) emitters about 17" (43 cm) apart. Clay soil: Dense clay, slow to absorb water. Space 0.5 GPH (1.9 Lph) emitters about 20" (51 cm) apart. If using micro-sprinklers, space them 2–3 inches (5–7.5 cm) further apart than described above. For trees or other plants with higher water needs, install two closely spaced emitters. Don't mix and match emitters with different flow rates on the same drip line.

Purchase of equipment (s)

Besides the pipes and emitters, you'll need a plastic fitting for each connection, plus an end cap or flush valve for each drip tube. Read the instructions in the next section for additional equipment necessary to connect the system to a water source. Compare all sizes and threads before purchasing. You'll need adapters to connect pipes of different size, or to attach "hose thread" to "pipe thread." If using a lateral line, use standard PVC irrigating piping. Cover it with several layers of aluminum tape to protect from sunlight. If using a mainline, choose piping made from copper, galvanized steel, PEX, sturdy PVC, or heavy polyethylene. Bury or tape over PVC to protect it from sunlight. ¾" pipe and valves should be plenty for most homes. Most home irrigation systems use ½" (1.25 cm) drip tubing.

Install the mainline if necessary

If you included a mainline in your plans, install this as an extension of your plumbing. Turn off the water supply and remove the faucet, then thread the pipes together tightly through a pipe connector. Connect new faucets along the mainline wherever you plan to install drip tubing. Tape over all connections with Teflon tape to prevent leaks. The equipment below must be installed after each faucet on the mainline.

Attach a Y connector (optional)

A Y connector allows you to use the faucet even after the irrigation system is hooked up. All of the remaining equipment will attach to one arm of the Y, while the other can be hooked up to a hose or second faucet.

Install a timer (optional)

If you want to water your garden automatically, attach a timer to the Y connector. These can be set to turn on the water at specific times each day. You may be able to find a combination timer, back flow preventer, and/or filter, which can save some money and hassle.

Install a back flow preventer

In many regions, this step is required by law to prevent contaminated water from backing up into the drinking water. Read the label on the back flow preventer before purchasing. Many back flow preventers must be installed a certain height above the drip tubing in order to work.

Anti-siphon valves will not function if installed upstream of other valves, making them unsuitable for most drip irrigation systems.

Add a filter

Drip tubing is easily clogged by rust, minerals, and other particles in the water. Use a mesh sized 155 (100 microns) or higher.

Connect a pressure regulator if necessary

Also called a pressure reducing valve, this reduces and regulates water pressure in your irrigation lines. Install this if your system has a water pressure above 40 psi (2.8 bars).
Use an adjustable regulator if placing this upstream of four or more control valves.

Fit the lateral line if necessary

If more than one drip line will run from this faucet, install your PVC lateral line first. Each drip line in the area will run from this pipe.
Don't forget to protect your lateral line from sunlight using aluminum tape.

Assemble the drip lines

Use a tubing cutter to cut the drip tubing to desired lengths. Push each drip tube into a connector and attach the connector to your pressure regulator or lateral line. Lay out the drip lines on the surface of the garden. Do not bury your drip lines, or they may end up chewed by rodents. Cover them with mulch if you wish to hide them — after you finish installation. Add control valves before each drip line if you want to be able to adjust or shut them off individually. Stake the drip lines in place. Secure the drip lines using ordinary garden stakes.

Attach the emitters

If you are using drip emitters or micro-sprinklers, attach these along your drip lines. Use a small punch tool to pierce the drip tube, and then insert the emitter tightly.
Do not use a nail or other improvised object, which may create a leaky, ragged hole.

Cap

The end of each drip tube. Attach a flush valve or end cap to each drip tube to prevent water leaking out the end. While you could just bend the tube back and crimp it shut, these tools make it easy to inspect and clean clogged tubing.

Test

The system. Set the timer on manual and turn on the water supply. Adjust the faucet or control valves until the emitters release a slow, steady trickle of water. Once finished, set the timer according to your garden's needs. If you notice any leaks, repair them with Teflon tape.

Ask

- Do you know about the Components of Installation Techniques?

Notes for Facilitation

- Arrange the Handout(s) of the above mentioned information.

Notes

UNIT 2.3: Training of Farmers

Unit Objectives

At After completing this session the participants will be able to:

- Train farmers on using the system
- Explain farmers on how to retrieve the system afer harvest and again laying the pipelines

Ask

- How many of you know about Training of Farmers?

Do

- Wait for the responses and ask the next question.

Say

- Wait for the responses and ask the next question.

Do

- Do you know about the Components of Training of Farmers?

Say

Training of Farmers

During Farmers training a complete end to end solution would be portrayed comprising of the following:

1. Farm survey
2. Soil & water analysis
3. Design of system - customized to farmer needs
4. Installation & commissioning of system
5. Training to the farmer/user
6. Regular after sales services

And apprise farmers on various Components of Drip System:

1. Well/ Tank
2. Pump
3. By Pass/ Pressure Relieve Valve
4. Non Return Valve
5. Hydro Cyclone Filter
6. Inlet Valve
7. Back Flush Valve No 1 & 2
8. Sand Filter
9. Head Unit Control Valve
10. Fertilizer Tank/ Injector
11. Pressure Gauge
12. Disc Filter
13. Air Release Valve
14. Supply Main
15. Ball Valves
16. Pressure Regulators
17. Sub Main
18. Sub Main Flush Valve
19. Laterals/ Emitting Pipes
20. Drippers
21. End Plug

Benefits of farmers training would be marked as:

Benefits of Drip Irrigation:

1. Water savings up to 70%, since only those areas directly around the plant's root zone are irrigated
2. Plants undergo less stress from variations in soil moisture. Plant appearance is enhanced
3. Constant moisture improves plant growth and increases yield consistently
4. Slow application rate prevents excess surface water build-up and reduces evaporation
5. The low application rate and the use of automatic timers results in precise water control
6. Weed growth is reduced because areas between plants are not irrigated
7. System can be designed for use in all types of terrain and soil conditions
8. System's low flow rate allows irrigation of larger areas and more plants can be watered at once
9. Drip irrigation systems are usually installed at costs considerably less than those of an underground sprinkler, bubbler, or shrub spray system

10. Through the use of fertilizer dispensers, chemicals and nutrients can be fed directly to the plant in controlled quantities increasing use of fertilizer efficiency by 30%

11. The water application rate can be tailored to fit each individual plant. This is accomplished by the use of different quantities of emitters and emitters with different discharge rates

12. Conversion to drip irrigation is easily accomplished since the hydraulic design of a sprinkler system is more than adequate

13. The drip system is economical to use with native landscapes in dry weather conditions

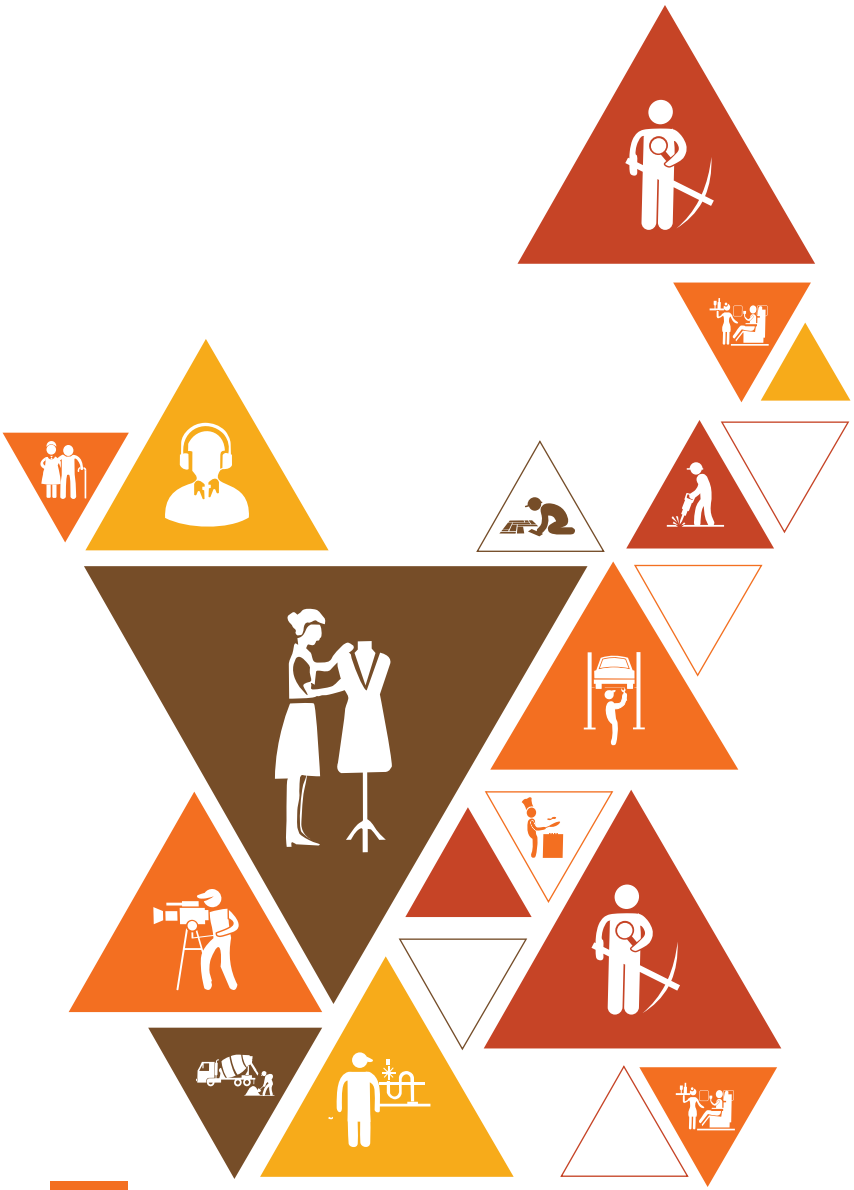
Ask

- Do you know about the Components of Training of Farmers?

Notes for Facilitation

- Arrange the Handout(s) of the above mentioned information.

Notes



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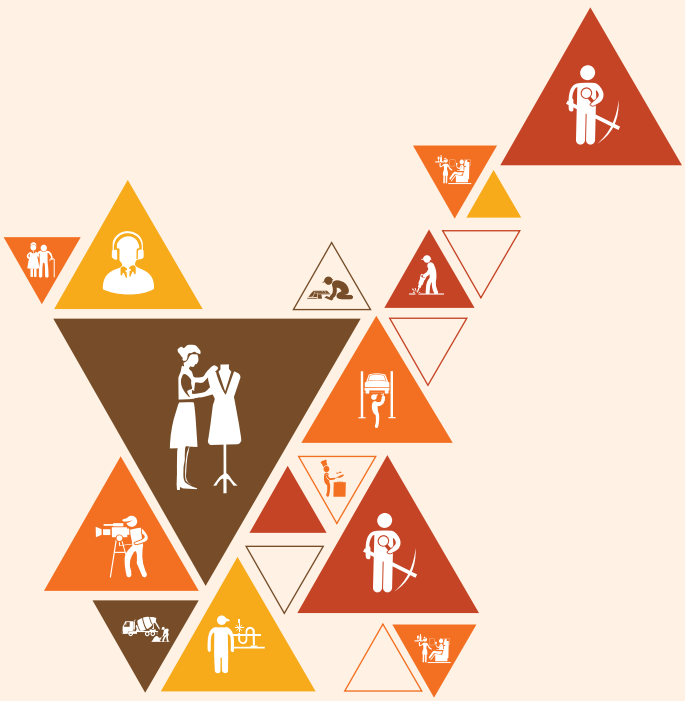
3. Maintenance of Micro Irrigation Systems

Unit 3.1 – Trouble shooting the problems that occur in the farmer's field

Unit 3.2 – Maintenance of micro irrigation system



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Key Learning Outcomes

At the end of the session the participants will be able to:

- Identify various problems farmer may come across in the farmer's field
- Address the common problems during the installation of the system
- Rectify common problem in MI System faced by farmers
- Do System cleaning as per the field situation in terms of type of soil and its other characteristics
- Fix the system clogging due to fertigation
- Follow various maintenance guidelines prescribed for a given micro irrigation system

UNIT 3.1: Trouble Shooting The Problems That Occur In The Farmer's Field

Unit Objectives

At After completing this session the participants will be able to:

- Identify various problems farmer may come across in the farmer's field.
- Address the common problems during the installation of the system

3.1.1 Trouble shooting the problems that occur in the farmer's field

Ask

- How many of you know about problems occurring in the field?

Do

- Wait for the responses and ask the next question.

Say

- Wait for the responses and ask the next question.

Do

- Do you know about the Trouble shooting the problems that occur in the farmer's field?

Say

Micro irrigation systems include micro sprinklers for tree crops, drip emitters for trees, vines, and some row crops, and drip tape for row and field crops. Micro irrigation systems apply water to the soil through emitters that are installed along drip lines and contain very small flow passages. Micro irrigation systems can apply water and fertilizers more uniformly than other irrigation methods. This uniformity results in potentially higher yields, higher revenue, and reduced irrigation operating costs. Uniformity, a performance characteristic of irrigation systems, is a measure of the evenness of the applied water throughout the irrigation system. Distribution uniformity (DU), sometimes called emission uniformity (EU), is an index that describes how evenly or uniformly water is applied throughout the field. A uniformity of 100% means the same amount of water was applied everywhere. Unfortunately, all irrigation systems apply water at a uniformity of less than 100%, and thus some parts of a field receive more water than others. Field evaluations have shown that micro irrigation systems have the potential for higher uniformity than other irrigation methods. However, clogging reduces the uniformity of applied water in micro irrigation systems, thus increasing the relative differences in applied water throughout a field. The small flow passages in the emitters and micro sprinklers make micro irrigation systems highly susceptible to clogging. Clogging reduces the uniformity of the applied water and decreases the amount of applied water. Clogging also decreases the amount of salt leaching around the lateral line in saline soils.

Addressing the common problems faced by farmers in the MI System

General Maintenance Guidelines

- Keep the bypass valve “OPEN” before switching on the pump and adjust / close the same gradually to adjust the required pressure on the mainline.
- Always install suitable pump as per design/system requirements.
- Always maintain the required operating pressure within the system.
- Do not under or over irrigate. Always maintain optimum moisture level in the field.
- Always position J-Turbo Aqura with emitter facing upwards.
- Keep the lid of filter and fertilizer tank optimally tightened while in operation.
- Backwash the media filters regularly. Drain the screen filter and hydro cyclone filter daily.
- While back-washing the manual media filter, always first open backwash valve, then close outlet valve, after this, open the middle valve and then close inlet valve. Follow vice versa procedure while switching over to normal mode.
- Flush the main line, sub mains, laterals and online emitters at regular interval (generally once in a week) depending upon the water quality.
- Carry out the chemical treatment (Acid and/or chlorine treatment) as per requirement to prevent dripper clogging. Follow procedure given in Indian Standard IS 14791.

- Drinking water from the system should be strictly avoided & particularly during chemigation and fertigation.
- Root intrusion can occur if plants are under-irrigated or if chemicals and fertilizers are not flushed out of the line properly.
- Periodically inspect all the components installed above the ground for physical abuse, damage by field machinery, rodents etc.
- Do not pull the laterals while shifting, laying / relaying.
- The end cap / stop of laterals and flush valve at the end of sub main should always be in closed position. If left open, these points may allow pressure loss / drop and also water wastage.
- Operation of valve should be proper as per the direction given on valve. Do not tamper with or disturb the factory setting.
- Before making any alteration or change in the system design, always consult the technical division of the Company or Authorized dealer. The system designed for one crop may not be adequate or suitable for another crop and / or spacing.
- Always use pump as per design requirements. Consult Company or Authorized dealer in case of any change in pump HP.
- Do not change the water source without ascertaining the quality of water.
- Run system daily to keep continuous wetted strip. It also helps to avoid salt precipitation inside the tubing/ emitter.
- To avoid damage, protect the system properly while operating farm machineries in the field or carrying out any manual operation.
- Roll the laterals properly in coil form while removing the laterals from the field and ensure that no damage is done to GTO while folding lateral-tubes.
- Store the poly tube/ piping properly stacked and away from rodents at levels higher than ground.
- It is advisable to conduct a 'rat campaigning' when rats/mice is a nuisance.
- Use only 100% Water Soluble Fertilizer during fertigation through MIS. Don't use any other type of fertilizer.
- Do not mix cow dung in suction piping to prevent / stop leakage in the foot valve, instead change rubber flap and / or clean the foot valve strainer properly.

- Power supplied (including current, voltage and frequency) to any electrical/electronics components (including controllers, control panel, pumps etc.) shall be regulated and/or as per the specifications / requirements.

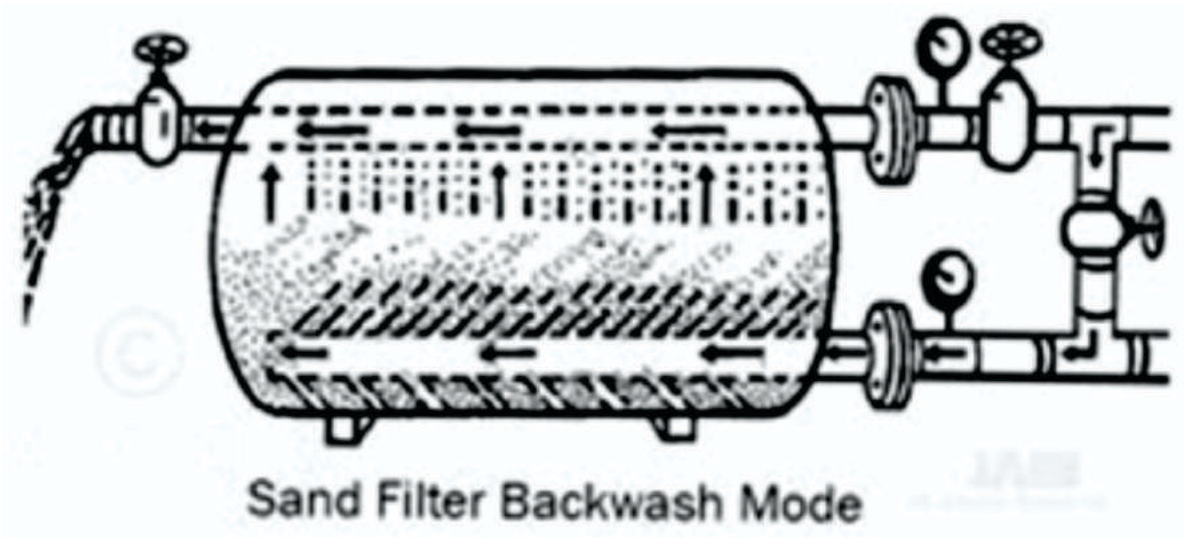
Maintenance

In order to get maximum efficiency and optimum result it is necessary to prevent emitter, mini sprinkler and laterals from clogging. Hence, filtration system is the heart of irrigation systems. Properly maintained filters will ensure maximum efficiency of irrigation systems, by avoiding clogging. Install the filter/s on properly constructed masonry or concrete platform. Connect all the assembly properly. Ensure that all the filter candles inside the sand/media filters are at their place before filling up the sand. If hydro cyclone is to be connected to sand filter, install air release valve at highest point of the fitting.

Maintenance of Hydro cyclone Filters

Hydro cyclone filter requires least maintenance by cleaning the dirt, inside the under flow chamber at daily interval. Flush the chamber by opening flush valve/cap or open the main valve, for thorough cleaning. Please note that hydro cyclone filter becomes ineffective once the dirt collection chamber is full. Always run the hydro cyclone filter at nominal operating pressure. Clean the dirt regularly. Excess pressure and/or un cleaned dirt chamber may lead to erosion of walls.

Maintenance of Sand / Media Filters



Sand filter is effective for removing organic heavy and inorganic contaminates. Over a period, the contaminants in water accumulate and clog pore space in the sand bed and thus reduce the efficiency of filter. Daily back washing of your sand filter is very important. Back washing is the processes in which water flow is reversed and sand bed is lifted and expanded allowing it to release the collected dirt. The dirt is then carried away through back washing valve. Backwash flow should be adjusted properly, because excessive backwash flow will lead to removal of sand itself out of the filter and insufficient backwash flow will not clean the sand properly.

Sequence of backwash operation

Step 1. Open the Backwash Valve.
Step 2. Close the Outlet Valve.
Step 3. Open the Bypass Valve.
Step 4. Close the Inlet Valve.

Please note that in semiautomatic and automatic backwash option. Opening and Closing of the valve is done at the same time. The sand filter should also be cleaned regularly as follows:

1) Open the lid of sand filter
2) Start the Back flush operation
3) Put your hand inside the sand filter and stir the sand thoroughly.
4) Allow all the water along with dirt to flow through the main hole of the sand filter.
5) Close the lid for normal operation.

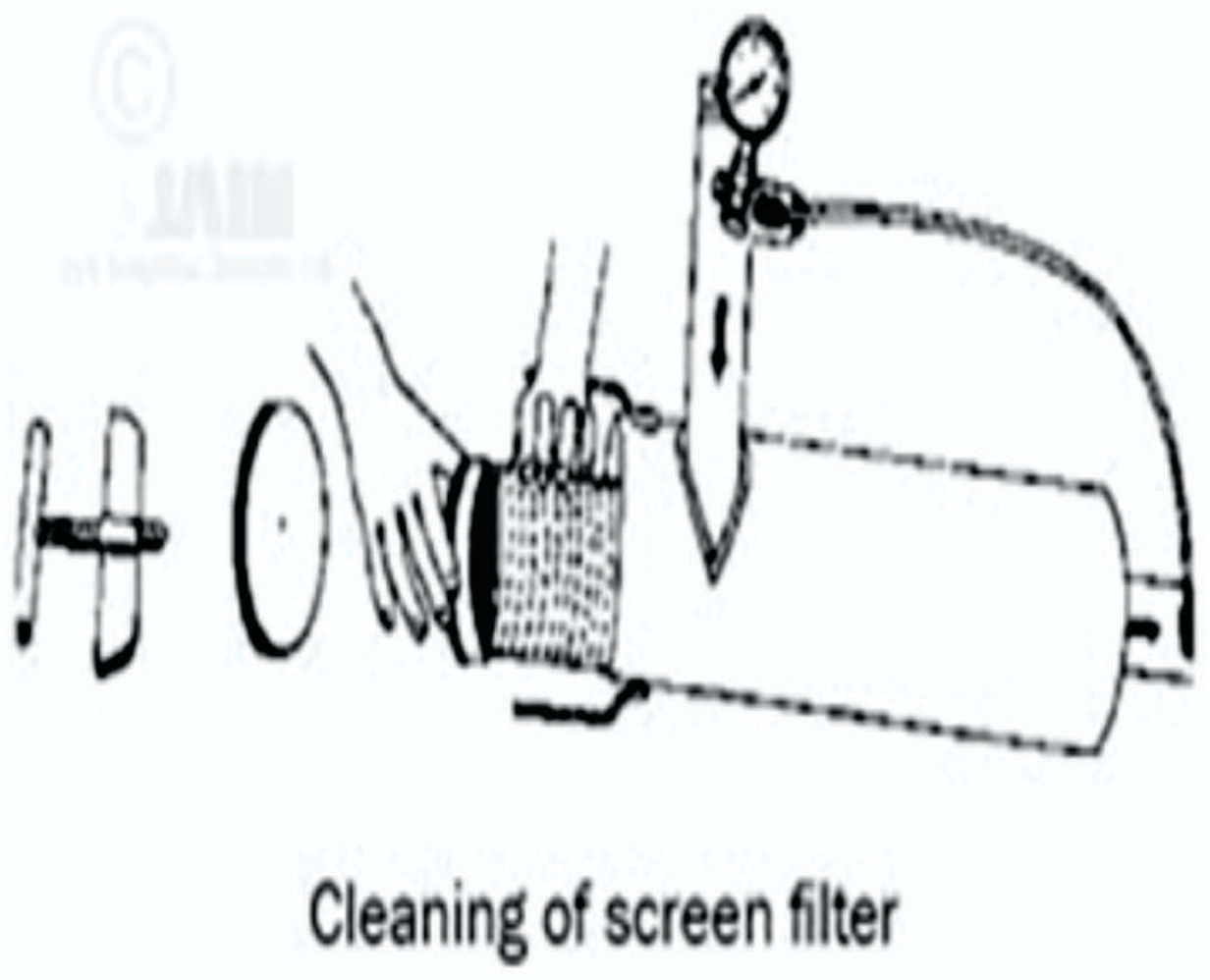
Sand Filter Cleaning

Install the filter/s on properly constructed masonry or concrete platform. Connect all the assembly properly. Ensure that all the filter candles inside the sand/media filters are at their place before filling up the sand. If hydro cyclone is to be connected to sand filter, install air release valve at highest point of the fitting.

Maintenance of Screen Filter

Flushing at scheduled daily interval is necessary to maintain your screen filter. It is recommended to flush your screen filter, if pressure drops more than 0.5 Kg/cm2 (5 m at water head). The pressure difference can be observed by checking inlet and outlet pressure by using a single 3-way control valve. Flushing can be done by simple opening of the drain valve, allowing the force of water to flush the dirt out through drain valve. It is also necessary to clean the screen at regular interval. Procedure of cleaning is very simple, open the screen filter lid, remove the screen & clean it in flowing water by rubbing with cloth or soft nylon brush.

Protect the metal parts of the filters from scratches, acid/chlorine/fertilizer spillage etc. Put oil paint immediately on the scratch to avoid propagation of pitting corrosion.



Cleaning of screen filter

Ask

- Do you know about the Trouble shooting the problems that occur in the farmer's field?

Notes for Facilitation

- Arrange the Handout(s) of the above mentioned information.

Notes

UNIT 3.2: Maintenance of Micro Irrigation System

Unit Objectives

At After completing this session the participants will be able to:

- Do System cleaning as per the field situation in terms of type of soil and its other characteristics.
- Fix the system clogging due to ferti gation
- Follow various maintenance guidelines prescribed for a given micro irrigation system

Ask

- How many of you know about Maintenance of micro irrigation system?

Do

- Wait for the responses and ask the next question.

Say

- Wait for the responses and ask the next question.

Do

- Do you know about the Maintenance of micro irrigation system?

Say

The Maintenance schedule of Drip Irrigation System is in 4 steps;

- Current or Daily maintenance, after starting the pump let the pressure be stabilized in the system. Check for leaks & correct the pressure at sub-main. It should be as per the design. If pressure is less adjust it by throttle/ by-pass valve.
- Inspect the dripping and ensure that water is reaching all the corners of the plot/field if at some portion water is not dripping correctly find the cause & correct.
- If a twist, fold, cut, puncher etc. is found causing discharge variation, correct it immediately. At the end of shift inspect uniform wetting pattern. If dry patches are found increase duration of operation.
- Inspect through out the field to detect precipitation, scaling, if clogging is taking place, the end drippers are the first affected. Take corrective actions if scales/precipitates are found.
- Monitor the mechanical damages by rodents, farm operations by labour, animal or machinery, causing leakage; correct it immediately by using proper joiners.
- Flush all the laterals by opening end plug 1 to 5 in a series; then close them 1-5 in the same sequence allowing flushing for 3 minutes until clean water starts flowing.
- Flush each sub-main at the end of every section (shift) till dirt free clear water starts flowing.
- Check inlet & outlet filter pressures. Remove slurry from hydro cyclone, back flush sand filter at every 5 hours; flush screen/disc filter at the end of day's operation.
- Periodic or Fortnightly maintenance.
- Repeat 1 to 9 operations and take corrective actions.

Take out the element of screen/disc filter and clean it thoroughly. Open the lid of sand (media) filter manhole, allow the water to come out through manhole, stir the sand thoroughly by moving the hand in between filter mushrooms (candles) without disturbing their position for thoroughly separating accumulated foreign material with media (sand) for recharging its filtering capacity.

3.1 Acid Treatment

Precautions – Always use goggles & surgical/rubber hand gloves & never pour water in acid but always add acid in to water as safety precaution before handling acid. Always use plastic containers for acids.

The commercial Grade of Acid recommended for Acid Treatment are:

Hydrochloric Acid	HCl	- 35%
Nitric Acid	HNO3	- 33%
Sulfuric Acid	H2SO4	- 65 %
Ortho Phosphoric Acid	H3PO4	- 85%

Treatment instructions:

1. Treatment should be carried out 1-2 times during the irrigation season or when system discharge drops by 5%

2. Flush all sub mains and laterals before starting the treatment

3.Check the discharge of the system before the treatment so you can later compare this with the discharge of the treated system

4. Solution preparation:- The solution volume (water +acid) should be equal to one quarter (¼) of the hourly discharge of the injector. This way the injection will last for 15 minutes We recommend working with the maximum injector discharge in order to avoid working with a highly concentrated solution

5.Start the injection only after the system is full of water and the drippers are emitting

6. Control:-Using a litmus indicator strip, check the pH at the furthest lateral for residual acid (pH 2.0). second application is recommended if no residual acid is detected

7. Inject during 15 minutes

8.Continue irrigation for 30-60 minutes to ensure the complete flushing of the system

9.Check the discharge of the system
Example:

- Acid needed for receiving pH (2.0) in the 10 liter bucket = 12 cc
- 12 cc X 100 = 1200 cc = 1.2 liters
- Inject 1.2 liters of acid per 1 m3 of the system discharge
- System discharge (of the treated sector) = 30 m3 /h
- System discharge during the 15 minute treatment= 7.5 m3
- Acid required = 1.2 liter X 7.5 = 9 litter
- Max. injector discharge = 200 l/h
- Total solution volume required (¼ of 200 liters) = 50 liters
- 50 liters of solution = 9 liters of acid + 41 liters of water
- Injection time = 15 minutes (50 liters injected with a 200 l/h injector)

3.2 Iron, Manganese Treatments

If water analysis report shows higher amount of iron and/or manganese following measures can be taken, oxidation by aerations allows iron to precipitate faster. Store the water in settlement tank after stepped aeration to allow iron to precipitate down and then pump the water for your system. Chlorination along with aeration can enhance rate of oxidation. Please note that manganese impurities react slow with chlorine hence they coagulate after the main filters. In such cases, either allows some additional reaction and precipitation time or use plot filters as secondary fine filter to avoid drip per clogging which cannot be cleaned by any chemical means.

3.3 Chlorination Treatment

Precautions for chlorination – Chlorine is toxic to human & animal. Do not have direct contact with Skin, eyes, nose, mouth with any Chlorine substance or Cl2 gas; as it is poisonous for human and animal. Wear goggles, hand gloves, safety shoes etc. during chlorination treatment. Vessels for the solution should be thoroughly washed to avoid accident by reaction. Never use Fertigation of Nitrogenous fertilizer during Chlorination to avoid formation of sublime compound like Ammonium Chloride etc. Never mix acid in Chlorine solution; use another device of injection for acid prior to Chlorine. For making/diluting solution of Chlorine add Chlorine product into water but do not pour water in chlorine substance/solution. It can be in three forms: Cl2 gas (100 %Chlorine), Sodium Hypochlorite NaOCl, (10% Chlorine) or Calcium Hypochlorite Ca (OCl) 2 (50 to 65% Chlorine).

Chlorine is a biocide that kills micro organism: bacreria, algue etc. Chlorine injection will reduce clogging and help keeping the irrigation lines clean. It is recommended as an intermittent treatment or as an ongoing preventive treatment in systems that use water that contains a high concentration of organic materials. The most commonly used material is sodium hypochlorite 10-12%.

Treatment instructions:

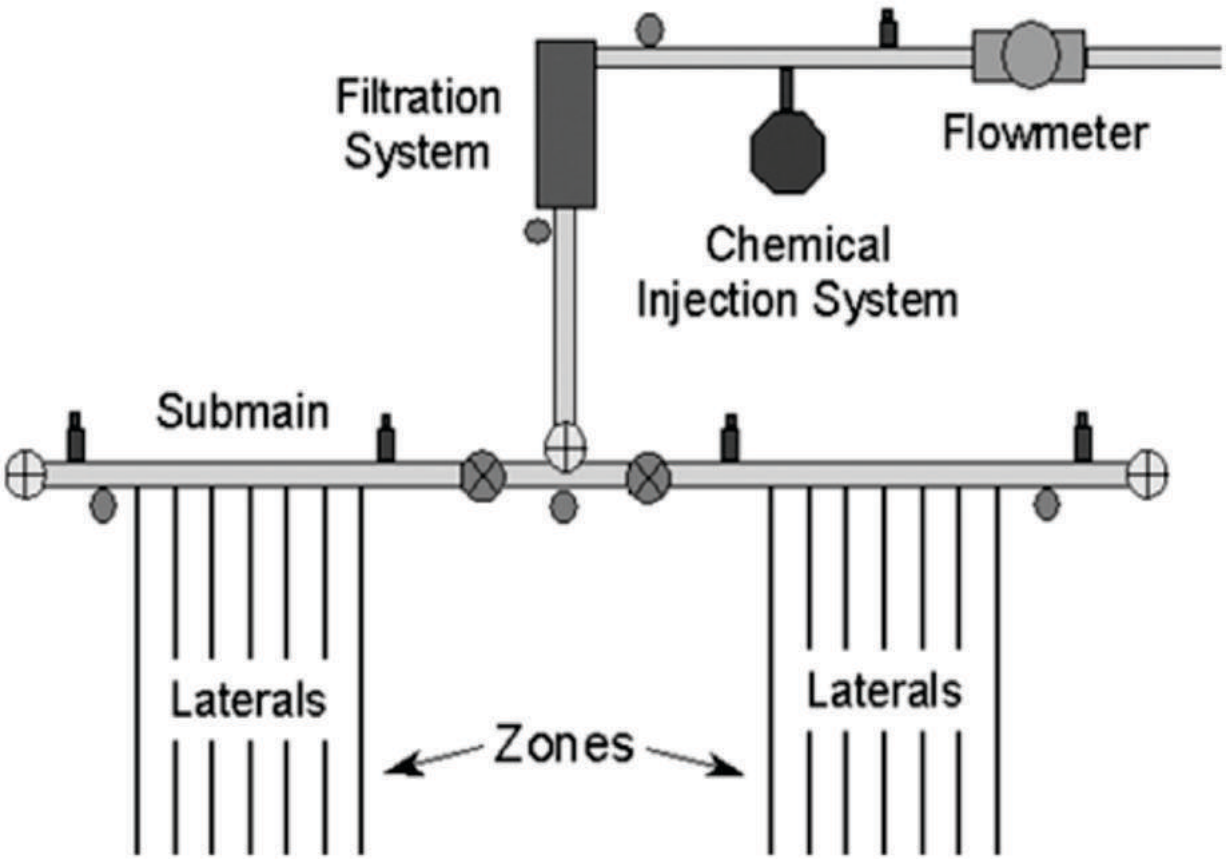
1. Find out the required dose, treatment frequency and duration.
2. Flush all sub mains and laterals before starting the treatment.
3.Dosing and injecting: Use the following formula to determine injection rate and stock solution concentration: If the injector can be manipulated to inject at different discharge levels, you may do so, according to your requirements. If not, you can adapt the stock solution concentration. Adapting the stock solution concentration to a fixed injection rate

Warning:

Active Chlorine is dangerous. Follow the manufacture instruction.
Storage: Sodium hypochlorite should be stored under a shaded area in a clean dark tank, without any fertilizers residues. Concentration will degrade over time.

3.4 LATERAL FLUSHING

Lateral flushing flushes out debris that accumulates in the drip line and can eventually clog the dripper's water inlet or labyrinth. During the irrigation season, laterals should be flushed every 2-3 weeks. Flushing is done by opening the lateral end for 30-60 seconds until the water coming out of the lateral is clear. Flushing with a flushing sub main will reduce costs of manual labor and guarantee frequent flushing.



Ask

- Do you know about the Maintenance of micro irrigation system?

Notes for Facilitation

- Arrange the Handout(s) of the above mentioned information.

Tips

Post-training Assessment

Unit Objectives

At After completing this session the trainer will be able to:

- Assess the knowledge gained by the participants on Micro Irrigation

Notes for Facilitation

- Conduct the Post-training assessment for the trainees
- Distribute the internal assessment paper
- Ask the trainees to write their name and date in the boxes provided
- Ask the trainees to mark a tick in the Pre-training assessment box
- Collect and check the papers and grade them accordingly.
- Compare the marks obtained by the trainees in Pre-training and Post-training assessment.
- Make a report of the grades and comparison.

Notes

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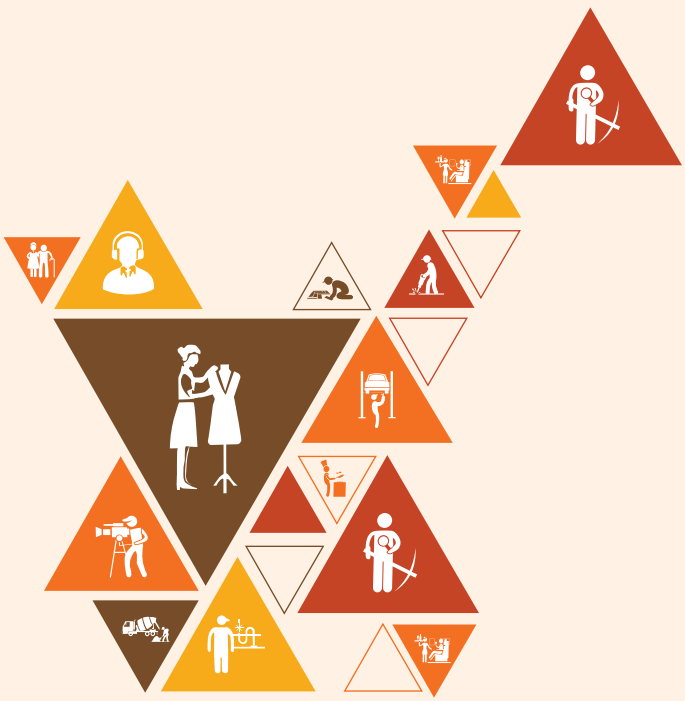
4. Annexures

Annexure I : Training Delivery Plan

Annexure II : Assessment Criteria



AGR/N9903

Annexure I

Training Delivery Plan

Training Delivery Plan			
Program Name:	Certificate Course in Micro Irrigation Technician		
Qualification Pack Name & Ref. ID	Micro Irrigation Technician- **AGR/Q1002, AGR/Q1004, AGR/Q1005,AGR/Q1006, AGR/N9903**		
Version No.	1.0	**Version Update Date**	07-04-16
Pre-requisites to Training (if any)	No entry level barrier; 5th Standard Passed preferable One year prior experience in field (crop) operations		
Training Outcomes	**By the end of this program, the participants would have achieved the following competencies:** 1. Increased understanding of micro irrigation techniques 2. Increased knowledge about various aspects of micro irrigation system 3. Enhanced knowledge of micro irrigation components 4. Increased motivation to take up micro irrigation as livelihood options 5. Increased awareness about schemes like - NHM, NHB, NABARD, Central & State Schemes 6. Development of a strategy for adaptation of micro irrigation technology		

S. No.	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/Aids	Duration
(I).	Internal Assessment	**Pre-training Assessment**	• Assess the current knowledge of the participants on Floriculture cultivation	Bridge module	Theory Test (Pre Test)	Trainer's Guide	1 hour
(ii).	Ice Breaker	**Ice Breaker**	• Get introduced to one another to build rapport with their fellow participants and the trainer	Bridge module	Activity	Trainer's Guide	30 min
1.	Designing & Layout of Micro Irrigation Systems	**Session 1.1** Designing of Micro Irrigation Systems	• PC1. Identify the characteristics of the soil, climatic conditions, land gradient, crop	AGR/ N1OO4, PC1, PC2	Trainer-led Discussion Demonstration	Participant's Handbook & Trainers Guide on Micro Irrigation Technician	1 hour

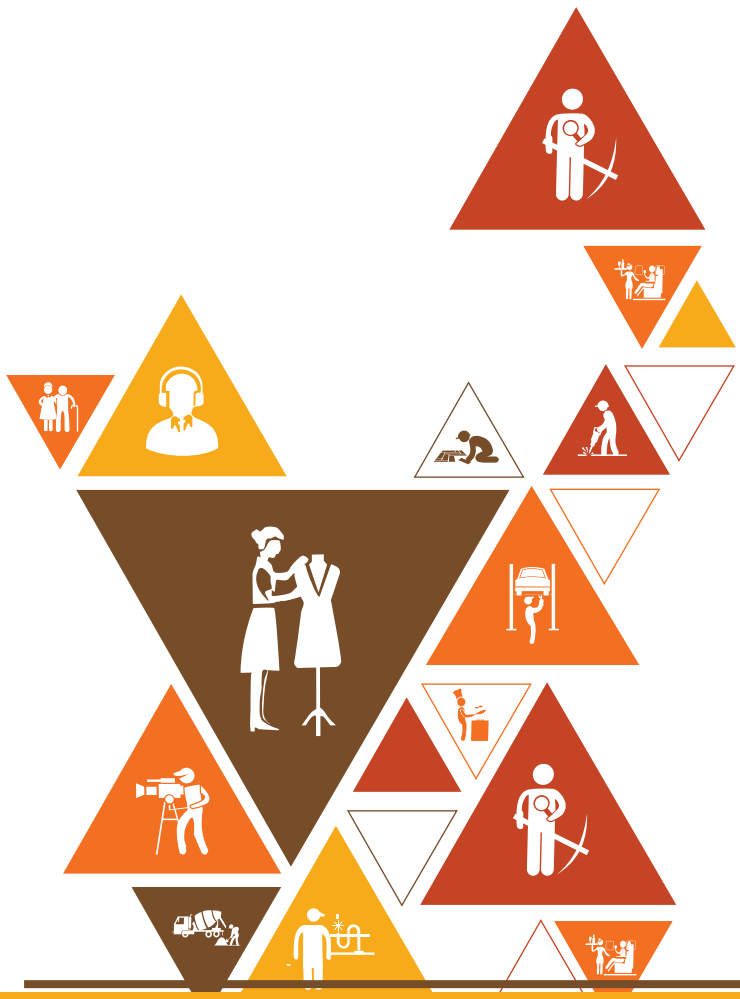
			etc., essential for designing the system PC2. Follow Micro Irrigation Principles in the design of the Micro Irrigation System in the field.				
		Session 1.2 Layout of designed Irrigation System	• PC3. Layout Irrigation System as per the legend used in drawing • PC4. Handle the site deviation if required • PC5. Take note of basics of crop cultivation such as spacing, water requirement, spacing of the crop stand, nature of rooting etc.	AGR/N1OO4, PC3, PC4, PC5	Trainer-led Discussion Demonstration	Participant's Handbook & Trainers Guide on Micro Irrigation Technician	1 hour
2.	Installation of Micro Irrigation Systems	**Session 1 Components of Micro Irrigation System**	• PC1. Identify various components of MIS. • PC2. Identify f various parts of the MI units for timely fitting and installation.	AGR/N1005, PC1, PC2	Trainer-led Discussion Demonstration	Participant Handbook Trainer's Guide Required materials for Demonstration	1 hour
		Session 2 Installation Techniques	• PC3. Use right components at the right place for better installation Pc4. Do quick and error free installation of the MIS	AGR/N1005, PC3, Pc4, PC5	Trainer-led Discussion Demonstration	Participant Handbook, Trainer's Guide and other Required materials for Demonstration	1 hour

			PC5. Test and Commission the MIS after installation				
		Session 3 Training of Farmers	• PC6. Train farmers on using the system • PC7. Explain farmers on how to retrieve the system after harvest and again laying the pipelines.	AGR/N1005, PC6, PC7	Trainer-led Discussion Demonstration	Participant Handbook Trainer's Guide Required materials for Demonstration	1 hour
3.	Maintenance of Micro Irrigation Systems	**Session 1 Trouble shooting the problems that occur in the farmer's field**	·PC1. Identify various problems farmer may come across in the farmer's field. ·PC2. Address the common problems during the installation of the system PC3. Rectify common problem in MI System faced by farmers	AGR/N1006, PC1, PC2, PC3	Trainer-led Discussion Demonstration	Participant Handbook, Trainer's Guide and other Required materials for Demonstration	1 hour
		Session 2 Maintenance of Micro Irrigation System	• PC4. Do System cleaning as per the field situation in terms of type of soil and its other characteristics. • PC5. Fix the system clogging due to fertigation • PC6. Follow various maintenance guidelines prescribed for a given micro irrigation system	AGR/N1006, PC4, Pc5, PC6	Trainer-led Discussion Demonstration	Participant Handbook, Trainer's Guide and other Required materials for Demonstration	1 hour

4.	Recap	**Recap**	• Revise the learning of the Module 1,2 & 3	Related AGR/ N1004, AGR/ N1005, AGR/ N1006	Trainer-led Discussion	Trainer's Guide Participant Handbook	30 min
5.	Knowledge and Under-standing	**Session 4 Knowledge mapping**	• evaluate the adequacy of existing system of micro irrigation • effective working relationships with farmer and company.	AGR/Q1002, KA1, KA2	Group Discussion Activity	Trainer's Guide Participant Handbook	2 hour
6.	Professional Skills	**Session 5 Case Study**	• Make decisions pertaining to the concerned area of work for any issues which is instant; • Plan and manage time effectively; • Deal with others workers lacking the technical knowledge for Micro Irrigation to solve the problem on their own; • Monitor and maintain the condition of tools and equipment required for Micro Irrigation; • Monitor the growing crop as suggested by the supervisor. Apply, analyze, and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action	AGR/Q1002, Sb1, Sb2, Sb3, Sb4, Sb5, Sb6, Sb7, Sb8, Sb9 ,SB10, SB11	Group Discussion Activity	Trainer's Guide Participant Handbook	2 hour and 30min

7.	Core Skill/ Generic skills	**Session 7 Writing skills**	·The bills and expenses incurred at site ·Report problem to the appropriate personnel ·Description and details about incident in report Follow basic arithmetic and algebraic principle	AGR/Q1002, SA1,SA2, SA3,SA4	Trainer-led Discussion Demonstration	Participant Handbook Trainer's Guide Required materials for Demonstration	1 hour
8.	Recap	**Recap**	Revise the learning of the Module of Micro irrigation technology	AGR/Q1002	Trainer-led Discussion Demonstration	Participant Handbook Trainer's Guide Required materials for Demonstration	30 min
9.	Professional Skills	**Session 15 Case Study**	·Make decisions pertaining to the concerned area of work for any issues which is instant; ·Deal with others workers lacking the technical knowledge for MIS to solve the problem on their own; Monitor and maintain the condition of tools and equipment required for MIS	AGR/Q1002	Group Discussion Activity	Participant Handbook Trainer's Guide Required materials for Demonstration	2 hour and 30 min
10.	Practice in Micro Irrigation technology in green house and open field	**Session 16 Dos and Don'ts in Micro Irrigation**	• State the Dos and Don'ts in Micro irrigation techniques	Bridge Module	Trainer-led Discussion Demonstration	Participant Handbook Trainer's Guide Required materials for Demonstration	1 hour

11.	Internal Assessment	**Session 17 Post Assessment**	Assess the knowledge gained by participants on Micro Irrigation technology in Greenhouse and Open field	Bridge Module	Theory	Trainer's Guide Assessment Guide	1 hour
12.	Field Visit	**Session 18 Field visit to Greenhouse and open field where Irrigation system is installed**	Observe the techniques to apply the Micro Irrigation system in Greenhouse and Open field	Bridge Module	Field Visit	Trainer's Guide	4 hour



Annexure II

Assessment Criteria

CRITERIA FOR ASSESSMENT OF TRAINEES

Assessment Criteria for ASCI- Micro-Irrigation Technician	
Job Role	**Micro-Irrigation Technician**
Qualification Pack	**AGR/Q1002**
Sector Skill Council	**Agriculture Skill Council of India**

S.No.	Guidelines for Assessment
1.	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2.	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3.	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
4.	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criteria.
5.	To pass the Qualification Pack, every trainee should score a minimum of 50% in aggregate.
6.	In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.
7.	The marks are allocated PC wise, however, every NOS will carry a weight age in the total marks allocated to the specific QP.

			Marks Allocation		
Assessment Outcome	Assessment Criteria for Outcomes	Total Marks (225)	Out of	Theory	Skills Practical
1.AGR/N1004 Designing and Layout of Micro Irrigation System	PC1.Identify the characteristics of the soil, climatic conditions, land gradient, crop etc., essential for designing the system	**50**	10	6	4
	PC2.Follow Micro Irrigation Principles in the design of the Micro Irrigation System in the field.		10	5	5
	PC3.Layout Irrigation System as per the legend used in drawing.		10	5	5
	PC4.Handle the site deviation if required.		10	5	5
	PC5.Take note of basics of crop cultivation such as spacing, water requirement, spacing of the crop stand, nature of rooting etc.,		10	5	5
			50	**26**	**24**

2.AGR/N1005 Installation of Micro Irrigation	PC1.Identify various components of MIS	**100**	15	10	5
	Pc2. Identify f various parts of the MI units for timely fitting and installation		15	10	5
	PC3. Use right components at the right place for better installation.		10	10	0
	PC4.Do quick and error free installation of the MIS.		30	15	15
	PC5.Test and Commission the MIS after installation.		10	5	5
	PC6.Train farmers on using the system.		10	0	10
	PC7.Explain farmers on how to retrieve the system after harvest and again laying the pipelines.		10	0	10
			100	**50**	**50**
3.AGR/N1006 Maintenance of Micro Irrigation System	PC1.Identify various problems farmer may come across in the farmer's field.	**50**	10	6	4
	PC2.Address the common problems during the installation of the system.		10	6	4
	PC3.Rectify common problem in MI System faced by farmers.		5	5	0
	PC4.Do System cleaning as per the field situation in terms of type of soil and its other characteristics.		10	3	7
	PC5.Fix the system clogging due to fertigation.		5	2	3
	PC6.Follow various maintenance guidelines prescribed for a given micro irrigation system.		10	3	7
			50	**25**	**25**
4.AGR/N9903 Maintain Health & Safety at the workplace	PC1.undertake basic safety checks before operation of all machinery and vehicles and hazards are reported to the appropriate Supervisor.	**225**	5	3	2
	PC2.work for which protective clothing or equipment is required is identified and the appropriate protective clothing or equipment is used in performing these duties in Accordance with workplace policy.		2	2	0

	PC3.read and understand the hazards of use and contamination mentioned on the labels of pesticides/fumigants etc.		1	0	1
	PC4.assess risks prior to performing manual handling jobs, and work according to currently recommended safe practice.		1	1	0
	PC5.use equipment and materials safely and correctly and return the same to designated storage when not in use.		4	2	2
	PC6.dispose of waste safely and correctly in a designated area.		3	2	1
	PC7.recognise risks to bystanders and take action to reduce risk associated with jobs in the workplace		1	0	1
	PC8.perform your work in a manner which minimizes environmental damage all procedures and work instructions for controlling risk are followed closely.		1	1	0
	PC9.report any accidents, incidents or problems without delay to an appropriate person and take necessary immediate action to reduce further danger.		1	0	1
	PC10.follow procedures for dealing with accidents, fires and emergencies, including communicating location and directions to emergency.		1	0	1
	PC11.follow emergency procedures to company standard / workplace requirements.		1	0	1
	PC12.use emergency equipment in accordance with manufacturers' specifications and workplace requirements.		1	0	1
	PC13.provide treatment appropriate to the patient's injuries in accordance with recognized first aid techniques.		1	1	0
	PC14.recover (if practical), clean, inspect/test, refurbish, replace and store the first aid equipment as appropriate.		1	0	1
	PC15.report details of first aid administered in accordance with workplace procedures.		1	0	1
			25	**12**	**13**
	Total		**225**	**113**	**112**

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