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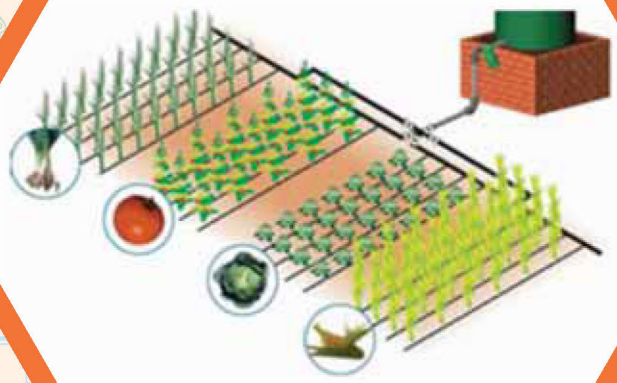
Partcipant Handbook



Sector
Agriculture and Allied

Sub-Sector
Agriculture Crop Production

Occupation
Micro Irrigation Technician

Reference ID: **AGR/Q1002, Version 1.0**
NSQF Level 4

Micro Irrigation Technician

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> 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

Certificate

COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

AGRICULTURE SECTOR SKILL COUNCIL

for

SKILLING CONTENT : PARTICIPANT HANDBOOK

Complying to National Occupational Standards of
Job Role/ Qualification Pack: **Micro Irrigation Technician**' QP No. '**AGR/ Q1002 NSQF Level 4**'

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Authorised Signatory
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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. Rouhangiz 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.

KVK,Amravati

About this book

A Micro Irrigation Technician will be responsible for carrying out the ground level activities involved in Micro Irrigation as per the Micro Irrigation Technician Qualification Pack (QP). Micro Irrigation Technician is responsible for Installation, Testing, and Commissioning of Micro Irrigation System at farmer's field for better water management and increase in yield of crop. As per these standards the Micro Irrigation Technician should not work independently, should be laborious and must have the ability to make operational decisions pertaining to his area of work. The trainee should gain clarity of work and should be result oriented; The Trainee should also be able to demonstrate skills to use various tools in the Micro Irrigation. The trainee will enhance his/her knowledge under the guidance of the trainer in the following skills:

- **Knowledge and Understanding:** Adequate operational knowledge and understanding to perform the required task
- **Performance Criteria:** Gain the required skills through hands on training and perform the required operations within the specified standards
- **Professional Skills:** Ability to make operational decisions pertaining to the area of work.

The handbook incorporates well-defined roles for Installation, Testing, and Commissioning of Micro Irrigation System at field level by ensuring uninterrupted supply of water to the plant stand on the farm. This job-role requires the participant to work independently and be comfortable in making decisions pertaining to his/her area of work. Further it requires clarity, skill to basic arithmetic and algebraic principles too. The participant should be result oriented and responsible for his/her own working and learning. The participant should also be able to demonstrate skills of using various tools and decision making for instant problem solving.

We wish all the best for your future in the Micro Irrigation sector.

Symbols Used


Key Learning Outcomes


Steps


Time


Tips


Notes


Unit Objecti es


Exercise

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1. Introduction

Unit 1.1 - Importance of irrigation System

Key Learning Outcomes

At the end of this module, you will be able to:

- Define the Micro Irrigation System
- Explain the importance of Micro Irrigation System
- Understand the concept of Micro irrigation System

UNIT 1.1: Importance of Irrigation System

Unit Objectives

At the end of this unit, you will be able to:

1. Explain the importance of Micro Irrigation System in Indian Agriculture
2. Identify the types of Irrigation System

1.1.1 General Instructions to Trainee

- Greet your instructor and other participants when you enter the class
- Always be punctual for every class
- Be regular
- Inform your instructor if, for any reason, you need to miss class
- Pay attention to what your instructor is saying or showing
- If you do not understand something, put up your hand and seek clarificaation
- Make sure you do all exercises at the end of each module in this book. It will help you understand the concepts better
- Practice any new skills you have learnt as many time as possible
- Make sure you are neatly attired and presentable at all times
- Participate actively in all activities,discussions and games during training
- Bath daily, wear clean clothes and comb your hair before you come to class

The three most important words you must always remember and use in your daily conversation are **'please', 'thank you', and 'sorry'**

1.1.2 Introduction

Water is the most vital input in agriculture and has made a significant contribution 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.
Water application method may be broadly classified into two groups: Surface irrigation method

(gravity) and Pressurized irrigation methods.

1.1.3 Importance of Irrigation in Indian Agriculture

The necessity and importance of irrigation is highlighted below in points:

1. Climate variation: Indian climate and weather conditions experiences a varied range of climate. There is extreme heat at some places, while the climate remains extremely cold at other places. While there is excessive rainfall at some places, other places experience extreme dryness. So, good irrigation technology is needed in India.

2. Irregular and uncertain monsoon: India is a land of monsoon. But monsoon is irregular and erratic in nature. Sometimes it Comes easily and brings heavy rainfall, but some times monsoon is late and may bring inadequate rainfall. Further, there is irregularity in the distribution of Rainfall throughout the year. The irrigation system helps the farmers to have less dependency on rain-water. During the months of inadequate rainfall, the crops are supplied water through irrigation systems.

3. Agriculture based economy: Indian economy is based on agriculture. A large portion of Indian population depends on agriculture. Without irrigation agriculture is not possible in dry areas or during the months of inadequate rainfall. Naturally, for the agricultural activities across diverse regions, there is a need for proper irrigation system.

4. Winter crop: India is a vast country with fertile plain lands suitable for Rabi as well Kharif crops. But there is no rainfall during winter months in several places. Without irrigation production of Rabi crops along with other crops is not possible. Rabi crops are grown during the long dry spell of winter season. This is possible mainly due to advanced irrigation facilities.

5. Hybrid seeds: At present because of hybrid seeds, crops can be produced at any season. But the production of crops is totally dependent on water. The introduction of advanced irrigation system has enabled the farmers to produce crops even during dry seasons.

6. Soil Character: In many places, the soils have less water-retaining capacities.
Irrigation refers to the process of supply of water through artificial means such as pipes, ditches, sprinklers, etc. The irrigation system helps the farmers to have less dependency on rain-water for the purpose of agriculture.

1.3.1 Job Role of a Micro IrrigationTechnician

Micro Irrigation Technician: The individual holds a very critical role in the installation and function of micro irrigation system that not only uses the existing natural resources efficiently but also benefits the farmers in terms of decreased cost of cultivation in the long run. The individual is responsible for Installation, Testing, and Commissioning of Micro Irrigation System at field level and thus ensure uninterrupted supply of water to the plant standing on the farm.

This job requires the individual to work independently and be comfortable in making decisions pertaining to his/her area of work. Requires clarity, skill to basic arithmetic and algebraic principles. The individual should be result oriented and is responsible for his own working and learning. The individual should also be able to demonstrate skills of using various tools and decision making for instant problem solving.

Exercise

1. Sprinkler irrigation is suitable for ---------- crops
   a) Paddy
   b) Jute
   c) Vegetable crops

2. ---------- Irrigation works well for row crops, tree crops
   a) Sprinkler
   b) Furrow
   c) Tube

Answer: ----------

3. Identify the Irrigation Method

a)

b)

4. ---------- Irrigation is the most efficient Irrigation method?
   a) Furrow Irrigation
   b) Canal Irrigation
   c) Drip Irrigation

Tips

Who is a Micro Irrigation Technician?

Think about this. Who do you think is responsible for Installation, Testing, and Commissioning of Micro Irrigation System at field level and thus ensure uninterrupted supply of water to the plant standing on the farm Well. It is the Micro irrigation Technician.

Notes

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2. Designing & Layout of Micro Irrigation Systems

Unit 2.1 – Designing of Micro Irrigation Systems

Unit 2.2 – Layout of designed Irrigation System

AGR/N1004

Key Learning Outcomes

At the end of the module the You 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 2.1 Designing of Micro Irrigation Systems

Unit Objectives

At the end of this unit, you will be able to:

- Know how on how to Design Micro Irrigation Systems
- 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

2.1.1 Designing of Micro Irrigation Systems

A properly designed irrigation system addresses uniform irrigation application in a timely manner while minimizing losses and damage to soil, water, air, plant, and animal resources. The design of a conservation irrigation system matches soil and water characteristics with water application rates to assure that water is applied in the amount needed at the right time and at a rate at which the soil can absorb the water without runoff. Physical characteristics of the area to be irrigated must be considered in locating the lines and spacing the sprinklers or emitters, and in selecting the type of mechanized system. The location of the water supply, capacity, and the source of water will affect the size of the pipelines, irrigation system flow rates, and the size and type of pumping plant to be used. The power unit selected will be determined by the overall pumping requirements and the energy source available.

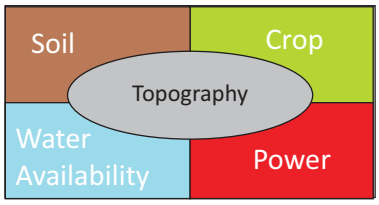
Key points in designing an irrigation system include:

- The irrigation system must be able to deliver and apply the amount of water needed to meet the crop-water requirement.
- Application rates must not exceed the maximum allowable infiltration rate for the soil type. Excess application rates will result in water loss, soil erosion, and possible surface sealing. As a result, there may be inadequate moisture in the root zone after irrigation, and the crop could be damaged.
- Flow rates must be known for proper design and management.
- Soil textures, available soil water holding capacity and crop rooting depth must be known for planning and designing system application rates, irrigation water management, and scheduling irrigations so that water applied is beneficially used by the crop.
- The water supply, capacity, and quality need to be determined and recorded.
- Climatic data - precipitation, wind velocity, temperature, and humidity must be addressed.
- Topography and field layout must be recorded.
- Farmer's preferences in irrigation methods, available operation time, farm labor, cultural practices, and management skills must be noted for selecting and planning the type and method of irrigation

2.1.2 Design Procedure

A step-by-step checklist of the procedure normally used in planning a sprinkler irrigation system follows:

Step 1. Identify resource concerns and problems. Determine objective(s) and purpose of new or revised irrigation system. Include soil, water, plant, and animal resources, and human considerations.



Step 2. Make an inventory of available resources and operating conditions. Include information on soils, topography, water supply (quantity and quality), and source of power (type and location), crops, and irrigator's desire for a type of sprinkler system, labor availability, farm operation schedules, and water management skills.

Crop	Variety	Soil Type	Water Source	Source of Power	Irrigation type	Cost of Irrigation

Step 3. Determine soil characteristics and limitations. Include AWC, maximum allowable application rates, usable rooting depth, acidity, salinity, and water table. Crop rooting depth needs to be denied for specific fields and soils. A field investigation is strongly recommended. If a field contains more than one soil, the most restrictive soil must be determined.

Soil	Zone	Acidity	Salinity	Root Depth	Water application rates
Sand					
Loam					
Clay					

Step 4. Determine net irrigation water requirements for crops to be grown. Use season, month, and peak or average daily use rate, accounting for expected rainfall and acceptable risks.

Irrigation Schedule for----------
--- crop

Week	Start date- end date	Soil type	Moisture	Evaporation	Rainfall	Water Requirement	Irrigation Frequency	Irrigation System
1-2nd								
3-4th								
5-6th								
7-8th								
9-10th								
11-12th								

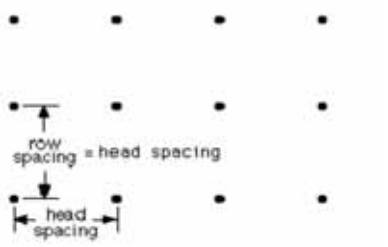
Step 5. Determine irrigation frequency, net and gross application (based on estimated applicaication efficiency) at each irrigation and minimum system capacity requirements.

Step 6. Determine alternati e irrigation systems suitable to the site and desired by the user. Evaluate alternative irrigation systems with user, and their r multi-source impacts on the environment.

Step 7. Determine sprinkler spacing, nozzle sizes, head type, discharge, operating pressure, wetted diameter, average applicationrate, and performance characterisstics.

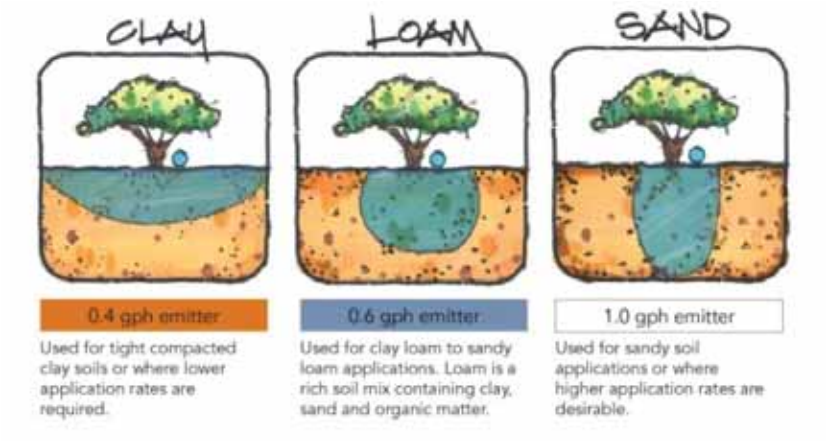
Nozzle Pattern	Pressure	Litre per minute		Radius Metres	
		Standard Flow	Low Flow	Standard Flow	Low Flow

Step 8. Determine number of sprinklers in an irrigation set (zone) required to meet system capacity requirements; number of laterals needed for a selected time of set; set spacing; moves per day; and frequency of irrigation in days.

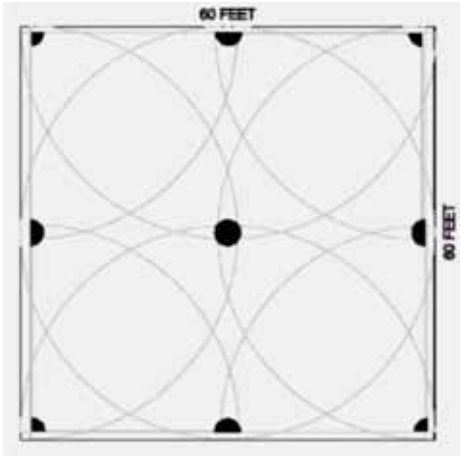


Step 9. Evaluate design. Does it meet the objective and purpose(s) identified in step 1.

Step 10. Make necessary adjustments to meet layout conditions so the system fits the field, soils, crops, water supply, environmental concerns, and the desires of the irrigation decision-maker.



Step 11. Finalize sprinkler irrigation System design, layout, and management skills required by then irrigation decision maker.



Step 12. Determine lateral size(s) based on number of heads, flow rate, pipeline length, and allowable pressure loss differentiate between the first and last sprinkler head. Determine if pressure or flow regulators are needed. Determine minimum operating pressure required in mainline(s) at various criti al location on the terrain.

Step 13. Determine mainline sizes required to meet pressure and flow requirements according to number of operating laterals.

Step 14. Determine maximum and minimum Total Dynamic Head (TDH) required for critical lateral location conditions Determine total accumulated d friction loss in mainline, elevation rise (drip) from pump to extreme point in the fields, water surface to pump impeller (lift) column loss with vertical turbine pumps, and miscellaneous losses (fittings alves, elbows) at the pump and throughout the system.

Step 15. Determine maximum and minimum pumping plant capacity using required flow rate and TDH. Estimate brake horsepower for the motor or engine to be used.