Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

# D301MAINTENANCE OF DRIP IRRIGATION INFRASTRUCTURES

**MAINTAIN DRIP IRRIGATION INFRASTRUCTURES**

## Competence

RQF Level: 3

Learning Hours
30

Credits: 6

Sector: Agriculture and food processing

Trade: Water and Irrigation

Module Type: SPECIFIC

Curriculum: AFPWIR3001- TVET Certificate III in water and irrigation



**Issue Date: May, 2022**

<table>
<tr><td>Purpose statement</td><td colspan="5">This module describes the skills, knowledge and attitude required to perform maintenance of drip irrigation infrastructures. At the end of this module, learners will be able to check all components of drip irrigation system, Carry out regular hygienic conditions of the irrigation system, Carry out routine maintenance of drip irrigation system, Qualified learners deemed competent to this competency may work alone or with others on routine tasks in marshland, hillside, small scale irrigation, garden, greenhouses, agricultural land, rain water harvesting, in-situ rain water harvesting and ground water harvesting related activities under minimum supervision.</td></tr>
<tr><td rowspan="6">Delivery modality</td><td colspan="2">Training delivery</td><td>100%</td><td colspan="2">Assessment</td><td>Total 100%</td></tr>
<tr><td colspan="2">Theoretical content</td><td>30%</td><td rowspan="4">Formative assessment</td><td>30%</td><td rowspan="4">50%</td></tr>
<tr><td colspan="2">Practical work:</td><td rowspan="3">70%</td><td rowspan="3">70%</td></tr>
<tr><td>• Group project and presentation</td><td>20%</td></tr>
<tr><td>• Individual project /Work</td><td>50%</td></tr>
<tr><td colspan="3"></td><td colspan="2">Summative Assessment</td><td>50%</td></tr>
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## Elements of Competency and Performance Criteria

| Elements of competency | Performance criteria |
|---|---|
| 1. Check all components of drip irrigation system | 1.1. Pump, filters, pipes, laterals and drippers are regular inspected to ensure their good conditions. |
| | 1.2. Leakages of irrigation network are properly identified to maintain the working pressure and water delivery to the crop |
| | 1.3. Drip irrigation system is periodically inspected to make sure that emitters work properly without leakage and clogging. |
| 2. Carry out regular hygienic conditions of the irrigation system | 2.1 The pump engine is properly oiled and greased according the time of operation |
| | 2.2 Drip irrigation components are adequately cleaned according to safety condition and occupational health |
| | 2.3 System is properly flushed, closed down and maintained in post-season operation in accordance with design specifications and enterprise standards. |
| | 2.4 Equipments are careful dismantled, loaded, transported and stored according to enterprise standards and safe working practices. |
| 3. Carry out routine | 3.1 Irrigation parts are appropriately inspected and timely reported for wear or blockage |

| | |
|---|---|
| maintenance of drip irrigation system | according to enterprise guidelines |
| | 3.2 Damaged materials are carefully removed and replaced according to technical specifications. |
| | 3.3 Irrigation pipes are adequately removed, cleaned and proper reassembled according to manufacturer's specifications. |
| | 3.4 Maintenance activities are regularly recorded and reported in accordance with enterprise standards. |

# Course content

| | |
|---|---|
| **Learning outcomes** | At the end of the module the learner will be able to:<br>1. Check all components of drip irrigation system;<br>2. Carry out regular hygienic conditions of the irrigation system;<br>3. Carry out routine maintenance of drip irrigation system |
| **Learning outcome 1: Check all components of drip irrigation system;** | **Learning hours: 10** |

**Indicative content**

- Inspection of the pump, filters, pipes, laterals and drippers
  - ✓ Irrigation water quality and quantity
  - ✓ Pump malfunctions, causes and remedies
  - ✓ Drip irrigation components, their malfunctions, causes and remedies
- Identification of leakages of irrigation network to maintain the working pressure and water delivery to the crop
  - ✓ Malfunctions checklist of drip irrigation network
  - ✓ Causes of leaks in drip irrigation network:
    - Incorrect connections of pipes joints, excessive high pressure, excessive temperatures, pipes of poor quality, blockages due to pipes corrosion or rust
  - ✓ Drip irrigation systems clogging
    - Biological clogging, chemical precipitate clogging, no line flushing, physical clogging, start-up processes for drip irrigation system
- Inspection of the drip irrigation system to make sure the emitters work properly without leakage and clogging.
  - ✓ Malfunctions checklist for emitters
  - ✓ Causes of leaks for emitters
  - ✓ Emitters clogging

**Resources required for the learning outcome**

| | |
|---|---|
| Equipment | Control panel, Drip irrigation components, |
| Materials | Flip chart, Books, Technical manual, DVD players, PPE, Field, water source |
| Tools | Irrigation tool box |
| Facilitation techniques | • Demonstration and simulation<br>• Individual and group work<br>• Practical exercise<br>• Individualized<br>• Trainer guided<br>• Group discussion |
| Formative assessment methods | • Written assessment<br>• Oral presentation<br>• Performance assessment<br>• Project based assessment |

| **Learning outcome 2: Carry out regular hygienic conditions of the irrigation system** | **Learning hours: 10** |
|---|---|

**Indicative content**

- Oiling and greasing the pump engine
  - ✓ Types of fuel in accordance with the pump engine and specifications
  - ✓ Types of greases in accordance with the pump engine and specifications
  - ✓ Pump oiling and greasing process
  - ✓ Pumping schedule
- Cleaning the drip irrigation components

✓ Drip irrigation components:

- Pressure generating units (Pump unit), Water carrier units (Mainlines, sub mainlines, Laterals), Water delivery units (Drippers/Emitters), Filtration unit, Ancillary units (Fertilizer and other chemical applicator), Fittings and connectors

✓ **Types of cleaning materials**

- Detergents, acid cleaners, alkaline cleaners, solvent cleaners, polishes

✓ **Cleaning method**

- Flushing Lines, chlorination, acidification, polishing
- Technical procedures of cleaning, repairing, replacement and reassembling of drip components

- Flushing, closing down and maintaining irrigation kit for post-season
- Dismantling, loading, transportation and store equipment

✓ Disassemble techniques for drip system

✓ Storage conditions and requirements

- Humidity, ventilation, packaging, air conditioners, sunlight

✓ PPE

| Resources required for the indicative content | |
|---|---|
| Equipment | Pump engine, Pump, Air vessels, Pump, Fertigation Unit, water tank, Drip irrigation kit |
| Materials | Technical manual, Lubricants, Fuels, Greases, Oils, Chloride, Acid, DVD players, Books, Markers, Flip chart, DVD players, Pressure Control Valve, Pipe and Fittings, Emitters devices |
| Tools | Irrigation tool box |
| Facilitation techniques | • Demonstration and simulation<br>• Individual and<br>• group work<br>• Practical exercise<br>• Individualized<br>• Trainer guided<br>• Group discussion |
| Formative assessment methods | • Written assessment<br>• Oral presentation<br>• Performance assessment<br>• Project based assessment |

| Learning outcome 3: Carry out routine maintenance of drip irrigation system | Learning hours: 10 |
|---|---|

**Indicative content**

- Inspecting the wear, broken or reported irrigation parts

✓ Causes of blockages in a drip irrigation network:

- Pipes corrosion or rust
- Microorganisms (Plants and algae and other sediments deposit)

- Removing and replacing damaged materials
  - ✓ Pipe dissembling and reassembling techniques
  - ✓ Types of drippers and their connection techniques
- Clean and reassembling of pipes
  - ✓ Pipe dissembling and reassembling techniques
  - ✓ Types of drippers and their connection techniques

- Recording and reporting maintenance activities

  - ✓ Irrigation data recording techniques
  - ✓ Report format

| Resources required for the indicative content | |
|---|---|
| Equipment | Drip irrigation kit, water tank, pumping station |
| Materials | Flip chart, Books, Technical manual, Water, Pipes |
| Tools | tool box |
| Facilitation techniques | • Demonstration and simulation<br>• Individual<br>• group work<br>• Practical exercise<br>• Individualized<br>• Trainer guided<br>• Group discussion |
| Formative assessment methods | • Written assessment<br>• Oral presentation<br>• Performance assessment<br>• Project based assessment |

## Integrated/Summative assessment

### Integrated situation

ABIBUMBIYEHAMWE Ltd (Horticulture production and selling), is horticultural company working in Nyanza District, Mukingo Sector and grows different vegetables according to the market requirements. The company has several problems of poor maintenance of drip irrigation infrastructures which cause fewer yields of vegetables to be exported. For this reason, the company would like to recruit an experienced irrigation technician who will be in charge of drip irrigation facilities maintenance for their farm

The tasks should meet the following specifications:

1. Check all components of drip irrigation system;
2. Carry out regular hygienic conditions of the irrigation system;
3. Carry out routine maintenance of drip irrigation system;

The task must be completed within 8hours

**Resources**

| | |
|---|---|
| Tools | Toolbox, Pipe cutter, pipe wrench |
| Equipment | Fertilizer tank, Fertigation Pump, Water tank/ reservoir/ dam, Pump engine/ pump motor, Sand/screen Filters, Pressure gauge, Ventury |
| Materials/ Consumables | PPE, Inlet pipes, Outlet pipes, Valves, Fuses, Steel pipes |

| Assessable outcomes | Assessment criteria (Based on performance criteria) | Indicator | Observation | | Marks allocation |
|---|---|---|---|---|---|
| | | | Yes | No | |
| **Learning outcome 1:** Check all components of drip irrigation system **(30%)** | 1.1. Pump, filters, pipes, laterals and drippers are regular inspected to ensure their good conditions. | Ind.1 Checking of water quality and quantity | | | 4 |
| | | Ind.2Causes of pump malfunction | | | 3 |
| | | Ind.3Clean components of drip irrigation | | | 3 |
| | 1.2. Leakages of irrigation network are properly identified to maintain | Ind.1Malfunctions checklist | | | 3 |
| | | Ind.2Causes of leaks in | | | 3 |

| | | | | | |
|---|---|---|---|---|---|
| | the working pressure and water delivery to the crop | a drip irrigation | | | |
| | | Ind.3 Check the causes of Blockages | | | 3 |
| | 1.3. Drip irrigation system is periodically inspected to make sure that emitters work properly without leakage and clogging. | Ind.1 Start up processes for drip irrigation system | | | 4 |
| | | Ind.2Flush the sub-mains until the water at the end of the laterals runs clear | | | 4 |
| | | Ind.3 Operate the system | | | 4 |
| **Learning outcome 2:** Carry out regular hygienic conditions of the irrigation system **(30%)** | 2.1 The pump engine is properly oiled and greased according the time of operation | Ind.1 Identify fuels | | | 1.5 |
| | | Ind.2 identify grease | | | 1.5 |
| | | Ind.3Timely oiling the pump engine | | | 1.5 |
| | | Ind.4Timely greasing of the pump engine | | | 1.5 |
| | 2.2 Drip irrigation components are adequately cleaned according to safety condition and occupational health | Ind.1 drip components | | | 3 |
| | | Ind.2 types of cleaning materials | | | 2 |
| | | Ind.3choose cleaning method | | | 3 |
| | 2.3. System is properly flushed, closed down and maintained in post-season operation in accordance with design specifications and enterprise standards. | Ind.1 Preparation for flushing | | | 1.5 |
| | | Ind.2. flushing | | | 1.5 |
| | | Ind.3check and reassembling of damaged components | | | 3 |
| | 2.4 Equipments are careful dismantled, loaded, transported and stored according to enterprise standards and safe working practices. | Ind.1 Disassembling techniques of damaged components | | | 2 |
| | | Ind.2Repairing the damaged dripline | | | 4 |
| | | Ind.3 Safe working practices | | | 2 |
| | | Ind.4 storing in good conditions | | | 2 |
| **Learning outcome 3:** Carry out routine maintenance of drip irrigation system | 3.1. Irrigation parts are appropriately inspected and timely reported for wear or blockage according to enterprise guidelines | Ind.1check the weared or blocken parts | | | 3 |
| | | Ind.2identify the Causes of blockages | | | 2 |
| | | Ind.3Report on equipment damages | | | 2 |
| | 3.2 Damaged materials are carefully removed and replaced according to technical | Ind.1Identify the tools | | | 3 |
| | | Ind.2Technical disassembling for pipes | | | 3 |

| | | | | | |
|---|---|---|---|---|---|
| **(40%)** | specifications. | Ind.3Technical reassembling of pipes | | | 4 |
| | 3.3 Irrigation pipes are adequately removed, cleaned and proper reassembled according to manufacturer's specifications**.** | Ind.1 identification of tools | | | 2 |
| | | Ind.2Technical disassembling for pipes | | | 3 |
| | | Ind.3Technical replacement of equipment | | | 3 |
| | | Ind.4 Technical reassembling of pipes | | | 4 |
| | 3.4 Maintenance activities are regularly recorded and reported in accordance with enterprise standards**.** | Ind.1 Technical data recording | | | 4 |
| | | Ind.2 Report on drip irrigation components damages | | | 4 |
| | | Ind.3 Filling report format | | | 3 |
| **Total marks** | | | | | **100** |
| **Percentage Weightage** | | | | | **100%** |
| **Minimum Passing line % (Aggregate): 70%** | | | | | |

## References


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