Global Distributors Collective

# How to sell drip irrigation kits without having to be an agritech specialist

From our GDC innovation how-to-guide series

MWEZI

# Today's agenda

- Innovation Challenge scene-setting and intro to Mwezi pilot
- Conversation with Mwezi

  - Why a training tool?
  - Demo of the tool
  - Lessons learned from Mwezi's experience selling solar-powered drip irrigation kits

- Q&A

Photo credit: Bopinc

# About the GDC Innovation Challenge

A **unique** challenge that crowdsources innovations from **GDC members** and other organisations,

helps **pilot the best ideas**, and supports the broader last-mile distribution community to

**replicate and learn** from those innovations.

Funded by:

UKaid from the British people

Transforming Energy Access


SOLAR POWERED
DESIGNING THE Perfect IRRIGATION SYSTEM FOR EACH FARMER
RIGHT TOOLS
BEST PRACTICES

# Improving the uptake of solar powered drip irrigation systems to small-scale farmers in Western Kenya

# Agenda

1. **Why we thought this tool was needed? – Mike Sherry**

2. **Overview demo of tool – Mike Sherry**

3. **Pilot results – John Okiri & Faith Nkirote**

4. **Q & A**

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# The Why

An **existing customer base** who would benefit from a well designed drip irrigation system

Theoretically, drip irrigation could **improve** the **productivity** of small scale farmers in Sub-Saharan Africa using less water, less fertiliser and improving crop yields.

To achieve these benefits an **appropriate** drip irrigation system needs to be specified that takes account of the small scale farmers individual circumstances.

The **complexity** of specifying an effective drip irrigation system and prevented more widespread uptake.

The project intends to digitise the **tools and best practice** needed to improve the uptake of solar powered drip irrigation systems.

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# Project modules

1. Module 1- Brochureware

   Learning and sales tool

2. Module 2 – Customer Facing Decision Content

   Decision Trees

3. Module 3 – Digitisation

   Mobile app digital tool to deliver Modules 1 and 2.

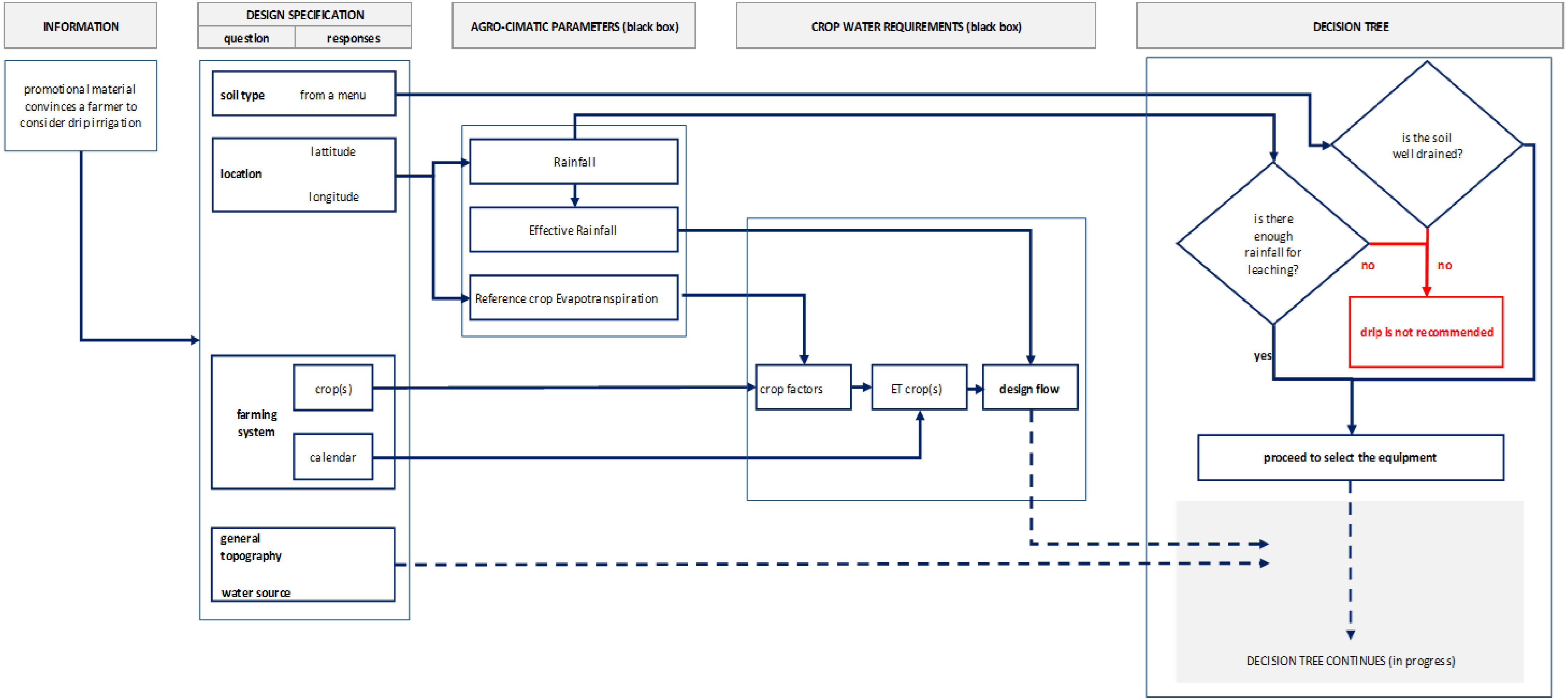
# Project module 1

## 1. Brochureware – paper & online training and information for staff, sales team and customers

- ❑ What is drip irrigation and what does it do?
- ❑ What are the key benefits for a small-scale farmer?
- ❑ What are the key components of a drip irrigation system?
- ❑ What different systems are available (description, advantages and disadvantages)?
- ❑ The importance of smart specifications for drip-irrigation systems.

# Project module 2

## Calculating Key design Parameters – decision tree



# Project module 2

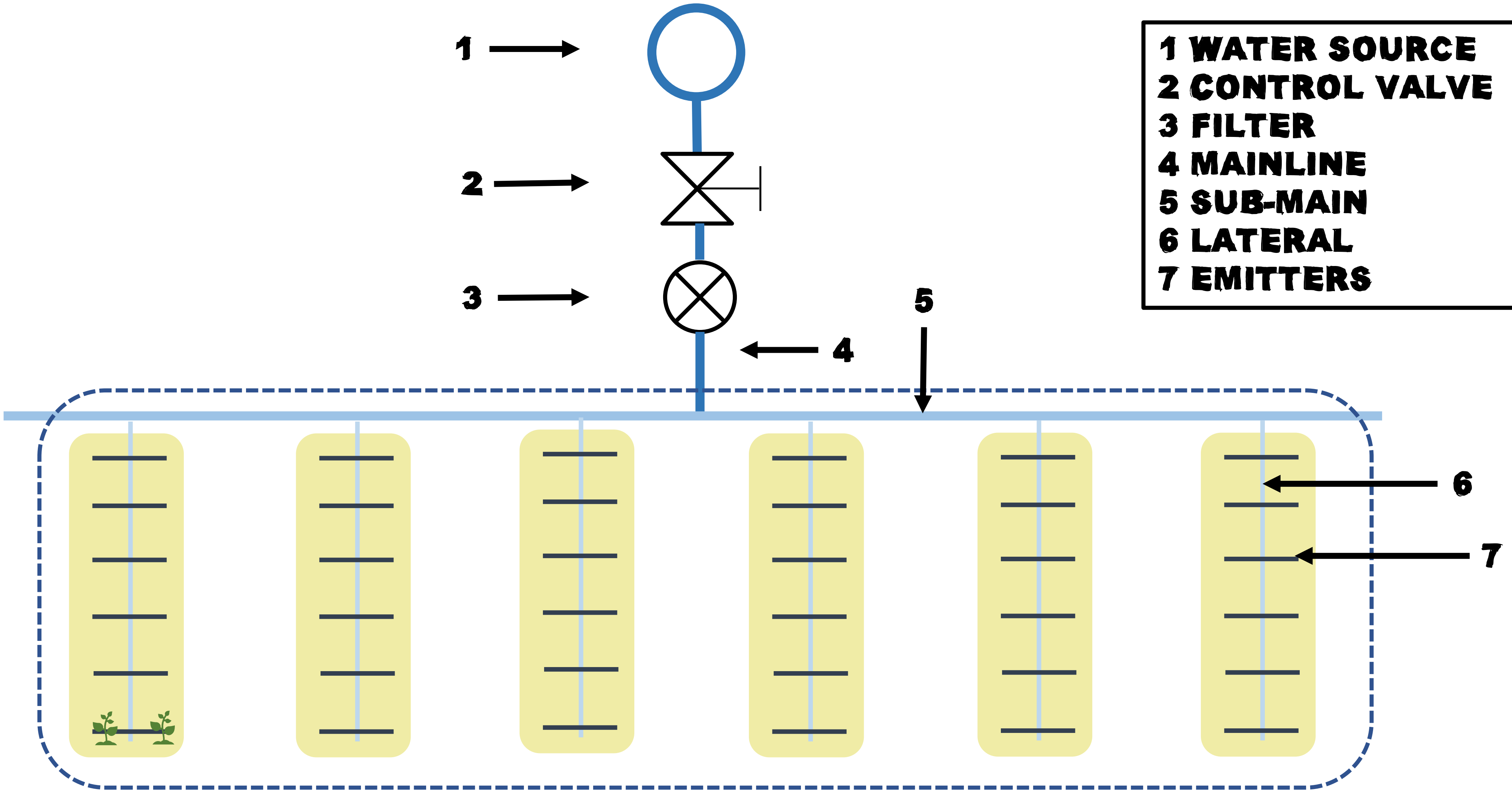
## In summary – data & decisions

1. **Soil type** – drip not recommended with poorly draining soil - clay soils

2. How much **water** is **required** to grow healthy crops
    - ❑ What plants are to be grown
        - ❑ At that particular farm location
        - ❑ What time of year
        - ❑ Difference between rainfall, evaporation and plant needs
        - ❑ Area to be irrigated
        - ❑ Individual plant water requirement - emitter distribution
    - ❑ Water source, storage and/or pump requirements

3. **Specifying the Equipment**
   Output from above will provide a technical specification of an appropriate system and design layout for the individual farmer.

# BASIC COMPONENTS




1 WATER SOURCE
2 CONTROL VALVE
3 FILTER
4 MAINLINE
5 SUB-MAIN
6 LATERAL
7 EMITTERS

NOT TO SCALE!

# WORKED EXAMPLE – FARM SURVEY DATA

| Crop Block | Units | Data |
|---|---|---|
| Length | m | 50 |
| Width | m | 20 |
| Area | $m^2$ | 1,000 |
| Shape | | Rectangle |
| Crop Name | | Maize |
| Planting Date | | 1st March |
| Plant Spacing | m | 0.4 |
| Row Spacing | m | 0.9 |
| Water Source Capacity | Litres | 5,000 |
| Water Head | m | 5 |
| Longitude | | 36.475 |
| Latitude | | 0.6800 |

# WORKED EXAMPLE – CLIMAT & CROPWAT

1. Use the Cropwat & Climat to identify for the farm location the month with the largest precipitation deficit.
2. Record the value of ETo value for that month

**SCHEME SUPPLY**

ETo station: TORORO                    Cropping pattern: test0203
Rain station: TORORO

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Precipitation deficit | | | | | | | | | | | | |
| 1. MAIZE (Grain) | 0.0 | 0.0 | 0.0 | 2.3 | 7.7 | 13.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Net scheme irr.req. | | | | | | | | | | | | |
| in mm/day | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| in mm/month | 0.0 | 0.0 | 0.0 | 2.3 | 7.7 | 13.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| in l/s/h | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Irrigated area (% of total area) | 0.0 | 0.0 | 0.0 | 100.0 | 100.0 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Irr.req. for actual area (l/s/h) | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**MONTHLY ETO PENMAN-MONTEITH DATA**
**(File: C:\Program Files (x86)\CLIMWAT 2.0 for CROPWAT V2.0\TORORO.pen)**

Country: Location 1                    Station: TORORO
Altitude: 1171 m.                    Latitude: 0.68 °N        Longitude: 34.16 °E

| Month | Min Temp °C | Max Temp °C | Humidity % | Wind km/day | Sun hours | Rad MJ/m²/day | ETo mm/day |
|---|---|---|---|---|---|---|---|
| January | 15.8 | 30.6 | 58 | 190 | 6.7 | 19.0 | 4.88 |
| February | 16.5 | 30.7 | 59 | 190 | 7.5 | 20.9 | 5.19 |
| March | 17.0 | 30.1 | 63 | 190 | 6.5 | 19.8 | 4.89 |
| April | 17.0 | 28.5 | 73 | 156 | 7.7 | 21.0 | 4.46 |
| May | 16.8 | 27.5 | 76 | 138 | 6.8 | 18.6 | 3.85 |
| June | 16.2 | 27.2 | 74 | 156 | 7.3 | 18.6 | 3.86 |
| July | 16.0 | 26.8 | 73 | 156 | 6.5 | 17.8 | 3.76 |
| August | 15.7 | 27.1 | 73 | 156 | 5.5 | 17.2 | 3.75 |
| September | 15.7 | 28.1 | 71 | 156 | 6.2 | 18.9 | 4.14 |
| October | 16.0 | 29.0 | 69 | 156 | 7.0 | 20.1 | 4.44 |
| November | 16.1 | 29.0 | 68 | 173 | 7.9 | 20.9 | 4.63 |
| December | 16.0 | 29.2 | 64 | 173 | 7.5 | 19.9 | 4.56 |
| Average | 16.2 | 28.6 | 68 | 166 | 6.9 | 19.4 | 4.37 |

ETo 3.86 mm/day

# WORKED EXAMPLE – INITIAL INPUT TO DETERMINE OVERALL WATER REQUIREMENT

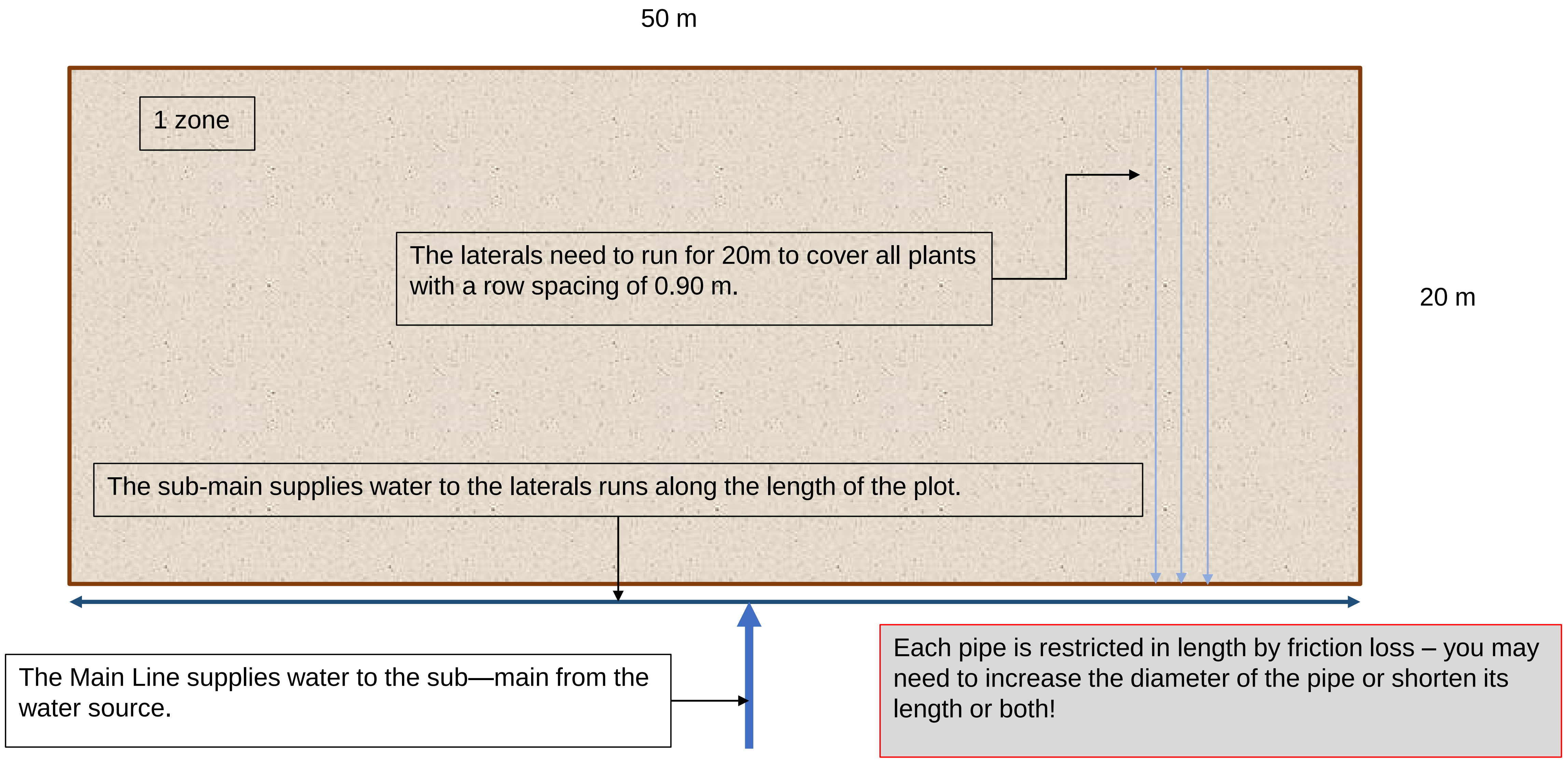
Worksheet extract

| Data | Units | CROP BLOCK 1 |
|---|---|---|
| | | |
| Crop | | Maize |
| | | |
| **Dimensions** | | |
| Length | m | 50 |
| Width (m) | m | 20 |
| Area (L x W) | m 2 | 1,000 |
| | | |
| Maximum ETo | mm/day | 3.86 |
| | | |
| Crop Factor (Look up) | | 1.20 |
| Emission Uniformity | | 90% |
| Canopy Factor | | 1.0 |
| | | |
| Peak Water requirement | | 5.1 |
| **Max. Water requirement for block** | litres/day | **5,147** |

| Notes |
|---|
| Look up in relevant sheet |
| Calculated or pull through from other sheet |
| Manual entry required |
| See Crop Factor sheet for values - if not listed choose nearest value or use 1.0 |
| If climate is hot dry use 80%, moderate - 85%, humid - 90%. |
| =Canopy area/Plant Spacing x Row Spacing, use 1.0 for row crops, orchard crops will need to be determined. |

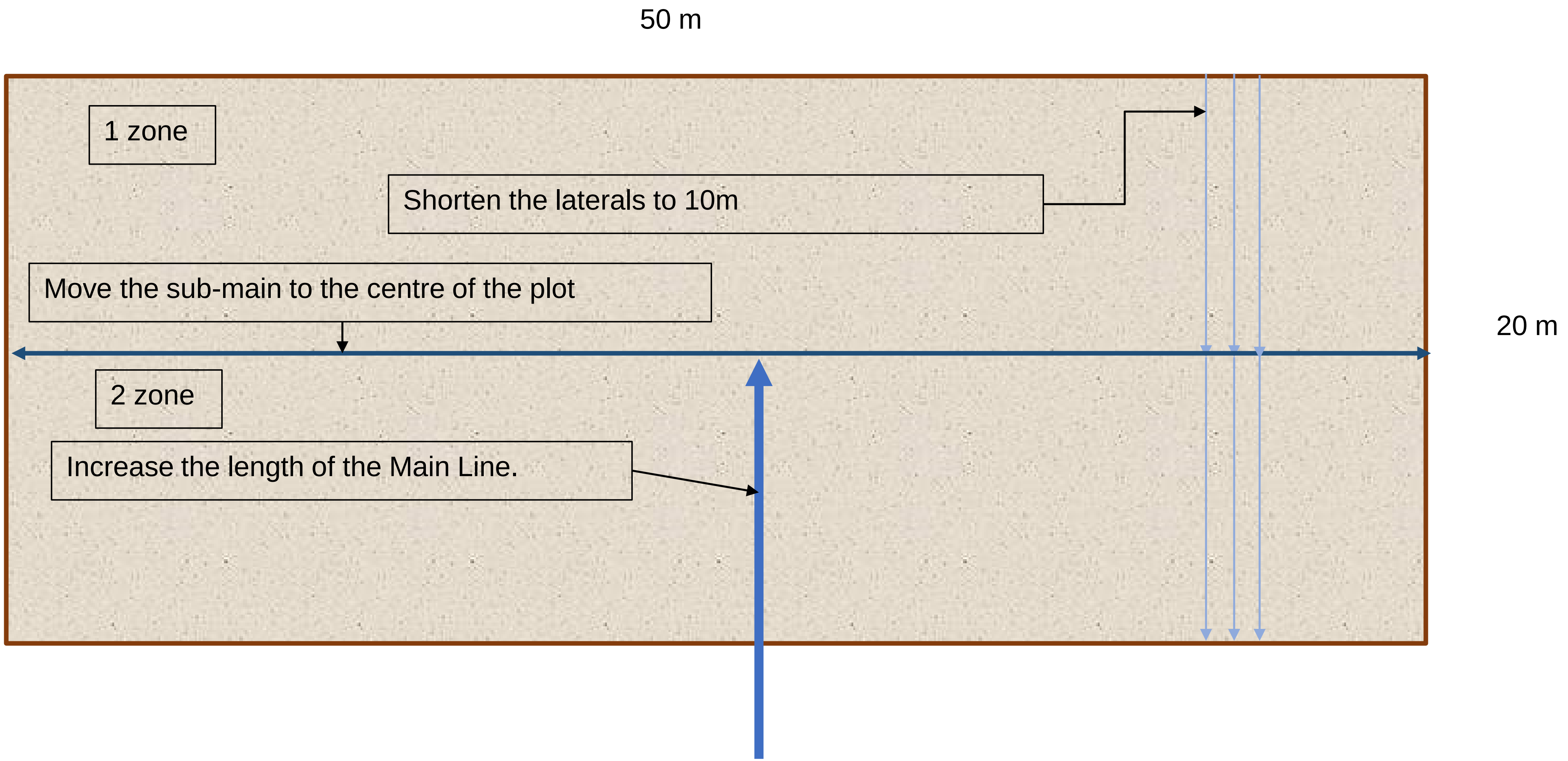
From previous slide

# WORKED EXAMPLE – DESIGNING THE LAYOUT



# WORKED EXAMPLE – CHANGING THE LAYOUT THE LAYOUT

Each pipe is restricted in length by friction loss – you may need to increase the diameter of the pipe or shorten its length or both!



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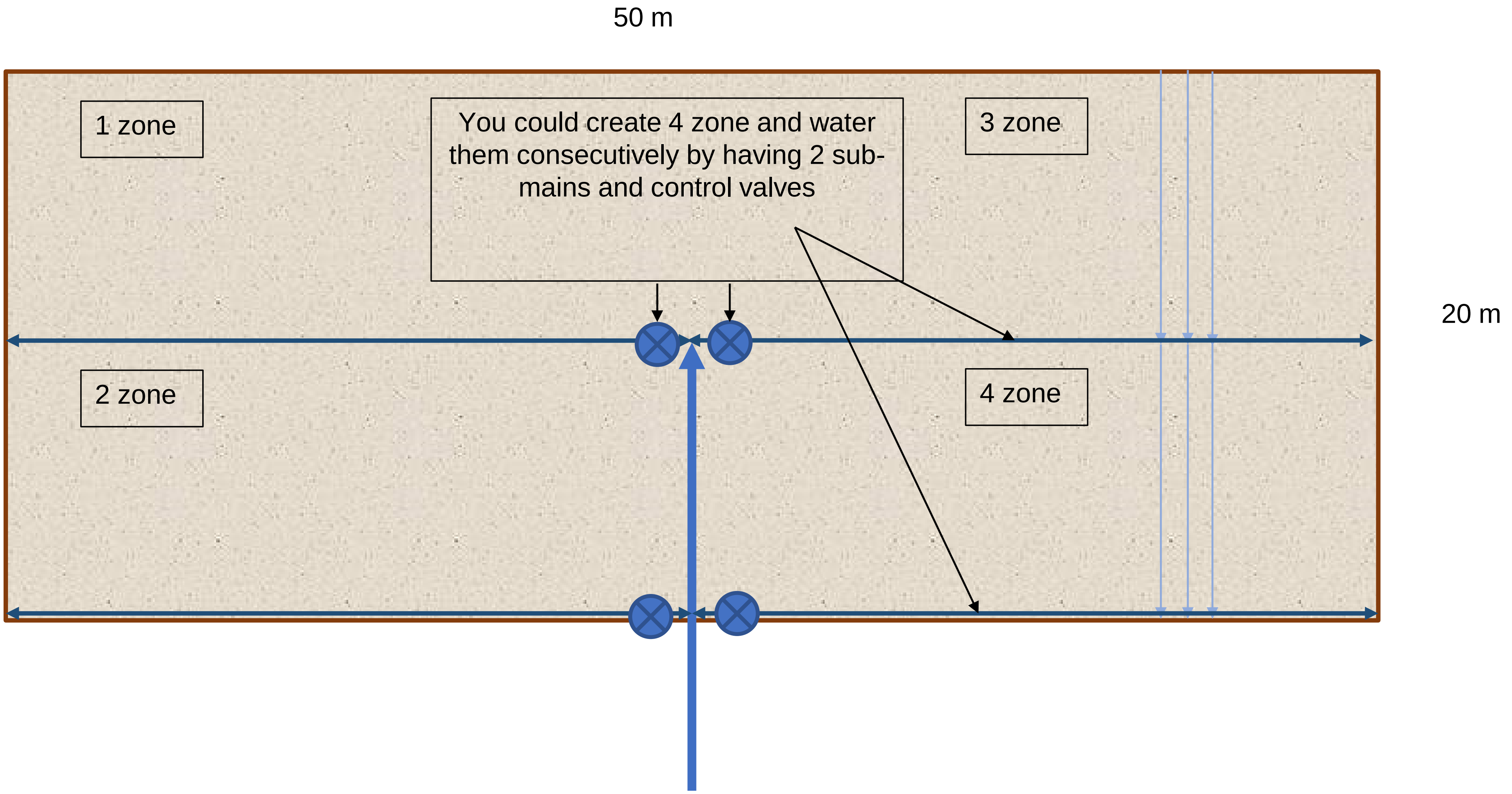


# WORKED EXAMPLE – INPUT LATERAL DATA

Worksheet extract

| | | |
|---|---|---|
| **Lateral Design** | | |
| Crop Row spacing | m | 0.90 |
| Length of laterals required | m | 1,111 |
| Plant Spacing | m | 0.40 |
| No. of plants | | 2,778 |
| Emitter spacing on lateral | m | 0.30 |
| Irrigation rate of lateral | litres/hr/m | 2.00 |
| Diameter of lateral | mm | 16.00 |
| Total Number of emitters | | 3,704 |
| Total flow rate | Litre/hr | 7,407 |
| | | |
| No. of laterals | | 56 |
| Division of laterals | | 1 |
| Length of laterals | m | 20 |
| | | |
| Friction loss for length of lateral | m | 0.03 |
| Maximum head loss 20%, of 10m | m | 2.00 |
| | | OK |
| | | |

Data in grey is calculated from initial inputs

This data can be obtained from supplier data sheets

This figure is calculated by the worksheet– if the lateral design is out of limit then change either the diameter of the lateral or divide the lengths

Once the laterals are designed within tolerances then design the sub-main

# WORKED EXAMPLE – INPUT SUB-MAIN DATA

Worksheet extract

| | | |
|---|---|---|
| **Sub-Main** | | |
| No. of sub-Mains | | 1 |
| Length of sub-Main | m | 50 |
| No of laterals from each sub-main | | 56 |
| Sub-Main flow | Litre/hr | 7,407 |
| Diameter of Sub-Main | mm | 32 |
| | | |
| Friction loss for, length of sub-main | m | 3.56 |
| Maximum head loss 20%, of 10m | m | 2.00 |
| | | OUT OF LIMIT |

The friction loss for this design exceeds maximum tolerance

1 x 32mm sub-main 50m long is out of limit

| | | |
|---|---|---|
| **Sub-Main** | | |
| No. of sub-Mains | | 2 |
| Length of sub-Main | m | 25 |
| No of laterals from each sub-main | | 28 |
| Sub-Main flow | Litre/hr | 3,704 |
| Diameter of Sub-Main | mm | 32 |
| | | |
| Friction loss for, length of sub-main | m | 0.56 |
| Maximum head loss 20%, of 10m | m | 2.00 |
| | | OK |

Change to 2 x 25m Sub-Mains

Inside design tolerance

Once the sub-main is designed within tolerances then design the main line

# WORKED EXAMPLE – INPUT MAIN-LINE DATA

Worksheet extract

| **Mainline Design** | | |
|---|---|---|
| Length, m | | 100 |
| No. of sub-Mains | | 2 |
| Sub-Main flow rate, LPH | | 3,704 |
| Diameter of sub-main (mm) | | 50 |
| | | |
| Friction loss for, length of Main-Line | m | 0.46 |
| Maximum head loss 20%, of 10m | m | 2.00 |
| | | OK |
| Velocity m/s | | 0.52 |
| Maximum velocity in Mainline - 2.5m/s | | OK |

Change the length and diameter of the Main Line to meet tolerances.

Main Line design has two tolerances:
Friction Loss
Max. Velocity

# WORKED EXAMPLE – TOTAL DYNAMIC HEAD LOSS

Worksheet extract

| | | |
|---|---|---|
| **Total Dynamic Head Loss (m)** | | |
| Emitter operating pressure | | 10.00 |
| **Head loss in lateral** | | 0.03 |
| Lateral elevation | | - |
| **Head loss in sub-main** | | 0.56 |
| Head loss in Valve -assume 2m | | 2.00 |
| Field fitting head loss | | 5.00 |
| **Head loss in Main line** | | 0.52 |
| Filter head losses | | 2.00 |
| Fertigation equipment head loss | | 5.00 |
| Water Source depth | | - |
| Suction head | | 1.00 |
| Delivery head | | 1.00 |
| Safety equipment head loss | | 2.00 |
| Elevation difference | | - |
| | | |
| **Total Head Required** | | **29.12** |
| | | |
| Flow required through Mainline | LPH | 3,704 |
| | LPS | 1.03 |
| | | |
| Watering time | Hours | 1.39 |
| Number of sub-Mains | | 2 |
| Total watering time | Hours | 2.8 |
| Total daily watering requirement | Litres/Day | 5,147 |
| Current storage capacity | Litres | 10,000 |
| **Shortfall** | | 4,853 |

This data is used to specific an appropriate pump

Also determine if there is sufficient irrigation water available

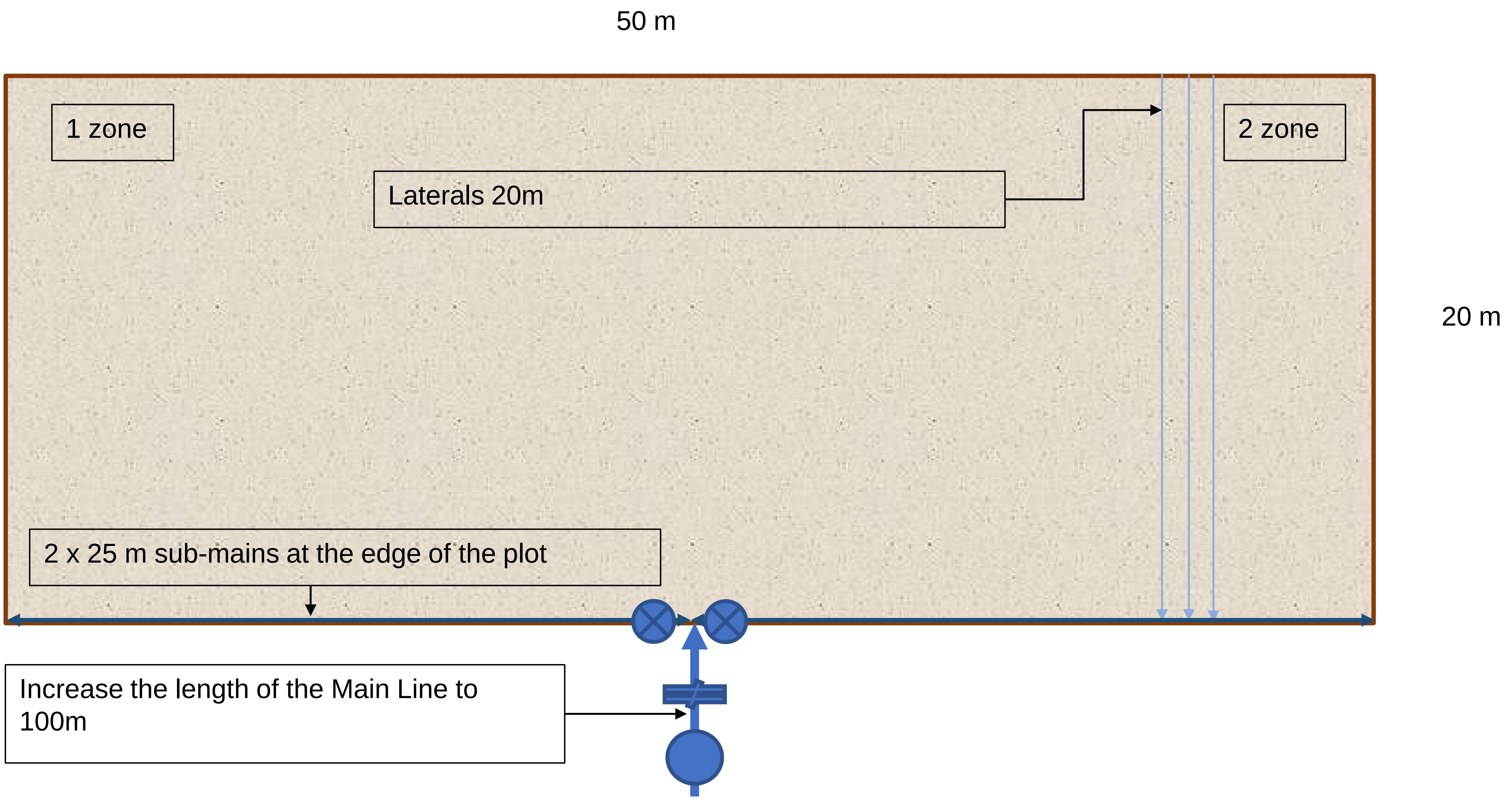
# WORKED EXAMPLE – MATERIALS & QUANTITIES

Worksheet extract

| Materials and quantities | | CROP BLOCK 1 |
|---|---|---|
| **Laterals** | | |
| Diameter | mm | 16 |
| Length | m | 20 |
| Division | | 1 |
| Quantity | | 56 |
| **Total Length** | **m** | **1,120** |
| **Sub-Main** | | |
| Diameter | mm | 32 |
| Length | m | 25 |
| Division | | 1 |
| Quantity | | 2 |
| **Total Length** | **m** | **50** |
| **Main Line** | | |
| Diameter | mm | 50 |
| Length | m | 100 |
| Quantity | | 1 |
| **Total Length** | **m** | **100** |
| **Emitter Specification** | | |
| Emitters | No. | 3,704 |
| Spacing | m | 0.30 |
| Volume | litres/hr/m | 2.00 |
| | | |
| **Number of Irrigation Zones** | | |
| Lateral | | 1 |
| Sub-Main | | 2 |
| **Total zones** | | **2** |

This data can be used to produce an accurate cost

# WORKED EXAMPLE – FINAL DESIGN



# Project module 3

## Digitisation

- Mobile and web application
  - Capture data on site via a questionnaire (inputs)
  - Process the data through the decision tree (process)
  - Drip irrigation is not recommended (output)
  - Technical specification of equipment (output)
  - Match technical specification to LMDs product catalogue (output)
  - Provide customer with an accurate quote (output)

- Specification can be completed without mobile and web app – manual processing

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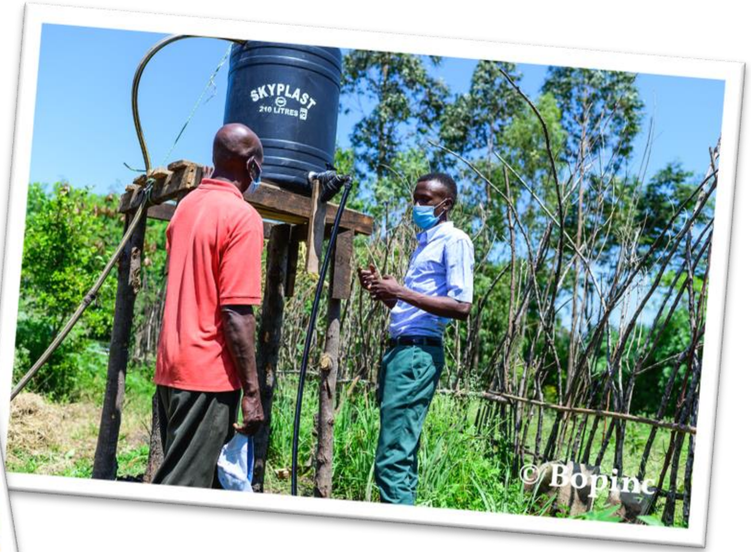
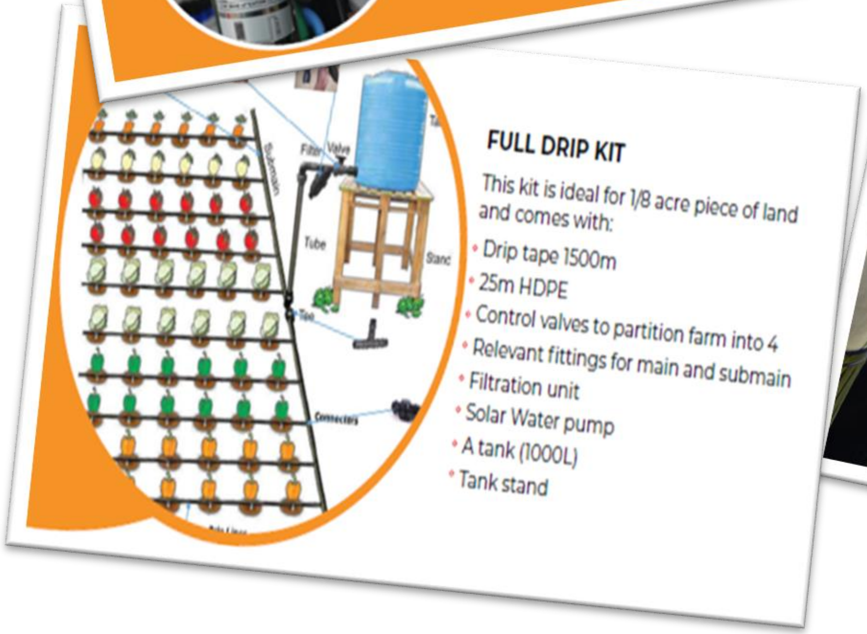
# Pilot results

- Training
- Customers feedback
- Learnings
- Way forward


# Customers

- Christopher
  - Purchased basic kit on 4th December 2020
  - 1 day to install
  - Successfully growing spinach, amaranth and spider plant
- Francis
  - Purchased full drip kit 11th Feb 2021
  - 2 days to install
  - Plant kale and African nightshade for selling locally and own consumption
  - No longer reliant on rainfall
- Peter
  - Purchased full drip kit on 31st March 2021
  - 3 days to install
  - Planting vegetables

# Options and recommendations

- Everyone in organisation needs training about basic drip irrigation
- Sales team can offer drip irrigation but should refer to specialist sales team who have more knowledge
- Farm survey data critical – can be paper or digital
- Soil type determines if drip is recommended
- Once data survey is complete either process in house or passed to partner supplier who specializes in irrigation and can specify the system needed.
- Supply and installation can be done by supplier or trained in house team if you carry products

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**Thank you**

MWEZI

# Q&A