PHANS4 CONSULTING PVT. LTD.

MICRO IRRIGATION

DRIP IRRIGATION SYSTEM

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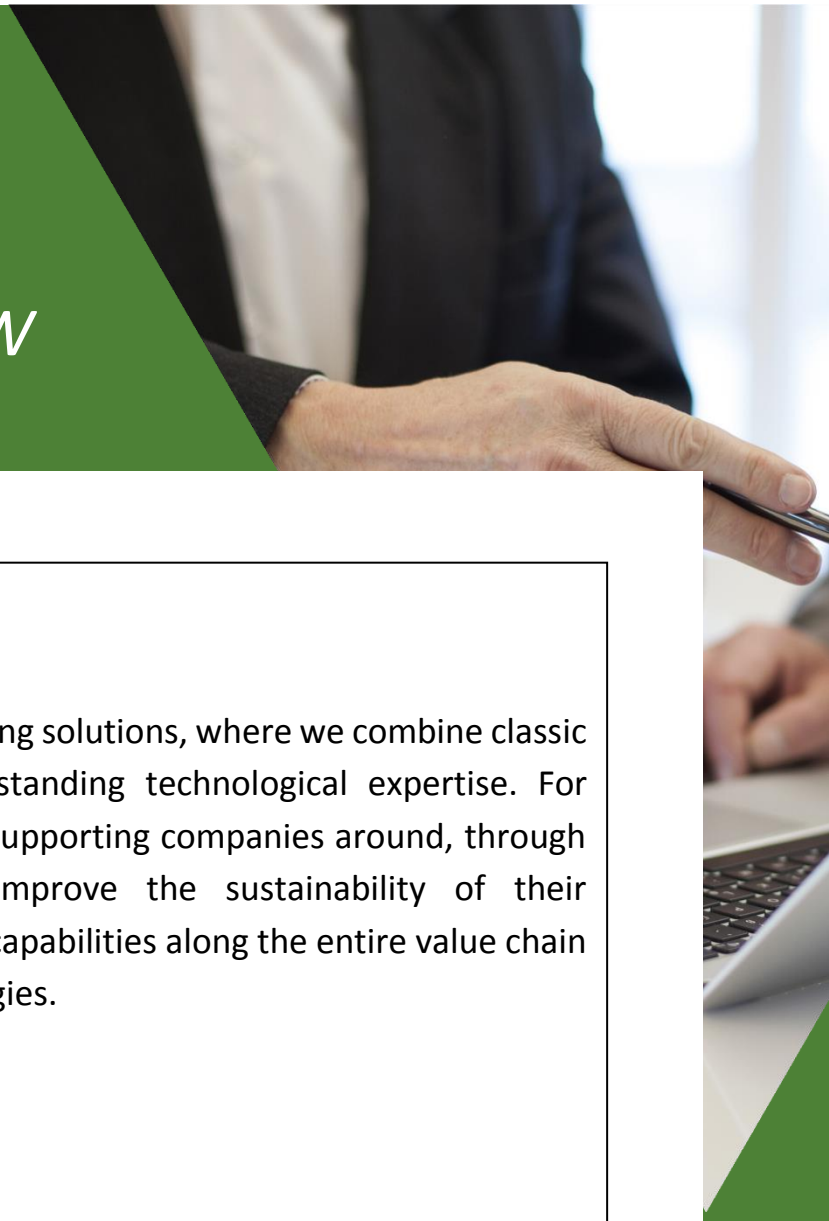
AN OVERVIEW



About us

Phans4 is engaged in global consulting solutions, where we combine classic management consulting with outstanding technological expertise. For more than 9 years, we have been supporting companies around, through various consulting services to improve the sustainability of their competitiveness and performance capabilities along the entire value chain with the aid of innovative technologies.

Vision

Phans4 consulting private limited is a global diversified company with a network of workforce committed to the growth of your business through innovation which strikes for a sustainable development of your business.

Areas We Do Consulting

Phans4 consulting services are carried out in areas like water resources, lift irrigation schemes, micro irrigation (drip & sprinkler), rural water supply and sanitation, effluent treatment plants, sewage & sewerage treatment, storm water drainage system, lake development.

DRIP IRRIGATION

Introduction

Over the years PHANS4 CONSULTING has been providing complete package of consultancy service in micro irrigation with various aspects covering design of drip irrigation network, automation, operation and maintenance of the system. Phans4 has a team of exceptional professional who can survey the proposed area and can design effective drip irrigation systems with cost effective designs per acre.

At Phans4 we understand that the Drip irrigation designs should match to your farm's operating conditions including the type of water you have, the infrastructure already in place and the lay of the land. We at phans4 consulting deliver comprehensive professional drip irrigation design services that will take all of these factors into account while designing a system that is perfect for your farm.

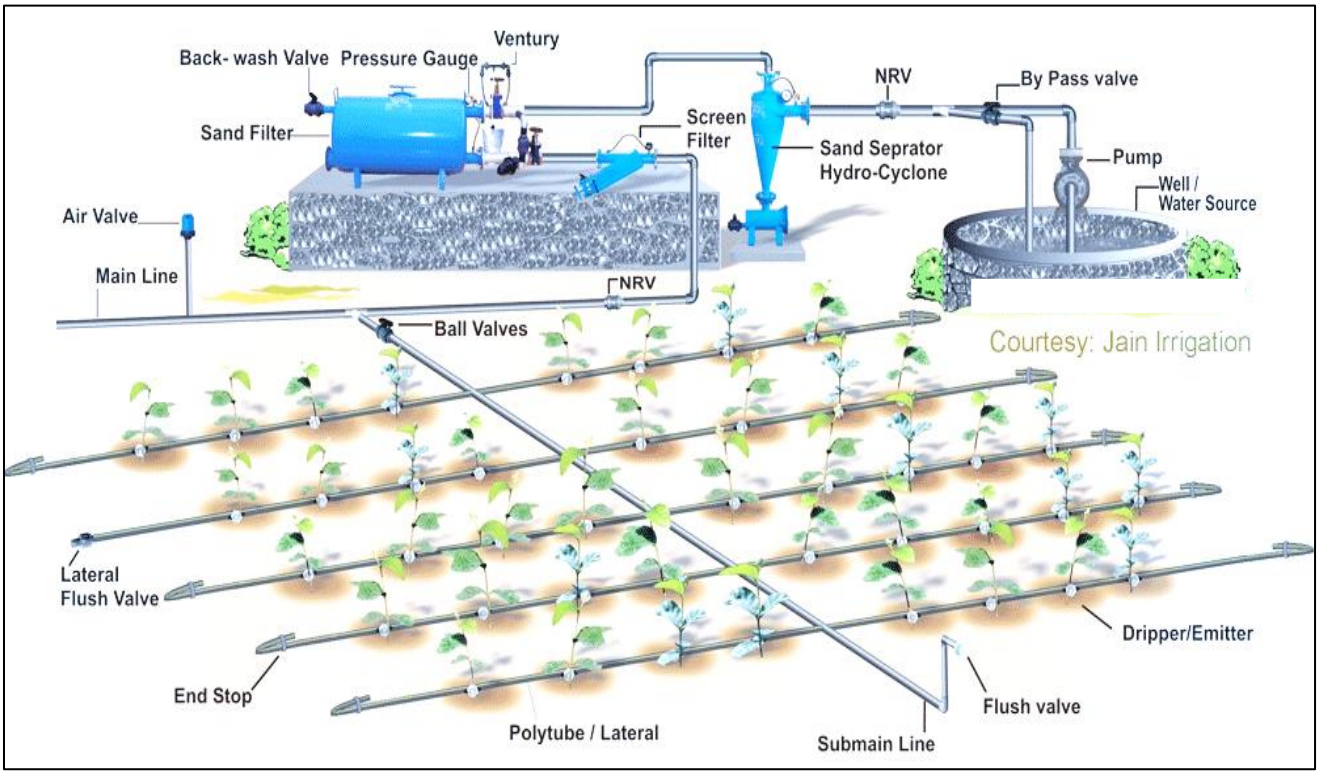
Our Understanding about Drip irrigation:

Drip irrigation is a water conserving technology that is aimed at reducing water wastage. The system delivers water through small holes made on pipes. The system uses ensures frequent supply of water to the plant the as this system has many advantages which include

- High crop yields & High yields are realized as a result of regular water supply to the plant
- Water conservation and efficient water usage. Since the system delivers water to the roots of the plant, it ensures that water is conserved thus ensuring that there is no wastage.
- Low chemical and fertilizer application costs. Since the chemicals and fertilizers are applied together with the water, it saves on labor and costs.

Drip irrigation systems consist of emission devices serviced by a water distribution network that includes control zone equipment. At the water source, water is controlled with automatic valves, sometimes amended with nutrients or chemicals, filtered and regulated at levels suitable for the emission devices chosen and plants being grown. From there, water is delivered to each of the emission devices through a network of PVC and PE pipes. The emission device, whether it is drip tape, a drip emitter, jet or micro-sprinkler, then delivers water and nutrients to the soil where plant roots may nourish the plant.

TYPICAL LAYOUT OF DRIP IRRIGATION SYSTEM



Advantages of Drip irrigation:

Drip irrigation is the targeted, intelligent application of water, fertilizer, and chemicals that when used properly can provide great benefits, such as:

- Increased revenue from increased yields
- Water saving
- Enhanced plant growth and yield.
- Increased revenue from increased quality
- Decreased water costs
- Improved environmental quality
- Saving in labor and energy
- Most suitable to poor soils
- Decreased labor costs
- Decreased energy costs
- Control of weeds
- Economy in cultural practices and easy operations

- Flexibility in operation
- Decreased fertilizer costs
- Decreased pesticide costs
- No soil erosion
- No land preparation

PHANS4 DRIP IRRIGATION CONSULTING OFFERS FOLLOWING SERVICES

To maximize the benefits from drip irrigation system, phans4 consulting service will ensure the effective site investigation, design aspects, installation and usage of the appropriate technology mix to maximize the benefits you receive.

Understanding this criteria phans4 teams backed up with consulting services like

1. Irrigation parameters
2. Major components
3. Determination of water requirement
4. Crop water requirement
5. Crop selection criteria
6. Design of main line
7. Design of sub main
8. Design of distribution line
9. Pipe materials & diameters
10. Project Management
11. Operation and maintenance

Irrigation parameters

Some of the irrigation parameters to be determined included:

- Application rate of the drip system, depending on the type of soil
- Application efficiency which depends on system of distribution.
- Irrigation water requirement.
- Operating time of the system.
- Management allowed depletion.

- Total run-time of the system per day.
- Maximum run-time per cycle.

Major Components of drip irrigation system

1. Water Sources for drip irrigation - There are basically two main types of water sources: groundwater and surface water: Many existing and potential water supply sources for irrigation systems are derived from surface water, which does not tend to have high levels of salts (with the exception of some coastal areas), and thus systems are usually less prone to formation of precipitates in drippers when using a surface water source.
    a. Surface water - tends to introduce biological hazards. If wastewater is being considered as a source, quality and clogging potential will vary depending upon the extent of treatment.
    b. Groundwater is generally of higher quality than surface water. However, iron and manganese levels should be measured, as high levels may lead to dripper clogging, and treatment may be required.
2. Intake facilities - This refers to structures built at the abstraction point from the water source to the conveyance System. It may involve a pumping or gravity system depending on the nature of the place.
3. Distribution System – Once the emission device is chosen, a system of filters, chemical injectors, pipes, valves and fittings must be constructed to deliver water reliably, safely and efficiently to each outlet, and to facilitate system maintenance.
4. Emission Devises – Emission devices vary according to their flow rate, hydraulic characteristics and wetting pattern. The ideal emission device is durable (withstands outdoor conditions), resists clogging (large internal passageways, self-flushing), is insensitive to pressure variation that occurs as a result of slope and/or lengths of run (pressure compensating), accurate (low manufacturing Coefficient of Variation, or CV), and is economically affordable. Drip irrigation emission devices are typically installed on the surface such that there is flexibility in placement and convenience for management. These attributes are achieved via advanced plastics, hydraulics, and injection molding technology.
5. Control Zone Equipment – Now the drip irrigation system must be monitored and operated. It cannot be stressed enough how important the first two categories (flow

meters and pressure gauges) are to assess performance and guidance for operation, and how important the last two categories (valves and controllers) are to deriving the maximum benefit from a drip irrigation system.

Determination of Irrigation water requirement

In determination of irrigation requirement several factors were looked into which include:

- Evapotranspiration rate of the area based on reference crop.
- Effective rainfall
- Irrigation efficiencies
- Proposed crop and cropping patterns
- Assumption of no ground water contribution

Crop water requirement estimation

Phans4 consulting professionals has predetermined the crop water requirement data based on information collected on climatic characteristics of the area (temperature, rainfall, humidity, sunshine hours and wind speed), soil characteristics of the area, existing crops with the cropping pattern and existing vegetation.

Sr. No.	Crop	Peak Water Requirement
1	Grapes	10 – 12 Ltr/Day/Plant
		18 – 20 Ltr/Day/Plant
		24 Ltr/Day/Plant
		30 Ltr/Day/Plant
2	Pomegranate	30 – 40 Ltr/Day/Plant
		40 – 50 Ltr/Day/Plant
		70 – 75 Ltr/Day/Plant
3	Guava	70 – 80 Ltr/Day/Plant
		100 – 120 Ltr/Day/Plant
		120 – 130 Ltr/Day/Plant
4	Mango	120 – 140 Ltr/Day/Plant
		150 – 170 Ltr/Day/Plant
5	Sapota / Chiku	120 – 140 Ltr/Day/Plant
		150 – 170 Ltr/Day/Plant
6	Orange / Lemon / Citrus	75 Ltr/Day/Plant
		85 Ltr/Day/Plant
7	Custard Apple	40 Ltr/Day/Plant

		50 Ltr/Day/Plant
8	Ber	30 Ltr/Day/Plant
		55 Ltr/Day/Plant
9	Banana	22 Ltr/Day/Plant
		25 Ltr/Day/Plant
		22 Ltr/Day/Plant
		25 Ltr/Day/Plant
10	Papaya	18 Ltr/Day/Plant
		20 Ltr/Day/Plant
11	Coconut	90 Ltr/Day/Plant
12	Cardamom	15 Ltr/Day/Plant
13	Rubber	24 Ltr/Day/Plant
14	Oil Palm	150 Ltr/Day/Plant
15	Sugarcane	20 Lit/Mtr/Day
		18 Lit/Mtr/Day
		16 Lit/Mtr/Day
		14 Lit/Mtr/Day
16	Cotton	15 Lit/Mtr/Day
17	Vegetables / Flowers	14 Lit/Mtr/Day
		12 Lit/Mtr/Day
18	Tea / Coffee	15 Lit/Mtr/Day
		13 Lit/Mtr/Day

Crop selection criteria

- Land suitability in terms of (climate, soils, topography) for cultivation of various crops under irrigation.
- Financial and economic returns to farmers.
- Market potential and its requirement
- Farmers' familiarity with various crops.

Overall design project criteria

Prime objectives of design should be,

- To achieve higher water application and conveyance efficiency.
- To optimize both initial as well as operation cost.
- To design the system for long term and high performance.
- To satisfy and fulfillments and requirements of the farmer

Design of Mainline

Mainlines are pipelines that are connected to the conveyance lines and are mostly buried in the ground. They are made from either PVC or steel material depending on the nature of the place where they are to be laid. Their sizes are determined by considering quantity of water flowing through the pipe, velocity

Required, ground elevation etc.

Design of mainlines looks into the following:

- Velocity (recommended range is between 0.5 to 1.5m/s)
- Class of pipe: If possible it is recommended that a low class pipe be used as it minimizes cost.
- Control measures- provide air release valves at suitable points, pressure reducing valves where necessary so that there's uniform distribution of water.
- Areas of minimal bends as bends result into head losses which should be minimized

Design of sub-mains

This is a conduit majorly that carries water from the main-line to serve a particular area. Its design is similar to that of the lateral main lines and it may include pressure regulators, flow control valves, manual or automatic control valves and filters. It is observed that discharge decreases across the length of the sub-main line.

Design of distribution lines

These conduits carry water from sub-mains and distributes to the lateral lines. They have a smaller diameter compared to the sub-main lines. Their size and length depends on topography, lateral flow rate, pressure loss in laterals and total pressure variation

Pipe materials/ characteristics

The proposed network for the system will consist of different pipe materials as shown below

- HDPE - this is suitable for rocky areas that require pipe diameters up to 100 mm
- PVC pipes- this is suitable for non-rocky areas and diameters above 100 mm (these are locally produced)
- PE- For infield irrigation systems.

Selection of pipe diameters

The following design criteria were applied in determination of pipe sizes and in selection of pipe material.

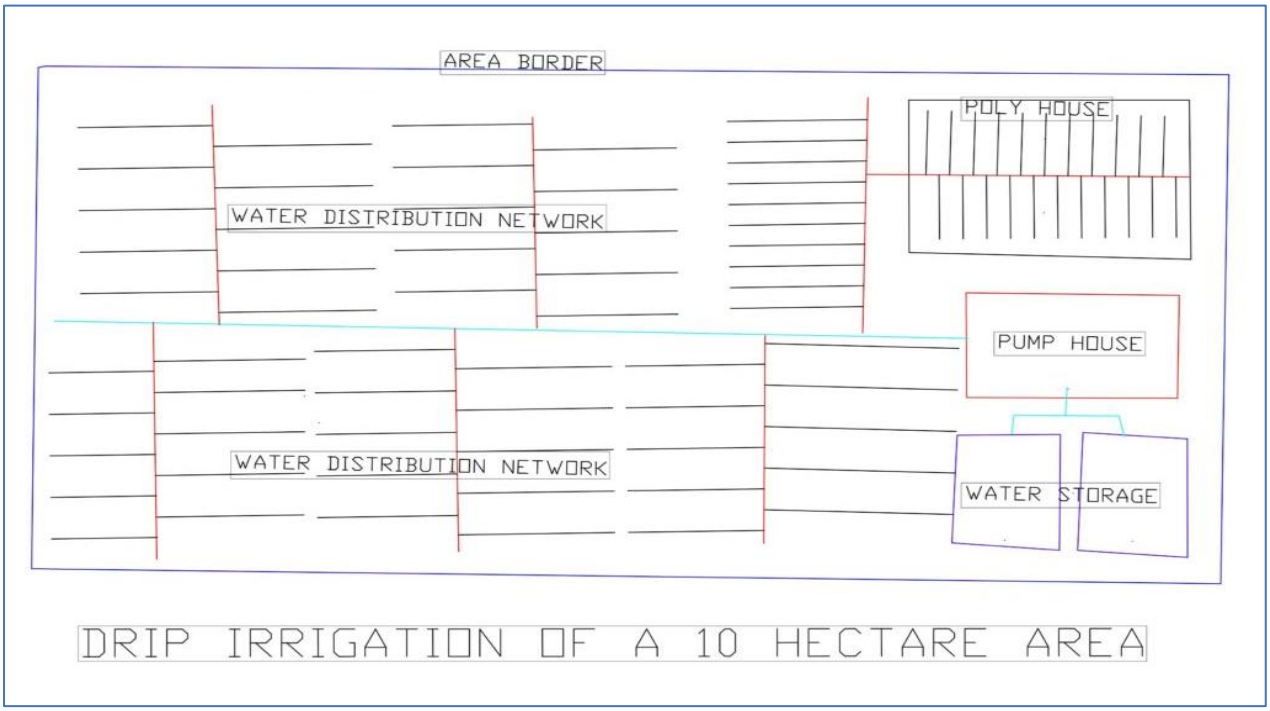
- A minimum flow velocity of 0.35m/s is set to avoid siltation in the pipe system.
- Maximum flow velocity of 2.5 m/s for pvc.
- Hazen-Williams formula used in determination of friction losses within pipe system, Roughness coefficient C=140 for pvc.
- Inside pipe diameters have been used in the design.
- Where ground is rising, larger pipe diameters are to be used to minimize friction losses and make more head available as long as flow velocity is within acceptable ranges.
- Lateral diameters are fixed between the ranges 25-20mm.

Tools employed.

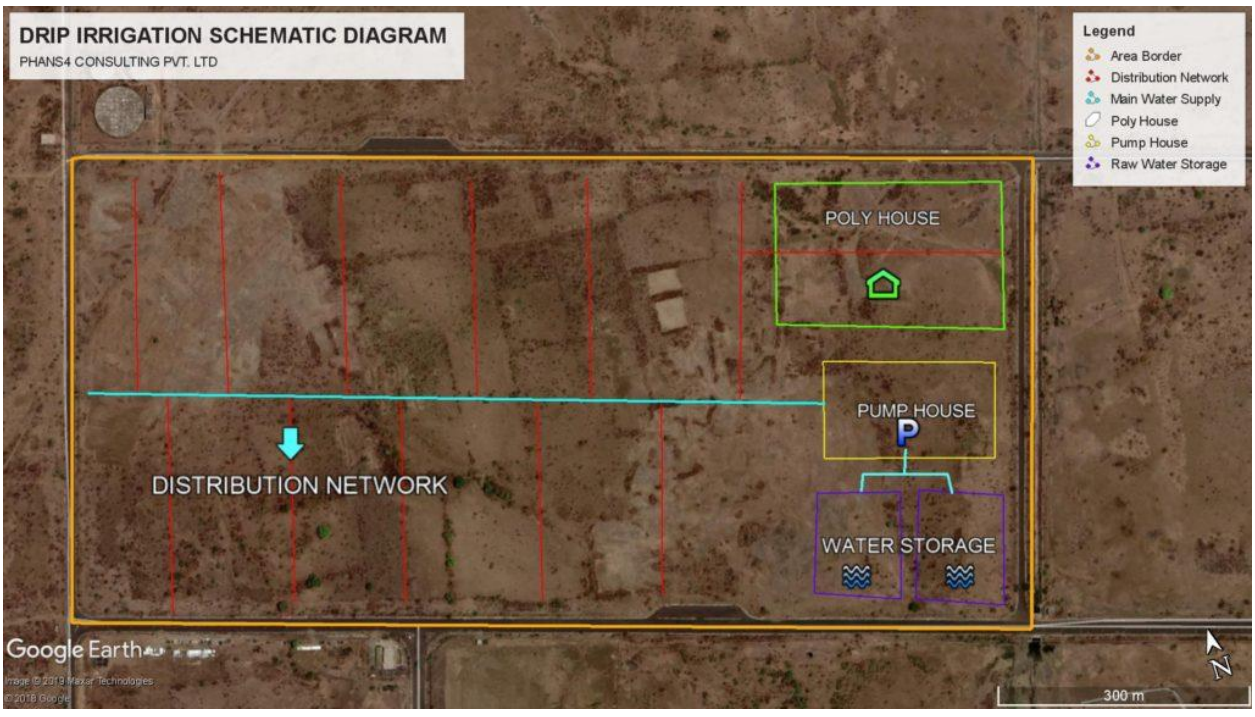
Some of the tools that were incorporated during the design include:

- Global mapper together with Digital Elevation Model in generation of profiles,
- Google earth for preliminary estimation of aspects such as lengths and identification of a suitable area for intake.
- Excel spreadsheets for the design of pipeline hydraulics
- AUTOCAD for presentation of design drawings.

LAYOUT OF THE DRIP IRRIAGTION SYSTEM



LAYOUT OF THE DRIP IRRIAGTION SYSTEM ON GOOGLE EARTH



PUMP FOR THE DRIP IRRIAGTION SYSTEM

ON FIELD DRIP IRRIAGTION SYSTEM

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