Durian

Irrigation & Fertigation Guidelines

NETAFIM™

orbia

Introduction

Durian is a highly prevalent fruit for 60% of the world's population, particularly in Southeast Asia. However, durian trees are very sensitive to water stress, leading to high mortality rates in young trees, slow development, and low production.

Since precision irrigation systems mitigate water stress, they help overcome such challenges. These systems lower the mortality of young trees and enable faster, higher and better-quality yields to raise growers, income and to provide them with a rapid return on investment (ROI).

Drip irrigation is a fast-reacting system that enables optimal and uniform soil moisture with outstanding aeration, while directly distributing water and nutrients to the crop's root zone. Increasing yields while lowering nutrient and water usage, drip is the most cost-efficient irrigation solution for growing durian.

Drip Irrigation and Fertigation Benefits

- **Higher yields** – Intensive cultivation with drip irrigation and fertigation significantly increases yield.
- **Better quality** – Precise drip and fertigation capabilities improve crop quality.
- **Significant water and nutrient savings** – An efficient irrigation system leads to water savings and better water use efficiency (WUE) and nutrient use efficiency (NUE) (kg&mm/ton).
- **Crop protection** – Drip offers an innovative and cost-effective method for applying a wide range of substances that protect the crop in an environmentally safe way.

Irrigation of Durian

General guidelines

Below are basic guidelines for the irrigation and fertigation of durian orchards with an estimated yield of 8-16 tons/Ha in tropical climates. Durian roots do not have root hair, which leads to inefficient water uptake. You should adapt your plan to specific local conditions related to soil type, climate, rootstock, planting patterns, and yield targets.

Irrigation recommendations

- Most of the roots of durian trees are shallow (0-45cm) and are under the tree canopy. Place the two driplines on each side of the tree lines at an effective distance according to age and canopy size (20-70cm from the trunk).
- Micro-sprinkler irrigation requires about a 20% additional water dose compared to drip. Lay out the sprinklers based on tree age and canopy size.
- There is a need for 3-4 weeks of water stress (no irrigation and rain) for flowering induction.
- Recommendations are based on zero rainfall and for fully grown trees. If trees are already productive but the canopy is not fully developed, reduce irrigation by 10-20% relative to tree size.
- Precipitation factors
  - An effective rain event is >10mm.
  - Rain efficiency should be calculated at a 60% rate for mature orchards and a 40% rate for young orchards.
  - After a significant rain event, resume irrigation either when the topsoil layer starts drying or according to the soil sensor indication. In the case of light-sandy soil or hot climate, resume irrigation within 1-2 days. In the case of medium-heavy soil or cooler climate, resume irrigation within 2-4 days.
- Convert mm/day or m3/Ha/day recommendations to hours/shift/day via the following formula:

$$\frac{\text{Dripper flowrate (l/h)} \times \text{number of driplines per row}}{\text{Dripper spacing (m)} \times \text{dripline spacing (m)}} = \text{Application rate (mm/h)}$$

Example

- Recommended irrigation dose: 4mm/day = 40m3/Ha/day
- Dripper spacing: 0.5m
- Dripline spacing: 8m (usually 2 driplines/crop row are used, so typical dripline spacing is 4m)
- Dripper flow rate: 1.0 l/h

$$\frac{1.0}{0.5 \times 4} = \frac{0.5\text{mm}}{\text{hour}} = 5\text{m}^3\text{/Ha/hour} \qquad \frac{4\text{mm/day}}{0.5\text{ mm/hour}} = 8\text{ hours/shift/day}$$

Crop Coefficient Per Growth Stage

Growth stage	Flowering & fruit setting	Early fruit growth	Fruit growth	Fruit maturity	Vegetative growth	Floral initiation	Floral development
Graphic presentation							
Duration (days)	45	30	35	30	150	30	45
Kc	0.50	0.60	0.85	0.75	0.60	0.00	0.4
Depletion threshold (%)	30	30	30	30	30	70	30

Fertigation of Mature Durian

Fertigation recommendations

- In acidic soils, add lime before planting and incorporate it into the soil in the planting row.
- Assume low-to-medium levels of P and K in the soil.
- Apply fertilizer in every irrigation to spread the overall amount across expected irrigation events throughout the relevant period.
- Start fertigation only once the system is fully pressurized.
- After fertilizer injection, irrigate with clean water for at least 30 minutes.
- If fertigation in every irrigation is unfeasible, fertigate at least once a week.
- In the case of rain, skip irrigation but not fertigation, applying a high concentration of fertilizer with a small water volume.

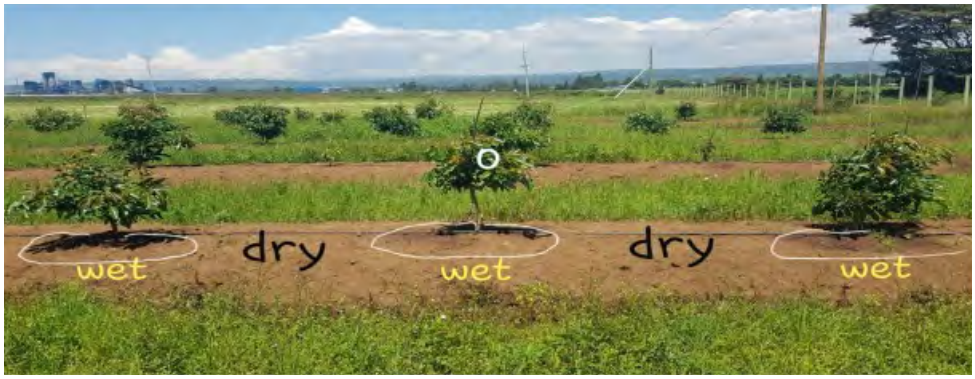
Growth stage	Flowering & fruit setting	Early fruit growth	Fruit growth	Fruit maturity	Vegetative growth	Floral initiation	Floral development
N (Kg/Ha)	7	20	20	26	52	0	7
$P_2 0_5$ (Kg/Ha)	7	7	0	0	33	13	7
$K_2 0$ (Kg/Ha)	46	23	46	46	35	12	23
Ca0 (Kg/Ha)	6	3	9	6	18	12	6
Mg0 (Kg/Ha)	4	2	6	4	12	8	4

Note: These phenological stages refer to one flowering and harvesting wave per year.
In the event of two waves, adjust accordingly.
Recommendations may vary depending on soil analysis results, location and variety.

Irrigation and Fertigation of Young Orchards

General guidelines

- Ensure that the fertigation dose is close to the trunk and within reach of the young root zone.
- Place all drippers directly above the root zone, and ensure that drops do not slide along the drip laterals and miss their target.
- The root zone diameter is roughly parallel to the canopy diameter, so drippers that are not under the canopy do not reach the root zone effectively.
- Install cap drippers between the trees to avoid water and fertilizer waste during the first few years of fertigation. Use dedicated caps for UniRam™, and continue opening them as the tree develops.



Example

- First-year orchard has four x 1.0 l/h drippers near the root zone.
- Recommended irrigation is 10 liter/tree/day (l/t/d).
- 4 drippers per tree x 1.0 l/h = 4 l/h/t drippers flow rate

$$\frac{10\ \text{l/t}}{4\ \text{l/h}} = 2.5\ \text{hours/tree/day}$$

- Irrigate for 2.5 hours/shift/day.

Irrigation and fertigation table – young durian

Irrigation recommendations are for l/t/d = liters per tree per day.
The lower amount (left side of the Irrigation column) is at the beginning of the year, and the higher amount (right side of the column) is at the end of the year. Gradually add water from month to month.

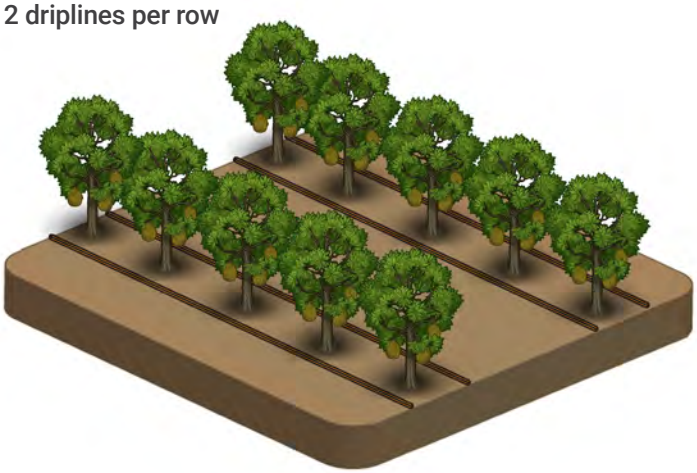
Age of plants (years)	Irrigation (l/t/d)	Rate (kg/plant/year)	N:P_2O_5:K_2O:MgO+TE	Tree growth stage	Kg/Ha (for 100 trees)
1	10-20	0.7	26:12:12:2+TE	Vegetative	70
2	20-40	1	26:12:12:2+TE	Vegetative	100
3	40-60	1.8	26:12:12:2+TE	Vegetative	180
4	60-80	2.5	26:12:12:2+TE	Vegetative	250
5	80-120	3.5	21:11:21:2+TE	Production	350
6	120-160	5.5	16:8:32:2+TE	Production	550
7	180-250	6	16:8:32:2+TE	Production	600
8	Mature	6.7	16:8:32:2+TE	Production	670
9	Mature	7.5	16:8:32:2+TE	Production	750

From year 6, in density planting (120 trees/Ha and up), fertigate like mature trees.

Drip Irrigation Configurations

On-surface

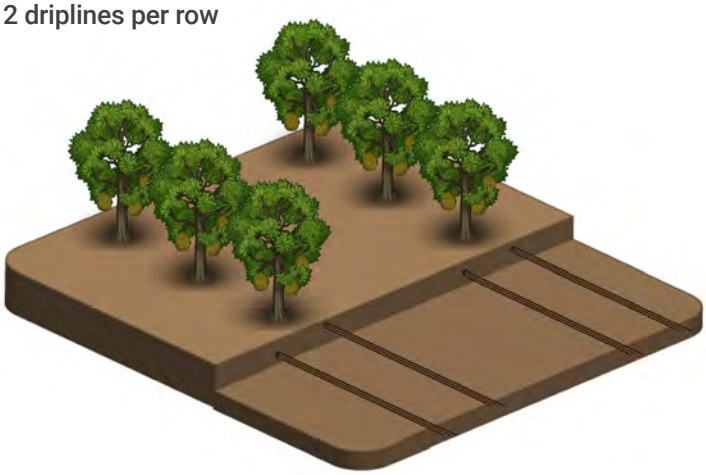
2 driplines per row



DripNet™ PC / UniRam™ 1-2.3 l/h
Plant spacing: 6-12m
Row spacing: 8-12m
Dripper spacing: 50-75 cm (varies according to soil structure and dripper's flow rate)

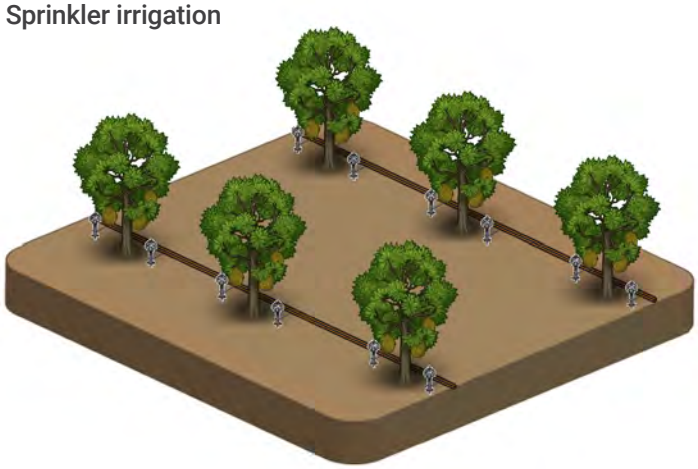
SDI

2 driplines per row



DripNet™ PC XR / UniRam™ XR 1-2.3 l/h
Plant spacing: 6-12m
Row spacing: 8-12m
Dripper spacing: 50-75 cm (varies according to soil structure and dripper's flow rate)

Sprinkler irrigation



Sprinklers: 2 per tree
SuperNet™ / GyroNet™ 20-110 l/h
Plant spacing: 6-12m
Row spacing: 8-12m

Drip irrigation - spiral

Dripper spacing: 20-50cm
UniRam™ / PCJ™ + Microdrip™
Plant spacing: 6-12m
Row spacing: 8-12m

Subsurface Drip Irrigation (SDI)

Subsurface is a popular drip application method for durian, offering several advantages.

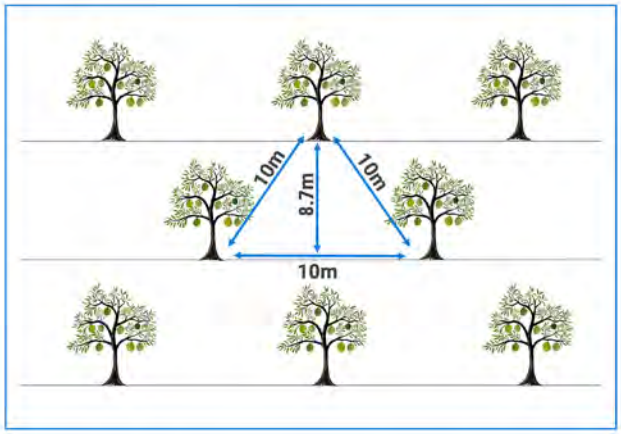
- **Easier cultivation** - SDI eliminates the need to move or adjust driplines prior to above-ground tractor operations to facilitate the cultivation process.
- **Lower physical and mechanical damage** - SDI protects driplines and cultivation equipment from physical damage, and enables full harvesting operations without damaging the drip system.
- **Fewer weeds** - SDI ensures that the irrigated water remains underground in the root zone to ensure a clean, relatively weed-free durian plantation.

Planting Density

The common planting distance for mature orchards is typically 10–12 × 10–12m in a square, rectangular or triangular planting pattern.

Drip irrigation facilitates modern density and intensive planting, which leads to earlier yields and enables maintaining the appropriate tree size by pruning or by a plant growth regulator (PGR).

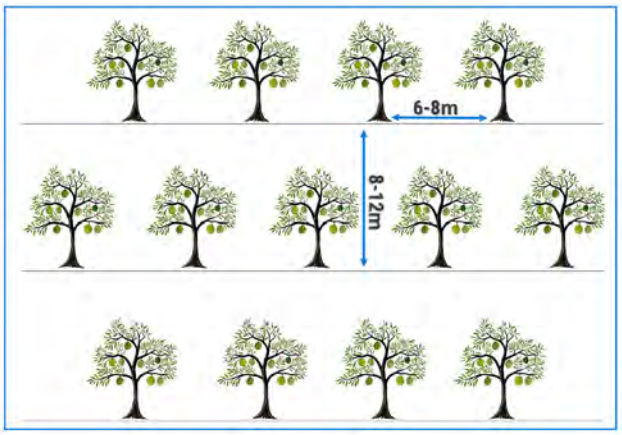
10 x 10 Triangular



Row spacing: 8.7-10.4m
Plant spacing: 10-12m
Dripper spacing: 50cm
UniRam™ 1-2.3 l/h

In modern plantations, plant spacing can be 6-8m × 8-12m.
The tree canopy must be controlled by pruning or by plant growth regulator.
Another option is to plant 6x6 for a highly rapid yield, and then gradually thin out parts of the trees after several years.

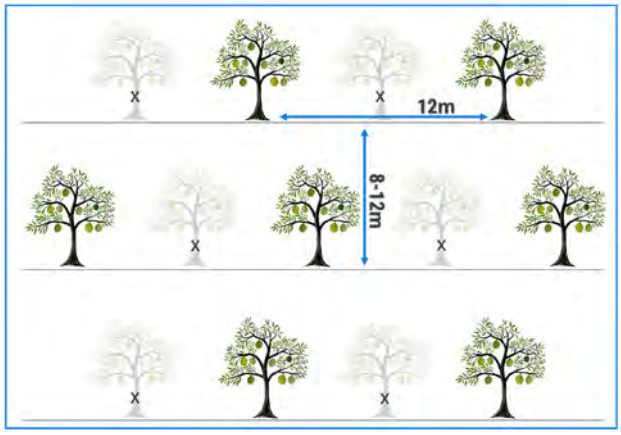
6 x 8-12 rectangle



Row spacing: 8-12m
Plant spacing: 6-8m
Dripper spacing: 50cm
UniRam™ 1-2.3 l/h

Thinning

12 x 8-12 rectangle

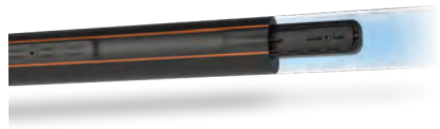


Planting 6 x 8-12 leads to a very early yield. Gradually thin out parts of the trees after several years according to their growth, variety and pruning regime.

Netafim Irrigation Solutions

Multi-Seasonal – On-surface/Subsurface Drip Irrigation Solutions

UniRam™
Large PC dripper
- Wall thickness: 1.0-1.2mm
- Flow rates: 1.0, 1.6, 2.3, 3.5 l/h



DripNet PC™
Compact PC dripper
- Wall thickness: 0.31-1.00mm
- Flow rates: 1.0, 1.6, 2.0, 3.8 l/h

Row spacing and configuration: 2 dripline for every row, 0.5-0.75m distance between drippers (based on soil structure and flow rate)
For SDI application use UniRam™ XR/ DripNet PC™ XR to prevent root intrusion and dripper blockage

Micro drip
Integral non-pressure-compensated dripper
High clogging resistant dripper, small dripline diameter for short fields, irrigation kits and nurseries

PCJ
Compact pressure-compensated dripper
Continuous self-flushing dripper
Flow rates: 4, 8, 12, 15 l/h

Multi-Seasonal – Micro-Sprinkler Irrigation Solutions

Netafim micro-sprinklers for durian include:

- Localized coverage of irrigated area
- Deflector - for a lower wetting diameter in the first years, and it can be broken, allowing for extended irrigation diameter.
- Pop-up swivel - a pop-up mechanism that opens only during irrigation
- EverSpin technology - upper bearing offers higher reliability & longevity – providing excellent clog resistance.
- High crop uniformity - thanks to the unique design of the flow regulation mechanism.
- Stream splitter - divided the stream to eliminate the water on the trunk.

SuperNet™
PC micro sprinkler

- Flow rates: 20-110 l/h

GyroNet™
Non-PC micro sprinkler

- Broad applications
- Long lateral
- Flow rates: 27-300 l/h

Got more questions?
Consult our global durian expert
Click here >>

Check out our digital agronomy platform - GrowSphere
Click here >>

Disclaimer: This document is a decision support tool based on estimations and should serve as a general guideline only. Netafim makes no warranties or representations of any kind whatsoever, whether expressed or implied, regarding the accuracy and/or completeness of the information. The use of this information is at the user's own responsibility and risk.

GROW MORE WITH LESS™

www.netafim.com