

Sugarcane

Irrigation & Fertigation Guidelines



/ Introduction

Sugarcane industry adopts new crop practices in order to shift from extensive to intensive modern and environmentally friendly cultivation. This shift, however, is accompanied by several challenges that sugarcane growers worldwide are facing:

1. **Scarce skilled labor:** The implementation of new crop cultivation technologies like mechanization and irrigation requires an experienced workforce. Yet, there is a shortage of qualified labor capable of effectively introducing and managing these technologies.
2. **Yield focus vs. expansion:** The emphasis has shifted from expanding into remote regions to achieving higher yields from existing cultivated areas. This redirection is driven by the desire to cut high transportation expenses associated with remote expansion.
3. **Marginal soils and water constraints:** Growers are increasingly cultivating sugarcane in marginal soils with suboptimal water quality. This trend is exacerbated by the scarcity of available irrigation water, adding to the complexity of achieving successful cultivation.

Drip irrigation is the most effective way to significantly increase yields and save water. To ensure success with drip, it is essential to design a drip system correctly and apply the best irrigation management and maintenance practices.

/ Drip Irrigation and Fertigation Benefits

- **Higher sugar content** - Drip enables manipulation of the plant to induce sugar accumulation and growth.
- **Improved yields** - Intensive cultivation with drip irrigation and fertigation significantly increases yield.
- **Extended ratoons** - Rapidly resuming highly frequent irrigation after harvest reduces internal stress signals and enhances bud germination.
- **Greater efficiency** - drip irrigation setup enables optimal use of mechanized cropping systems (Harvester, planting) thanks to row length and field layout.
- **Lower climate change effect** - Precise and frequent application of water and nutrients reduces stress.
- **Greater water savings** - An efficient subsurface irrigation system leads to water savings, yield increase, and significantly greater water use efficiency (mm/ton).
- **Enhanced crop protection** - Drip offers an innovative and cost-effective method for applying a wide range of substances to protect the crop in an environmentally-safe way.



/ Irrigation of Sugarcane

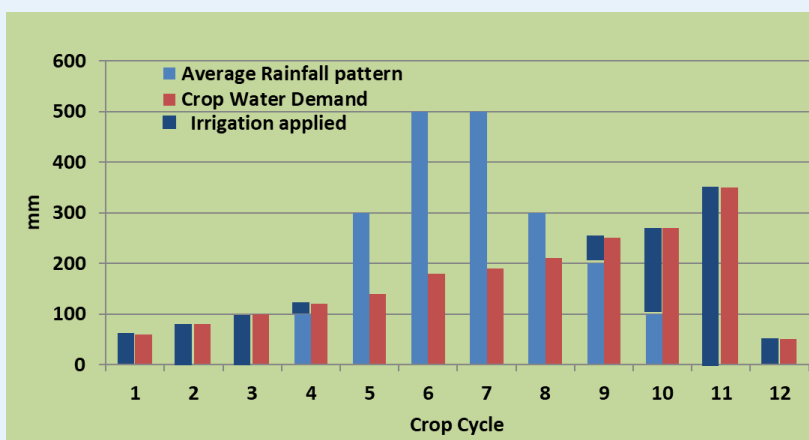


General guidelines

Below are basic guidelines for irrigating and fertigating sugarcane with an estimated yield of 140–180 tons/Ha. We recommend adapting your plan according to specific local conditions related to soil type, climate, variety, planting patterns, and yield target. Irrigation units cited in these guidelines are in mm per day (mm/day) and apply to both the plant and ratoon.

Irrigation recommendations

- Most of the roots of sugarcane are close to the soil's surface. Keep the wetting profile at 30cm depth.
- Climate and precipitation factors:
 - Recommendations are based on annual rainfall of 500-1500mm, cool and dry winter and hot and humid summer.
 - An effective rain event is > 10mm.
 - For rain event of 10<x<60mm, efficiency should be calculated at a 70% rate.
 - Above 60mm of rain, should be considered as 45mm.
 - After a significant rain event, resume irrigation when the topsoil layer starts drying. If the soil is sandy or the climate is hot, then resume irrigation within 1-2 days. If the soil is heavy or the climate is cooler, then resume within 2-4 days.
- Apply water in the center of the dual row within reach of the root zone; applied water that does not meet the root zone should not be considered.
- Bury the dripline 20cm deep and 5-10cm below seed cane depth (for sub-surface drip irrigation, SDI).
- Do not irrigate the area between rows, since the root zone diameter is roughly parallel to row width.
- Be sure to refill the soil profile during the first irrigation for germination or after harvest by continuously irrigating for 2-4 days.



This graph describes typical sugarcane irrigation requirements for a crop cycle in dry winter and humid summer conditions. Several months of both complete irrigation and partial irrigation are required, while there is no need to irrigate during the peak rain season, although fertigation still must be applied in such circumstances.

- Convert mm/day or m³/Ha/day recommendation to hours/shift/day via the following formula:






$$\frac{\text{Dripper flowrate (l/h)}}{\text{Dripper spacing (m) x dripline spacing (m)}} = \text{Application rate (mm/h)}$$

Example

- Recommended irrigation dose: 5mm/day = 50m³/Ha/day
- Dripper spacing: 0.5m
- Dripline spacing: 1.9m (usually 2 rows of cane per one dripline, so typical dripline spacing is dual row 0.4m + 1.5m = 1.9m)
- Dripper flow rate: 1.0 l/h

$$\frac{1.0}{0.5 \times 1.9} = 1.05\text{mm/h} = 10.5\text{m}^3/\text{Ha}/\text{hour} \qquad \frac{5\text{mm}/\text{day}}{1.05\text{mm}/\text{hour}} = 4.7 \text{ hours/shift/day}$$

/ Crop Coefficient Per Growth Stage

Growth stage	Planting / Germination			Tillering and canopy establishment		Grand growth				Ripening		
Graphic presentation												
Duration (days)	30	30	30	30	30	30	30	30	30	30	30	30
Kc	0.45	0.55	0.65	0.7	0.75	0.8	0.85	0.9	1.00	1.05	1.05	0.60
Depletion threshold (%)	30			20		30				50		

/ Fertigation of Sugarcane

Fertigation recommendations

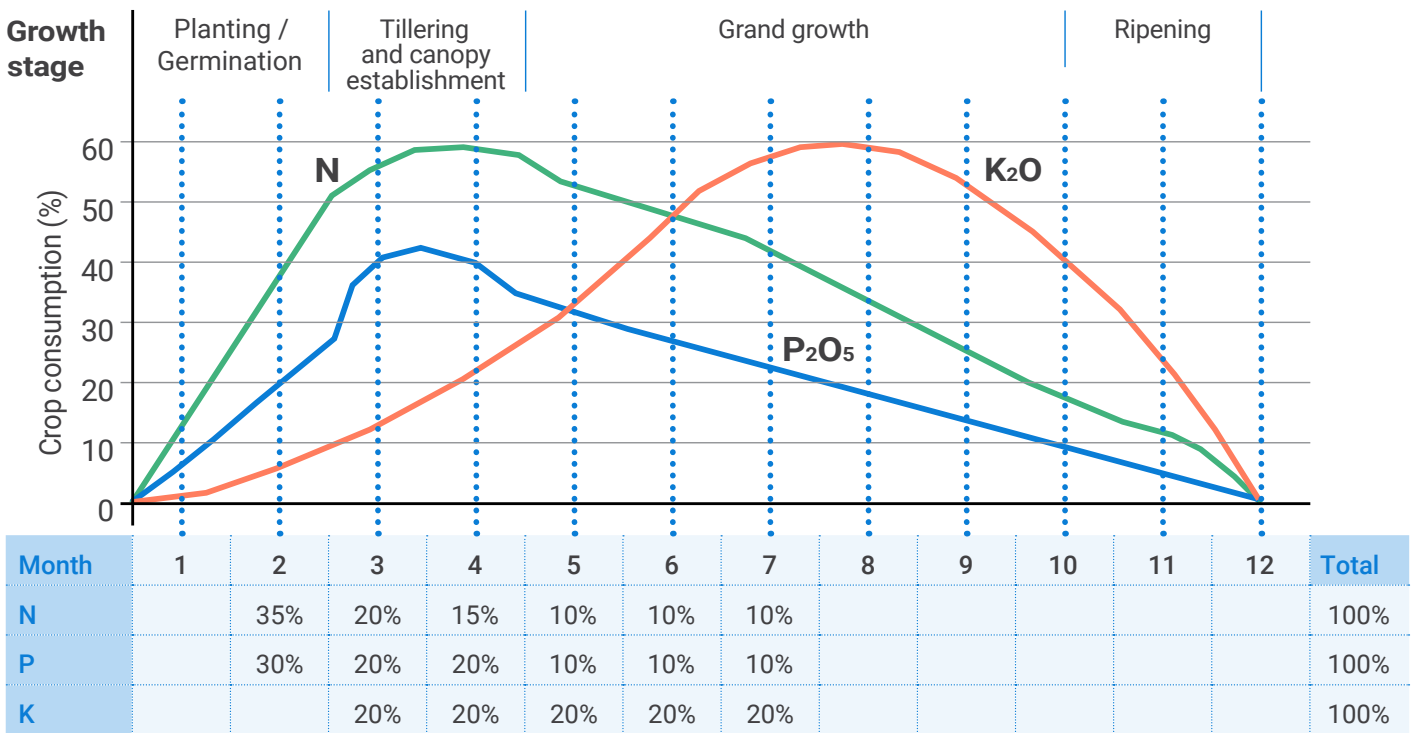
- Apply fertilizer at every irrigation to spread the overall amount across expected irrigation events throughout the relevant period.
- Start fertigation only once the system is fully pressurized and stop 30 minutes before halting irrigation.
- If you cannot fertigate every irrigation, fertigate at least once a week.
- In the case of rain, skip irrigation but not fertigation, applying a high concentration of fertilizer with a small water volume.
- Sugarcane is a giant crop that produces a huge quantity of biomass, therefore, it usually requires higher amounts of nutrient elements.
- Depending on soil conditions, other nutrients may also be necessary. It is essential to always maintain the correct nutrient balance and nutrient form to ensure maximum yield.

Annual dose – Kg/Ha/year

The basic calculation for applied fertilizer quantities is as follows:

N	1.25 Kg per ton/expected/Ha – usually determined by the expected yield
P ₂ O ₅	0.5 Kg per ton/expected/Ha if the soil analysis values are within the desired range
	If they are below, add 20-100%
	If they are above, reduce 20-100%, depending on deficient or excessive levels
K ₂ O	1.5 Kg per ton/expected/Ha if the soil analysis values are within the desired range
	If they are below, add 20-100%
	If they are above, reduce 20-100%, depending on deficient or excessive levels

Relative NPK requirement at different growth stages

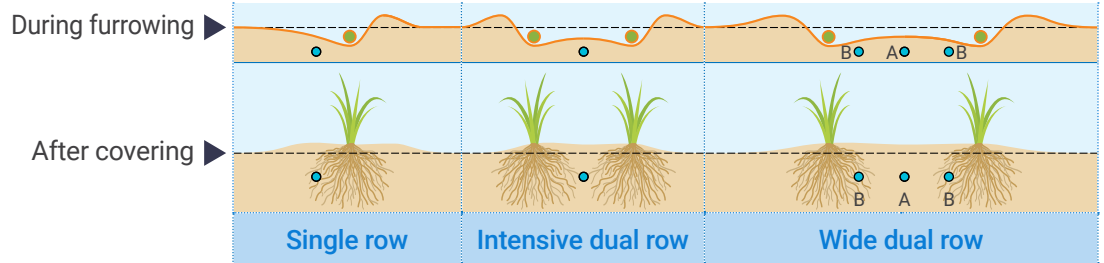


/ Subsurface Drip Irrigation

Subsurface drip irrigation (SDI) is the most common drip application method for sugarcane; it maintains several operational advantages, including labor savings in the distribution and retrieval of driplines at the beginning and end of each cycle. SDI also protects driplines from physical damage and enables full harvesting operations without damaging the drip system.

Planting

Planting configuration
In general, there are 3 families of plant spacing:
The drip location is different for each family.



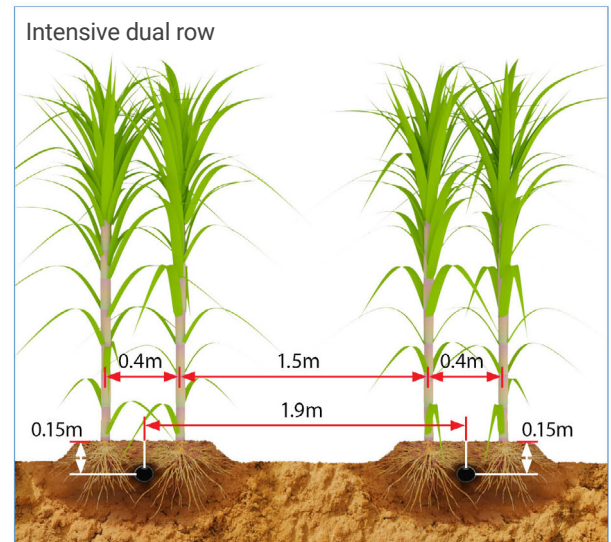
Legend

- Soil surface
- Furrowing
- Cane set
- Dripline

Cane row spacing center to center	1.4-1.8m	1.8-2.0m	2.1-2.5m	
Dual row spacing	-	0.4-0.6m	0.5-0.7 (0.9)m	
Dripline location	5cm below the set 10 cm to the side	5cm below the set center of the dual row	A 0.5 - 0.7m 5cm below the set center of the dual row	B 0.8 - 0.9m 2 driplines, one per row 5cm below the set 10cm inside

During furrowing	
Dripline depth below the cane set	5-10cm
Depth from soil surface	Furrowing - 15cm
	Dripline - 20cm

After covering	
Raised soil above surface	10cm
Seed cane depth	15cm
Dripline depth	25cm



For subsurface drip irrigation, it is recommended to use the following type of drip line:

- Pressure compensated, DripNet PC with Anti Syphon (AS) mechanism and a flap. Both add a safety feature by preventing soil particles or soil insects drawing into the dripper during system shut down (back-flow effect).
- Dripline wall thickness vary from 15 mil to 25 mil.
- Dripline diameter is calculated by the row length, ideal row length for sugarcane is 400m and this can be achieved with a 22mm dripline diameter.



/ Netafim Irrigation Solutions

DripNet PC™ AS XR

Compact PC dripper with Anti Syphon

- Dripper spacing: 0.4-0.6m (according to soil type)
- Mechanical barrier (optional)
- Wall thickness: 0.4-0.6mm
- Flow rate: 0.6-1.6 l/h



Use a professional burying machine. For additional information, consult your local Netafim dealer/agronomist.

Net Flush™

Normally Closed (NC) controlled flush valve

- Enables clear visibility of dripline drainage to ensure line flushing quality.
- Easy to operate by a single hydraulic command.
- Flush either automatically via irrigation controller or manually.
- Flushes a cluster of driplines at once.



Got more questions?
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platform - GrowSphere
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