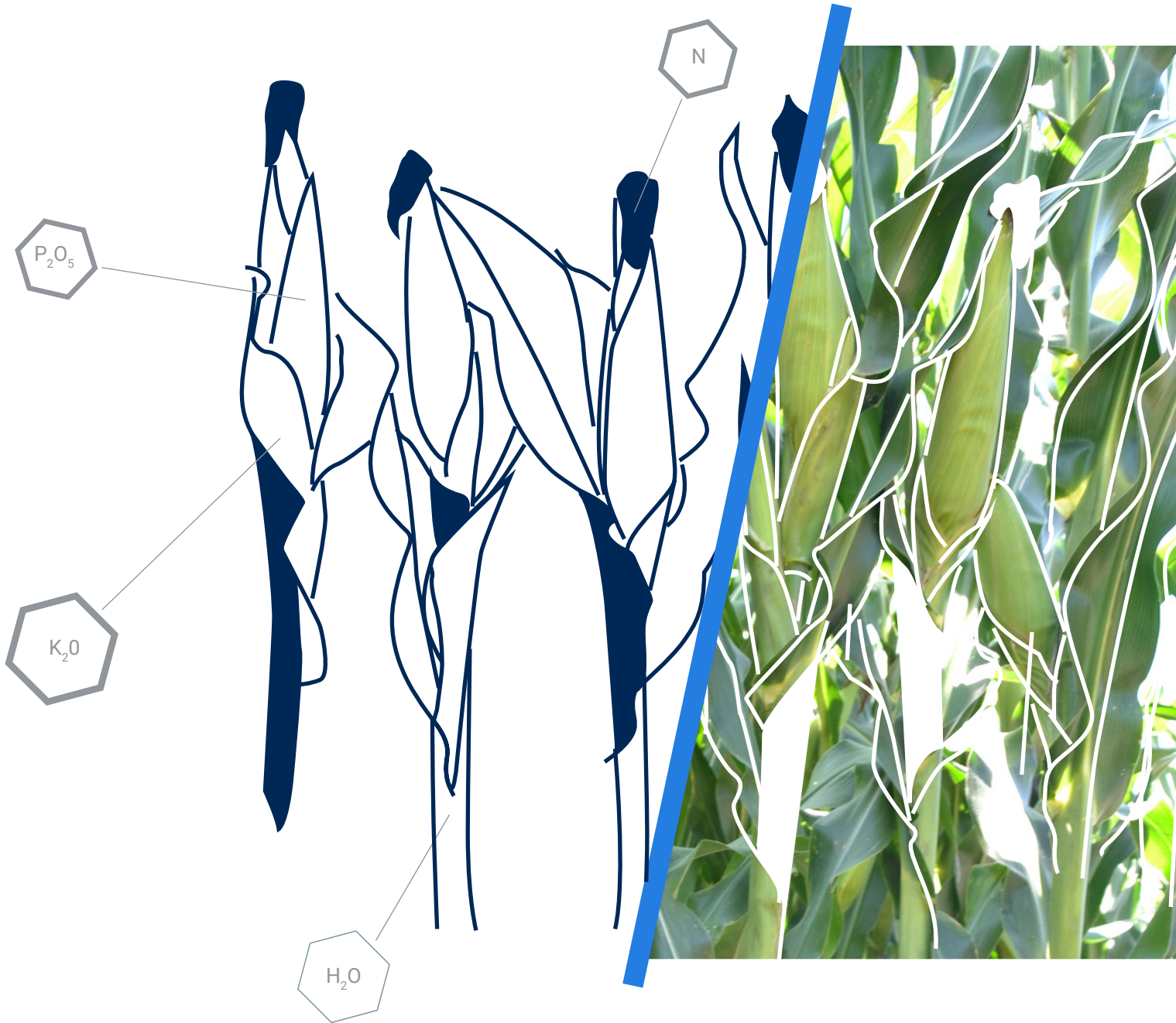


# Subsurface Drip Irrigation for Corn

/ Irrigation & Fertigation Guidelines



# Irrigation management



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## Water content management prior to planting

**ATTENTION**  
Always start the season with a fully wet soil profile (at field capacity). Examine up to a depth of 1.0m.

**Best-case scenario:** If the field reaches field capacity and a full wet profile during the winter, you can germinate and establish the crop with no need for irrigation before V3. This is true if all tillage is done during autumn, since plowing can dry out the soil.

**Worst-case scenario:** Proper germination and establishment of the crop can be achieved only in a fully wet soil profile. If rains are scarce prior to planting and the soil profile is not wet, pre-season irrigations are required in order to fill the soil profile and maintain hydraulic conductivity of the soil.

### How to manage pre-season irrigation

- Start 3 weeks prior to planting with 25mm applications at 3-day intervals, reaching an estimated total of 100mm until you see water on the surface, or the profile seems fully wet.
- In most cases, this works only if soil is not cracked (caused by very extreme dry conditions).
- If the water doesn't reach the planting depth, use an add-on scraping device on your planter that allows deeper planting and positioning of the seeds in moist soil.
- Once planting is completed, irrigate an additional 30mm and manually dig and sample the soil close to the seed planting line to make sure moisture is reaching it.

Since SDI is designed for a dry surface (one of its advantages), planting in dry soil at the conventional depth of 5cm and expecting the drip system to provide water for germination of the seeds is not recommended, and could result in low germination rates.

### Estimated soil moisture vs. precipitation quantities between crop cycles

This table provides a rule of thumb regarding the expected soil moisture as a result of rain. After the harvest and prior to next-season planting, it is advisable to monitor rain quantities to establish whether the water content of the soil has been replenished.

		Precipitation (mm)		
		0 - 200	200 - 300	> 300
Soil category	Sandy	0 - 200	200 - 300	> 300
	Heavy	0 - 300	300 - 450	> 450
Soil moisture		Extreme deficit	Deficit quantity	Adequate quantity
Required action		Requires supplementary overhead, due to extremely dry and cracked soil	Pre-irrigate by drip to overcome deficit	In most cases, no need for pre-planting irrigation

### How do I know I have a wet profile?

Rain measurement - Measure rain quantities between growing seasons. After autumn tillage, start measuring rain quantities. One month prior to planting, check your total precipitation quantity and take action as in the table below. Don't wait for planting day!

### Evaluating soil moisture by feel and appearance

Dig and probe the soil to a depth of 90cm, and feel the soil moisture content. Soil should be at field capacity - elastic and dark in color (see video at <https://www.netafim.com/crop/corn/video-tutorial>).

### Soil moisture feel-and-appearance test, and how much water to add to reach field capacity

Available soil moisture remaining (%)	Dominant texture	Sand, loamy sand	Sandy loam	Silt loam, loam, sandy clay loam, silt	Silty clay loam, clay loam, sandy clay, silty clay, clay	
		Feel or appearance of soil and moisture deficiency				
		Upon squeezing, no free water appears on the soil, but a wet outline of a ball is left on hand.				
		mm to irrigate*				
100	At field capacity (100%)	00				
95	75 - 100%	Tends to stick together slightly, sometimes forms a very weak ball under pressure	Forms a weak ball, breaks easily, will not become slick	Forms a ball, is very pliable, readily becomes slick if relatively high in clay	Easily ribbons out between fingers, feels slick	
90						
85						
80						
75	mm to irrigate*	0 - 5	0 - 8	0 - 10	0 - 15	
70	50 - 75%	Appears to be dry, will not form a ball with pressure	Tends to form a ball under pressure but seldom holds together	Forms a somewhat plastic ball, may become slightly slick with pressure	Forms a ball, ribbons out between thumb and forefinger	
65						
60						
55						
50	mm to irrigate*	7 - 10	10 - 15	15 - 20	25 - 30	
45	25 - 50%	Appears to be dry, will not form a ball with pressure	Appears to be dry, will not form a ball	Somewhat crumbly, but holds together after pressure	Somewhat pliable, will form a ball under pressure	
40						
35						
30						
25	mm to irrigate*	10 - 15	15 - 25	25 - 35	30 - 40	
20	0 - 25%	Dry, loose, single grained, flows through fingers	Dry, loose, flows through fingers	Powdery dry, sometimes slightly crusted, but easily broken down into powdery condition	Hard, baked, cracked, sometimes has loose crumbs on surface	
15						
10						
5						
0	mm to irrigate*	15 - 30	30 - 40	35 - 45	40 - 60	

### Soil moisture monitoring

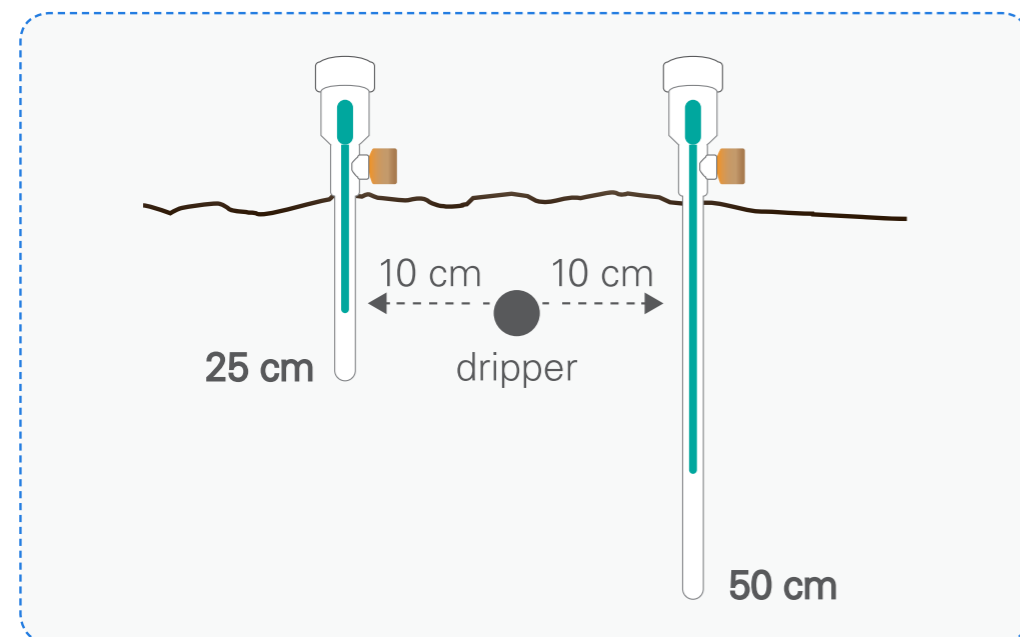
It is recommended to use the Netafim digital farming monitoring platform that allows real-time soil moisture monitoring. The farmer needs to be familiarized with his thresholds for irrigation triggering. It is best if the agronomist holds a weekly phone meeting to analyze the moisture graphs with the farmer. At a minimum simple mechanical tensiometers is also a cost-efficient option for moisture monitoring should be used.

### Soil moisture tensiometer values (centibar) prior to planting (field capacity)

Dominant texture	Sand; Loamy sand	Sandy loam	Silt loam; Loam; Sandy clay loam; Silt	Silty clay loam; Clay loam; Sandy clay	Silty clay; Clay
Tensiometer tension value at field capacity (centibar)	5 - 15	10 - 20	15 - 25	20 - 30	30 - 35
mm water per 30cm soil at field capacity	15 - 30	30 - 40	35 - 45	40 - 50	50 - 60

### Tensiometer positioning

Position the tensiometers 10cm from the dripperline (horizontally), at depths of 25cm and 50cm.



### Rain and irrigation management

- Use a simple rain gauge to identify the exact amount of rainfall in the plot. Don't guess!
- An effective rain event is one with over 10mm. Any event with a lower quantity is negligible, and should not be considered as part of the water balance. In such events, stick to the original plan with no changes.
- Rain efficiency should be calculated at an 80% rate (e.g. in the event of 10mm of rain, reduce 8mm of the recommended irrigation application amount).
- Rain at precipitation rate over 5mm/h should be considered less efficient due to expected run-off.





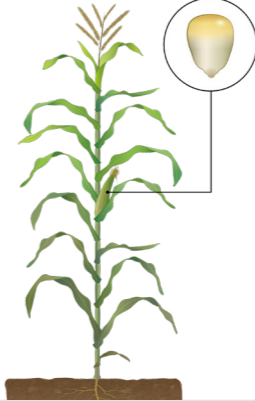
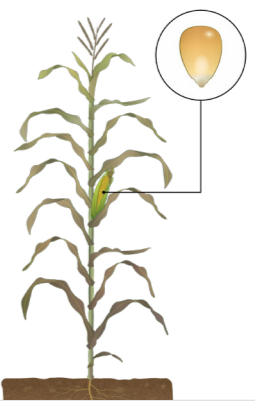
## Plant nutrition management

### Basic guidelines for a 15ton/ha yield target

	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
Typical applied quantity* (kg/ha)	300	100	300
Apply as base + starter (kg/ha)	100	50	200
Apply by Fertigation (kg/ha)	200	50	100
Scheduling	Once a week from V4 to R2	Once every 2 weeks from V6 to R2	Once every 2 weeks from V6 to R2

\*This is applicable for cases when there is no soil analysis or knowledge regarding soil nutrient content, and assumes medium levels of P and K in the soil.

# General guidelines for irrigation & fertigation

Crop stage	Planting – V3	V3-V6	V6-V10	V10-R3	R3-R5	Total /season
						
Kc	-	0.5	0.8 - 1.0	1.2	1.0 - 0.8	-
Qty per irrigation (mm)	25 (possibly consecutive)	15	12	8	8	<b>600-700**</b>
Interval between irrigations (days)	10-15*	3	2	1	2	-
Number of irrigation events per period	1-2	4-5	6-8	30-40	10-15	<b>50-70</b>
N weekly (kg/ha)		10	30	30	0	<b>250***</b>
N applications per period	0	2	2	5	0	<b>8-9</b>
K <sub>2</sub> O (kg/ha) every 2 weeks	0	0	25	25	0	<b>100***</b>
K <sub>2</sub> O applications per period	0	1	1	2	0	<b>4-5</b>
P <sub>2</sub> O <sub>5</sub> (kg/ha) every 2 weeks	0	10	15	15	0	<b>50***</b>
P <sub>2</sub> O <sub>5</sub> applications per period	0	0	2	2	0	<b>4-5</b>
Important tips	<p>*Make sure seeds are in moist soil. If not, apply large irrigations of 25mm.</p> <p>At V3, apply 2 consecutive irrigations of 25mm. If temperatures exceed 30°C for more than 1 day, apply an irrigation dose of 25mm.</p>	<p>Make sure you enter this stage with a full profile and that moisture reaches the root zone. If necessary, add another large (25mm) irrigation at the beginning of this stage.</p>	<p>Increase irrigation frequency.</p>	<p>Make sure you reach field capacity every day so there is no stress at all. Apply N+K closer to VT and P toward R2.</p>	<p>No need for additional fertigation. Irrigation quantities are slightly reduced, since it is time to consume the available water in the deeper soil layers.</p>	<p><b>*Depends on hybrid</b>  <b>**Assuming no rain and beginning the season with a wet profile</b>  <b>***Fertigation - see base+ starter reference in the table above</b></p>
	<b>0-20 days</b>	<b>20-35 days</b>	<b>35-50 days</b>	<b>50-90 days</b>	<b>90-120 days</b>	<b>100-120* days</b>

