Coffee

metzer

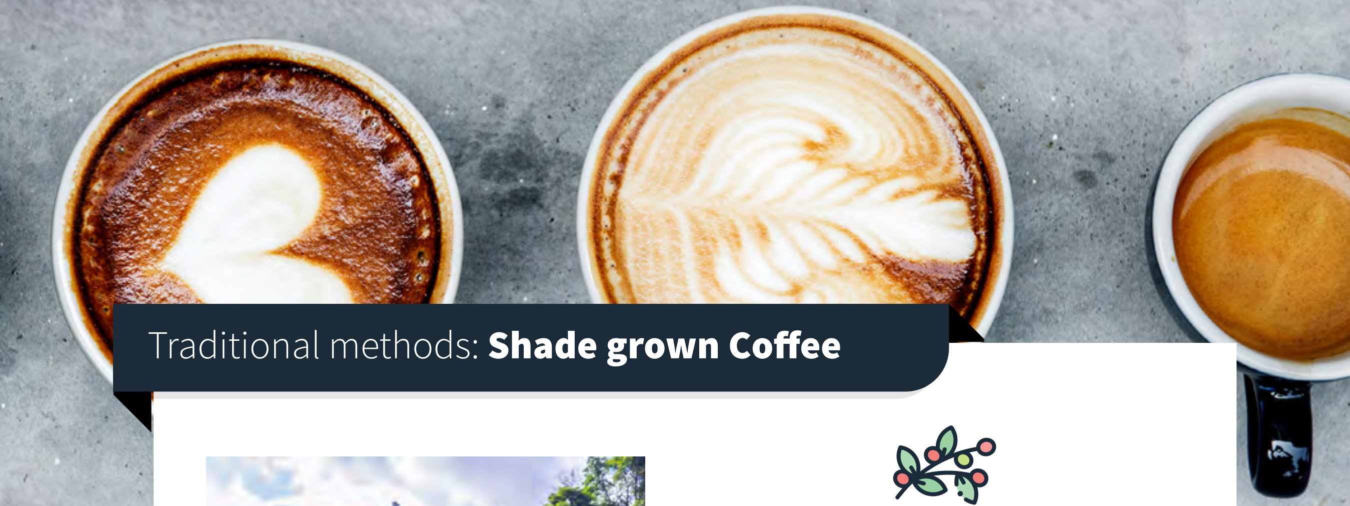
Growing Coffee with Drip Irrigation

The Optimum conditions for growing coffee

Coffee is a flowering plant belonging to the Coffea genus of the Rubiaceae family. Originating in central east Africa, Ethiopia, and Sudan, coffee is cultivated worldwide in tropic and sub-tropic regions around the equator.

Arabica vs. Robusta

Coffee grows in relatively high altitudes and is quite sensitive to frost and extreme weather.
Coffee production relies on two primary species: Arabica (Coffea Arabica) and Robusta (Coffea canephora) – each with its own distinct features.
Arabica is normally grown in altitudes over 900m – it’s possible to grow it in lower altitudes, but that makes it even more susceptible to pests and disease than it already is. It is also more sensitive than Robusta to drought and extreme weather.
Despite being less vigorous, producing lower yields, and containing less caffeine than Robusta, Arabica varieties account for 60% to 80% of global coffee production – due to producing a higher quality coffee with subtler, richer taste.
True to its name, Robusta (“robust”) coffee grows in lower altitudes, is more resistant to pests, diseases, and drought, and produces higher yields with higher caffeine content.



Traditional methods: **Shade grown Coffee**

Coffee plants are planted 1-2m apart with 2-3m between rows. They require well-drained, slightly acidic (PH 6) soils rich in organic matter, and between 2 to 4 hours of direct sunlight. Traditionally, and often today as well, coffee is grown under tree canopies that provide shade throughout the plantation's lifespan – in which case harvest is usually manual. Shade-grown coffee is considered of higher quality, and various shading practices utilizing various tree species have arisen in different growing regions.

Modern methods: **Sun grown Coffee**

More modern, intensive plantations grow coffee in direct sunlight, with no shade whatsoever. This practice is commonly identified with Brazil. In these plantations, plants are planted much more densely and harvested mechanically – resulting in more efficient production and much higher yields.

The need for irrigation

Climate change and surviving dry spells

Shade-grown coffee is traditionally un-irrigated, surviving dry spells through careful management. Climate change, however, has made dry spells far more frequent and severe. In the absence of an irrigation system, this water stress can take a heavy toll on the plantation's yield and overall wellness.

Progress through drip irrigation

Modern intensive sun-grown coffee is gaining in popularity worldwide, with coffee planted in straight dense rows, and pruned, harvested, and treated mechanically.

"Yields as high as 2,000 to 3,000 pounds per acre (2,300 to 3,400 kilograms per hectare) can be grown, compared to 450 to 900 pounds per acre (500 to 1,000 kilograms per hectare) by traditional methods."

https://www.britannica.com/plant/coffee-plant-genus ©2021 Encyclopædia Britannica, Inc.

Yielding over 3 times more than traditional plantations, modern coffee plantations require a different approach – with inputs to match yields. Since sun-grown coffee transpires much more and grows much faster than traditional shade-grown coffee, a drip irrigation system allows the grower to carefully tweak root-zone moisture levels and provide plants with their exact needs.

Flowering 01

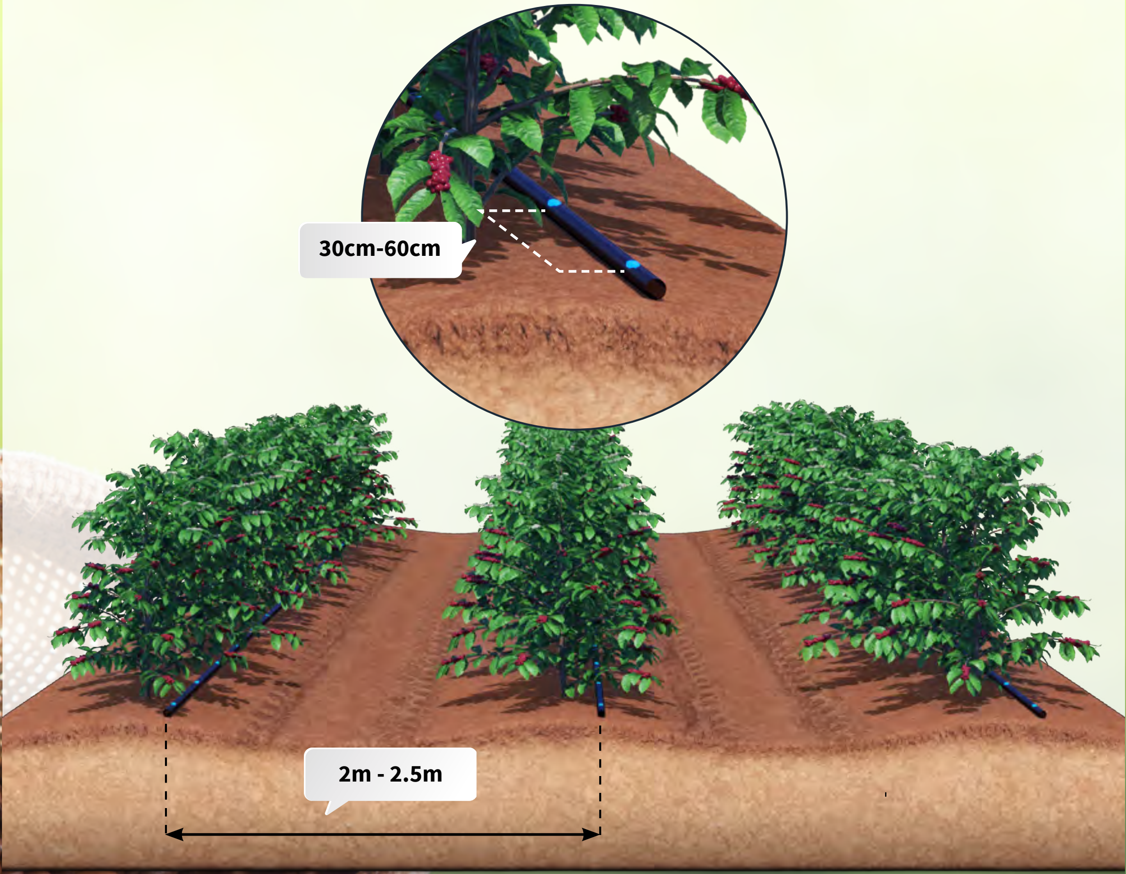
One crucial watering point in the season is during flowering. A common approach is to create water stress right before flowering to obtain better results. Nowadays, however, water stress is recommended once blooming has started.

Berry expansion 02

Other crucial points where water stress should be avoided are during berry expansion and bean filling. As long as the plants bear fruit, optimum conditions must be maintained.

Coffee irrigation **practices**

In irrigated coffee plantations, it is common to place 1-2 drip laterals per row, with drip spacing at 30-60cm per lateral to provide a continues wetting strip.

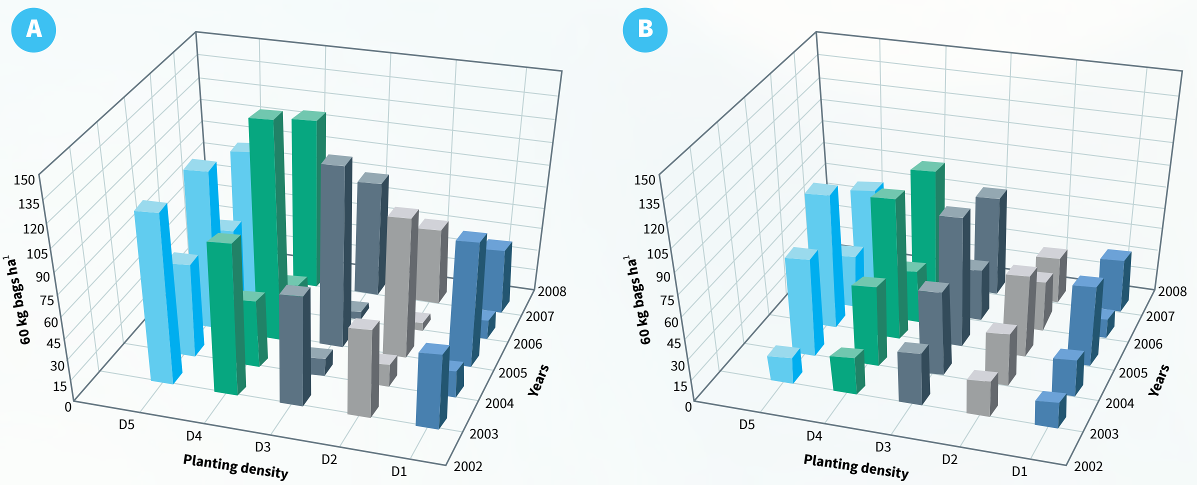


The exact distance between drippers is determined by tree spacing, cultivation practices (e.g., sun/shade-grown), climate, and most importantly, soil type: the lighter the soil (=higher sand content) the smaller the distance between drippers, and the heavier the soil (=higher clay content) the larger the distance.

The proven benefits of coffee irrigation

In modern coffee production, irrigation provides clear advantages re: vegetative and reproductive performance.

Drip irrigation in coffee crops under different planting densities: Growth and yield in southeastern Brazil



D1, D2, D3, D4 and D5 refer to respectively 2,500, 3,333, 5,000, 10,000 and 20,000 plants ha^{1}

Yield of five harvests (2003-2007) in bags ha^{1} of processed coffee irrigated (A) and non irrigated (B) in function of the planting densities.

01 Regardless of planting density, irrigation promoted higher growth of coffee plant.

02 The effect of irrigation on the increase in coffee yield (processed bags) varied in function of plant density per area.

03 For densities of 10,000 and 20,000 plants ha-1, regardless of the regime used to manage irrigation (20 kPa, 60 kPa and climatologic water balance) mean yield increases can be obtained of over 49.6% compared to non-irrigated cultivation.

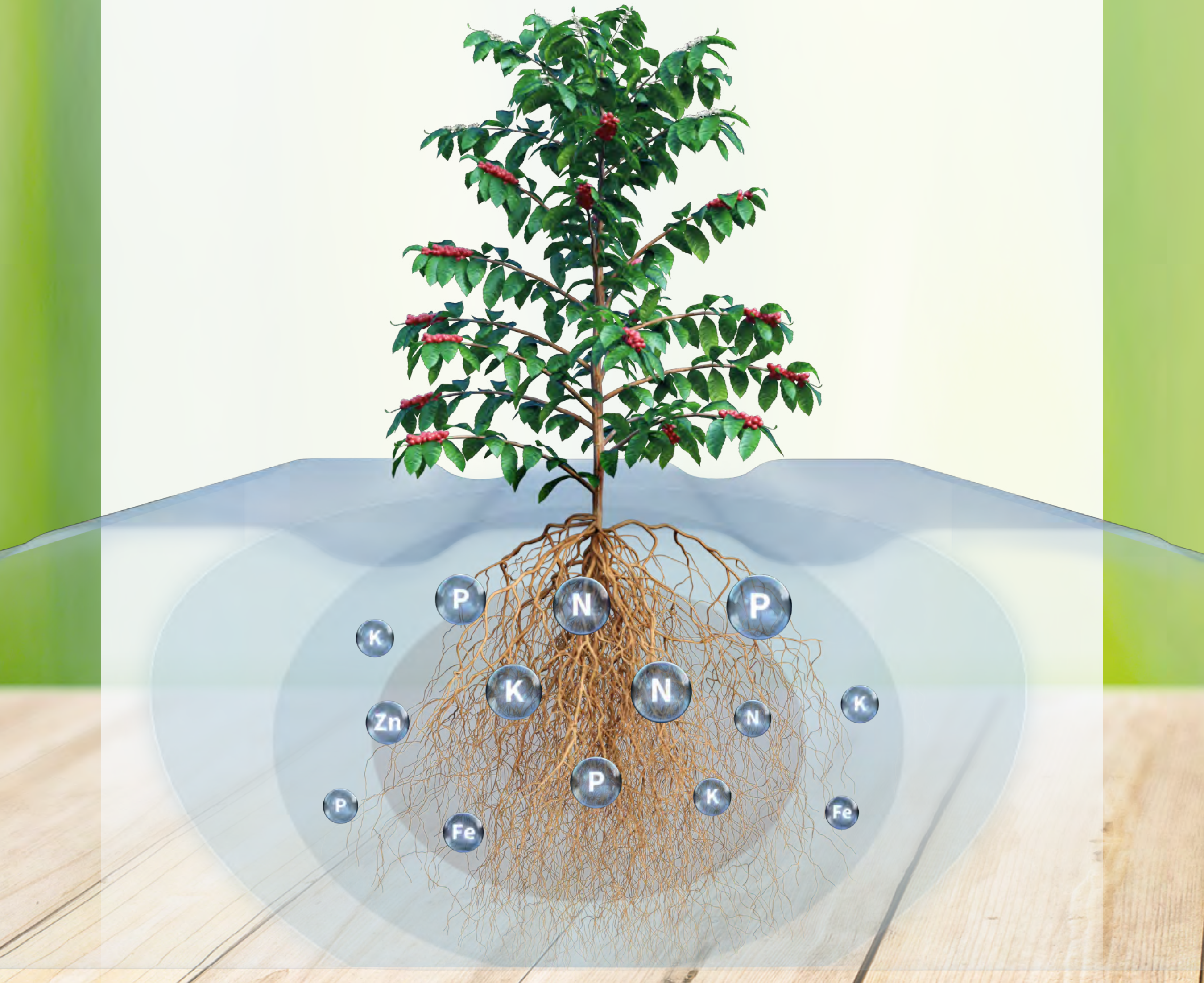
Source: Gleice A. de Assis, Myriane S. Scalco, Rubens J. Guimarães, Alberto Colombo, Anderson W. Dominghetti, Nagla M. S. de Matos, https://doi.org/10.1590/1807-1929/agriambi.v18n11p1116-1123

Coffee fertilization

Coffee is a medium-to-high consumer of nutrients

Coffee is a medium-to-high consumer of nutrients: the higher the yield, the higher the nutrient demand.

A mature plantation will require 150-300 Kg/Ha Nitrogen (N), 100-200 Kg/Ha Phosphorus (P), and 150-300 Kg/Ha Potassium (K), depending on yield and production.
As a rule, traditional shade-grown coffee requires less nutrients than a modern sun-grown coffee.



Nutrition for coffee trees

Annual nutrient demand for a low-yielding coffee plantation

Coffee nutrition requierments in Kenya

At production level of 1,850 kg/ha of berries, in typical Kenyan conditions.
Source: Mr. Peder Mortensen of Standard Chartered, March, 1999.
Source: https://www.haifa-group.com

N	P2O5	K2O	CAO	MGO	S
Kg / ha					
160	50	70	80	40	20

The recommended average rates of nutrients for coffee trees, and how Multi-K can improve the yield and the coffee quality

Recommended average rates of nutrients for coffee trees

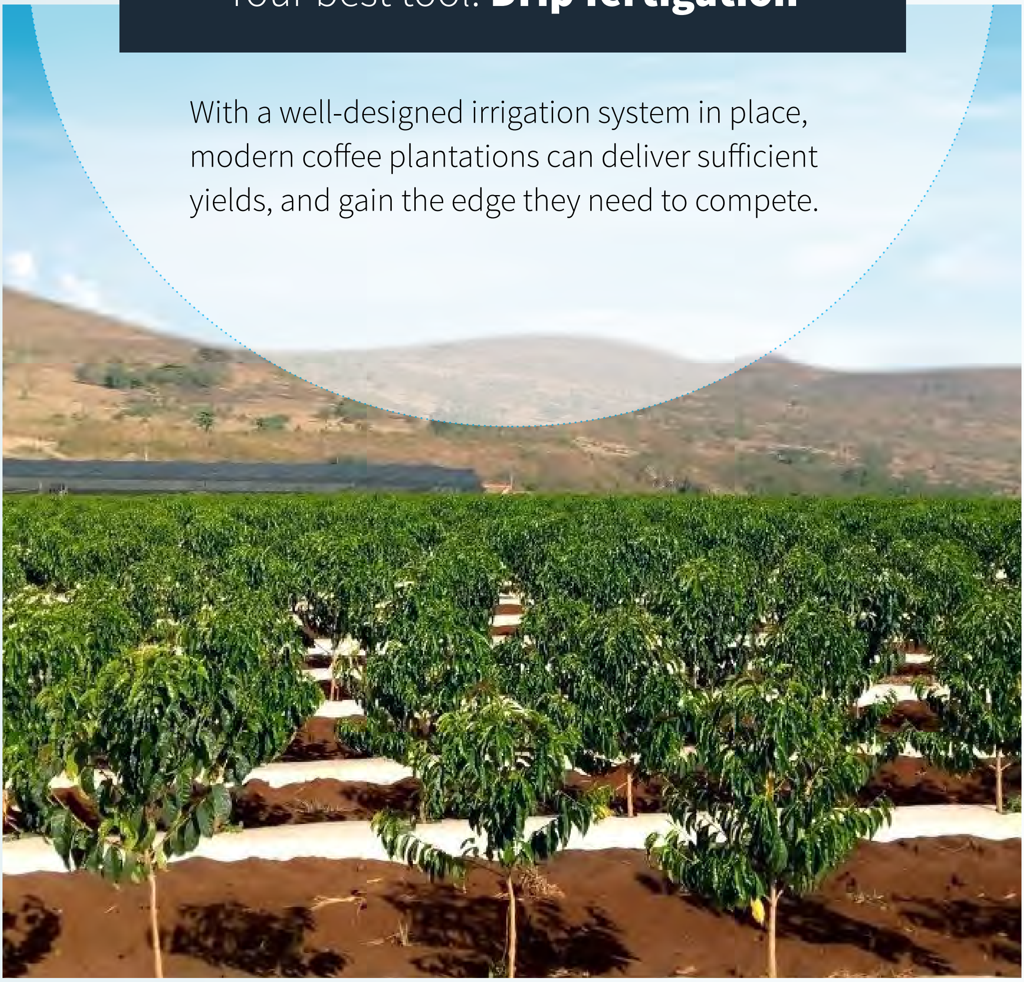
Variety: Arabica*.
Soil type Deep, well-drained, loamy or volcanic.
Plant population: 1200-1800 mat/Ha. (3000-4000 trees/ha).
Expected yield: 45-50 t/Ha. (1.8- 2 t/Ha clear coffee).

*Robusta coffee generally requires less nutrients than ArabicaSource: https://www.haifa-group.com

Tree age (years)	Nutrients demand (Kg/Ha/ year)		
	N	P2O5	K2O
1	30-40	0	30-40
2	60-80	0	60-80
3	120-160	20-30	150-200
Maturity	200-300	30-50	250-400

Your best tool: **Drip fertigation**

With a well-designed irrigation system in place, modern coffee plantations can deliver sufficient yields, and gain the edge they need to compete.



One major advantage of drip irrigation is the ability to precisely provide not only water but nutrients as well.

Like any crop, a coffee plantation is subject to multiple seasonal and other factors that affect its biological requirements – which only a smart irrigation system can supply accurately.
At the push of a button, the perfect fertilizer receipt can be delivered directly to the relevant root zone of the plants.

Metzer's

Drip Irrigation Solutions

for growing Coffee

For surface and suspended irrigation

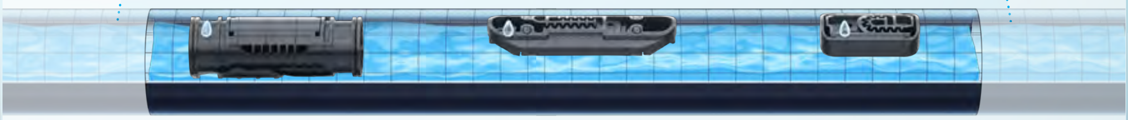
Metzer offers heavy-duty drippers with 0.9-1.25mm wall thickness.

PC models for uniform distribution over long laterals and irrigating sloped terrain

Adi
PC Cylindrical Dripper.
Reliable & robust

Vered
Flat PC Dripper.
Field-proven with excellent clog resistance

Vardit
Flat PC Dripper.
Cost-effective with excellent performance



Non-compensated drippers

For flat land and limited lateral lengths

Idit
Cylindrical dripper.
A true drip irrigation workhorse

Lin
Flat dripper.
Cost-effective with excellent performance

metzer

info@metzerplas.com
metzer-group.com

Kibbutz Metzer, M.P. Hefer 3882000, Israel
Tel + 972.4.6387001