orbia Precision Agriculture

NETAFIM™

POTATO

Irrigation & Fertigation Guidelines

Introduction

Global adoption of drip irrigation for potatoes is becoming more widespread. More and more growers and industry stakeholders are moving toward drip as a long-term solution thanks to several advantages. Drip can ensure high yields and quality while overcoming growing obstacles, including demand for uniformity, dry and hot periods, water salinity, and pest and disease risk. As such, the need for practical irrigation and fertigation know-how is crucial to ensure success.

Drip Irrigation and Fertigation Benefits

- **Higher yields** – 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 as we as improved water use efficiency (WUE) and nutrient use efficiency (NUE) (in kg and mm/ton).
- **Crop protection** – Drip is an innovative, cost-effective method for applying a wide range of substances that protect the crop in an environmentally-safe way.

Potato Irrigation

General guidelines

Below are basic guidelines for irrigation and fertigation scheduling and management of potatoes with an estimated yield of 45-65 tons/Ha in North European climates and 70-90 tons/Ha in drier Mediterranean climates.
As a rule of thumb, potato plants require 500 mm (5,000 m^3/Ha) to reach their yield potential. Potatoes are a medium-water, stress-sensitive crop. Therefore, it is essential to ensure accurate irrigation that avoids over-irrigation and under-irrigation to achieve yield goals.

Irrigation recommendations

- The effective root zone for water uptake in potatoes is at a depth of 10-50 cm.
- Schedule relatively long irrigation events rather than short ones to reach the entire ridge surface and to achieve uniform distribution in the effective root zone.
- Define the relative amount of water according to soil water holding capacity (e.g., 6-10 mm for sandy soil or 10-15 mm for silt loam soil), and make sure that no irrigation event goes below the minimum predefined quantity.
- Precipitation factors:
  - An effective rain event is > 8 mm.
  - Rain efficiency should be calculated at 70%.
  - Above 60 mm of rain, should be considered 45 mm.
  - After a significant rain event, resume irrigation either when the topsoil layer starts drying or according to the soil sensor indication. In hot climates, the topsoil layer may start drying only after several days, so be sure to pay close attention to the drying process.

Crop coefficient (Kc) per growth stage (medium cycle)

Growth stage	Sprout development	Vegetative growth	Tuber initiation	Tuber bulking	Tuber maturation
Description	Sprout begins to rise from seed.	Early young leaves appearance.	Young tubers begin to form from stolon, and early flowering might occur.	Canopy growth, tuber enlargement.	Canopy senescence, tuber hardening, consider manual wilting
Graphic presentation					
Duration (days)	15	20	20	35	30
Kc	0.5	0.5-0.75	0.8-1.1	1.1-0.8	0.8-0.4
Depletion threshold	30%	30%	20%	20%	30%
Irrigation intervals (days)	3-6	3-6	1-4	1-4	3-6

- Irrigation intervals vary by soil type.
- For sprinkler irrigation consider adding 10% more water and in the event of windy conditions consider 15%.
- These phenological stages refer to one flowering and harvesting wave per year. In the event of two waves, adjust accordingly.

Irrigation calculations

Recommended irrigation dose calculation (quantity)
The recommended irrigation dose (= crop water requirements = ETc) is the amount of water a crop needs during its growth cycle to ensure proper development and yield.
The equation includes environmental and vegetative factors:

$$\text{ETo } (\text{mm/day}) \times \text{Kc} = \text{ETc } (\text{mm/day})$$

- ETo = Evapotranspiration
- Kc = Crop factor

Example
- ETo = 5 mm/day
- Kc = 0.8

Recommended irrigation dose: 5 mm/day × 0.8 = 4 mm/day

Application rate – quantity and time calculations
Convert mm/day or m^3/Ha/day recommended irrigation dose to hours/shift/day via the following formulas:

- Application rate calculation

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

- Irrigation cycle duration calculation

$$\frac{\text{Recommended irrigation dose (mm/day)}}{\text{Application rate (mm/h)}} = \text{hours/shift/day}$$

Example
- Recommended irrigation dose: 4 mm/day = 40 m^3/Ha/day
- Dripper flow rate: 0.7 l/h
- Number of driplines per row: 1
- Dripline spacing: (1:1 configuration, 1 dripline per ridge): 0.75 m
- Dripper spacing: 0.3 m

Application rate calculation:

$$\frac{0.7 \text{ (l/h)} \times 1}{0.3 \text{ m} \times 0.75 \text{ m}} = 3.1 \text{ mm/h} = 31 \text{ m}^3\text{/ha/hour}$$

Irrigation cycle duration calculation:

$$\frac{4 \text{ mm/day}}{3.1 \text{ mm/h}} = 1.3 \text{ hours/shift/day}$$

Potato Fertigation

Fertigation recommendations

- Base dressing - adjust the base/side dress ratio according to the relevant soil type and nutrient (see example in table below).

	Light soil	Medium soil	Heavy soil
N	15%	20%	25%
P_2O_5	25%	40%	50%
K_20	20%	30%	40%

- Preseason soil analysis is a valuable tool to adjust fertigation plans and maximize yield. Consult with a Netafim agronomist for fine-tuning.
- Each crop and target yield requires a different range of nutrient elements at each stage of development.
- The use of manure types is recommended on base dressing. The amount of base fertilizer should be reduced from the seasonal fertigation plan.
- Use only water-soluble fertilizers for the fertigation process.
- Schedule fertigation to spread the overall amount precisely across expected crop demand and irrigation events.
- In case of heavy rains, apply technical irrigation for high concentration fertigation.
- Start fertigation only once the system is fully pressurized and stop 30-50 minutes before halting irrigation (depends on the fertilizer traveling time from the injector to the farthest dripper in the field. Calculate it by using Netafim's HydroCalc 3.0).
- It is very important to fertilize at least once a week to avoid deficit and large fertilization events.
- Tissue (petiole) analysis during the season is a valuable tool to adjust the N & K fertigation regime.

Fertigation recommendation per growth stage

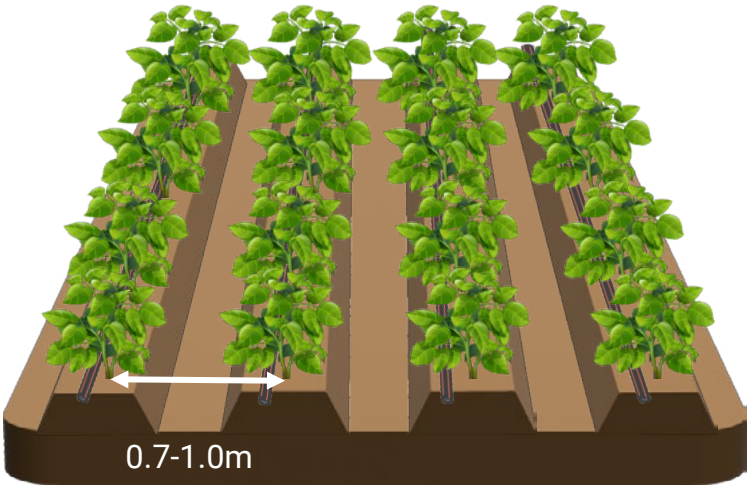
Relative NPK requirement at different growth stages
Annual dose – kg/Ha/year

Growth stage	Base fertilization	Sprout development	Vegetative growth	Tuber initiation	Tuber bulking	Tuber maturation	Sum
Graphic presentation							
Duration (days)		16	20	20	34	30	
Start date		15/4	30/4	21/5	10/6	14/7	
End date		30/4	21/5	10/6	14/7	13/8	
N (kg/Ha)	100	15	25	30	30	0	200
P_2O_5 (kg/Ha)	100	0	0	0	0	0	100
K_20 (kg/Ha)	100	20	80	50	50	0	300

Note: Recommendations may vary depending on soil analysis results, local conditions, target yield, and variety.

Drip Irrigation Configurations

1:1 configuration



Field layout:
- 1 dripline per ridge
- Shallow burring over the ridge

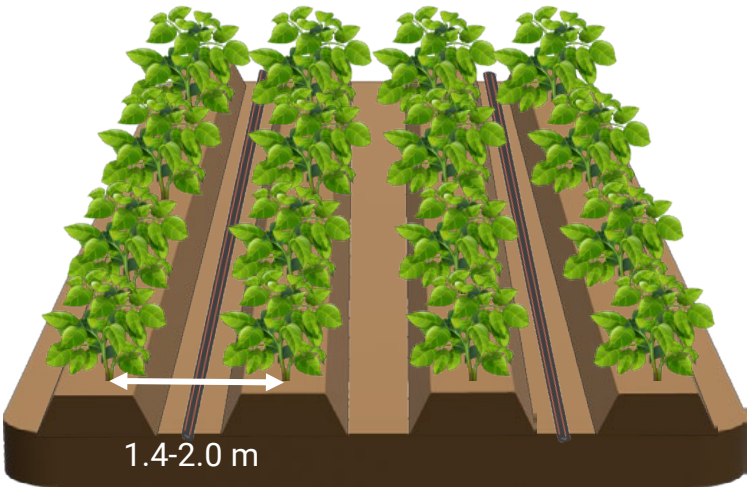
Crop row spacing: 0.7-1.0 m

Drippers:
- Seasonal: Streamline™ X
- Multi-seasonal: DripNet™ PC

Flow rate: 0.35-1.60 l/h
Dripper spacing: 0.3-0.5 m

Ranges vary depending on soil type.

1:2 configuration



Field layout:
- 1 dripline per 2 ridges

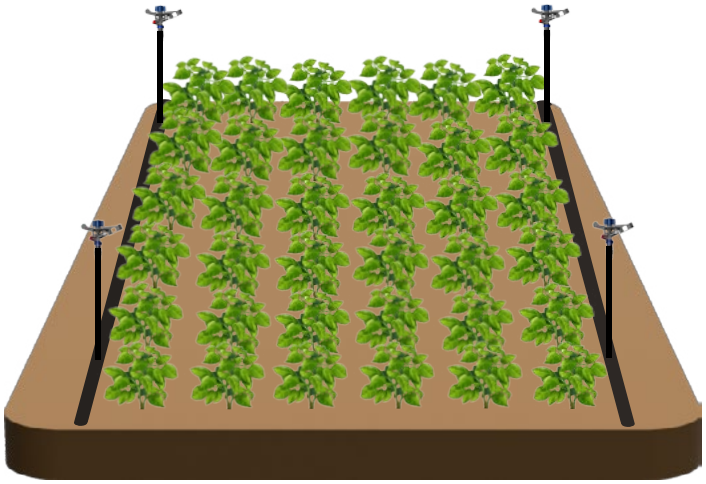
Crop row spacing: 1.4-2.0 m

Drippers:
Seasonal:
- Seasonal: Streamline™ X
- Multi-seasonal: DripNet™ PC

Flow rate: 0.35-1.60 l/h
Dripper spacing: 0.3-0.6 m

Ranges vary depending on soil type.

Sprinkler Irrigation Configurations



Field layout: 12x12 m, 18x18 m

Sprinklers: MegaNet™ / D-Net™
Flow rate: 210-860 l/h

Drip Installation and Retrieval Options

	1:1 configuration	1:2 configuration
Installation	During planting and up to 3 weeks after seeding. Complete before emergence to avoid damaging the tubers	• Dry climates - 2 weeks from emergence • Humid climates, if the soil is wet - 4 weeks from emergence
Retrieval	Just before harvest, when the soil is still moist. • Single-step - above the crop row using a retrieval machine • Two-steps - extraction on top of the row, followed by retrieval from the edge of the field	At the irrigation season end, in metal drums for reuse

Netafim Solutions for Potatoes

DripNet™ PC

Pressure compensated

Anti-syphon mechanism

Self-flushing mechanism

Integral compact, pressure-compensated (PC) anti-siphon mechanism dripper for semi-permanent drip applications for growers seeking a rapid ROI. Ideal for field crops in complex topographies and for subsurface applications.

Streamline™ X

Tough

High clogging resistance

Wide filtration area

Integral, non-pressure-compensated (NPC) high clogging-resistance dripper, for single season applications.

MegaNet™

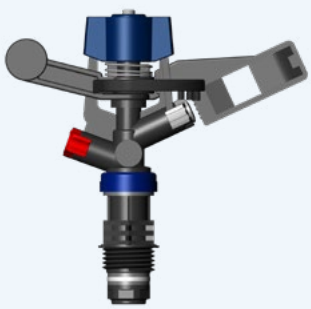
Uniform wetting & higher yield

Insect protected

Anti- clogging

A unique encapsulated and protected impact sprinkler designed for field crops and vegetable irrigation, ensuring excellent crop uniformity while preventing issues caused by insects, poor water quality, or field machine damage.

D-Net™



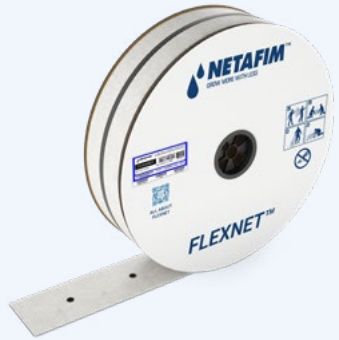
Very high water distribution uniformity

Robust & long lasting

Reduced labor cost

A durable impact sprinkler with a unique 3D arm and a 24-degree water trajectory angle, designed for field crops and vegetable irrigation, providing uniform water distribution for large and varied spacing above 10x10 meters.

FlexNet™ - Flexible Pipes



Labor saving | Leak free | Zero snaking

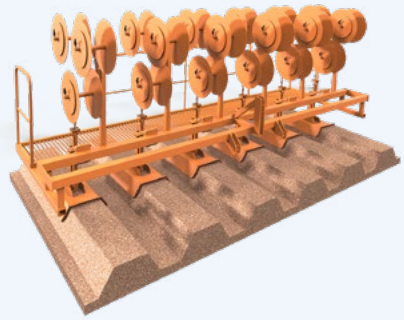
Innovative leak free mainline and sub-main pipes that are easy to install, retrieve and relocate. Made from reinforced polypropylene with integral fittings.

HWD Three-Wheels Layout Machine

HWD | Installation | On Surface

An ideal layout machine for long laterals in open fields featuring three HWD large metal reels.

TWD / MWD Shallow Insertion Machine for Potatoes



TWD & MWD | Installation | Shallow

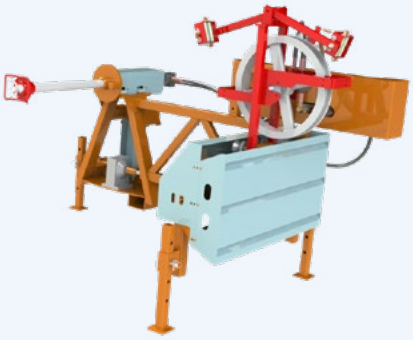
A TWD / MWD insertion machine suitable for all sizes of potato fields. The machine is equipped with unique ridge plates that install the dripline centered and at an accurate depth, while maintaining the ridge shape.

TWD / MWD Retrieval Machine for Reuse

TWD & MWD | Retrieval | Reuse

End-of-row retrieval machine suitable for small-to-medium fields. The machine is equipped with a tensioning device that ensures uniform and tight TWD coils that are ideal for reuse.

HWD Metal Reel Retrieval Machine for Reuse



HWD | Retrieval | Reuse

An end-of-row retrieval machine suitable for small to medium fields. The machine is equipped with a tensioning device that ensures uniform and tight TWD coils ideal for reuse.

TWD / MWD Retrieval Machine for Recycling

TWD & MWD | Retrieval | Recycling

An over-the-row retrieval machine suitable for small to medium fields, featuring a special system that creates uniform, dense rolls of used TWD for recycling.

To optimize your irrigation & fertigation practice, check out our digital agronomy platform - **Grow**Sphere™

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