Crop Irrigation Water Requirement and Pump Flow

Net and gross irrigation requirement of a crop from reference evapotranspiration, crop coefficient and effective rainfall, and the volume and pump flow for an area.

Input parameters

Unit system: SI

Parameter	Value	Unit
Reference evapotranspiration (mm per day)	5.5000	
Crop coefficient	1.0500	
Effective rainfall (mm per day)	0.50000	
Conveyance efficiency	90.000	%
Application efficiency	70.000	%
Irrigated area	10.000	ha
Pumping hours per day	10.000	h

Calculated results

Parameter	Value	Unit
Crop evapotranspiration (mm per day)	5.7750	
Net irrigation requirement (mm per day)	5.2750	
Gross irrigation requirement (mm per day)	8.3730	
Water volume per day	837.30	m³
Pump flow	23.258	L/s

Notes for this case

• Crop water use ET_c = K_c ET₀ is partly met by effective rainfall; the rest is the net irrigation requirement. Losses in canals or pipes (conveyance) and in the field (application) raise it to the gross requirement, which sets the water volume and, for the pumping hours available, the pump flow. Use the peak month for system capacity.

Formula and method

$$ET_c = K_c ET_0, \quad NIR = ET_c - P_e, \quad GIR = \frac{NIR}{\eta_c \eta_a}, \quad Q = \frac{GIR\, A}{t_p}$$

Variables

ET_0	Reference evapotranspiration (mm per day)	-
K_c	Crop coefficient	-
P_e	Effective rainfall (mm per day)	-
η_c	Conveyance efficiency	-
η_a	Application efficiency	-
A	Irrigated area	m²
t_p	Pumping hours per day	s
ET_c	Crop evapotranspiration (mm per day)	-
NIR	Net irrigation requirement (mm per day)	-
GIR	Gross irrigation requirement (mm per day)	-
V	Water volume per day	m³
Q	Pump flow	m³/s

Method and standards

Irrigation requirement.

Assumptions and limits

- Daily averages for the period.

Report details

Report reference	FCC-JM0Q-27CF (the same inputs always give the same reference)
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Calculator	Crop Irrigation Water Requirement and Pump Flow
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/civil/irrigation-farm/irrigation-water-requirement

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.