



LEAF WATER METER

Next generation of smart agriculture

APPLICATIONS

- Measure water variation in vivo samples
- Monitor effects of stress
- Help to determine irrigation requirements
- Research
- Teaching

FEATURES

- Non-invasive, non-destructive measurements
- Light weight and easy to install
- Real time online display of data
- LoRaWAN technology
- Optional solar panel for power supply

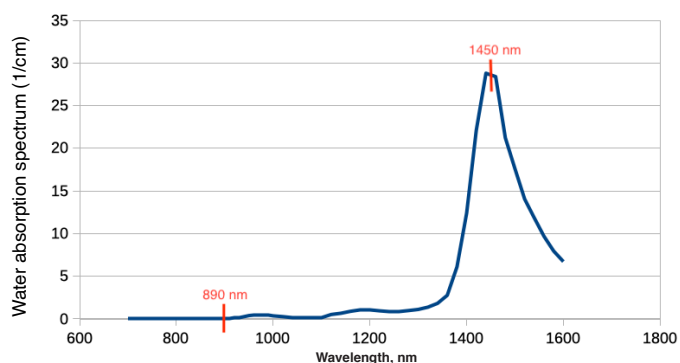
LEAF WATER METER

The new Leaf Water Meter (LWM) provides real time accurate measurements of water contents on the intact leave of plants and crops. The installation is rapid and the system is ready just after a short calibration period that the LWM runs by himself. Cultivar details can be specified for maximum precision and customization. On open field, it can be possible to apply solar panels to the LWM to sustain its own power requirements. Accurate measurements are taken every 10 minutes and sent online in real time using the LoRaWAN, a low power, wide area networking protocol designed to wirelessly connect battery operated instruments to the internet in regional, national or global networks. Data can be seen immediately online on the website, easily understandable thanks to the clear graphic representation. Data can also be downloaded to keep track of progress and management choices and results.

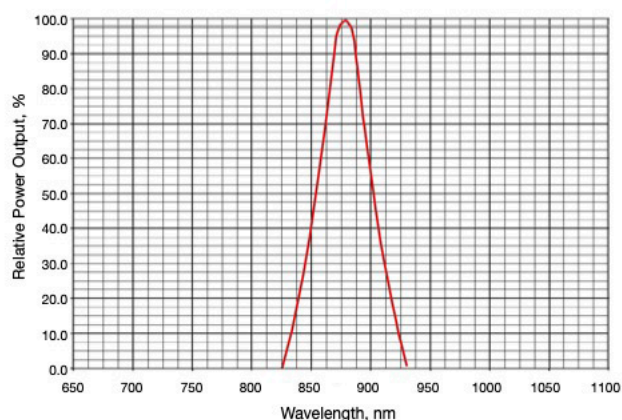
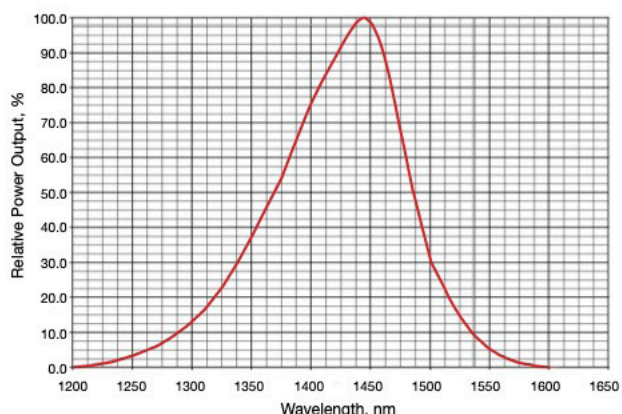
The LWM is useful for improving the irrigation managements programs, whether on open fields or in greenhouses. The LWM can also detect stresses that are not related to water deficit or surplus, like illness, extreme heat or excessive insolation. The LWM can be used on a variety of species of plants C3 and C4. In the next decades the climate change and the world population growth will challenge the sustainability of the agricultural production systems in the various regions of world. In this scenario the limited availability of water resources and the improper use of irrigation will make the agricultural sector even more vulnerable

to such changes, with effects on the ecosystems. The LWM detect changes in hydro content of the plants that can be used to manage water optimization programs, to improve crop yield and to help protecting the environment. A more effective usage of water resources can ensure many benefits: on one side this can help the reduction of detrimental mould and fungal development on crops, on the other side it can increment the productivity of some cultivations, as for example the possibility of increasing sugar content in the raisin for a specific wine production.

Laboratory methods for determination of Relative Water Content (RWC) in plant leaves are time consuming and destructive to the sample. Typically, a sample must be detached, rehydrated and dehydrated. The LWM provides non-destructive, rapid measurements. Moreover, current techniques for measuring the water content of the leaf are affected by a fluctuation caused by light incident on the leaf. The LWM allows to estimate the fluctuation of the relative water content and to evaluate the real water content.



Water absorption spectrum



Emission spectrum of light sources

TECH SPECS

Optical parameters measured: Optical absorption in two different wavelength (880 nm and 1450 nm).

Spectrometric sensor: 3

Test area: 2 cm²

Optical resolution: +/- 1% SDI

Light sources:

- Led IR (peak 880 nm)
- Led SWIR (peak 1450 nm)

Light sensors:

- IR photodiode
- SWIR InGaAS photodiode

ADC resolution: 10 bit

Measurement technique: Average value of 100 samples

User interface: Website

Connectivity: LoRa

Environment sensors: Temperature, relative humidity, luminosity and soil moisture.

Temperature resolution: 1°C

Temperature precision: ±1°C

Relative humidity resolution: 1%

Relative humidity precision: ±3% (5%-95%, 25°C)

Luminosity measurable range: 0-65535 lux

Luminosity resolution: 1 lux

Luminosity precision: ±7% (25°C)

Soil moisture resolution: 1%

Soil moisture precision: ±3% (0-53%); ±5%(53-100%)

Operating temperature: -10 °C to 80 °C

Supply voltage: 12V

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