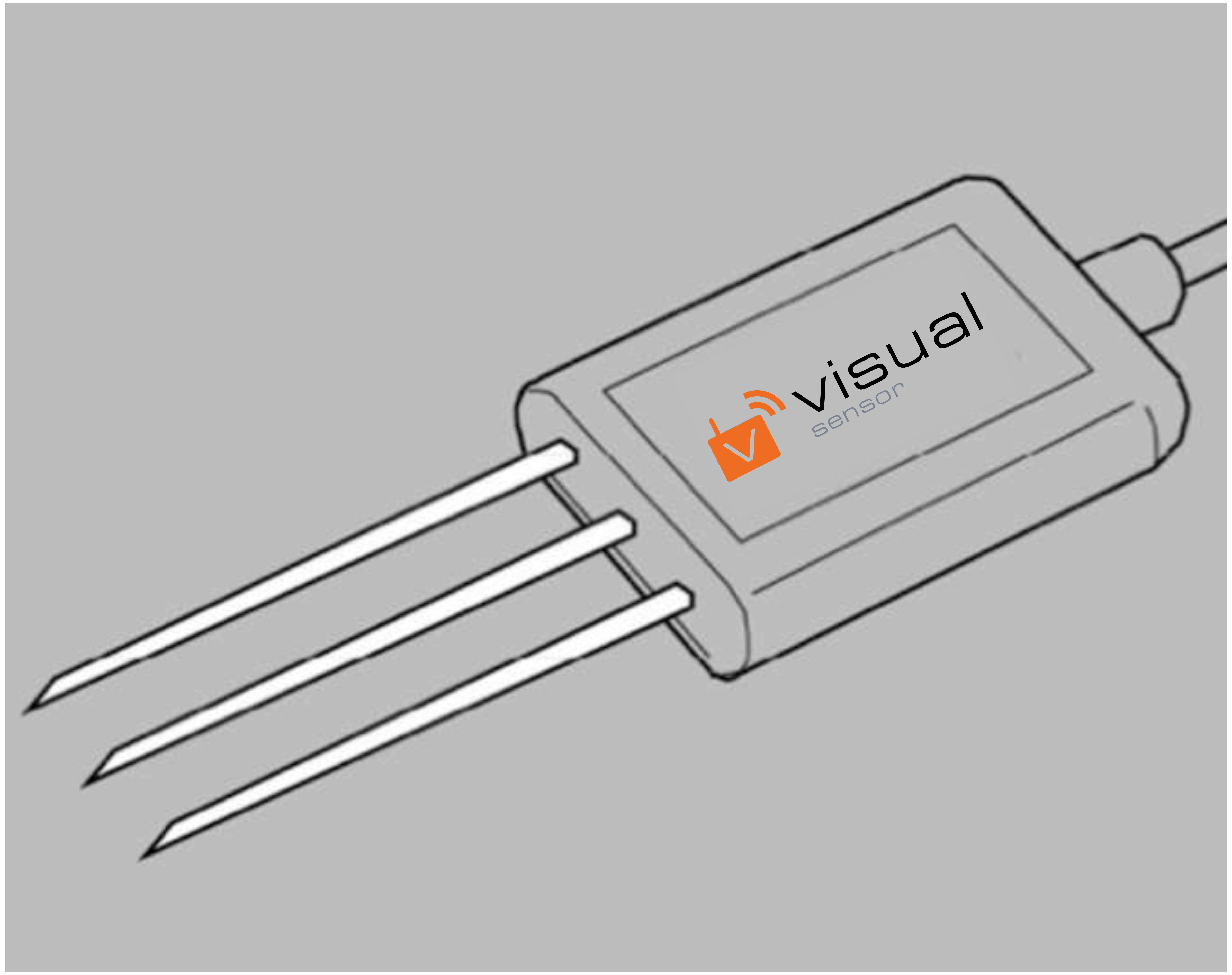
visual sensor

SOIL SENSOR QUICK GUIDE



visual
sensor

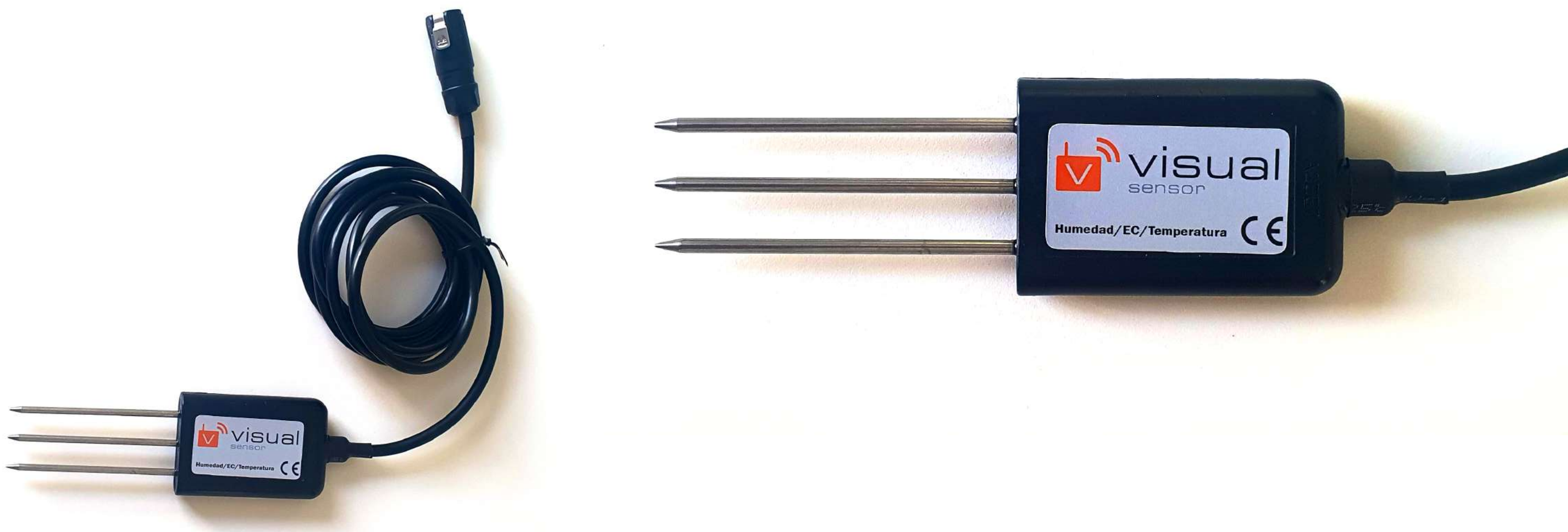
What is a soil sensor?

The soil sensor is an instrument for measuring the most important soil parameters. This industrial quality device is designed to withstand the harsh conditions of the field: agricultural work, inclement weather and physical-chemical and biological wear. Its rods are made of stainless steel and the electronics are covered by a very resistant and inert polyurethane sheath.

Water only when necessary. The sensor monitors water stress and / or volumetric water content in the soil.

The measured values are the most demanded by agricultural professionals: volumetric water content (humidity), electrical conductivity (salinity) and soil temperature.

Using FDR technology, the sensor sends an injection of current to the ground and measures the dialectical permissiveness of a volume of land around the sensor itself. This allows obtaining information in orders of accuracy much higher than the rest of agricultural sensors.



Technical characteristics

Measurements:
Volumetric water content (%) or (m3 / m3) (Range 0-100% and resolution 0.03%)
Electrical conductivity (dS / m) or (ms / cm) (Range 0-20 dS / m and resolution 0.01 dS / m)
Temperature (ºC) (Range -40 / 80ºC and resolution 0.1 ºC)

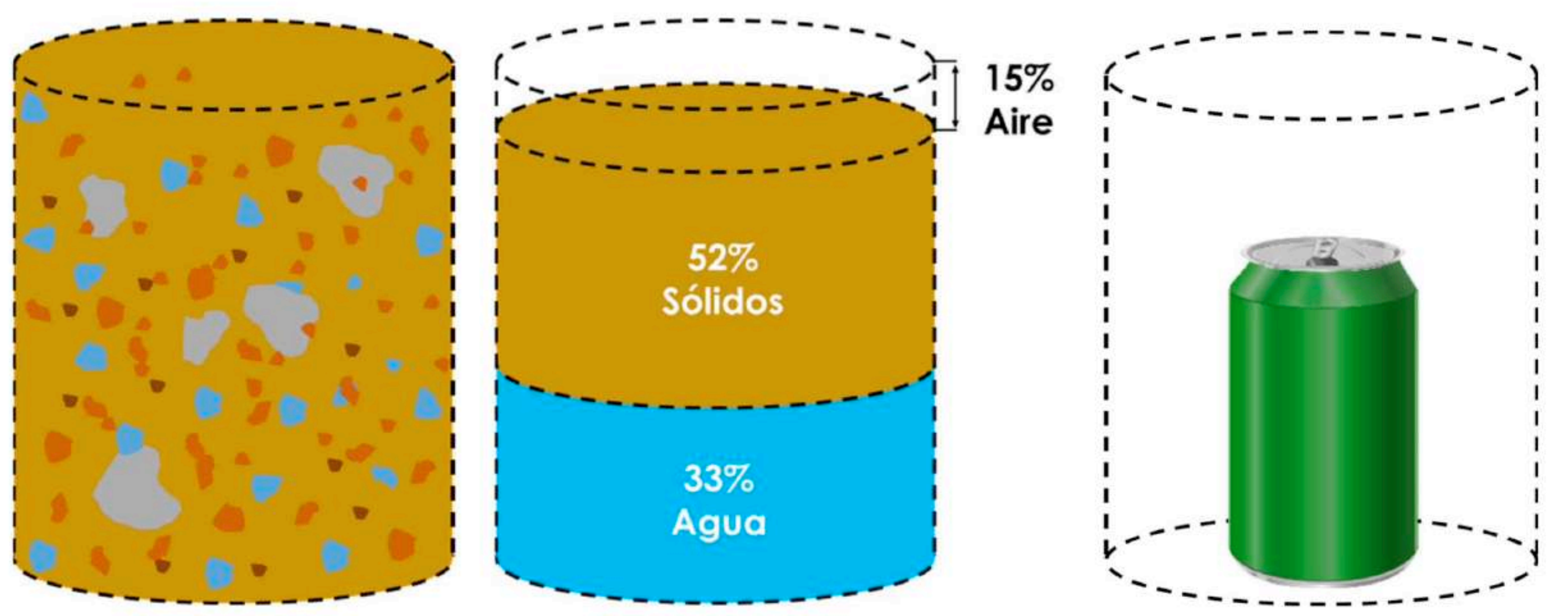
Cable length: 2m
Connection: Push-Pull (waterproof)
Communication: RS485
Polyurethane resin and stainless steel rods
Dimensions: 45x15x145 mm. (70 mm. Electrodes)

Installation:
Drill a hole in the ground to the desired depth and insert the sensor into the ground. Refill with the extracted earth while compacting avoiding air pockets and stones.
Connect the sensor to the link.

Measurement

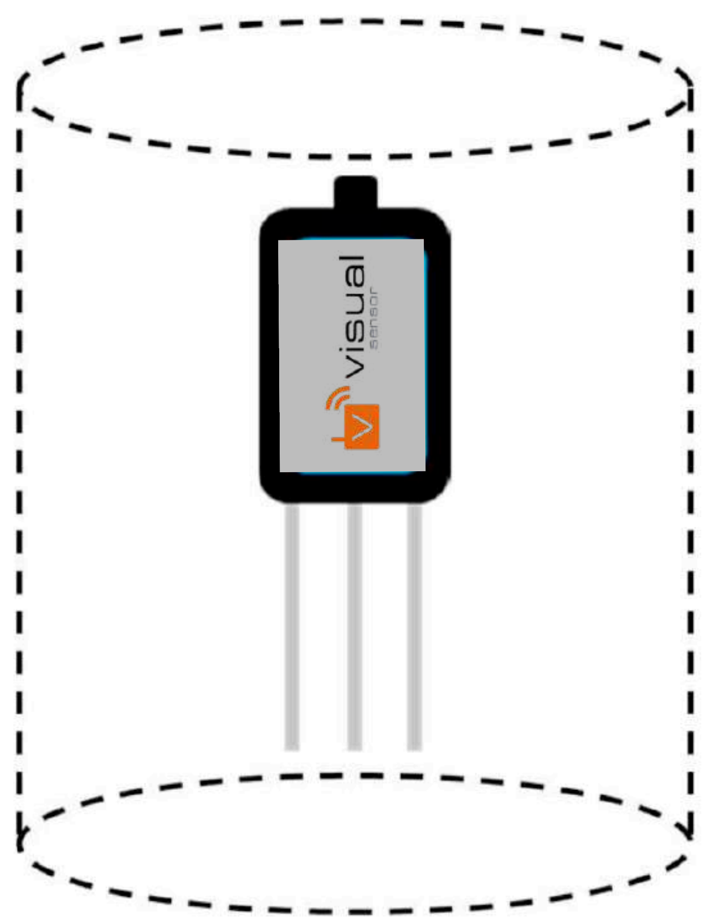
Through the FDR (Frequency Domain Reflectrometry) measurement technique, AT-32 soil sensors allow the amount of water contained within the sensor's measurement volume to be measured with laboratory precision. This measurement is called “volumetric water content” or VWC for its acronym in English (Volumetric Water Content).

So that you have a point of reference: measurements will rarely exceed 50% water content in soil, since otherwise we would be practically talking about "land contained in water".



33% VWC = 0.33m3 water/1m3ground

= 33cl water/ Volumetric measurement



Volumetric sensor control

Measurement

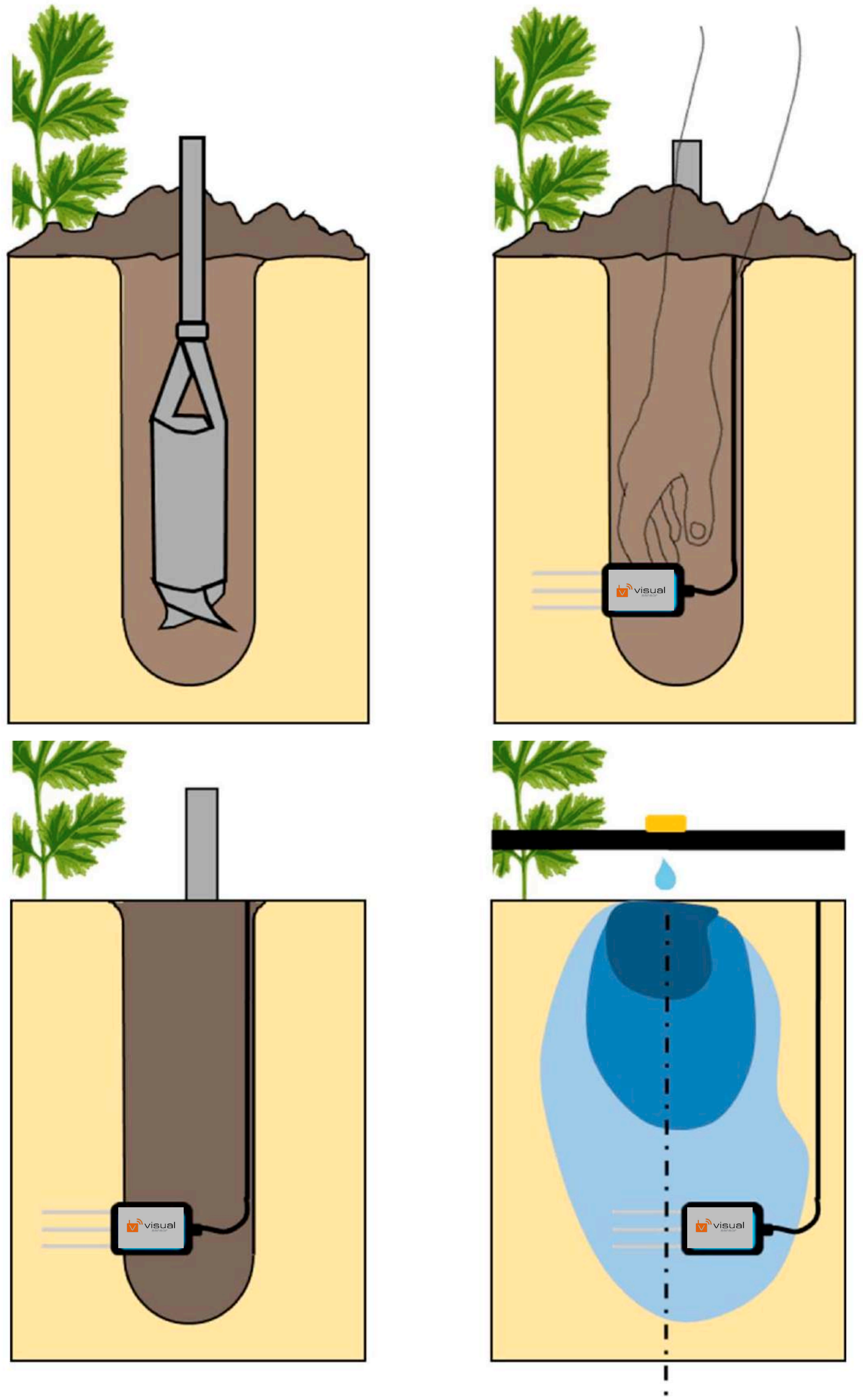
A good installation of the soil sensors is the most critical part if you want to obtain rigorous data and the best reference on your risks. Here's how to best install your soil probes.

Choose a representative soil ratio for your crop. Try to avoid sector margins as much as possible. Make a hole with a feat or auger.

2. Nail the sensor preferably horizontally as shown in the picture. If you notice that the sensor hits a stone, remove the sensor and try again.

3. Return the removed soil by gently compacting around the sensor to avoid air pockets.

4. The sensor should be just below the dropper to measure the center of the wet bulb. Use fixatives to prevent dripper point drift relative to sensor.



If you choose to install the sensor at another point that does not coincide with the vertical of the dripper, it is recommended to ALWAYS use that reference when performing a new installation.
Check that the dropper IS NOT CLOGGED.

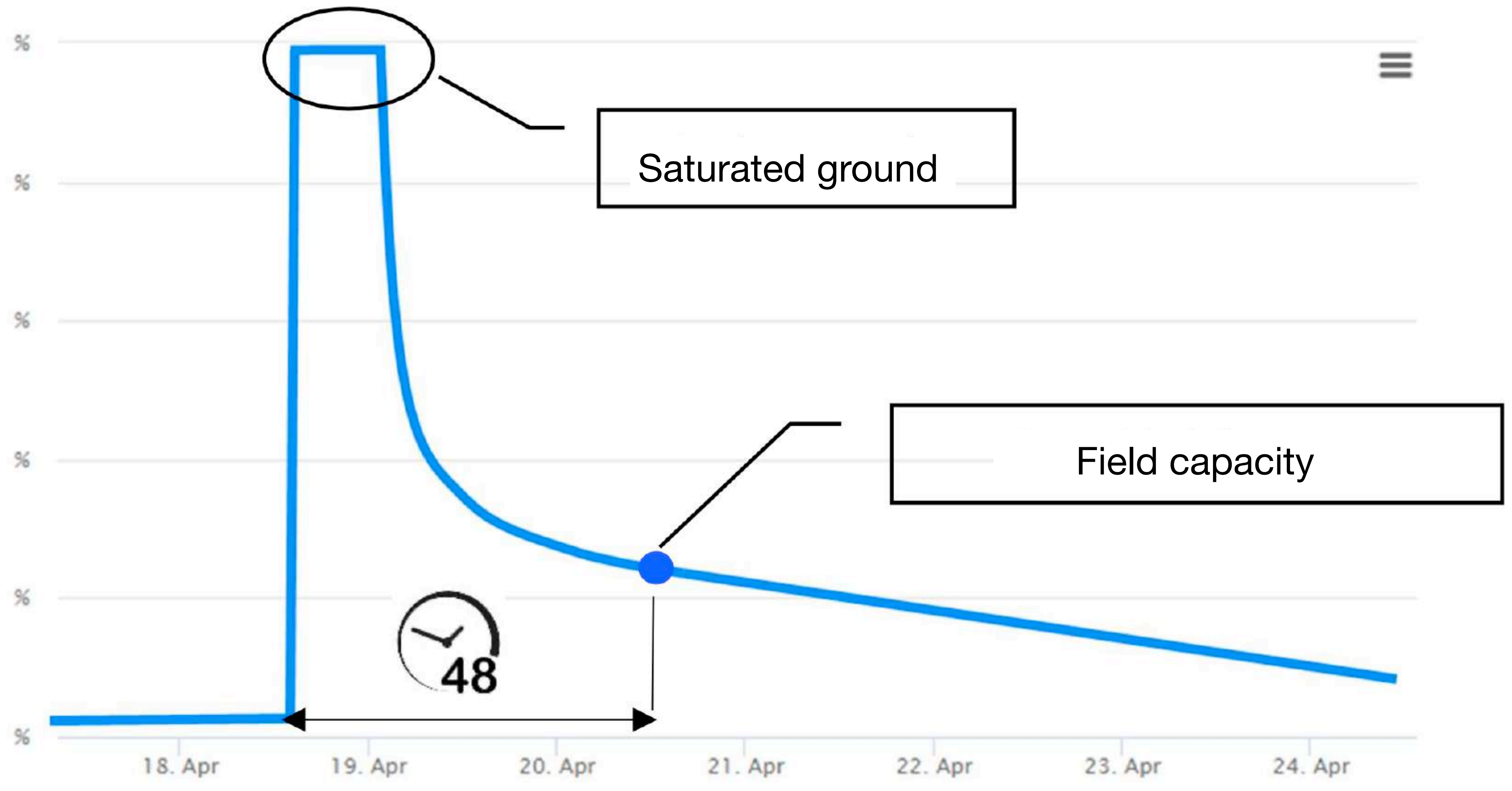
Optimizing irrigation with field capacity

The “field capacity” is the upper limit from which more is being irrigated, since the granulometric composition of the soil does not allow to sustain this volume of water.

To determine the best time to apply irrigation, it is ESSENTIAL to know what the “field capacity” of your soil is. Field capacity is defined as the point from which a soil begins to lose water constantly.

To determine the field capacity of your soil, you can do one of the following:

A. Have a soil test done by a certified laboratory.
B. Perform the following experiment with your soil probe once installed:
    A. Saturate the soil with water through long-term irrigation, until your soil will not accept any more water.
    B. Allow to drain freely without adding more water for 48 hours. The percentage of water it has at that moment from which the soil constantly loses water.
C. According to the definition of “field capacity”, determine visually in the graph what is the moment from which the soil loses water constantly.

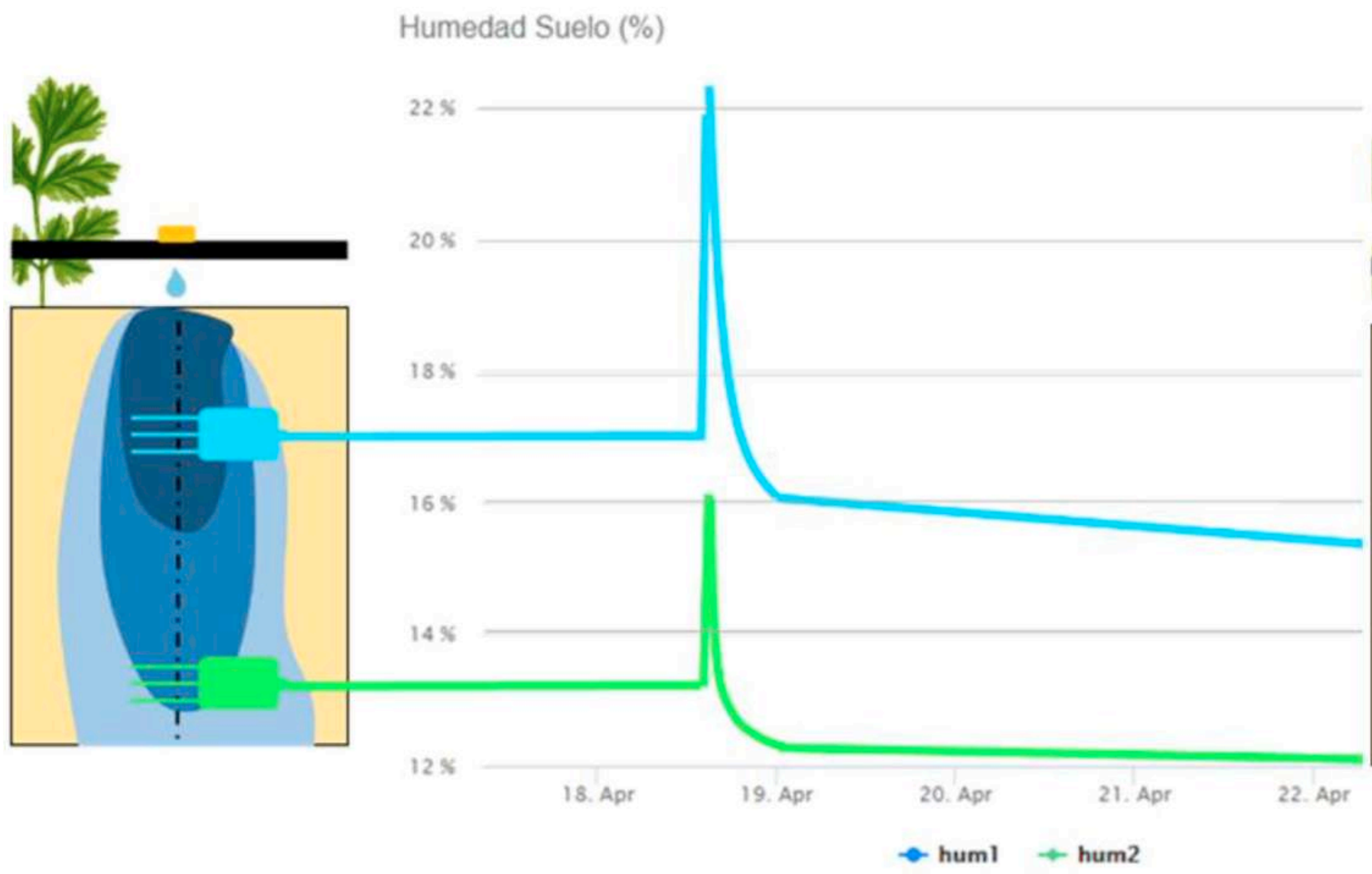


If you opt for experiments A and B to obtain the "field capacity", do so in cold seasons and in a dormant state of the crop that allows minimizing the effects of "evapotranspiration" in the experiment.

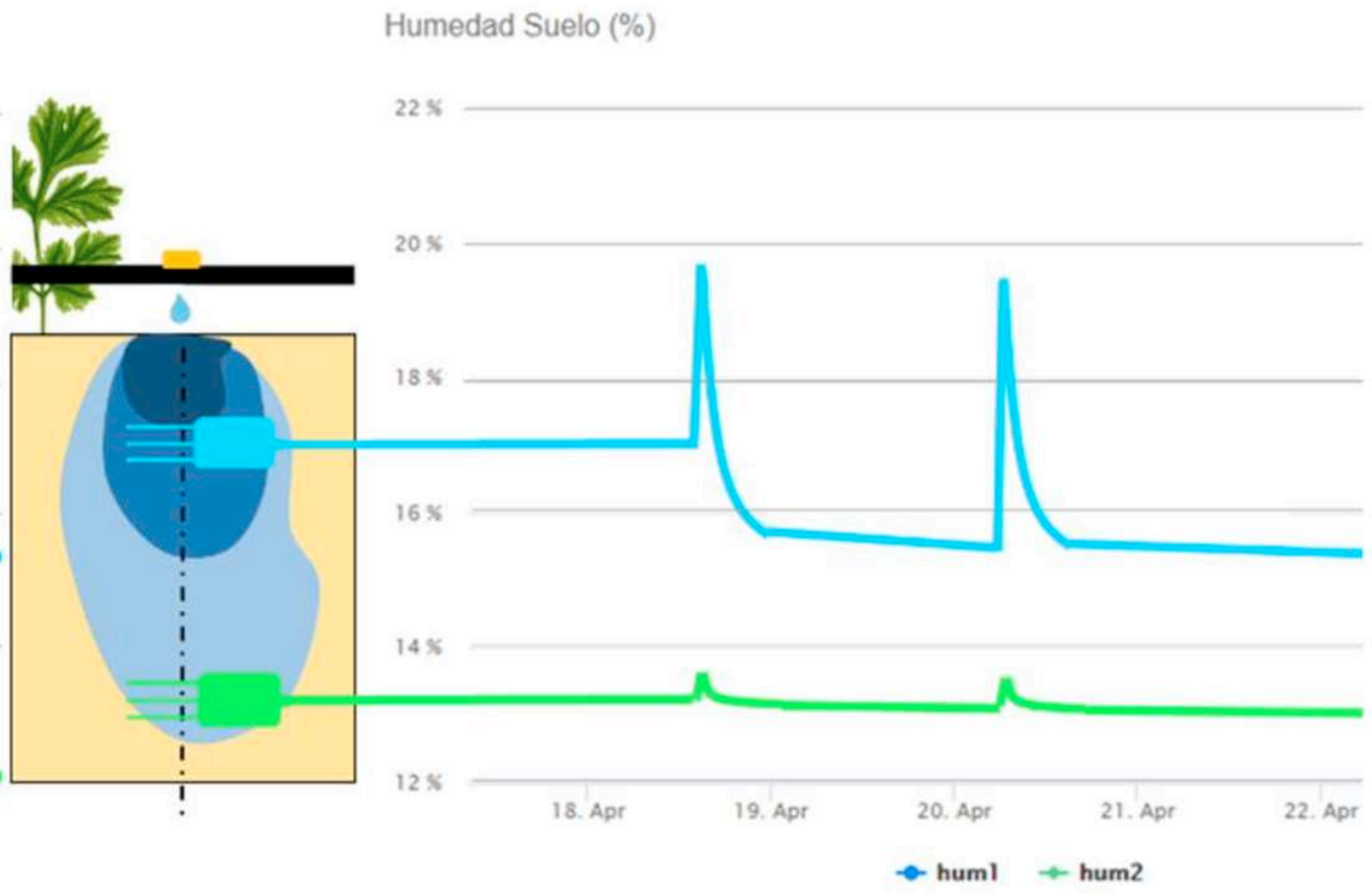
Optimizing irrigation with field capacity

The recharge point is the limit moment after which the crop can enter into water stress. This point depends on the evapotranspiration (ETo), the water needs of the type of crop itself and the quality of the water (salinity).
As a starting point, we will use the weekly water supply and use a second measurement point (drainage) to determine the optimal frequency of irrigation.

In the following figure you can see how, starting with irrigation with the same weekly supply, optimization is achieved by minimizing drilling losses by maximizing moisture in the middle root zone of the plant.



Drainage losses



Adjusted irrigation

To determine the weekly supply of water, consult your agricultural technician or consult the databases that each autonomous community makes available to farmers based on the type of crop and geographic location.

Optimizing irrigation by controlling salinity

The only way to continuously measure salinity in the soil is through soil probes. All soil probes measure salinity through "apparent conductivity" which depends on the water content in the soil and its temperature. The apparent conductivity will increase the more salts and water are in the soil.

The table shows the limit values for the inlet conductivity of the water (with fertilizer) and the conductivity of the soil.

Rendimientos	100%		90%		75%		50%		0%	
(Conductividad eléctrica en dS/m)	Extracto saturado	Agua riego	Extracto saturado	Agua riego	Extracto saturado	Agua riego	Extracto saturado	Agua riego	Extracto saturado	Agua riego
EXTENSIVOS										
Cebada	8	5,3	10	6,7	13	8,7	18	12	28	19
Algodón	7,7	5,1	9,6	6,4	13	8,4	17	12	27	18
Remolacha azucarera	7	4,7	8,7	5,8	11	7,5	15	10	24	16
Sorgo	6,8	4,5	7,4	5	8,4	5,6	9,9	6,7	13	8,7
Trigo (Triticum aestivum)4,6	6	4	7,4	4,9	9,5	6,3	13	8,7	20	13
Trigo (Triticum turgidum)	5,7	3,8	7,6	5	10	6,9	15	10	24	16
Soja	5	3,3	5,5	3,7	6,3	4,2	7,5	5	10	6,7
Cacahuete	3,2	2,1	3,5	2,4	4,1	2,7	4,9	3,3	6,6	4,4
Arroz	3	2	3,8	2,6	5,1	3,4	7,2	4,8	11	7,6
Caña de azúcar	1,7	1,1	3,4	2,3	5,9	4	10	6,8	19	12
Maíz	1,7	1,1	2,5	1,7	3,8	2,5	5,9	3,9	10	6,7
Lino	1,7	1,1	2,5	1,7	3,8	2,5	5,9	3,9	10	6,7
Haba	1,5	1,1	2,6	1,8	4,2	2	6,8	4,5	12	8
Alubia	1	0,7	1,5	1	2,3	1,5	3,6	2,4	6,3	4,2
HORTALIZAS										
Calabacín	4,7	3,1	5,8	3,8	7,4	4,9	10	6,7	15	10
Remolacha roja	4	2,7	5,1	3,4	6,8	4,5	9,6	6,4	15	10
Brócoli, Brécol	2,8	1,9	3,9	2,6	5,5	3,7	8,2	5,5	14	9,1
Tomate	2,5	1,7	3,5	2,3	5	3,4	7,6	5	13	8,4
Pepino	2,5	1,7	3,3	2,2	4,4	2,9	6,3	4,2	10	6,8
Espinaca	2	1,3	3,3	2,2	5,3	3,5	8,6	5,7	15	10
Apio	1,8	1,2	3,4	2,3	5,8	3,9	9,9	6,6	18	12
Col	1,8	1,2	2,8	1,9	4,4	2,9	7	4,6	12	8,1
Patata	1,7	1,1	2,5	1,7	3,8	2,5	5,9	3,9	10	6,7
Maíz dulce	1,7	1,1	2,5	1,7	3,8	2,5	5,9	3,9	10	6,7
Boniato	1,5	1	2,4	1,6	3,8	2,5	6	4	11	7,1
Pimiento	1,5	1	2,2	1,5	3,3	2,2	5,1	3,4	8,6	5,8
Lechuga	1,3	0,9	2,1	1,4	3,2	2,1	5,1	3,4	9	6
Rábano	1,2	0,8	2	1,3	3,1	2,1	5	3,4	8,9	5,9
Cebolla	1,2	0,8	1,8	1,2	2,8	1,8	4,3	2,9	7,4	5
Zanahoria	1	0,7	1,7	1,1	2,8	1,9	4,6	3	8,1	5,4
Judía	1	0,7	1,5	1	2,3	1,5	3,6	2,4	6,3	4,2
Nabo	0,9	0,6	2	1,3	3,7	2,5	6,5	4,3	12	8
FRUTAS										
Palmera datilera	4	2,7	6,8	4,5	11	7,3	18	12	32	21
Pomelo	1,8	1,2	2,4	1,6	3,4	2,2	4,9	3,3	8	5,4
Naranja	1,7	1,1	2,3	1,6	3,3	2,2	4,8	3,2	8	5,3
Melocotón	1,7	1,1	2,2	1,5	2,9	1,9	4,1	2,7	6,5	4,3
Albaricoque	1,6	1,1	2	1,3	2,6	1,8	3,7	2,5	5,8	3,8
Uva (Vitus sp.)	1,5	1	2,5	1,7	4,1	2,7	6,7	4,5	12	7,9
Almendra	1,5	1	2	1,4	2,8	1,9	4,1	2,8	6,8	4,5
Ciruela	1,5	1	2,1	1,4	2,9	1,9	4,3	2,9	7,1	4,7
Mora (Rubus sp.)	1,5	1	2	1,3	2,6	1,8	3,8	2,5	6	4
Fresa (Fragaria sp.)	1	0,7	1,3	0,9	1,8	1,2	2,5	1,7	4	2,7

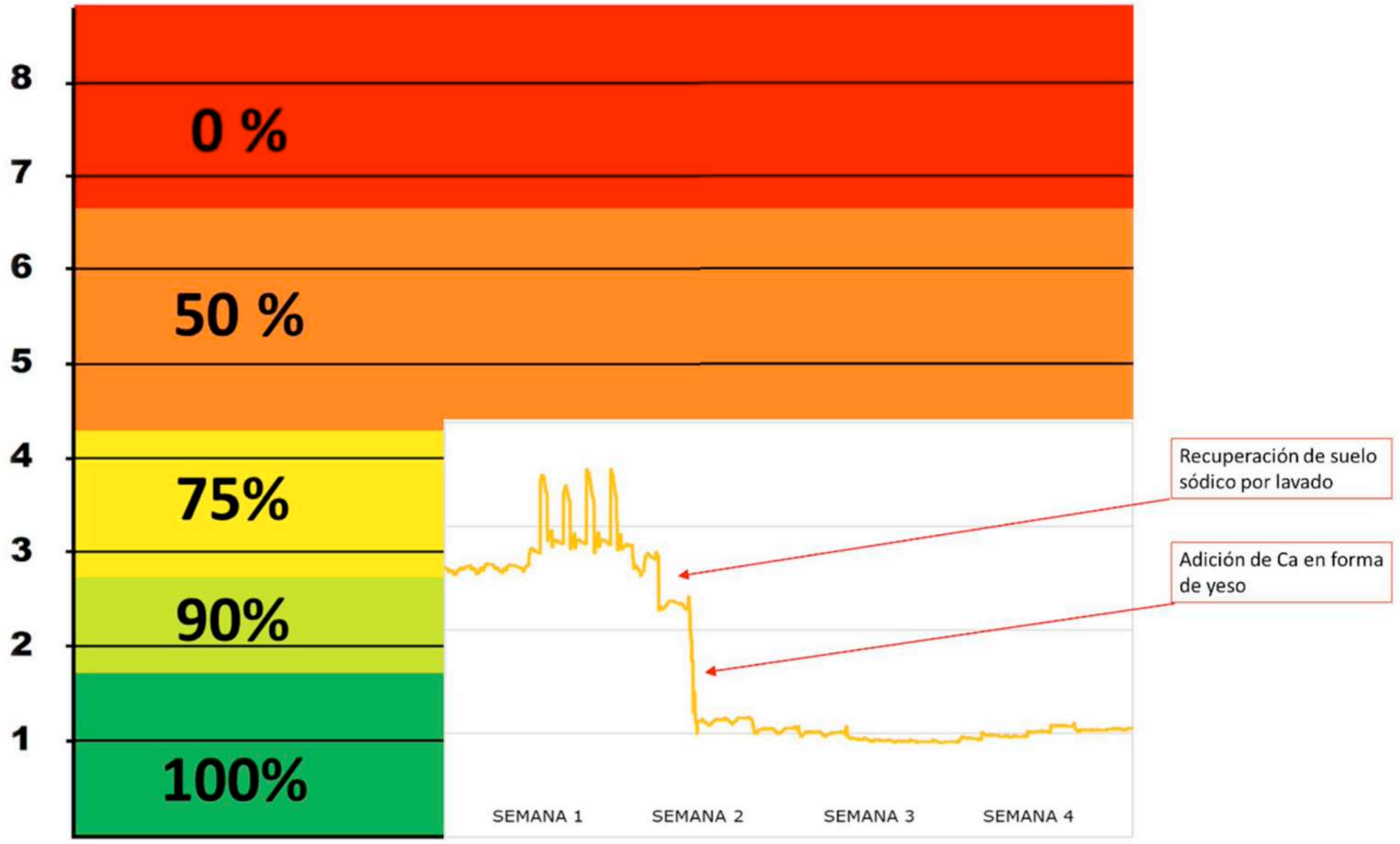
Font: https://www.agromatica.es/conductividad-electrica-del-agua/

Not to be confused with the conductivity of the water-saturated extract. Which is the result of measuring the conductivity in a bucket of the water extracted from the soil with a lysimeter or vacuum pump.

Optimizing irrigation by controlling salinity

Below is an example of how a saline soil is recovered in tomato cultivation.

In this example, a washing irrigation is carried out, without fertilizer to reduce the salinity of the soil, and then a Calcium addition treatment is applied to reduce the salinity.



This list is for informational purposes only. The salinity values can vary according to the type of soil or variety of cultivation. Consult with your technician or expert to adjust your salinity limit values to the reality of your crop.

Care and maintenance

Take care of the sensor rods. Do not try to push the rods through rocks or extremely hard earth. (When in doubt, use an insertion tool to make pilot holes before inserting the sensor.)

Do not remove the sensor from the ground by pulling the cable.

The sensor is completely sealed and can be safely submerged in water, but the connectors are not sealed and although they have resistance to ambient water, they should preferably be kept dry.

Clean the sensor after use. To clean it, you can use water with or without detergent and rub with a brush or plastic or cloth scouring pad.
Avoid using and storing in areas subject to extreme temperatures.

Take precautions to protect the sensor from physical damage from the rods and from handling damage. When the sensor is not in use, it is advisable to store it clean, with the rods inserted in foam and to use the packing materials provided.

Usage warnings

- Make a note of the sensor location, with references if necessary. You can also mark its position on the spot. Once installed and over time, it can be difficult to locate.

- Identify numerically the sensors of the same VISUAL BOX, according to its connector, associating it with its position or depth.

- Check that the cable is not placed in such a way that someone can trip over it or that it does not interfere with the normal tasks of your cultivation or the passage of machinery.

- Do not try to remove the sensor by pulling on the cable, you could damage it.

- Do not bury the VISUAL BOX module.

- The incorrect installation of the sensor in the ground can give incorrect measurements and even break it.

- Sensor measurements depend on many soil factors and should be used as a guide. To validate them, they must be contrasted with analysis in certified laboratories or with duly calibrated devices, and if necessary, apply a conversion factor.

- Use caution with the sharpness of the sensor rods. Keep it away from children.

- Use of the equipment for sexual purposes is not recommended.

- If you have any questions, contact us.

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Support - Do you have any questions or concerns?
We test, install, calibrate and repair each sensor where you need it. Our technicians use the instruments every day. No matter what the question is, there is always someone available.

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