

OFIVO - Optimization of irrigation & fertigation on Occitan vineyards

Short description of the OG

The gradual change in rainfall patterns experienced in the vineyards of southern France, especially around the Mediterranean Sea, means that the vines are increasingly subject to summer drought.

The objectives of the operational group OFIVO are to study the **different irrigation systems** to see which one is best suited for vines, as well as **the implementation of fertigation** and its use in viticulture.

OFIVO was implemented by 5 partners (winegrowers, technical institutes, negociants, cooperatives) and 40 winegrowers were involved throughout the project. The trials were mainly located on two plots: the first in Gascony and the second in the Mediterranean area.

To compare irrigation systems, profiles of wet bulbs in the soil were examined thanks to capacitive probes. More than 10 000 data were collected during the project. Impacts of fertigation were assessed by yield measurement and quality analysis of the harvest.

Benefits

The main added ecological value for the farmer addressed by the OG: water use efficiency in vineyards, precision of water and fertiliser inputs, better mobilisation of fertilising units by the vines

Stage of implementation

OFIVO is over (2018-2021).

Applicability box

Theme

Climate change adaptation, water-use efficiency, fertilization

Context

South of France, 2 main regions concerned (near Toulouse = Gascony and near Montpellier = Mediterranean context). In the area near Montpellier, irrigation is already highly developed which is not yet the case in Gascony. Fertigation is not yet widely used in viticulture.

Application time

Period of use: April to mid-August (a deadline may be imposed by local regulation)

Installation of the fertigation system: Before planting, maintenance during winter

Required implementation time

In average, 30 hours are needed for the installation of this kind of fertigation system.

Period of impact

April-August

Equipment

A lot of material needed for the installation + heavy and important maintenance: filtration device, drippers, valves or solenoid valves, pressure regulator, pipes...

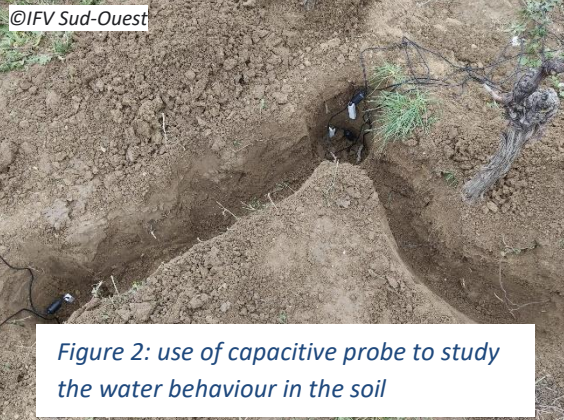
Main achieved or expected results

The results are focused on the positioning of the irrigation system in the vine row (aerial or buried in the middle of the inter-row or under the row) and on the impact of the use of fertigation on vines and especially on grape maturity. Expected results are:

- Secure annual production in terms of quantity and quality
- Optimize water use according to its availability
- Reduced fertilization inputs thanks to the definition of differences in needs between plots.
- Improved farm competitiveness thanks to better control of yield factors and better grape quality management in line with market expectations
- Improved vine longevity thanks to better nutritional balance



Figure 1: fertigation tests



Existing materials

Videos

OG presentation :

https://www.youtube.com/watch?v=DqhjMEjyGmw&t=930s&ab_channel=CLIMED-FRUIT

Web links

Project presentation  : <https://www.vignevin-occitanie.com/nos-recherches-2/viticulture-de-precision/ofivo/>

Further reading

Fertigation  : <https://www.vignevin-occitanie.com/fiches-pratiques/vignobles-innovants-et-eco-responsables/la-fertirrigation/>

Contact information

Publisher:

IFV Sud-Ouest

1920 route de Lisle sur Tarn

81310 Peyrole, <https://www.vignevin-occitanie.com/>

Author (s): Eric Serrano, Thierry Dufourcq

Contact: eric.serrano@vignevin.com, thierry.dufourcq@vignevin.com

Project partners: Val de Gascogne, Domaine Uby, Domaine de Pellehaut, Les Grands Chais de France

This practice abstract was elaborated in the CLIMED-FRUIT project.

Project website:

<https://climed-fruit.eu/> (no OFIVO website)

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Subsurface irrigation

Challenge

Summer drought no longer allows the winegrower to perfectly control his production system. Aerial drip irrigation under the vine row is the most widely used, but is it the most efficient one? The objective of this study was to examine the profiles of wet bulbs of the soil obtain from 2 irrigation systems: aerial drip located under the vine row and subsurface drip located in the middle of the inter-row of vine.

Solution

In this experiment, using capacitive probes in the soil, it was demonstrated that **subsurface irrigation (40 cm depth) in the middle of the row generated larger volumes of wet bulb**, with vertical and lateral percolation of the water, than aerial drip irrigation system (figure 3).

Subsurface irrigation in the inter-row did not modify the vines water status neither the yields comparing to aerial irrigation under the vine row.

During our trial, it was also possible to visualize, without measurement, that the water from the subsurface irrigation reached the ground surface by capillarity. This irrigation system, still underdeveloped, could be a lever in dry areas to promote the establishment of plant cover in the inter-row, which is known for providing a set of sustainable services.

Benefits

Better water use efficiency, facilitating the establishment of vegetal cover in the mediterranean area, maintain viticulture in dry areas.

Applicability box

Theme

Climate change adaptation, water-use efficiency, cover crop

Context

Mediterranean area, no stony soils

Application time

Period of use (irrigation + eventually fertigation): April to mid-August (a deadline may be imposed by local regulation)

Installation of the subsurface irrigation system: Before planting or during vine dormancy (after harvest, before budburst)

Required implementation time

Depends on plot configuration, similar to an aerial drip system

Period of impact

April-August

Equipment

Irrigation material: pipes, drippers, valves, backwash, etc

Practical recommendation

Subsurface drip irrigation system installation on the plot, 3 main steps:

1. Opening of trenches and installation of irrigation combs
2. Assembly of the central station and connection to the combs
3. Installation of drip rails and connection to the combs

It is advisable to adapt the irrigation equipment to this subsurface technique. For installation, a subsoiler is all you need to lay the pipe network. A mini-excavator can be used to install the combs and fittings. This installation is quick to set up, and the working time is comparable to that of an aerial drip system.

Points of focus:

- Importance of filtration and network maintenance
- Need to install appropriate drippers: flat (to prevent crushing of the drop-forming system under the weight of the soil), anti-siphon, anti-root and self-regulating

Advantages of subsurface drippers:

- ✓ Improved system durability: pipes are protected from pests and machinery
- ✓ Easier mechanical weeding/weed management
- ✓ Between rows, better expand of the vine's root volume



Disadvantages of subsurface drippers:

- ✓ More expensive to install than an aerial drip system (+20% approx.)
- ✓ Not suitable for stony soils

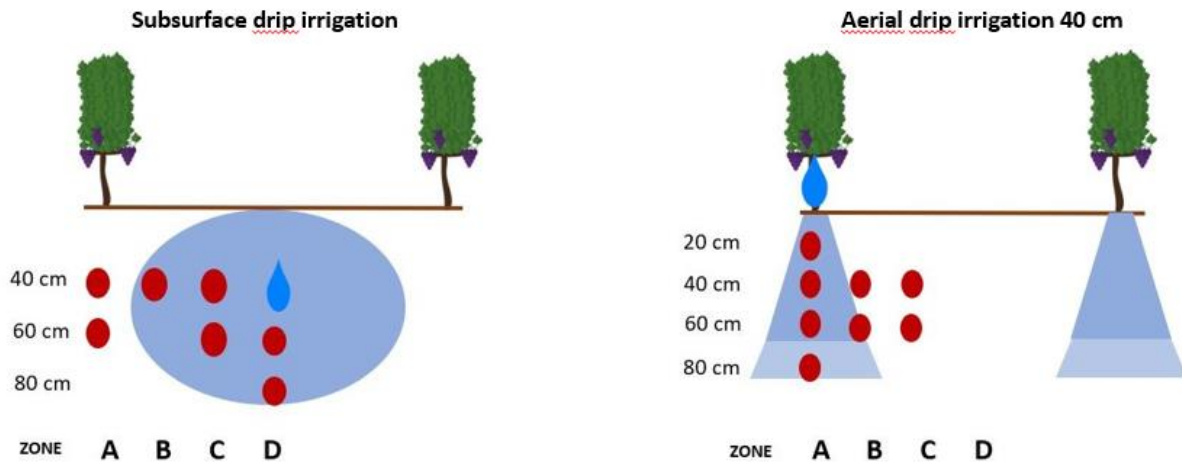


Figure 3: capacitive probes positioning on subsurface irrigation and aerial irrigation treatments

Further information**Videos**

- Tuto: Installation of a drip irrigation system (Youtube subtitles): https://www.youtube.com/watch?v=6e2vM_ko7xg&list=PL2VxgaK4MB_AefHRA13bf3Vu6uwpgZVDQ&index=3&t=1s&ab_channel=IFVSudOuest
- Irrigation management (Youtube subtitles): https://www.youtube.com/watch?v=8uvsWC1_OKU&t=148s&ab_channel=IFVSudOuest
- Vine irrigation: water regime and water quality (Youtube subtitles): https://www.youtube.com/watch?v=hPSVxGFRg9k&ab_channel=IFVSudOuest

Web links

- Vine's irrigation ■ ■ <https://www.vignevin-occitanie.com/fiches-pratiques/irrigation-de-la-vigne/>
- Subsurface irrigation ■ ■ <https://www.vignevin-occitanie.com/fiches-pratiques/vignobles-innovants-et-ecoresponsables/irrigation-enterree/>
- Vine irrigation: water regime and water quality ■ ■ <https://www.vignevin-occitanie.com/fiches-pratiques/vignobles-innovants-et-ecoresponsables/qualite-de-leau-et-entretien-du-systeme-dirrigation/>
- Estimation of the vine water status ■ ■ <https://www.vignevin-occitanie.com/fiches-pratiques/estimation-de-letat-hydrique-de-la-vigne/>

Further reading

Better understand the soil wet bulb formation with subsurface or aerial drip irrigation in viticulture <https://ives-openscience.eu/12943/>

Contact information**Publisher:**

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Author (s): Eric Serrano, Thierry Dufourcq

Contact: eric.serrano@vignevin.com,

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