



STRENGTHENING SUSTAINABLE LOCAL DEVELOPMENT AND COEXISTENCE IN LEBANON THROUGH IMPROVED OLIVE TREE YIELD AND PRODUCTIVITY

GUIDEBOOK OF AGRONOMIC TECHNIQUES



**DIPUTACIÓN
DE ZARAGOZA**

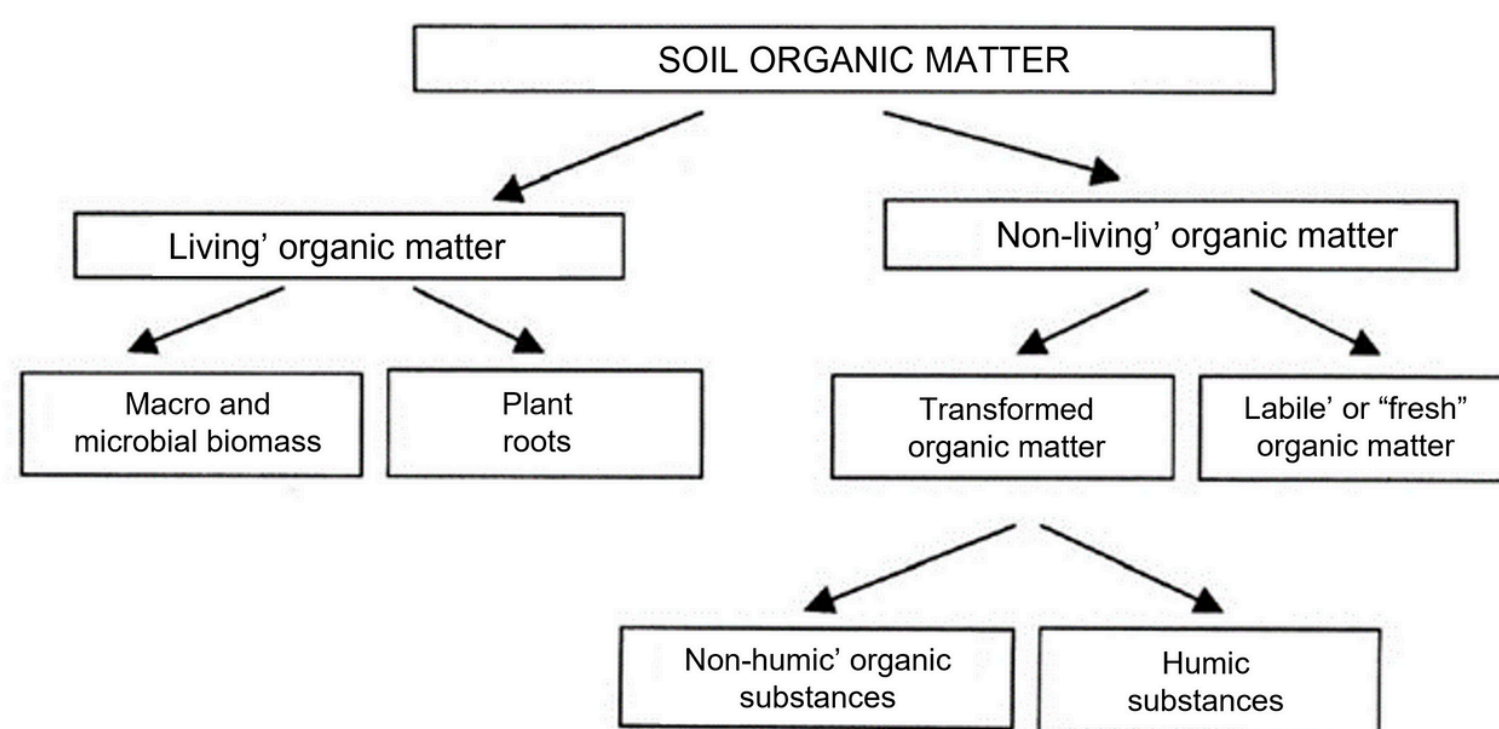


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ZARAGOZA**

This project has received funding from the Provincial Government of Zaragoza in the 2023-24 call for international development and solidarity projects

THE SOIL AS A LIVING ENTITY

Soil is a system composed of several parts: The mineral fraction, organic matter and organisms, which make up what is called the solid phase; water, which represents the liquid phase; and air, corresponding to the gaseous phase. These phases interact with each other to form the complex system we know as soil.



Soil organic matter fractions (Labrador, 2001).

THE SOILS OF SOUTHERN LEBANON

Red soils can be found on limestone, due to the oxidation of iron-bearing minerals. They may have an accumulation of organic matter and enrichment in iron oxide and kaolinite formation.

From soft limestones with large amounts of calcium carbonate, **white soils** (rendsinas in the FAO classification) are formed. The texture can range from loamy to clayey, depending on the loam content of the parent rock.

Brown soils, with similar properties to white soils, may have a secondary accumulation of calcium carbonate in the B horizon, which may become petrocalcic, impermeable to water and roots.

Very locally, **black limestone soils** can be found, either in forest areas that have not suffered any type of anthropic action or in waterlogged areas.

Basic basalts with olivine develop different types of soils **from red lithosols to black soils**. In general, the bedrock is highly altered. And the soils have a silty or clayey-loamy texture.

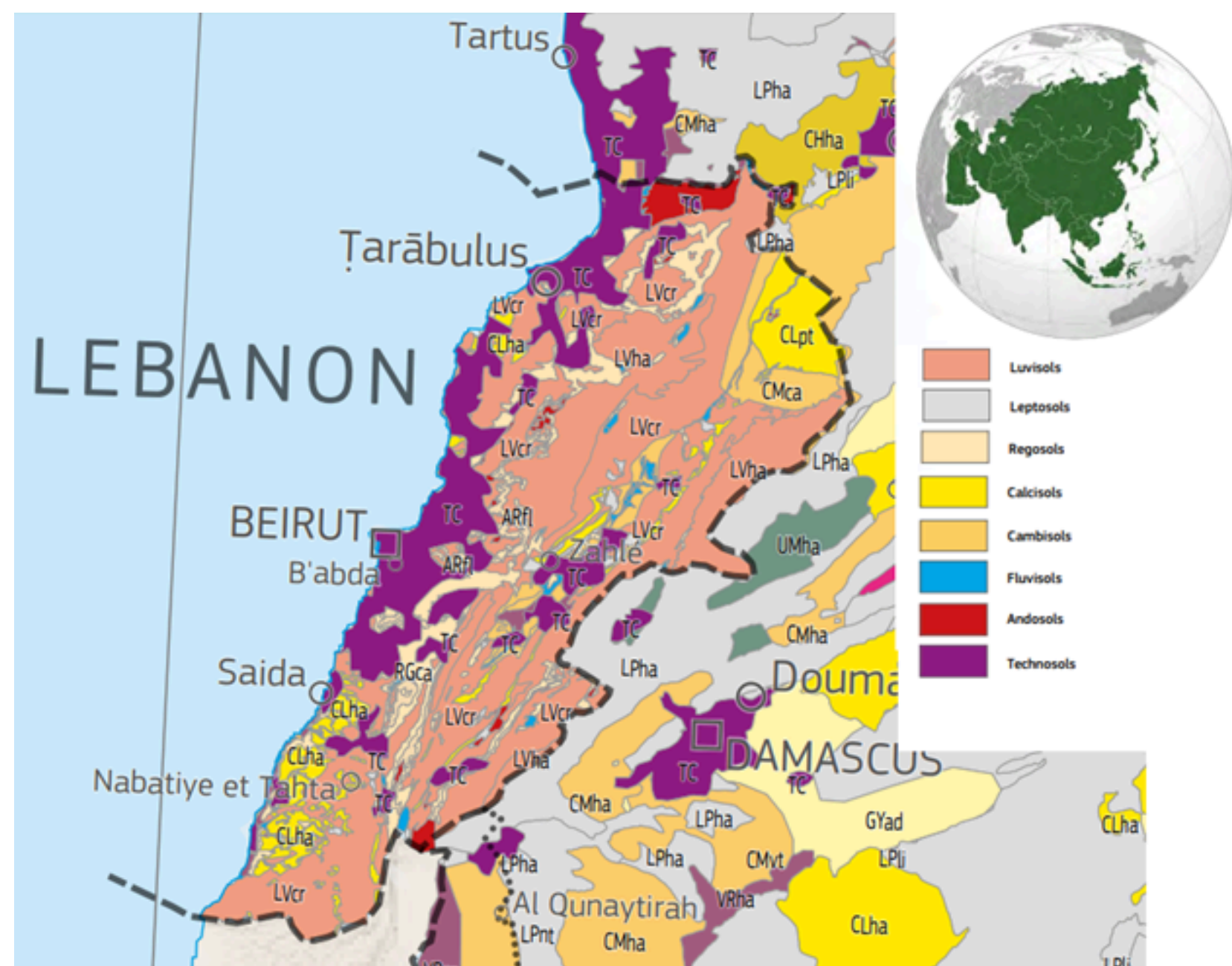
Assessment of soil characteristics:

- Test pits & representative sampling



SOIL DEGRADATION AND LOSS

- erosion
- physical degradation
- chemical degradation
- biological degradation
- depletion or decline in fertility



Soil map of Lebanon extracted from the Atlas of the Soils of Asia (JRC & FAO, 2023)



COVER CROPS

Agronomic strategy that seeks to preserve the soil by covering it with living plant species, mainly during the autumn and winter seasons.

Maintaining a layer of vegetation on the soil, which contributes to soil protection and improvement. When spring arrives, these species are mowed in order to avoid competition for resources such as water and nutrients between the cultivated plants, especially trees, and the vegetation that forms the cover. This practice allows the mown plant material to remain on the soil surface, helping to improve soil fertility and conserve moisture.



Spontaneous



Sown



Spontaneous with treatment



Vetch



From pruning waste



Hammer crusher

BENEFITS

- Improved trafficability on the farm
- Reduced production costs and operation times
- Increased organic matter content
- Improved infiltration of rainwater
- Reduction of soil erosion
- Increased soil fertility
- Increased biodiversity
- Improved air quality and contribution to combating climate change

METHODS OF MOWING COVERS

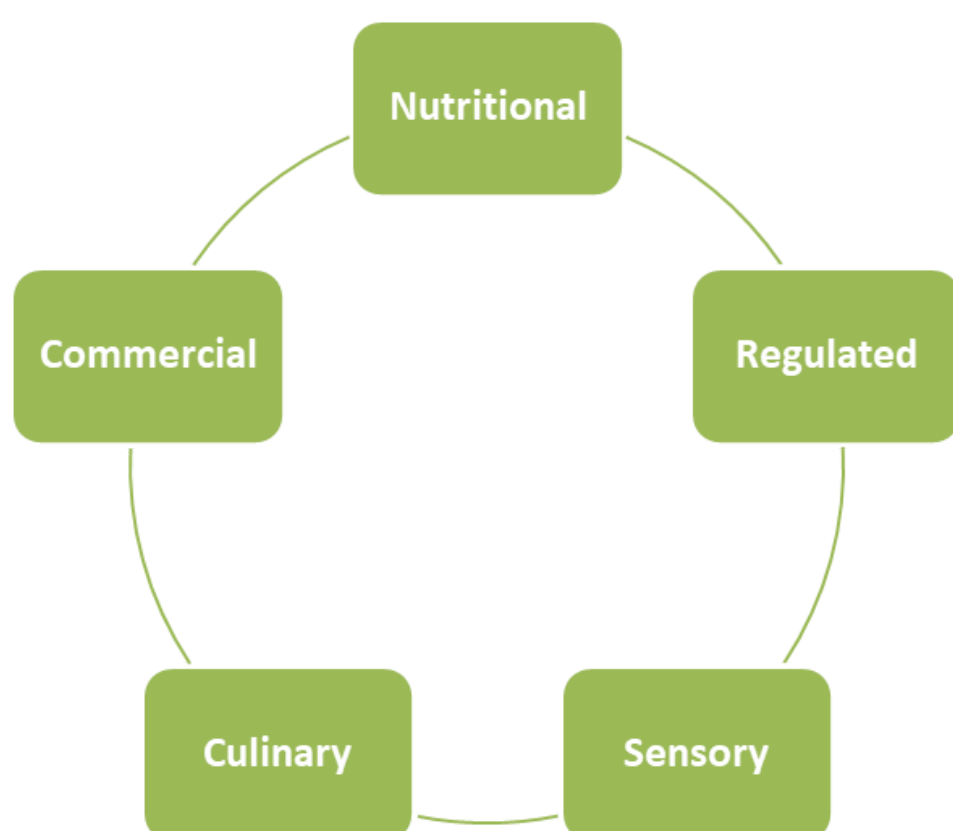
- Mechanical: chain brushcutters, blades and hammers
- Chemical: phytosanitary products to control plant cover.
- Grazing: combining agricultural activity with livestock farming

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QUALITY IN OLIVE OIL

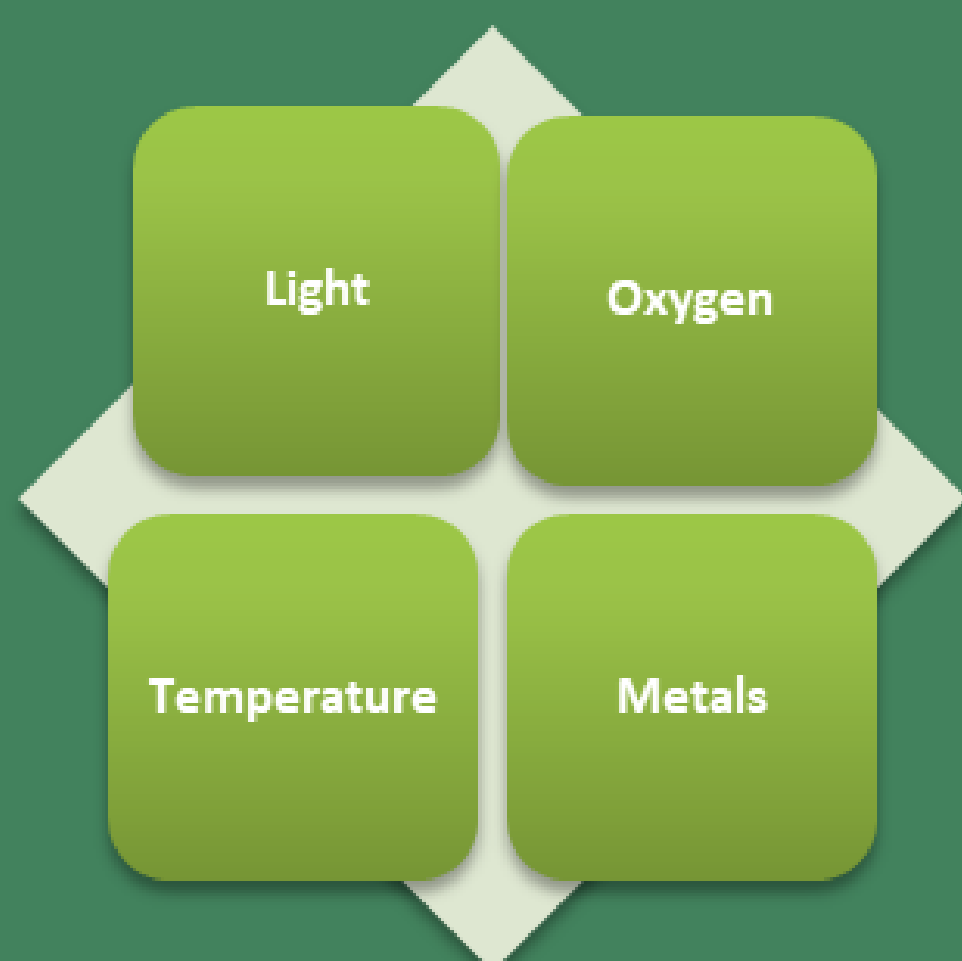


AGRONOMIC FACTORS



Traditional olive groves (left) and super-intensive olive groves (right)

CONSERVATION FACTORS

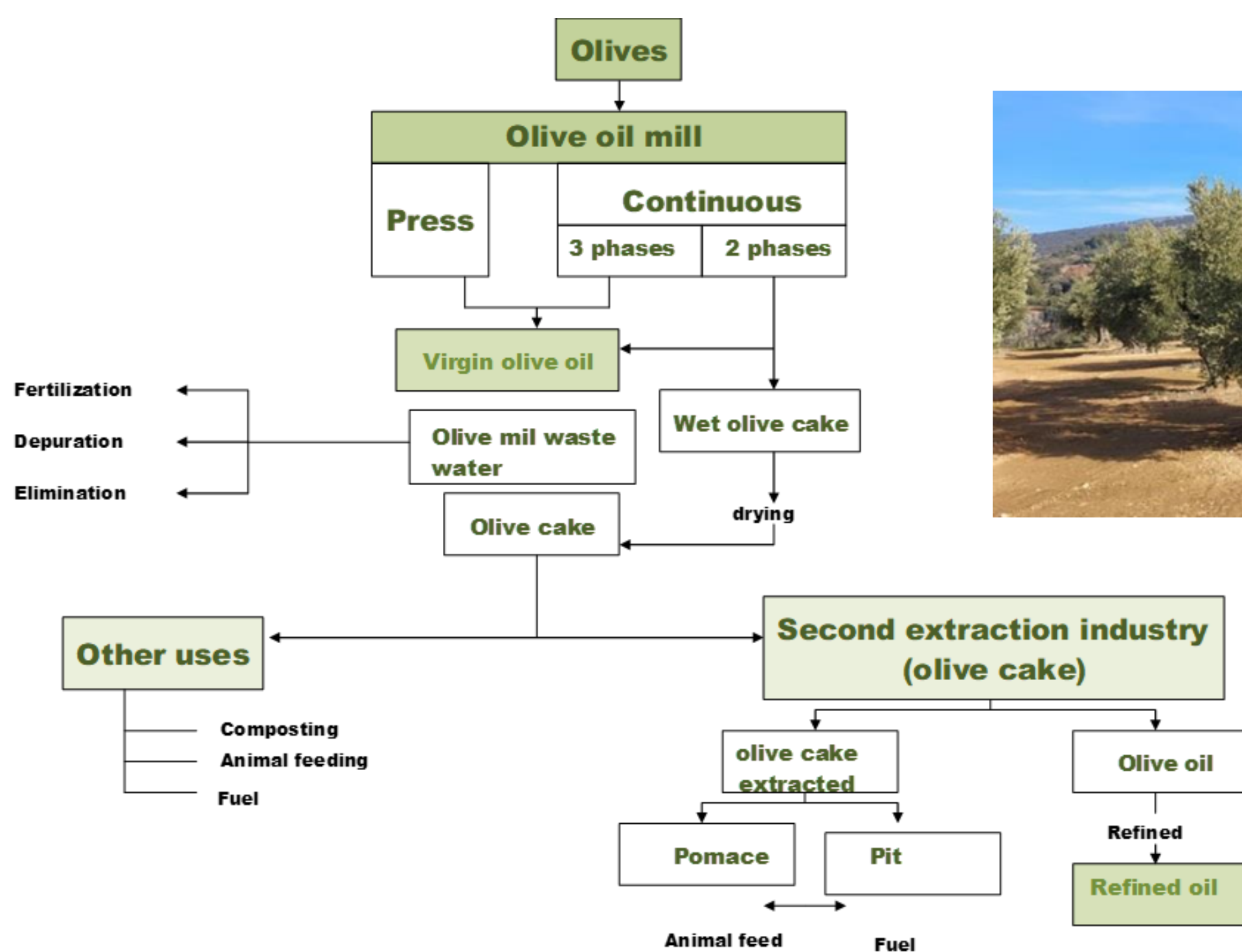


PROCESSING FACTORS

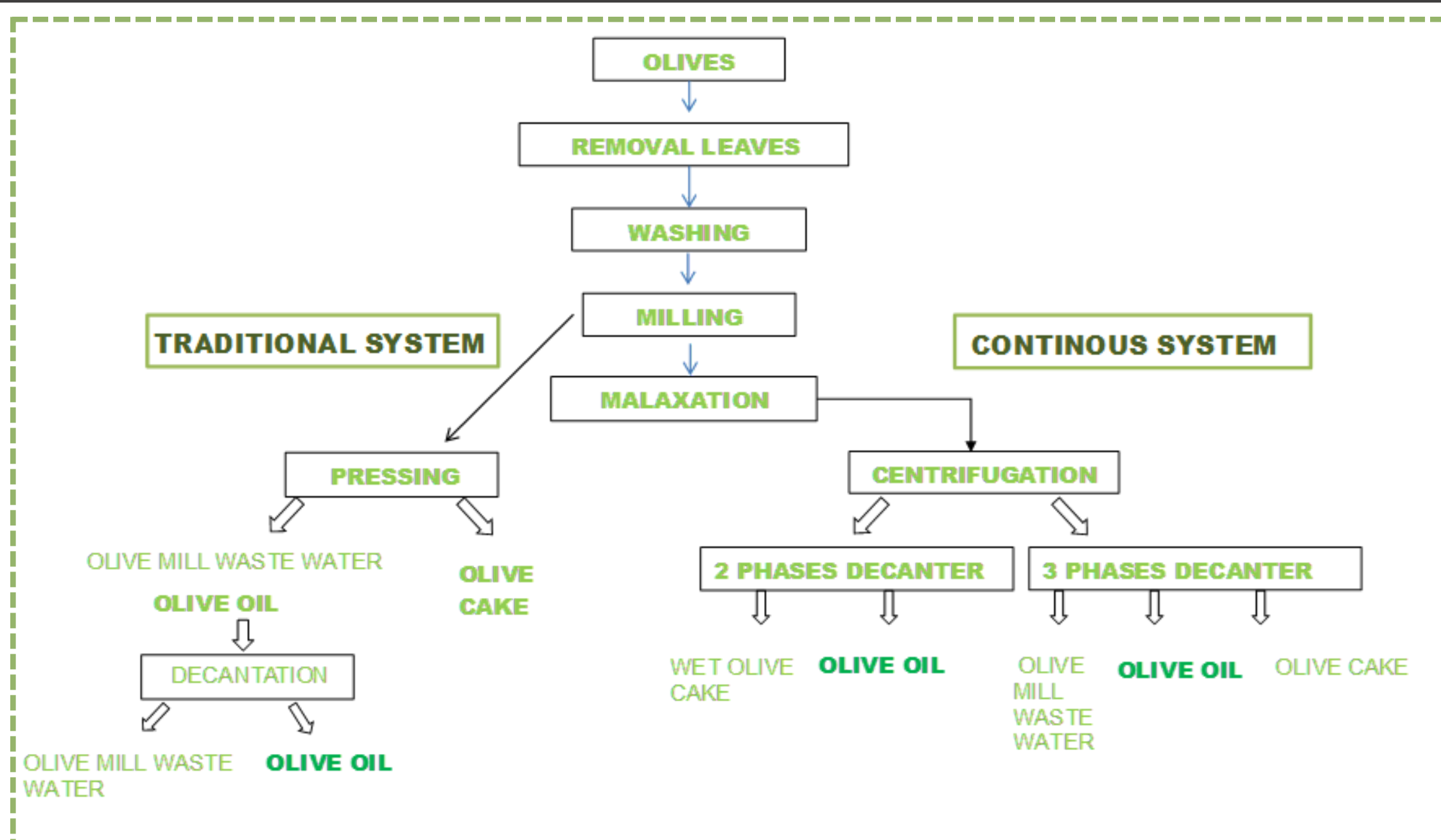
Alterations and defects in olive oils at different stages of processing

Operation	Alteration factor	Defect
Harvest	Ground olives	Insects, earth
Transport	Crushing	Enzymatic degradation: fresh fruity loss
	Closed bags or containers	Fusty sediment
Reception at oil mill	Not separated by qualities	All oil spoiled
Removal of impurities by air	Ineffective	More bitterness
Washing	Dirty water	More acidity, humidity
Storage	Anaerobic fermentation	Musty, earth
Milling	Metalic trace elimination	Oxidation and rancidity
	High speed with aeration	Metal
	Moisture in olives	Runny paste
Malaxation	Long time High temperature Bad cleaning	Cooked or burned, olive mill waste water, etc. Winey
Solid-liquid separation	Esparto presses	Winey
	Three-phase decanter	Decreased aromatic and gustatory intensity
	Dirty filter	Dirty, winey
Storage	Impurities	Fusty
	Unsuitable deposits	Oxidation
		Metalic

OLIVE OIL AND BY-PRODUCTS



PRODUCTION PROCESS



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THE PANEL

For the olive oil tasting, a number of 8 to 12 selected and trained tasters and a panel leader are required, with a few more tasters in reserve to cover possible absences.

THE ROOM



Preparation area (left) and tasting booth (right)

THE GLASS

The official olive oil tasting glass is blue or red because the colour of olive oil is not an attribute of quality.



Each glass must be marked with a random numeric or alphanumeric code. There are other types of non-standardised tasting glasses made of plastic or similar materials for other types of tastings.



POSITIVE ATTRIBUTES

- Fruity: by direct and/or retronasal routes
- Bitter: on the circumvallate papillae of the tongue
- Pungent: in the oral cavity, especially in the throat

NEGATIVE ATTRIBUTES

- Mould/damp/soil
- Mouldy-moisture-earth
- Vinegary-sour
- Acidic-sour
- Rancid
- Frozen olive (wet wood)
- Other: boiled or burnt/ wood-hay/ rough/ lubricant/ vegetable water/ metallic/ esparto/ grubby.

THE PHASES

- Olfactory phase: The tasters pick up the glass, covered with a watch glass, tilt it slightly, and rotate it fully in this position so as to wet the inside as much as possible. Then they remove the watch glass and smell the sample.
- Taste phase: Once the olfactory test has been carried out, the tasters then evaluate the buccal sensations on the tongue to perceive the bitterness at the back of the tongue, other flavours or astringency.
- Retronasal phase: To evaluate overall retronasal olfactory, gustatory and tactile sensations, tasters take short, successive breaths, drawing in air through the mouth to perceive the volatile aromatic components via the back of the nose by forcing the use of this channel.

Commercial classification of olive oils according to sensory parameters

Categories	Score
Extra virgin olive oil	Median fruity attributes greater than 0 Median defects equal to 0
Virgin olive oil	Median fruity attributes greater than 0 Median defects 0-3.5
Current virgin olive oil	Median defects 3.5- 6 or median defects less than 3.5 and median fruity equal to 0
Lampante olive oil	Median defects greater than 6



OBJECTIVES OF PRUNING

- To form the tree in an appropriate way
- To guarantee optimum production
- To obtain a higher quality olive
- To help to increase yield

STAGES IN THE LIFE OF THE TREE

Juvenile stage - formation pruning



Adult stage - production pruning



Old-age stage - renewal pruning



When pruning is carried out at times that may be delicate for possible diseases (high humidity), the cut area can be impregnated with compounds rich in iron or copper.

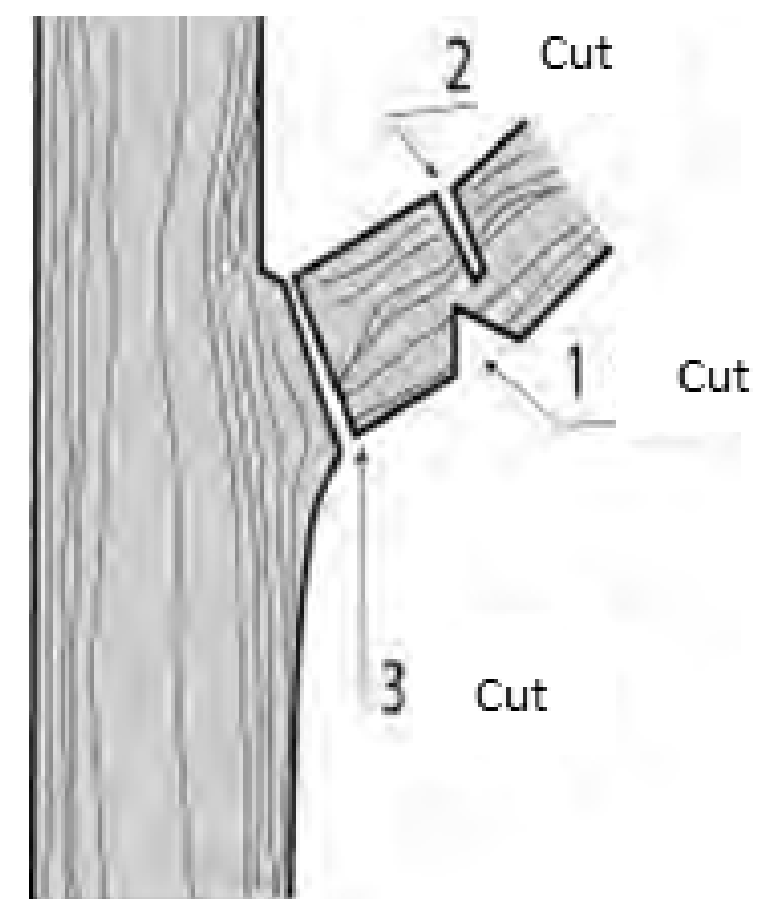
It is advisable to prune after harvesting is finished.

GENERAL CONSIDERATIONS

- Olive trees normally bear fruit on the shoots produced in the previous year.
- A thinning cut allows more light to reach the branches: it improves nutrition, flowering and fruiting.
- A thinning cut encourages the buds on the preserved portion to sprout.
- Cuts should not be made too close to the main branch or too far away, as a 'stump' can be difficult to heal and may lead to rotting.
- First make a cut from below in a more distant area.
- Then, cut the branch at the point where the first cut was made, cutting from top to bottom.
- Make the final cut from top to bottom in the desired area, neither too close nor too far from the main branch, without leaving a stump.

TYPES OF SHEARS

- Bypass pruning shears: two very sharp blades that work like scissors, this type is very suitable for plants with tender, hollow stems.
- Anvil pruning shears (one very sharp blade and a flat block). The stem rests on the flat block and the blade falls on the stem to cut it. Very suitable for plants and shrubs with woody branches.
- Two-handed pruning shears: designed for thicker branches. The length of the handles can be adjusted.
- High-branch cutting shears: for trees with higher branches.
- Electric pruning shears: greater comfort, precision, speed of pruning. Cleaner cut.
- Pruning saw: narrow-blade saw, jigsaw, chainsaw, saw (electric or manual).



CNFL - manual of pruning on power lines



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OLIVE FRUIT FLY - *BRACTOCERA OLEAE*



www.phytoma.com



2-5
generations



Olive fruit fly cycle and timing of treatment.

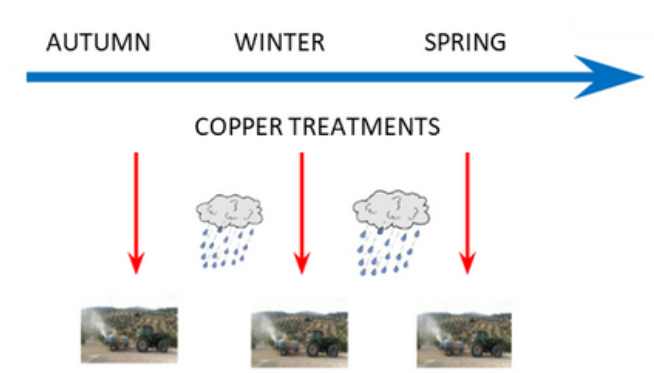
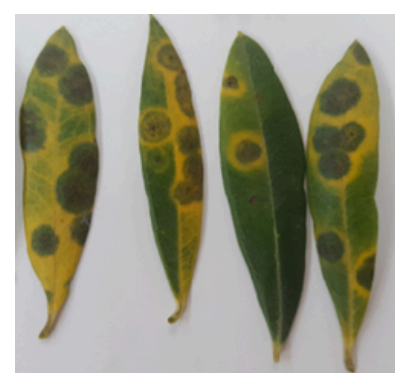
RAIF, Junta de Andalucía

Traps for detecting the time of presence and lowering pest levels

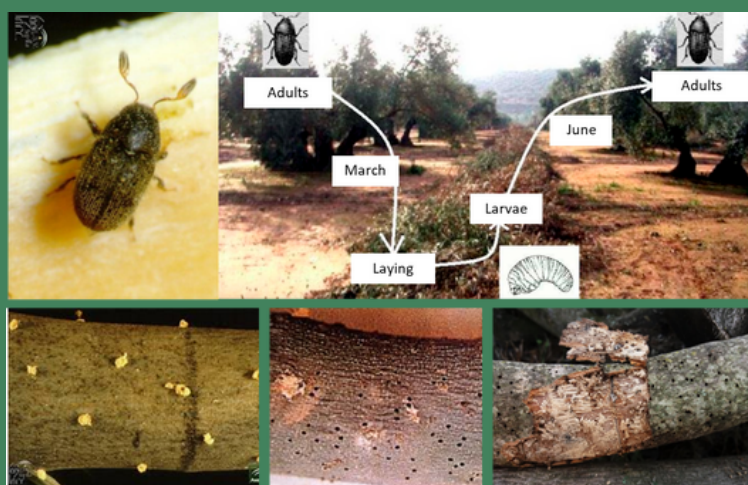
CONTROL METHODS

- **Cultural:** maintenance of the olive grove - pruning and soil tillage
- **Biotechnological:** traps to capture insects
- **Chemical methods:** fungicides, insecticides
- **Plant cover:** shelter for beneficial insects

SPILOCAEA OLEAGINEA



PHLOEOTRIBUS SCARABAEOIDES



- Do not leave pruning wood in storage
- Destroy by chopping or burning

RAIF, Junta de Andalucía

PSEUDOMONAS SAVASTANOI



- When wounds occur (frost, hail or blows), treat with copper.
- Protect thick pruning cuts



Left; www.hoy.es Centre: <https://www.maquituls.es> Right: www.sembralia.com

OTIORRINCHUS GRIBILOORIS



Example of straps and protectors
Left and centre: www.greenagri.com
Right: www.plastyagro.com

PRAYS OLEAE



Control:
Treatment with *B. thuringiensis*

BIOLOGICAL CONTROL

Enhance biological control of pests by maintaining a cover crop that can host auxiliary insects.



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COMPONENTS OF OLIVE TREE FERTILITY

The absorption of nutrients is carried out by the roots growing in the top 50 cm of the soil, which requires water to dissolve these nutrients.

The shape of the aggregates, the structure and the analysis will detail the qualities of the aggregates and the fertilisation needs.



(Badia, 2017)

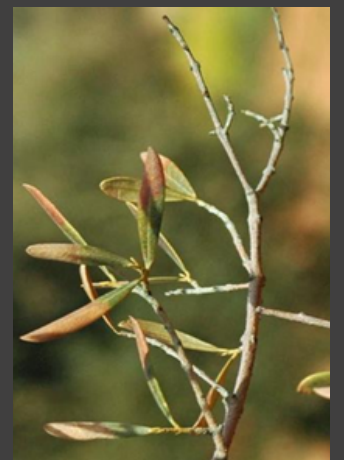
DEFICIENCY SYMPTOMS



Nitrogen



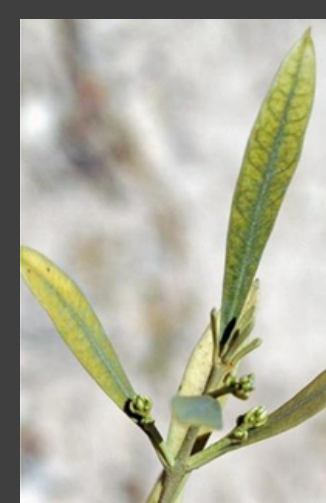
Phosphorus



Potassium



Zinc



Iron



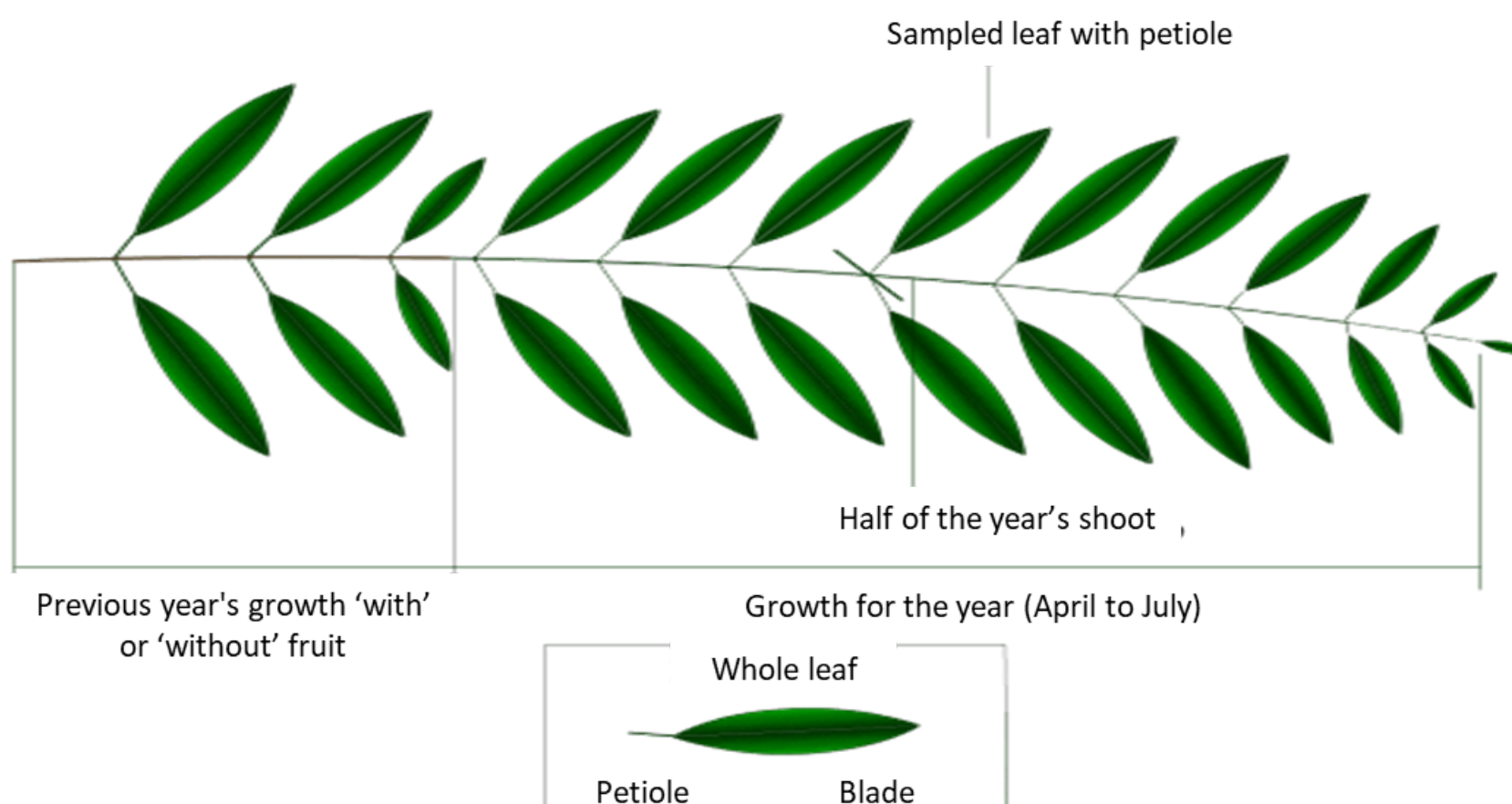
Magnesium



Boron

(Faustino de Andrés Cantero, 1997; Barranco, 2017)

LEAF ANALYSIS



(Fernández Escobar, 2009)

Element	Standard nutrient levels on dry weight basis			
	Deficient	Low	Normal	High
N (%)	<1,40	1,41-1,50	1,51-2,00	>2,00
P (%)	<0,05	0,06-0,09	0,10-0,30	-
K (%)	<0,40	0,40-0,79	0,80-1,00	>1,00
Ca (%)	<0,30	0,30-1,00	>1,00	-
Mg (%)	<0,08	0,08-0,10	>0,10	-
Mn (ppm)	-	-	>20	-
Zn (ppm)	-	-	>10	-
Cu (ppm)	-	-	>4	-
B (ppm)	<14	14-19	20-150	-

* For Iron, foliar analysis is not valid as a diagnostic method.

(Consejería de Agricultura de la Junta de Andalucía, 1996)

ALTERNATION

Alternate bearing is a natural tendency in some varieties of olive trees, aggravated by rainfed production, pests, rainfall, harvesting, pruning or fertiliser application.

With suitable fertilisation, if the olive tree is pruned regularly and receives enough water, alternate bearing will be reduced.

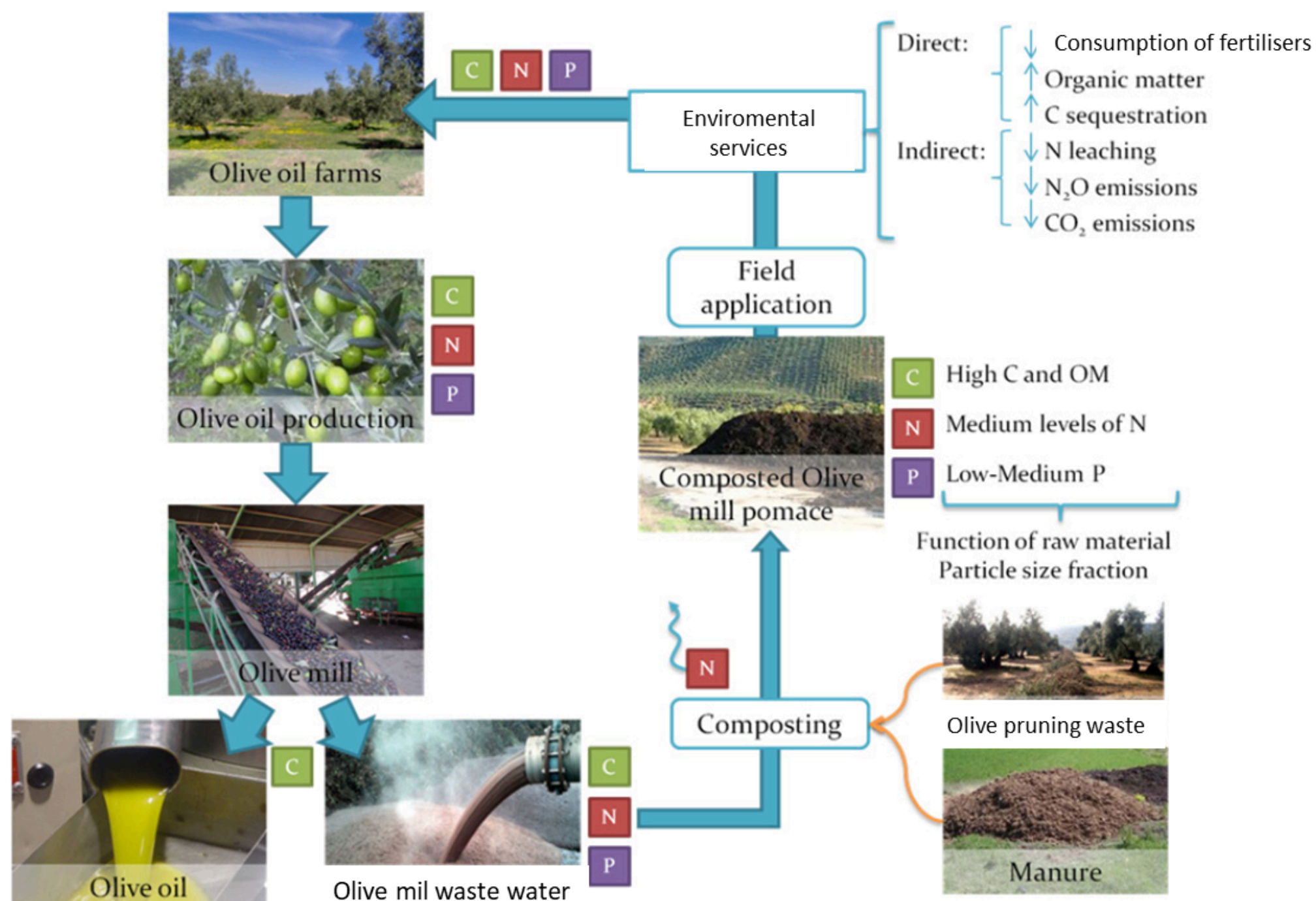


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RECOVERY OF NUTRIENTS FROM OLIVE MILL RESIDUES



RESIDUES FROM OIL EXTRACTION

Waste water or slurry
Cogeneration
Olive pits
Sludge
Biological Oxygen Demand
Shredded pruning waste
Olive pomace
Pomace
Pellets

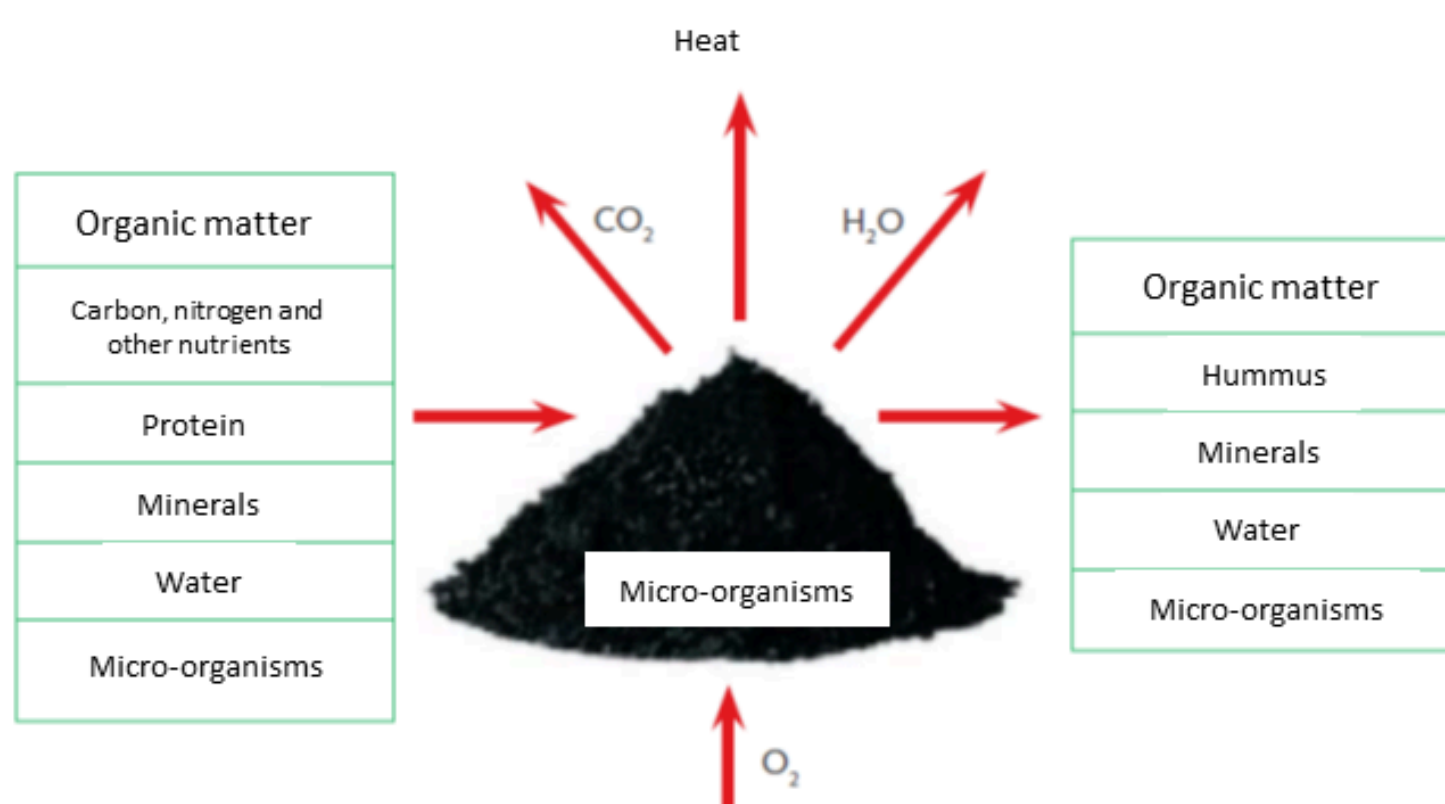
Composting methods

In static piles
In turning piles

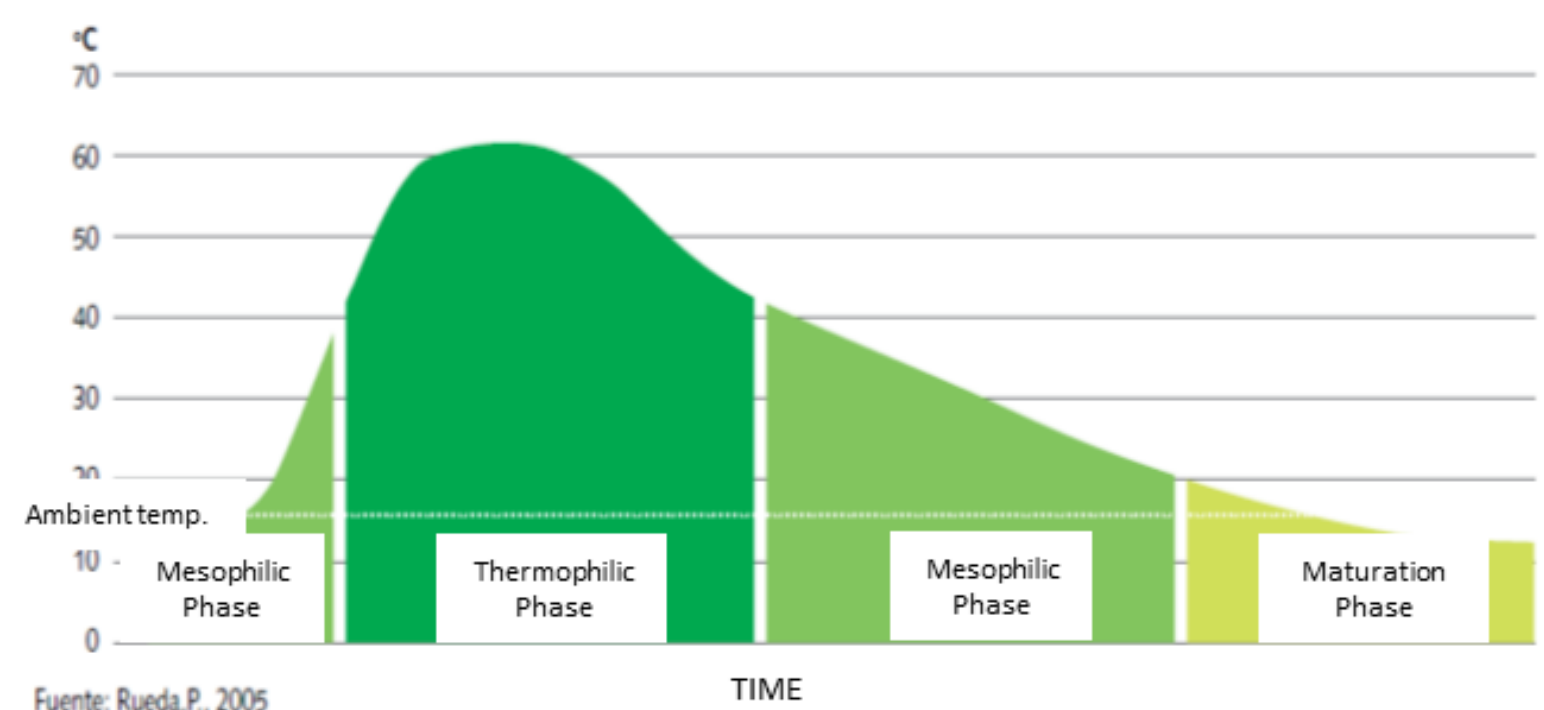
Composting control

temperature - humidity
maturity - volume - odour
germination test

COMPOSTING PROCESS



Process of compost formation



Temperature evolution in the composting process





(BRESSLER)

WEATHER SERVERS

ProWeatherlive

<https://proweatherlive.net>

Wunderground

<https://www.wunderground.com>

Weathercloud

<https://weathercloud.net>

Awekas

<https://www.awekas.at/es/benutzer.php>

PREVAILING WINDS

The station determines the direction and speed measured over a period of time.

TEMPERATURE

Frost

The olive tree can tolerate certain frosts, if they are of short duration.

Risk with absolute minimum temperature is close to - 10 °C.

During the first three years of the life of the olive grove the temperature should not fall below absolute minimum temperature of - 5 °C in winter.

Bud break

Hours of cold to ensure adequate bud break and fruit set.

Flowering

Flowering of the olive tree occurs when the average daily temperature exceeds 18 °C.

INSTALLATION



- Choose an area of open space with direct sunlight.
- Unobstructed from rain, wind and sun.
- Unobstructed transmission range up to 100 m.
- Check the quality of the reception signal.
- Use a mast to fix the station.
- Set the tilt angle of the solar panel.
- Orient the station.
- Set up the station:
 - Update the date and time.
 - Clear logs to purge incorrect data.

PLUVIOMETRY

The olive tree is well adapted to annual rainfall between 400 and 600 mm. Critical stages: flowering and fruit ripening

Diseases: *Spilocaea oleaginea*

Free water on the conidia and on susceptible organs.

Temperatures between 15 °C and 20 °C. Rain or relative humidity above 98 %.

Irrigation

Lack of moisture during flowering can reduce fertilisation and the number of flowers.

Fruit set is also dependent on humidity.

WETNESS

Excessive moisture in the soil can encourage the development of fungi and other pests, which can damage the roots and affect the overall health of the plant.

Pests

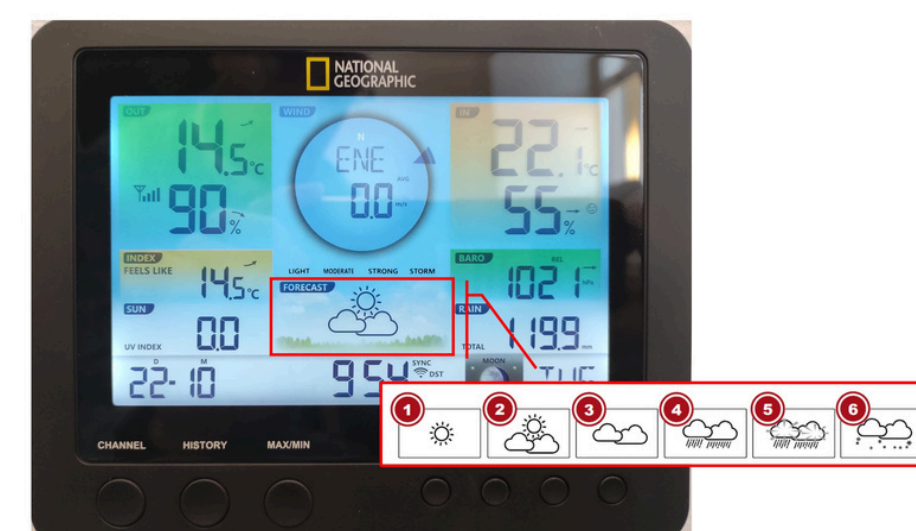
Olive fruit fly
Prays oleae

WEATHER FORECAST

Own station

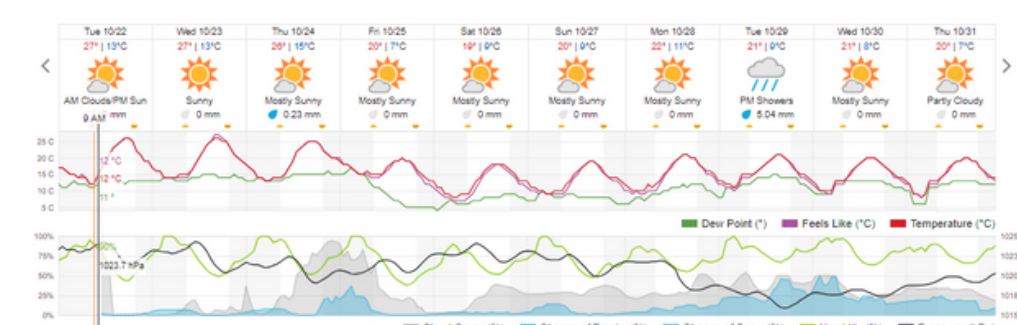
The weather station predicts the weather for the next 12-24 hours within a radius of 30-50 km.

It uses up to 6 different icons for the weather forecast: sunny, partly cloudy, cloudy, rainy, stormy and snowy.



Weather server

10-day forecasts based on an extensive network of personal weather stations, providing very specific and localised data.

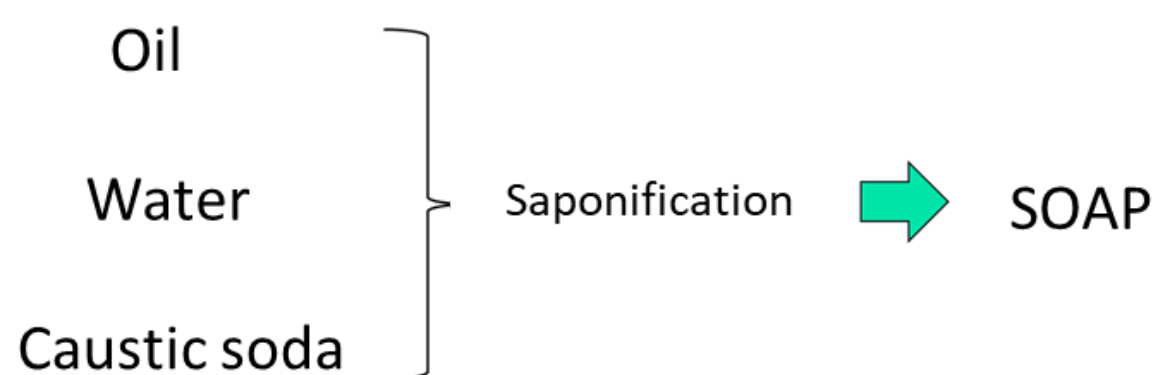


(Wunderground)

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Oil soap is the result of mixing vegetable oils and butters with soda and water through a natural reaction called SAPONIFICATION.

Advantages of cold saponification vs. hot saponification

- Performed at room temperature or slightly above (<40 °C).
- Fast at the beginning, it takes about 40 days to be completely finished.
- Better preservation of ingredients and their properties
- Safer, does not require the precautions of a hot process with soda.
- More environmentally friendly, does not require large amounts of energy.

STEP-BY-STEP PREPARATION

STEP 1: PREPARATION OF THE LYE

- Weigh soda and water
- Always add the soda to the water
- Stir gently until dissolved
- Wait for the temperature to drop to 40-45 °C.
- Precautions:
 - Always wear gloves and safety goggles
 - In a ventilated place
 - Always soda over water

STEP 2: OIL PREPARATION

- Measure or weigh oil
- Heat the oil (in a water bath) to 40-45 °C

STEP 3. MIXING AND SHAKING

- Pour the oil into a bucket
- Stir and slowly and carefully add the lye
- Blend until a line can be left on the surface: the trace

STEP 4. ADD ADDITIVES

- Add flavourings, colourings, active components when trace appears
- Stir slowly with a spatula to distribute the additives

STEP 5. MOULDING

- Pour thick liquid into the moulds
- If the trace is still too liquid, stir for longer

STEP 6. DRYING

- The soap is dry after 24/48 hours
- Unmould and cut the soap (still soft)
- Cut it into bars

STEP 6. MATURATION

- The saponification continues for 30/40 days
- It is advisable to check the pH to make sure it is close to pH 7
- Wrap the bars in transparent paper. They are ready to be used

RECIPE FOR A BASIC OIL SOAP

Ingredients

Virgin olive oil 800 g
Mineral water 386,4 g
Coconut oil 300 g
Caustic soda 150.3 g
Bergamot essential oil 30 g
Olive green liquid pigment as desired

Step by Step

1. Pour the soda over the water (NEVER THE OTHER WAY AROUND) and stir. Allow to cool to approximately 40 °C
2. Heat the oil (ideally in a bain-marie) to 40 °C.
3. Slowly add the lye over the oil (not the other way around) and whisk
4. Add colouring to taste and continue whisking
5. When the mixture is thick enough (the trace appears), add the bergamot oil and mix with a silicone spatula.
6. Fill the mould and leave to harden for 24/48 hours.
7. Dismantle and cut tablets
8. Keep in a cool place without light for 40 days and the soap is ready to use.

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The olive, symbol of peace and source of olive oil, is the main pillar of the OLIB project 'Strengthening Sustainable Local Development and Coexistence in Lebanon through Improved Olive Tree Yield and Productivity' coordinated by CIHEAM Zaragoza.

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 **LIB**