Orange trees intercropped with legumes

Increasing income from your orange orchard

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Orange trees intercropped with vegetables *Ref : Anastasia Pantera*

Why intercropping?

Market-focused farmers manage orange tree (*Citrus sinensis*) varieties by pollarding and crafting. This procedure can take up to 15 years for the tree to reach maturity and attain maximum fruit yields. In the meantime, farmers can take advantage of the wide and open space created by the pollarding, to produce a variety of vegetables and raise a further income to supplement that earned from the orange trees.

Why chickpeas?

Chickpeas (*Cicerarietinum L.*) are valued as a high quality food for humans. They are also an excellent source of protein for animal feed. They are easy to cultivate, requiring little management and, in general, have low treatment costs. They have high monetary value, so a farmer can gain considerable additional income from cultivating chickpeas among trees.

One of the important characteristics of chickpeas is their low water demand. This makes them ideal for intercropping with trees of similar water economy in Mediterranean and other dry ecosystems. Another important feature of chickpeas is the nitrogen they provide to the soil by the symbiotic relationship of their roots with nitrogen fixing bacteria. This benefits the farmer by reducing the need for expenditure on nitrogen fertilizers, which also protects the soil and water from nitrogen contamination.

Where and how to plant

Between 2015-2016, a trial was conducted in Skine, Crete, in an 80 year-old "Valencia" orange grove to investigate the interaction of orange trees with chickpeas. Tree spacing between the trees was 10 m. It involved two treatments. One 0.1 ha area of the grove was cultivated by chickpeas. Another 0.1 ha of the orchard, without chickpeas, was used as a control. The chickpeas were cultivated in 8 m wide rows. The seed quantities were 80 kg/ha. We used a local variety of chickpea named "Amorgos", which was developed by the National Agricultural Research Foundation. It is resistant to fungal infections.

The best time for sowing is between late February and March for lower altitudes. However, at higher altitudes, it can be sown up to late April.

Chickpeas production provide additional income to the farmer whilst enhancing soil nitrogen in an eco-friendly way *Ref : Anastasia Pantera*

There are many compatible crops that can be chosen for intercropping with orange trees. *Ref : Anastasia Pantera*

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Advantages

- The system can produce orange fruits and orange juice.
- Additional products, such as liqueurs, sweets, marmalades, and dried oranges can be produced and sold separately.
- Orange extracts are used in the pharmaceutical and fragrance sectors, as well as in cooking.
- The chickpeas contribute to soil nitrogen content and reduce the need for chemical fertilizers. Consequently, they can contribute to reducing chemical contamination of soil and soil water (e.g. nitrification).
- The trees reduce local wind speed and protect soils from erosion.
- Pruned branches can be used as fodder and, when the trees have matured, as fuel wood.

Above: Chickpeas can be a profitable choice for the farmer *Ref : Maria Mitsou.*
Below: Once the crown is fully developed, interplanting is no longer possible *Ref : Anastasia Pantera*

Oranges and chickpeas production

In 2015, orange production met the farmer's expectations. The yield from the orange tree was effectively the same in the orange and chickpeas treatment (which received no fertilizer) and in the control orange treatment (which received N fertilizer). The level of chickpea production was poor as low rainfall during the spring affected flowering. In 2016, even though the establishment and yield of the chickpeas was very successful the farmer decided to cultivate the field and incorporate the chickpeas for soil amelioration.

Conclusion

In short, intercropping chickpeas saves money from fertilizer cost but also protects the environment from soil contamination caused by leaching nutrients from fertilizers.

Further information

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