

Irrigated citrus in Spain

Case Study 2

Experimenting crop diversification and low input farming

Experimentation plot of 2.3 ha with mandarin trees located in Region of Murcia (Spain)

Crop rotations and multiple cropping were established in the alleys between mandarin tree rows with the application of regulated deficit irrigation to save water consumption



2 TYPES OF CROP ROTATIONS WERE TESTED BETWEEN MANDARIN TREES

- 1 Multiple cropping of fava bean (September-December) and barley/vetch (January-June) for three years
- 2 Rotations of fava bean, purslane, and cowpea for three years

AGRONOMIC BENEFITS

Mitigation of the effects of some pests on the crops

Complementary products as alley crops, which can compensate for losses in the cash crop in years with low production.

No negative effect of diversification on cash crop

ENVIRONMENTAL BENEFITS

Increase in biodiversity, particularly groups of soil microorganisms related to soil health and fertility (such as *Bacillus* and *Pseudomonas*)

Reduction of soil erosion by 60%

SOCIOECONOMIC BENEFITS

Increase in the provision of regulating and cultural agroecosystem services, socially valued at **between 1,100 - 1,400 €/ha/year**

Improves local economy and retains local population

Diversification practices **reduce market risk for farmers**



WHY IMPLEMENT CROP DIVERSIFICATION?

This type of practice is necessary to slow down the erosion rates, increase biodiversity and reduce the incidence of some pests.

AGRONOMIC DRAWBACKS

Water consumption increased by 34%

ENVIRONMENTAL DRAWBACKS

Environmental changes in the short-term are difficult to detect due to the harsh semiarid environmental conditions. Changes are expected to happen in the long-term

Slight increases in CO₂ emissions after rainfall events

High frequency of machinery passages on the alleys to manage alley vegetable crops

SOCIOECONOMIC DRAWBACKS

Farm labour costs should be monitored cautiously in the diversification within irrigated woody crops in order to avoid them compromising farm profitability

It is a challenge to **differentiate diversified fruit from other products in real markets**. The environmental value of diversified fruit is due to the cultivation practices not to changes in the quality or properties of the crops

Lack of private incentives to support the implementation of diversification practices in mandarin orchards by farmers

FINAL CONCLUSION

Is it beneficial to adopt these sustainable practices?

Alley cropping can positively reduce erosion rates and increase above and below-ground biodiversity, decreasing the incidence of pests. The cash mandarin crop is not affected while new commodities are produced. The rotations used are suitable for improving soil drainage, the amount of plant available water, above and below-ground biodiversity and for slowing erosion. However, they are associated with increased tillage, which leads to losses of organic matter that can result in a decrease in chemical fertility.



DIVERFARMING

