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Intercropping fruit trees and field crops in water scarcity conditions for nutrition-sensitive and climate-resilient agricultural transformation

Intercropping fruit trees and field crops is a traditional practice in Mediterranean and dryland regions, yet this practice has been disappearing with the advent of agricultural mechanization and intensification. However, in Europe it is increasingly promoted as a component in the agroecological transformation of agrifood systems. **Selecting, designing and managing the crop-tree combination in line with the prevailing water availability and product value chain conditions offers an opportunity for nutrition-sensitive and climate-resilient dryland agriculture**.

On-farm assessment, field experiments and modelling[(1)] were used to analyze competition and facilitation between crops and trees to define the conditions required for intercrop system success when water supplies are scarce. In Morocco, intercropping barley-faba bean rotations with mature olive trees increased the total land productivity compared to sole cropping, but reduced crop production by 50% over a water availability gradient. The negative effects of mature trees on the crop vegetative stage was not fully offset by the positive effects during the reproductive phase[(4)]. However, in peach orchards in southern France, when the association was set up at the tree plantation stage with regulated deficit drip irrigation, it was possible to stimulate tree and crop root system separation in different soil horizons, thereby limiting water–nutrient competition while ensuring early leaf and branch growth[(2,3)]. In central India, guava trees planted in pea-mung bean rotation led to a 12.5 kg/tree fruit yield 3 years after plantation, and yield increased with subsequent flowering. Compared to conventional rainfed wheat-soybean rotation, the economic water productivity of the system increased by 41% in the guava/pea-mung bean system.

These results and the research approach provide a solid basis for **designing and managing agroforestry systems under water scarcity, cereals and pulses providing income and food during the first unproductive orchard plantation years (3-10 years) while creating the good conditions for positive field crops and trees interactions once the orchard has reached maturity**.

Contacts

Jacques Wery (Institut Agro, France), jacques.wery@institut-agro.fr

Karim Barkaoui (ABSYS, CIRAD, France), k.barkaoui@cirad.fr

Vinay Nangia (ICARDA, CGIAR, Morocco), v.nangia@cgiar.org

Other authors

Aurelie Metay, Fida Temani and Oswaldo Forey (ABSYS, Institut Agro | Montpellier SupAgro, France)

For further information

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▲ *Experimental intercropped young peach orchards managed with drip regulated deficit irrigation in Montpellier (southern France).* © *O. Forey*

▲ *Comparison of olive orchards and barley-faba bean rotation as sole crops or intercropped in Morocco.* © *F. Temani*