AGROFORESTRY : NEW CHALLENGE FOR FIELD CROP BREEDING?

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How the association tree-crop may modify the way of thinking plant improvement?

Which **Crops** associated to trees?

Which **Breeding criteria** for these crops?

**How** to breed for Agroforestry?
Number of publications (WOS source)

Farmers deplore that usual crop varieties aren’t adapted to their AF systems. There is an urgent need to breed for AF!
Which crops associated to trees?

- Ecological approach: example of olive trees

To identify weeds naturally associated with olive trees.
Which crops associated to the tree are:

- Bulb plants
- Asparagus acutifolius
- Asteraceae
- Poaceae
- Legumes (Fabaceae)
Proposal of alley-cropping design

Within Rows

Asparagus acutifolius

Ditrichia viscosa
Proposal of alley-cropping design

Between Rows

Annual species

Higher fertility

Bulb Plants

Lower fertility

Perennial species
Which Breeding criteria for these crops?

- Shade tolerance
- Response traits
- Pests and Diseases resistance
- Weed competition
- Microclimate adaptation

Quality and productivity
Which Breeding criteria for field crops?

Effect traits

How plant can positively influence the ecosystem?

- Soil Water contribution
- Soil Structure Improvement
- Soil Nutrient contribution
Inra Mauguio
3 modalities

➢ Control

➢ Olive groves yearly pruned

➢ Olive groves never pruned

Restinclières

Farmer’s fields
25 Durum wheat varieties
(from wild genetic ressources to elite varieties )

Populations

Screening of varieties to select the best adapted to AF

Pure lines
Important genetic variability in the response to AF
Characterization of environment: sensors of temperature, light (PAR), soil humidity ...
Tools to study responses/effects of varieties (phenotyping)

Greenseeker

LAI 2200

Chlorophyll meter: SPAD

Mycorrhization analysis

SPIR Labspec 4
How to breed for Agroforestry?

Participatory Plant Breeding

Objectives (functional / process approach)
Institutional context (farmer led / formal led)
Interactions (consultative/ collaborative/ collegial)
Location (centralized / decentralized)
Stage of participation (evaluation or breeding)
Conclusion

• AF contributes to change perception of plant improvement towards an ecologic manner.

• Not only Response traits but also Effect traits must be taken into account

• Participatory approach is needed to catch the wide diversity of AF situations.

• Oikosbreeding / oikosimprovement for AF: to emphasize the importance to consider the whole ecosystem