

### Methodology to co-design temperate fruit tree-based agroforestry systems: three case studies in Southern France

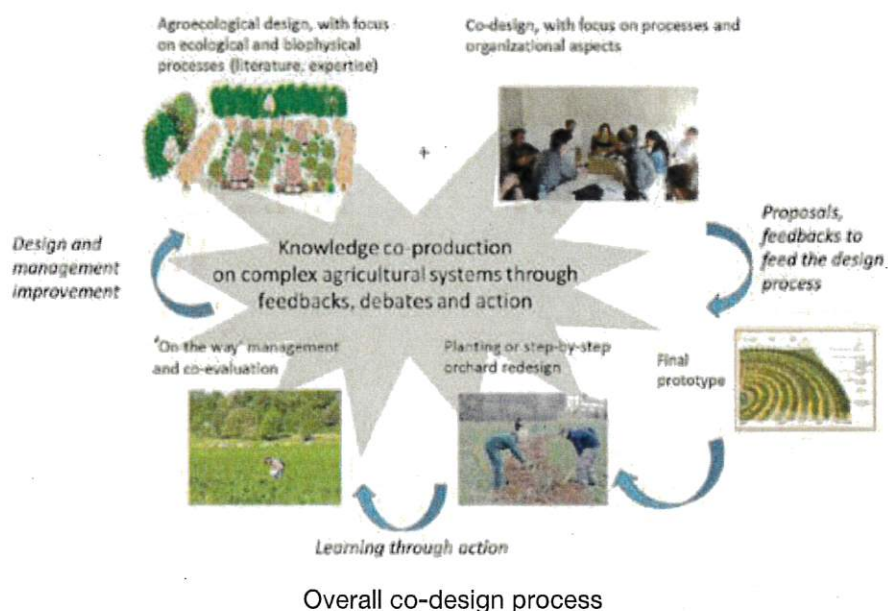
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Diversification of fruit tree species, cultivars, crops and companion plants is a way to reinforce ecosystem services towards productive and 'pest suppressive' fruit-tree based agroforestry systems (FT-AFS). We analyzed the approach and the outputs of three design processes that shared the same objectives of ecological intensification and diversification in FT-AFS.

The approach targeted 'pest suppressive' processes but also resource use optimization within time and space between productive and associated plants. Basic and applied knowledge on ecological and biophysical processes, feedbacks and experiences of various stakeholders in the fruitchain permitted to make tradeoff between agronomic, ecological and organizational aspects. For genericity purpose, the functions of each plant species or assemblage (e.g. barrier, trap, production) were identified taking into account growth dynamics over time.

The set-up of those FT-AFS prototypes implies changes in technics due to the spatial design (e.g. machinery adaptation, ergonomics) and changes in management of the agroecosystem, made 'on the way' considering the objectives and design principles as dynamic guidelines. The trajectory and performances of those systems are now assessed through multicriteria evaluation including organizational aspects and products' valorization. All steps include an interdisciplinary and participative approach fostering exchanges, knowledge sharing and building, and providing innovative avenues in FT-AFS.



**Keywords:** temperate agroforestry, fruit, co-design process, ecosystem service, pest suppression.

#### References:

1. Lauri PÉ et al., 2016, Acta Hort 1137, 255-265, <http://dx.doi.org/10.17660/ActaHortic.2016.1137.37>
2. Penvern S et al., 2018, Proc. 13th European IFSA Symposium (IFSA 2018), Greece. <http://www.ifsa2018>.
3. Simon S et al., 2017, Eur. J Agron 82,320–330, <http://dx.doi.org/10.1016/j.eja.2016.09.004>

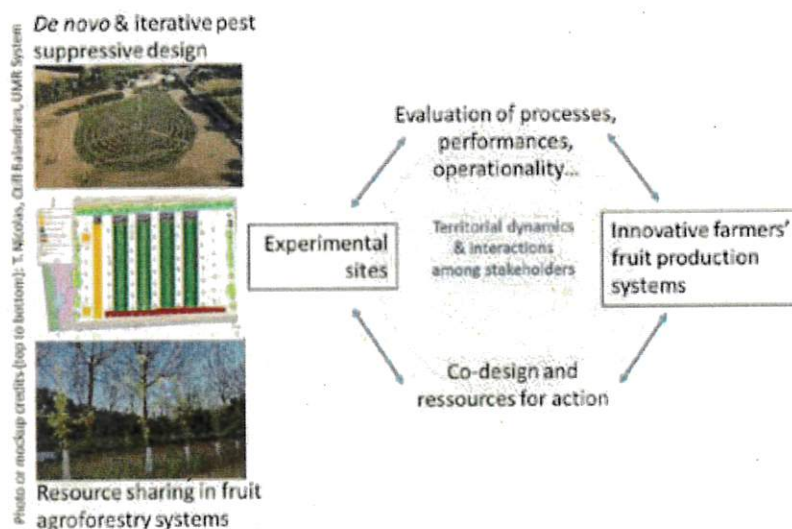
## Temperate fruit-based agroforestry systems: three case studies in Southern France in the framework of the 'ALTO' project

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Fruit production systems rely on a heavy input use. Pesticide use reduction is challenging and can rely on reinforced ecosystem services through diversification of fruit tree species, cultivars, crops and companion plants in a 'pest suppressive' and productive arrangement designed at various scales. The design of such multi-layer and multi-production systems is complex and requires an interdisciplinary and multi-actors approach.

The aim of the French 'ALTO' project (2018-2023) is to design through ecological intensification low-input and/or pesticide-free fruit-based multi-production systems, to be assessed through multicriteria evaluation (yields, inputs/outputs, organizational aspects). Interdisciplinary knowledge, expertise, know-how and feedbacks from farmers, advisors, teachers and scientists are considered in a participatory approach. Three experimental sites were set up that explore i) *de novo* and ii) step-by-step 'pest suppressive' design (e.g. through barrier, dilution, push-pull or natural-enemy mediated processes) including the supraplot scale, and iii) the way to optimize resource use between associated and cultivated plants, and between vertical layers. More generally, this project will create a place for scientific, technical and educational interactions around temperate fruit tree-based agroforestry systems through long-term experiments, on-farm surveys and debates that foster interactions among stakeholders to co-produce knowledge.



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Organization of the 'ALTO' project and interactions among stakeholders

**Keywords:** temperate agroforestry, fruit, ecosystem service, co-design, research project.

### References:

1. Lauri PÉ et al., 2016, Acta Hort 1137, 255-265, <http://dx.doi.org/10.17660/ActaHort.2016.1137.37>
2. Simon S et al., 2017, Eur. J Agron 82,320–330, <http://dx.doi.org/10.1016/j.eja.2016.09.004>
3. ALTO Project: <https://www6.paca.inra.fr/ueri/Contrats-et-projets/ECOPHYTO-II-ALTO/En-savoir-plus>