

Outdoor Laboratories for agrobiodiversity (LHM), initiated by the association BEDE (Biodiversity, Exchanges, and Diffusion of Experiences), was established with the Foundation for Citizen Science and two joint Research Units of Montpellier (Centre d'écologie fonctionnelle et évolutive - Centre for functional and evolutionary ecology, and INNOVATION). The Outdoor Laboratories create collaborations in the field between the agricultural world and the research sphere for dynamic management and enhancement of biodiversity in peasant agroecology. These collaborations are implemented from the questions that farmers arise in Mediterranean, Saharan and sub-Saharan lands. This review summarizes the approach adopted and the first results from two years of collaboration. It was structured in such a way as to compare different experiences Outdoor Laboratories.

Other experiences of the Outdoor Laboratories:

- ◆ Agroecological fight against pests of the katche and toura (cowpea) beans in the Djougou region (Benin);
- ◆ Democratization of peasant agroecological research in the Lodevois and Larzac (France);
- ◆ Diversifying peasant grapevine varieties and seedlings in the Minervois (France);
- ◆ Enhancement of fig biodiversity in Beni Maouche, Bejaia wilaya (Algeria);
- ◆ Economic enhancement of the biodiversity of date palms in Mzab (Algeria).

Peasant Farmer

Organization

› Association Chemin cueillant

Started in

› 2009

Beginning of collaboration with BEDE

› 2010

Scientific institution(s)

› Experimental Horticultural Centre of Marsillargues
 › Herault Association of Climatology
 › SupAgro

Outdoor Laboratories workshop

› October 30, 2014
 Tourouzelle (Aude, France)

Master's Thesis

› Water management in arboriculture in the Minervois. Focus on putting in place tools to follow up on underground diffusion irrigation. (Victor Brumelot)

Presentation and context

For a long time farmers around the Mediterranean have tried to guard themselves against the irregularity of precipitation, made even more worrisome by climate change. The Minervois territory, predominantly limestone soils and very windy, is fully concerned by these challenges.

The large majority of farmers, particularly those of the foothills, cannot be linked to irrigation networks. It is therefore necessary to collectively develop strategies for autonomous water management, the subject of this Outdoor Laboratories project.

Collaborative process

➤ WHAT ARE THE PEASANT DYNAMICS IN THE AREA?

A small collective of farmers organized themselves into an association in 2009, Chemin Cueillant, whose objective is to put in place and diffuse innovative and environmentally respectful cultivation systems.

The recurrent crises of the wine market created a precarious financial situation for wine-makers and several of them have been led to convert their land. Vegetable farming and field crops are excluded due to lack of water or the impossibility to mechanically manage the land. Two other possibilities remain: pastoralism, difficult to reintroduce due to the division of lands and conflict of interest around land, and fruit tree farming.

From the beginning of their collaboration, BEDE and Chemin Cueillant found the agroecological cultivation of Mediterranean fruit trees to be the most adequate choice. Indeed, it seems to be the least constraining to put into place, considering the soils and climate of the Minervois, but also from a

technical standpoint for farmers used to working with perennial crops.

BEDE and Chemin Cueillant oriented their work along 4 complementary axes: agroecological management of soil fertility; thrifty water management; valuing local or well adapted varieties; training workshops on fruit tree farming.

Lacking conventional irrigation, arboriculture demands optimizing rainwater, combined with supplemental watering to offset climate vagaries, in order to obtain a more or less regular production each year.

Therefore, a project to stimulate Mediterranean arboriculture with supplemental irrigation through underground diffusion was proposed.

Irrigation through underground diffusion.

The idea is to bring water directly to the rhizosphere, in order to avoid loss through evaporation. The technique is also used for anticipatory irrigation (water storage in the soil during the rainy season).]

➤ **WHAT ARE THE QUESTIONS FARMERS ARE ASKING TO THEMSELVES AND TO RESEARCHERS?**

- ◆ What can be done with the fallow lands due to the wine industry crisis, knowing that the foothill plots, of small surface area, more or less rugged, are the most threatened because they are the most difficult to recultivate?
- ◆ How can water management be thrifty while guaranteeing a good yield and regularity of production?
- ◆ What is the scientific evaluation of experimental underground diffusion irrigation tools, inspired by Tunisian ones and adapted to the Minervois context?

➤ **HOW RESEARCHERS HAVE JOINED THIS INITIATIVE?**

The project started out as part of a classic evaluation case, specific to each project, but one of the main donors (the Languedoc-Roussillon Region) decided it would be useful to go further by including scientists. Thus the project was added to the Outdoor Laboratories program that had just begun.

In the beginning, BEDE asked Mr Chahbani, inventor of the technique (IRAT of Medenine, Tunisia) and Mr Jacques Maihol, irrigation specialist at IRSTEA in Montpellier.

➤ **WHAT ARE THE PRIORITIES OF THE COLLABORATION?**

The project's priorities were defined by the farmers concerned within Chemin Cueillant, and can be summed up in two questions, also posed by the donors:

- ◆ Do the tools provide for significant water reduction compared to habitual practices?
- ◆ Do the gains in lowering water use justify the financial cost of the installation?

➤ **STEPS IN THIS COMMON APPROACH:**

◆ From 2012 to 2014, BEDE and Chemin Cueillant chose and set up experimental sites for the underground diffusion method with assistance from one of the Tunisian researchers

◆ In 2013, collaboration with IRSTEA (National Institute for Research in Science and Technology for the Environment and Agriculture, formerly CEMAGREF) was initiated. The choice of scientific protocols

was unanimous among BEDE, Chemin Cueillant, the Tunisian



M. Chahbani, inventor of the technique, prepares the installation

researchers, and Mr Maihol of IRSTEA. The choice was determined by the homogeneity of the plantings (species, varieties, age, vigour). Potential interns were also chosen, and a research contract was proposed by IRSTEA, asking BEDE to take care of fees. After one year, collaboration with IRSTEA ended due to lack of financing.

- ◆ In 2014, BEDE turned to other structures: the Experimental Horticultural Centre of Marsillargues (CEHM) and the Hérault Association of Climatology (ACH). An ACH researcher, Frederic Laget, took part in choosing the plots and observation stations. Xavier Crete, of the CEHM, guided the intern and the BEDE representative, and took part in the elaboration of the protocol and the choice of tools to measure soil humidity.

- ◆ In 2014, collaboration with SupAgro started a scientific evaluation of one of the underground diffusion irrigation tools in an olive orchard, carried out by a first-year Master's student, Victor Brumelot.

- ◆ The Outdoor Laboratories workshop in October 2014 brought together researchers and farmers, as well as other actors who took part in the debates and showed their interest in implicating themselves in the process: the mayor of Azillanet, the Olive Conservatory of Durban-Corbieres (CODC), the association Nature & Progress, and the Organic Agriculture Research Group (GRAB).

First fruits of this Outdoor Laboratory

➤ WITH REGARDS TO KNOWLEDGE:

There are not formal results at present, because the evaluation cannot be done in just one year. Bringing water to a depth of 80cm or more requires 2-3 years to see a difference, the time that it takes for surface roots to search and grow deeper in the soil.

On the oldest site, (2 years), one farmer clearly noticed that her olive trees irrigated by this system are more productive and vigorous than those watered with surface drip irrigation, with the same quantity of water.

→ New questions and hypotheses:

Concerning the underground diffusion system:

To be adopted by small farmers, the techniques developed should be the most economically profitable, the least demanding in labour and the least costly to install.

- ◆ Using supplemental irrigation, at what moment in a tree's cycle is it necessary to water?
- ◆ In what pedoclimatic contexts this system is appropriate?
- ◆ Which sizing for the installations?
- ◆ What is the economic gain?

Other autonomous water management ideas to explore through collaborative research:

- ◆ Methods based on canalization of runoff and directed infiltration, such as swales, should be looked into.
- ◆ Are there any rootstocks (especially for grapevine) to better withstand water stress and not to resort to irrigation? (Link with the workshop "vine").
- ◆ Associating crops and agroforestry: in hindsight, those who have been doing it for several years see optimal use of precipitation with agroforestry. What are the best combinations of plants to optimize

water use?

- ◆ How effective are certain innovative soil tillage tools, such as the *Yeomans* plough, for conserving water in the soil?

➤ **WITH REGARDS TO COLLABORATIVE PROCESS:**

The workshop marked the first steps of the collaborative process: identifying shared challenges, groups of people ready to work collaboratively and the different disciplines that need to be brought into the project (agroeconomists, hydrologists, agronomists specialized in agroforestry, etc.).

➔ **What limitations or critiques were brought forward over the course of these meetings and workshops?**

- ◆ The researchers have not been very present in the field, following the funding problem.
- ◆ The Outdoor Laboratory experiment was too short: water management in arboriculture requires much more than 18 months.
- ◆ The technical works of realization of installations and the searching for funding have monopolized BEDE, leaving little time for mediation.
- ◆ The autonomous water management project did not start out as a participatory research project, it was added to the LHM process and inherited constraints difficult to reconcile with a collaboration logic.
- ◆ There is no clear implication of the researchers from SupAgro: BEDE and Chemin Cueillant have been considered simply as structures that can employ an intern on a specific and original subject.
- ◆ It was difficult to reconcile the academic calendar and the olive tree cycle.

Perspectives for the future

- ◆ BEDE continues to work on mediation. Contacts are underway to continue monitoring through Master's student internships, while deepening collaboration between researchers and farmers. Without funding, a minimum follow-up will be conducted by BEDE.

*To know more about Outdoor Laboratories for Agrobiodiversity: bede@bede-asso.org
and on the BEDE website : <http://www.bede-asso.org/?p=140>*