The "PAP notes" devote three articles to the theme of the return of the tree to the post-oil landscape. Rediscovering the millennial alliance between man and tree, the post-oil landscape will be a dense landscape of trees!

To dispense with fertilizers derived from petroleum and the toxic use of pesticides, the agri-environment effectively recomposes the territorial configurations of industrial agriculture - the expansion of plots, the filling-in of ditches, the levelling of land, the removal of hedges and lines of trees. In doing so, agriculture recovers the multitude of functions of the tree in the agricultural system and thereby revives a memory that the oil age had tended to erase.

Trees outside of the forest, a long story

Véronique Mure

Over the last thirty years, the forested areas of metropolitan France have increased on average by 0.7% per year, mainly because of agricultural abandonment[1]. On the other hand, trees "outside of the forest", a term used since 1995[2] for rural trees - scattered trees, hedges, lines of trees and scattered trees combined with hedges and groves[3] ... are becoming scarce. They played a big role in rural history because peasants knew how to take advantage of them in every region of the world. Today, they can be used to curb or even offset the negative consequences of the limitless use of fossil resources, to create harmonious landscapes and to bring well-being to the people.

Diversity of tree species and uses of rural trees

Oaks, ash, elms, poplars, alders, willows, hornbeam, walnut, linden, maples, beech, chestnut as well as mulberry, hawthorn, service trees, azarole, fig and almond trees: these trees, which used to decorate the countryside, are tending to die of old age without being replaced or else they are being deliberately uprooted. Composed mainly of broadleaved trees, this group of different trees occupied small areas but offered a great diversity of spatial, aesthetic and functional situations. The modernization of agriculture in the twentieth century is one of the causes of the scarcity of these rural trees. Rearrangements of plots and the size of the agricultural machinery became incompatible with the presence of trees in the fields - a certain idea of performance was fatal to them. But perhaps this was simply forgetfulness or a lack of attention to the quality of the landscape?

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[1] Figures from IFN 2017.

[2] Bellefontaine (R.), Petit (S.), Pain-Orcet (M.), Deleporte (P.), Bertault (J.-G.). - *Trees outside of the forest, towards better consideration.* - FAO Conservation Papers, No. 35, 2001, 231 p.

[3] Pointereau (P.). - *Hedges. Evolution of the hedgerow in France over the last forty years.* - The INRA's Environmental Journal, no. 46, June 2002, pp. 69-73 (http://www.inra.fr/dpenv/pointc46.htm).

Amongst all of these trees, oaks have a special place. These are the most prevalent forest tree species in metropolitan France in agricultural hedgerows as well as in meadows. Their hard wood, which is also resistant to insects and fungi, has long been a popular material. Pedunculate oaks (*Quercus robur*) and Sessile oaks (*Quercus petraea*) were used until the 19th century for shipbuilding and carpentry. In an isolated location, over the centuries the oak develops a majestic port, constituting a true event in the landscape. A sacred tree in many traditions, it was valued as a symbol of strength and justice. This tree is still known and recognized, perhaps because of its regular presence in the history books, whilst many other species have fallen into oblivion.

Yet it is amazing when, from historians and anthropologists, we learn about the diversity of uses of these plant resources that were patiently explored by the men of the past. **Ash** wood, *(Fraxinus excelsior)* soft and elastic and resistant to shock[4], was famous for making javelins in ancient times, but it was also used to make tool handles, rudders and wheel spokes, as well as the sticks of the tridents used by the guardians of the Camargue. Its foliage, preserved for the winter in the form of bundles of boughs, was also an excellent fodder.

On the other hand the Field Elm (*Ulmus minor*), planted in the 17th century, present in all of the communes thanks to incentives provided by the State, provided a lumber that was of higher quality than oak and that sold at a higher price. Like alder and oak, it was resistant to water when immersed and therefore suitable for equipping lock gates. The epidemic of Dutch elm disease that has been raging in Europe since 1970 has eliminated it from our landscapes and as yet no real response has been found to counter this pathogenic fungus.

Alder (*Alnus sp*) was widely used for making cabinets and it was all the more useful because its roots fix nitrogen. It therefore enriches land in the valleys, around the rivers whose shores it inhabits.

In the same way, the walnut tree (*Juglans regia*) was planted close to all of the farms in the Cévennes as well as elsewhere around the Massif Central and sometimes also in hedges along the edges of cultivated land for its fruit and especially for its wood, which was very much sought after by carpenters and shoemakers[5].

The Black Elder (*Sambucus nigra*), good for everything, was a valuable ally for gardeners. Its leaves accelerate the decomposition of compost, its fruits attract birds and its fragrant flowers, known as the "vanilla of the poor", perfume creams and wine. The elder is also a protector of houses as the legend says that each elder flower houses a fairy that has come to take refuge between its petals.

Poplars, lime trees and ash trees have been planted as trees that represent freedom since the Revolution. Victor Hugo celebrated them on 2nd March 1848, during the

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[4] Durand-Tullou (A.), *The role of plants in the traditional way of life - Ethnobotany study in the mountainous area of the Gard* - Cevennes encyclopedia - Cevennes Almanac no. 8 around 1980.

[5] Ibid.

plantation of such a tree at Place des Vosges in Paris: "This tree is a beautiful and true symbol of freedom! Freedom has its roots in the heart of the people, just as the tree has its roots in the heart of the earth; like the tree, freedom raises and spreads out its branches in the sky; like the tree, it grows incessantly and covers generations with its shade".

The trees lining the boulevards, roads and canals had their hour of glory when they were used to magnify the great works launched by the monarchy of the Ancien Régime and the leaders that came after them. The linear park of the famous Canal du Midi, dug from Toulouse to Sète thanks to the stubbornness of the *gabelou* biterrois Pierre-Paul Riquet was thus planted, from the eighteenth century onwards, with various species: willow, white mulberry and fruit trees in the eighteenth century, near the locks; field elm and pubescent oak from the 18th to the 19th centuries; poplar from Italy in the eighteenth century; ash, in great numbers, in the nineteenth century; cypress from the 19th century onwards on the Mediterranean side; and finally, plane trees, uninterruptedly from the 19th to the 20th centuries.

As an essential part of the agricultural production system, an ingredient in the maintenance and management of roads, waterways and canals, as well as in the communal and domestic economy, the "tree outside of the forest" was multifunctional and its value was recognized by everyone. Providing lumber, used as material for the manufacture of just about everything from Navy vessels to agricultural tools, serving as firewood, fuel and fodder for animals, the rural tree was a strategic resource for citizens as well as for the state.

Landscape structures linked to scholarly cultural practices

Until the twentieth century, trees outside of forests were considered structuring elements of rural landscapes. Due to the diversity of their species, but also their architecture and their spatial organization, they helped to design our countryside. Hedgerows, bred cultures, lines of trees and pollarded trees are a familiar type of wooded heritage, but they have tend to become less well-known as the many peasants who used to maintain them gave way to smaller numbers of farmers who have abandoned them.

Hedgerows have taken on great historical value as they have lasted over time. They existed in antiquity. Varro, in the 1st century BC, described four main types of hedgerows in *Res Rusticae*:

- The hedgerow (*saepes*), planted with thorny plants (brambles, hawthorns, rose plants...) and large trees delimiting the area.
- The wooden palisade or wattle of branches (plessis).
- The ditch along embankments that allows the water to flow away and drain.
- Dry stone walls.

Columella, two centuries later, explained in *De Re Rustica* how to prune prickly hedges in

the winter and how to create a hedge made of wild mulberry trees, rose plants and Paliures "Thorns of Christ" (*Paliurus spina-christi*). Many other wild shrubs are also used in these hedgerows (elder, dogwood, blackthorn, etc.). Our rural hedges that that have resisted land consolidation have not changed much, more than two thousand years later.
The tree was closely linked to the rural economy and helped to shape the features and, at a greater depth, the ecosystem of soils. Planting tall trees amongst the hedgerows was an investment in the future, for the day when the felled tree would produce wooden planks whose sale would bring in fresh money. For each tree cut down, two were planted. Over time, hedgerows have become structuring elements of the landscape, particularly in the farmland areas, but they are also true ecotones and provide shelter for all wildlife including certain species that are very useful to crops nearby.

The historical value of the trees that are scattered or aligned in the fields now feeds the reflections of those working on the implementation of agroforestry production systems. These relics of ancient poly-cultural practices have indeed found a justification that is both economic and environmental. For the agriculture of the past as well as for the agri-environment, the notion of a "field" has nothing to do with the stereotyped image of monocultures where the same species stretches out infinitely in perfect order. At the same time agricultural ground and picking areas, the soil planted with different species was rich in different resources. Here is what Varron wrote: "Practices that help beautify the fields, such as planting olive and other trees in lines, often not only make them more productive but also more healthy and they add value to the land."

Trees were regularly trimmed to increase their productivity**.** With their strange shapes, the pollarded trees, tree trunks, trimmed trees, "bourrus" or "tors" of the Creuse region, whose architecture has been modelled by repeated cutting, are easy to spot. The white willow (*Salix alba*) was pruned each year to obtain the wicker needed for weavers and to provide foliage for livestock. The same was true of Ash trees (*Fraxinus sp.*), Black Poplar (*Populus nigra*), and more rarely Glaucous Alder (*Alnus glutinosa*), Lime trees (*Tilia sp*.), Maples (*Acer sp*) and White Mulberry (*Morus alba*), whose leaves were also harvested for silk farming in the south. The characteristic silhouette of these pollarded trees (or what remains of them) is a structure that is typical of our rural arboreal heritage whose productivity is particularly high.

All of these ancient practices involving trees outside of the forest have contributed to the long process of constructing rural landscapes and can therefore be considered as heritage. Some of these everyday trees have progressively become so rare that they have been classified as remarkable to celebrate their value. "The very old and very big trees associated with stories or legends that always arouse surprise or emotion, unshakeably linked to man, constitute a true natural and cultural heritage that deserves

respect and protection."[6] In this respect, nearly 500 of these trees have been awarded the "remarkable tree of France" label by the association with the same name.

The effects of trees outside of forests on landscapes and the environment

Demanding in terms of space and profitability, the advent of agricultural machinery has removed trees from the fields and relegated them, at best, to the edges of plots. The consequences of this type of "oil-era" agriculture have led more and more concerned farmers, researchers and citizens to join together to try to fix the scarcity of these rural trees because, apart from the loss of customs and cultural practices, the multiplication of different pathologies is starting to threaten major species (Canker Stain in Plane trees, Chalara fraxinea in Ash trees, Rhynchophorus ferrugineus in Palm trees, the boxwood moth, *xylella* in Olive trees and many others species).

The disappearance of isolated trees, hedgerows, bred crops and tree-lined paths has led to a simplification of our rural landscapes and even their trivialization. But the value of these plant structures is not only aesthetic or historical, it is also technical, economic, social and ecological.

Apart from the uses mentioned above, some of which belong to the past, we can draw on this long history of the rural tree and look at the eco-systemic services provided by trees outside of the forest, which also affect cities.

Environmental news keeps reminding us how trees, and trees outside of the forest in particular, have important effects in terms of environmental preservation: water saving, soil conservation, climate regulation and, above all, maintenance of the balance of ecosystems. Their impact on our daily lives is also significant. Trees provide essential shade during the summer, they help to reduce the urban heat island, they regulate rainfall and the water cycle in general, they purify the air, they hold the ground together with their root system and they help to fight against the erosion of precious soil. They protect crops and the animals from the wind, they participate in the preservation of all of the fauna that find refuge in or feed on them, they contribute to the storage of the CO^2 responsible for global warming... and at the same time they generously share with us their production, lumber, firewood, fruits and medicines...

Experts note, however, that they have been omitted from natural resource assessments, neglected in statistics, ignored by policies, neglected in legislation and are barely mentioned during public discussions[7]. But the growth of agroforestry and interest in some of their characteristics (nitrogen fixing trees, trees for fodder, etc.) have recently given new impetus to scientific research on trees.

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[6] ARBRES Association - http://www.arbres.org

[7] Pointereau (P.) : "Farmland, a reflection of rural society", in *Farmland, crossed glances*, Cahiers of the Compagnie du paysage number 2, 2004, pages 17-31. Guillerme (S.), Alet (B.), Briane (G.), Coulon (F.), Maire (E.) - Rev. *Trees outside of the forest in France. Diversity, uses and perspectives.* For. Fr. LXI - 5-2009.

Knowledge about trees has increased significantly in recent decades. There are numerous books about them. Research has made us change our view of trees and showed us the links between their biological reality, their needs, their living conditions in their natural state and the constraints to which we submit them when we domesticate them, select them, grow them and prune them. Knowing the functioning of root systems, mycorrhizae and leaves makes it possible to take better care of the plant with regard to the regulation of its water needs, for example. In the same way, knowing the architecture and biology of trees is essential for choosing their place of implantation and, subsequently, the modes of intervention that are respectful of their growth.
Part of the agricultural world is currently recovering this lost memory of the interest in trees outside of the forest and promoting it again in its practices. On the other hand, urban areas still have a lot to learn about the use of plants in urban planning.

Humans have historically known how to work with trees for many purposes and they have learned how to take into account the particular needs of each species to improve its productivity. They have found out where to plant them, how to prune them, which plants to associate them with and which predators to protect them from. By combining them with crops and pastures, the landscape structures they have created have inspired the art of gardens. Each region has unique tree shapes that contribute to its identity. Today, after a century during which the use of fossil or nuclear resources and energy has led us to neglect the rural tree, it is time to form an alliance with it. Scientists have identified the many duties that it could fulfil during this period of transition towards the sustainable development of territories now and in the future. Landscapers, urban planners, historians and artists nourish our imagination by showing us all the forms trees can take. These professionals encourage us to use the tree to give inhabitants a better quality of life and to create productive and harmonious landscapes. The associations promoting the tree outside of the forest testify to the growing interest aroused by this theme during their replanting activities. People are interested in knowing the local history of these trees and the values that have presided over their planting. They aim to use this knowledge to give the tree outside of the forest a place in the development of their territory in order to meet the challenges of our times.

The rural tree is starting to take root again!