

Farming Connect Management Exchange

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Nyons, France

Trufficulture on the Continent (part 1)

March 2019



1 Background

During an Agrisgôp visit to the Farm Business and Innovation show (NEC, Birmingham) in November 2018, I attended a presentation about the cultivation of truffles in the UK. The figures looked attractive, and the advice given was that it was a possible diversification on most soil types in the UK, albeit with the addition of copious amounts of crushed limestone.

Being committed to woodland planting on previously productive small parcels of land along “streamside corridors” under Glastir, the possibility of adding value by co-production of truffles seemed attractive.

Truffles are currently being cultivated in Monmouthshire, and with no experience in this subject, it seemed worthwhile to find out more and to visit producers in France where this

has been practised for hundreds of years. The opportunity to study a week foundation course in trufficulture seemed the perfect opportunity to find out whether this was viable in Radnorshire, and to answer the question, is this speculation or opportunity? With high planting costs being quoted in the UK (£10-20,000/ha), and waiting times of 8-10 years before the first crop, it seems that answering this question for oneself is a primary consideration.

2 Itinerary

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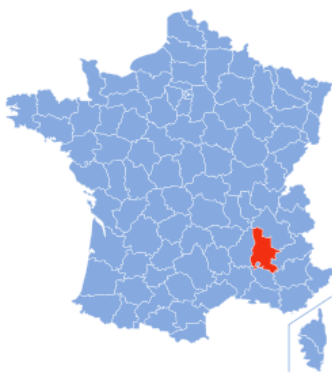
I travelled to the SIAL exhibition in Paris on where I met Claude Murat, who works with the French agricultural scientific advisory body INRA (Institut National de la Recherche Agronomique – *National Institute of Agricultural Research*). In addition, he is editor of the European Journal of Trufficulture. He works closely with commercial producers in the Lorraine region, east of Paris.

We discussed the possibilities of trufficulture in Wales, to which he seemed positive. Careful choice of site, species planted and close associations with established knowledge at every step of the way were themes of the conversation.

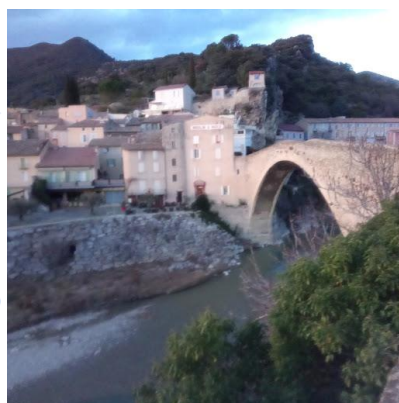
One thing I took from this meeting is the attention to detail required to succeed. He was working with small, intensively managed truffières (truffle orchards) in Lorraine who adopted research from INRA. However, these efforts paid off, with his highest yielding truffière cropping 300kg/ha/yr. These truffles can be worth up to £800/kg (roughly twice what UK varieties are worth). The techniques discussed are covered later in this report.

04 - 08 March, CFPPA Nyons.

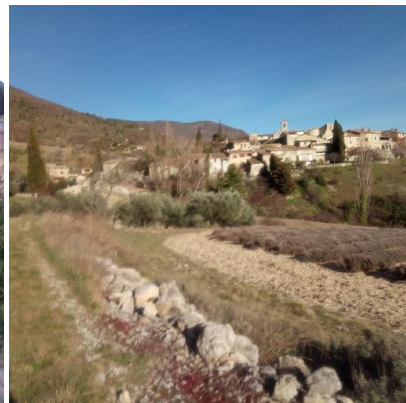
I enrolled at CFPPA (Centre de Formation Professionnelle et de Promotion Agricole - an agroecology college) in Nyons, the Drôme department, Auvergne-Rhône-Alpes, South-East France. I was to spend five days at this college studying trufficulture. Mornings were taken up with theory lessons, whilst afternoons were spent on field visits to study all aspects of truffle production.



Map courtesy Wikipedia



Nyons.



Villeperdix

Curriculum

The course curriculum over these five days comprised:

- Classification of Fungi
- Biological cycles of truffles
- Principal species of truffles, their characteristics, observation of mycorrhiza with microscopes
- Agronomy and ecology of truffle species
- Principal species of host trees
- Practical techniques for mycorrhization of trees with truffles (inoculation of tree roots with fungal culture)
- Types of truffle orchard (natural and cultivated)
- Physical and chemical qualities necessary for soils suitable for trufficulture
- Favourable environments for trufficulture
- Cultivation of orchards, weed control
- Irrigation of orchards
- Fertilisation of orchards
- Pests of truffles
- Judging maturity of truffles
- Training truffle dogs
- Economy of trufficulture
- Zones of production in France and globally
- Truffle markets
- Adding value to truffles
- Legislation regarding truffle production

As may be seen below, this foundation course was detailed and comprehensive. I have attempted to filter out the information that is relevant to the potential for trufficulture in Wales. The class of 35 people was largely French, but also included Belgians and Swiss, although I was the only attendee from the UK.

Species and Range

The Autumn (or Burgundy) truffle, *Tuber uncinatum*, is the native species in the UK. It is a woodland fungus (in contrast to other species) and succeeds in the UK's wetter climate. UK tree species that *T. uncinatum* associates with include oak, beech, hornbeam and hazel. Its range extends as far north as Scotland and Sweden. Climatically, this is perfectly possible to grow successfully in Wales, and it will be this species that I concentrate on largely in this presentation; it is worth roughly £250-£350/kg

The winter truffle *Tuber melanosporum* is more often found in Southern Europe. It is a fungus of open spaces, and so thrives in areas exposed to sunshine. However, with climate change and desertification encroaching throughout Southern Europe, its range is expanding

northwards. It was commented upon that climatic conditions in the south of the UK was starting to fall within the habitable zone for this species, and they have been successfully harvested in Monmouthshire, although this is likely to be highly site-specific; it is worth roughly £600-800/kg.

Supply and Demand

The prices for truffles as any commodity depend upon supply and demand. Figure 1. shows French winter truffle supply since 1890; note the two big drops in production associated with the two world wars and the more recent decline in production often associated with climate change. With the industry established in France, world truffle prices are influenced by French supply. Demand continues to increase with increasing affluence.

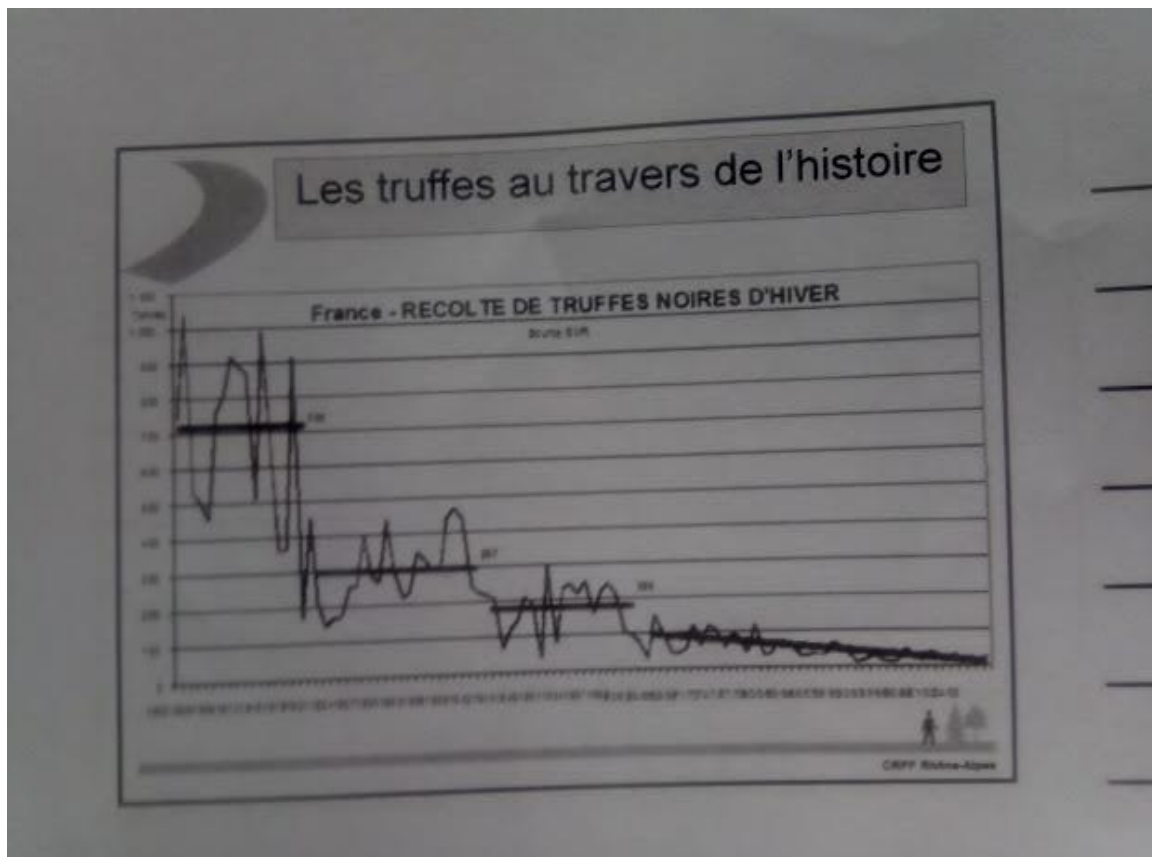


Figure 1. Winter truffle supply in France since 1890

Mycorrhization

Truffles exist in a close relationship with host trees. The mycorrhizal association between fungus and tree root is advantageous to both, with infected trees outperforming uninfected trees, and the fungus deriving its necessary nutrition from photosynthetic products from the roots. This can be observed under a microscope (Figure 2) and this is a key skill in monitoring the progress of an orchard.

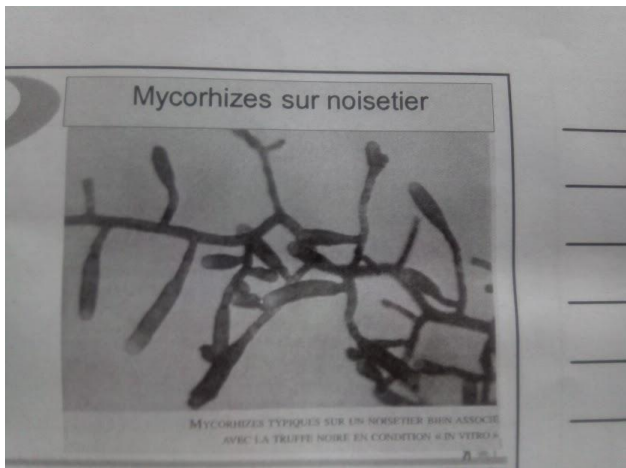


Figure 2. Truffle mycorrhiza on hazelnut roots.

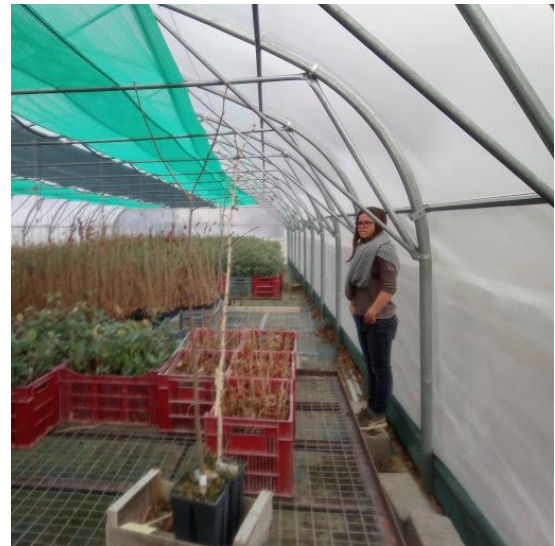


Figure 3. A truffle “pépinière” or nursery

Exploiting this association is the key to truffle production. This inoculation is performed at the seed stage (on acorns in the case of oak trees) in a nursery (Figure 3). Close cooperation between nursery (pépinière) and producer are necessary to ensure correct species choice (both truffle and tree), soil preparations and timeliness of supply. French governmental agencies (e.g. INRA) control and monitor this inoculation and provide accreditation for the trees. In my understanding, inoculated trees bought in the UK are likely to have come from these pépinières.

Soils

Absolutely key to the success of any trufficulture enterprise is assessment of the soil, and this should be the first consideration, in cooperation with a dedicated soil lab (Figure 4).



Figure 4. Laboratoire Teyssier



Figure 5. Soil test dedicated to trufficulture.

It is a more complicated science than we might be used to as conventional farmers. Soil structure is assessed using criteria of texture, granulometry and chemistry. Of particular importance are the total calcium and active calcium (equivalent to CaO). Simply adding ground limestone as a soil amendment (as recommended in the UK) is seen as a poor substitute for calcareous soils. Whilst the perfect granulometry was unclear to me, it seems that a significant sand content in the soil is necessary.

Laboratory reports are reported on the soil's suitability in terms of stability, fissurability, and risk of asphyxiation. I have subsequently sent some medium loam from the Radnor valley for testing and the recommendation was "unsuitable for truffle production". This was partly due to zero calcium content (which we expected). But also, it was explained by high silt and clay, with low sand content.

Many of the soils we observed where truffles were being grown on would be considered very poor in the UK. Indeed, many appeared to be stone and sand, with little observable soil as we might describe it (Figure 6). Often, these were cut into terraces in mountainsides, although some were also on agricultural land in the valley bottoms.



Figure 6. A typical soil on a truffle terrace.



Figure 7. Mountainside terraces.

Truffière management

Once planted, management of a truffière is crucial to its future success. Weed control is a major effort as any competition can upset delicate mycorrhizal relationships. This is most often done by shallow cultivation but needs doing on a regular (i.e. monthly) basis. Also, mulching around tree bases is practised. Once the truffles have started thriving, they control the weeds themselves, and burnt areas or "brûlées" appear around tree bases.

Pruning trees is an expert job. A careful balance needs to be established between tree canopy area and exposing the ground to sunlight. Twice yearly pruning is also used to stress the tree,

to make it more dependent upon the fungus associated with its roots. If the tree is not dependent upon its fungal symbiont, it will succeed without it and the truffles will disappear.

Truffières need irrigation. This may be less crucial with *T. uncinatum* than *T. melanosporum*. However, on a dry summer it is necessary, or the project may fail totally! It is also very possible to over-irrigate, to the same effect.

Re-inoculation of tree roots is very advantageous throughout the first few years of a tree's life. This is done by introducing truffle slurry into the ground on an annual basis. Once a tree starts cropping (after eight years or so), it is necessary to destroy the first fruit where they develop. The costs of these procedures are high.

Harvesting

Traditionally, especially in Italy, female pigs were used to hunt truffles. However, nowadays dogs are more commonly used. (Figures 8, 9.)

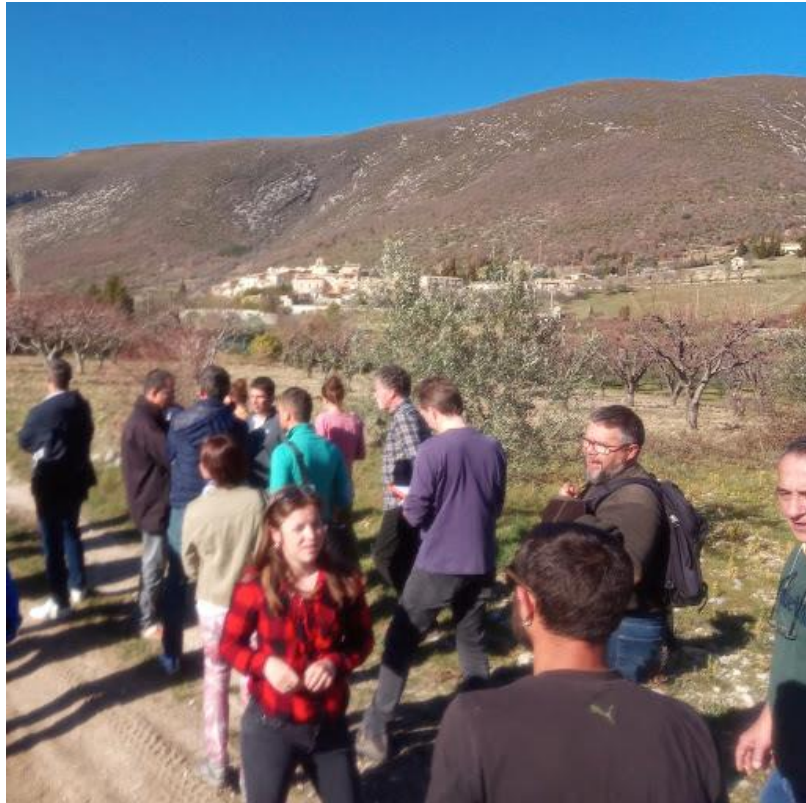


Figure 8. A Lagotto Romagnolo truffle hound



Figure 9. Using a Jack Russell cross

Sows require no training as they naturally are attracted to the pheromones in truffles, but dogs require training. However, using pigs carries risks associated with them biting the handler's fingers (off!) or eating the produce. One man with a pair of trained Labradors can harvest 15ha of truffles as a full-time job during harvest season (2-3 months). Trained truffle dogs are reputedly worth their own weight in truffles!



Take-home points

- Climatically, trufficulture is becoming less favourable in the south of France, with the fungus' range extending northwards due to desertification and climate change. Some species are well suited to the Welsh climate, even possibly with Southern European species - viable as far north as Scotland and Sweden!
- The industry is highly profitable where it is viable. The best figures encountered were €240,000/ha/yr (north east of Paris) in similar conditions to Southern UK.
- Provençal land values- Agricultural €5-10k/ha. Vineyards €40k/ha. Truffières €60-80k/ha! Demand increasing, supply falling in France.
- In direct contradiction to information received in the UK, it is highly site-specific. Calcareous limestone and sandy soils are necessary. It is not a case of simply applying lime as I was led to believe by UK firms.
- On suitable sites, this may be compatible with Glastir woodland establishment schemes, and in the future, carbon offsetting and public goods schemes. Green field sites are best suited - not established woodland.
- By working directly with a pépinière and laboratory in France, planting costs can be slashed compared to those quoted in the UK.
- Speculation or opportunity?
- No-one can guarantee success. But to improve chances of success, a measured, scientific, and sequential approach is necessary, starting with soil analysis. To increase chances of success, it is necessary to stack the odds in your favour. The more you put into management, the higher the returns are likely to be. High yielding French

orchards are intensively managed, it is not a case of planting orchards and returning in eight years!

- Soil analysis, irrigation, weed control, pruning, microscopy, and re-inoculation are vital parts of the process.

Part 2 of my trip to Sweden promises to show a different aspect, where they have developed the industry recently in conditions more similar to those found in Wales.