Farming Connect Management Exchange

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Visby, Sweden

Trufficulture on the Continent (Part 2)

November 2019

Gotland, Sweden

Nov 2019

Nyons, France

March 2019

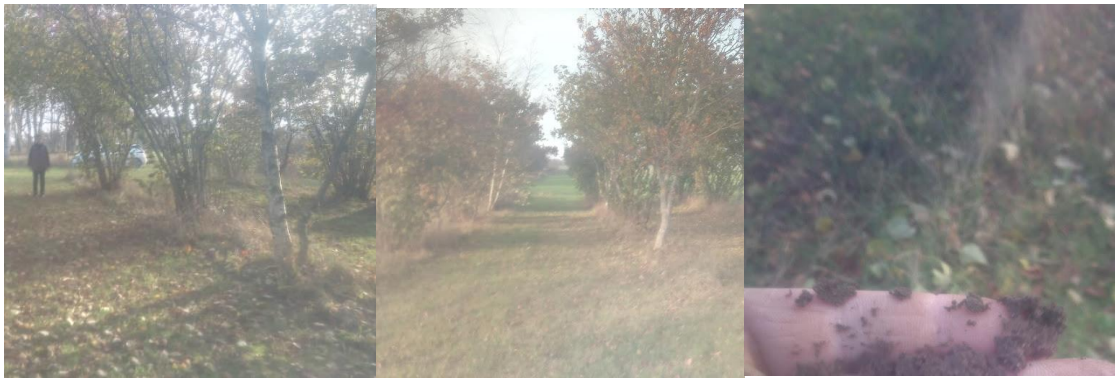
Introduction

Following my visit to France in March 2019, I visited Visby on the Island of Gotland, Sweden in November 2019. This Baltic island has a great deal in common with Wales; the maritime climate is cold and wet, and the latitude is Northern (approximately the same latitude as the Scottish Highlands). The principal industries in recent years have included sheep farming, cropping, forestry, university education, technology and tourism.

Trufficulture on Gotland

Trufficulture is a fairly new industry on Gotland, with the first wild truffles found in the 1970s. French truffle hunters with dogs were invited to investigate three sites at first, and truffles were found in the wild at all three. A larger survey was then conducted, and widespread occurrence in the wild led to interest in their cultivation. First plantings took place in the late 1990s, and under the guidance of Dr Christina Wedén of Uppsala University, a new industry has developed. Many plantations have been established across the island; on a scale of a few trees up to a scale measured in hectares.

Nowadays, Gotland truffles are revered in Swedish cuisine, and a truffle academy has been established to bring stakeholders such as consumers, producers, chefs and scientists together. The truffle festival I attended was one manifestation of this academy.



The original university trial orchards on Gotland, and an example of the soil texture.

Geology and soil

Following visits to both France and Sweden, it has become obvious that soil is a primary consideration in trufficulture.

UK based companies make bold statements about the possibilities of growing truffles in Britain. It is claimed that most soil types are suitable, and that plantations are nationwide.

The soil in the Radnor Valley is of medium fertility. It is multitextured mixed loam comprising clay, silt and sand, with a fairly high organic matter content. It might be thought that if truffles grow in "most soil types", with the addition of crushed limestone, they might stand a chance of growing here under Glastir woodland establishment scheme trees. However, the advice received from Laboratoires Teyssier in France was that it is "unsuitable for truffle production" (Figure 1).

Figure 1. Truffle-specific soil analysis from Laboratoire Teyssier, France.

Our soil is represented on the soil texture triangle with a blue spot.

Diagram A. This diagram shows our soil with some clay (the top corner of the texture triangle) and some silt (the bottom right corner). It also shows that there is high organic matter and low calcium, both CaCO3 and active calcium.

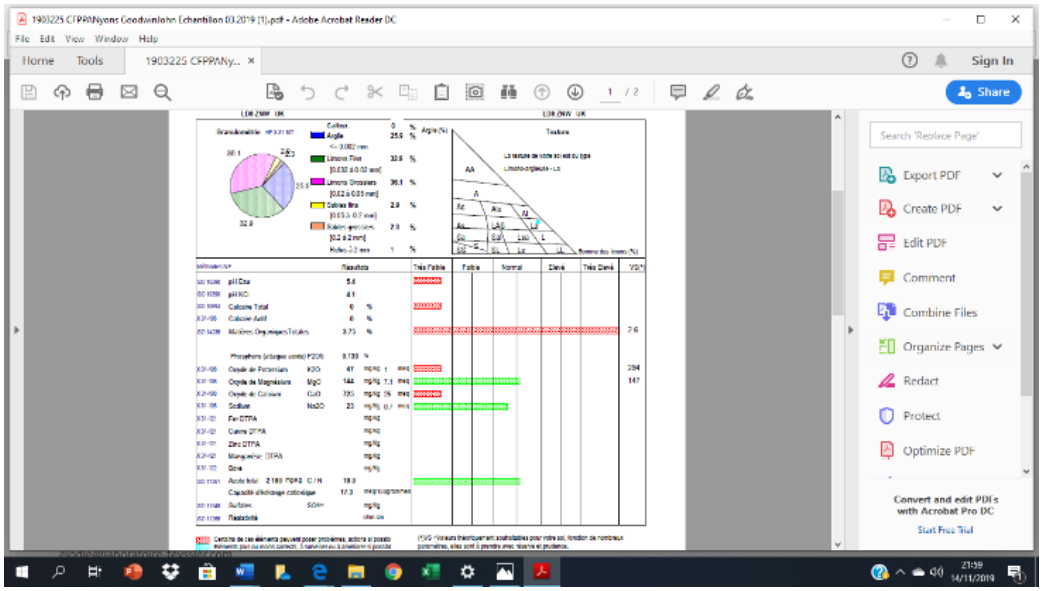


Diagram B. This diagram shows our soil with an average aptitude for fissurisation, poor structural stability and a high risk of asphyxiation.

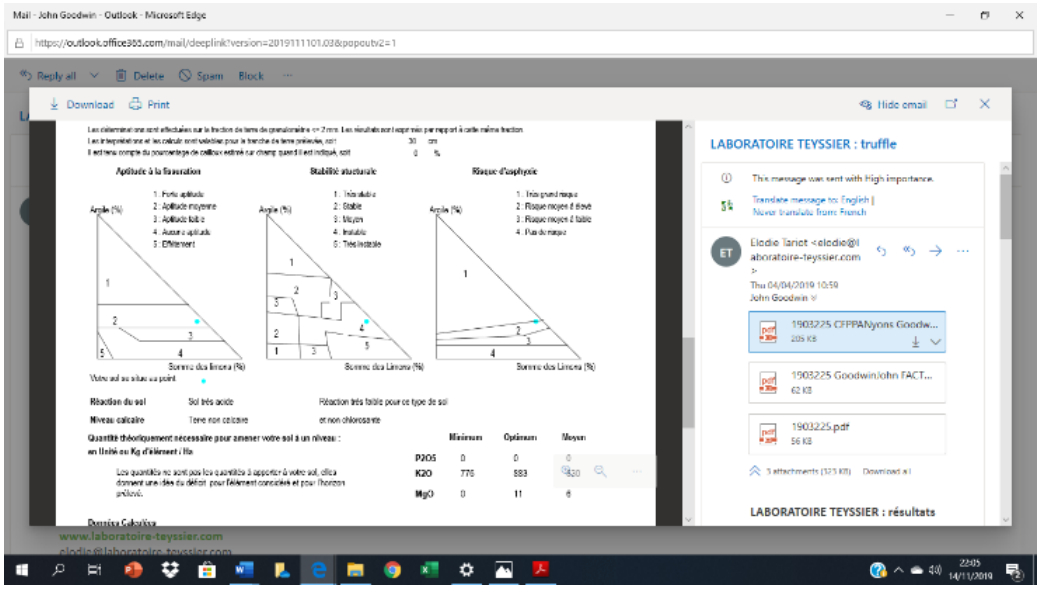
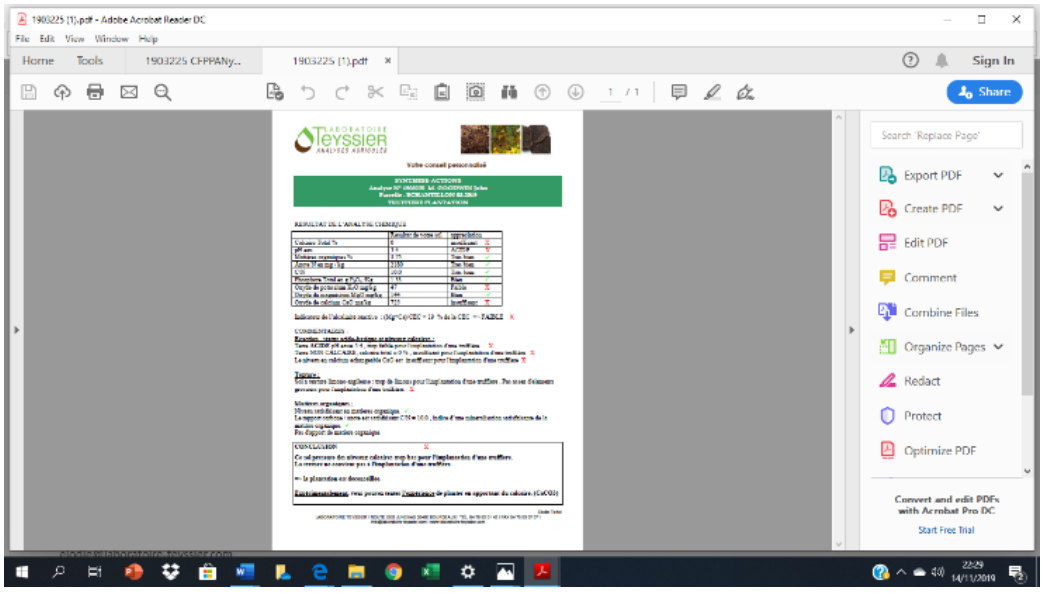


Diagram C. This diagram sums up the strengths and weaknesses of our soil for trufficulture.



Summary of results

Positives	**Negatives**
Good level of organic matter	Zero total calcium
Good level of organic nitrogen	Low pH (5.4)
Good carbon/nitrogen ratio	Low level of potassium
Good level of phosphorous	Low level of active calcium
Good level of magnesium	Poor soil texture and structure

Recommendations given

"This soil has limestone levels too low for the implantation of truffle. The texture is not suitable for the implantation of a truffle. Planting is not recommended. Experimentally, you can try the experiment of planting by bringing limestone (CaCO3)."

Following the return of these results, it is becoming clear that statements such as "most soil types are suitable for truffles" are likely to contradict French experience of 300 years of trufficulture. I set myself the challenge whilst in Sweden of finding out for myself whether growing truffles in the Radnor Valley, and in other parts of Wales, was a possibility.

The underlying nature of the rocks on Gotland is almost entirely limestone. Below is a quote from Gotland museum describing the geology of the island.

"430 million years of Gotland.

Gotland consists of limestone formed 420-430 million years ago during the Silurian geologiocal period. This period has also been referred to as Gotlandium, a reference to the bedrock of the island.

During the Silurian, our continent was closer to the equator where the climate was tropical, a warm sea covered parts of the continent. A plethora of plants and animals thrived on the sea bottom, in the water and on coral reefs. Many animals had a calcareous shell or skeleton, these ended up on the sea floor, and became part of the sediment. Millions of years later, they were petrified into limestone rock.

Today a small part of the former sea floor by way of a limestone cliff has emerged from the Baltic sea to form Gotland."

When considering this in our context, underlying limestone bedrock is commonplace throughout Wales. Carboniferous limestone is to be found on the Great Orme in the north, on the Gower peninsula, the Pembrokeshire cliffs, inland in the Usk valley and near Llandovery. Limestones are covered with a shallow layer of sandstone across the northern edge of the south Wales valleys, and Jurassic limestones are found across the Vale of Glamorgan. Faulted outliers of limestone such as Dolyhir and Nash near Presteigne also occur. However, the calcium content of the soil and pH, seem to be critical factors.

When consulting the Soilscape map of the UK (Cranfield University), there appear to be no true limestone soils in Wales, such as those found in Hampshire, Avon and in a band through to Lincolnshire and Yorkshire. Even those Welsh areas with limestone bedrock do not appear to have extensive calcareous soils. It seems that great care needs to be exercised before planting Welsh truffles

Dr Wedén states that "free calcium is more important than calcium carbonate", which agrees closely to what we were told in France. This probably precludes using crushed limestone as the sole source of calcium for trufficulture, especially in low calcium soils (such as ours). Of course, it is possible to apply free calcium (as burnt lime, granulime etc). The problem with these products is, as it is in

cereal production, that they act quickly, but don't persist in the soil. When we are considering truffle production and the requirement for free calcium in the top inches of soil over prolonged periods (before even the first crop), the costs may be prohibitive.

As mentioned, soil texture and granulometry is also of importance. Dr Weden gave advice that *T. uncinatum* in nature requires soils comprising at least 10% clay, 10% silt and not more than 80% sand. She states that in France, they're able to cultivate them in clay contents of up to 40%, but that would be heavy ground for trufficulture. Organic matter is favourable to truffle success with *T. uncinatum*. However, the definition of a perfect soil structure for trufficulture is elusive. It needs to be free draining, have a significant sand content, and yet, have enough soil structure to allow stability and fissurisation.

When considering all of the information I have been presented with, it seems that truffle production is highly site specific, and that careful research needs to be conducted before considering it as an enterprise.

Dr Christina Wedén addressing the Gotland truffle conference.

<u>Truffles in Swedish Cuisine</u>

As part of the Gotland truffle festival, three Swedish celebrity chefs spoke with regard to their experience of cooking with truffles. It is clear the reverence that they hold for truffles, especially *T. uncinatum,* our most likely candidate species in Wales. Truffles have become so ubiquitous in Swedish fine dining that they have been banned from some top-class competitions to require chefs to demonstrate other culinary skills. As part of the conference, Dr Giovanni Pacioni (University of

Aquila) also spoke about the chemical makeup of truffles, including describing the addictive nature of some of the constituents as “necessary ingredients for bliss”. Many of these chemicals have evolved to encourage consumption by wild animals to spread their spores, and help explain their attraction to humans.

A commercial truffle orchard on Gotland

I visited a commercial truffle orchard, courtesy of Susanne Welin-Berger, chair of the Gotland truffle association. This oak tree orchard was planted in 4m rows, with 4m spacing between trees to allow grass control, with a 3m mower in both directions. Trees were mulched with wood chip initially, but only mowing of grass had taken place in recent years. Some boughing of lower limbs of trees had been done. This orchard was planted in 2001, one of the early commercial plantations on Gotland.



The main problem with harvest seemed to be the ability to keep up with the dog! Whilst retrieving a truffle, the Lagotto Romagnolo had often found another fruit, and was frantically digging it. Dogs will eat truffles, and some of them are worth 100 Euros! In the 20 minutes we spent truffle hunting, we found about £500 worth.



Harvest of Burgundy truffle *(T. uncinatum)* takes place here during October, November and December. At the time of my visit, 2.5kg were being harvested weekly from the 1 hectare plantation. Current prices were 1 Euro/gram retail, or 0.4 Euro/gram wholesale!

Conclusions

- The climate in Wales is well suited to the production of Burgundy truffle (*T. uncinatum*) and possibly Perigord truffle (*T. melanosporum*).
- Climate change is starting to favour the UK above what have traditionally been regarded as truffle producing areas.
- Supply of truffles is dropping across Europe but demand is increasing.
- Truffle production is compatible with Glastir woodland establishment schemes, but the capital grants available are unlikely to be significant in the overall economics. Planting density may require attention.
- The underlying bedrock and soil structure make truffle production site-specific.
- Anyone considering trufficulture should start with a soil test at a specialised laboratory.
- Expert advice and careful consideration are required before considering planting truffle orchards. Using a certified tree supplier is a crucial consideration.
- When taking the above factors into account, high planting costs, intensive management, and long periods before the first harvest, mean that it is a long-term investment.
- Even with the best efforts in the above areas, unpredictable results mean that there is a degree of speculation involved in planting a truffle orchard.
- Where trufficulture is viable, it seems to be highly profitable.