# Bitter orange trees at Freyr Castle.
# Sébastien Conil and Stefan Vidts

1: Freyr Castle.

Freyr Castle possesses a collection of very old citrus trees. The oldest trees almost certainly date from the late 17th or early 18th century.

The château is located in Belgium, along the Meuse River, just over the border from France. It has belonged to the same family for centuries. It has passed several times through the hands of women, resulting in a change of family name. Adaptations over the generations have taken place in the family atmosphere of a noble agricultural estate, and define Freyr's atmosphere and appearance to this day.

Freyr is now located in Belgium, which has existed as a country since 1830. Today's Belgium is the result of the merger of the Southern Netherlands and the Principality of Liège. This description will be used in the text to describe the historical region.

The present form of the garden was determined in the 18th and 19th centuries by the Dukes of Beaufort Spontin. At the end of the 19th century, Freyr came under the management of the de Laubespin Lagarde family. Today, it is managed by a non-profit association, ASBL, under the auspices of the Bonaert de Laubespin family. Management is also supported by the Laubespin-Lagarde Fund within the King Baudouin Foundation. This fund manages the inheritance of one of the family's ancestors.

2: Monitoring the citrus trees and the estate.

Stefan Vidts has been responsible for  the trees since 2009. At first, this only involved a few days a year, but gradually the advice, pruning and maintenance have developed. To this day, Stefan's work remains focused on pruning, repotting and providing advice on tree maintenance.

Since 2017, Sébastien Conil has been appointed head gardener and is present on a daily base. Sébastien is responsible for watering, feeding and driving the trees inside and outside the orangeries. He reports any problems he thinks he spots.

Today, the two men form a tandem that ensures that these old trees are preserved as well as possible.

Stefan Vidts is a landscape architect and art historian by profession. He specialises in citrus trees and the management of gardens and historic estates.

Sébastien Conil is a landscape architect who specialises in maintenance with respect for and knowledge of historical and maintenance techniques. He works full-time on the management and restoration of the historic gardens around the castle.

3: Citrus growing in the Austrian Netherlands and the Principality of Liège + the earliest mentions of Citrus in Freyr.

During the 17th century, knowledge of citrus growing gradually spread. One of the pioneers of citrus growing in the Spanish Netherlands was the Ghent-born Willem de Blasere[1] (1584-1653), lord of Hellebus and alderman of Ghent, a pioneer in horticulture who introduced the cucumber seed. [2] This enthusiast overwintered citrus trees in the gallery of his town hall in Ghent's Hoogstraat and managed to grow fruit on his trees without any problems. He corresponded with the Italian Jesuit Giovanni Battista Ferrari. [3] Ferrari was very surprised and described de Blaesere's orangery in his main book on citrus fruits, published in 1646. [4]

De Blaesere owned several varieties of beautiful, special orangetrees. A notice board in Ghent dated 12 August 1675 announces the sale of his collection. [5]

Another important source is the death inventory of Antwerp Mayor Nicolaas Rockox (1560-1640), drawn up in 1640, which states that he kept his orange trees in winter in a cellar beneath 't cleyn saleth' (the room with the art gallery). This inventory mentions that there were ten orange trees, apparently well cared for and already several years old since some of the trees were bearing oranges.

We can assume that the respectable Citrus collections in the Netherlands and the Principality of Liège consisted of between 10 and 20 plants at most. They were part of a botanical collection of unusual plants. The emphasis was clearly on a botanical collecting effort, of which citrus was only one part. Throughout the 17th and 18th centuries, this was the leitmotif of botanical collecting among the nobility and bourgeoisie. A vast collection like Freyr's is therefore the exception rather than the rule. They were mainly found in the upper classes of the nobility and bourgeoisie.

Several post-death inventories support this observation, including that of Frédéric-August de Beaufort Spontin.

His inventory, drawn up after his death on 1 September 1817, mentions the following in Freyr: 40 orange trees, 9 lemon and lime trees, 3 pomegranate trees, 12 small baylaurel trees, 18 large laurel trees pruned into balls on stems, 4 large laurel trees pruned into pyramids, 13 oleanders in large boxes, 5 fig trees, 2 in pots and 3 in boxes, 111 pineapple plants with fruit and 80 plants without fruit, several hundred foreign plants, shrubs and flowers in stone pots. This inventory, with a total of 48 large citrus trees in cases, is quite exceptional for a noble house in the Austrian Netherlands and the

[1] Guillaume DeBlasere, knight, lord of Hellibus, was an alderman in 1625, according to the book of aldermen kept in the town archives:http://www.dbnl.org/tekst/will028belg06_01/will028belg06_01_0022.htm
[2] https://nl.wikipedia.org/wiki/Willem_de_Blasere
[3] Van Driessche T., Van den Bremt, P., 2015, Methodologie voor het beheer van historische tuinen en parken in Vlaanderen, Onroerend Erfgoed, p. 194
[4] Giovanni Battista Ferari, Hesperides sive de malorum aureorum cultura et usu libri quatuor, Rome, 1646, p.
[5]Ghendtsche Post –Tijdinghen van 12 augustus 1675lezen we dit: "WAERSCHOUWINGE. Dijnsdagh den dertienden Ougste ten twee uren na middagh salmen verkoopen op de Hooghstrate binnen Ghendt, ten Huyse van den Heere van Idewalle veele schoone en rare Oragnie-boomen, Granaden, Laurieren, Myrthus, Oleanders, Witten en Geelen Jazamijn, planten van (...) en andere raere dinghen, toebehoorthebbende wijlens Jos Guillaume de Blasere, in sijn leven heer van Castere, en canonick vande Cathedrale Kercke van S. Baefs in Ghendt." Ghendstsche Post –Tijdinghen, maandag 12 augustus 1675 (nr. 62), Universiteitsbibliotheek ghendt, BIB.J.000001.

Principality of Liège. With such a collection of citrus fruits, the Duke of Beaufort-Spontin was in the realm of royalty.

The earliest mention of the presence of Pomeranians at Freyr dates from 1710; it is an annual account mentioning an additional payment to a servant for placing orange trees in the garden by order of the Baron de Beaufort. [6] The number is not specified. The oldest image in the collection is a drawing by Remacle Leloup, circa 1738, which was used for the engraving included in the 10-volume set of "Délices du païs de Liège", which describes almost all the castles, monasteries and abbeys in the principality of Liège and the province of Luxembourg. The most important are accompanied by an engraving. This drawing of the gardens at Freyr highlights the citrus collection. It suggests that the collection included 30 to 40 citrus trees, which was a considerable number. [7]

A charcoal drawing dated 1850 shows the gardens in their current layout. This layout dates from around 1770, but we have no earlier images. [8] The drawing clearly shows the citrus trees planted in containers surrounding the two ponds.

It is remarkable to note that at the end of the 18th century, gardeners and master gardeners in the Southern Netherlands and the Principality of Liège were still working according to essentially ancient traditions, based on early 17th-century customs and described in the professional literature of that century. The plants are mainly wintered in rather dark cellars and stables. These conditions are certainly not optimal for overwintering these extraordinary collection of plants, and highly skilled gardeners have had to be employed to get the plants back into tip-top shape, year after year, before the summer season.

4: To grow orangery plants, you need an orangery, i.e. a building where you can let in enough light, even in winter.

Houses or specific buildings, orangeries, did not exist in the 16th century. At least, no trace of them has been found. The construction of real orangeries was particularly slow to develop in the Southern Netherlands and the Principality of Liège. At the beginning of the 18th century, these wintering houses for container grown plants and orange trees were compact, solid, enclosed structures with limited window openings. The two orangeries at Freyr, built well before 1760, belong to this type.

It can be assumed that they were used as tea and refreshment pavilions in the summer. They may be interpreted as a wintering place for frost-sensitive plants. However, they remain dark, compact buildings that are not ideal for housing plants from early October to mid-May. It therefore took highly skilled gardeners to get the plants through the winter and back to full vitality in summer.

The two orangeries are still being used to overwinter plants. They are certainly not optimal, as the light never reaches the back. Without additional lighting, the trees are considerably weakened. To remedy this problem, the trees at the back are artificially lit in winter with horticultural lamps. This gives a good result.

[6] AEN, Fiefs et seigneuries, n°136, Compte des dépenses par le prêtre Brant (1703-1721)
[7] 'Délices du païs de Liège'
[8] Private Archives of Freyr

5. Main historical manuals on growing orange trees.

There are several books on growing oranges and lemons. The most indicative for this region are in Dutch. The most important are Van Sterbeeck and Commelyn, whose two authors knew each other. They recount the symbolism of the golden apple, discuss the different cultivars and give very detailed growing instructions. Both are simple publications, without many illustrations, aimed not only at a noble public (Francophone), but also at literate head gardeners. For the illustrations, they both refer to the reference work by Ferraris.

1676 Amsterdam, J. Commelyn, Nederlantze Hesperides (Using notes sent to him by Van Sterbeeck in the years preceding publication. Commelyn sent his notes back to Van Sterbeeck in 1676, who did not publish his work until 1696).

1682, Frans Van Sterbeeck (Antwerp priest), Citricultura, out regeringhe der uythemsche boomen, te weten oranien, lemons, limes, grenades, laurels and others.

1687, Jan Van der Groen; Den Nederlandtsen Hovenier, Brussels, 1687, deals in general with the cultivation and wintering of orange trees. This is an important work, which was quickly translated into French and reprinted until the 19th century.

6. The variety of old citrus trees at Freyr and their positioning.

The castle garden has two orangery parterres with a rectangular pond in the centre. Around each basin, there is space for 22 container plants, 9 of which are on the long side.

In 2009, Freyr still had 24 historic bitter orange trees, as well as a lemon tree seedling and 4 sweet orange seedlings. These now mature seedlings date back to the inter-war period, when the last head gardener was trained.

Six trees had been grafted at a height of 1.5 m to 1.8 m and were in a deplorable state. Four of these trees died because their physical condition was too weak. These trees received far too little light in the low, dark orangery with its high canopies, so they were irreparably affected by root rot due to inadequate repotting and poor, inappropriate pruning. After a brief revival, five trees soon perished. Annual ring counts have confirmed that these trees were venerated between 1780 and 1840.

In 2020, another high-grafted tree dating from the early 20th century, with a very weak root system, was killed by a summer storm.

The oldest bitter orange trees were grafted at the base or at a maximum height of 50 cm. These trees were all grafted at the end of the 17th or beginning of the 18th century. Of these old trees, 14 remain today.

In total, we still have 15 historic trees as well as the seedlings from the inter-war period.

All the historic trees had a counterpart, they were couples. We were able to confirm this when the trees started to bear normal fruit again in 2015. Since then, we have been able to identify a wide variety of bitter orange cultivars.

For the naming, we apply the one used by Van Sterbeeck's 'De Citricultura'. It seems to correspond best to the trees we find at Freyr and to the historic trees in the historic oranges near the Château de

Laeken. The exact naming of its cultivars is rather difficult, as in the past these cultivars were named differently depending on the region.

We can distinguish various forms of the horned types, the corniculata, as well as a very large variety of plants that Van Sterbeeck calls variants of the Adam's apple or "Pommo Adami". These fruits refer to the tree of the knowledge of good and evil with its golden fruits. This is the apple that Adam bit into when he was expelled from paradise. In a Pommo Adami, we seem to recognise the bite of the teeth at the base of the fruit.

At present, 15 of these historic trees are still alive. Since 2009, a great deal of energy has been required to ensure that the trees are once again relatively healthy and that the Phytophthora fungi are brought under control. They have actively affected the roots of all the trees. To suppress the fungus, it was important to reactivate the vitality of the trees so that they could begin to minimise the effect of the fungus from within.

The cultivation method used today to keep the trees alive is based on the historical descriptions as given in the publications cited. The different publications use a similar description.

7. Substrate or soil mix.

Classically, a substrate composed of 1/3 decomposed leaf compost, 1/3 matured manure that is several years old and 1/3 good garden soil is recommended. If the garden soil is too clayey, it can be lightened with draining sand. We have found that this mixture is too rich for the very old Freyr trees. If more solid roots are damaged when the crates are replaced, the wounds are rubbed with activated carbon dust. Nevertheless, we found that, as a general rule, in the third year, shortly after putting them outside at the beginning of May, the plants deteriorated very quickly, with a possible risk of losing the trees. In the case of the trees we eventually lost here, we found that the active Phytophthora fungus had been able to establish itself on one or more of the main roots in contact with the base of the trunk, causing the tree to die back. Given that Freyr's orangeries are very dark and not optimally ventilated, we have found that an overly rich mixture of rather heavy soil on very old trees acts like a steroid treatment on humans: a brief, spectacular flush after which the plant falls back, eventually leading to the loss of the tree.

After evaluating various substrates, we came up with the following mix after several years.

1/3 roof garden substrate for extensive use. A standard mix for sedums on roof gardens, rich in pozzolana, brick rubble and mineral-rich substrates.

1/3 fine, slightly decomposed Picea or Abies bark. The bark keeps the substrate stable and slightly acidic.

1/3 standard substrate for growing citrus fruit or chrysanthemums in pots. This is a standard mix available from wholesalers in Belgium. It is based on peat, germ-free digested organic matter and 20% sterilised clay particles.

We opt for such a highly draining and sterile mix to avoid germs. The draining aspect is important to prevent the trees from becoming too damp in winter in orangeries that are not optimally ventilated and dark. The disadvantage of this mix is that you need to water generously every 2 days during hot, dry spells, otherwise the trees may show symptoms of drought stress. By opting for a highly draining mix, we have been able to keep the problem of root rot under control in recent years.

8. Water for irrigation and fertilisation.

The water used in the fountains and basins is taken from a spring in the rock through a system of underground channels. The ph of this water varies between 7 and 7.5 °D in winter and between 7 and 8 °D in summer. The warmer the weather, the greater the absorption of calcium from the rock and the greater the hardness of the water. This slightly alkaline water has been used for centuries to water the trees. In winter, each orangery has a large barrel where the water used for watering is kept at the same temperature as the orangery itself.

For fertilisation, we use a dissolved chemical fertiliser specially designed for citrus trees. It has a very low mineral content, something to which all citrus fruits are relatively sensitive. Our specific citrus soft fertiliser has an NPK of 11-3-6 and is enriched with magnesium and additional trace elements. When used externally, we dilute it several times as a foliar fertiliser. During the summer, until the beginning of September, we apply it diluted every 14 days, as indicated on the packaging.

This mixed feed gives better results than organic feed, the exact composition of which is never known. The trees were much more susceptible to root rot with the organic compost and blood meal.

We sprinkle the root ball with fine lava powder every 3 or 4 years. This has a natural anti-fungal effect as well as being a great source of minerals. We only do this every 3 or 4 years, as the powder is very fine and therefore has time to settle slowly into the root ball with the watering.

9. Pruning.

Until 2009, orange trees and bay trees were pruned every year with a hedge trimmer at the beginning of August. Until before the Second World War, they were pruned by hand using secateurs. As a result of decades of shearing, the fruiting wood was barely rejuvenated, so the trees barely grew, had masses of dead wood in the crown and showed chronic chlorosis due to the very limited growth, which weakened the trees considerably and allowed Phytophthora spores to settle on the roots, further undermining the trees.

The formation of the crown clearly showed that the plants had been meticulously pruned over the centuries using the pruning technique for espaliered fruit trees. During the formation of a young tree, a crown is first formed around a central trunk in 3 to 5 stages. Once the crown has formed, maintenance pruning is carried out, with the fruiting branches cut off every two or three years to make way for new vital branches.

This carefully considered pruning allows the tree to regenerate continuously. Material that is too old and slow-growing is eliminated to make way for young, vital shoots that will produce flower buds the following year.

Pruning takes place from Christmas until shortly before the beginning of May.

Once again, from May onwards, the trees are able to produce fresh green vital leaves that can be optimally used for photosynthesis. Maintenance pruning of a healthy tree involves removing between 30 and 40% of the crown volume each year. Once the crown has reached its mature volume, it must be kept under control. When pruning to obtain flowering wood from vital dormant buds, these are located along the underside of the branch or twig.

When growth wood or vital wood is needed to restore the crown, it is pruned on a vigorous eye that will produce a shoot planted at approximately 35° to 45° to the horizontal axis. These buds are always located at the top of the branch. This method of pruning is very labour-intensive and is never used in commercial cultivation. The advantage of this pruning method is that it produces a compact, robust crown with lots of short wood. These trees are easy to transport to their winter quarters, even if they are full of fruit.

10. Maintaining the collection.

Shortly after the first visit to Freyr in 2009, it became clear that a number of trees were too advanced to regain their full vitality. It is, and remains, a collection of trees that can be compared to a nursing home full of centenarians. It's not impossible for an old plant to dry out from time to time. To improve wintering conditions, the family and the de Laubespin-Lagarde Fund authorised the installation of professional horticultural lamps against the vaults at the back of the orangery. For the past 4 years, this has enabled us to provide adequate lighting for the trees that spend the winter at the back of the orangery, and which really don't get any light there during the winter.

Now we can get them out under much less stress, making them less susceptible to fungus, chlorosis and leaf scorch in the first sun.

When the fruit started to ripen normally, we quickly realised that it was a special genetic inheritance. In order to preserve the cultivars for posterity, all the historic trees were grafted onto rootstocks of Citrus x aurantium, the bitter orange tree. A collection of shadows can be found at Stefan's home.

Thanks to the use of strong rootstock, the grafts immediately began to grow very vigorously. After 9 years, the young trees are starting to look good and can gradually take the place of trees that are too sick or whose gaps have been filled by laurels in tubs.

Summary.

The cultivation of a wide variety of potted and container plants, in which citrus fruits do not generally occupy a dominant position, became widespread in the Netherlands and the Principality of Liège from the end of the 16th century. A wealth of professional literature was soon available to inform gardeners and homeowners about the cultivation and propagation of these plants. It should be noted that, compared with other regions of northern Europe, the construction of orangeries, suitable and ideal overwintering sites for these plants, was very slow to develop. The art of placing plants in perfect condition year after year in the garden was largely down to the skill of the gardener.

Since the early 18th century, Freyr Castle on the Maas has had a fine collection of citrus trees, which, according to the earliest drawings, numbers around forty. Such a collection of citrus trees is quite exceptional for a noble family, and is on a par with the royal courts.

Today, the collection still includes around fifteen historic trees. It is not certain that these trees have been on the estate since the 18th century; some may have been purchased over time to replace diseased or dead specimens. It has to be said that the Freyr orangeries are among the oldest in Belgium, and that they are dark and proportionately too low for their depth, which means that the plants suffer greatly from the lack of light in winter.

All the historic trees at Freyr have been grafted since 2015, preserving their genes for posterity.

Commelyn, J.; *Nederlantze Hesperides, dat is Oeffening en Gebruik van de Limoen en Oranjebomen gestelt na den Aardt en Climaat der Nederlanden*, Amsterdam, 1676

De la Court van de Voort, P*., Bijzondere aenmerkingen over het aenleggen van prachtige en gemeene Landhuizen, Lusthoven, Plantagiën en aenklevende cieraeden*, Amsterdam, 1737

Geytenbeek, E.; *Oranjerieën in Nederland*, Canaletto, Alphen aan den Rijn, 1991.

Goovaerts, L. ; *Ecrivains, artistes et savants de l'Ordre de Prémontré*, dl. 1, Brussel, 1899, p. 244-245. ??? niet 100% bruikbaar

Van der Groen, J.; *Den Nederlandtsen Hovenier*, Brussel, 1687

Van Sterbeeck, F.; *Citricultura, oft regeringhe der uythemsche boomen, te weten oranien, citroenen, limoenen, granaten, laurieren en andere*, Antwerpen (nakijken), 1682