

Oak breeding in the Netherlands

Members of the Future Trees Trust visited the Netherlands in May 2013 to see the results of a long history of selection and breeding of fine oaks for timber. **Jo Clark** and **John Fennessy** report on their visit.

Oak (*Quercus robur*) is very important in the Netherlands and is the most wide-spread indigenous species in the country accounting for approximately 16% of the forest cover and about 25% of roadside plantations. The Netherlands has a long tradition of breeding oak trees for landscape and commercial purposes, not least for the strong wood that was very suitable for the well-known ships of the Dutch East India Company. In this way, the Dutch developed world-class expertise in breeding

tall, straight oak trees. One of the top universities in this area is Wageningen University and Research Centre (WUR). Our small group of researchers, nurserymen and oak enthusiasts were taken on a guided tour of the country by Sven de Vries, oak researcher at WUR, to look at how the Dutch have been so successful at producing high quality oak for which they are now rightly famous.

Sponsored by the British Embassy in the Netherlands, the visit was co-ordinated by Liesbeth Bouwhuis and Irena Gucianu of the Embassy who joined us on the tour, and ensured everything ran smoothly. One topic of conversation that cropped up numerous times, was that Holland does not actually exist as a country, contrary to many of the group's understanding – it is a province of the Netherlands (of which there are 12. See Figure 1) in the same way that Wales is part of the United Kingdom, but not part of England!

The first day of the tour took us to several sites around Gelderland. The Netherlands has many fine seed stands that are being evaluated in provenance trials. Once selected, they are listed in the Dutch National Catalogue and many are established in roadside seed stands. Our first stop was a stand at Wolfheze from which seedlings had been taken to make an adjacent roadside seed stand. However, this was a good example of 'how not to do it'. The parent trees exhibited poor form (crookedness, forking and heavy branching) and the progeny in the roadside seed stand also reflected this. Privately owned, the stand had originally been managed for coppice and displayed dysgenic selection – the removal of the best individuals, leaving the poorer performers from which seedlings had been taken. Because of this, the roadside seed stand was not on the register of approved planting material.



Figure 1. Map of the provinces of the Netherlands.

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Figure 2. The seed stand at Ede de Klomp (left), and the more impressive stand at Nunspeet (right), although 'lumps' could be seen on some of the trees.

In stark contrast, we were next shown a tested seed stand at Ede de Klomp (Figure 2), where we were joined by wholesale seed supplier, Johan Vink of Pelgrum Vink Materialen. The stand here comprised 1800 trees growing in a double row on both sides of a busy public road. Although this seed stand was tested, the highest category of material available under forest reproductive material (FRM) regulations, the group came away with the vague feeling that although it was good, we hadn't seen anything especially impressive.

Our next stop was a selected seed stand at Garderen, one of only two we visited within a forest environment, where a lively discussion took place on the process of seed stand selection in the Netherlands (Figure 3). Registration of stands is based on the evaluation of 50 trees chosen at random. The method seemed complicated, but after several examples, the group were convinced of the validity of the approach. Each of the

50 trees is assessed on a number of criteria that are split in to two groups. The form of the trunk below the crown and within the crown, along with branching habit fall in to Group 1 criteria, and spiral grain, 'lumps', grooves and epicormics fall in to Group 2.

For evaluation, each trait is given a score out of 3. For example, for the trunk a score of 1 is given for a straight stem (less than 10% deviation); 2 for a slightly curved stem (deviation 10-25%) and 3 for a curved stem (deviation greater than 25%). For Group 2 traits, a score of 1 is given for no

Table 1. The evaluation criteria for oak seed stand selection in the Netherlands.

Group 1 traits				Group 2 traits			
Feature	% Trees			Feature	% Trees		
	1	2	3		1	2	3
Trunk below crown	70	30	0	Spiral grain	93	7	0
Trunk within crown	17	47	36	Lumps	70	10	20
Branching habit	60	23	17	Grooves	100	0	0
				Epicormics	83	13	4
Total	147		53	Total	346		24

For group 1 traits: $147 - 53 = 94$. A score over 90 is acceptable.

For group 2 traits: $346 - 24 = 322$. A score over 300 means the stand will be selected and entered on to the register of approved material.

Features



Figure 3. The group discussing seed stand selection criteria at Gerderan.

defects, 2 for defects hardly present, and 3 for moderate to many faults. The number of trees that fall in to each category is converted to a percentage, and the percentage of number 3 trees is subtracted from the percentage of number 1s. If the final score is greater than 90 for Group 1 traits, and greater than 300 for Group 2 traits, the stand is selected. Table 1 shows how this scoring system works.

The Gerderan stand was planted about 75 years ago, with progeny from Lisbos (a famous seed stand which we saw on our final day) and under planted with beech, which is common practice once the stand reaches about 50 years of age. The purpose of this is to shade the trunks to stop the formation of epicormics, and to help promote self-pruning. It is important to keep the crown of the oak above the beech; if the beech are planted much before stand age 50, they overtop the oak too quickly. Sven emphasised that the management of seed stands is important; frequent and heavy thinning is required to allow final crop trees to develop large open crowns with associated regular heavy flowering and acorn production. Interestingly, Sven reported that every year is a mast year in the Netherlands compared to every 3-5 years in the UK, but the reason for this wasn't clear. It was

thought that the active stand management to promote flowering along with greater water availability were contributing factors. This selected stand was met with the seal of approval by the group, many of whom sounded quite envious when comparing the trees to their own stands.

The final stop of the day was at Nunspeet, an exceptionally fine seed stand of 113 roadside trees, again in a double row along a busy public road (Figure 2). Sven explained that the demand for oak was go great in the Netherlands, that this method of establishing seed stands along roads was common practice to utilise land availability. It also enabled easy collection of the acorns which can be hampered in unmanaged forest stands.

Day 2 of our tour took us east out of Gelderland to Flevoland (the reclaimed polders of the Zuiderzee) to see the only clonal seed orchard in the Netherlands planted in 1978 at 8 x 10m spacing at Bremerbergbos. The trees selected for inclusion in the seed orchard were based on late flushing individuals to minimise frost damage and selected from within already selected forest seed stands. Although many trees were originally selected for inclusion in the orchard, only 56 clones are actually represented. Originally planned for ten

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ramets of each clone, the resulting orchard was much smaller due to the difficulties of grafting oak, something that the FTT group is currently also grappling with. Time of grafting is considered critical in the Netherlands with a small window for successful grafting only at the end of December.

The clonal seed orchard at Bremerbergbos falls under the qualified category of FRM and progeny tests are on-going with the expectation of producing tested oak in 2014. Because contamination of pollen from outside the orchard is undesirable, the site selected was very isolated with no natural oak in the vicinity. Yet studies of pollen flow and patterns of pollination within the orchard have shown that 70% of the pollen is in fact from trees from elsewhere, a finding consistent with other oak breeding programmes throughout Europe. This orchard has been in production for a number of years, and produces about 2,000kg of acorns annually. However, this only satisfies 0.5% of the Dutch demand for pedunculate oak (currently about 400,000kg) annually. It is worth noting that a seed orchard of 56 clones, as with all well designed breeding programmes, is far more genetically diverse than many seed collections commonly undertaken. Back in the bus, we passed a newly established oak seed stand (Figure 4), beautifully laid out with very fine young trees, and stopped for a look. Trees were again planted in the standard double row, 10m apart, each staked and mulched. These gave us a taste of what to expect from the oak nursery, our final stop for the day.



Figure 4. A newly planted roadside seed stand.

The nursery at Wildetsedijk is owned by Peter de Labie and his family. Peter is a third generation nurseryman, and his expertise evident as we toured the extremely well managed nursery. Peter placed particular emphasis on his oak production methods as he demonstrated the various stages in the system. Here we saw older (five years and over) trees managed very intensively to produce straight individual trees for roadside planting of seed orchards seen earlier.

Sven had saved the best for our last day, and we explored an extensive area of superb oak in the forest area of Princenhage, where a number of stands had been surveyed as potential seed stands. This included the famous seed stand 'Lisbos' the progeny of which we had seen at Gerderan. In the previous survey done in 1984, two stands



Figure 5. The oak stand at Lisbos, underplanted with beech to help prevent epicormics.

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were selected and one rejected. The quality of these stands was something to take the breath away, and even the rejected stand was considered by the group to be of such good quality that the consensus was that it should now be re-evaluated, which Sven also agreed with. However, an adjoining younger stand was showing considerable stress and some dead stems, with suspected acute oak decline.

The final stop of our study tour was to a progeny trial of Dutch oak seed stands in a replicated field trial in Schuddebeurs. This type of trial is used extensively in the Netherlands to upgrade 'selected' seed stands to the higher 'tested' category. Half-sib families (acorns from a single mother tree) are collected from a number of individual seed stands; here it was twenty four selected seed stands but throughout the entire country 119 are presently under test. These trials are regularly subjected to assessment in relation to height and diameter growth, form, flushing time and survival levels. Based on the performance of these progeny over several sites, the top seed stands can be identified and categorised.

Knowledge gained from the tour to the Netherlands

Despite only having spent two and a half days in the Netherlands, the study tour proved to be a great learning experience for all participants and resulted in a large number of positive findings for the group:

- The insight into the schematic system and the methodology applied to the selection of seed stands in the Netherlands.
- The critical time and methodology for grafting of our older selected plus trees.
- The approach and method for developing and establishing roadside seed stands
- The Dutch system of upgrading seed stands from the category 'selected' to 'tested'.
- The level of foreign pollen in an oak seed orchard – over 70%.
- The value of having seed stands along roadsides in terms of ease and cheapness of seed collection.

- The possibility of getting more tested seed to market relatively quickly by growing seed stand material in comparative trials. For UK seed production, several seed stand sources are being tested in existing Forestry Research provenance trials that could, as in the Netherlands, be upgraded to 'tested' status almost immediately. Similarly, in Ireland, there are a number of seed stand seed sources also in similar trials. These must now be reviewed and classified accordingly.
- Based on Dutch findings, it seems that positive judgements can be made on the performance of seed stand progeny at about twelve years.

The group is indebted to a large number of people for the great success of the study tour but we owe a special debt of gratitude to Sven de Vries for organising the tour programme and planning the itinerary. The group also owe a large debt of gratitude to the British Embassy in the Netherlands and in particular Liesbeth Bouwhuis, Science and Innovation Officer and Irena Guianu, Science and Innovation Intern for their work in organising the tour with Sven and for financial support. We are also grateful to the people who met us along the way especially Johan Vink of PVM and Peter and Heidi de Labie for their kindness and hospitality shown at their nursery in Wildertsedijk and finally a word of thanks to Johan Brouwers, driver of the mini-bus. To all of you we say a very special 'thank you' for a great study tour to the Netherlands.

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