

# Sweet Chestnut in Britain: when and whence was it introduced? A new study in the Forest of Dean, Gloucestershire, UK.

## Seeking evidence from genetics, pollen, charcoal and historical sources



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1. ACCEPTED WISDOM has Sweet Chestnut (Castanea sativa Mill.) first coming to Britain with the Romans ~2000 years BP (Godwin 1975, Huntley & Birks 1983).

There has been scant evidence to accept or reject this view (EH 2001, 2002, 2010) - but now the new technique of genetic characterisation, coupled with targeted palaeoenvironmental and historic assessment in the Forest of Dean region, could provide fresh clues to sweet chestnut's antiquity in Britain.

Genetics can reveal:

- 1. Origin: the home place of the tree;
- 2. Individual plant or clone spatial extent: age index;
- 3. Utility: varieties selected for nuts, or for wood, or both;
- 4. Disease resistant varieties (cf. continental Europe).

This research in Dean will attempt to use genetic evidence to tell a palaeoenvironmental story for a species whose pollen and wood remains can be difficult to determine.





2. British sites could have been populated directly from Spain, Italy or Mediterranean chestnut woods...into S & W England with Bronze Age or Iron Age traders? Or later, in the early monastic period? Or, indeed, in the Roman period?

Genotypes can define the Ice Age refugia for sweet chestnut on continental Europe; and indicate whence British chestnut originated.

Fig.1: original theory for spread of *C. sativa* post-glaciation, by Greek & Roman translocations



Fig.2: sweet chestnut populations in Europe, showing sampled sites for a recent genotype study (Mattioni et al. 2013).

3. Analysis of these 31 sites identified 3 main European refugia for sweet chestnut in the last Ice Age, additional to the Caucasian refugia. The Dean project will evaluate selected sweet chestnut stands using the genetic markers developed by Buck et al. (2003) and used by Mattioni et al.



Fig.3: sweet chestnut stands in the Forest of Dean.

115 sites surveyed in 2013. Leaf samples taken for genetic analysis at East Malling Research laboratories. Results due early-2014.

### REFERENCES

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4. GENETIC CHARACTERISATION of a group of chestnut stems can potentially identify stems that belong to a single, genetically-distinct, plant and differentiate them from other neighbouring chestnut stems. A single chestnut plant can then be spatially mapped; and its size used to estimate its age. The original nut from which the tree grew might have been fertilised and germinated long ago, since when the plant may have regrown vegetatively many times, after cutting, or layering, or natural windthrow or die-back. Genetically, the plant is identical to its original seed - and can potentially be traced back to the place where the seed originated, maybe 1000 miles away. A single generation could have lived for >1000 years, so the living plant can serve, in effect, as part of the palaeoenvironmental archive.

A chestnut tree (the above ground form) can be ancient: ~1200 years is the oldest in England. A chestnut plant (the entire rootstock below ground) could be much older - and certainly very much older than the tree stem(s) growing from it.







Chestnut tree with 9 metres basal circumference

same root system as adjacent stool



Stool with **5** metres basal circumference

Fig.5: the 3 main *C. sativa* genotype clusters, east to west across Europe. (Mattioni *et al.* 2013)

5. The research objective is to find where British sweet chestnuts first came from, and when. Genes in the living plant nuts and leaves, can tell us 'where'.



'When' requires preserved plant material e.g. pollen and charcoal, that can be dated. AND geneticallyderived chestnut plant extents and thereby ages. <sup>3</sup>East Malling Research, East Malling, Kent, UK

6. POLLEN ANALYSIS may have to rely on buried soil profiles, as Dean has few undisturbed wet soils/peats. Chestnut pollen does not preserve well and only occurs very local to source, so finds may be very sparse; and even if chestnut pollen is confirmed, dating its context will be difficult. Buried soil can be searched for beneath archaeological features, where chestnut has been known since pre-Norman period, e.g. defensive, boundary and field banks, such as Welshbury Iron Age camp overlying a Bronze Age field system (Fig.6). Krebs et al (2004) mapped all the chestnut pollen records across Europe (Figs. 7 & 8). 2300 BP 400 BP



7. CHARCOAL ANALYSIS will focus on the oldest sites, associated with occupation and especially early iron working bloomeries. Chestnut wood is confusable with oak and radiocarbon dating is expensive! - so a very selective approach to searching for and sorting material will be needed. There are hundreds of charcoal hearths in Dean...some charcoal hearths may display stratigraphy of deposits, so careful Charcoal platforms ecorded in Statutory 🕅 to be selected for dating.

Fig.8

0 150 300 600 90



8. ARCHIVAL EVIDENCE can show that chestnut grew in a certain place, at a certain time, for certain reasons. Flaxley Abbey, in East Dean, gives a prime example: "...et singulis annis totam decimam castanearum de Dene..."

The Flaxley Cartulary records this royal gift of 'all the tithe of chestnuts in Dene' in 1153AD. Other 12<sup>th</sup>C gifts to the Abbey refer to 'Castiard' and a wood called 'Chestnuts'. 'Castiard' may be Primitive Welsh *castein-iarth* = 'the enclosure on a promontory with chestnuts'. This is the earliest written record for sweet chestnut in Britain (Rackham 1980). Records in the





0 150 300 600 900