

# **Walnut Limb Bending for Fun and Profit**

*or*

## **Mechanical Suppression of Apical Dominance in *Juglans regia* cultivars for early and high yielding in commercial plantations**

**(Report from study tour on emerging industry best practice in  
south western France, November 2004)**

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### ***Summary:***

Walnut trees share characteristics with other fruit trees such as the pome family in that growth can be channelled in younger trees from vegetative growth patterns producing wood (i.e. apical growth resulting in heavier lateral limbs) into the early yielding of fruit (i.e. nuts, in the case of walnuts). This is achieved by minimising pruning, allowing the free growth of the central leader, but the physical manipulation (bending) of lateral branches such their growth is at or below the horizontal. Walnut trees, along with apple, cherries, etc, reduce the energy going into wood in such limbs and channel the energy into fructification. Not only should this result in earlier and possibly higher yields of nuts, this should also reduce the long-term canopy growth and shading between trees grown in high density hedgerows, thus also increasing yield per hectare.

### ***Background***

A study tour prior to the 2004 International Walnut Symposium was undertaken by a group of Australian growers who visited two research walnut stations in south western France, a commercial tree nursery, and a number of walnut orchards. It was found that in France there is a general acceptance of, and move towards, what is generally known as the Delort system for walnuts.

This system was developed by Dr Frances Delort, currently at the INRA Research Station near Bordeaux (Figure 1). This system has its antecedents in work Dr Delort

did over a decade with pome fruit. The work with walnuts seems in many ways to be an extrapolation from other fruit bearing species to walnut. The observations and photos presented here were primarily of trees at the INRA facility but some at the Creysse walnut research farm and private walnut plantations.

## ***Principle features of the Delort method***

### **Pruning**

Pruning usually acts to stimulate vegetative growth, with the tree putting more of its energy into producing wood to replace that removed by pruning. Hence, pruning can run counter to nut production. Figure 2 illustrates a walnut tree<sup>1</sup> left to grow without any form of pruning or manipulation while Figure 3 is a tree where short twigs off the lateral limbs have been snapped off. Dr. Delort snaps rather than cuts these off since he considered cutting simulates vegetative growth<sup>2</sup>. Branches with fewer than 9 to 13 buds should be culled under this regimen.

### **Bending Lateral Limbs**

The timing and physical extent of this manipulation is variable depending on the walnut variety. However, for lateral bearing varieties of walnut, an angle of 90 to 120 degrees from the vertical is considered optimal (although they now seem to be experimenting with limbs bent 130 to 150 degrees from the vertical currently)(Figure 4).

Timing of this limb bending process is important. It needs to be done in late summer. If done too early in the growing season, the normal vegetative growth processes during summer will tend to “repair” this manipulation. However, optimal timing seems to be dependent on the cultivar, and on the age of the tree. The suggestion is to try at about the 3<sup>rd</sup> year for vigorous lateral bearers and the 4<sup>th</sup> year for slower

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<sup>1</sup> The Fernod walnut cultivar that is becoming increasingly popular in French commercial orchards was principally used in these experiments.

<sup>2</sup> Increased risk of infection at a broken rather than a cut end is apparently not an issue.

growing older varieties such as Franquette although at Creysse they seem to do this earlier<sup>3</sup>.

For thinning of short branches growing off these bent limbs, if the limb is bent at 90 degrees from the vertical, remove those growing underneath but, if they are bent more than 130 degrees, remove those growing on top since these tend to support vegetative growth.

For those limbs well above head height, manipulation and thinning is performed using a long pole with a rounded hook on the end (item not sighted). Dr Delort reported that it takes 30 hours per hectare for this manipulation with trees at 8x7 metre spacing<sup>4</sup>.

This bending and pruning regimen results in yields with lateral bearing varieties (Fernod) of 5 tonnes per hectare and 3 tonnes for terminal bearers such as Franquette, with good sized (32 to 34 mm) nuts at the INRA station. This site is on river flats with deep clay loam with some rounded river stones throughout the soil.

Dr Delort appears to favour lower tree densities. However, his method has been applied in a commercial orchard (Figure 5) near the Unicoque nut plant at Cancon. Here dense hedgerow planting had been used with experimental rows with:

- a) classical pruning with laterals at 50 cm intervals,
- b) torsion (bending) of laterals to 90 degrees (i.e. horizontal),
- c) torsion below the horizontal, and
- d) no pruning or manipulation.

These trees were 6 years old. At this stage, any conclusions to be drawn from this trial were unclear. Apparently all gave good production but it was unclear just how closely this had been monitored. Tree height was retarded in the row (a) up to year 5 but caught up in year 6.

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<sup>3</sup> However could it be that the definition of tree age might differ between groups (i.e. age from grafting or age of actual rootstock)?

<sup>4</sup> It was not clear to me how frequently this thinning would need to be repeated, apparently not every year but multiple times during the productive life of the tree.

In addition, the walnut research station in Creysse is also experimenting with limb bending, reinforcing the general interest in France in the Delort method. However, with a new planting of Fernod in Creysse, limbs were tied down with cord to achieve this bending of the limbs (Figure 6). Why Creysse was not able to achieve this with a simple one off manipulation as at INRA was not clear, although it may have been related to having some precise control of the extent of limb torsion for experimental reasons.

## ***Conclusions***

One clear conclusion from our conversations with prominent members of the French walnut industry is that the Delort method is now gaining currency as the best practice for walnut cultivation, at least in France. However, inevitably there are a number of questions relating to the general applicability of this work to larger scale commercial plantings. In particular, it remains to be seen just how amenable major commercial cultivars used in Australia, such as Chandler, react under our growth conditions. In particular just how readily can their limbs be bent without breaking, or how well these torsional manipulations are retained by the limbs?

However, the manipulation of lateral limbs on walnut trees to induce growth at or below the horizontal has a prior and reputable history with other commercial fruit species such as pome fruit. The application of this technique to younger walnuts looks extremely promising in forcing walnut towards the mature stage where the tree puts more of its energy into producing nuts rather than the trees putting energy into producing robust lateral branches.

The evidence actually sighted during this study tour was lacking in depth and suffered from the usual problem with studies with walnuts in that trees were only 6 to 8 years old while at least 10 to 15 years of continual reporting is required for any true long term conclusions. However, if the aim of a new walnut planting is early production and high yields with higher planting densities, use of the basic principles developed by Frances Delort appears worth exploring.

## ***Acknowledgements***

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## Figures:

- 1) Dr Frances Delort in front of one of his experimental walnut trees talking to members of the study tour at the INRA station near Bordeaux.



- 2) A tree allowed to grow without any pruning, etc, showing dense growth and interlinking between branches.



- 3) A tree thinned by snapping off smaller twigs off the main lateral limbs with more open habit and better ventilation.



- 4) Laterals bent down from the vertical. This process can be quite brutal involving not just bending but also twisting of the limb to make it retain this low lying aspect.



- 5) Limb exhibiting marking on the bark from an extreme torsion on the limb.  
This is apparently well tolerated by the tree and is not a cause for alarm.



- 6) A Fernod walnut planted out February 2002 with limb bending being applied over 4 months using cords to tie down the limbs. Cressy appears to have more trouble inducing limb torsion than INRA.

