



Grower Summary

TF 206

Comparison of different planting material for Fruit Wall orchard systems for apple

Annual 2017

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GROWER SUMMARY

Headline

- Early results suggest that 2 Year Old, Standard Knip and 1 Year 5+ Branche trees are offering the most suitable planting material for Fruit Walls, in terms of early yield build-up, class 1 fruit and optimum returns.

Background and expected deliverables

Growers in many countries are actively looking for ways to reduce labour inputs and increase the use of mechanical aids in a range of fruit crops. With a general decline in skilled labour, ease of management is another requirement, but in all these developments it is essential that there is no loss of yield or quality. In fact, an increase in yields will be required to enable growers to maintain profitability.

Following the successful development and commercial uptake of the Concept Orchard (AHDB Horticulture Project TF 151) by many UK growers, further evolution and development of more intensive planting systems is being considered. In TF 151, reference was made to 'Le Mur Fruitier', a newly developed orchard system in France. Further developments of this system have been carried out privately and at the PC Fruit Research Station in Sint Truiden, Belgium. Generally this work has been done in existing orchards that have been adapted to the new pruning regime and generally on varieties not grown in the UK. Results have shown that the principles developed in the work by CTIFL in France can apply in more northern growing areas. However, they need to be adapted to local growing conditions and varieties, as the timing of pruning is critical and specific to individual varieties, whilst the length of the growing season varies in different geographical areas.

Little work has been done on ways of establishing Fruit Wall orchards and which type of tree gives the best results. Conventionally produced trees have a form and structure ideally suited to wider spacings, where a branch framework is necessary, but they can be adapted to be managed in a Fruit Wall planting. However, other tree types may be more suitable, either because they are cheaper and can be planted more intensively at the same cost per hectare, or because they have been specifically grown in the nursery to form a narrow, tall tree potentially giving higher, early yields.

Several specialist nurseries are developing tree types designed and grown especially for Fruit Wall orchards. These include 'grow through trees' from several nurseries, and Bibaum® trees from Mazzoni nurseries. Other nurseries recommend that using a maiden tree or an 8 month

tree at a close planting distance can give better results. This project will provide a comparison of five different tree types using a standard variety/ rootstock and spacing, and provide growers with comparable data to allow them to make informed decisions about the best tree type to use for their own situation.

Summary of the project and main conclusions

Trees were planted and established during 2013. Gala trees (clone Royal Beaut) were sourced from specialist nurseries. The trees were planted in March 2013 at Brogdale Farm, Faversham. The site (soil type: clay loam with flint) had been fallow for at least 10 years. The trees were planted at a distance of 3.5m by 0.8m (except Twin Stem at 1.6m).

The trees were not irrigated during establishment and have not been irrigated during the trial. A standard commercial programme for management of pest and disease, nutrient requirements and foliar feed sprays plus herbicides has been applied since establishment.

The five different tree types selected were:

1. 1 Year 5 + Branches
2. 1 Year Unfeathered
3. 2 Year Old (grow through)
4. Standard Knip
5. Twin Stem

The trial area consists of a randomized complete block with each of the 5 growing systems replicated in 6 blocks (rows):

Table 1. Trial plan.

Twin stem	2 year old grow through	1 Year 5 + branches	1 year unfeathered	Standard knip	1 year unfeathered
2 year old grow through	1 Year 5 + branches	Standard knip	2 year old grow through	1 year unfeathered	Twin stem
1 year unfeathered	Twin stem	2 year old grow through	Standard knip	1 Year 5 + branches	Standard knip
1 Year 5 + branches	Standard knip	1 year unfeathered	Twin stem	2 year old grow through	1 Year 5 + branches
Standard knip	1 year unfeathered	Twin Stem	1 Year 5 + branches	Twin stem	2 year old grow through
Block 1	Block 2	Block 3	Block 4	Block 5	Block 6

Each row has 1 plot of 10 trees of each tree type (except for twin stems which have 5 trees but 10 stems), making 300 trees in total on an area approximately 0.09 ha. The middle 8 trees (3 trees for twin stems) were used for recording and sampling and the end 2 trees (1 for Twin Stems) in each plot were guards.

Table 2. Plot layout – except Twin Stems:

1 guard tree	8 trees used for recording	1 guard tree
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Table 3. Plot layout – Twin Stems:

1 guard tree	3 trees used for recording (6 stems)	1 guard tree
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During 2013 the trees received minimal pruning by hand to remove excess branches (any that were too strong or too weak) and all fruit was removed in order to ensure that the trees established well.

Growth stages were monitored regularly during early 2016 and shoot growth assessments commenced in May, to establish when to prune at the 9 leaf stage which occurred on 24 June.

Photographs of trees before and after the 9 leaf cut in 2016 cut are included in Appendix 1 at the end of the Science Section of the report.

In July 2016 (after the fruit wall cut), all trees were thinned to 2 fruit per cluster on branches below 1.5m and 1 fruit per cluster on branches above 1.5m. A further quality / crop load thin was also carried out.

Fruit was harvested commencing 12 October 2016 following maturity testing to determine the optimum harvest date, placed into cold store and assessed later for quality and size.

Key results in 2016

- There were statistically significant results in yields – 2 Year Old tree types yielded the most fruit and 1 Year Unfeathered yielded the least fruit.
- Fruit quality in 2016 was good – all tree types achieved over 80% Class 1 except 1 Year 5 + Branches.
- Fruit size in the trial and across the industry in general was small in 2016 due to climatic conditions during fruit development.
- Tree volume decreased for all tree types in 2016. The 2 Year Old trees continue to have the highest volume.

Financial benefits

The trees have now carried three crops, two of which have been heavy. It is too early to determine conclusive financial benefits but some treatments are approaching commercially acceptable Class 1 yields and have the potential for increased returns compared to non Fruit Wall managed systems.

There is potential for reducing pruning costs and skilled pruning labour requirements.

The trial is responding to industry requirements to investigate shortening payback periods and to produce guidance on the cropping potential of different tree types in the early years.

The cost of successfully establishing an intensive orchard is currently up to £28k per hectare (FAST 2017). In particular:

- a. The differences in costs of the various tree types available are variable depending on type selected and quantity (from an extra £0.70 to £2.50 per tree or from an extra £1,600 to £4,100 per hectare (FAST 2017)). Some tree types have the potential to increase in volume, vertically and horizontally, much more quickly, leading to increases in early yields.
- b. A reduction in yield from a Fruit Wall system of 5% in each of the first 4 cropping years can reduce net returns by around £2,100 per ha.
- c. New intensive orchard systems are simpler and easier to prune than lower density traditional orchards. Depending upon planting distance, it takes approximately 34 hours (4.5 days) to hand prune 1 hectare of orchard (FAST 2017) compared to 3 hours for mechanical pruning or a difference of £420 per hectare (Adrian Scripps Ltd 2017). Some hand pruning will be needed (eg inter pruning) even where mechanical pruning is used but net savings of around £6,300 per ha over a 15 year orchard life are envisaged (excluding machinery costs).
- d. Anecdotal evidence from experimental plots in Northern Europe suggests that annual yields from Fruit Wall plantings can be around 20 t/ha greater than orchards of a similar density managed conventionally. Mika et al (2016) have recorded an 11.5% increase in yields from mechanically pruned compared to hand pruned trees which would equate to 50 t/ha versus 45 t/ha respectively. The value to the grower of a 5 t/ha increase would be approximately £31,000 net of all post harvest costs over 15 years.
- e. For growers to implement the system they would have to rent or buy specialist pruning equipment. Current costs for this type of equipment are approximately £16,750 (Seymour 2017), but the machine could also be used for other operations on the farm (eg. hedge and windbreak cutting) and could also be rented out.

- f. Continued good technology and knowledge transfer will be needed and possibly further adapted developmental work. This is because the interaction between the Fruit Wall growing system and other orchard management operations (such as use of growth regulators for fruit setting and thinning) could well be different (possibly due to the effects of late pruning on leaf metabolism at a critical time of year during the early fruit development phase). As the leaf to fruit ratio is altered in the Fruit Wall more attention to crop nutrition and leaf health will be necessary.

Action points for growers

- The Fruit Wall cut was carried out when 9 new leaves had emerged on the current season's growth. To determine this, growers need to regularly make random leaf counts to establish the growth stage before making the cut.
- Inter tree pruning requirements should be considered and will need to be done regularly once the orchard reaches maturity. Only one or two cuts per tree may be required.
- Irrigation is critical at high planting densities otherwise fruit size and quality may deteriorate. Growers will need to ensure adequate irrigation especially during low rainfall / higher than average temperature seasons, to ensure adequate fruit size and maintain sufficient regrowth. Extra fertigation and mulching should also be considered in particular for any weak areas.
- Fruit Wall managed trees have a narrow profile and may be suited to narrower alleyways - 3.0m rather than 3.5m as in this trial. Growers may consider increasing the density for newly planted orchards which would increase trees per hectare (from 3,571 to 4,167) and maximise the yield efficiency of orchards managed under the Fruit Wall system.
- Other actions points will be determined in future years when it is concluded which tree type may be most suitable to Fruit Wall management in terms of early yield build up, highest yield of Class 1 fruit and optimum returns. Early results suggest that 2 Year Old, Standard Knip and 1 Year 5 + Branch trees are leading in this regard.

