



Agriculture & Horticulture
DEVELOPMENT BOARD



Grower Summary

TF 177

Apples: Long term effects of
applied composted green waste
mulch on the cropping of
Braeburn and Cox

Final 2013

Disclaimer

AHDB, operating through its HDC division seeks to ensure that the information contained within this document is accurate at the time of printing. No warranty is given in respect thereof and, to the maximum extent permitted by law the Agriculture and Horticulture Development Board accepts no liability for loss, damage or injury howsoever caused (including that caused by negligence) or suffered directly or indirectly in relation to information and opinions contained in or omitted from this document.

No part of this publication may be reproduced in any material form (including by photocopy or storage in any medium by electronic means) or any copy or adaptation stored, published or distributed (by physical, electronic or other means) without the prior permission in writing of the Agriculture and Horticulture Development Board, other than by reproduction in an unmodified form for the sole purpose of use as an information resource when the Agriculture and Horticulture Development Board or HDC is clearly acknowledged as the source, or in accordance with the provisions of the Copyright, Designs and Patents Act 1988. All rights reserved.

AHDB (logo) is a registered trademark of the Agriculture and Horticulture Development Board. HDC is a registered trademark of the Agriculture and Horticulture Development Board, for use by its HDC division. All other trademarks, logos and brand names contained in this publication are the trademarks of their respective holders. No rights are granted without the prior written permission of the relevant owners.

The results and conclusions in this report may be based on an investigation conducted over one year. Therefore, care must be taken with the interpretation of the results.

Use of pesticides

Only officially approved pesticides may be used in the UK. Approvals are normally granted only in relation to individual products and for specified uses. It is an offence to use non-approved products or to use approved products in a manner that does not comply with the statutory conditions of use, except where the crop or situation is the subject of an off-label extension of use.

Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

Further information

If you would like a copy of the full report, please email the HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

HDC
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

Tel – 0247 669 2051

HDC is a division of the Agriculture and Horticulture Development Board.

Project Number: TF 177

Project Title: Apples: Long term effects of applied composted green waste mulch on the cropping of Braeburn and Cox

Project Leader: Tim Biddlecombe

Contractor: Farm Advisory Services Team Ltd.

Industry Representative: Peter Checkley

Report: Final Report 2013

Publication Date: 16 May 2013

Previous report/(s): Annual Report 2012

Start Date: 01 October 2008

End Date: 31 January 2013

Project Cost: £25,928

Headline

- The use of green compost mulch in Cox and Braeburn orchards offers the potential to increase the rate of orchard establishment and improve yields in the early life of the orchard.

Background and expected deliverables

Previous work has been carried out to determine the effect of the application of composted green waste as a mulch in apple production. Positive effects on fruiting as well as growth have been observed but the work tended to be relatively short term and concentrate on testing the effect in the four years following planting. This project continues on from previous work funded by WRAP which tested the effect of green waste compost mulch on the growth and fruiting of two varieties of apple (Cox and Braeburn) with an extended evaluation of the effect on growth and fruiting of the trees over four years. In addition, an economic analysis of the use of composted green waste as a mulch for apple production was undertaken.

Summary of the project and main conclusions

The trial was conducted on both Cox and Braeburn, to which mulch was applied to half the field on two occasions. In 2004 when the trees were planted, a 10cm layer of compost was applied, giving a rate of 30 tonnes per hectare. This was then repeated in 2007. The mulched area was compared to one where the herbicide strip had been left bare.

Fruit number and size were recorded at harvest. A series of fruit maturity tests were conducted on both varieties during August, September and October as an additional measurement to test whether the compost mulch altered maturity characteristics and fruit quality. Length of shoot growth was recorded in October. Soil, leaf and fruit nutrient analysis was carried out to determine the effect of mulch on soil nutrient content and uptake by the tree. Enviroscan soil moisture probes were used to determine the effect of compost on soil moisture content.

As one of the main detrimental effects of the compost treatment was the decrease in fruit calcium, an additional series of treatments were added to the project in 2011 when three rates of gypsum were applied to both the 'compost' and 'no compost' treatments in both varieties. The aim was to test whether gypsum could be used to alleviate this negative effect of the compost.

For Cox, average fruit size was greater in the compost treatment in every year of the project, increasing by up to 6mm compared to the no compost treatment. For Braeburn, the effect differed between years and actually decreased by 1mm in two years, increasing in size in the

other two years. In the compost treatment, fruit number increased in both varieties and in all years, although the difference did vary significantly between years. In Braeburn the increase varied between 12 and 120 fruit per tree and for Cox the difference in fruit number varied between 20 and 90 fruit per tree.

In all years, there was a significant difference in the amount of shoot growth between the two treatments, with the compost increasing growth in both Braeburn and Cox significantly. The combined effect of increased growth over the last eight years meant that the compost treated trees filled their spaces much earlier than the no compost, control trees. This was one of the reasons that the compost treated trees were able to produce so much more fruit without a detrimental effect on fruit size.

However, the application of composted green waste significantly altered fruit nutrient content and, perhaps of most importance, there were increases in nitrogen and decreases in calcium levels. This has implications for fruit storability and a test conducted in 2011 confirmed that this was the case. It will certainly mean that fertilizer and foliar feed applications need to be based on current analyses.

Maturity tests demonstrated that the fruit from the compost treated area matured around two weeks earlier than the fruit from the untreated area, this being seen by an earlier decline in percentage starch and fruit firmness. Fruit colour was also altered, with the compost treated fruit not showing as much red colouration. It also had a darker green background colour, although this was more a result of the fruit nitrogen content rather than any effect on maturity.

Clear differences in soil moisture between the two treatments have been observed in each year that the project has been running. The main differences have been greater percolation of water through the soil profile and a greater overall soil moisture content in treated plots.

Main conclusions

- Over the course of this project, the use of compost as a mulch increased fruit number per tree, at the same time as increasing fruit size. This resulted in yield increases of between 7kg and 19kg per tree for Braeburn and between 5 and 14kg for Cox.
- Fruit and leaf nutrient levels were significantly altered by the use of compost mulch. Fertiliser and foliar feed applications therefore need to be based on recent analysis results. In particular, fruit nitrogen is increased and fruit calcium decreased through the use of compost mulch.

- Significant differences in fruit maturity timings have been observed between the two treatments. Compost mulch advanced maturity by around two weeks compared to the no compost treatment.
- Similar differences in soil moisture content have been seen in each year of the project. The main effects seen have been the increase in water availability and improved percolation of water through the soil profile in the compost treatment.
- Growth is significantly increased through the use of compost and became excessive during the course of the project as the trees had filled their spaces. This makes careful pruning and growth regulation necessary to maintain fruiting/growth balance.

Financial benefits

The tables below (Tables 1a and 1b) demonstrate the calculation required to calculate the annual increased margin through the use of compost. The following figures have been used for this calculation:

- A farm gate price of £90 for a 330kg bin for Braeburn and £80 for Cox
- The density of the orchard was 2,300 trees per hectare
- The increased cost of pruning was an extra 30p per tree
- The cost of application of compost at a rate of 50 tonnes per ha is £550 per ha. However, in the trial described here, the application rate was much greater at around 450 t/ha. This has then been calculated into an annual cost over the 15 year life of the orchard.

Table 1a. The effect of treatment on margins for Braeburn 2009-2012

Year	Compost yield (t/ha)	No compost yield (t/ha)	Increased yield (t/ha)	Increase d income (£/ha)	Extra pruning costs (£/ha)	Growth regulator applicati on (£/ha)	Annualised cost of compost application (£/ha/year)	Increased margin (£)
2009	56	43	13	3,545	621	92	330	2,502
2010	47	34	13	3,545	656	97	330	2,462
2011	59	45	14	3,818	690	102	330	2,696
2012	49	16	33	9,000	725	107	330	7,838

Table 1b. The effect of treatment on margins for Cox 2009-2012

Year	Compost yield (t/ha)	No compost yield (t/ha)	Increased yield (t/ha)	Increased income (£/ha)	Extra pruning costs (£/ha)	Growth regulator application (£/ha)	Annualised cost of compost application (£/ha/year)	Increased margin (£)
2009	42	29	13	3,151	621	92	330	2,109
2010	28	19	9	2,181	656	97	330	1,099
2011	35	11	24	5,818	690	102	330	4,696
2012	27	12	15	3,636	725	107	330	2,474

Action points for growers

- Use mulch to aid establishment and growth of trees.
- Mulch can be used in situations where increased growth is required. This has been shown to result in improved yield as tree volume increases.
- However, where vigour is already adequate or strong, the use of a mulch could lead to problems of excessive vigour.
- Conduct leaf and fruit analysis to determine whether fertiliser and foliar applications are necessary.
- Assess maturity and record fruit analysis separately to non-treated blocks of trees, as maturity and storability can be affected by compost mulch applications.