

Grower Summary

CP107c

The application of precision farming technologies to drive sustainable intensification in horticulture cropping systems (PF-Hort)-

Survey of soil structure and soil management in horticulture
2018

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Further information

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

AHDB Horticulture,
AHDB
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

Tel – 0247 669 2051

AHDB Horticulture is a Division of the Agriculture and Horticulture Development Board.

Project title: The application of precision farming technologies to drive sustainable intensification in horticulture cropping systems (*PF-Hort*)

Project number: Review conducted as part of AHDB Horticulture project CP107c

Project leaders: Dr Lizzie Sagoo & Dr Paul Newell Price, RSK ADAS Ltd.

Report: Survey of soil structure and soil management in horticulture

Previous report: Nil

Key staff: Prof. Bryan Griffiths & Dr Joanna Cloy, SRUC (soil survey work in Scotland)
Dr Barry Mulholland (ADAS Head of Horticulture - project director)
Angela Huckle (ADAS Field vegetable consultant)
Dan Munro (ADAS soil scientist)
Geoff Bailey, Gail Bennett, Martin Crookes, Dom Edwards, Daniel Jakes & Michael Morris (ADAS field teams)
Tim Chamen, CTF Europe

Location of project: Grower sites around the country

Industry Representative: Andy Richardson, Allium & Brassica Centre

Date project commenced: 01/04/2015

GROWER SUMMARY

Headline

- A survey of 75 fields covering a range of crop types identified soil compaction in 70% of annual crops and 60% of perennial crops and a clear need to improve assessment and management of soil structure for greater efficiency and profitability of horticultural crop production.

Background

Soil compaction was the principal issue identified by the AHDB Horticulture panel consulted in AHDB Horticulture project CP107 '*A gap analysis of soil management research and knowledge transfer in horticulture to inform future research programmes*'. Developing and facilitating industry uptake of good crop rotation and soil management practice forms a key part of the AHDB Horticulture strategic plan. There was plenty of anecdotal evidence on frequent cultivation and late autumn and winter harvesting resulting in soil compaction, but very little data on the actual condition of soils within horticultural systems. This project provided the opportunity to carry out a structured and systematic assessment of soil physical properties under horticultural production and to capture typical soil management practices across a number of sectors.

Summary

The majority of topsoils under annual and perennial cropping were in moderate condition and improved as a result of cultivation practices. However, in some circumstances (e.g. when soil was 'wet'), cultivation either had no effect or resulted in a deterioration in soil structure. The majority of annual cropping sites (63%) had a well-developed tillage pan before cultivation and fewer than half had a pan after planting. Compacted topsoil layers and signs of subsoil compaction were also common in perennial crops, although there was no clear pattern relating the age of perennial crops and soil condition. Earthworm numbers were generally low in both annual and perennial crops, although numbers tended to be higher in fields with abundant crop residue and in apple orchards.

Bulk density (BD) values indicated that porosity was low in many annual cropping subsoils. However, the implications for system efficiency and productivity are unclear and further work is needed to determine the best management option in each situation, as the optimal response may differ according to soil type, crop type and field conditions.

Growers acknowledged that soil structural condition is an issue for crop production and used a variety of methods to improve soils, including the use of cover crops and organic amendments. Ploughing was commonly used to address shallow compaction and subsoiling

was widespread, although the latter was not always closely related to a clear need to alleviate compaction. Equally, in some situations deep cultivation was not carried out when a tillage pan was present.

Many growers visually assessed soils and adjusted subsoiling depth based on their observations. Nevertheless a significant proportion of growers were keen to learn more about visual assessment of soil structure and how to link this to management options.

The results of the soil survey will provide a useful tool for dissemination, discussion and knowledge exchange that will help stimulate interest and develop awareness and industry expertise in soil management practices.

Financial Benefits

Poor soil structure can impact on the efficiency and productivity of horticulture systems. Conversely, better structured soils increase opportunities to access land (improved timeliness); reduce irrigation and tillage costs; and can improve the evenness and overall yield of commercial crops.

Soil compaction typically reduces yield by around 20%, with gross margins in some horticulture crops reduced by 15-30% or by £600-£1,200/ha (Balshaw *et al.*, 2014; Hallett *et al.*, 2012; Nix, 2015). In some circumstances soil degradation in any single year can result in the complete loss of yield.

Soil compaction can also result in higher weed/disease pressure; increased fuel use (50%+; Mouazen and Palmqvist, 2015); as well as poor drainage and poor rooting, thereby increasing frequency of irrigation and overall irrigation costs. Typical overall operating costs for 25 mm of irrigation are £85-£155/ha (Nix, 2015).

Action Points

Guidance to assess the structural condition of soils is available for growers on the AHDB Greatsoils website. Growers are advised to access this guidance and use it to select management strategies that are tailored to their specific situation. A broad range of factors should be considered including farm type, soil type, crop rotation, soil condition, ease of access to capital investment and availability of machinery.

An initial appraisal of soil structural condition and how it relates to current soil management practices is important, to identify relevant, practical measures that will either maintain a good situation or improve poorly structured soil over time.