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NurseryFootprint – A carbon footprinting tool for the Australian nursery and garden industry

Carbon footprint is a term used to describe the total amount of greenhouse gas (GHG) emissions generated by a business or product. The term is often discussed in conjunction with climate change and variability and is also increasingly being used by consumers to identify more environmentally-friendly products. During 2009, the Nursery & Garden Industry Australia (NGIA) commissioned Growcom to develop a carbon footprinting tool for the Australian nursery and garden industry called *NurseryFootprint*.

In this month's Nursery Paper NGIA Environmental & Technical Policy Manager, Dr Anthony Kachenko provides an overview of carbon footprinting and explains how best to utilise *NurseryFootprint* in a production nursery environment.

NurseryFootprint –
A carbon footprinting tool for the Australian nursery and garden industry

Carbon footprinting basics

A carbon footprint is a description of the total amount of GHGs emitted in the life cycle of a product or activity. Six key GHGs are considered in the calculation of a carbon footprint. These include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N2O) and hydrofluorocarbons (HFCs). These GHGs vary in their global warming potentials. For example, nitrous oxide (a by-product of fertiliser use) has about 300 times the warming potential of carbon dioxide. Owing to this variation among the different gases, the amounts of each gas must be weighted according to their warming potential before being combined into a single measurement. The unit used to measure a carbon footprint is tonnes of carbon dioxide equivalent (or t CO_2-e).

The calculation of a carbon footprint should include GHG emissions from the entire supply chain, including processes that might occur outside of the business boundary. For example, it should include both direct emissions that occur on-site (e.g. burning fuel in a tractor) and indirect emissions that occur elsewhere but are still associated with the product (e.g. production of raw materials, or fuel for freight). In this way, a carbon footprint encapsulates all of the GHG emissions resulting from the production of a product, including the raw materials, manufacturing processes, transport, packaging and distribution.

The importance of carbon footprinting

A carbon footprint is a useful tool to quantify the contribution of a business or product to climate change and to identify areas where GHG emissions can be reduced. The nursery and garden industry has the capacity to make a significant contribution to reducing GHG emissions and may also play an integral role in the mitigation of climate change. Some of the key challenges arising from predicted climate change and variability include securing adequate water supplies for irrigation of green-life and changes in pest and disease dynamics, such as heightened risks of exotic pest incursions.

The nursery and garden industry already has very low GHG emissions in comparison to other agricultural sectors. However, there is scope to further reduce these emissions and lessen the impact of production nurseries on predicted climate change. A carbon footprint is the first step in identifying opportunities for reducing GHG emissions. A reduction in the carbon footprint of a business is directly linked to other management practices that improve farm business efficiency. Many of the steps that can be used to reduce a farm's footprint (improved energy efficiency, reduced on-farm traffic, less fertiliser) will also result in reduced input costs. Consequently, a smaller footprint can be used as an indicator of production efficiency.

It is also important to note that in the coming years, consumer preferences are likely to evolve and drive demand for more environmentally-friendly products. A smaller carbon footprint may provide a distinct marketing advantage for the more efficient businesses.

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GHG emissions in the nursery and garden industry

Carbon dioxide released by burning fuels in vehicles, farm machinery, pumps and various heating applications (greenhouses, propagation benches etc.) and nitrous oxide released from the use of nitrogenous fertilizers are the key gases in the nursery and garden industry. Small amounts of methane may also be released from waste and waterlogged soils. Other sources of potential GHG emissions arise from a variety of inputs and processes including freight, water, packaging and waste.

Including supply chain emissions into the calculations brings more gases and processes into consideration. For example, in the case of a plastic pot, GHG emissions may result from the extraction of the raw material (oil and natural gas), transport, processing into intermediate products (polymers), by-products, fugitive emissions from the processing plant, more transport, product manufacture, and even more transport (delivery). In addition to the direct emissions throughout the supply chain, each step has additional inputs (energy use, other raw materials, construction processes etc.) that must be quantified. In reality, it is a supply tree or network rather than a supply chain.

Introducing the *NurseryFootprint* calculator

The *NurseryFootprint* calculator has been developed in Microsoft Excel ensuring that it will run on almost any computer using a Microsoft Windows operating system (XP, Vista or 7). The calculator is designed to be very easy to use and understand. For example:

- It assumes that users may not have a great deal of computing experience,

- It only requires data that is easily available to nursery managers,

- It can deal with the huge number of products and processes in the nursery industry, and

- It produces results that are relevant and easy to understand

You can download a copy of *NurseryFootprint* by visiting the 'Environment' pages at www.ngia.com.au
An easy to follow, yet comprehensive User Manual has been developed to accompany the calculator and can also be downloaded from the 'Environment' pages.
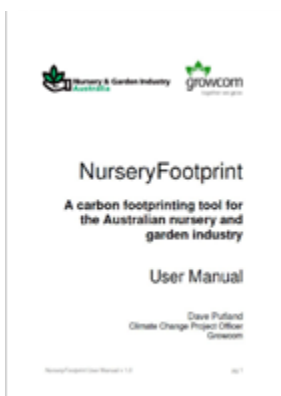
The *NurseryFootprint* User Manual is available to download from www.ngia.com.au

How do I use *NurseryFootprint*?

When you open up *NurseryFootprint* in Excel, a new custom toolbar will appear at the top of the Excel window. This toolbar features custom buttons to simplify some calculator functions such as printing data and clearing the cell contents. Once open, *NurseryFootprint* is organised into six main worksheets with distinct functions:

1. **Introduction** - Explains the purpose of the calculator and contains basic instructions etc.

2. **Data Input** - This is the form where the user enters all of the data required to calculate a footprint. The form is arranged into logical sections for ease of data entry. There are fields for:

   a. General information such as the location and the start and end dates of the period of interest (i.e. financial year, calendar year, month or quarter);

   b. Energy inputs such as the amount of electricity consumed (in kWh),

   c. Direct emissions resulting from fuel use and the application of fertilisers (Data on the amount of fuel and fertiliser used should be relatively easy to extract from business records);

   d. The amount of waste produced;

   e. Supply chain components such as freight, plastic products (e.g. pots), chemicals etc. For these components, the user is required to enter data on the business's expenditure for a range of product, activity or service categories;

   f. Product information, including the total number of items sold in the various product classes (trays, tubes, small pots etc.) and the relative contribution of each of these product classes to the total business income.

   You can clear or print your data at anytime using the 'Clear data' or 'Print results' buttons on the custom toolbar.

3. **Your Carbon Footprint** - The results are all presented on this single sheet. This sheet provides an estimate of the business's total carbon footprint, and also provides a breakdown of the emissions data into useful categories (energy, fuel, fertiliser, freight, plastics, services, etc.). There is a graphical representation of the emissions profile to enable the user to easily identify areas that may require attention. The calculator also produces estimates of the amount of emissions associated with each unit in a number of different product categories. These estimates are calculated using an Economic Input-Output approach. You can print the results on this sheet using the 'Print results' button on the custom toolbar.

4. **Conversion Factors** - This sheet contains all of the emissions' conversion factors used in the calculations.

5. **Cost-Benefit Analysis** - This optional tool allows you to compare the emissions per unit consumed, per dollar spent or per dollar generated for a range of products.

6. **Information** - This sheet contains brief notes and links to external information sources.

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Data input

NurseryFootprint requires data on energy use (electricity and liquid fuels), fertiliser use, waste produced and expenditure on a range of products or services. All of the data should be relatively easy to extract from business records and accounts, and there should be no need for the user to obtain additional information from upstream suppliers. Data can be entered in the Data Input worksheet (second tab from the left). For each category within the calculator, further details can be found by clicking the '?' or clicking each data entry box.

An example of the Data Input worksheet showing a pop-up help box. The calculator will only allow you to enter or change values in the cells with the black borders.

Viewing your results

Once all the business data is entered the user can simply click on the worksheet ,'Your Carbon Footprint', to view their results. This worksheet presents the total carbon footprint (in tonnes CO_2-e), and also provides a breakdown into general emission sources and product categories. This enables the business to clearly identify the emission contributions of particular activities or products. There are tool tips to clarify what products or activities are included in each category.

A graph at the bottom of this sheet provides a quick visual overview of the emissions profile by showing the proportion of the total emissions that are contributed by each category. Users can 'hover' the mouse over a section of the chart to view a pop-up box that will display the name of the source of the emissions and the amount in tonnes.


An example of the Your Carbon Footprint worksheet.

Case Study - Provincial Plants and Landscapes

Provincial Plants and Landscapes of Pialligo, ACT and Wandella, NSW specialises in the supply of drought-tolerant, sun and frost-hardened plants grown in chemical-free outdoor spaces. They were awarded the 'NGI National Environment Award' at the recent 2010 Nursery & Garden Industry Awards held in Darwin for their outstanding environmental business practices and initiatives. Director and Environmental Designer Lisa Roberts and Ecologist David Charlton have long been advocates for the environment and practice sound environmental strategies both internally and within the community.

Provincial have undertaken several environmentally sound initiatives which include running their Wandella site independent of mains water supply and using tank and dam water. They have also installed two solar energy systems that power the Wandella site completely.

They recently utilised *NurseryFootprint* to calculate their businesses carbon footprint in order to better understand how their business could manage the risks and identify the opportunities posed by predicted climate change.
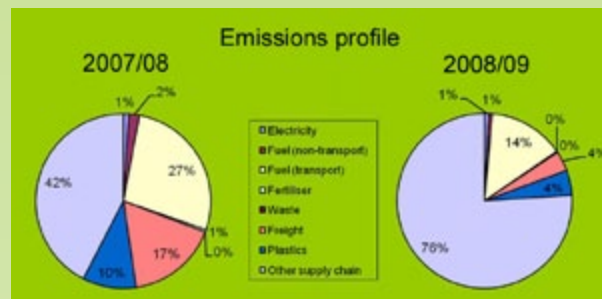
A graphical representation of the emissions profile generated for Provincial Plants and Landscapes in 2007/08 and 2008/09.

The graphical representation of their emissions profile provided them with a clear and concise 'ready reckoner' on how their business practice has changed from 2007/08 to 2008/09. It helped them make clear choices on 'where to next' and assisted them in targeting specific areas in which they could improve. The data generated indicated that business practices such as using renewable resources, harvesting rainwater, recycling and being chemical free, had paid off.

In the period 2007/08 to 2008/09, Provincial's business doubled and at the same time, they still reduced their emissions significantly. For example, emissions associated with fuel consumption reduced by 5% and through the use of efficient transportation systems emissions associated with freight reduced by 9%. Similarly, thanks to recycling, emissions generated from plastics use remained the same while stock levels doubled. They anticipate that the introduction of another 10KW solar system will generate at least 3 times more energy than is required for all 3 of their sites and will reduce annual carbon emissions by 5 tonnes while providing an annual grid feedback payback on investment of around 15%. This proves that being an environmentally responsible business is smart business.

In moving forward, Lisa and David have indicated that by improving their MYOB record keeping system, they aim to better capture the specific data required in the *NurseryFootprint* tool in order to have more accurate results. This will also enable them to make more changes in order to increase their efficiency whilst continuing to reduce their carbon footprint.

A 4 Kilowatt Solar System at the Wandella production site (one of two Solar Systems).

Business decisions based on carbon footprinting

Calculating your business's carbon footprint is smart business. *NurseryFootprint* will identify what areas of a business are generating the most greenhouse gases and help identify where efforts should be focussed to improve efficiencies and consequently reduce emissions. Emission targets and goals could be set to assist in this process. For example, the results may indicate that electricity consumption is a major emissions source because the business relies heavily on electrical inputs (e.g. pumps, heaters, potting machines etc.). The business may then decide to switch to an alternate energy provider specialising in green energy or implement non-renewable technologies on-farm.

This tool also allows businesses to compare the emissions generated per dollar spent on selected inputs (electricity, fuel and fertiliser) or emissions generated per dollar of income across a product range. These results will allow businesses to weigh up the various options for cutting emissions within their business whilst optimising their profit to emissions ratio. For example, the results might suggest that a business could consider alternative fuel sources for some operations or an adjustment to a product mix.

NurseryFootprint can also target the footprints of individual products or activities. To achieve this, data that relates to a specific product or activity of interest only should be entered. This can provide a business with an estimate of the carbon footprint for the targeted product and could also be used in carbon labelling. The emission information could be placed on plant labels to provide customers with pertinent information about the product allowing them to make smarter shopping decisions.

The bottom line

Calculating the carbon footprint associated with a business or product can create tremendous opportunity for that business to showcase its green credentials and demonstrate its commitment to the environment. Not only will this commitment deliver a tangible benefit to the environment and the wider community, but it will also drive efficiencies within a business. Carbon footprinting will also provide a business with a marketing opportunity that can appease consumer's appetite for information on level of sustainability for the business or product.

Further Information

Download a copy of the *NurseryFootprint* tool or the User Manual at www.ngia.com.au

Download the fact sheet 'Climate change and the Australian horticulture industry' available at www.ngia.com.au

For information on climate change and the horticultural sector visit www.horticulture.com.au

Visit the Department of Climate Change at www.climatechange.gov.au
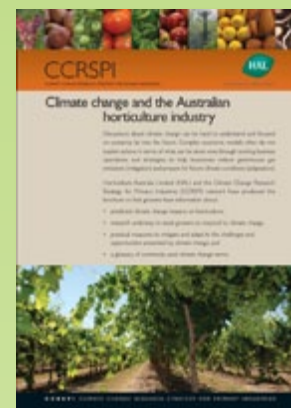
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• This Nursery Paper was written by NGIA Environmental & Technical Policy Manager, Dr Anthony Kachenko.

• NurseryFootprint was first launched at the NGI National Conference in Darwin April 19-22, 2010.

Disclaimer
The *NurseryFootprint* calculator is a basic tool to collect emissions data. It does not provide a comprehensive life cycle assessment of emissions that complies with emerging standards (e.g. ISO 14040 or PAS 2050). It provides an approximation to a life cycle assessment by applying conversion factors obtained from published data.

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