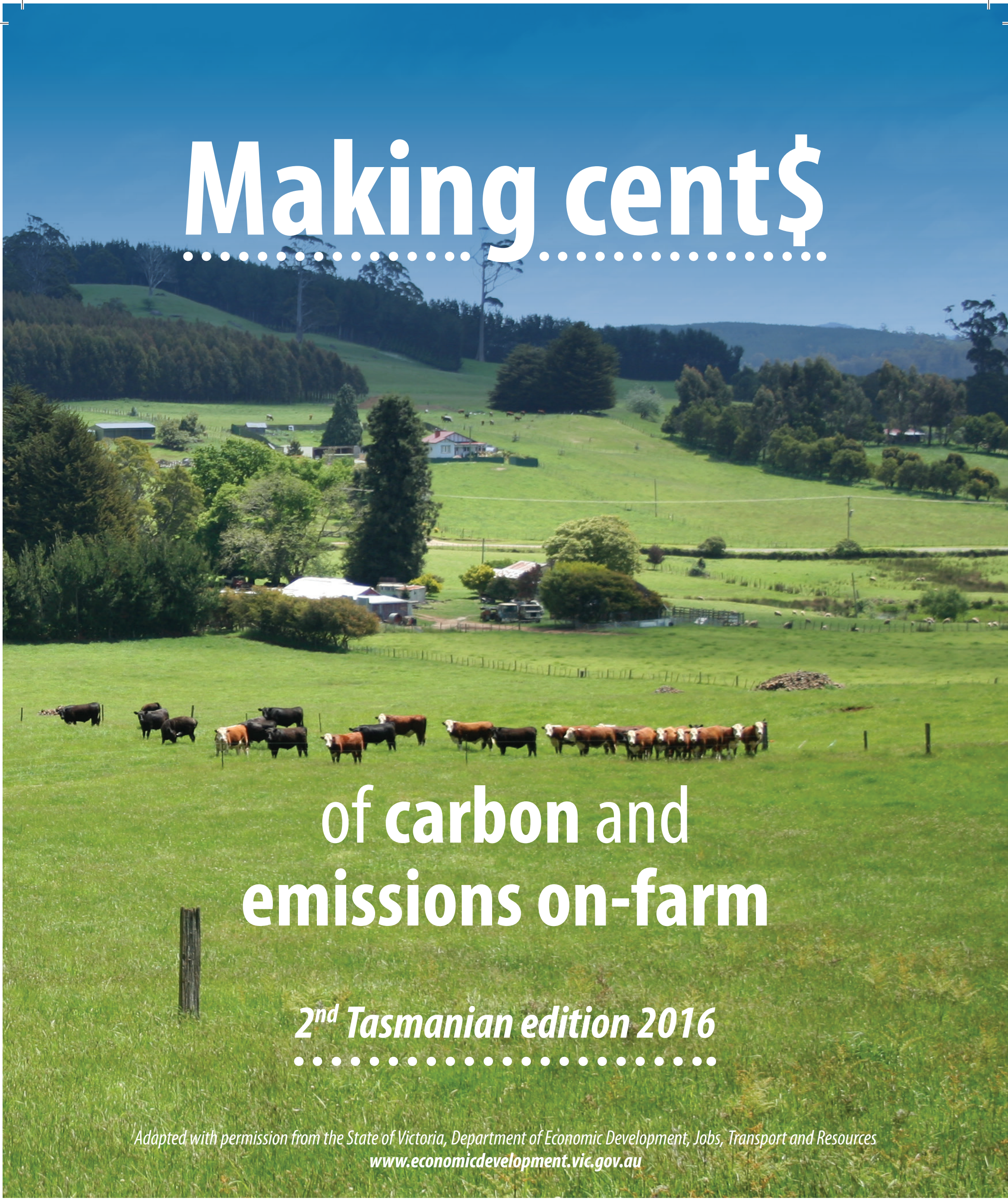


Making cent$

of **carbon** and **emissions on-farm**

2nd Tasmanian edition 2016

Adapted with permission from the State of Victoria, Department of Economic Development, Jobs, Transport and Resources
www.economicdevelopment.vic.gov.au

Tasmanian Government

Tas Farming Futures:
reducing land sector emissions and
effecting carbon farming in Tasmania

Higher productivity, reduced costs and less emissions

Tasmanian farm businesses are getting on with the job of growing more food and fibre, while dealing with climate variability and changing weather patterns. We also know that more attention is being paid to the carbon and emissions performance of our agriculture industries and farms (Australia's per capita emissions are more than four times the world average).

All food and fibre systems produce some form of greenhouse gas emissions, mostly in the form of:

- Methane (mainly caused by animal digestion and respiration),
- Nitrous Oxide (mainly from fertilisers and animal waste), and
- Carbon Dioxide from electricity and liquid fuels and soils.

However, our farms also contain trees, plants, grasses and soils that take up carbon dioxide from the atmosphere and use it to grow biomass.

It may seem surprising but, in general, more emissions are released than are stored on farms, resulting in increased concentrations in the atmosphere. These increased concentrations of gases are trapping more solar radiation, resulting in the enhanced greenhouse effect.

Learn more about these gases on page 19.

This has been linked to increasing global temperatures and other changes in the climate system. For Tasmania this may mean an increase in mean daily temperatures and changes to seasonal and regional rainfall patterns.

Learn more at
http://www.dpac.tas.gov.au/divisions/climatechange/climate_change_in_tasmania/impacts_of_climate_change

We know we have to grow more food and fibre and farmers are constantly under pressure to improve farm productivity to stay profitable. We also know there are ways to improve our emissions performance that might reduce our costs and improve profits along the way.

Potential benefits to farm businesses from improving their emissions performance include:

- Decreasing costs and increasing productivity, particularly by minimising energy losses in the farm system; and
- Increasing market opportunities as supply chains and consumers become more aware of and willing to pay for food and fibre produced with lower emissions.

photo: RMCG

Take a proactive approach, be prepared

A number of farmers are proving there are ways to increase on-farm productivity while also reducing greenhouse gas emissions on-farm.

Learn more from our case studies on pages 15-18.

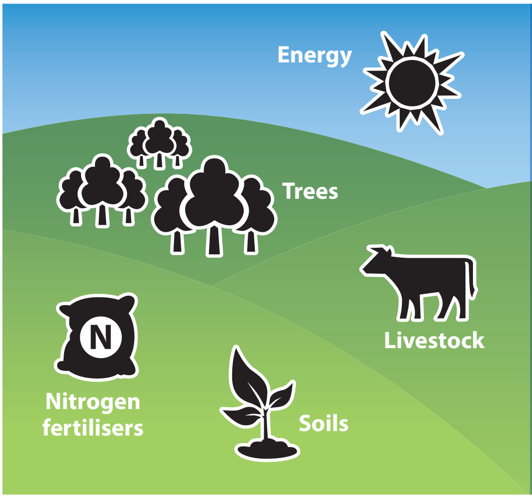
In many cases, actions to reduce emissions or increase carbon storage on farms have multiple benefits for farm businesses, such as increasing farm health and profitability. Most farmers have already made great resource use efficiency improvements, helped by new technologies, new practices and skills. Such improvements can also result in reduced overall emissions.

The following pages provide examples of actions that farm businesses can take to improve their emissions performance on-farm under the key action areas identified below.

This booklet aims to help farm businesses take control of their situation and consider options to improve the resource use efficiency of their operations. Research and development will identify additional options over time.

Read on for some practical tips on how you can continue to manage carbon and emissions on your farm. You might be surprised at how much you are already doing!

☑ Use the tick boxes to check what you already do and/or to plan your future actions.



When thinking about how to manage carbon and emissions on farms, it is useful to think of a farm as having the following key action areas:

Trees: for farm health

Soils: turning more carbon and nitrogen into food and fibre

Nitrogen fertilisers: improving efficiency and saving money

Livestock: improving performance and reducing energy loss

Energy: increasing efficiency, renewable energy, saving money

Trees:
for farm profit and health

Managed trees on farms improve productivity (and ultimately profit) and conservation values, as well as capturing and storing carbon.

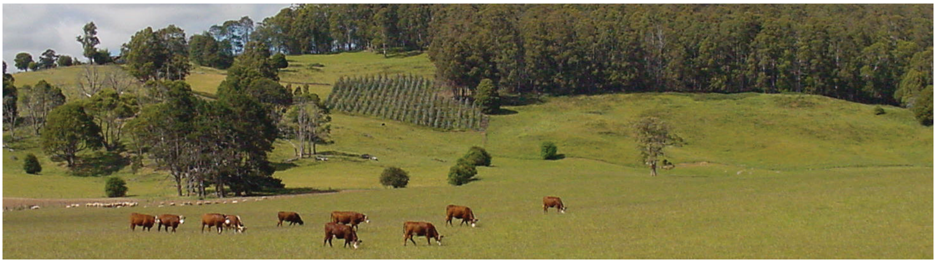
Trees and wood products store carbon. As trees grow they take carbon dioxide out of the air and convert this into carbon to make wood. When wood rots or is destroyed, by say fire or land clearing, the carbon is returned to the air. About 50% of the dry weight of wood and wood products is carbon.

Trees, when strategically integrated into farms, can improve soil, water and biodiversity conservation and also increase farm productivity through shelter and shade for livestock, beneficials and crops. This extends growing seasons, improves animal health and condition, improves crops and may reduce spray drift. Trees make farms a more pleasant place to live and work and increase property values. Well managed trees may provide extra income if harvested.

Good planning ensures trees can be an asset and not a future liability. Managed trees are good trees.

Two recent studies[1] in Tasmania reveal many farms do not have sufficient planted trees to offset their greenhouse gas emissions.

A number of farmers have shown that up to about 10% of their broad acre farms can be treed without loss of food and fibre yield. In fact, profitability may well increase – this is a win-win for farmers and the environment.



Photos this section – All Private Forests Tasmania

[1] See reports at: **http://www.pft.tas.gov.au/images/carbon_plantations_Kit_2014-optimised.pdf** and **http://www.tamarnrm.com.au/wp-content/uploads/2011/02/GHG-Emissions-Audits-Project-Summary-Report-28.04.10x.pdf**

Actions and options

- ☐ Identify what you want to achieve by integrating trees into your farm and clearly state your objectives.
- ☐ Use your property management plan to site shelterbelts, farm forests, biodiversity corridors and/or areas of erosion and salinity that can be planted to trees.
- ☐ Ensure tree species match the site conditions (e.g. soils and climate) and your objectives.
- ☐ Plan and prepare sites for high survival and good tree growth. Seek advice from those who know how to, and have grown trees. This includes neighbours, local groups/networks, consultants, contractors, nurseries, industry, non-government and government agencies. Learn from both others' mistakes and successes.
- ☐ Consider growing some trees that can be used on farm or sold. This includes: fodder, fencing, poles for firewood and even timber. If growing trees for future sale seek professional advice before investing.
- ☐ Keep an eye out for NRM or other programs that may provide planning, technical advice, and financial assistance.
- ☐ Before planting trees, seek to encourage regeneration of remnant native trees by fencing out animals and protecting the regeneration from fire.
- ☐ Very large scale tree plantings may have potential for generating carbon credits under the Australian Government's Emission Reduction Fund (**for more information** go to http://www.environment.gov.au/topics/cleaner-environment/clean-air/emissions-reduction-fund)

Healthy soils: to grow food and store carbon

Healthy soils support healthy plant growth, resist erosion, receive and store water, retain nutrients (e.g. nitrogen) and act as an environmental buffer in the landscape.

Soils have the ability to store carbon. How much and for how long varies depending on factors such as soil texture (how much sand, silt and clay is in soil), farming practices, soil moisture and temperature and climate.

The following actions and options aim to improve soil health by improving soil structure, reducing losses of carbon and nitrogen from the soil and building soil organic matter (SOM). This will enhance a plant's ability to access the nutrients it needs to grow, and will reduce losses of nitrogen to the atmosphere and waterways.

Photo:RMCG

Improving nitrogen use efficiency (NUE) and growing better pasture and crops can have direct financial benefits to farm businesses.

Nitrogen loss from soils is included here, as a component of healthy soils, but nitrogen-based fertilisers are addressed more specifically in the following section titled 'Nitrogen fertilisers'.

Photo:RMCG

Actions and options

There are ways to increase soil carbon and reduce nitrogen loss, while also increasing productivity, water holding capacity and nutrient cycling. This will reduce input costs and produce wider natural resource management benefits.

- ☐ Check your soil for nutrient status and structure and develop a plan to improve constraints to nutrient access (e.g. pH, aeration, drainage, compaction, salinity and toxicity).
- ☐ Monitor soil organic matter / soil organic carbon.
- ☐ Use minimum tillage, conservation tillage and controlled traffic in cropping operations to avoid lost nutrients and carbon through erosion and soil cultivation.
- ☐ Avoid burning crop residues and retain where possible.
- ☐ Do not cultivate soils that are too wet or dry.
- ☐ Avoid bare fallows, have continuous plant cover where possible e.g. green manure crops between seasons and crops can use available nitrogen and avoid losses by leaching.
- ☐ Manage irrigation and soil drainage to reduce waterlogging. Use irrigation scheduling and monitoring.
- ☐ Rotate crops and include perennial pastures and legumes.
- ☐ Add composted materials where practical.
- ☐ Manage soil structure to maximise plant uptake and minimise nitrogen loss (be careful with sodic clays and sands).
- ☐ Manage livestock waste (dung and urine) to minimise nitrous oxide emissions (also see Livestock section).
- ☐ Complete a nutrient balance/budget to match fertiliser requirements to crop demand.
- ☐ Do not overgraze pastures. Keep enough groundcover through the year.
- ☐ Manage livestock movement and rotations to reduce compaction.
- ☐ Keep a watching brief on policy changes relating to potential payments for carbon stored in soil. Always seek financial advice first.

Learn more from available resources:
www.tasfarmingfutures.com.au
soilquality.org.au
www.grdc.com.au

Nitrogen fertilisers: improve efficiency and save money

Becoming more efficient with nitrogen (N) fertilisers on farms and avoiding N losses has direct financial benefits, and reduces nitrous oxide emissions and nitrate leaching or runoff into waterways.

Nitrogen is critical to plant growth and reproduction. In agriculture, this usually requires higher levels of nitrogen than are normally found in native soils. This situation is generally managed through the addition of nitrogen fertilisers.

Nitrogen based fertilisers and livestock waste (urine and dung) are the key sources of nitrous oxide emissions on farms. Nitrous oxide is an extremely potent greenhouse gas (about 298 times that of carbon dioxide); it remains in the atmosphere for over 100 years.

Nitrous oxide is most likely released from warm, waterlogged soils where there is excess nitrogen in nitrate form present. Volatilisation of urea can also lead to nitrous oxide emissions.

Farmers can save money, boost production and reduce nitrous oxide losses by adjusting the rate, type, timing and placement of N fertilisers to match plant needs.

Follow the 4 Rs
Right product, **R**ight rate,
Right time and **R**ight place
http://fertsmart.dairyingfortomorrow.com.au

Actions and options

Research has estimated that between 40% and 60% of nitrogen inputs into cropping and grazing systems, respectively, is lost to the environment and never completes the cycle into agricultural product. The percentage of nitrogen inputs lost is fairly consistent across different rainfall zones and production systems; the process and quantity of what is lost differs.

- ☐ Improve plant access to nitrogen by improving soil condition and nutrient status – see previous section on Soils. Adding nitrogen to soils that have inherent limitations to plant growth (with the aim to overcome the reduced growth) is unlikely to result in higher productivity and financial gain.
- ☐ Avoid application of nitrogen fertilisers (especially nitrate) to waterlogged soils. Plants do not grow while waterlogged or take up nitrogen during that time.
- ☐ Place urea and ammonium-based fertilisers below the soil surface where possible to limit ammonia volatilisation, especially on alkaline soils. Surface applied urea or ammonium fertilisers should be watered in (rain, irrigation) as soon as possible after application. Use coated urea and urease or nitrification inhibitors as much as possible.

Match nitrogen supply to crop/pasture demand by:

- ☐ Using soil testing and plant monitoring to assess plant available nitrogen supply and uptake as a basis to decide on the quantity of fertiliser N to apply. Use a calculation of target yield and crop nitrogen requirement (via uptake and removal figures) over the growing season.
- ☐ Never exceeding total recommended rates.
- ☐ Using as many split applications as viable and matching each application amount to crop growth; small plants or plants that are growing slowly because of weather conditions need less N that rapidly growing plants.
- ☐ Using appropriate, industry- relevant decision support tools if available (e.g. Yield Prophet in Grains) and seasonal forecasts for more timely and fertiliser decisions.
- ☐ Monitoring your nitrogen management and nitrogen use efficiency (NUE), e.g. with the NUE calculator available at **www.tasfarmingfutures.com.au**

Time fertiliser application to minimise nitrogen loss via denitrification or volatilisation:

- ☐ Apply nitrogen fertiliser when the crop/pasture needs it rather than early in the growing season (when there is a greater probability of losses). Crop/pasture demand for nitrogen is greatest during rapid growth phases and drops off later in the season.
- ☐ Avoid tillage under wet conditions. Large amounts of nitrogen can build up in the soil (via mineralisation) following a pasture legume, good pasture, cover crop or pulse crop or incorporation of green crop residues and other organic materials / composts; this nitrogen is especially susceptible to losses following tillage under or prior to wet conditions.

Choose the best source of nitrogen:

- ☐ In the wet season urea and DAP will lose less nitrate and nitrous oxide than nitrate based fertilisers.
- ☐ Where possible use a fertiliser with inhibitors in summer, to reduce ammonia loss; and in winter to reduce nitrous oxide and nitrate leaching losses.
- ☐ Consider how you might incorporate fertiliser at the top of raised beds or ridges and avoid wet areas.
- ☐ Estimate your methane and nitrous oxide emissions using a greenhouse gas calculator.

NUE indicates the ratio between the amounts of fertiliser nitrogen (N) applied to a crop and the amount of N removed from the paddock by the crop or product.

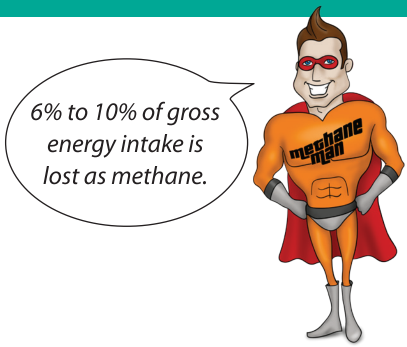
Livestock: improve performance and reduce loss

There are many techniques that can improve livestock performance and efficiency while reducing emissions produced on-farm.

Methane is the main greenhouse gas produced in grazing systems. Ruminant livestock (cattle, sheep, and goats) have microbes in their stomach called methanogens.

These microbes produce methane gas as an end product (from feed) that is then belched out by the animal. Feeds with lower digestibility produce more methane than higher quality feeds. Belched methane represents energy lost from your production system that might otherwise be converted to the milk, meat or fibre that generates income.

Livestock waste (i.e. dung and urine) contains nitrogen. In some situations, wastes can be used to improve pasture or crop growth instead of losing nitrous oxide to the atmosphere as greenhouse gas emissions.



Methane is a major inefficiency in animal production systems. This energy loss has been calculated as the equivalent of up to 55 to 60 days grazing intake for ewes and steers, and 40 days for dairy cows.

Nitrogen levels that are optimal for plant growth can result in excess nitrogen intake for grazing animals. Consequently, 70% to 95% of nitrogen consumed by ruminants is excreted. Livestock urine, fertiliser applications and nitrogen fixed by legumes are the largest sources of nitrous oxide emissions from grazing enterprises.

Photo:RMCG

Actions and options

Optimise feed digestibility and conversion and minimise nutrient excretion:

- ☐ Improve the quality of pasture or forage by optimum grazing management, growing high quality forage crops or supplementing the diets of grazing livestock when necessary with grain or other energy-rich, low fibre feeds (e.g. during summer and autumn).
- ☐ Match the protein to energy ratio of livestock feed with animal requirements. Young, growing stock and lactating females have a higher need for protein than dry stock.
- ☐ Use plant variety selection to produce fodder that better matches livestock needs.
- ☐ Manage pasture quality (e.g. maturity, legume content) through grazing strategies, such as rotational grazing, to optimise feed value.
- ☐ Manage silage and hay quality using short lockup periods and good storage practices.
- ☐ Use feed testing to assess the feed value of your grain, hay or silage.

Optimise reproductive efficiency:

- ☐ Maximise the proportion of young, growing or lactating stock.
- ☐ Ensure that breeding stock are managed according to their nutritional requirements.
- ☐ Optimise fertility through good health and body condition.
- ☐ Minimise neo-natal losses through good husbandry and adequate shelter.

Improve genetics for increased reproduction and shorter finishing times:

- ☐ Include breeding values for productivity traits such as fecundity, growth rate, feed conversion efficiency and disease resistance in your ram and bull selection criteria.
- ☐ Identify, monitor and cull less productive stock.

Manage waste (dung and urine) to minimise nitrous oxide emissions:

- ☐ Avoid applying slurries or manure to land in wet conditions, such as wet winter soils.
- ☐ Avoid causing conditions that lead to poorly aerated soils (e.g. pasture pugging and compaction).
- ☐ Consider processing livestock waste (e.g. for organic fertilizer or methane collection).
- ☐ Test manure and organic wastes used for fertiliser for their nitrogen content and apply at a rate based on crop or pasture requirements.
- ☐ Manage manure stockpiles (e.g. through composting) to avoid anaerobic conditions.
- ☐ De-water storage ponds (about every 6 months) and anaerobic ponds (about every 3 years) by irrigating to crops or pastures. The timing required will vary depending on rainfall and plant growth.
- ☐ Estimate your methane and nitrous oxide emissions using a greenhouse gas calculator.

Energy:
increase efficiency and save money

Energy efficiency both on-farm and along the supply chain will help minimise impacts of rising energy costs for electricity, gas and liquid fuels.

Additionally, there is a range of cost-effective alternatives to fossil fuels for energy generation currently available. Over time, it is expected that additional cost-effective options for farms will become available.

Greenhouse gas calculators often show that farm energy use is a small portion of overall farm emissions.

However for many farmers, it is a significant and growing cost, so finding alternative energy sources and improving energy efficiency can save money and reduce emissions.

Photo: Darren Cooper

Campania orchardist Ian Newnham is reducing his energy usage by upgrading irrigation pumps for the benefit of his bottom line and to combat GHG emissions. Energy consumption at his Lowinda property accounts for 25.9% of the farms' GHG emissions. As this relates strongly to farm costs it is an area that farmers are often keen to reduce. Tips for on-farm energy efficiency include:

- Undertake a pump efficiency review
- Upgrade pumps to ensure pump size and pressure is optimised
- Ensure that in-orchard irrigation delivery is designed to run efficiently
- Use irrigation scheduling and moisture monitoring tools
- Ensure irrigation type provides an optimal wetting pattern
- Reduce irrigation needs by using mulches to help retain soil moisture
- Investigate options for renewable energy use on-farm
- Review grading, lighting and refrigeration systems for maximum efficiency

Learn more:
read the Newnham case study in full at
www.tasfarmingfutures.com.au

Actions and options

Farmers who increase their energy efficiency and find alternative, low cost sources of fuel, heat and electricity may ultimately become more profitable, equipped to capitalise on new market opportunities and respond to supply chain and consumer pressures.

Efficiency on-farm

- ☐ Find out if you're on the best available tariffs – get your power bill right and save money straight up.
- ☐ Undertake an energy audit as part of your property management planning to measure your current energy use and highlight areas for improvement. An on-farm greenhouse gas accounting tool can help to estimate your on-farm emissions.
- ☐ Consider energy efficiency as a factor when buying new equipment. There may be other members of the supply chain that may create opportunities to reduce energy consumption.
- ☐ Develop a plan to replace inefficient systems and equipment (e.g. phase out HCFC refrigerant gas).
- ☐ Save fuel consumption by improving efficiencies with input applications.
- ☐ Look into production of bioenergy, where residues or wastes are available. Consider potential waste along the supply chain.
- ☐ Develop and follow a regular maintenance schedule for machinery, vehicles and equipment (e.g. service refrigeration systems to reduce gas leakage).
- ☐ Investigate using controlled traffic or precision agriculture to maximise efficiency.
- ☐ Carefully match engine power to the requirements of irrigation pumps. Three phase motors are often more efficient.
- ☐ Improve the efficiency of irrigation practices through monitoring soil moisture and irrigation scheduling.
- ☐ Run applications during periods with lower cost tariffs, where possible.
- ☐ Irrigate at night using off-peak tariffs to save costs and reduce water loss from evaporation.
- ☐ Use variable rate application technology to match water applied to soil and crop needs.
- ☐ Undertake an irrigation pump efficiency review (the ARM Pump Efficiency Calculator Tool is available on FarmPoint: search www.farmpoint.tas.gov.au).

Renewable energy

- ☐ Insulate buildings.
- ☐ Use light coloured, heat reflective paint on roofs and walls.
- ☐ Use natural light and ventilation in farm buildings.
- ☐ Install energy efficient lighting systems (e.g. LED).
- ☐ Look into renewables like solar, wind or hydro, after you've improved efficiencies across the business.
- ☐ Explore options for financial help with improving efficiency, like projects, grants and incentives.

Learn more at:
www.power.tas.gov.au
www.stategrowth.tas.gov.au/energy
www.dpac.tas.gov.au/divisions/climatechange
www.dairytas.com.au/nrm/energy/

Tasmanian farmers getting involved in renewable energy

In early 2012, the Nichols family of Redbank Farming commissioned a 35-metre-tall wind turbine on their farm at Sisters Creek, north west Tasmania. The Nichols were keen to safeguard the business from expected rising energy costs, and are now saving around $4000 on their power bill every month. They estimate that this investment will be paid back within five years.

Cost effective micro-hydro is now available in Tasmania. Michael Green runs a sheep and cropping operation at Cressy. The Greens have installed a micro-hydro system that utilises existing irrigation infrastructure to generate hydro-electricity in the off-season. Four turbines generate up to 155 kilowatt hours per day—the equivalent of about six standard homes' power use per day. They were inspired after seeing the State's first grid-connected micro-hydro system at Ashgrove Cheese in the north of Tasmania.

Paul Bennett from Ashgrove Cheese near Elizabeth Town in northern Tasmania, wanted to reduce his increasing energy costs. With a micro-hydro scheme running from an irrigation dam outlet, Ashgrove are looking at savings of around 45-50 per cent of the dairy shed's energy costs. *Source: http://www.dairytas.com.au/nrm/energy/*

Photo: Redbank Farming

Photo: Darren Cooper

Photo: DairyTas

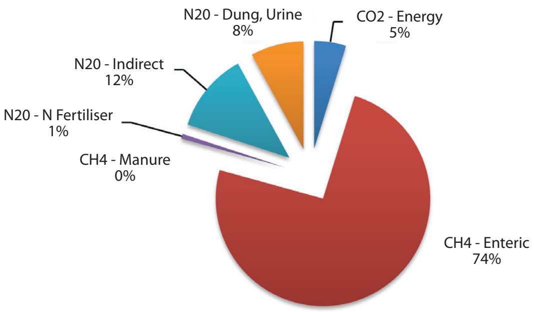
More success stories: mixed farming case study

Sustainable soil management saves costs and emissions, Chris & Ronald Gunn

Richmond farmers Chris and Ronald Gunn are advocates for protecting their soils to maintain soil carbon for the benefit of their farm productivity, bottom line and to combat greenhouse gas (GHG) emissions.

"Reducing carbon emissions is good business. Reducing soil degradation, fertiliser and fuel [use], is not only good for soils but also good for the bottom line", Ronald Gunn.

Farm emissions snapshot



As with most mixed farms that produce livestock (ruminants e.g. sheep, cattle) the majority of the Gunn's GHG emissions are derived from enteric methane (74%) or belching from sheep and cattle. Only 5% of emissions stem from energy consumption and diesel use. Both affect variable farm costs and therefore farmers are keen to reduce the use of diesel and power. While these GHG calculations did not include potential emissions from soil carbon due to data availability, Ronald and Chris are focusing on continuously improving soil management to preserve carbon, the main component of soil organic matter (SOM).

Ronald and Chris Gunn have six rules of thumb when it comes to managing their soils:

- Don't cultivate too much – use no-till or reduced tillage practices
- Cultivate at optimum conditions
- Use soil testing and sap analysis to guide fertiliser decisions
- Remove stock from cropping paddocks when wet
- Maintain ground cover
- Don't overgraze

"We soil test every paddock every three years so we have a good handle on what's happening"

Photo: Sophie Folder

More success stories: dairy case study

Good business management reduces emissions, Brian and Michele Lawrence

In 2007, Brian and Michele Lawrence purchased 'Janefield' at Meander, Tasmania for a dairy conversion – at the time it was a poorly drained, low fertility sheep farm. Through a lot of planning and hard work, they now have a successful dairy business that is optimised for their location. Every decision they make on farm is made with not only production benefits in mind but also sustainability.

"We compare with others in the industry and identify our strengths and weaknesses" says Brian. *"What we do is good for us as it's profitable, and good for the environment as we're not wasting resources."*

One aspect of sustainable farming is the reduction in GHG emissions that are contributing to climate change. Methane and nitrous oxide are the main GHG emissions from dairy farms. The dairy industry has committed to reducing GHG emissions intensity by 30% by 2020. Brian and Michele are addressing each of Dairy Australia's key messages for farming efficiently to reduce emissions:

- Identify and cull less productive animals
- Ensure cows are in calf, on time, every time
- Keep cows comfortable, provide shade and shelter
- High quality feed is always best
- Get your nitrogen fertiliser strategy right
- Audit and reduce your energy use

At 'Janefield', following best practice for soil, pasture, fertiliser and herd management results in an efficient farm and the potential to lower GHG emissions intensity.

Emissions intensity is a measure of the emissions per unit of product, e.g. per kg of milk solids

Photos: RMCG

Livestock case study

Managing protein and energy ratios in feed for reduced emissions, Andrew and Kate Beven

In Tasmania it is common for lush pasture and fodder crops in autumn, winter and spring to have very high protein levels, often exceeding livestock requirements. This can result in an imbalance in the protein and energy provided in the livestock diets and may affect livestock performance.

High levels of feed protein can dilute energy levels in the rumen and result in higher methane emissions.

Low energy feeds like straw can produce more methane and achieve less animal growth than a vigorous ryegrass/clover pasture.

Campania farmer Andrew Beven has used feed testing as a tool to measure the nutritional balance of pasture and fodder crops grown on his Coal River Valley property to improve grazing nutrition for his sheep. By identifying risk periods where the crude protein levels in the feedbase are very high, Andrew can tailor strategies that will increase livestock performance and help to combat GHG emissions from his livestock operations.

Andrew is taking the following steps:

- Understand the value of your fodder – feed testing provides a simple and accurate measure. Regional guides and averages for different feeds are also available.
- Understand the protein and energy requirements of your stock – guides on animal needs can be sourced from industry and government departments. Compare these with your feed test results.
- Implement strategies to 'restore the balance' in high-risk periods – you may need to provide another source of energy to meet the livestock's needs. Use feed value tables to compare potential supplements.

Remember to always seek advice when making changes to your feed system.

Photo: Sophie Folder

More success stories: cropping case study

Healthy soils for healthy profits, Matthew and Ruth Young

Sassafrass farmers Matthew and Ruth Young are planning ahead. By looking after their natural resources they are making sure their farm remains profitable into the future. Spending time "doing things right" is paying off. The Young's have adopted several key practices that maintain healthy soils and build soil carbon:

- Minimum tillage and low impact tyres
- Long term perennial grasses instead of short term species
- Green manure crops

This was confirmed by results from the soil carbon modelling tool "Black Magic". A typical cropping rotation that includes pasture and green manures (as well as vegetables) was found to maintain their soil carbon stores over a 25-year simulation.

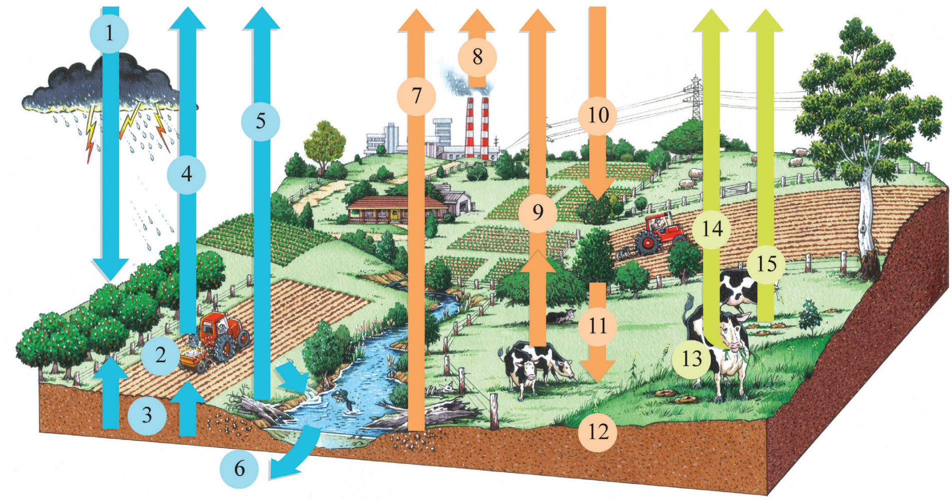
Improved soil structure also means spending less time in the tractor preparing ground, in turn reducing the potential for carbon dioxide emissions from soil and from machinery.

"Whether you believe in climate change or not, the seasons are changing. Whether it's natural or man-made change, you can't deny that things are totally different to what they have been. You've got to be prepared to adapt your practices and if there are opportunities to look at different ways of doing things, to make life easier and more profitable, then I reckon it's worth going for it" says Matthew.

Photo: RMCG

Greenhouse gas cycles in agriculture

Nitrous Oxide	Carbon Dioxide	Methane
is mainly released through soil disturbance, nitrogen fertilisers, urine and dung. The global warming potential of nitrous oxide is 298 times that of carbon dioxide over a 100 year period.	is mainly released through burning of fossil fuels, plant decay and insect and microbial activity in soils. It is also absorbed by plants through photosynthesis and stored in soils and trees.	is mainly released from cows and sheep following digestion of plant matter. The global warming potential of methane is approximately 25 times that of carbon dioxide over a 100 year period.



1. Nitrogen (N) absorbed by lightning (falls in rain) and nitrogen fixing bacteria in legumes
2. Nitrogen-based fertilisers applied to pasture or crops
3. Nitrogen taken up by pasture, crops and trees
4. Nitrous oxide (N_2O) released through volatilisation of urea fertiliser
5. Nitrous oxide released through process of denitrification
6. Nitrogen loss through runoff and leaching from fertilisers and nitrification process in soil
7. Carbon dioxide (CO_2) released through plant decay, and insect and microbial activity in the soil
8. Carbon dioxide released from burning fossil fuels to produce electricity and fuel
9. Carbon dioxide released by animals and plants through respiration
10. Carbon absorbed by trees, pasture and crops through photosynthesis
11. Animals consume carbon by eating plants
12. Carbon from organic residues (e.g. dead leaves, roots, manure & urine) absorbed into the soil
13. Methane (CH_4) is produced within the rumen (fore-stomach) during digestion, via a chemical reaction between carbon and hydrogen
14. Methane released by cows and sheep burping following ruminant digestion
15. Small amounts of methane released from fermentation of animal dung and urine under anaerobic (no oxygen) conditions

Further Information

For more information on carbon and emissions management, visit the Tas Farming Futures webpage at
www.tasfarmingfutures.com.au

Other useful links:

FarmPoint Tasmania
www.farmpoint.tas.gov.au

Climate Futures for Tasmania
http://www.dpac.tas.gov.au/divisions/climatechange/climate_change_in_tasmania/impacts_of_climate_change

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