Factsheet 3: Reducing Greenhouse Gas Emissions from the NT Pastoral Industry

Introduction
Reduction of the main greenhouse gas (GHG) emissions from pastoral operations can be achieved in a number of ways, for example by:
- Avoiding fuel consumption (eg horse riding).
- Improving operational efficiencies.
- Investing in emissions saving technology.
- Capturing and storing carbon (sequestration).
- Paying for your emissions (offsetting).

A great deal of information is now available on practical ways to reduce emissions from agricultural practices and a lot of research has begun to focus on emission reduction technologies for the future. Many of these emission abatement strategies also bring long term cost benefits to the pastoral enterprise. Some major examples of these are presented in this Factsheet.

Energy
The use of fossil fuel to power generators, tractors and vehicles is a major cost for pastoral and mixed farming operations. Reducing fuel consumption will save money as well as reduce emissions of carbon dioxide (CO\textsubscript{2}). A saving of 10 litres of diesel per day to run a generator will reduce carbon emissions by almost 10 tonnes CO\textsubscript{2}-equivant/year and lower fuel costs.

**Maintenance Schedules:** Petrol and diesel engines require regular maintenance and tuning to ensure maximum fuel efficiency. Records should be kept of the amount of fuel used by each engine as a way of monitoring their consumption rate and efficiency.

**Diesel/Battery Hybrid Generators:** The main power source with this system is from a bank of batteries which are recharged daily by a diesel generator. While the generator is charging the batteries, it takes over the power supply until the batteries are fully charged thereby ensuring optimum loading. The generator typically runs for about 6 hours a day to recharge the batteries thus saving fuel and CO\textsubscript{2} emissions. This system can also be integrated with renewable energy sources (solar, wind) to recharge the batteries thereby further reducing the need to run the diesel generator.

**Solar Energy:** The domestic electricity needs of homesteads can be supplied by photovoltaic systems, with substantial savings in the fuel costs of a diesel generator and reductions in CO\textsubscript{2} emissions.

A typical homestead package producing 3.5 kW for ~7 kWh/day load costs around $50,000 to install. The NT Government's **Renewable Energy Rebate Program (RERP)** provides for a cash rebate of up to 50% for remote settlements (off-grid users) to replace a diesel generator with a renewable energy source such as solar or wind power. See the RERP website at [www.maketheswitch.nt.gov.au](http://www.maketheswitch.nt.gov.au) and details of a renewable energy program for NT pastoralists at [www.ntca.org.au](http://www.ntca.org.au).

**Telemetry:** This technology allows automated radio controlled monitoring and switching of utilities (eg stock watering points) in remote locations and has an important energy saving role in the management of water infrastructure for rangeland cattle. Telemetry is capable of carrying out all the stock water checks that are usually done during a bore-run and therefore can replace vehicle use and save GHG emissions.

According to the WaterSmart Pastoral Project being conducted by the Desert Knowledge (CRC), up to one bore-run per week could be replaced by telemetry thus saving fuel and vehicle maintenance costs. See website below for more information about this technology at: [www.desertknowledgecrc.com.au/watersmart](http://www.desertknowledgecrc.com.au/watersmart)

**Livestock**
Methane (CH\textsubscript{4}) production from enteric fermentation in cattle is a major contributor to agricultural GHG emissions. In the past, research focussed on ways to lower CH\textsubscript{4} production (methanogenesis) in cattle because it reduces feed efficiency, now the focus is on inhibiting its production because of its role as a GHG.

Maximising feed efficiency and performance of cattle herds is therefore the key to lowering CH\textsubscript{4} emissions per unit of productivity in the first instance, until new cost-effective technologies for inhibiting CH\textsubscript{4} microbes have been developed. Examples of ways to manage livestock emissions are given below.

**Herd Management:** Based on calculations used by the Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks: Agriculture (2006), average CH\textsubscript{4} production from a typical mixed tropical beef cattle herd in Northern Australia is about 60 kg/haad/year (87 kg/AE\textsuperscript{1}/year). Emissions per unit productivity (eg weaners per annum) fell by 18% when pregnancy rates increased from 55% to 75%. In this case, an improvement in emissions intensity brings about benefits in terms of increasing herd output.

**Grazing Management and Feed Quality:** Total CH\textsubscript{4} production in cattle grazing tropical pastures actually increases with pasture quality (ie higher

\textsuperscript{1} AE (Animal Equivalent) = 425 kg live weight.
digestibility and energy content) towards the limits of roughage intake. By further increasing intake of digestible energy with concentrate feeds reduces CH₄ production in the rumen. A study by Kulihara et al. (1999) found that CH₄ production in Brahman cattle fed good quality Rhodes grass hay was more than twice that of native pasture hay and grain based rations. But in terms of unit productivity (ie live weight gain), CH₄ emissions were lowest on grain and highest on native pasture.

In general, best practice management ensures lowest emissions intensity for extensively grazed beef herds. NT graziers are therefore encouraged to fine tune their management skills by attending Meat & Livestock Australia’s EDGEnetwork Grazing Land Management (GLM) workshops on strategies to increase profit and sustainability (contact your local DPIFM office).

**Breeding for Feed Efficiency:** Cattle that utilise feed more efficiently produce less CH₄ as well as bring cost benefits to both intensive and extensive cattle operations. This is a genetic trait that can be bred for by selection and is being trialled on Breedplan as a feed efficiency measure called the Net Feed Intake (NFI) Estimated Breeding Value (EBV). The economic and GHG mitigation importance of NFI EBV is also part of a larger initiative being undertaken by the Beef CRC in Armidale, NSW, to significantly reduce feed costs and CH₄ emissions (by up to 16%) in cattle. Pastoralists are therefore encouraged to consider the NFI EBVs when buying bulls.

**Feed Additives:** These are currently used in cattle rations to improve feed efficiency which also has the effect of reducing CH₄ production in the rumen. One compound in particular is the ionophore monensin (Rumensin®) which actively inhibits methanogenesis with verified claims of 20% reduction in CH₄ emissions (www.etvcanada.com). However, the repeatability of these claims by researchers conducting field trials is proving difficult. Rumensin® is currently available in controlled release capsules and in dry season proprietary licks for extensively grazed cattle herds.

**Emerging Technologies:** Australia and New Zealand are investing a great deal of research funding into the development of new technologies for reducing emissions in cattle. For example, studies are ongoing to inhibit CH₄ rumen micro-organisms by using anti-methanogenic antibodies (vaccine). Work is also in progress to find suitable replacement microbes such acetogens (found in marsupial digestion systems) which compete for the same rumen hydrogen source as methanogens but produce energy-yielding acetate instead of CH₄.

**Savanna Burning**

Fire management studies show that GHG emissions are significantly reduced when burning occurs early in the dry season. This is because the moisture content of plant material is still relatively high resulting in low-intensity fires that are effective in reducing fuel loads without killing trees. Where controlled burning is an integral part of property management, a rotational burning program together with proper fire breaks and fire-fighting equipment to reduce unintentional fires will help to keep GHG emissions to a minimum.

**Agricultural Soils**

In mixed-farming operations, soil and fertiliser management that minimises nitrogen (N) loss is the key to reducing GHG emissions. The inclusion of pasture legume rotations, retention of crop residues and conservation tillage will bolster soil structure (ie organic matter, N, water storage capacity, aeration etc) and optimise conditions for plant growth. Fertiliser requirements should be carefully calculated according to expected yield and existing soil N levels, and use of split applications of N fertiliser placed under the soil surface, will minimise N losses and ultimately save money. For large scale cropping operations, guidance on best practice fertiliser management should be obtained from accredited advisers (see www.fertcare.com.au).

**Land-Use Activities**

**Land Clearing:** Agricultural development in the NT usually involves the clearing of trees particularly for mixed-farming operations. The impact of clearing on biodiversity and GHG emissions can be reduced by retaining or establishing tree corridors for cropland development and/or by selective thinning of trees for pasture development.

**Forest Sinks:** Planting trees to capture atmospheric carbon (sequestration) is an effective way of reducing the carbon footprint of pastoral and mixed-farming operations in parts of the NT. The economic benefits may be derived from additional farm revenue from marketing timber products or carbon offsets associated with accredited emission trading schemes, or from natural resource management benefits that lead to improvements in the operational environment (eg erosion control). More information on forest sinks can be found at www.climatechange.gov.au under the Land Systems link. A separate Factsheet will examine in more detail the carbon trading opportunities for pastoralists.

**Further Reading**

A comprehensive guide to emissions management in agriculture is the publication Farming For The Next Generation - Guidance For Managing Greenhouse Gas Emissions which is available by contacting www.climatechange.gov.au. Future Factsheets in this series will cover self-auditing of GHG emissions and best practice emissions management for NT pastoralists.

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