LEGISLATIVE ASSEMBLY OF THE NORTHERN TERRITORY

11th Assembly

Sessional Committee on
Environment and Sustainable Development

Northern Territory Capacity to Progress Environmentally Sustainable Agricultural Production

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COMMITTEE REPORT

March 2011

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Chair's Preface

The Sessional Committee on Environment and Sustainable Development was asked to inquire into the Northern Territory's capacity to progress agricultural production in an environmentally sustainable manner. Within this broad subject area, the Committee focused on opportunities for, and limitations to, progressing sustainable agricultural production and the contribution the government can make.

The Committee agreed that the Northern Territory has a substantial capacity to progress agricultural production in an environmentally sustainable manner. The Territory's natural resources are finite and have natural limits for the level of development. It is within these limitations that opportunities must be found to develop sustainable agriculture. Pushing too far beyond these limits could result in repeating the mistakes of southern States. However, with improved understanding of the environment and production techniques, there is room for expansion within those limits. With the support of government and active participation of the industry, developing resilient food production systems that use our natural resources responsibly and strategically will ensure that the Northern Territory can continue to play its part in supplying food to the nation and region.

The Committee agreed that there are many opportunities that environmentally sustainable agriculture offers the Northern Territory. There are opportunities to develop our vital agriculture industry which contributes a great deal to the Territory, Australia and the region. There are also opportunities to reduce our greenhouse gas emissions and grow our carbon economy. There are opportunities for Indigenous economic development and greater participation in the industry. Crucially, there are opportunities for the Territory to be a better environmental manager in protecting this unique and special place for the future, alongside any development. The capacity of the Northern Territory to make full use of the opportunities will depend on government to drive the realisation of potential through investment in research, education, extension services and promotion of the industry to support the growth of environmentally sustainable agriculture in the Northern Territory.

On behalf of the Environment Committee, I would like to thank all the organisations and individuals who provided evidence to the inquiry. I also thank the Committee Office staff for their work. Finally, I thank Members of the Environment Committee for their bi-partisanship during the inquiry and genuine interest in environmental sustainability of agricultural production in the Northern Territory for the future.

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Chair

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Acronyms and Abbreviations

ABARE	Australian Bureau of Agricultural and Resource Economics
AZRI	Arid Zone Research Institute
BOM	Bureau of Meteorology
CDEP	Community Development Employment Projects
CDU	Charles Darwin University
Centrefarm	Centrefarm Aboriginal Horticulture Limited
CITES	Convention on International Trade of Endangered Species
CLC	Central Land Council
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTH	Commonwealth
DRDPIFR	Department of Regional Development, Primary Industry, Fisheries and Resources
EIS	Environmental Impact Statement
EPA	Northern Territory Environment Protection Authority
EPBC Act	*Environmental Protection and Biodiversity Conservation Act, 1999* (Cth)
ESD	Ecologically Sustainable Development
ETS	Emission Trading Scheme
GHG	Greenhouse Gas
GIS	Geographic Information System
GPS	Global Positioning System
GSL	Great Southern Ltd
GSP	Gross State Product
ILC	Indigenous Land Corporation
ILUA	Indigenous Land Use Agreement
IPM	Integrated Pest Management
IPP	Indigenous Pastoral Program NT
LNG	Liquified Natural Gas
Mt CO_2-e	million tonnes of carbon dioxide equivalent
NALWTF	North Australia Land and Water Taskforce
NLC	Northern Land Council
NRETAS	Department of Natural Resources, Environment, the Arts and Sport
NRM	Natural Resource Management
NT	Northern Territory
NTAgA	Northern Territory Agricultural Association
NTHA	Northern Territory Horticultural Association
NWI	National Water Initiative
TIFP	Tiwi Islands Forestry Project
TRaCK	Tropical Rivers and Coastal Knowledge program
WA	Western Australia
WALFA	West Arnhem Land Fire Abatement Project
WTO	Wright Training Organisation

Inquiry Terms of Reference

Pursuant to the Terms of Reference of the Sessional Committee on Environment and Sustainable Development (1(a) and (b) (at Appendix A), on 15 September 2008, the Minister for Natural Resources, Environment and Heritage referred to the Sessional Committee on Environment and Sustainable Development to inquire into and report upon:

1. The Northern Territory's capacity to progress agricultural production in an environmentally sustainable manner.

2. In its Inquiry the Committee will:
   (a) consider the environmental issues, including opportunities and constraints, facing various types of agricultural production in the different geographical and climatic areas of the Northern Territory;
   (b) examine best practice agricultural production in the Territory and other locations with similar geographical and climatic characteristics to that of the Territory and the ways in which best practice can be supported through appropriate policy, regulation and education;
   (c) draw upon existing and emerging scientific research from a wide range of sources;
   (d) consult widely with relevant stakeholder groups;
   (e) adopt an inquiry methodology that considers long-term, inter-generational impacts of agricultural production on the Territory's environment;
   (f) include an analysis of carbon reduction schemes and their likely impact on agricultural enterprise in the Northern Territory;
   (g) examine the current and possible future contribution of agriculture and agricultural-based products to the Northern Territory economy, including the provision of employment and enterprise opportunities to indigenous people living in remote and regional areas;
   (h) examine implications of progressing agricultural production on other enterprises reliant upon the natural environment; and
   (i) as a result of the Committee's inquiries and analysis, recommend relevant strategies to progress agricultural production in an environmentally sustainable manner.[1]

[1] A copy of the Minister's referral letter is Appendix B.

Executive Summary

Agriculture already makes a significant contribution to the Northern Territory by providing food, jobs and export income. There nevertheless remains significant potential to increase the Territory's agricultural production through both improved use of the land already under production and increasing the area of land under production.

However, increased production cannot be brought about sustainably by simply increasing stocking loads or clearing more land. Sustainable agriculture is achieved through working smarter, not just harder. Maximising production in a sustainable manner is a challenge throughout the globe, and poses unique challenges to the Territory, with its shallow soils, and monsoonal and arid climates.

Increased sustainable agricultural production requires a thorough understanding of the environment, including climate, soil, water, and the biosystems that inhabit them; the development of crops and stock suited to that environment; and an understanding of how best to manage them. This can only be achieved with a solid research basis to both identify the environment and trial the effects of different methods of production. Such research only becomes effective once its results are communicated to those who can use it. A strong link is needed between researchers and producers to ensure both well targeted and informed research and the implementation of the results.

The clearest message the Committee received from its inquiry is that more effort is required in the research base for agriculture in the Territory. The potential for agriculture is not fully known as we do not yet know the extent of our soil and water resources. There has also been limited research done on agricultural production within the Territory's environment so there is considerable scope for increasing production through improved strains of crops and stock and farming techniques. Together with this research must come the means of communicating it to producers.

The second message the Committee received was the need for an improved legislative framework. Regulation is essential to prevent environmental degradation and provide the legal infrastructure for fair and effective industries, but such regulation should not impose unnecessary burdens. Laws require periodic review to keep up with developing agricultural and environmental management techniques. The Committee was told that the *Pastoral Land Act* needlessly prevents agricultural diversification and that some provisions of the *Territory Parks and Wildlife Conservation Act* prevent the development of industries without any commensurate environmental benefit. The review of

these laws needs to be expedited so they can provide their benefits without unnecessary burdens.

The other requirements for improving sustainable agricultural production the Committee heard were the provision of better infrastructure, particularly roads, the pursuit and development of markets for products (and products for markets), and the encouragement of investment to enable opportunities to be realised.

Within these areas for Government action, a number of issues for particular attention arose.

Witnesses identified the need to work to protect the Territory's biodiversity. An important feature of the Territory was seen to be the extent of its natural environment. However, the Territory's biodiversity was experiencing a number of threats both from agricultural production, such as through land clearing and grazing, and from other factors, such as pests and diseases and climate change. Agricultural management can play an important role in both minimising harm and helping to provide suitable habitats.

Water and soil management were also issues of particular concern. Both present issues of how to effectively manage a scarce resource.

Another theme raised was options for Indigenous economic development. This raised a range of questions around the forms of agricultural production possible on Aboriginal land; the education, infrastructure and investment needs to realise those possibilities; and whether agricultural production was the most appropriate use of the land.

The final theme to emerge was the impact of climate change and the carbon economy. Climate change requires action to reduce greenhouse gas emissions; to adapt to its effects, including increased temperatures, changing rainfall and rises in the sea level; and to take advantage of opportunities presented by emerging markets in carbon abatement.

The Committee was encouraged to see that communities, industry and the Government were taking action to address the issues identified. It found numerous examples of innovative action to address local needs and opportunities, and developing partnerships between communities, industry organisations, and government departments and research organisations.

The Committee also found a number of recent Government policy statements that addressed key issues of concern. For example, the *Territory 2030 Strategic Plan* has targets for: identifying suitable land and water for further long-term and sustainable food production; ensuring no deterioration in the health of biodiversity; and increasing Government and business expenditure on research. The Government has also produced a Primary Industry Extension Strategy, an Agribusiness Investment Booklet, and information on the economic outlook and statistics on primary industries. The Committee considers these to be a useful start, but require sustained effort to implement the identified strategies.

The Committee has therefore made a number of recommendations to address the issues outlined above.

Recommendations

Recommendation 1

The Committee recommends the Government continue to provide assistance to Centrefarm and other agribusinesses that develop horticultural enterprises.

Recommendation 2

The Committee recommends that the Government support the further development and renewal of the Indigenous Pastoral Program NT in 2011 to enable the program to fulfil its long-term objectives.

Recommendation 3

The Committee recommends that the Northern Territory Government complete and release its *Living Rivers Strategy* as soon as possible.

Recommendation 4

The Committee recommends that the Government provide the necessary resources to NRETAS to complete capability assessments and an audit and mapping of land and water suitable for long term sustainable food production as soon as possible.

Recommendation 5

The Committee recommends that the Government complete the proposal guidelines to progress the establishment of a north Australia Cooperative Research Centre for environmentally sustainable development as soon as possible.

Recommendation 6

The Committee recommends that the Government develop a five to 10 year research strategy that identifies research and development priorities to strengthen the Territory's capacity to progress environmentally sustainable agricultural in the Territory. The strategy must align with national research and development priorities for rural research and development and connect directly to the work of the proposed north Australia CRC for environmentally sustainable development of the region.

Recommendation 7

The Committee recommends that the Government facilitate the production of a 'Striking the Balance' type publication for the Central Desert region of the NT.

Recommendation 8

The Committee recommends that the Government ensure that it has an effective mechanism to foster communication and collaboration between government, agricultural industry groups, other natural resource management groups and the wider community on the development of environmentally sustainable agriculture in the NT, either through the *Strategy for Guiding Public Sector Extension in Primary Industries in the Northern Territory (2010-2015)* or by some other means.

Recommendation 9

The Committee recommends that the Government actively participate in the establishment and operation of regional bodies, such as a north Australia regional body or ministerial council, to build institutional capacity and develop an integrated vision for sustainable development of the region.

Recommendation 10

The Committee recommends that the Government implement the recommendations of North Australia Land and Water Taskforce where they are applicable to the Northern Territory.

Recommendation 11

The Committee recommends that the Government continue to implement its *Strategy for Guiding Public Sector Extension in Primary Industries in the Northern Territory (2010-2015)* and report annually to the Legislative Assembly on the outcomes of the strategy.

Recommendation 12

The Committee recommends that the Government complete and implement its review of the *Pastoral Lands Act* as soon as possible with a view to removing any inappropriate restrictions on diversifying the use of pastoral land.

Recommendation 13

The Committee recommends that the Government release and implement its plan for rural roads and highways as a matter of priority.

Recommendation 14

The Committee recommends that the Government explore options for work with the agricultural industry to develop the concept of a Territory wide system

of certification and branding that is based on environmentally sustainable principles, standards and industry codes for agricultural production.

Recommendation 15

The Committee recommends that the Government where possible, assist producers aiming to achieve certification from existing national and international industry bodies for environmentally sustainable agricultural production.

Recommendation 16

The Committee recommends that the Government continue to encourage investment in the Territory's agricultural industries by, among other things, maintaining a commitment to the maintenance and development of necessary transport infrastructure.

The Inquiry

Background and Scope

The inquiry was referred to the Environment Committee by the Minister for Natural Resources, Environment and Heritage on 15 September 2008.

The inquiry Terms of Reference sought detail on a broad range of aspects of the Northern Territory's capacity to progress environmentally sustainable agriculture.

Guided by the principles of ecologically sustainable development, the Committee focused on the role and responsibilities of government as well as the tools and mechanisms available to government to develop industry capacity and progress environmentally sustainable agriculture in the Northern Territory.

The Committee did not examine the extent to which current or previous agricultural practices are sustainable, but focused on the mechanisms for promoting sustainable agriculture into the future.

The Committee did not receive sufficient evidence to make a comparative analysis of carbon reduction schemes and their impacts on agriculture but did consider the participation of agriculture in a carbon economy.

Conduct of the inquiry

The Committee sought written submissions through advertisements in Northern Territory newspapers. Four written submissions were received. Appendix C provides a list of the written submissions received. Six public hearings were held. Appendix D lists the oral submissions received during public hearings.

The Report

Chapter one is a brief introduction to the issues covered by the Committee. Chapter two gives an overview of the agricultural industry in the Northern Territory, its current level of production, contribution to the Territory's economy, extent and potential for further development. Chapter three looks at the key environmental factors of relevance to sustainable agricultural development. Chapter four discusses the recurring issues raised during the inquiry that affect the Territory's capacity to progress environmentally sustainable agriculture. Chapter five considers the important role of government to support the Territory's capacity to progress environmentally sustainable agriculture. Chapter six summarises the Committee findings.

1. INTRODUCTION

Agriculture is a developing industry in the Northern Territory (NT). In 2000, it produced $250 million. In 2009-10, agriculture, forestry and fisheries production was approximately $548 million.[2] There has been a significant growth of the industry in some areas, for example, horticulture has grown by 13.6% to $99.3 million in the past five years[3] and significant untapped potential has been identified in others.

Agriculture fulfils a range of very important roles from providing food and fibres, to contributing to regional economies, to the flow on impacts and interactions with other sectors in human communities. Concerns about declining natural resources and the threats on global food security have raised the need for all industries, including agriculture to better manage existing natural resources.[4] The issues include:

- increasing world-wide declines of growth in agricultural productivity;
- increasing demand for agricultural products;
- increasing costs of agricultural production;
- competition for limited natural resources;
- changes in climate affecting production;
- investment decline in agricultural research, development and extension; and
- increasing land degradation.[5]

The Committee found that agricultural producers must be central to the management of the environment. Sustaining the land they manage is essential not only for their own livelihoods but for others both now and in the future, who are dependant on a healthy environment. As the Department of Regional Development, Primary Industry, Fisheries and Resources (DRDPIFR) explained to the Committee, how farmers and pastoralists manage land and water will determine the health and long-term productive capacity of natural resources to sustain communities, people and the natural environment.[6]

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[2] Northern Territory Government, 'Budget 2010-11, Budget Overview', http://www.budget.nt.gov.au/papers/econ_over/econ_overview.pdf, at 13 December 2010
[3] Northern Territory Economy, Budget 2010-11, p 129
[4] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[5] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[6] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008

Environmental sustainability is vital to ensure that agriculture as an industry can continue into the future and that high environmental values are preserved. The challenge of addressing new and emerging issues such as climate change and increasing populations in Indigenous remote and rural communities will provide new opportunities for agriculture, such as carbon capture and storage and the development of potential agricultural production to contribute to Indigenous economic and social development.

Progressing sustainable agriculture development must be based on sustainable development principles. The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) sets out the following principles for ecologically sustainable development:

> (a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;
> (b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;
> (c) the principle of inter-generational equity--that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;
> (d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;
> (e) improved valuation, pricing and incentive mechanisms should be promoted.[7]

The Australian National Strategy for Ecologically Sustainable Development defines ecological sustainable development as:

> development which aims to meet the needs of Australians today, while conserving our ecosystems for the benefit of future generations. To do this, we need to develop ways of using those environmental resources which form the basis of our economy in a way which maintains and, where possible, improves their range, variety and quality. At the same

[7] *Environment Protection and Biodiversity Conservation Act 1999* (Cth), Sect 3a

time we need to utilise those resources to develop industry and generate employment.[8]

The Northern Territory's Environment Protection Authority (EPA) provided the Committee with a set of principles of ecologically sustainable development that refers specifically to the following characteristics of the Territory:

- relatively intact natural environment that is recognised nationally and internationally for its significance;
- population identifying the unique natural environment as a significant element to the Northern Territory identity;
- small population spread across a large geographic area and where Indigenous people living in regional areas make up approximately one third of the population;
- economy which is dependent upon a limited diversity of development types (resource extraction, tourism, pastoral activity and the public sector).[9]

The EPA's six principles of ecologically sustainable development are:

1. Ecologically sustainable development is necessary to support a strong, diversified and healthy Northern Territory society;
2. The nature dependent Northern Territory identity is to be protected and promoted;
3. Equity and social cohesion are intrinsic to how the Northern Territory operates;
4. The public sector must lead in the advocacy and enactment of ecologically sustainable development;
5. The Northern Territory community and business are key partners in ecologically sustainable development; and
6. Acknowledging and addressing regional circumstances is required to achieve ecologically sustainable development in the Northern Territory[10]

DRDPIFR gave the Committee the following definition of sustainable agriculture:

[8] Australian Government, 1992, 'National Strategy for Ecological Sustainable Development', http://www.environment.gov.au/about/esd/publications/strategy/intro.html#WIESD, at 3 December 2010
[9] Submission No. 4, Environment Protection Authority of the NT, 10 August 2009, p1
[10] Submission No. 4, Environment Protection Authority of the NT, 10 August 2009, p2

Sustainable agriculture is the use of farming practices and systems which maintain or enhance:

- economic viability of agricultural production;
- the natural resource base; and
- other ecosystems which are influenced by agricultural activities.

The definition has five principles:

1. farm productivity is sustained or enhanced over the longer term;
2. adverse impact on the natural resources base of agriculture and associated ecosystems are ameliorated, minimised or avoided;
3. residues resulting from the use of chemicals in agriculture are minimised;
4. the net social benefit derived from agriculture is maximised; and
5. farm systems are sufficiently flexible to manage risks associated with vagaries of climate and markets.[11]

In reference specifically to horticulture, the NT Horticultural Association (NTHA) defined ecologically sustainability development for horticulture as 'farming systems that are capable of maintaining their productivity and usefulness to society indefinitely'.[12] The NTHA provided the Committee with the following framework for ecologically sustainable development for horticulture:

- Conserves natural resources;
- Social/culturally supportive;
- Commercially competitive; and
- Environmentally sound[13]

The Committee found that on the whole, the agricultural industry in the NT understood the importance of environmental sustainability for the protection of natural resources and long-term viability of their industry. The Committee also found that the agriculture industry, particularly the horticultural sector, is open to considering changed practices to production and sees better environmental practices as opportunities to grow their industries. The Committee also found

[11] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources, p 4
[12] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association
[13] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association

that across agricultural industries, participants have been effective in finding markets and utilising new technologies.

Despite the level of growth in understanding and recognition of environmental sustainability across the range of agricultural sectors, the Committee acknowledged that governments have an important role in providing services that embrace and encourage the sustainable development of agriculture and ensure that the regulatory framework is effective without imposing unnecessary burdens and barriers. Further research and data collection is required to comprehend the full extent of potential for development as well as address the unique challenges of Wet-Dry farming in the Top End and arid farming in the Central Australia region.

Management of soil and water and the impacts of climate change present a range of challenges for governments and producers alike. Research and data collection needs to continue to support decisions that best meet the needs of the environment and a sustainable agricultural industry. Government must continue to ensure that the best information on how to improve sustainability is available to producers. The Committee also found that the Government needs to ensure that the regulatory environment meets the needs of a dynamic industry and the environment.

2. INDUSTRY OVERVIEW

The first part of this chapter provides an overview of the current state of the agricultural industry in the Territory including plant industries and pastoralism. It then examines the potential for the development of these industries.

Current

In addition to its own population, Australia's farms feed over 50 million people in other parts of the world.[14] If the level of land degradation continues at its current rate, it has been projected that by 2050 the world will need to produce twice as much food from fewer resources and of declining quality.[15] The impacts of climate change will add more pressure on soil and water for the production of food and fibre. If food producing resources are diverted to producing energy to deal with climate change, then the resource base for food production will decline further.[16] The North Australia Land and Water Taskforce (NALWTF) acknowledged the limits to available water and suitable soils for the sustainable development of Northern Australia.[17] The NALWT believes that further development of the region has to be smart and build on the region's unique attributes.[18]

A Senate Committee inquiry into food production in Australia found that Governments around the world have to begin planning for the food needs of their populations into the long-term future.[19] The Senate Committee also found that Australia's governments have to seriously consider the mechanisms for protecting the most fertile agricultural land to ensure Australia's long-term productive capacity and food security.[20] Referring to the Senate Committee

[14] Gliessman, S.R. & Rosemeyer, M., (eds), 2010, 'The Conversion to Sustainable Agriculture - Principles, Process and Practices', CRC Press, Florida USA, Ch 14, p317 - 342
[15] O'Gara, F., 2010, 'Striking the Balance: Conservation Farming and Grazing Systems for the Semi-arid Tropics of the Northern Territory' 2nd ed, NT Government
[16] O'Gara, F., 2010, 'Striking the Balance: Conservation Farming and Grazing Systems for the Semi-arid Tropics of the Northern Territory' 2nd ed, NT Government
[17] North Australia Land and Water Taskforce, 2009, 'Sustainable Development of Northern Australia', http://www.nalwt.gov.au/files/NLAW.pdf, at 27 January 2011, p3
[18] North Australia Land and Water Taskforce, 2009, 'Sustainable Development of Northern Australia', http://www.nalwt.gov.au/files/NLAW.pdf, at 27 January 2011, p3
[19] Parliament of Australia, Senate Select Committee on Agricultural and Related Industries, August 2010, 'Food production in Australia' http://www.aph.gov.au/Senate/committee/agric_ctte/food_production/report/report.pdf, at 28 January 2011
[20] Parliament of Australia, Senate Select Committee on Agricultural and Related Industries, August 2010, 'Food production in Australia' http://www.aph.gov.au/Senate/committee/agric_ctte/food_production/report/report.pdf, at 28 January 2011

findings, the NT Agricultural Association (NTAgA) focussed on the need for sustainable development stating:

> I agree with the report: we are not going to be the food bowl of Asia or Australia. But what I am saying is that we have resources to develop here and develop sustainably and contribute. I mean, we are all consumers.
>
> Really I think it is unfair on the rest of Australia for us to sit up here and criticise and say: 'We want to drink wine, we want to eat pasta, we want to eat bread, we want to eat beef' and get it all from southern Australia.
>
> We have got resources, we have got soil - in limited abundance, if I can put it that way, in limited quantities - and they should be developed sustainably and sensibly and certainly I have got the report here and anyone that has been up in the Territory for any length of time knows that the Territory is not going to be the food bowl of Asia. But that does not say that we cannot contribute, and that is where I am coming from and our association, and the people out there that are working from 6 am to 6 pm. There are more people that can contribute and use our resources wisely.[21]

Speaking about the idea of the North Australia region becoming the nation's food bowl, the NTHA said to the Committee:

> I felt the need to acknowledge the concept of the 'Northern Food Bowl' because it is appearing increasingly in the media. This is the concept that we are going to expand our agricultural industry, essentially to feed the nation. The researchers are warning us that this is not a reasonable expectation and certainly key players in our industry have known that for a long time. This is not, however, to say that greater production outcomes are not possible in the NT. Producing food locally to whatever extent the broader environment allows it is the most sustainable long term model, so we should be endeavouring to expand our industry within the context of concern about environmental impacts. Furthermore, in the context of local and global concerns about food production and food availability; I think there is an onus on us to do so,

[21] Committee Hansard, Public Hearing, 22 February 2010, Northern Territory Agricultural Association Incorporated, p6

> I think it is more important than ever that we explore opportunities for growth in the NT sector. As I said, the underpinning issue should always be an acknowledgement that development should be sustainable.[22]

The Committee heard from DRDPIFR that since the 1980s the agriculture industry has changed dramatically in its recognition of and responsibility for sustainable production and become actively involved in the supporting its principles. DRDPIFR believes that the industry is now aware of the need to embrace environmentally sustainable production to protect the natural resources upon which they depend and to remain economically viable.[23]

Agriculture

Agriculture makes an important contribution to the Territory economy and in supporting the livelihoods of Territorians, especially in regional and remote areas. The industry contributes around 2% of the State Product[24] and employs 2-3% of the Territory's workforce.[25]

The agricultural industry in NT economy comprises the plant industries from horticulture, cropping and forestry and the pastoral industry which is dominated by cattle but also includes farmed buffalo, deer and goats.[26] There has been growing interest in goat production in the NT reflecting the growth in world wide demand for goat products. Australia is the world's largest exporter of goat meat, the most widely consumed meat in the world.[27]

In the NT, there are no large commercial poultry farms. Most flocks are for household supplies.[28] The sale of eggs in the Territory is not regulated, but

[22] Committee Hansard, Public Hearing, 16 October 2009, NT Horticultural Association, p6
[23] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[24] The NT Cattlemen's Association puts the figure at 4.6% of Gross State Product to the Committee. Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[25] Submission No. 4, Environment Protection Authority of the NT, 10 August 2009
[26] Department of Resources - Primary Industry, 'Animal Health Services, Biosecurity & Product Integrity, Deer', http://www.nt.gov.au/d/Primary_Industry/index.cfm?newscat1=&newscat2=&header=Deer, at 27 January 2011
[27] Department of Resources - Primary Industry, 'Animal Health Services, Biosecurity & Product Integrity, Goats', http://www.nt.gov.au/d/Primary_Industry/index.cfm?newscat1=&newscat2=&header=Goats, at 27 January 2011
[28] Department of Resources - Primary Industry, 'Animal Health Services, Biosecurity & Product Integrity, Poultry',

information for keeping a small poultry flock in the Top End, including egg care and storage, is provided by the Department.[29] There are no commercial pig farms in the NT but there are a number of hobby producers.[30] Crocodiles are farmed in the NT for their eggs, skin and meat, and their feet and teeth are also sold. There are seven commercially operated crocodile farms in the NT.[31]

Camels are a significant feral pest in the NT and can be found on approximately 40% of the land mass. In Australia feral camels number in excess of 1 million and are capable of doubling their population every nine years. Management of camels includes wild harvest for commercial sale. Since 1993, a small industry has existed in the NT from wild harvest and live export of feral camels. The annual rate of wild harvest is fewer that 2,000 animals. This is having little effect on numbers which continue to increase. Demand in the live export market fluctuates depending on the size and sex of the animals required at particular times of the year. More recently, feral camels have been processed for domestic meat markets. An abattoir designed to handle camels could have the potential to open up new markets.[32]

The Committee was informed that, with the exception of small areas of Howard Springs and Humpty Doo, a mosaic pattern of agricultural production has naturally developed in the NT in keeping with the natural patchwork of landscape types that exists. It was explained to the Committee by the NTHA that this pattern of agricultural establishment is best practice for maintaining healthy ecological systems.[33] This is supported by the NALWTF, which stated that:

http://www.nt.gov.au/d/Primary_Industry/index.cfm?newscat1=&newscat2=&header=Poultry, at 27 January 2011

[29] http://www.nt.gov.au/d/Primary_Industry/index.cfm?newscat1=&newscat2=&header=Poultry, at 25 February 2011

[30] Department of Resources - Primary Industry, 'Animal Health Services, Biosecurity & Product Integrity, Pigs', http://www.nt.gov.au/d/Primary_Industry/index.cfm?newscat1=&newscat2=&header=Pigs, at 27 January 2011

[31] Department of Resources - Primary Industry, 'Animal Health Services, Biosecurity & Product Integrity, Crocodiles', http://www.nt.gov.au/d/Primary_Industry/index.cfm?newscat1=&newscat2=&header=Crocodile, at 27 January 2011

[32] Department of Natural Resources, Environment and the Arts and Sport, 'Feral Animals of the Northern Territory, Feral Camel - *Camelus dromedarius*', http://www.nt.gov.au/nreta/wildlife/animals/feral/camel.html, at 27 January 2011

[33] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association

> Mosaic agriculture has been identified as an appropriate model for new agriculture in northern Australia that warrants further consideration.[34]

The Northern Territory Agricultural Association told the Committee that the current high prices of land discourage young entrants to agriculture:

> In Katherine 700 acres was being sold for $1.5m. You can buy a big station down in Queensland or northern New South Wales for $1.5m. You are not going to make a living out of 700 acres of cattle.[35]

One of the findings of the Senate Committee inquiry into food production in Australia supported the observations of the NTAgA that high land prices are making it difficult for potential young farmers to enter the industry.[36]

Plant Industries - Horticulture, Cropping and Forestry

The NT horticultural industry operates right across the NT with the vast majority of value and effort occurring north of Mataranka.[37] The Committee learnt that the NT horticultural industry produces over $160 million per annum, from over 630 horticultural businesses and employs 4,100 full time and seasonal employees. Along with the flow-on business it generates, the horticultural industry is a significant contributor to the NT economy.[38] Over the last 20 years its contribution has doubled and is expected to increase in the future.[39] Incredible growth in the industry was seen between 1980 and 2000 with the industry doubling every five years.[40] DRDPIFR explained that in the last five to seven years, growth has somewhat plateaued.[41] The Arid Zone Research Institute (AZRI) places the farm gate value of horticultural production in the Territory at $224 million with grains and fodder at $38 million.[42]

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[34] North Australia Land and Water Taskforce, 2009, 'Sustainable Development of Northern Australia', http://www.nalwt.gov.au/files/NLAW.pdf, at 27 January 2011, p3
[35] Committee Hansard, Public Hearing, 22 February 2010, Northern Territory Agricultural Association Incorporated, p7
[36] Parliament of Australia, Senate Select Committee on Agricultural and Related Industries, August 2010, 'Food production in Australia' http://www.aph.gov.au/Senate/committee/agric_ctte/food_production/report/report.pdf, at 28 January 2011
[37] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[38] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'
[39] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[40] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[41] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[42] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute

NT horticulture represents 1% of national production. Mangoes grown in the NT represent 30% of national production, bringing in approximately $36.3 million to the Territory. Melons in the NT make up 7% of national production making approximately $11.6 million.[43]

Production of crops, forestry and other horticulture is concentrated in five areas: rural Darwin, Douglas Daly, Katherine region, Ti Tree areas and Central Australia.[44] The Darwin region accounts for the majority of production, followed by Katherine, then Ti Tree and Central Australia and then the Douglas Daly region.[45]

Horticulture in the NT is concentrated in small pockets of suitable land which is often surrounded by natural bushland. This provides corridors for wildlife as well as feral pests. The Darwin region is able to produce a variety of fruit, vegetables, ornamentals as well as pasture, field and fodder crops. The Katherine region produces fruit, curcubits (cucumber family), peanuts and grain, as well as pasture, field and fodder crops. The Douglas Daly produces pasture, field and fodder crops. Central Australia produces fruit, vegetables, and pasture, field and fodder crops.[46]

Forestry is conducted over 30,970 hectares (ha) in the NT: in the Darwin region, Tiwi Islands, Katherine region and the Douglas Daly.[47] Forestry is a growing industry in the NT. The Committee heard that figures for horticultural production do not include forestry because as yet nothing has been produced off the 30,970 ha.[48]

Most horticultural production and harvesting occurs in the Dry Season from May to November. This includes vegetable crops, melons and bananas. The Top End is able to produce summer vegetables and bananas throughout the Dry when southern States are not able to. Bananas and rambutan can also be harvested through the Wet Season. Production of mangoes, melons and

[43] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association
[44] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[45] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[46] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[47] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[48] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources

bananas are the most labour intensive. In the Top End, September, October and November are the busiest harvesting months.[49]

Of all the horticultural crops, the production of mangoes is the most valuable, producing $46.1 million in 2009.[50] The harvest of mangoes in Darwin occurs slightly earlier than in Katherine, therefore spreading demand for labour and transport across both regions. Occasionally there is overlap. Shortages of labour have been reported at the height of the mango season.[51]

The production of melons in 2009 increased by 33% to $24.4 million as a result of large plantings in Darwin, Katherine and Tennant Creek regions.[52]

In the Top End, grain, hay and fodder production occurs over the Wet Season and mechanical harvesting occurs at the start of the Dry in April and May.[53]

In Katherine, peanuts and grain are harvested mechanically at the end of the Dry in October.[54]

The arid zone specialises in table grapes which are harvested from November to January.[55] Olives are grown on a property south of Alice Springs.[56] Lettuce is grown in Alice Springs.[57] The Committee learnt that some table grape growers are beginning to diversify into pomegranates, cabbages and cauliflowers.[58]

The horticultural industry in the NT has the following strengths which can be capitalised on to progress environmentally sustainable agricultural production:

[49] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[50] Northern Territory Government, 'Budget 2010-11, Budget Overview', http://www.budget.nt.gov.au/papers/econ_over/econ_overview.pdf, at 13 December 2010
[51] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[52] Northern Territory Government, 'Budget 2010-11, Budget Overview', http://www.budget.nt.gov.au/papers/econ_over/econ_overview.pdf, at 13 December 2010
[53] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[54] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[55] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[56] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[57] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[58] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute

- There are a number of valuable and productive grower networks and associations such as Katherine Water Advisory Committee and Katherine Best Practice Group.
- Water use in the industry is generally considered to be efficient.
- The industry is young and small and therefore any negative impacts on the environment have not been sustained over a long period of time and it is possible for the industry to change and repair as well as learn from the mistakes of the States.
- Overall, there are a number of younger participants and therefore possibly more open to environmental management systems messages and implementing change.
- There is some evidence of the increasing use of Integrated Pest Management (IPM) in the industry.
- There is noted increase in the use of more sustainable practices.
- The mosaic nature of farm locations means reduced environmental impact, including from buffer zones of vegetation in between properties.
- Farming is restricted to certain areas and therefore communication between properties is easier.
- Use of peat in some areas in Katherine.
- Willingness of growers to work together and learn from each other.
- There is currently a relatively stable and predictable climate.
- There is growing national recognition of the role and potential of NT horticulture.
- There is less potential for urban encroachment into valuable production areas.
- There is a biosecurity advantage from the industry's relative isolation which can be a barrier against incursions.[59]

Against the strengths are a number of NT and industry specific challenges, including:

- There is very limited marketing and that which occurs is uncoordinated.
- There are long distances to major wholesale markets in Sydney, Brisbane and Melbourne.
- High costs of goods such as fertilisers due primarily to high transport costs.
- Cost of managing weeds.
- Due to the proximity of bushland near properties managing native and feral animal populations can be difficult.

[59] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'

- Poor biosecurity practices being used.
- Biosecurity risk from its regional location and trade internationally.
- Low (but growing) awareness of natural resource management and related issues.
- Increasing population of growers from non-English speaking backgrounds who are disengaged from the wider community and therefore unable to access opportunities.
- Disagreements between water values for horticulture and urban living.
- Overall poor soil quality.
- Poor water quality in some areas.[60]

The Committee heard from AZRI that one of the biggest challenges of farming in Central Australia is the intensity of high temperatures on crops. Growers have found ways to adapt their practices, such as growing lettuces hydroponically and under shade cloth. AZRI informed the Committee that it might be possible to integrate greenhouse technology with solar technology to cool greenhouses.[61]

To address the issues associated with the growing number of growers from non-English speaking backgrounds, particularly in communication, the NTHA engages private training providers and works with Charles Darwin University (CDU) to deliver training through the Smart Train[62] system and the ChemCert[63] program respectively. The training also informs and engages growers who are not members of the Association or operating in isolation about best practice horticulture and land management as well as good business practice.[64]

The Committee heard from the DRDPIFR that although the horticultural industry is playing catch-up in regards to sustainability, environmental sustainability is a key issue for the industry and it has embraced the need to develop through more environmentally sustainable practices.[65]

[60] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'
[61] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[62] An education program that provides nationally recognised training in the use of agricultural and veterinary chemicals. SmartTrain http://www.smarttrain-publications.com/index.html, at 28 February 2011
[63] Industry standard training in chemical risk management. ChemCert Australia, http://www.chemcert.org.au/, at 28 February 2011
[64] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association
[65] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources

Plant Industries on Indigenous Land - Current

There are few commercial-scale enterprises of horticulture, crops and forestry on Aboriginal owned land in the NT. There are several small scale community market gardens and nurseries in remote communities that produce fruit and vegetables for local markets. Production activity in the small scale ventures is mostly periodic and therefore there is no current data available.[66] The Indigenous sector of horticulture, crops and forestry is small and there is no data available for value or volumes.[67]

One example of small scale Indigenous enterprise is the Bawinanga Aboriginal Corporation Nursery. The nursery is operated by local women. Native plants are propagated from seeds and cuttings taken from the bush. Vegetables, herbs and flowers are also grown from commercially bought seed. Fruit is also grown, including coconuts, limes, mangoes, passionfruit and bananas. The nursery supplies the Ye' Ya Community Development and Employment Projects (CDEP) for local landscaping contracts and occasionally sells to nearby communities of Ramingining and Milingimbi. Locally harvested cycads and *Corpya* palm seeds have a market in Darwin.[68]

There are two major commercial operations occurring on Aboriginal owned land. The first is the Desert Springs Melon Farm at Ali Curung on land held in trust by Warrabi Aboriginal Land Trust. This is the first commercial horticulture enterprise on Aboriginal land through Centrefarm Aboriginal Horticulture Limited (Centrefarm).[69] Desert Springs Melon Farm is on a 1,000 ha property with two tenures established for PMG Agriculture to grow watermelons. One is a 90 year licence for the operation. The other is a 40 year sublease of the land. The first harvest from 30 ha was in May 2008. It is envisaged that 400 ha will be developed over five years.[70] Yields of up to 5,000 tonnes are expected in the 2010-11 season and due to the impacts of high rainfall on production in eastern States, Desert Springs Melon Farm watermelons are expected to fetch

[66] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[67] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[68] Bawinanga Aboriginal Corporation, 'BAC Nursery', http://www.bawinanga.com.au/cdep/bacnursery.htm, at 14 December 2010
[69] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[70] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008

up to $1,000 a tonne.[71] At November 2009, Centrefarm estimated that the watermelons were producing approximately $70,000 per ha.[72]

Centrefarm is a non-profit company established in 2002 by Aboriginal landowners in Central Australia and the Central Land Council (CLC) to progress horticulture on Aboriginal land, Aboriginal Land Trust properties, other properties and areas owned or part-owned by Aboriginal interests such as the Pine Hill 'B' property previously under an Indigenous Land Use Agreement (ILUA).[73] [74] The Committee learnt that under the Centrefarm model, Aboriginal land is leased to a private organisation for a significant period for the purpose of developing a horticultural enterprise. The traditional land owners are remunerated through land rentals paid to a company established in the name of the traditional owners to receive the payments. The payments are held in trust and Centrefarm manages the payments on behalf of the traditional owners. A small part of the funds is used for community development but the rest is held in trust with the view to buying out the operator in the future. Centrefarm explained to the Committee that licences to operate were preferable to leases but that the financial sector did not recognise licences to operate to be of the same value. Centrefarm explained that licences gave private organisations greater flexibility to develop the land for their enterprises than leases which can require lengthy negotiations to approve an activity. Also under the Centrefarm model, the Committee learnt that if for example a bore is drilled, the Aboriginal company owns the bore not the operator but the operator has a right to use the water from the bore under the rental agreement.[75]

There are 33 locations in Central Australia identified for horticultural development. The Committee heard that based on its experiences, Centrefarm has developed a template to facilitate the process of establishing an enterprise under its model which covers negotiations and understanding relevant NT and federal laws, particularly for approval processes. The Committee heard that Centrefarm plans to develop at least two new farms a year and increase this amount in due course as other traditional owners have expressed interest in developing commercial farms on their land. Many traditional owners and communities in Central Australia have asked Centrefarm to set up community

[71] ABC Country Hour, 7 December 2010, 'NT melons take advantage of good early season prices http://www.abc.net.au/rural/nt/content/201012/s3086987.htm, at 14 December 2010
[72] Public Hearing, 27 November 2009, Centrefarm Aboriginal Horticulture Ltd
[73] Centrefarm Aboriginal Horticulture Limited, 'What is Centrefarm', http://www.centrefarm.com/10-history-centrefarm.html, at 14 December 2010
[74] Public Hearing, 27 November 2009, Centrefarm Aboriginal Horticulture Ltd
[75] Public Hearing, 27 November 2009, Centrefarm Aboriginal Horticulture Ltd

farms next to their communities to produce fresh fruit and vegetables for their community stores as well as provide employment for young people. The Committee heard that Centrefarm uses horticultural and environmental best practice.[76] Centrefarm has established monitoring systems such as a method to check that leachates via irrigation water are not polluting aquifers. This system, the Committee was told, doubles as a mechanism to maximise water use to grow more crops with the same unit of water. Other monitoring systems check water temperature and water quality. The data collected will support the identified needs of production and the Aboriginal owners for the long-term sustainability of the resources so the properties can be managed to best practice. The Committee was also advised that Centrefarm works closely with traditional owners and the CLC to ensure the protection of significant and other cultural sites.[77]

The second commercial operation occurring on Aboriginal land has so far not delivered any of the benefits anticipated by the people involved. The Tiwi Islands Forestry Project (TIFP) was a partnership between Great Southern Ltd (GSL) (formerly Sylvatech and before that Australian Plantation Group Pty Ltd). The project was a forestry Managed Investment Scheme operating under a set of complex contracts and company arrangements established to deliver the project.[78] The project was approved under the EPBC Act 1999. Approval for the clearing of land for the project by a NT authority was not required under NT legislation.[79]

The forestry plantations on Melville Island employed 11 Tiwi Islanders as forestry workers, 12 apprentices and eight full-time trainee rangers on plantations covering 30,000 ha.[80] In 2007, GSL was found and admitted to breaching conditions of the project under the EPBC Act, including failing to prevent the plantation species establishing in surrounding protected rainforest and wetland areas. An agreed settlement was reached between GSL and the

[76] Public Hearing, 27 November 2009, Centrefarm Aboriginal Horticulture Ltd
[77] Public Hearing, 27 November 2009, Centrefarm Aboriginal Horticulture Ltd
[78] Parliament of Australia, Senate Environment, Communications and the Arts Committee, 29 October 2009, 'Report of the Inquiry into Forestry and mining operations on the Tiwi Islands', http://www.aph.gov.au/Senate/committee/eca_ctte/tiwi_islands/report/index.htm, at 14 December 2010
[79] Parliament of Australia, Senate Environment, Communications and the Arts Committee, 29 October 2009, 'Report of the Inquiry into Forestry and mining operations on the Tiwi Islands', http://www.aph.gov.au/Senate/committee/eca_ctte/tiwi_islands/report/index.htm, at 14 December 2010, p12
[80] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008

Commonwealth Department of Environment Water, Heritage and the Arts. GSL also agreed to rehabilitate the affected areas.[81]

In 2009, GSL entered voluntary administration and by October 2009, the Tiwi Land Council had terminated the leases. By January 2010 the receivers for GSL had applied for insolvency.[82] The plantations were projected to be ready for harvest by 2012-13. A Senate Committee inquiry into the forestry operations on the Tiwi Islands found that poor quality wild seeds were used so seedlings failed to produce the level of growth promised.[83] More than 4,000 investors were involved in the plantations under GSL and these investors are now suing the Tiwi Land Council for terminating their leases. This could have implications for future investment particularly for certainty of tenure for private enterprises to operate on Aboriginal owned land.[84]

There are many lessons that must be learnt from the example of the Tiwi Islands Forestry Project before the model can be considered for other projects on Aboriginal owned land. The Tiwi Island plantations may yet produce the desired economic benefits for the Tiwi Islanders if their determination and drive to succeed is any measure. The Senate Committee in 2009 found that there was dissent and concern amongst Tiwi people about the approval processes for the project and the extent and distribution of benefits to the communities. This combined with the substantive matters relating to the terms of the project as well as misunderstandings and miscommunications during project delivery were likely factors involved in the collapse of the project.[85]

Pastoralism

The pastoral industry contributes greatly to regional economies, providing approximately 1,600 jobs directly in rural areas as well as contributing millions

[81] Parliament of Australia, Senate Environment, Communications and the Arts Committee, 29 October 2009, 'Report of the Inquiry into Forestry and mining operations on the Tiwi Islands', http://www.aph.gov.au/Senate/committee/eca_ctte/tiwi_islands/report/index.htm, at 14 December 2010
[82] Northern Territory News, 20 January 2010, 'Two Tiwi Forestry Projects Insolvent' http://www.ntnews.com.au/article/2010/01/20/117321_nt-business.html, at 14 December 2010
[83] Parliament of Australia, Senate Environment, Communications and the Arts Committee, 29 October 2009, 'Report of the Inquiry into Forestry and mining operations on the Tiwi Islands', http://www.aph.gov.au/Senate/committee/eca_ctte/tiwi_islands/report/index.htm, at 14 December 2010
[84] ABC Northern Territory Stateline, 26 November 2010, 'Tiwi Woodchip Plantations' http://www.abc.net.au/news/video/2010/11/26/3078041.htm, at 14 December 2010
[85] Parliament of Australia, Senate Environment, Communications and the Arts Committee, 29 October 2009, 'Report of the Inquiry into Forestry and mining operations on the Tiwi Islands', http://www.aph.gov.au/Senate/committee/eca_ctte/tiwi_islands/report/index.htm, at 14 December 2010

indirectly through the purchase of goods and services and through the expenditure of salaries in the local economy.[86] The industry also has an important place in the history of the NT and continues to be a big part of its social character and make-up.[87]

Pastoralism in the NT uses 55% of the Territory's land,[88] approximately 606,000 km^2 [89] [90] and includes pastoral leases and Aboriginal owned land.[91] The industry is primarily based on breeding and turning off young cattle for live export or fattening locally or elsewhere in Australia.[92] Attempts at raising sheep were unsuccessful due to climate and other factors.[93] Buffalo is farmed in small areas on the northern floodplains.[94]

The Committee heard from DRDPIFR that the live export trade in North Australia is successful because Australia breeds cattle very effectively. South-east Asia can fatten cattle very inexpensively and create a large number of by-products from the cattle it receives so the relationship is complementary.[95]

Of the agricultural, forestry and fisheries sectors, the cattle industry is the largest contributor to the Territory economy contributing approximately 50.7% of total production in 2009-10.[96] In 2009-10 cattle production increased by 5% from the previous year with approximately 536,000 cattle turned off to market. This increase was attributed to the recovery from the drought of recent years.[97]

[86] Department of Resources (formerly Department of Regional Development, Primary Industry, Fisheries and Resources), undated, 'Northern Territory Pastoral Industry', Brochure, http://www.nt.gov.au/d/Content/File/p/Anim_Man/NT_Pastoral_Industry_2008.pdf, at 9 December 2010
[87] Department of Natural Resources, Environment, the Arts and Sport, 'Pastoral Land Use', http://www.nt.gov.au/nreta/wildlife/programs/threats/pastorallanduse.html, at 8 December 2010
[88] Department of Natural Resources, Environment, the Arts and Sport, 'Pastoral Land Use', http://www.nt.gov.au/nreta/wildlife/programs/threats/pastorallanduse.html, at 8 December 2010
[89] NT Pastoral Land Board, 'Annual Report 2007-2008', http://www.nt.gov.au/nreta/natres/rangeland/pdf/pblannualreport_0708.pdf, at 9 December 2010
[90] The NT Cattlemen's Association put to the Committee the figure of 620,000 km² of the NT or 44% of the land mass. Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[91] Department of Natural Resources, Environment, the Arts and Sport, 'Pastoral Land Use', http://www.nt.gov.au/nreta/wildlife/programs/threats/pastorallanduse.html, at 8 December 2010
[92] Department of Natural Resources, Environment, the Arts and Sport, 'Pastoral Land Use', http://www.nt.gov.au/nreta/wildlife/programs/threats/pastorallanduse.html, at 8 December 2010
[93] Department of Natural Resources, Environment, the Arts and Sport, 'Pastoral Land Use', http://www.nt.gov.au/nreta/wildlife/programs/threats/pastorallanduse.html, at 8 December 2010
[94] Department of Natural Resources, Environment, the Arts and Sport, 'Pastoral Land Use', http://www.nt.gov.au/nreta/wildlife/programs/threats/pastorallanduse.html, at 8 December 2010
[95] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[96] Northern Territory Government, 'Budget 2010-11, Budget Overview', http://www.budget.nt.gov.au/papers/econ_over/econ_overview.pdf, at 13 December 2010
[97] Northern Territory Government, 'Budget 2010-11, Budget Overview', http://www.budget.nt.gov.au/papers/econ_over/econ_overview.pdf, at 13 December 2010

The NT Cattlemen's Association estimates that the number of cattle in the NT is 2.1 million, annual turn-off is at 550,000 head, value of production is in the order of $370 million and 1,800 people are employed.[98] The NT Cattlemen's Association informed the Committee that over 300,000 cattle are exported annually into South-east Asia, of which 90% goes to Indonesia. Approximately 200,000 cattle are transported to Queensland, New South Wales and South Australia. The port of Darwin is the largest Australian port for live export and the second largest in the world, accounting for 50% of Australia's live exports. The NT supplies the Indonesian market because of the lack of cold chain refrigeration storage. At the time their evidence was received by the Committee, the NT Cattlemen's Association anticipated a doubling in the market to Indonesia in the future.[99]

The 2004 pastoral industry wide survey showed that the most common form of management of pastoral properties in the NT is by owner-managers. Private ownership accounted for 55% of stations in the NT. Company owned properties accounted for almost 25%. These figures varied between regions. Properties in Alice Springs and the Top End are mostly privately owned with 15% and 8% respectively being company owned. A greater proportion of properties in Katherine and the Barkly are company owned (50% and 30% respectively). Indigenous owned land made up 6% of ownership type (18,663 km^2.)[100]

The main markets for cattle are export at approximately 60% and abattoirs approximately 40%. Turn-off to market occurs between April and September.[101] The production value of the pastoral industry in the NT was approximately $190 million in 2000.[102] The value of the NT cattle industry was estimated at $212.9 million in 2007[103], representing 44% of the total output of the NT primary industry and fisheries sector.[104] The projected total for 2008 was approximately

[98] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[99] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[100] Department of Primary Industry, Fisheries and Mines, 2004, 'NT Wide Pastoral Industry Survey', http://www.ntca.org.au/_assets/04_PastoralSurvey.pdf, at 10 December 2010
[101] Department of Primary Industry, Fisheries and Mines, 2004, 'NT Wide Pastoral Industry Survey', http://www.ntca.org.au/_assets/04_PastoralSurvey.pdf, at 10 December 2010
[102] Department of Natural Resources, Environment, the Arts and Sport, 'Pastoral Land Use', http://www.nt.gov.au/nreta/wildlife/programs/threats/pastorallanduse.html, at 8 December 2010
[103] NT Pastoral Land Board, 'Annual Report 2007-2008', http://www.nt.gov.au/nreta/natres/rangeland/pdf/pblannualreport_0708.pdf, at 9 December 2010
[104] NT Cattlemen's Association, 'History: the NT Cattle Industry', http://www.ntca.org.au/our_industry/history.html, at 8 December 2010

$238 million.[105] As at 2008 demand was expected to be greater than supply and the danger of losing markets to interstate and overseas competitors was recognised by DRDPIFR.[106]

There are variations in industry structure by region due to climate, pasture type, size of property, ownership, infrastructure, system of production and associated land management issues.[107] As at 2008, 820,000 cattle were turned off to market of which 270,000 were live exports.[108] There are approximately 1.8 million cattle in the NT.[109] The breakdown of production value of the cattle industry in the NT by region is directly proportionate to the number of cattle in each region. In 2008, Katherine produced 40% of the Territory value, the Barkly-Tennant Creek region 30%, Central Australia 20% and the Top End 10%.[110]

Although alternative markets are constantly being explored, generally, the Top End and Katherine regions target the South-east Asia export market, predominantly with *Bos indicus* cattle. The Alice Springs region is oriented towards the southern domestic market with *Bos taurus* cattle. The Barkly-Tennant Creek region supplies crossbred cattle to Queensland's supply chains.[111]

The Committee learnt that there are several Indigenous pastoral properties in Central Australia.[112] AZRI has been working with seven of them in collaboration with the CLC and the Indigenous Land Corporation (ILC) to restore, replace and install new infrastructure such as fence lines, dams and watering areas to help control soil erosion and provide assistance to properties that are just establishing.[113]

[105] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[106] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[107] Department of Natural Resources, Environment, the Arts and Sport, 'Pastoral Land Use', http://www.nt.gov.au/nreta/wildlife/programs/threats/pastorallanduse.html, at 8 December 2010
[108] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[109] Department of Resources (formerly Department of Regional Development, Primary Industry, Fisheries and Resources), undated, 'Northern Territory Pastoral Industry', Brochure, http://www.nt.gov.au/d/Content/File/p/Anim_Man/NT_Pastoral_Industry_2008.pdf, at 9 December 2010
[110] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[111] Department of Primary Industry, Fisheries and Mines, 2004, 'NT Wide Pastoral Industry Survey', http://www.ntca.org.au/_assets/04_PastoralSurvey.pdf, at 11 December 2010, p10
[112] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[113] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute

Potential

Agriculture

The issues of food security, declining availability and health of natural resources and the need for more sustainable development has in a large part triggered the consideration of the potential for the NT to develop more environmentally sustainable food producing systems. The Committee heard that much of the national debate has been based around the idea that there is a large tract of undeveloped land and water in northern Australia that can be developed. All of the submissions received by the Committee commented on the possibilities and potential for further development but acknowledged that these possibilities are constrained by a number of natural limitations. The advice received from the DRDPIFR in relation to horticulture is that:

> the future will be smaller mosaics of intensive plant industry production based around pretty robust agronomic models.[114]

DRDPIFR also believed that to achieve growth in demand for Territory produce, growth of the industry must be part of the broader picture of community development and respond to challenges in achieving environmental sustainability.

The Committee found that the potential for further development of agriculture in the NT is dependent on:

- suitability and capacity of natural resources;
- industry willingness and capacity;
- market and economic drivers;
- government support for the industry and the market drivers; and
- sound environmental management including the management of invasive species and their impacts on agriculture.

Several submissions discussed the number of limitations to the further development of agriculture in the NT. The Committee found that broadly these limitations are:

- climatic limitations including drought;
- access to appropriate land and water; and

[114] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources

- proximity to infrastructure i.e. roads, energy and markets.[115]

DRDPIFR told the Committee that the Top End has considerable potential to expand its production with intensification but this would have to be undertaken alongside measures to ensure the protection of natural resources. DRDPIFR also told the Committee that the Katherine region, being a big supplier to the live export market, also has the potential to expand sustainably by 20%. Research conducted by DRDPIFR and the Department of Natural Resources, Environment, the Arts and Sport (NRETAS) on one land type in the Katherine area suggests that by increasing the use of the areas of available grass, biodiversity values can still be protected with a 20% expansion.[116] The Committee learnt that utilisation is based on fodder budgeting. DRDPIFR explained that fodder budgeting is calculated at the beginning of each year to achieve target weights for the class of stock based on pasture growth rates. Although these studies have only been conducted on one land type, DRDPIFR believes that the indicators for potential reflect the need for greater investment in infrastructure on property and a change in management practices towards environmentally sustainable production.[117]

DRDPIFR told the Committee that intensification has the potential to increase the total number of cattle and the number turned-off, in both the Barkly and Katherine regions by 35%.[118]

For Central Australia DRDPIFR told the Committee that owing to the limitations of climate, soil and water availability, intensification is not recommended. Instead, huge gains can be achieved through research and extension to support environmentally sustainable development.[119]

AZRI described the current approach to the development of agriculture in the NT as fragmented or mosaic, particularly in identifying access to land, water, roads, energy and markets.[120] AZRI stated that even with periods of substantial development, less than 1% of the NT is developed for agriculture.[121]

[115] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[116] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[117] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[118] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[119] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[120] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[121] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute

In Central Australia, recharging of the aquifers upon which irrigators rely occurs infrequently. However the AZRI told the Committee there are small areas around Alice Springs like Ti Tree where further development of agriculture is possible because there are good soils, aquifers and access to roads, transport and other infrastructure.[122] The AZRI pointed out that further development needs to be well planned and take into account potential increases in temperature and decreases in rainfall predicted to occur by 2030.[123]

The NT Cattlemen's Association spoke about the importance of succession planning to ensure that future generations in primary production have a sustainable and viable industry. Environmental resources will need to be managed well to sustain regional communities and economies.[124]

The planned development of the Douglas-Daly over the next five years will increase potential but it also highlights the need for strategies to ensure the protection of environmental values in the region. The Committee understands that the Draft Conservation Plan for the Daly Basin is in the final stages of approval before release.[125] The NTAgA advised that most producers in the area appreciate the need to protect biodiversity in conjunction with changing land use. The Association advised that currently, less than 50% of most properties in the region are cleared.[126]

The NTHA informed the Committee that large retail grocery stores are moving away from the model of produce being sent to central markets for distribution. This is increasing the range of locally grown fresh produce being sold in local stores. This trend creates opportunities for local growers to market directly to local stores.[127]

The Committee was also told that within pastoral properties there is land capable of growing crops but the *Pastoral Land Act* does not permit the use of land for this purpose. The NTHA gave the example of a cattle station in Alice Springs where a piece of the land was given an exemption to grow table grapes

[122] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[123] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[124] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[125] Department of Natural Resources, Environment and the Arts, 'Water Extraction' http://www.nt.gov.au/nreta/wildlife/programs/threats/water.html, at 14 January 2011
[126] Committee Hansard, Public Hearing, 22 February 2010, Northern Territory Agricultural Association Incorporated
[127] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association

and the property has successfully and profitably grown table grapes for many years.[128]

The Committee sought the advice of the NT Cattlemen's Association on how invasive pasture species that are highly valued by the cattle industry such as buffel grass in Central Australia, can be managed within ecologically sustainable development. The NT Cattlemen's Association explained that there would be strong resistance from the industry to eradication of such species and believes that priority for control and eradication should be given to invasive weed species with no economic value such as mimosa (*Mimosa pigra*) and bellyache bush (*Jatropha gossypiifolia*). Further, the Association advocates the controlled use of introduced pasture species such para grass (*Brachiaria mutica*) which can out compete invasive weeds such as *Mimosa pigra* as part of a control program on floodplains.[129]

AZRI advised the Committee that the extent of buffel grass (*Cenchrus ciliaris*) is so great that it will never be eradicated. The focus must be on management to reduce it out competing and displacing native species and increasing intensity of local fires.[130] AZRI informed the Committee that buffel grass has been shown to increase production on pastoral properties, however cattle grazed on diverse species do better than on a monoculture of any species. AZRI informed the Committee about one of their projects on grazing strategies taking place on Mt Riddock Station. The station owners and AZRI are working to demonstrate that species diversity can be achieved easily through controlled grazing and maintained inter-tussock space, which in turn can increase production.[131]

DRDPIFR informed the Committee that there has been significant consolidation in business numbers with smaller businesses leaving the industry and larger corporations taking up horticultural enterprises. DRDPIFR also stated that as technology is improving rapidly, especially with irrigation management and scheduling, the larger commercial operators are able to make use of these technologies. The Committee also heard that there are better varieties of the range of crops available now than 15 to 20 years ago, and there is better

[128] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association
[129] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[130] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[131] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute

understanding of whole-of-farm management, rotation farming and management of pests and diseases.[132]

The increased cost of fuels and the subsequent doubling of the cost of fertilisers have forced a shift towards biological farming practices for sustainability and for viability.[133]

DRDPIFR told the Committee that there is a great deal of interest in both irrigated and non-irrigated agriculture or plant industries particularly as drought continues to affect the southern parts of Australia. This has also seen the move of southern companies such as the Peanut Company of Australia and some forestry companies moving to the NT to diversify their production base and make use of the opportunities of water and land availability.[134]

Plant Industries - Horticulture, Cropping and Forestry

Plant industries are critical for regional economies, including providing semi-skilled jobs. Despite the rapid growth of plant industries in the NT over the last 10-20 years, there is still significant potential for further growth. In addition to the main regions of horticultural production, there are opportunities for horticultural development in Ali Curung, Elliot and other remote communities.[135] The NTHA expressed to the Committee that despite limitations from water resources and limited availability of suitable soil, opportunities for further development exist and the full extent of the NT food production capacity is still unknown.[136] AZRI believes that despite some setbacks with corporate entities, the value of forestry can increase over the medium to longer term.[137]

Opportunities must be developed on sustainability principles with adequate planning and support to ensure that natural resources and values are protected and the industry can continue in the future.[138] Strategic investment in sustainable agricultural systems will help to achieve this goal.[139] In the words of the NTHA:

[132] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[133] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[134] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[135] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[136] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[137] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[138] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[139] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009

> We certainly do not have plains of highly arable organic soils and we certainly do not have an unlimited water resource, but we do have resources. Another opportunity is that we can, as I said before, learn from mistakes in the past. I think that is really important. Because we are starting relatively early on in the process, we have a fairly young horticultural industry and we have the opportunity to plan for the future and get it right.[140]

The NTHA informed the Committee that the contribution of plant industries to the community is increasingly highlighted in the context of environmental pressures.[141] The Association told the Committee that the industry recognises the importance of public confidence in the conduct of agriculture in the use and management of natural resources. The Association believes that a positive perception of the industry, fostered through a strong relationship with the community, is important for further growth of the industry.[142]

The potential for further development in horticulture in the NT is affected by a number of challenges including:

- access to labour, which is seen as a critical constraint;
- high input costs for fuel and fertiliser;
- freight costs and availability;
- demonstrating sustainability;
- access to land and water;
- research and development;
- biosecurity threats from pests and diseases;
- access to markets;
- regulation – too hard for smaller producers;
- engagement of Indigenous people which has been identified as a critical opportunity;
- climate change impacts – positive and negative;
- investment attraction e.g. for the development of forestry;
- peri-urban encroachment; and
- limits on groundwater[143]

[140] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association
[141] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[142] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[143] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008

The NTHA highlighted three key requirements to developing appropriate sustainable horticultural strategies in the NT:

1. greater direction from the NT government in demonstrating their support to develop the Territory's horticultural industry;
2. greater long-term commitment through collaboration between producers, industry representatives and government to address the challenges of developing sustainable production systems suitable for NT conditions; and
3. increased investment in research, technology, infrastructure and skills development.[144]

Steps towards meeting the requirements proposed by the NTHA would include:

1. Investment in research that focuses on the Territory's unique environmental conditions and aims to fill critical gaps in knowledge, such as would be filled by a complete inventory and assessment of NT natural resources, and more understanding of Indigenous environmental knowledge;
2. Support and capacity building services that give producers the skills, knowledge and confidence to change to or manage complex agricultural production systems;
3. Efficiently implemented regulation to support environmentally sustainable practice; and
4. Improving market supply chains so as to reduce inefficient transportation of products and decrease greenhouse gas (GHG) emissions.[145]

The NT Sustainable Land Use Guidelines have been written to provide agriculturalists and land managers with ways to self assess their current practices against agricultural and environmental best practice. The guidelines are also designed to direct users in developing environmental management plans for their enterprises and towards achieving accreditation for their produce as environmentally sustainable.[146] The NTHA believes that accreditation must be backed up by science, and supported by practical assistance and effective regulation.[147]

[144] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[145] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[146] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[147] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009

Better collaboration with neighbouring jurisdictions in Australia and in the region to identify and develop opportunities and markets would also be beneficial. Government support for all these measures will help to drive any opportunities, their uptake and success, supporting Territory primary producers to embrace environmentally sustainable production.[148]

The Committee heard from the NTAgA that the development of the Ord River area offers great potential for agricultural development in the NT. This will depend largely on the economic development on the Western Australia (WA) side, particularly as services will be sourced from Kununurra.[149] The NTHA were concerned that the irrigation practices in the next stage of the Ord development include archaic channel systems which have high evaporation rates.[150]

The Committee learnt that research in Australia has concentrated on temperate and subtropical climate zones and that research and development on agriculture in wet/dry tropics and arid regions was limited.[151] Much of the knowledge and skills has been learnt through trial and error,[152] such as the attempt at growing rice in Humpty Doo in the late 1950 to 1960s.[153] Agricultural practices need to be supported by science and technological advances. Investment in research and development and involving primary producers in the processes can ensure that producers are connected to, and actively engaged in, the practical application of the results and outcomes.[154]

The Committee heard from the NTHA that adapting to climate change will urge the expansion of environmentally sustainable agriculture. Decreased rainfall in southern States and increased rainfall closer to the equator is predicted. Such dramatic alterations and their impacts need research to support appropriate responses for sustainable food production. Rejuvenation of the existing research farms in the NT - Coastal Plains, Douglas Daly, Katherine and Ti Tree - would ensure that the foundations for research and development are in place and current.[155] The NTHA believes that this would position the NT well to

[148] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[149] Committee Hansard, Public Hearing, 22 February 2010, Northern Territory Agricultural Association Incorporated
[150] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association
[151] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[152] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[153] Department of Primary Industry and Fisheries, 1997, 'The Primary Industry and Fisheries of the Northern Territory, Northern Territory Government
[154] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[155] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009

capitalise on future opportunities and contribute to local and global food security.[156]

The research priorities must focus on:

- Environmentally sustainable production systems - the ones that work well in NT conditions, how to modify and improve the systems already being used and any new productions systems;
- the extent of land capability for the different agricultural industries and production zones; and
- invasive species and diseases in the natural environment and in horticultural production.[157]

The NTHA informed the Committee of some of their more recent projects, including a project that examined the challenges of promoting sustainability amongst the industries least advanced participants; another project that contributes to water efficiency outcomes and another project to develop a Natural Resource Management (NRM) Strategic Plan for the horticultural industry.[158]

Some of the factors that will influence the potential for NT agriculture in the future are:

- changes to land use in the Douglas-Daly region through approved sustainable management activities and clearing of native vegetation in the Daly River catchment;[159]
- Implementation of the Water Allocation Plan for the Tindal Limestone Aquifer in the Katherine region which was developed in consultation with the community and details sustainable water management strategies that also protects environmental values for the next 10 years;[160]
- improved soils;
- more efficient water use;
- capitalisation of mangoes already planted;

[156] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[157] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[158] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[159] Northern Territory Government and Daly River Management Advisory Committee, 'Adaptive Management Framework for Native Vegetation Clearing in the Daly River Catchment', http://www.nt.gov.au/nreta/water/drmac/pdf/adaptivemanagement.pdf, at 14 December 2010
[160] Department of Natural Resources, Environment, The Arts and Sport, 'Katherine Water Advisory Committee', http://www.nt.gov.au/nreta/water/kwac/wap.html, at 14 December 2010

- opportunities arising from adaptations to climate change in northern Australia;
- mechanisation;
- new crop varieties extending supply; and
- capital investment from southern regions.[161]

The Committee learnt that trials undertaken by the NTAgA over the last two years to improve some of the lighter soils of the Katherine region are showing that, despite the input demands, viable crops such as Asian vegetables can be grown in the region to supply southern markets when other regions cannot grow these crops.[162]

There are many opportunities for horticulture and other plant industries to contribute to economic development and healthier lifestyles in remote communities. Through their knowledge of the natural environment, Indigenous people have a great deal to offer agriculture. There are opportunities to develop economic enterprises for Indigenous Territorians through partnerships, as well as for people as landowners, investors, business owners and as part of the workforce. There are opportunities to develop small scale horticultural productions for local consumption, which can also provide social and health benefits to the communities.[163]

AZRI advised the Committee that in order to develop market garden opportunities in Indigenous communities there needs to be more capacity building. Natural resources have limits on what can be grown. There are also barriers to knowledge for people trying to build a market garden into a business, particularly for production and marketing the products. AZRI advised that it is important that the goal behind establishing the market garden is clear from the beginning whether it is to supply a supermarket or for local consumption, and that the expectations are realistic, for example, that profits may not be achieved for the first 10 seasons.[164]

The Committee heard from DRDPIFR that although there is a great deal of interest from communities in establishing market gardens, the Department has in the past struggled to establish the growing of plants in Indigenous

[161] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[162] ABC Country Hour, 'Katherine Soils Under the Microscope', http://www.abc.net.au/rural/nt/content/201012/s3089259.htm, at 14 December 2010
[163] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[164] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute

communities. DRDPIFR has been looking at a project called 'Box of Veg', which involves a community pre-purchasing fruit and vegetables produced by a commercial producer for that community.[165]

The Centrefarm model has the potential to be applied on Indigenous-owned land in the northern regions of the NT, but the Committee heard from the DRDPIFR that the perception has been that the model is an inappropriate use of land and the necessary support of the relevant land council has not been achieved.[166] However, the Committee heard from the Centrefarm that at the request of the Top End traditional owners and the Northern Land Council (NLC), Centrefarm will be expanding to encompass Aboriginal land in the NLC area where traditional owners would like to establish Centrefarm model horticulture enterprises.[167] Using the Western Davenport plains as an example, Centrefarm informed the Committee that with the support of the Federal and NT Governments for the infrastructure required such as for power, 2,500 ha can be developed for horticulture and agroforestry, creating more than 500 jobs, generating a minimum of $100 million value to the NT economy.[168] Centrefarm told the Committee it expects that within 10-15 years the horticultural industry in Central Australia to overtake the pastoral industry in number of farms but still only occupy a very small area in comparison to the pastoral industry. Centrefarm also spoke about the large volumes of groundwater in storage and the unrecognised potential of the sand plains to sustain a range of crops.[169]

Recommendation 1

The Committee recommends the Government continue to provide assistance to Centrefarm and other agribusinesses that develop horticultural enterprises.

New crops and varieties

Centrefarm spoke to the Committee about its work to select crops that provide work opportunities during the cooler months. With table grapes, 60% of the production work occurs in the hotter months so the labour intensive work of pruning and vine training happens in the cooler months. For the Anmatjere

[165] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[166] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[167] Public Hearing, 27 November 2009, Centrefarm Aboriginal Horticulture Ltd
[168] Public Hearing, 27 November 2009, Centrefarm Aboriginal Horticulture Ltd
[169] Public Hearing, 27 November 2009, Centrefarm Aboriginal Horticulture Ltd

region, pomegranates and citrus are being considered because the labour intensive work such as picking occurs in the cooler months. Asparagus too has been considered as it is a winter crop. Centrefarm believes that this approach creates more opportunities for growth in horticulture.[170]

To support the development of new crops in Central Australia by Centrefarm, AZRI advised the Committee that it is working with Centrefarm as much as possible but that much of the research into technical aspects of growing the crops in the region has been conducted, some of which by AZRI. AZRI has been focused on water use efficiency trials to achieve the current degree of yields of table grapes using less water to be prepared for the possibility of reduced rainfall due to climate change.[171] AZRI has been working with melon growers in Ali Curung on ways to improve soil management through better wind breaks.[172]

The NTAgA told the Committee:

> Sesame has got a huge potential, it really has, if people [put] the time and money in to it because we import all our sesame from Japan. You want a loaf of bread and you see all the sesame seeds, multiply that by several million.[173]

Pastoralism

For each region in the NT, the potential to increase output through intensification has been recognised. Katherine and the Barkly have the potential to increase output by 35% through intensification and productivity gains, Central Australia by 15% and the Top End can double its output.[174]

The NT Cattlemen's Association told the Committee that the potential for further development of the industry is affected by the challenges with weeds, fire, feral animals and potential exotic diseases which threaten production systems and the environment.[175] Industry investment is influenced by

[170] Public Hearing, 27 November 2009, Centrefarm Aboriginal Horticulture Ltd
[171] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[172] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[173] Committee Hansard, Public Hearing, 22 February 2010, Northern Territory Agricultural Association Incorporated
[174] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[175] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association

government and corporate timeframes which can affect decisions about long-term investment in capacity building. Land values and finance also influence investment considerations.[176]

The Committee was informed that the extensive grazing systems in Central Australia are managed against a number of environmental constraints including low rainfall, high evaporation and availability of suitable and adequate groundwater. These grazing systems are sophisticated and require skilled management and significant input costs.[177] The NT Cattlemen's Association spoke about the potential to further develop the pastoral industry in Central Australia which has high levels of productivity and developed resilience to variability. The NT Cattlemen's Association also stated that there is an opportunity to produce 'a more organic, far more natural type of turn-off of product' in Central Australia.[178] For further development of the Top End for pastoral production, the NT Cattlemen's Association stated that there is less variability and other opportunities. However, lower fertility and higher input costs require higher levels of management and technical expertise. More pests and greater reliance on chemicals in some cases makes it more difficult for organic production.[179]

The NT Cattlemen's Association spoke about the availability of labour as an ongoing issue for the pastoral industry.[180] Periodic shortages are experienced because the work is seasonal and the industry attracts transitory workers. This also creates a shortage of workers with experience. Centrefarm suggested to the Committee that travellers and those on temporary work visas could help to fill the labour shortages.[181] The Committee was informed that over the last 30 years labour on pastoral properties has been replaced by capital resulting in properties which historically had 30-40 staff being run by a very small handful of people or nuclear family. The Committee heard that increasing use of technology will force further change in this area. Traditional practices like the

[176] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[177] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[178] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association, p7
[179] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[180] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[181] Public Hearing, 27 November 2009, Centrefarm Aboriginal Horticulture Ltd

use of horses and hands-on management of cattle as well as the humane treatment of animals will always require physical labour.[182]

The NT Cattlemen's Association told the Committee that more intensive and better use of existing land, bringing new land into production and, with the assistance of the NT Government Primary Industry group, better animal husbandry practice, nutrition and genetics could result in 10-15% increase in production in Central Australia, 30% in the Barkly and Katherine regions and doubling of production in the Top End. The NT Cattlemen's Association stated that this would not necessarily be attributed to increases in the number of cattle, but increased turn-off reflecting improved calving rates and other improvements in production. Depending on the level of development, "some currently undeveloped land, including undeveloped Aboriginal land and further development of floodplains for finishing operations" can result in more increases.[183] The NT Cattlemen's Association also told the Committee about developing new markets such as Vietnam where the Association has been involved in a program to set up infrastructure to receive live cattle.[184]

The Committee sought advice on whether land used for forestry could be shared by cattle grazing on the understorey and was informed by the NT Cattlemen's Association that it could be possible once trees were mature enough and would also be dictated by fire management of the plantation. The NT Cattlemen's Association also talked about the loss of valuable food production land to forestry and the concerns in the cattle industry about poor farming practices of new entrants to farm forestry.[185]

For any industry, markets determine profit returns.[186] Indonesia is the largest importer of NT cattle.[187] The growth of Indonesia's commercial cattle industry will have a dramatic long-term effect on the industry in Australia and the market internationally. Indonesia has already imposed restricted quotas on its live

[182] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[183] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association, p4
[184] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association, p4
[185] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[186] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[187] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association

imports of NT cattle.[188] The Committee learnt that as the industry in Indonesia grows it is likely that demand will decrease but there may still be a need for Indonesia to import some cattle from Australia.[189] Australian producers will have to find new markets to replace the previous demand from and compete effectively with Indonesia as well as develop new products.[190]

Indonesia's 350kg weight restriction on live imports has resulted in increased transport costs to Townsville and southern abattoirs.[191] There are currently four NT abattoirs, Oenpelli, Palumpa, Kalkaringi and Bond Springs and the Committee was informed that these abattoirs also supply meat to local markets.[192] A proposed abattoir to be built in Darwin by the Australian Agricultural Company is projected to have the capacity to process approximately 140,000 cattle per year. It is anticipated that the proposed abattoir will create new products and markets of the pastoral industry in addition to jobs and their flow on effects.[193] DRDPIFM told the Committee that some years ago, a document was prepared by the NT Government on the benefits of a business plan for anyone wishing to establish an abattoir in the northern part of the NT. At the time, given the export prices for livestock, the document warned that it would have been extremely difficult for an export-registered abattoir to purchase animals to be converted to meat products for export at the same price as live exporters. Since that time DRDPIFR believes that live export prices have strengthened and a business case for an export-registered abattoir would carry the same level of risk as it did in years past.[194]

The NT Cattlemen's Association spoke about the need to upgrade roads and transport infrastructure to ensure Wet Season access to markets, particularly delivery to Indonesia to occur prior to Ramadan.[195] It was explained to the

[188] Meat and Livestock Australia, 11 June 2010, 'Update – Live Cattle Trade to Indonesia', http://www.mla.com.au/Prices-and-markets/Market-news/Update-live-cattle-trade-to-Indonesia-110610, at 27 January 2011
[189] Meat and Livestock Australia, 11 June 2010, 'Update – Live Cattle Trade to Indonesia', http://www.mla.com.au/Prices-and-markets/Market-news/Update-live-cattle-trade-to-Indonesia-110610, at 27 January 2011
[190] Meat and Livestock Australia, 11 June 2010, 'Update – Live Cattle Trade to Indonesia', http://www.mla.com.au/Prices-and-markets/Market-news/Update-live-cattle-trade-to-Indonesia-110610, at 27 January 2011
[191] Australian Broadcasting Corporation, 'AAco Planning Darwin Abattoir', 23 July 2010 http://www.abc.net.au/rural/news/content/201007/s2962120.htm, at 9 December 2010
[192] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[193] Australian Broadcasting Corporation, 'AAco Planning Darwin Abattoir', 23 July 2010 http://www.abc.net.au/rural/news/content/201007/s2962120.htm, at 9 December 2010
[194] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[195] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association

Committee that this is because Ramadan is occurring closer to the NT Wet Season each year. The NT Cattlemen's Association is also concerned about the degradation of the roads in recent years, particularly the unsealed roads, from multiple users including mining, the community and the increase of activity from the NT National Emergency Response.[196] The Association recognised the NT Government's active involvement in lobbying the Federal Government for the necessary funding to upgrade these roads. The Association also spoke about the option that has been considered of a stand alone port at the end of Hudson Creek with a walk-on facility that's similar to a large depot where cattle could be walked onto a ship rather than being trucked five minutes down the road to be put on a ship for export.[197]

The NT Cattlemen's Association spoke about the need for the Douglas Daly and Katherine to be developed strategically for grazing because the areas offer the best potential during Wet Season for turn-off because of their proximity to roads and other infrastructure. The Wet Season is also when there is major grass growth and livestock can put on weight before being sent to market.[198]

Increasing public awareness of and demand for greater accountability and responsibility by industry in the use of natural resources and humane treatment of animals will continue to affect industry practice in the future. The growing market for products derived from production systems that are based on ethical and environmentally sustainable principles indicates the willingness of consumers to pay for goods and services founded on sustainability principles. Producers in Australia have changed their methods to meet demand for particular production methods such as certified halal, kosher and organic foods.[199] DRDPIFR believes that education is the key to improving public perceptions of animal welfare during transport to overseas markets. DRDPIFR informed the Committee that animals are only on a boat for three to four days and that mortality rates are less than 0.1%. On the question of treatment once they are received by overseas buyers, DRDPIFR told the Committee that the Commonwealth Government and Meat and Livestock Australia have invested

[196] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[197] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[198] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[199] Stensholt, John 'Top of the Food Chain,' BRW, 19/06/2008, Vol. 30 Issue 24, p22-24, 3p

significantly into programs in South-east Asia to train and improve the handling of animals from receipt to processing.[200]

The production value of the Indigenous Pastoral Industry is approximately $10 million. This is primarily from live exports interstate and trade locally. There is significant potential to develop under utilised Aboriginal Land Trust land where these developments are aligned with the aspirations of traditional owners. Responses from government achieved through negotiation, collaboration and legislation are required to allow economic development of Aboriginal land held in trust as well as addressing significant Indigenous political, social and economic issues that could be impeding development.[201]

Referring to the potential of developing pastoralism on land held under the Aboriginal Land Trust DRDPIFR recognised that this needs to take place under the *Native Title Act 1993* and *Aboriginal Land Rights (Northern Territory) Act 1976* and must be within the wishes of traditional owners. The Aboriginal pastoral herd is approximately 80,000 and selling approximately 24,000 so it is a very productive part of the industry.[202]

The Committee received information about the Indigenous Pastoral Program NT (IPP) involving agreement between the Federal Government, NT Government, the NLC and CLC to work together to increase cattle production on Indigenous pastoral leases and land held by the Aboriginal Land Trust and Indigenous participation in the NT pastoral industry. The IPP commenced in 2002-03, was renewed in 2006 and is due to expire on 30 June 2011. The program is administered by the NT Department of Resources and operates with the participation of other partners, the NT Cattlemen's Association, ILC and Commonwealth Department of Education, Employment and Workplace Relations.[203]

[200] 'Meat and Livestock Australia (MLA) is a producer-owned company, working in partnership with industry and government to achieve a profitable and sustainable red meat and livestock (cattle, sheep and goats) industry in Australia.', Meat and Livestock Australia, 'About MLA', http://www.mla.com.au/About-the-red-meat-industry/About-MLA, at 27 January 2011
[201] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[202] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[203] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008

The Committee heard that the first three years were very successful - 25,000 head of cattle on land and 60 short-term and seasonal jobs established.[204]

The IPP is currently working with 18 high priority properties, of which six are run under owner management and 12 are leased to pastoralists, in total covering an area of 53,000 km^2. An increase in cattle numbers has already been achieved. At 2008, there were between 50,000 and 60,000 cattle on Aboriginal land with the potential capacity of 61,500 cattle still to be realised.[205] A program has been established to get young Aboriginal people into unsubsidised employment on pastoral properties in the NT. In 2008, 48 trainees completed training under the IPP and the training program had a 60% retention rate.[206]

The support provided by the IPP to help build long-term capacity includes:

- extension support including access to relevant industry information provided through workshops tailored to Aboriginal people;
- enterprise skills development provided by NT Government Indigenous Business Development officers who assist with business planning management; and
- assistance with developing regional based natural resource management benchmarks.[207]

Although program delivery has been considered expensive and the implementation process described to the Committee as intricate,[208] the IPP has been successful in building capacity of the people in its focus properties. DRDPIFR told the Committee the 'the future of the IPP is fragile' owing to the need to further develop capacity within Aboriginal communities and pastoral entities to manage and take on their own businesses.[209] DRDPIFR also spoke about the model of leasing land to non-Indigenous pastoralists being very successful because it creates an economy for the local community and

[204] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[205] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[206] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[207] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[208] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[209] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources, p6

provides land management on Aboriginal land. The downside of the model is that it does not build capacity across business systems. DRDPIFR is working to build capacity with the number of properties in the IPP. DRDPIFR advised that focus on the key goals and the priority properties needs to continue to ensure that the gains already achieved are sustainable.

Recommendation 2

The Committee recommends that the Government support the further development and renewal of the Indigenous Pastoral Program NT in 2011 to enable the program to fulfil its long-term objectives.

NRETAS identified the potential for remote and Indigenous employment in the sustainable use of wildlife harvests, such as the harvest of crocodiles and the use of reptiles for the pet trade. Captive breeding programs on country can be established and extend the role of people already managing habitats for the protection of the environment. NRETAS gave the example of a current program to control weeds like *Mimosa pigra* and that also creates habitats for crocodiles for egg harvesting and magpie geese nesting.[210] NRETAS discussed with the Committee the challenges of developing sustainable use of wildlife industries in the NT. There are the challenges of remote locations for transport to markets and to receive supplies as well as the logistics of setting up infrastructure to contain and feed the animals. As emerging industries, they are unproven and a great deal of work needs to be done to establish these ventures to ensure that they are viable. There are also the broad public perceptions, ethical and moral issues associated with hunting wildlife, especially native wildlife and for commercial gain. Monitoring to ensure sustainability poses challenges for data collection and assessment of sustainability and these are compounded by the remoteness of locations.[211]

With native wildlife, sustainable use is a management tool in conjunction with maintaining sufficient populations. NRETAS gave the example of crocodile numbers which 30 years ago listed the species as 'threatened' but now they can be considered viable for industry development.[212] Crocodiles however are listed under the Convention on International Trade of Endangered Species (CITES) so any proposal to export must be approved by the Federal

[210] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[211] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[212] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts

Government and be open to public consultation. The NT management program for the saltwater crocodile for 2009-14 is in place and aims to ensure the long-term conservation of the species and its habitats as well as maintain public safety.[213] NRETAS informed the Committee about a few Aboriginal communities, and pastoral properties in wetland areas managing habitats to maximise the number of crocodile nests.[214]

NRETAS advised the Committee that the *Territory Parks and Wildlife Conservation Act 2006* provides for the application of permits for wild capture of native species for commercial enterprises.[215] NRETAS advised that discussions were being held to develop captive breeding of the Oenpelli python. With new enterprises like this, NRETAS works with the applicants to ensure the right permits can be obtained - that the applicants have the necessary husbandry knowledge and experience and a business plan in place.[216] NRETAS advised that being involved in the relevant parts of the establishment of a venture ensures that when applicants reach the stage of applying for permits, NRETAS already know that the harvest is sustainable.[217] The permits require that yearly returns are submitted to NRETAS stating the number of animals taken, bought or sold, perished and remaining.[218]

NRETAS gave some details of management programs to deal with feral animals in pastoral and agricultural lands such as in the Victoria River District for horses and donkeys.[219]

The natural resources of the NT are relatively intact.[220] The NT has a unique opportunity to make use of its assets in the face of climate change and learn from its own mistakes and the unsustainable practices and impacts of production systems in the southern Australian States. The NT has the potential

[213] NT Government, 'Management Program for the Saltwater Crocodile *Crocodylus porosus* in the Northern Territory 2009 - 2014, http://www.nt.gov.au/nreta/wildlife/programs/pdf/crocmanagementplan_summarypaper2009.pdf, at 18 January 2011
[214] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[215] *Territory Parks and Wildlife Conservation Act*, s 55(b)
[216] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[217] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[218] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[219] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[220] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009

to lead the way in developing sustainable agricultural systems.[221] With the appropriate level of investment in planning and science and the support of government and the community, the commercial competitiveness of agriculture and flexibility to adapt to change can be maintained to ensure the long-term productivity of the industry with minimal impact on the environment. Further development of agriculture in the NT has the potential to increase viability and resilience of rural economies, improve natural resource management protection and help to provide food security into the future.[222]

[221] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[222] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009

3. ENVIRONMENTAL OVERVIEW

Approximately 6% of Australia's land mass is occupied with agriculture. This is approximately 467,000 km^2 of arable land available for agriculture. Of all inhabited continents, Australia is the driest in the world with two-thirds classified as semi-arid or arid. In general, soils in Australia have low nutrient content and so require fertilisers to maintain productivity in agricultural systems.[223]

The Northern Territory covers an area of approximately 1.35 million km^2, 17% of the Australian land mass, most of which remains largely undeveloped and ecologically intact. Although relatively little of this land mass is under production, or is likely to be productive in the future due to issues such as limited water resources, the existing industry is evidence of the capacity for intense and sustainable horticultural production.[224]

Less than 1% of the NT landmass is cleared. Other land that is uncleared is used for extensive grazing.[225] Several submissions told the Committee that the quantifiable extent of arable land in the NT is not fully known. The Committee found that similarly the full extent of land suitable for the pastoral industry is not known.

Under the nationally agreed boundaries for NRM regions or bioregions, the NT is classed as one NRM region.[226] Within that, there are four sub regions:

1. Top End Region;
2. Gulf Savanna Region;
3. Tablelands Region; and
4. Arid Lands Region.

Sub regional or regional boundaries under the control of state or territory legislation and depending on the criteria for classification may differ slightly, or deviate from the NRM boundaries.[227]

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[223] Gliessman, S.R. & Rosemeyer, M., (eds), 2010, 'The Conversion to Sustainable Agriculture - Principles, Process and Practices', CRC Press, Florida USA
[224] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[225] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[226] Natural Resource Management Board (NT), http://www.nrmbnt.org.au/nrm-nt/top-end-region, at 1 February 2011
[227] Natural Resource Management Board (NT), 'NRM in Australia', http://www.nrmbnt.org.au/nrm-nt/nrm-australia, 1 February 2011

The Top End NRM region covers approximately 13% (176,500 km^2) of the NT land mass and includes the 'Darwin Coastal, Tiwi-Cobourg and Arnhem Coast bioregions, most of the Pine Creek, Arnhem Plateau and Central Arnhem bioregions, and parts of the Daly Basin, Victoria Bonaparte, Gulf Fall and Uplands and Gulf Coastal bioregions.'[228] The NRM region also takes in 'the coastal waters and islands between the mouths of the Victoria River in the west and the Roper River in the east. These coastal waters account for about 84% (64,500 km^2) of coastal areas within the NT's three nautical mile (3 NM) limit. Significant islands in the subregion include the Tiwi Islands, Croker Island, Wessel Islands and Groote Eylandt.'[229] Seventy per cent of the NT population live in the Top End. The majority of the Top End is Aboriginal land. The region also contains the Territory's more arable land in the Douglas Daly. Although an important land use, horticulture is restricted to certain areas in the region.[230]

By plant community, the Top End has three broad categories of habitats: sandstone, lowland and coastal. Sandstone habitats are characterised by eucalypt woodland and scrubland. Lowland habitats are characterised by eucalypt communities and wetlands. Coastal habitats are characterised by sand dunes, beaches and mangroves. Monsoon forest or vine thickets occur in sandstone vine forests, low land vine forests and coastal vine forests.[231] Woodland communities comprise 46% of the vegetation, open forest 35%, open woodland 11% and grassland 4%.[232] Only 1.2% of the region is cleared.[233] There are 19 river catchments in the Top End including the Tiwi Islands and Groote Eylandt catchments.[234]

The Gulf Savanna NRM region covers 23% of the NT land mass (311,000 km^2) and 'includes parts of Mitchell Grass Downs, Tanami, Gulf Fall and Uplands, Ord Victoria Plain, Sturt Plateau, Gulf Coastal, Gulf Plains, Victoria Bonaparte, Daly Basin, Pine Creek, Central Arnhem and Arnhem Plateau bioregions … [and] includes coastal waters and islands west of the Victoria River mouth in the Joseph Bonaparte Gulf and east of the Roper River mouth in the Gulf of

[228] Natural Resource Management Board (NT), 'Top End Region', http://www.nrmbnt.org.au/nrm-nt/top-end-region, at 1 February 2011
[229] Natural Resource Management Board (NT), 'Top End Region', http://www.nrmbnt.org.au/nrm-nt/top-end-region, at 1 February 2011
[230] Natural Resource Management Board (NT), 'Top End Region', http://www.nrmbnt.org.au/nrm-nt/top-end-region, at 1 February 2011
[231] Brock, J., 1988, 'Native Plants of Northern Australia', Reed Books Australia
[232] Natural Resource Management Board (NT), 'Top End Region', http://www.nrmbnt.org.au/nrm-nt/top-end-region, at 1 February 2011
[233] Natural Resource Management Board (NT), 'Top End Region', http://www.nrmbnt.org.au/nrm-nt/top-end-region, at 1 February 2011
[234] Natural Resource Management Board (NT), 'Top End Region', http://www.nrmbnt.org.au/nrm-nt/top-end-region, at 1 February 2011

Carpentaria.'[235] The most significant islands in the subregion are the Sir Edward Pellew group.[236] Nine per cent of the NT population live in the region. The largest town in the region is Katherine.[237] The Territory Growth Towns in the region are Lajamanu, Borroloola and Daguragu/Kalkarindgi.

The Gulf District is typified by eucalyptus, bloodwood and acacia woodlands and shrublands associated with grass understorey. [238] The Katherine region, including the Daly, Roper, Gulf, Victoria River and Sturt Plateau districts comprises large areas of rugged hills and ridges.[239] The Sturt Plateau comprises red and yellow earths, dominated by eucalypt woodlands associated with Ribbon grass, Perennial Sorghum and Kangaroo grass.[240] The Victoria River District has two key land types, the rugged and hilly land type associated with valleys of tropical tall grass and more undulating country plains dominated by Mitchell grass.[241] Woodland makes up approximately 56% of the vegetation, open woodland 24%, grassland 9%, spinifex grassland 6% and open forest 3%. Fires are frequent around Katherine, Borroloola and in the south where the Tanami desert extends into the region. There are 15 river catchments in the region. All except the internally draining Wiso catchment flow northward.[242] Almost 67% of the Gulf Savanna region is pastoral land. Approximately 20% of the region is Aboriginal freehold land. Protected areas make up 12.2% of the region. Horticulture is an important land use in the region but occupies only a small area.[243]

The Tablelands region makes up 15% of the NT land mass (203,000 km^2) and includes the 'Mitchell Grass Downs and Davenport Murchison Ranges bioregions, all of the Northern Territory section of the Mount Isa Inlier and parts of Tanami, Gulf Fall and Uplands and Sturt Plateau bioregions.'[244]

[235] Natural Resource Management Board NT, 'Gulf Savanna Region', http://www.nrmbnt.org.au/nrm-nt/gulf-savanna-region, at 31 January 2011
[236] Natural Resource Management Board NT, 'Gulf Savanna Region', http://www.nrmbnt.org.au/nrm-nt/gulf-savanna-region, at 31 January 2011
[237] Natural Resource Management Board NT, 'Gulf Savanna Region', http://www.nrmbnt.org.au/nrm-nt/gulf-savanna-region, at 31 January 2011
[238] Department of Primary Industry, Fisheries and Mines, 2004, 'NT Wide Pastoral Industry Survey', http://www.ntca.org.au/_assets/04_PastoralSurvey.pdf, at 10 December 2010
[239] Department of Primary Industry, Fisheries and Mines, 2004, 'NT Wide Pastoral Industry Survey', http://www.ntca.org.au/_assets/04_PastoralSurvey.pdf, at 10 December 2010, p10
[240] Department of Primary Industry, Fisheries and Mines, 2004, 'NT Wide Pastoral Industry Survey', http://www.ntca.org.au/_assets/04_PastoralSurvey.pdf, at 10 December 2010, p10
[241] Department of Primary Industry, Fisheries and Mines, 2004, 'NT Wide Pastoral Industry Survey', http://www.ntca.org.au/_assets/04_PastoralSurvey.pdf, at 10 December 2010, p10
[242] Natural Resource Management Board NT, 'Gulf Savanna Region', http://www.nrmbnt.org.au/nrm-nt/gulf-savanna-region, at 31 January 2011
[243] Natural Resource Management Board NT, 'Gulf Savanna Region', http://www.nrmbnt.org.au/nrm-nt/gulf-savanna-region, at 31 January 2011
[244] Natural Resource Management Board, 'Tablelands Region', http://www.nrmbnt.org.au/nrm-nt/tablelands-region, at 1 February 2011

Approximately 3% of the NT population live in the region. The largest towns are Tennant Creek and Elliot. Elliot is a Territory Growth Town. The Barkly Shire covers most of the region. There are three internally draining catchments and three north flowing catchments.[245] Open woodlands make up 44% of the vegetation, grassland 32%, spinifex grassland 11% and woodland 5%.[246] The land types of the Barkly-Tennant Creek region are eucalypt low open woodland and sparse acacia shrubland and hummock grassland[247] The Barkly is characterised by 'slightly undulating black cracking clay plains dominated by perennial Mitchell grass and annual Flinders grass.'[248] The frequency of fires is low throughout most of the region but is higher in the Sturt Plateau bioregion. Almost 75% of the region is under pastoral lease. Aboriginal freehold land makes up 17% of the region. Less than 1% of the region is conservation reserve.[249]

The Arid Lands subregion of Central Australia covers approximately 658,000 km^2 (49% of the NT land mass) and 'includes the MacDonnell Ranges and Burt Plain bioregions, sections of the Great Sandy Desert, Simpson Strzelecki Dunefields, Finke, Central Ranges, Channel Country and Stony Plains bioregions, most of the Territory section of the Tanami bioregion and parts of Sturt Plateau, Mitchell Grass Downs and Davenport Murchison Ranges bioregions.[250] Part of the Barkly Shire is also covered by the region. Approximately 19% of the NT population live in the region. Alice Springs is the largest town in the region.[251] Yuendumu, Hermannsburg Papunya and Ali Curung are designated Territory Growth Towns. Approximately 55% of the region is Aboriginal freehold and 36% are pastoral leases. Horticulture only accounts for a small area of the region but is an important land use. Protected areas make up 36% of the region, most of which are Indigenous Protected Areas.[252]

[245] Natural Resource Management Board, 'Tablelands Region', http://www.nrmbnt.org.au/nrm-nt/tablelands-region, at 1 February 2011
[246] Natural Resource Management Board, 'Tablelands Region', http://www.nrmbnt.org.au/nrm-nt/tablelands-region, at 1 February 2011
[247] National Land & Water Resources Atlas, http://www.anra.gov.au/topics/rangelands/overview/nt/ibra-dmr.html, at 10 December 2010
[248] Department of Primary Industry, Fisheries and Mines, 2004, 'NT Wide Pastoral Industry Survey', http://www.ntca.org.au/_assets/04_PastoralSurvey.pdf, at 10 December 2010, p10
[249] Natural Resource Management Board, 'Tablelands Region', http://www.nrmbnt.org.au/nrm-nt/tablelands-region, at 1 February 2011
[250] Natural Resource Management Board NT, 'Arid Lands Region', http://www.nrmbnt.org.au/nrm-nt/arid-lands-region, at 24 January 2011
[251] Natural Resource Management Board NT, 'Arid Lands Region', http://www.nrmbnt.org.au/nrm-nt/arid-lands-region, at 1 February 2011
[252] Natural Resource Management Board NT, 'Arid Lands Region', http://www.nrmbnt.org.au/nrm-nt/arid-lands-region, at 24 January 2011

Spinifex grassland makes up 69% of the vegetation, open shrubland 18% and open woodland 12%.[253] The main habitats suitable for pastoral production are open woodlands, mulga shrublands, gidyea woodlands, calcareous shrubby grasslands, chenopod[254] shrublands and alluvial plains of major rivers.[255] The frequency of fires is low throughout the region but the Sturt Plateau has the highest frequency of fires in the region. There are eight catchments in the region, all internally draining towards Lake Eyre.

Agricultural production in the NT is limited by a number of factors. Suitable land and adequate water resources as well as access to infrastructure particularly transport for markets are required to sustain growth in the long-term. The major environmental limitations for future expansion of agricultural production in the NT are its soils and land systems. These are considered fragmented.[256]

Climate

The Northern Territory has two climatic zones; the Top End and the Central Desert region. The Top End extends from Darwin to approximately 600 km south taking Katherine and Arnhemland. The Central Desert region or Arid Lands covers 49% of the land mass of the NT and includes Tennant Creek, the Barkly and Alice Springs regions.[257]

The Top End is tropical, characterised by two distinct periods, the Wet Season from September/October to May and the Dry Season from May to September/October.[258] October and April are periods of transition.[259] Aboriginal systems for describing weather patterns divide the two periods into other seasons distinguished by noticeable changes in temperature, rainfall and

[253] Natural Resource Management Board (NT), 'Arid Lands Region', http://www.nrmbnt.org.au/nrm-nt/arid-lands-region, 24 January 2011
[254] Class of salt tolerant shrubs with characteristics that tolerate drought. Department of Natural Resources, Environment, the Arts and Sport, 'Territory Environments, Bluebush and Other Chenopod Shrublands', http://www.nt.gov.au/nreta/wildlife/nature/bluebush.html, at 3 February 2011
[255] Department of Primary Industry, Fisheries and Mines, 2004, 'NT Wide Pastoral Industry Survey', http://www.ntca.org.au/_assets/04_PastoralSurvey.pdf, at 10 December 2010
[256] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[257] Natural Resource Management Board (NT), 'Arid Lands Region', http://www.nrmbnt.org.au/nrm-nt/arid-lands-region, 24 January 2011
[258] O'Gara, F., 2010, 'Striking the Balance: Conservation Farming and Grazing Systems for the Semi-arid Tropics of the Northern Territory' 2nd ed, NT Government
[259] Brock, J., 1988, 'Native Plants of Northern Australia', Reed Books Australia

humidity and marked by indicator species and their habits. The Yolngu of Northeast Arnhemland for example describe six different seasons.[260]

The average annual rainfall in the Darwin region is 1,660 mm, Douglas-Daly 1,250 mm, Katherine 1,100 mm and 550 mm at Daly Waters.[261] In the Top End, rainfall occurs predominantly in the Wet Season, of which more than 90% typically falls between November and March.[262] Intermittent rain and patchy thunderstorms occur with early Wet Season rain in September-October which is then followed by the formation of a monsoonal weather system which brings more consistent rainfall through to December.[263] [264] January and February are the periods of heaviest rainfall. From March-April the monsoonal activity begins to decrease. Cyclones can occur in the Top End resulting in several days of heavy rainfall. The intensity of rainfall increases the susceptibility of soil to erosion.[265]

Higher temperatures occur in the early Dry. During the Wet Season the average maximum temperature is 34°C on the coast and 38°C in Katherine and inland. During the 'build up' from October to November temperatures are 1-3°C higher. During the Dry Season, the average maximum temperatures range from 25-31°C and minimum from 13-23°C. Frosts are very rare but when they do occur it is in the southern inland areas near Ti Tree. Evaporation rates exceed the amount of rainfall except from January to March.[266] Together with low soil moisture, these factors affect crop growth. The combination of low soil moisture and high daily temperatures towards the end of the Dry Season limit production and break growing cycles.[267]

The climate of the Central Desert region centred around Alice Springs experiences very little rain and very low humidity throughout the year.[268] The

[260] East Arnhem Yolngu Tourist Hub, 'Yolngu Cultural Programs' http://www.yolngutourism.com/yolngu.html, 24 January 2011
[261] O'Gara, F., 2010, 'Striking the Balance: Conservation Farming and Grazing Systems for the Semi-arid Tropics of the Northern Territory' 2nd ed, NT Government
[262] Brock, J., 1988, 'Native Plants of Northern Australia', Reed Books Australia
[263] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[264] O'Gara, F., 2010, 'Striking the Balance: Conservation Farming and Grazing Systems for the Semi-arid Tropics of the Northern Territory' 2nd ed, NT Government
[265] O'Gara, F., 2010, 'Striking the Balance: Conservation Farming and Grazing Systems for the Semi-arid Tropics of the Northern Territory' 2nd ed, NT Government
[266] O'Gara, F., 2010, 'Striking the Balance: Conservation Farming and Grazing Systems for the Semi-arid Tropics of the Northern Territory' 2nd ed, NT Government
[267] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[268] Northern Territory Visitors Bureau, 'Northern Territory Visitors Information', http://www.northernterritory.visitorsbureau.com.au/visitors_info.html, at 28 January 2011

average annual rainfall is 274 mm. Most of the rain falls during summer in brief storms. The annual evaporation potential ranges from 2, 500 mm to 2,800 mm.[269] The breakdown of Wet Season tropical rain systems or northward extensions of systems from the south provides much of the rainfall for Central Australia.[270] The Central Desert region has the traditional four seasons, summer (December to February), autumn (March to May), winter (June to August) and spring (September to November). Summer temperature averages range from 20.6°C to 35.4°C. Autumn temperature averages range from 12.8°C to 27.8°C. Winter temperature averages range from 3.1°C to 20.5°C. Spring temperature averages range from 14.2°C to 30.3°C.[271]

Drought

The Committee found that the drought affecting much of Australia over the last 10 years has impacted the Barkly-Tennant Creek and Central Australia regions.[272] In the NT, the southern parts of Central Australia have been the worst affected. The south-eastern Alice Springs region did not experience significant rainfall in the 2001-02 growing season.[273] Between November 2007 and October 2008, the Alice Springs pastoral district received below average rainfall with the paucity of rainfall in areas to the north-west and north-east of Alice Springs classed as Severely Deficient (expected once every 20 years). North of Alice Springs and the Barkly-Tennant Creek region received low rainfall in 2008.[274]

As at 2008, 22 properties in Central Australia and 14 in the Barkly region were receiving NT drought assistance. Approximately 70 properties were eligible for declaration under Australian-Northern Territory Government Exceptional Circumstances for drought.[275] In Central Australia, stock numbers were reduced by approximately 50%.[276] From January to November in 2008,

[269] Department of Natural Resources, Environment, The Arts and Sport, 'Frequently Asked Questions', http://www.nt.gov.au/nreta/natres/soil/faq.html, at 28 January 2011
[270] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[271] Northern Territory Visitors Bureau, 'Northern Territory Visitors Information', http://www.northernterritory.visitorsbureau.com.au/visitors_info.html, at 28 January 2011
[272] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008, p2
[273] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[274] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[275] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008, p2
[276] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008, p2

approximately 300,000 cattle were moved from the Barkly-Tennant Creek region into Queensland because of the dry conditions.[277]

Modelling from AussieGRASS[278] showed that from November 2007 to October 2008, pasture growth in the Barkly-Tennant Creek region has been Below Average to Well Below Average.[279] The same low level of pasture growth was recorded in Central Australia for the same period, with approximately 50% of the region falling in the Well Below Average category for pasture growth. Areas around Alice Springs, Yuendumu and far eastern Plenty fell in Extremely Low growth category (expected once every 10 years).[280] The south-eastern Alice Springs region has not recorded any significant pasture growth since the 2001-02 season.[281]

Production systems in Central Australia are designed to deal with unreliable rainfall and extreme climate variability including the occasional year of low pasture growth. However, six consecutive years of low to very low growth has resulted in core breeder herds being destocked and longer term financial impacts even once recovery begins, for example the increasing cost of fuel has increased transport costs and will affect the cost of returning breeder cattle from agistment.[282]

The Committee heard that some of the long-established family properties have always had agistment properties as part of their ongoing management. DRDPIFR told the Committee that sound management takes the pressure off the resources during drought and the question is the length of time it will take for the land to return to its previous productivity once drought lifts. The Committee was informed that producers in Central Australia have demonstrated sound management by reducing their herds right down to only a core number of breeding animals and moving stock into agistment in other

[277] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008, p2
[278] 'AussieGRASS is an operational system run by Queensland Department of Natural Resources and Water. Queensland government scientists have conducted research into the science and management of rangelands for over a decade.' http://www.longpaddock.qld.gov.au/about/researchprojects/aussiegrass/index.html, at 6 December 2010
[279] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008, p4
[280] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008, p7
[281] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008, p9
[282] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008, p9

properties or interstate.[283] The Committee learnt that properties in the Barkly have responded similarly to the drought with animals being transported to market quickly and herd numbers reduced.[284] The Committee heard that one company employed Environmental Officers to help improve the environmental conditions on their properties.[285]

Since 2008, Australia has been entering a period of recovery from drought. This is also true of the Barkly-Tennant region and Central Australia where good rainfall has provided temporary relief. Follow-up rains are required for several seasons to enable germination of seed stocks and sustained pasture growth for recovery. [286] The north-west Alice Spring district continued to receive low rainfall in 2009. AZRI told the Committee that it has been working with producers in that district providing technical assistance.[287]

DRDPIFR informed the Committee that it has been recognised that arrangements for supporting businesses through drought have not been effective. Although 70% of businesses do not require drought assistance, there is still a significant number which do. As at 2008, a national review of the drought policy underpinning the provision of drought assistance was being conducted. The Committee learnt that three reports were produced to input into that reform process. One report by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Bureau of Meteorology (BOM) assessed the impacts of climate change on characteristics and frequency of exceptional droughts, i.e. one in 20-25 year droughts. Another report looked at the social aspects of droughts. The third report was undertaken by the Productivity Commission looking at support measures for businesses affected by drought.

On the social impacts of drought in the NT, the Committee heard from DRDPIFR that it did not believe that the NT had lost people off the land but that those kinds of changes would be inter-generational.[288] The Committee heard

[283] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[284] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[285] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[286] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008, p2
[287] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[288] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources

that NT properties affected by drought were provided with access to Rural Financial Counselling Services provided by the Commonwealth Government.

On the question of whether the social impacts of drought on farms were affecting communities indicated by reductions in purchasing in local areas, DRDPIFR informed the Committee that the information the Department has is largely qualitative and does not show a drop in purchasing in local areas. DRDPIFR explained that under the jointly managed Australian-Northern Territory Government Exceptional Circumstances program, the financial criteria to receive assistance can also apply to businesses that are dependent on the agricultural sector for their livelihoods. The Committee was told that no small business in the Alice Springs area applied for this kind of assistance.[289]

Water

Only 3% of the earth's water is freshwater of which 2.25% is in polar ice caps and glaciers, 0.6% is groundwater and 0.15% is in streams, lakes and the atmosphere.[290] In Australia, 67% of the water supply is used for agriculture, compared to the international average of 40%.[291]

Groundwater comprises approximately 17% of Australia's sustainable water resources, much of which comes from the Great Artesian Basin which covers 22% of the continent and contains water that is said to be 2 million years old.[292] Groundwater comprises 90% of Territory water supplies. There are 20 mapped groundwater aquifers or provinces in the NT, seven in the Top End, six in the Katherine region and seven in Central Australia.[293&294] There are approximately

[289] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[290] Australian Government, NT Government, NT Horticultural Association, NT Agricultural Association Incorporated & Landcare, 'Best Practice for Sustainable Land Use in the NT, Guidelines - Water', http://ntha.com.au/index.php?option=com_docman&task=doc_download&gid=229&mode=view, at 23 December 2010
http://ntha.com.au/index.php?option=com_docman&task=doc_download&gid=229&mode=view, 23 December 2010
[291] Australian Government, NT Government, NT Horticultural Association, NT Agricultural Association Incorporated & Landcare, 'Best Practice for Sustainable Land Use in the NT, Guidelines - Water', http://ntha.com.au/index.php?option=com_docman&task=doc_download&gid=229&mode=view, at 23 December 2010
[292] Australian Government National Water Commission, 'Water Availability', http://www.nwc.gov.au/www/html/233-water-availability.asp, at 23 December 2010
[293] Australian Government, NT Government, NT Horticultural Association, NT Agricultural Association Incorporated & Landcare, 'Best Practice for Sustainable Land Use in the NT, Guidelines - Water', http://ntha.com.au/index.php?option=com_docman&task=doc_download&gid=229&mode=view, at 23 December 2010

30,000 bores in the NT, of which 40% are used for pastoralism, 20% for rural domestic, 20% for water resource investigation and 10% for towns and communities, 5% used in mining and 5% for construction, roads and irrigation.[295]

Approximately 70% of Australia's freshwater resources (or surface water) are held in tropical rivers.[296] Torrential rains in the north of the NT cause rivers to flow in the Wet Season. In the Dry, many rivers stop flowing. Some rivers like the Daly River are fed by groundwater discharge during the Dry and so flow permanently.[297] Most rivers in the NT have little current development.[298] The availability of surface water for agricultural production, including seasonal availability is affected by the physical characteristics of the water resources, evaporation rates, availability and capacity of storage and regulations. According to DRDPIFR the policy of the NT Government is that 80% of available water must be used for the maintenance of ecosystems that are dependent on water.[299]

In 2009, the NT Government released a discussion paper for public comment as the first steps towards developing its *Living Rivers Strategy*. The discussion paper acknowledges the pressures on NT rivers from:

- increasing water use for an expanding population and irrigated agriculture;
- land clearing for agriculture and pastoralism;
- pollution associated with industry and urban development;
- increased recreational use;
- changing patterns of rainfall and hydrological processes associated with climate change; and

[294] Department of Natural Resources, Environment and the Arts and Sport, 'Aquifers (Groundwater Provinces)', http://www.nt.gov.au/nreta/water/ground/resources/aquifers.html, at 23 December 2010
[295] Australian Government, NT Government, NT Horticultural Association, NT Agricultural Association Incorporated & Landcare, 'Best Practice for Sustainable Land Use in the NT, Guidelines - Water', http://ntha.com.au/index.php?option=com_docman&task=doc_download&gid=229&mode=view, at 23 December 2010
[296] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[297] Department of Regional Development, Primary Industry, Fisheries and Resources, Arid Zone Research Institute, Alice Springs, Supplementary Briefing Paper, Sustainable Agricultural Development in Central Australia, 27 November 2009
[298] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[299] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008

- altered fire regimes and the effects of invasive animals and plants.[300]

The discussion paper explains that the *Living Rivers Strategy* intends to provide a plan for the future management of rivers in the NT that balances environmental sustainability with economic development. The Committee found that the public comment phase of the development of the strategy concluded in June 2009 but the strategy has not been released. Once complete, the strategy can form part of an overarching NT Government framework for the development of sustainable agriculture in the NT.

Recommendation 3

The Committee recommends that the Northern Territory Government complete and release its *Living Rivers Strategy* as soon as possible.

In the NT, irrigated production relies on groundwater extracted via bores or wells.[301] Surface water for irrigation is limited to tree crops and vegetable production.[302] In Central Australia, irrigation relies on aquifers that recharge infrequently due to low rainfall in the south of the NT. The Committee was informed that in small areas around Alice Springs with good soils such as Ti Tree, there are good quality aquifers for horticulture. The NTAgA told the Committee that due to the type of soils, NT irrigators have always used enclosed irrigation systems and have been considered the most efficient irrigators in Australia.[303] Major public dams for the purpose of irrigation, such as those in southern states, do not exist in the NT. Minor dams on private property for irrigation are few.[304] NRETAS advised the Committee that damming of rivers or streams is not being considered for the NT. NRETAS also advised that while there are plenty of naturally occurring weirs, there are no plans for building weirs in the NT.[305]

[300] NT Government, 'Living Rivers, Sustaining Landscapes, Livelihoods and Lifestyles, Discussion Paper' 2009, http://www.nt.gov.au/nreta/water/livingrivers/pdf/discussion_paper.pdf, at 27 January 2011
[301] Australian Government, NT Government, NT Horticultural Association, NT Agricultural Association Incorporated & Landcare, 'Best Practice for Sustainable Land Use in the NT, Guidelines - Water', http://ntha.com.au/index.php?option=com_docman&task=doc_download&gid=229&mode=view, at 23 December 2010
[302] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[303] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association
[304] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[305] Committee Hansard, Public Hearing, 19 August 2010, Water Resources Division, Department of Natural Resources, Environment and the Arts

Salt water wedges such as along the Adelaide River and Lambells Lagoon can pose a particular threat to groundwater accessed for agriculture. Groundwater extraction needs to be managed to prevent salt water intrusion that would have grave impacts on groundwater dependent ecosystems and agriculture. NRETAS also advised that the Department has been working on managing the salt water intrusion into the Mary River system.[306]

Water allocation plans are tools to manage the sharing of water for human and environmental needs.[307] DRDPIFR informed the Committee that Water Allocation Plans are developed by NRETAS for priority areas facing development and extraction pressure including by agriculture. Water Allocation Plans have been developed for the Ti Tree Region and the Tindal Limestone Aquifer in Katherine.[308] There is a great deal of interest in developing irrigated agriculture in the Western Davenport around the Ali Curung region and so a water allocation plan for the Western Davenport district is being developed. Planning for the Mataranka Water Allocation Plan is well underway and expected to be completed in approximately two to three years.[309] The water allocation plan for the Oolloo aquifer is also being developed.[310] Water allocation planning for the Darwin rural area and the Howard Springs and Berry Springs has also commenced. The NALWTF reported that these water allocation plans are resulting in caps on the extraction of groundwater.[311]

Due to the high rates of evaporation in Central Australia, the water source for agricultural production is groundwater. Production is therefore dependent on finding a suitable quality and quantity of water.[312] NRETAS informed the Committee about the Water Strategy for the sustainability of water resources in Central Australia. The strategy deals particularly with the supply of reticulated water from the Mereenie aquifer accessed by Power and Water and by one other user for agricultural purposes.[313] The water in the aquifer is considered

[306] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[307] Department of Natural Resources, Environment, the Arts and Sport http://www.nt.gov.au/nreta/water/oolloo/index.html, at 12 January 2011
[308] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[309] Committee Hansard, Public Hearing, 19 August 2010, Water Resources Division, Department of Natural Resources, Environment and the Arts
[310] Department of Natural Resources, Environment, the Arts and Sport http://www.nt.gov.au/nreta/water/oolloo/index.html, at 12 January 2011
[311] North Australia Land and Water Taskforce, 2009, 'Sustainable Development of Northern Australia', http://www.nalwt.gov.au/files/NLAW.pdf, at 27 January 2011
[312] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[313] Committee Hansard, Public Hearing, 19 August 2010, Water Resources Division, Department of Natural Resources, Environment and the Arts

non-renewable because the rate of recharge from rainfall is negligible to the amount extracted.[314] The Committee was told that the current rate of usage is very high and if this level persists, supply is expected to last for 320 years.[315] If the current depth of extraction is increased, costs increase and water may be of a lesser quality and require extra treatment before use. Power and Water are working towards reducing the current level of usage in the region by trying to raise the level of public awareness. The current NT Government policy is that no more than 80% of any resource can be used in less than 100 years.[316]

Options for rainwater harvest and storage are being researched by NRETAS. One option considered is to harvest surface water during the Wet Season after peaks have been reached. If the capture is well designed, as river levels begin to fall and the flood peak moves down the system, adverse impacts on environmental flows can be minimised. Surface water harvested in the Wet can be used to recharge an aquifer in the Dry. NRETAS has been working with one agricultural producer in Katherine to consider this option to control and manage aquifer recharge. DRDPIFR informed the Committee that this company has been considering coarse groundwater recharge in sinkholes in two locations and an off stream dam construction in that soil. DRDPIFR explained that the difficulty of this method is that a large, deep area is needed to manage against the NT's high evaporation rates for above ground storage and this needs to be considered against the profitability of making use of this water for the cost to establish and maintain.[317]

NRETAS explained that plans for surface water harvest to recharge aquifers must suit the aquifer's properties such as structure and capacity. For example, the Tindal aquifer in Katherine and Howard East aquifer fill to capacity almost every year but the Oolloo aquifer in the Douglas Daly does not. Options for natural storage of harvested surface water are complicated by the naturally occurring porous soil structures in the NT which would require lining with plastic or bentonite clay adding to the cost of building a storage structure.[318] Another

[314] Power and Water Corporation Fact Sheet, Mereenie Aquifer – Alice Springs http://www.powerwater.com.au/__data/assets/pdf_file/0004/2299/Mereenie_Aquifer_-_Alice_Springs_-_July_2008.pdf, at 11 January 2011
[315] Committee Hansard, Public Hearing, 19 August 2010, Water Resources Division, Department of Natural Resources, Environment and the Arts
[316] Committee Hansard, Public Hearing, 19 August 2010, Water Resources Division, Department of Natural Resources, Environment and the Arts
[317] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[318] Committee Hansard, Public Hearing, 19 August 2010, Water Resources Division, Department of Natural Resources, Environment and the Arts

obstacle for large scale surface water extraction is Wet Season floods washing away pipes, pumps and other infrastructure and causing other damage.[319]

NRETAS informed the Committee of a review taking place of the results of previous work conducted by the Department looking at the Mary River particularly the extent to which inundation of flood plains can be prevented. The previous work found that the interventions were resulting in increases in production and benefits for the protection of wildlife.[320]

NRETAS provided details about the CSIRO and Power and Water project recharging treated water into the Alice Springs aquifer. NRETAS informed the Committee that the project licensed under the *Water Act* is so far working well despite less water being recharged then originally estimated. NRETAS explained that the recharge rate is likely due to slower than anticipated filtration through the fine grained soils and sands. NRETAS advised that this unexpected result is an advantage because the treated water is given more time to be cleansed before reaching the aquifer.[321] Once the level of recharge has been determined as sufficient, the Department of Resources and AZRI will test the use of the water through agricultural projects.[322]

NRETAS informed the Committee that land and water resource assessments to determine size and sustainability are being conducted to support the development of the 21 Growth Towns under the NT Government's Working Future policy. This includes NRETAS working with Power and Water and the Department of Resources to map the areas of land and water suitable for intensive agriculture market gardens and thereby understand the capacity for each Growth Town to develop and be supported by its own local agricultural enterprises.[323]

The Committee was informed that a water strategy for the Tiwi Islands is being developed which would include sustainability plans for each of the water resources identified in the Tiwi. An investigation of water resources on the Tiwi Islands conducted in 2002 has been used as a model for water studies of other

[319] Committee Hansard, Public Hearing, 19 August 2010, Water Resources Division, Department of Natural Resources, Environment and the Arts
[320] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[321] Committee Hansard, Public Hearing, 19 August 2010, Water Resources Division, Department of Natural Resources, Environment and the Arts
[322] Committee Hansard, Public Hearing, 19 August 2010, Water Resources Division, Department of Natural Resources, Environment and the Arts
[323] Committee Hansard, Public Hearing, 19 August 2010, Water Resources Division, Department of Natural Resources, Environment and the Arts

areas such as the Gulf region including Mataranka and the Roper, north-east Arnhem Land, Central Arnhem Land and West Arnhem Land.[324] The same information has yet to be obtained for Central Australia. There are three studies being conducted in Central Australia mapping and measuring water availability in paleovalleys.[325] The intention is to determine how much of the water stored in the paleovalleys can be accessed for development.

NRETAS described the important shift over the past 10 years in water resource assessment to consider the entire resource, aquifer size and needs of different users and the environment. The Committee heard that the National Water Initiative (NWI) reflects the change with all Australian governments agreeing to increase the efficiency of water use in Australia through a national way to manage, measure and plan for water trading.[326] The overall objective of the NWI is create a national market, regulatory and planning based system for managing water resources to achieve optimal economic, social and environmental outcomes. Under the NWI State and Territory governments have committed to:

- prepare water plans with provision for the environment;
- deal with over-allocated or stressed water systems;
- introduce registers of water rights and standards for water accounting;
- expand the trade in water;
- improve pricing for water storage and delivery; and
- meet and manage urban water demands.[327]

NRETAS advised that in the NT, a great deal of monitoring and investigation as part of the NWI is taking place to identify and understand aquifer properties and capacities as well as suitability for agriculture. The Berry Springs and Howard East limestone aquifers have been identified as high yielding with good agricultural potential, while the Wildman siltstone aquifer past Coolalinga will not yield sufficient quantity or quality water for agriculture. Groundwater levels in Howard East in the area of McMinns Lagoon are lowering each year,

[324] Committee Hansard, Public Hearing, 19 August 2010, Water Resources Division, Department of Natural Resources, Environment and the Arts
[325] Paleovalleys are old river beds that are often gravely and potentially offer good water storage. Committee Hansard, Public Hearing, 19 August 2010, Water Resources Division, Department of Natural Resources, Environment and the Arts
[326] Committee Hansard, Public Hearing, 19 August 2010, Water Resources Division, Department of Natural Resources, Environment and the Arts
[327] Australian Government, 'National Water Initiative', http://www.nwc.gov.au/www/html/117-national-water-initiative.asp, at 28 January 2011

meaning that more water is being taken out each year. If two or three poor Wet seasons occur in a row, water levels may drop below the bottom of bores.[328]

Soil

Nutrient content, structure, organic matter, water holding capacity and other important soil qualities are dependent on geological history, climate, plants and animals living on or in the soil, nearby landforms such as rocks, and past and present land use.[329] In the NT these and other interdependent factors have produced soils which have been considered a key limiting factor to further development of intensive agriculture.[330] The NTAgA advised the Committee that the top soils of the NT are not very deep and therefore their conservation and protection must of high priority.[331]

Table 2 shows the soil orders across the NT.

Table 2: Common and less common soil orders across the NT

SOIL ORDER	DESCRIPTION
Common Soil Orders	
Kandosols	Soils that are massive and earthy (formerly red, yellow and brown earths). Throughout the NT; widespread across the Top End, Sturt plateau, Tennant Creek regions and Central Australia.
Rudosols	Very shallow soils or those with minimal soil development. Includes very shallow rocky and gravely soils across rugged terrain such as the Arnhem Plateau and also the sands of the Simpson Desert.
Tenosols	Weakly developed or sandy soils. Commonly shallow (slightly more developed than Rudosols), although they can include the deep sand dunes of beach ridges, granitic soils and sand dunes of deserts. Soils show some degree of soil profile organisation (minor colour or soil texture changes in subsoil).
Hydrosols	Seasonally wet soils. Throughout the NT on floodplains, swamps, drainage lines but more common in higher rainfall areas. Includes mangrove and salt marsh environments.
Chromosols	Soils with an abrupt increase in clay content below the top soil. Restricted to small occurrences across plains and relict alluvial plains.
Dermosols	Soils with highly developed structural characteristics. Common across the Tindal area and also in the Daly River Basin.

[328] Committee Hansard, Public Hearing, 19 August 2010, Water Resources Division, Department of Natural Resources, Environment and the Arts
[329] McTainsh, G.H. & Boughton, W.C., 1993, 'Land Degradation Processes in Australia', Addison Wesley Longman Australia Pty Ltd, South Melbourne
[330] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[331] Committee Hansard, Public Hearing, 22 February 2010, Northern Territory Agricultural Association Incorporated

Calcarosols	Soils with calcium carbonate often formed on limestone. Restricted to small pockets in Central Australia, Victoria River District including Gregory National Park and Katherine and Mataranka Districts.
Ferrosols	Iron rich soils generally formed on basalt. Restricted to volcanic landscapes of the Victoria River District and to a smaller extent in the Roper River Catchment.
Vertosols	Cracking clay soils which may or may not be poorly drained. Common across coastal floodplains of the Top End, the Barkly Tableland and alluvial plains of the Victoria River District.
Less Common Soil Orders	
Sodosols	Soils high in sodium with an abrupt increase in clay content from the top soil to subsoil. Dispersive. Restricted to small occurrences in the southern region.
Anthroposols	Soils resulting from human activities. Common in urban environments, industrial areas and mine sites
Kurosols	Soils with an abrupt increase in clay content from the top soil to subsoil and are strongly acid at depth.
Organosols	Soils with high organic matter. Restricted to very small occurrences in peat swamps of some Top End floodplains. One known occurrence is on the edge of a back swamp of the Finniss River.
Podosols	Soils with organic materials and aluminium with or without iron. Restricted to coastal heath areas along the Australian coastline.

Source: Department of Natural Resources, Environment, the Arts and Sport[332]

Table 2 shows that there are a limited number of soil orders and distribution of soil types suitable for medium to large scale agriculture. There are approximately 30 known soil types in the Top End however only a few are considered suitable for agriculture.[333] The distribution of Top End soils varies and the region is absent of extensive areas of uniform soil types.[334] In the Top End, only isolated patches of soils have favourable physical qualities for further intensive development. Most soils in the Top End are nutritionally poor requiring the addition of fertiliser.[335] Most soils are also susceptible to erosion, hard to manage with traditional cultivation and have poor water holding capacities.[336] The massive red earths (Red Kandosols) are the most agriculturally suitable soils in the Top End. The sandy land systems and high

[332] Department of Natural Resources, Environment, The Arts and Sport, 'Classification' http://www.nt.gov.au/nreta/natres/soil/classification.html, at 7 December 2010
[333] O'Gara, F., 2010, 'Striking the Balance: Conservation Farming and Grazing Systems for the Semi-arid Tropics of the Northern Territory' 2nd ed, NT Government
[334] O'Gara, F., 2010, 'Striking the Balance: Conservation Farming and Grazing Systems for the Semi-arid Tropics of the Northern Territory' 2nd ed, NT Government
[335] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008, p2
[336] O'Gara, F., 2010, 'Striking the Balance: Conservation Farming and Grazing Systems for the Semi-arid Tropics of the Northern Territory' 2nd ed, NT Government

rainfall of the Top End produces poor quality native pastures, therefore cattle is based on upland and floodplain improved pastures.[337]

In the Katherine/Daly district, the red earths with tropical tall grasses are the most important areas for pastures.[338] Most of the arable soil types are the sands referred to as Venn, Blain and Oolloo soil types and loamy red earths.[339]

The Barkly region including Tennant Creek and the Gulf has light textured soils. The Barkly District is typically treeless with slightly undulating black cracking clay plains.[340]

The Victoria River District is characterised by basalt based black soil pastures.[341]

The soils of the Roper and Gulf are mostly shallow, coarsely textured and stony dominated by open eucalypt woodland. [342]

The soils of Central Australia vary as much as the landscape features - salt lakes, mound springs, sand dunes, floodplains, mountain ranges and broad alluvial plains.[343] The soils of Central Australia have formed from strongly weathered parent materials and are generally shallow, of low fertility and very fragile.[344] In Central Australia, apart from areas such as Ti Tree and other scattered fragments where both good soil and groundwater resources are present, cattle in extensive grazing systems dominate agricultural production. Improvements in management practices such as incorporating sustainable agricultural techniques have resulted in sustainable increases in stocking capacity and turn-off to market.[345]

[337] Department of Primary Industry, Fisheries and Mines, 2004, 'NT Wide Pastoral Industry Survey', http://www.ntca.org.au/_assets/04_PastoralSurvey.pdf, at 10 December 2010
[338] Department of Primary Industry, Fisheries and Mines, 2004, 'NT Wide Pastoral Industry Survey', http://www.ntca.org.au/_assets/04_PastoralSurvey.pdf, at 10 December 2010
[339] O'Gara, F., 2010, 'Striking the Balance: Conservation Farming and Grazing Systems for the Semi-arid Tropics of the Northern Territory' 2nd ed, NT Government
[340] Department of Primary Industry, Fisheries and Mines, 2004, 'NT Wide Pastoral Industry Survey', http://www.ntca.org.au/_assets/04_PastoralSurvey.pdf, at 10 December 2010
[341] Department of Primary Industry, Fisheries and Mines, 2007, 'Grazing Strategies for Tomorrow', http://www.nt.gov.au/d/Content/File/p/pi/Pigeon_Hole_Handbook_2007_screen.pdf, at 13 December 2010
[342] Department of Primary Industry, Fisheries and Mines, 2004, 'NT Wide Pastoral Industry Survey', http://www.ntca.org.au/_assets/04_PastoralSurvey.pdf, at 10 December 2010
[343] Department Natural Resources, Environment, the Arts and Sport, 'Soils. Frequently Asked Questions', thttp://www.nt.gov.au/nreta/natres/soil/faq.html, at 7 December 2010
[344] Department Natural Resources, Environment, the Arts and Sport, 'Soils. Frequently Asked Questions', thttp://www.nt.gov.au/nreta/natres/soil/faq.html, at 7 December 2010
[345] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008

Top End soils, although low in nutrients, have the advantage over Central Australian soils of receiving reliable seasonal rainfall that means organic matter can build up quickly which helps with other nutrient aspects.[346]

Carbon

Carbon is an important component of all living things including plant life and soil organic matter. There are five major compartments for the storage of carbon, the atmosphere, oceans (including in carbonate sediments), terrestrial biomass (mass of living matter), soils and fossil fuels.[347] Atmospheric carbon dioxide (CO_2) levels have risen at approximately 1.5% per year since the start of the industrial revolution. Years of conventional tilling of the world's agricultural soils has depleted organic carbon from these soils.[348] It is predicted that if CO_2 levels exceed the removal capacity of vegetation and the ocean's carbonate system and together with increases of other greenhouse gases such as methane, dramatic changes in climate will result.[349]

Understanding the carbon cycle and how plants use CO_2 and energy from the sun to convert CO_2 to organic carbon as they grow and then also through decomposition store soil organic carbon above and below ground is important for understanding ways to reduce atmospheric carbon and limit the effects of climate change. The fixation of CO_2 by plants into soil organic carbon is one way of reducing the rise of CO_2 concentration in the atmosphere.[350]

Carbon is one of 13 key areas outlined in the NTHA's Sustainable Land Use Guidelines.[351] The role of carbon in agricultural systems needs to be better understood. For growers the gaps include knowing the:

[346] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[347] Odum, E.P, 1993, 'Ecology and Our Endangered Life-Support Systems', Sinauer Associates Inc
[348] Australian Government, NT Government, NT Horticultural Association, NT Agricultural Association Incorporated & Landcare, 'Best Practice for Sustainable Land Use in the NT, Guidelines - Carbon' http://ntha.com.au/index.php?option=com_docman&task=doc_download&gid=218&mode=view, 24 December 2010
[349] Odum, E.P, 1993, 'Ecology and Our Endangered Life-Support Systems', Sinauer Associates Inc
[350] Australian Government, NT Government, NT Horticultural Association, NT Agricultural Association Incorporated & Landcare, 'Best Practice for Sustainable Land Use in the NT, Guidelines - Carbon' http://ntha.com.au/index.php?option=com_docman&task=doc_download&gid=218&mode=view, 24 December 2010
[351] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009

- best crops to grow to maximise soil carbon in the different soil types and regions of the NT;
- soil additives that enhance carbon intake and storage in NT soils;
- best crops for biofuel production;
- most efficient slow release fertilisers on the market;
- most appropriate mulches from local sources for different plants and best practice and cost effective methods of preparing and applying mulches;
- most favourable ground cover species for self mulching in NT conditions i.e. heat tolerant, requires little water, nutrients or maintenance and whether the practice of growing self mulching species reduces the need for herbicides; and
- carbon footprint of their enterprises.[352]

The Committee sought the advice of the NT Cattlemen's Association on the application of pastoral production carbon footprint to the measurement of 'food miles' for the distance travelled of product to market. The NT Cattlemen's Association explained that the most accurate measurement that could be used to make comparisons between regions and countries would be the amount of carbon used per unit or kilogram of production however there are inherent difficulties in determining this. The Association gave the example of an animal produced in the UK which might have a higher carbon footprint in production because it is raised in heated sheds for part of the year compared with an animal reared in Australia and shipped to the European market. Further the Association explained that the idea behind gauging 'food miles' for agricultural products is about maintaining regional communities and economies.[353]

The Committee sought information from AZRI on the capacity of invasive species such as buffel grass to store carbon. AZRI advised that they were not aware whether any work had been done in that area. Work on maintaining land condition and stability has shown that perennials are better for production because they grow quickly after rain and with their root structures are more robust compared with annuals that need time to germinate and grow before they begin to capture the sun and this can take up to four weeks after rain. This suggests that perennials would be better at storing carbon.[354]

[352] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[353] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[354] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute

4. ISSUES

The Committee considered a number of issues to be of importance to developing the capacity of the NT to progress environmentally sustainable agriculture.

Biodiversity

The protection of biodiversity is at the core of ecologically sustainable development. Biodiversity protection is a core objective of the National Strategy for Ecologically Sustainable Development. Biodiversity is defined as 'the variety of all life forms on earth – the different plants, animals and micro-organisms and the ecosystems of which they are a part.'[355] Biodiversity is an indicator of overall ecosystem health and resilience to recover from unwanted change.[356] The importance of protecting biodiversity is therefore directly related to maintaining ecologically healthy communities, including people.

The Committee found that the substantial impacts of agriculture on biodiversity in the NT are recognised. For example, the commencement of pastoral land use has been associated with declines and extinctions of species of mammals in the arid regions of the NT.[357] Of the pastoral industry, the initial arrival of non native hard-hoofed herbivores (and possibly accompanied by feral animals and diseases) on Australian environments which did not evolve with their presence, had severe ecological impacts. Early management practices were poor, such as the keeping of very high stock numbers, little fencing, stock concentrated around natural waters and on areas of relatively fertile land.[358]

Although pastoral practices have improved substantially over the years such as the control of stock numbers and the eradication of brucellosis and tuberculosis from the NT, the effects of grazing on plant and animal communities is still evident. These effects include the rise in the number of artificial water-points,

[355] Conservation of Australia's Biodiversity', http://www.environment.gov.au/biodiversity/, at 27 January 2011
[356] Fisher, A., 2007, Maintaining Biodiversity in Tropical Rangelands' in *Grazing Strategies for Tomorrow*, http://www.nt.gov.au/d/Content/File/p/pi/Pigeon_Hole_Handbook_2007_screen.pdf, at 27 January 2011 Tropical Savannas Management CRC, NT Government, Meat and Livestock Australia Queensland University, CSIRO
[357] Department of Natural Resources, Environment, the Arts and Sport, 'Pastoral Land Use', http://www.nt.gov.au/nreta/wildlife/programs/threats/pastorallanduse.html, 31 January 2011
[358] Department of Natural Resources, Environment, the Arts and Sport, 'Pastoral Land Use', http://www.nt.gov.au/nreta/wildlife/programs/threats/pastorallanduse.html, 31 January 2011

spread of weeds, changed fire regimes and impacts of introduced exotic pasture species.[359]

The Committee acknowledges that the relationships between the factors involved with the impacts on agriculture are complex and still being understood.[360] The Committee recognises that agriculture must play its part in reducing its ecological impacts and protecting biodiversity in addition to improving economic performance. This requires understanding the impacts on biodiversity of utilisation and management practices. The Committee believes that changes in agriculture towards more environmentally sustainable practice shows the level of awareness the industry has reached in understanding the need to protect biodiversity.

The Committee heard from DRDPIFR that in their view the greater percentage of pastoralists are good land managers and that approximately three quarters of the pastoral industry are members of a Landcare group or association.[361]

The Committee heard from NRETAS about the changes in the management of feral species such as wild dogs. Management for wild dogs to preserve dingo populations, prevent hybridisation of dingoes with wild dogs, protect native and agriculture species from predation as well as protect human settlements has in the past only been conducted by NT Parks and Wildlife officers with the authority to use 1080 bait. The Committee was advised that the NT is moving towards allowing pastoralists who have undergone the necessary training and obtained authorisation from DRDPIFR (now Department of Resources) to apply for a permit to use dry baits. In pastoral areas where primarily the wild dog populations not dingos are causing the impacts on agriculture and social enjoyment, trained and authorised pastoralists are able to help reduce their numbers and effects.[362] The Committee learnt that in the Litchfield Shire the same shift is occurring for people to be permitted to bait within town boundaries provided that it occurs beyond the proximity of water sources.[363] The application of fresh meat baits will still only be authorised for NT Parks and

[359] Department of Natural Resources, Environment, the Arts and Sport, 'Pastoral Land Use', http://www.nt.gov.au/nreta/wildlife/programs/threats/pastorallanduse.html, 31 January 2011
[360] Department of Natural Resources, Environment, the Arts and Sport, 'Pastoral Land Use', http://www.nt.gov.au/nreta/wildlife/programs/threats/pastorallanduse.html, 31 January 2011
[361] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[362] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[363] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts

Wildlife officers until the appropriate packages are developed for others to gain the required training.[364]

The Committee considered whether in the face of sea level rise from climate change, the competition between preservation of areas for wildlife and for agriculture could be addressed by planning to designate areas for each purpose now. NRETAS advised that although the Department does not have good digital elevation models or mapping of rises and falls of the coast to know exactly what will happen to certain areas in the event of sea level rise, there is good data to support the protection of floodplains and the data can be used to support the protection of prone agricultural areas. NRETAS advised that there are differences in the methods of protecting areas for production and biodiversity and this has to be considered in any planning to designate areas for the protection of wildlife or agriculture.[365] NRETAS advised that the current best practice promotes the conservation of larger blocks of land that encompass different altitudes, temperatures and other environmental features.[366]

Water Management

The limits on the supply of freshwater, competing demands for its use, poor management practices in the past, the risks to supply from an increasing population, changes in land use, severe drought and climate change, have made water management one of Australia's most pressing environmental issues. Water management to meet these challenges will demand measures such as better pricing, water restrictions, allocation plans, enhanced efficiencies from better technology and using non traditional supplies of water such as recycled water, rainwater tanks, stormwater and desalination.[367]

Best practice water management in agriculture aims to ensure that enough water is available for high quality production and is used efficiently without harm to the environment from wastefulness or through plant nutrient and agrochemical run-off.[368] Sustainable water management requires sound

[364] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[365] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[366] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[367] Australian Government National Water Commission, 'Supply Risks' http://www.nwc.gov.au/www/html/239-supply-risks.asp, at 23 December 2010
[368] Australian Government, NT Government, NT Horticultural Association, NT Agricultural Association Incorporated & Landcare, 'Best Practice for Sustainable Land Use in the NT,

knowledge and understanding of the water cycle, sources, availability, quality, processes, interaction with other resources as well as knowing how to protect water supply and quality. Planning and management of water resource systems must establish a shared vision and purpose and through well coordinated contributions from all sections of the community, aim for social, economic and environmental goals that ensure the sustainability of water resources.

The Committee found that there are extensive knowledge gaps relating to water resources for agriculture including understanding the:

- extent and capabilities of water resources for agricultural regions and planned allocations for sustainable agriculture in the future;
- interaction of allocations with total catchment planning and management;
- impacts of agricultural production on the different regions and best practice management to minimise the negative impacts;
- best practice models for sustainable irrigation systems for arid and wet/dry tropics agriculture that can also be easily modified for various crop requirements;
- actual water requirements for crops grown in different soil types in the NT;
- most efficient delivery systems for the range of NT crops;
- environmentally sustainable methods to improve water holding capacity of NT soils;
- characteristics of optimal riparian[369] buffer zones to achieve in NT agricultural regions;
- knowledge of environmentally neutral water treatment methods and their cost effectiveness.[370]

The NTHA told the Committee that its membership has identified the need for training to develop:

- skills necessary to operate irrigation systems according to schedules designed to maximise crop quality and quantity and efficiency of water use, and monitor water resource use to ensure its sustainability; and

Guidelines - Water',
http://ntha.com.au/index.php?option=com_docman&task=doc_download&gid=229&mode=view, at 23 December 2010

[369] '… of pertaining to or situated or dwelling on the bank of a river or other body of water.' The Macquarie Dictionary, 2nd ed, 1981, Macquarie Library Pty Ltd, NSW, p 1468

[370] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'

- skills and knowledge to operate monitoring devices and assess soil moisture and regulate irrigation schedules accordingly.[371]

The NTHA suggested that a matrix be developed that plots various climatic conditions against various soil types for producers to determine appropriate irrigation scheduling requirements.[372] The Committee learnt that growers want to better understand the water cycle, how aquifers work, how they are replenished, the effect of water use on aquifers, as well as the processes and effects of nutrient leaching on water resources from their activities. Growers particularly in the arid zones identified a need for assistance with preventing back flow when injecting fertilisers through irrigation systems. The NTHA advised the Committee that growers also requested research to support the use of irrigation water to grow green manure crops to improve organic matter content and water holding capacity of soils.[373]

The NTAgA expressed its support for the current modelling and data used to base the water allocation plans. The Association noted that there are some in the industry that believe that the water allocations for agriculture are too restrictive. The Association pointed out the potential for applicants not to use their water extraction licences for the extraction of water but to tie up water to trade later or to inflate the value of their land. The Association explained that the new system of water allocation will take time to be understood and for its intended outcomes to be realised. The five year reviews will also provide more information. The Association recommends that the NT seek out the experience and knowledge of other jurisdictions that have had water allocation plans in place for many years.[374]

The Committee heard from DRDPIFR that NRETAS has been undertaking the modelling for water sustainability and management in the NT and this information will help to dispel the idea that there is unlimited quantity of water in the NT. The allocation of significant percentages of aquifers to environmental flows in the Tindal Aquifer Water Allocation Plan is helping to make this known in the public domain.[375]

[371] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'
[372] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'
[373] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'
[374] Committee Hansard, Public Hearing, 22 February 2010, Northern Territory Agricultural Association Incorporated
[375] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources

Soil Management

The threat of soil erosion to the sustainability of agriculture has been acknowledged.[376] Best practice soil management in agriculture works with the limits of soils to maximise productivity and provide for further development through improved soil fertility, structure and capacity. Best practice soil management also aims to protect soil qualities and function by minimising erosion and nutrient loss and preventing land degradation to maintain overall healthy ecosystems.[377]

Soil management for sustainability in agriculture can be achieved with soil management plans incorporated into environmental management plans and integrated with best practice production systems.[378] This requires knowledge of soil types and properties and regular testing for chemical, physical and biological properties. Adopting the range of best practice principles to maintain or enhance soil quality and structure is also recommended.[379] These practices include:

- enhancing soil biota, increasing soil organic matter through green manure, mulching and composting techniques to improve and maximise soil potential;
- keeping soil covered with crop residue or covering crops to prevent erosion and maintaining soil structure;
- optimising soil pH;
- minimising soil sodicity (exchangeable sodium that can interfere with the growth of plants) and salinity (accumulation of salts at the surface and or within the soil profile);

[376] For example O'Gara, F., 2010, 'Striking the Balance: Conservation Farming and Grazing Systems for the Semi-arid Tropics of the Northern Territory' 2nd ed, NT Government
[377] Australian Government, NT Government, NT Horticultural Association, NT Agricultural Association Incorporated & Landcare, 'Best Practice for Sustainable Land Use in the NT, Guidelines - Soils', http://ntha.com.au/index.php?option=com_docman&task=doc_download&gid=226&mode=view, at 22 December 2010
[378] Australian Government, NT Government, NT Horticultural Association, NT Agricultural Association Incorporated & Landcare, 'Best Practice for Sustainable Land Use in the NT, Guidelines - Soils', http://ntha.com.au/index.php?option=com_docman&task=doc_download&gid=226&mode=view, at 22 December 2010
[379] Australian Government, NT Government, NT Horticultural Association, NT Agricultural Association Incorporated & Landcare, 'Best Practice for Sustainable Land Use in the NT, Guidelines - Soils', http://ntha.com.au/index.php?option=com_docman&task=doc_download&gid=226&mode=view, at 22 December 2010

- ensuring that the balances of positive and negative ion exchanges[380] are correct;
- minimising use and leaching of nutrients;
- preventing heavy metal build up in soils.
- applying tillage techniques that aim to conserve soils;
- encouraging perennial grass growth;
- minimising soil compaction;
- minimising pesticide use and impacts;
- adopting stock management that prevents overgrazing and protects riparian zones; and
- controlling and reducing impacts of feral animals.[381]

The Committee was informed that to overcome the limitations of nutritionally poor soils, growers in the NT use modern tools and techniques to control and reduce fertiliser use. Fertigation for example is the process of injecting fertiliser through the irrigation system rather than by topical application. Another example is precision agriculture which uses information technology such as Global Positioning Systems (GPS), satellites and aerial imagery and Geographic Information Systems (GIS) to evaluate conditions and variations such as in climate or soil, support decisions such as fertiliser application, or predict yields.[382]

The intensive rainfall experienced in the Top End poses particular risks such as increased soil erosion, eutrophication of freshwater systems and creating water logged soils which are, from poor drainage or subject to seasonal inundation, low in oxygen needed for growing crops.[383] Eutrophication is the presence of excessive nutrients in water bodies often occurring from run-off containing nutrients, fertilisers, pesticides and any other chemicals, resulting in excessive plant growth especially weeds and algae, the depletion of dissolved oxygen which has impacts for aquatic animals and creating imbalance in the

[380] The storage and exchange of positive and negative ions between soil and water that is important for the storage of nutrients for plants. McTainsh, G.H. & Boughton, W.C., 1993, 'Land Degradation Processes in Australia', Addison Wesley Longman Australia Pty Ltd, South Melbourne, p 67

[381] Australian Government, NT Government, NT Horticultural Association, NT Agricultural Association Incorporated & Landcare, 'Best Practice for Sustainable Land Use in the NT, Guidelines - Soils', http://ntha.com.au/index.php?option=com_docman&task=doc_download&gid=226&mode=view, at 22 December 2010

[382] University of Sydney, Australian Centre for Precision Agriculture, http://www.usyd.edu.au/agriculture/acpa/, at 7 December 2010

[383] Department Natural Resources, Environment, the Arts and Sport, 'Soils. Frequently Asked Questions', thttp://www.nt.gov.au/nreta/natres/soil/faq.html, at 7 December 2010

ecosystem.[384] The protection of soil structure is therefore vital in soil management of Top End soils.

A number of knowledge gaps relating to soil management for agricultural systems in the NT were identified including the:

- need for current and detailed mapping of soils for agriculture in the NT - types, properties, susceptibility to erosion and other features, in order to understand the full extent of potential development of agriculture;
- biological properties and physical and chemical attributes of soils in NT regions and how the soils should be best managed for sustainability;
- soil biota requirements to sustain productive soils for particular crops;
- cost effective methods of increasing soil organic matter;
- best native grass species to increase soil structure in different NT regions; and
- need for soil additives developed specifically for NT soils.[385]

The NTHA suggested a soil management information tool or matrix be developed that plots soil types, soil properties and susceptibility to erosion with the corresponding appropriate management, to help growers improve their soil management practices.[386]

Indigenous Economic Development

The NALWTF projected that by 2030:

> Indigenous people will be central in land and water planning, management and decision making, reflecting the new demographic, economic and political reality in the north. Indigenous aspirations and rights are now fully recognised as a result of the integration of native title and non-Indigenous land use objectives, under a strengthened National Water Initiative which reflects the six principles enunciated at the landmark 2009 Mary River Indigenous Water Experts Forum. … Indigenous and non-Indigenous interests are also closer to effective integration in land and water planning and management practices

[384] McTainsh, G.H. & Boughton, W.C., 1993, 'Land Degradation Processes in Australia', Addison Wesley Longman Australia Pty Ltd, South Melbourne
[385] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'
[386] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'

> through multiple-use strategies for Indigenous and non-Indigenous controlled land. These strategies not only deliver economic viability, but also parity between Indigenous tenure and management systems and non-Indigenous institutions. Indigenous social and community issues are now also explicitly included in land and water planning and management activities.[387]

Indigenous people make up 32% of the NT population[388] and this is increasing (growth rate of Indigenous population in the NT of 1.6-1.7% by 2021).[389] In the NT, 79% of the Indigenous population live in remote and very remote areas.[390] Indigenous held land occupies approximately 50% of NT land mass.[391] A range of social and cultural issues challenge the development of agriculture on Aboriginal land. DRDPIFR listed the following issues for horticulture:

- absence of commercial horticultural traditions;
- cultural-based preference for spending for social capital rather than for economic gain, including investment;
- cultural-based ideas about appropriate use of natural resources, including land clearing and forestry;
- cultural practices that can require absences for extended periods not suiting the high input demands of industries like horticulture;
- disputes over rights to land;
- welfare dependence creating disincentive to work or develop enterprises; and
- possibility that horticulture, crops and forestry development may not be the best option suited to Aboriginal people and offering the best economic gain for the use of Indigenous land.[392]

[387] North Australia Land and Water Taskforce, 2009, 'Sustainable Development of Northern Australia', http://www.nalwt.gov.au/files/NLAW.pdf, at 27 January 2011
[388] Australian Bureau of Statistics, '4713.0 - Population Characteristics, Aboriginal and Torres Strait Islander Australians, 2006, - Where Indigenous People Live', http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/1B40E5C07AF557C9CA257718002A70EC?opendocument, at 31 January 2011
[389] Australian Bureau of Statistics, '3238.0 - Experimental Estimates and Projections, Aboriginal and Torres Strait Islander Australians, 1991 to 2021 - States and Territories' http://www.abs.gov.au/ausstats/abs@.nsf/Products/DDAB99776D7ABDC7CA25762A001CC066?opendocument, at 31 January 2011
[390] Australian Bureau of Statistics, '4713.0 - Population Characteristics, Aboriginal and Torres Strait Islander Australians, 2006, - Where Indigenous People Live', http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/1B40E5C07AF557C9CA257718002A70EC?opendocument, at 31 January 2011
[391] Australian Government Department of Foreign Affairs and Trade, 'About Australia, Indigenous Peoples - An Overview', http://www.dfat.gov.au/facts/indigenous_land_rights.html, at 3 March 2011
[392] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008

Other challenges for the development of plant industries on Aboriginal land include:

- need for outside assistance to provide expertise with management and development;
- the length of time needed to negotiate and develop land use agreements often being incompatible with timeframes of commercial developers;
- permission required from traditional owners for other Indigenous people to develop enterprises on traditional owners' land and often compensation to traditional owners is also required;
- for remote communities, distance from and transport to markets poses limits for perishable produce and access to allied industries;
- Infrastructure constraints such as reliable power supply and suitable roads; and
- suitability of Indigenous owned land to horticultural production.[393]

Political and legislative issues also pose a number of challenges for the development of plant industry enterprises for Aboriginal people including:

- legislative requirements for Aboriginal people to act collectively to develop businesses on Indigenous held land may be discouraging individuals from developing business ideas; and
- legislative restrictions that require complex resource management plans for wild harvest of plant products.

The NTHA told the Committee that there are capable soils and resources on Indigenous land that can be used for food production for those communities and for economic development.[394]

The NT Cattlemen's Association discussed the issue of the growing population of Indigenous people as well as the need for employment and economic opportunities that can help to build sustainable and healthy Indigenous communities and address some of the social disadvantages. The NT Cattlemen's Association sees these issues as important motivators for Indigenous economic development through agriculture and the Association

[393] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[394] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association

makes developing Indigenous employment programs one of its priorities.[395] The Association told the Committee that there were approximately 75 people on structured employment programs developed with the direct involvement of the pastoral industry. The Association recognises the opportunities in skilling and developing the participation of Indigenous people in rural and remote areas because they are more likely to remain in their local area for a long time.[396] In relation to the delivery of training programs to Indigenous people, the Committee heard that the approach of CDU and other training providers does not suit the needs and schedule of a pastoral worker who is more accustomed to waking at 4:00am than commencing at 9:00am and requires hands-on training on property.[397]

Centrefarm made similar comments as the NT Cattlemen's Association about training. Centrefarm explained that part of the problem with current training delivery is the requirement of training providers to meet their quotas of contact hours which has meant that class sizes can be between 16 - 20 people. Centrefarm told the Committee that this is too large a group for focused training to be effective. Centrefarm has developed its Training for Employment policy and proposed a package that promotes more training to take place in the paddock and less in a classroom. Also the Centrefarm training spends the first 10 weeks on work environment expectations so that after the first phase of training a person will know which primary industry they may or may not be interested in pursuing.[398] The remaining 30 weeks of training will be on the job in one of the enterprises established under the Centrefarm model. The Committee also heard that two Centrefarm training campuses are proposed, one in Ali Curung right next to the community that will not be residential but bring people to the region to be trained. A kitchen is also proposed to be located in the training block to train people about food production as a possible micro industry to provide light meals to workers on properties. The other proposed training campus will be in Anmatjere 65 km east of Ti Tree at Adelaide Bore and this campus will be residential.[399]

AZRI informed the Committee that in addition to IPP and the certificate level courses run by CDU, the Wright Training Organisation (WTO) based in

[395] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[396] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[397] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[398] Public Hearing, 27 November 2009, Centrefarm Aboriginal Horticulture Ltd
[399] Public Hearing, 27 November 2009, Centrefarm Aboriginal Horticulture Ltd

Queensland has begun operating in the NT. AZRI is working with WTO to use the AZRI demonstration farm for young people from different stations to see the work being carried out on the research farm.[400] Centrefarm has asked for NT Government policy to reflect the need for these changes to take place in training delivery and sought Commonwealth Government funding to implement its training strategy.[401]

The NT Cattlemen's Association also spoke about the economic opportunities for Aboriginal people for Aboriginal held land to be used for breeding and agistment.

Climate Change and Carbon Economy

The Committee received evidence from NRETAS that climate change modelling and forecasts predict more frequent and extensive, drier and hotter weather conditions in the NT.[402] NRETAS pointed out although modelling is constantly improving, climate modelling and projections are characteristically imperfect in predicting the future and that some level of uncertainty will always be present in predictive methods.[403] In answer to a question from the Committee about the differing views on the reality of climate change, NRETAS explained that the NT Government, as with other Australian governments rely on the projections of the Inter-governmental Panel on Climate Change whose 2,000 scientists have agreed on the reality of climate change and attribute its occurrence to human activities. NRETAS advised that as modelling improves, the projections provide a clearer picture of the direction of change and can help communities prepare and begin to adapt. The Committee understands that the challenge of addressing climate change has two parts: how to reduce GHG emissions and how to adapt to the changing climate and its effects on the environment and society.[404] NRETAS advised that partly due to this uncertainty of predictions, management of climate change impacts, nationally and internationally has been from a risk management perspective.

[400] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[401] Public Hearing, 27 November 2009, Centrefarm Aboriginal Horticulture Ltd
[402] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[403] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[404] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts

The Committee was informed that from 2030, temperatures are expected to increase by at least one degree.[405] By 2070 Darwin's annual temperature is predicted to increase by 3.2°C and Alice Springs by 3.7°C.[406] NRETAS explained that increases in average temperatures can affect the frequency and intensity of extreme temperature events such as the number of days over 35°C. Currently there are 11 days over 35°C. By 2030 there will between 28 and 44 days.[407]

Rainfall in Central Australia is predicted to decrease. By 2070 annual rainfall in Alice Springs is predicted to decrease by 17%.[408] In Central Australia periods of extremely low to no rainfall are predicted to occur more frequently.[409] NRETAS explained that at this stage projections in rainfall are broad, ranging from decreases to increases in rainfall and are so are generally inconclusive.[410]

Little change in relative humidity other than small decreases in the south is predicted. Increases in evapotranspiration[411] rates from plants and the landscape across the NT are projected.[412] NRETAS explained that this will result in nett decrease in available water in the environment.[413]

The intensity of tropical cyclones is likely to increase, but the frequency of cyclones has not been reliably projected. Global sea level is expected to rise by between 18-59 cm by the year 2100 due to ocean warming, with additional increases expected from melting from ice sheets.[414] Storm surges and resulting inundation are likely to increase due to high average sea level and more severe weather systems.[415]

[405] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[406] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009
[407] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[408] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009
[409] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[410] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[411] 'Evapotranspiration is the combination of evaporation from soil and water surfaces, and transpiration from vegetation.' Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009, p3
[412] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009
[413] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[414] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009
[415] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009

The Committee was informed that the threat to flood-plains from climate change is significant. Minor rises in sea levels would result in greater inundation of flood-plains, affecting wildlife as well as grazing cattle. NRETAS advised that although there has been work conducted on the national level on the effect of climate change on ocean temperatures, only limited information is available.[416] It is still uncertain whether the work of NRETAS on the Mary River in relation to salt water intrusion can be applied anywhere else in the NT.[417]

NRETAS informed the Committee about the Indian Ocean Climate Initiative, a joint project of the WA and Australian Governments looking at the impacts of Indian Ocean dynamics on the climate of Australia, especially on the WA coast. The NT Government is working with WA, Queensland and Australian Governments to establish the North Australia Climate Science Initiative to add to the work of the Indian Ocean Climate Initiative by incorporating climate information on the NT to better understand the possible effects of climate change.[418]

The Committee sought information from NRETAS on the effect of increased temperatures on animal fertility and was advised that there could be potential impacts on reptiles such as crocodiles whose sex determination during embryo development is temperature dependent. This could disturb the natural balance of numbers of each sex resulting in predominance in numbers of one sex.[419]

In 2006, Australia's net GHG emissions were 576 million tonnes of carbon dioxide equivalent (Mt CO_2-e).[420] It has been projected that over 2008-12 Australia's GHG emissions will average 582 Mt CO_2-e[421] per year. This is 106% of 1990 levels.[422] GHG emissions from agriculture including savanna

[416] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[417] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[418] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[419] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[420] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009
[421] CO_2 equivalent (CO_2 -e) used to compare differences in emissions by greenhouse gases, where CO_2 =1 and CH_4 for example = 21. CO_2 Australia Limited, 'Glossary', http://www.co2australia.com.au/index.php?action=help&helpcatID=621&helpID=3552#3552, at 4 March 2011
[422] Australian Government Department of Climate Change and Energy Efficiency, 'Australia's emissions projections 2010', http://www.climatechange.gov.au/en/publications/projections/australias-emissions-

burning made up 16% of the national total. In 2006, NT GHG emissions accounted for 2.8% of Australia's total emissions. From 2005 to 2006, NT GHG emissions increased by approximately 8% mostly from energy consumption/production and savanna burning.[423] In 2006, the agricultural sector in the NT, including savanna burning, contributed more than any other sector to total NT emissions (55%). Savanna burning alone contributed 36%. Agricultural emissions are from cattle, (methane (CH_4)), prescribed burning of savannas (CO_2, nitrous oxide (N_2O) and CH_4) and nitrous oxides from the disturbance of soils.[424] Methane from enteric fermentation in the gut of cattle makes up the majority of the 19% of NT agricultural GHG emissions.[425] NRETAS pointed out that although deforestation has not been counted as part of GHG emissions from agriculture, in 2006, 6% of NT GHG emissions were from deforestation, mostly associated with agricultural activities.[426]

NRETAS advised that the impacts of climate change on agriculture are uncertain but possible impacts of the projected changes in climate may include:

- increased exposure to heat stress, fire and extreme rainfall and flooding for remote communities;
- with a 30 cm rise in sea level, loss of biodiversity of up 80% in the wetlands of Kakadu; and
- changes in demand for energy, increase demand for cooling, decrease demand for heating in colder months.

The potential impacts of climate change on agriculture in the NT include impacts on livestock such as:

- lowering of production and reproduction and possible increase in morbidity due to increased heat stress from increased temperatures;
- increased pests and diseases and stock needing greater health maintenance;
- reduced pasture quality and growth especially in water limited environments;

projections/~/media/publications/projections/factsheet-emissions-projections.pdf, at 3 March 2011

[423] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009

[424] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009

[425] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009

[426] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts

- reduced water availability especially in Central Australia; and
- altered carrying capacity of pastoral properties especially southern rangelands.[427]

Potential impacts on irrigated agriculture from climate change include:

- changes to water availability; [428]
- increased demand on water resulting from increased temperatures and rates of evapotranspiration;
- changes to sowing and harvest times;
- increased pests and diseases;
- increased product damage; and
- extreme weather events and any adverse impacts.[429]

The Australian Bureau of Agricultural and Resource Economics (ABARE) predicted that for production and exports, Australia will be one of the countries in the region that will be adversely affected by climate change.[430] The additional pressures from climate change emphasises the need to continue technological advancements that could help to reduce the potential negative impacts. The work of ABARE on the vulnerabilities of different production regions to climate change predicts that northern broad scale production systems will be less susceptible than the annual cropping systems in southern States.[431] Declining productivity and output will have impacts locally and on other countries and their production.[432]

NRETAS explained that because the rate of climate change in a historical sense is very high, the likelihood of the possibility of species naturally adapting in time is reduced. Extinctions may be possible as well as the emergence of unique ecosystems resulting from adaptation by natural systems to the changed climate.[433] NRETAS advised that there are opportunities to reduce

[427] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009
[428] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009, p 4
[429] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009
[430] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[431] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[432] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[433] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts

GHG emissions from the agriculture sector in the NT. The options range from changes to pasture and livestock management to reduce methane emissions, altering tillage practices and crop management, changes to prescribed burning, and reducing land clearing.[434]

In the arid and semi-arid lands of the NT, changes to climate will require agricultural producers to adapt to managing for soil moisture deficiencies. This will require more advanced drought preparedness strategies.[435] Changes will have to be made to pasture and livestock management to reduce methane emissions. Reductions in methane emissions of 30% can be achieved with the use of feed supplements and management of stomach bacteria in cattle.[436] Grazing and crop management will have to be adapted to reduce emissions and increase carbon storage.

Emissions from soil account for 4% of NT agricultural emissions.[437] Soils are important carbon storage sites. Soil carbon comes from plant photosynthesis of CO_2 and water using energy from the sun to make carbohydrates. Soils with increasing clay content along its profile are known to have better storage capacity.[438] More storage takes place during a growing season. Losses of carbon from soil occur from clearing, cultivation, grazing and fire. Decaying plant matter and fungi associated with plant roots, take carbon into soil. To maximise soil carbon storage groundcover must be maintained. Better soil management can improve soil condition, fertility and productivity by replenishing soil organic carbon and increasing nutrient levels and water holding capacity.[439] Best practice use of fertilisers as well as manure and effluent management in intensive livestock operations can be adopted. Tillage will have to be reduced to minimise fuel use and soil GHG emissions.[440] The Committee learnt that the NT has a history of promoting 'no tillage' from when

[434] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[435] Submission No. 1, Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008
[436] Hatfield-Dodds, S., Carwardine, J., Dunlop, M., Graham, P. and Klein, C., 2007. Rural Australia Providing Climate Solutions: Preliminary report to the Australian Agricultural Alliance on Climate Change. CSIRO Sustainable Ecosystems, Canberra, cited in Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009
[437] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009
[438] Northern Territory Government, 'Factsheet 4: Carbon Trading Opportunities for the NT Pastoral Industry, http://www.nt.gov.au/d/Content/File/p/Climate_Change/CCFS04.pdf, at 16 December 2010
[439] Northern Territory Government, 'Factsheet 4: Carbon Trading Opportunities for the NT Pastoral Industry, http://www.nt.gov.au/d/Content/File/p/Climate_Change/CCFS04.pdf, at 16 December 2010
[440] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009

the Douglas-Daly region was first opened up to farmers from Queensland many years ago.[441]

The Committee was advised that other techniques can also be adopted such as stubble retention, bio-char sequestration[442] and use of pastures known to provide long-term carbon storage.[443] Other mixed farming practices such as crop rotations with perennial grasses and legumes can also restore soil carbon.[444] With controlled burning, tropical savannas can capture 1-2 tonnes of carbon/ha/year although this is dependent on soil nutrient and water availability. Rotational grazing or strip grazing, the practice of moving livestock from one patch of pasture to another after shorter periods of time (a few days to several weeks), if well managed, gives pastures time to recover and thereby provide for higher stock numbers, maintain pasture quality, animal productivity and lead to significant increases in soil carbon.[445]

The Committee was informed that land clearing accounts for 6% of NT GHG emissions. Carbon stored in vegetation is released into the atmosphere when land is cleared. Estimates put emissions from land clearing in the NT at 100 tonnes CO_2-e per ha cleared (compared with 5 tonnes CO_2-e per annum for a medium-size vehicle). Controls on land clearing in the future will reduce GHG emissions. This will have to be considered in the proposed land use changes in the Daly River catchment.[446] Changes to burning regimes to manage for fire frequency, intensity, fuel loads and to reduce loss of stored carbon will also have to be made. Agroforestry and farm-based revegetation for the storage of carbon are also options.[447]

The Committee heard that the NT is active in national processes to develop policy measures to reduce GHG emissions from agriculture, including

[441] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[442] Pyrolysis of biomass to create 'charcoal' which is then mixed into soil with multiple benefits including stable sequestration of carbon.
[443] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009
[444] Northern Territory Government, 'Factsheet 4: Carbon Trading Opportunities for the NT Pastoral Industry, http://www.nt.gov.au/d/Content/File/p/Climate_Change/CCFS04.pdf, at 16 December 2010
[445] O'Gara, F., 2010, 'Striking the Balance: Conservation Farming and Grazing Systems for the Semi-arid Tropics of the Northern Territory' 2nd ed, NT Government
[446] Northern Territory Government and Daly River Management Advisory Committee, 'Adaptive Management Framework for Native Vegetation Clearing in the Daly River Catchment', http://www.nt.gov.au/nreta/water/drmac/pdf/adaptivemanagement.pdf, at 14 December 2010
[447] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009

participation in the Natural Resource Management Ministerial Council.[448] This includes consideration of trading of carbon credits. A carbon credit is a value assigned to an emission, reduction or offset of GHG emissions, measured as one tonne of CO_2-e.[449] A carbon offset is a measured reduction in GHG emissions from an activity which can be traded to balance out GHG emissions from another activity.[450] The Federal Government is currently consulting with the business community and non-government organisations towards developing a regulated national emissions trading scheme.[451] A multi-party Climate Change Committee has also been established (September 2010) to look at options for implementing a price on carbon and to build consensus on how Australia will address the challenges of climate change.[452] Agricultural activities were excluded for a number of years[453] and forestry was covered on a voluntary basis from the formerly proposed Carbon Pollution Reduction Scheme (CPRS).[454] Whether this will be the same in the final scheme is still unknown. On the 24 February 2011 the Federal Government announced its intention to introduce a carbon pricing mechanism to commence on 1 July 2012 that will apply for three to five years and then transition into an emissions trading scheme (ETS).[455]

The following activities are not counted in Australia's GHG emission inventories:

- revegetation but not including forestation;
- management of forests for preservation and use;
- management of land on which crops are grown; and

[448] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[449] Carbon Offset Guide Australia, 'Glossary', http://www.carbonoffsetguide.com.au/glossary/8, at 17 December 2010
[450] Northern Territory Government, 'Factsheet 4: Carbon Trading Opportunities for the NT Pastoral Industry, http://www.nt.gov.au/d/Content/File/p/Climate_Change/CCFS04.pdf, at 16 December 2010
[451] Australian Government Department of Climate Change and Energy Efficiency, 26 November 2010, 'Roundtables on Climate Change', http://www.climatechange.gov.au/media/whats-new/roundtables-held.aspx, at 16 December 2010
[452] Australian Government Department of Climate Change and Energy Efficiency, 'Multi-Party Climate Change Committee', http://www.climatechange.gov.au/en/government/initiatives/multi-party-committee.aspx, at 16 December 2010
[453] Hatfield-Dodds, S., Carwardine, J., Dunlop, M., Graham, P. and Klein, C., 2007. Rural Australia
Providing Climate Solutions: Preliminary report to the Australian Agricultural Alliance on Climate Change. CSIRO Sustainable Ecosystems, Canberra, p3
[454] Northern Territory Government, 'Factsheet 4: Carbon Trading Opportunities for the NT Pastoral Industry, http://www.nt.gov.au/d/Content/File/p/Climate_Change/CCFS04.pdf, at 16 December 2010
[455] Prime Minister of Australia, The Hon. Julia Gillard MP Press Office, 'Climate change framework announced', http://www.pm.gov.au/press-office/climate-change-framework-announced, at 3 March 2011

- management of land used for grazing.[456]

This is partly because the level of reductions from these activities has been questioned. It is unclear how best to measure the contributions of these activities and the cost of making estimations and monitoring. How to factor in other aspects such as natural events like wildfires and drought which can quickly reduce the amount of carbon stored has also been questioned. It is unlikely that these activities will be counted in any future regulated schemes until an internationally accepted approach for estimating and monitoring emissions and abatement from these activities is determined.[457]

A national ETS offers opportunities for natural resource management and agriculture to engage in carbon capture and storage and gain carbon offsets.[458] In October 2010, the Federal Government established the Domestic Offsets Integrity Committee to assess the proposed methods for developing and selling carbon credits as part of the Carbon Farming Initiative which is also still being developed. The Carbon Farming Initiative will allow farmers, foresters and landholders to gain offset carbon credits for activities that reduce GHG emissions or store carbon. The credits can then be traded to generate income.[459]

Voluntary offset markets already exist and trade in Australia and offer incentive-based emissions management opportunities. There are approximately 91 registered offset providers in Australia.[460] Carbon Farmers of Australia is one example where farmers can register to trade in soil carbon credits under the Australian Soil Carbon Accreditation Scheme.[461] Other examples such as

[456] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009
[457] Submission No. 2, Department of Natural Resources, Environment, The Arts and Sport, 13 May 2009
[458] Garnaut Climate Change Review, 2008, 'Issues Paper 2, Financial Services for Managing Risk: Climate Change and Carbon Trading' http://www.garnautreview.org.au/CA25734E0016A131/WebObj/IssuesPaper2-FinancialServicesforManagingRiskClimateChangeandCarbonTrading/%24File/Issues%20Paper%202%20-%20Financial%20Services%20for%20Managing%20Risk%20Climate%20Change%20and%20Carbon%20Trading.pdf, 17 December 2010
[459] Parliament of Australia, House of Representatives, Official Hansard, No. 3, 2010, Wednesday, 27 October 2010, http://www.aph.gov.au/hansard/reps/dailys/dr271010.pdf, at 17 December 2010
[460] Carbon Offset Guide Australia, http://www.carbonoffsetguide.com.au/carbon-offset-guide-australia-0?sid=3784, at 16 December 2010
[461] Carbon Farmers Of Australia Australian, 'Soil Carbon Grower Register' http://www.carbonfarmersofaustralia.com.au/Carbon%20Farmers%20Of%20Australia/HOME.html, at 16 December 2010

Carbon Link[462] and Prime Carbon[463] are private companies that in addition to brokering for clients on local and international carbon markets, work directly with farmers to increase soil carbon storage and in doing so develop models of best practice based on verified scientific modelling and testing procedures.

The Committee heard from NRETAS that the NT Government policy on land clearing encourages development in ways that maximise social and economic benefits but minimise adverse effects on the environment. Cost-benefit analyses take into account the cost of emissions. Strategies are being developed by the relevant NT Government departments to identify places where agriculture can be developed in an environmentally sustainable manner. The Committee was informed that although land clearing was not covered under the formerly proposed CPRS, it is part of the overall cap that Australia has committed to under the Kyoto Protocol. That means that if GHG emissions are increased from land clearing, then the Australian Government will have to purchase credits from elsewhere to pay for the carbon emitted. If the cap is made stronger in the scheme, then other industries will pay for those emissions.[464]

NRETAS explained that they were not aware of any modelling undertaken on balancing carbon trade and costs in the marketplace to account for the flow through of pollution generated locally for the production of goods and services used overseas and how the costs will translate into the price of products. Further NRETAS explained that balances would likely be achieved through imports to Australia and therefore the incentive to reduce carbon pollution is present for producers and consumers alike.[465] The Committee learned that energy prices are expected to increase under emissions trading and could increase farm input costs such as fuel, power and fertilisers by 3% by 2025 adding to the cost of agricultural products.[466]

Fire abatement projects can be used to reduce GHG emissions and create carbon credits that can be traded in regulated or voluntary offset markets. It is

[462] Carbon Link, 'How We Work', http://www.carbonlink.com.au/about/howwework/index.htm, at 17 December 2010
[463] Prime Carbon, 'About Us', http://www.primecarbon.com.au/about/about.html, at 17 December 2010
[464] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[465] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[466] Hatfield-Dodds, S., Carwardine, J., Dunlop, M., Graham, P. and Klein, C., 2007. Rural Australia Providing Climate Solutions: Preliminary report to the Australian Agricultural Alliance on Climate Change. CSIRO Sustainable Ecosystems, Canberra, p3

anticipated that these types of projects will have high accreditation standards and more work needs to be done to ensure that such standards can be met when a formal national system for carbon trading is established. The West Arnhem Land Fire Abatement Project (WALFA) trading on the voluntary offset market is demonstrating how such projects can work.[467]

The WALFA is a collaborative partnership between traditional owners of the area, Indigenous ranger groups, Darwin Liquified Natural Gas (LNG) the NT Government and NLC. Indigenous ranger groups are carrying out strategic fire management across 28,000 km^2 of Western Arnhem Land to offset some of the GHG emissions produced by the LNG plant at Wickham Point. The fire management strategy involves burning early in the dry season to reduce fuel load and to reduce the extent of wildfires should they occur.[468] Also 'less of the woody vegetation burns [so] there is less smouldering combustion which produces more of the potent GHGs'.[469] NRETAS explained that with controlled savanna burning there is a difference in the way fuels decompose and the extent to which GHGs reach the atmosphere. There is evidence that if vegetation is left to break down, the gases, especially methane produced by termites, is absorbed by soil biota so less reaches the atmosphere.[470]

NRETAS further explained that the fire management strategy of the WALFA is to produce patchy areas of different ages of burns in the landscape, managing for the different needs of different plants and animals, so the strategy is designed to preserve biodiversity and reduce GHG emissions.[471] NRETAS explained that each year a set of maps is produced from satellite data showing the areas burned, when the areas were burned and, based on a series of formulae, comparisons are made on the amount of GHG emissions if the areas were burnt early in the season or later. This information is then compared to baseline data established as the 10 year period until 2004.[472]

[467] Tropical Savannas CRC, 'The West Arnhem Land Fire Abatement Project (WALFA)' http://savanna.cdu.edu.au/information/arnhem_fire_project.html, at 16 December 2010
[468] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[469] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts, p7
[470] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[471] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[472] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts

Environmental and cultural values in the region are also being conserved in the WALFA. Darwin LNG is paying Indigenous fire ranger groups $1 million a year for the work. The funds are being used to create jobs, educational opportunities and networks for the Indigenous people of the region. The project is reducing GHG emissions by an average of 100,000 tonnes of CO_2 each year.[473] The success of the project is showing the potential for application in other fire-prone biodiversity rich regions of the tropics. The project is also a model for collaboration between Indigenous people, private enterprise and government as well as the opportunities to link conservation, natural resource management with enterprise development for Indigenous people.[474] When asked by the Committee whether the same principles of the WALFA could be applied to agriculture, NRETAS responded that the idea behind such projects is to develop mechanisms for landholders, including primary producers and Aboriginal communities to sell credits generated by their emission reduction activities. NRETAS explained that just as total emissions from LNG production can not be offset by fire abatement, controlled burning does produce emissions, but these projects make a useful contribution to reducing GHG emissions in ways that are achievable.[475]

Further development of a carbon economy will create opportunities to increase NT capacity to progress environmentally sustainable agriculture. The NT Government through its Climate Change Policy has set a goal to '[m]aximise economic opportunities arising from emerging carbon markets for Territory land managers, including traditional owners.'[476] Under this goal seven targets have been set:

> Target 14: By 2020, the Territory Government will work with business and the community to establish a carbon offset industry in the Northern Territory, removing four million tonnes of carbon per year from the atmosphere through land management-based carbon offsets. This has the potential to reduce greenhouse gas emissions by up to four million tonnes in 2020. This is equivalent to the emissions produced by about 1 200 000 cars in one year.

[473] Tropical Savannas CRC, 'The West Arnhem Land Fire Abatement Project (WALFA)' http://savanna.cdu.edu.au/information/arnhem_fire_project.html, at 16 December 2010
[474] Tropical Savannas CRC, 'The West Arnhem Land Fire Abatement Project (WALFA)' http://savanna.cdu.edu.au/information/arnhem_fire_project.html, at 16 December 2010
[475] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[476] NT Government, 2009, 'Climate Change Policy', http://www.greeningnt.nt.gov.au/climate/docs/Climate_Change_Policy.pdf, p10, at 16 December 2010

Target 15: Establish new carbon fund arrangements to provide financing for investment in land management, renewable energy technology and other sustainability programs in the Territory.

Target 16: Territory land managers will be at the forefront of sustainable land management, running economically and environmentally sustainable businesses that are ready to grasp opportunities from carbon storage in the land.

Target 17: Research emissions reduction opportunities for Northern Territory agriculture and forestry.

Target 18: Support landholders to use carbon offset markets to reduce the emissions from savanna burning by 500 000 tonnes per year by 2030. This has the potential to reduce greenhouse gas emissions by up to 500 000 tonnes in 2030. This is equivalent to the emissions produced by about 150 000 cars in one year.

Target 19: Explore the viability of developing a Territory-based biofuels industry.

Target 20: Immediately reduce the impact of feral camels on vegetation in arid environments and, by 2015, achieve measurable improvements in carbon sequestration.[477]

Research and Data Collection

Several submissions highlighted the gaps in knowledge that need to be addressed to progress environmentally sustainable production in the NT. Research and data collection can help to fill these gaps. There are gaps in environmental data and in information on best practice to support continued growth in agriculture and achieve high standards in natural resource management for water, carbon, soils, chemicals, nutrients, climate, waste, energy, weeds, fire, air and biosecurity, and supported by the availability of ecosystem services to assist producers as environmental managers.[478]

[477] NT Government, 2009, 'Climate Change Policy', http://www.greeningnt.nt.gov.au/climate/docs/Climate_Change_Policy.pdf, p10, at 16 December 2010

[478] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'

Submissions from the NTHA expressed the need for data on physical properties of soils in the NT to understand carrying capacity and use, as well as appropriate and efficient irrigation schedules. The Committee heard that while there is some soil mapping, understanding land capability requires more detailed information on soils and water availability.[479]

The NTHA expressed concerns about the loss of valuable information and expertise due to poor record keeping and the passage of time. The Association was also concerned that the closure of the CSIRO Tropical Horticulture Research Laboratory in Darwin was occurring at a time when the horticulture industry was in a critical stage of development and that valuable expertise would be lost.[480]

The NTAgA informed the Committee about its many projects to support sustainable agriculture in the future. These include:

- Preparation and release of 'Striking the Balance-Conservation Farming and Grazing Systems for the Semi-arid Tropics of the NT, 2nd edition'.
- A project looking at controlling regrowth on cleared land to bring the land back into production in the most sustainable and cost effective way and to ensure the protection of biodiversity. It is envisaged that the results of the project will help to reduce land clearing by making use of already cleared land, reduce costs of managing sucker regrowth and protect pasture biomass.
- A project in Tipperary looking at birds and ants as indicator species for changes in biodiversity.
- A project comparing use of heavy cultivation, chemicals, slashing and ploughing for yields and other gains.
- A project working with producers to improve the design of their irrigation systems by looking at irrigation frequency, amount and efficiency of infrastructure in conjunction with other factors such as evaporation rates, drainage and plant root uptake.
- A project working with the NTHA to find suitable biodegradable mulches for growing melons.

[479] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association

[480] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'

The Committee found that the NT Government is engaged and supports a number of research activities to develop sustainable agriculture in the NT. AZRI for example is involved in 15 research projects conducted by the Department of Resources. The Committee was informed that eight of the projects relate to plant industries. The projects are:

1. the development of a table grape growing manual containing technical information to help current and potential growers;
2. trials of weed management herbicides;
3. trials of wind break;
4. trials on soil carbon and nutrient dynamics;
5. a pilot study working with Desert Knowledge Cooperative Research Centre (CRC) on a disease currently affecting date palms;
6. a project on bush tomatoes;
7. trials on irrigation efficiency;
8. a project looking at the possibility of water reuse on a 300 ha piece of land on the AZRI site that could be used at some time in the future for commercial horticulture using recycled water from the Alice Springs treatment plant. The treated water is currently stored in paleo-channels underneath the AZRI.[481]

The seven pastoral industry projects of the AZRI are:

1. the Territory-wide IPP;
2. the provision of general extension services to the pastoral sector including the use of a demonstration site on Old Man Plains;
3. the 21st Century Pastoralism Project where there are two full-time Department of Resources working with Desert Knowledge CRC;
4. a heifer fertility project looking at ways to increase turn-off by increasing the number of animals weaned from current stock as well as increasing the number of stock overall;
5. sustainable carrying capacity on properties;
6. safe utilisation in accordance with land types; and
7. grazing strategies for productive and environmentally sustainable outcomes.[482]

The Committee received information about projects that the Committee believes will fill the knowledge gaps identified in many of the submissions it

[481] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[482] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute

received. One significant project is a study on the environmental impacts of cropping, forestry and horticulture in the NT being conducted by the Department of Resources. The study aims to understand the impacts of plant industries and identify all knowledge gaps and the work related to fill these gaps.[483] Another project involves the collation of all the information available on irrigation in the NT, identifying any gaps in knowledge and developing a user-friendly database from which to access this information.[484]

The Committee learnt that the NT is leading the way in research on savanna burning, improving the capacity to estimate emissions and develop systems for reducing GHG emissions through fire management and involving people in remote areas.[485] The research into understanding methods to reduce emissions from the guts of cattle is being funded and carried out at the national level. The NT Department of Resources is looking at the distribution of carbon in trees across the NT to determine the effect of clearing the best soils for agriculture on local and total GHG emissions. The Committee was informed that this research is in its early stages but will hopefully provide valuable information and inform policy about developing agriculture in the NT and the interaction with climate change and reducing GHG emissions.[486]

Centrefarm expressed to the Committee the need for more research into biofuels, particularly the species that are suitable to grow in the NT and that are termite resistant. As well, information is required on the margins of returns for each species to determine if forestry for biofuels is worth developing in the NT.[487]

AZRI has applied for funding for Horticulture Australia to look at root stocks that do well in the arid zone including those that are resistant to nematodes. AZRI will also be looking at green manure crops such as cabbage varieties that suppress nematodes.[488]

DRDPIFR told the Committee that a large percentage of its research work is about sustainable production and tied into that is responsible use of natural

[483] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'
[484] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'
[485] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[486] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts
[487] Public Hearing, 27 November 2009, Centrefarm Aboriginal Horticulture Ltd
[488] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute

resources. The data and information derived from the Department's research provides the support for the use of natural resources for growing over 160-170 different crops.[489] DRDPIFR described the shift in emphasis of its research into sustainable methods in production systems to make those crops grow. Further DRDPIFR explained that the range of the industry participants is changing to include larger enterprises, both family based and corporate. The Department explained that it does conduct some experimental work on new crop varieties such as biofuels and bush foods but it does not have the resources to focus equally on new crop varieties at the same time as conducting research into long-term environmental sustainability. DRDPIFR informed the Committee that the environmental impacts of agriculture have not had as much focus as the development of new crop varieties in the past and the shift is necessary to progress environmentally sustainable agricultural production.[490] Further DRDPIFR explained that nationally the trend has been for commercial operators to drive product demand rather than government departments seeing if a crop variety will grow and then trying to find a market for the crop.[491]

The Committee learnt that NRETAS is involved in number of research projects on groundwater. These include projects on:

- allocating Water and Maintaining Springs in the Great Artesian Basin;
- assessment of Major Spring Systems in the Oolloo Dolostone, Daly River;
- identifying and Assessing Australia's Palaeovalley Groundwater Resources; and
- Koolpinyah Dolomite Aquifer Characteristics.

A major project of NRETAS is a complete stocktake of the NT groundwater and the production of a three dimensional hydrogeological map of groundwater management units across the NT. The project is part of the National Groundwater Action Plan.[492] Once completed, this valuable data will address some of the concerns raised by industry representatives during this inquiry regarding understanding the extent of resources and potential for development in an environmentally sustainable manner. The project is due for completion in

[489] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[490] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[491] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[492] Australian Government National Water Commission, 'National Groundwater Action Plan', http://www.nwc.gov.au/www/html/157-national-groundwater-action-plan-projects.asp, at 2 February 2011

2011.[493] The groundwater stocktake project complements other Commonwealth coordinated projects such as the Tropical Rivers and Coastal Knowledge program (TRaCK) which consists of 21 research projects that includes research on the NT coast and Daly River catchment.[494] The Northern Australia Sustainable Yields Assessment is another Commonwealth project in which the NT is involved. This project is assessing current and future water yields in several Australian regions including north Australia.[495]

[493] Department of Natural Resources, Environment and the Arts, 'Current Projects', http://www.nt.gov.au/nreta/water/ground/projects/index.html, at 31 January 2011
[494] Tropical Rivers and Coastal Knowledge, http://www.track.gov.au/, at 2 February 2011
[495] Australian Government Department of Sustainability, Environment, Water, Populations and Communities', 'Sustainable yields project — providing critical information on Australia's current and future water availability', http://www.environment.gov.au/water/policy-programs/sustainable-yields/index.html, at 2 February 2011

5. ROLE OF GOVERNMENT

The evidence collected by the Committee pointed to the need for further action on:

- research into the stock of Territory natural resources and sustainable production techniques suited to local conditions;
- communication, education and training on sustainable production techniques;
- a more efficient and effective legislative environment;
- improved transport infrastructure;
- accessing new markets; and
- encouraging investment.

The Government can make an important contribution in all these areas. However, in all cases this contribution needs to be made in partnership with the relevant communities and industries. The Government has an important role in maintaining a regulatory environment that ensures the protection of the environment, balances competing interests and promotes sustainability while imposing the minimum burden practicable. Its intervention is also needed where the market is not able to provide the incentives or cohesion to lay the foundations for further sustainable development, as may be the case in auditing the natural resources and biodiversity of the Territory. The Government may also assist with the creation of new initiatives within communities and industries, and the provision of transport infrastructure.

At the same time, opportunities may present in these areas for the initiatives to be promoted by the communities or industries themselves.

Targets that the Government has set itself in *Territory 2030: Strategic Plan 2009* indicate particular areas where the Government sees itself as having an important role:

- Governments maintain high levels of investment in public infrastructure to underpin long-term development and growth;[496]
- Identify new solutions to the key infrastructure challenges in the NT by 2010 for rural roads and highways and by 2012 for high-speed broadband;[497]

[496] NT Government, 'Territory 2030: Strategic Plan 2009', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 31 January 2011, p 34

- Identify suitable land and water for further long-term and sustainable food production;[498]
- Develop a single focal point for promoting the opportunities for business, education, tourism, investment and jobs, and integrate the various campaigns to lift the Territory's national and international profile;[499]
- Ensure no deterioration in the health of biodiversity in the NT;[500]
- Reduce the impact of weeds and other invasive species, including feral animals and disease organisms;[501]
- By 2030, the Territory will have a comprehensive set of connected systems protecting the terrestrial environment, making up 20% of the Territory's land area, and substantially increasing the length of coastline under conservation management;[502]
- Manage the NT's natural resources according to the principles of ecologically sustainable development;[503]
- The NT contributes to the national target for GHG reduction;[504]
- By 2015, government expenditure on research and development, as a proportion of Gross State Product (GSP), will match or exceed investment compared to the other states and territories;[505]
- By 2030, increase Territory business expenditure on research and development to the national average, and double the number of Territory businesses participating in research and development;[506]
- Build or further develop a number of major centres of research and teaching;[507]
- Continue to establish government-sponsored partnerships with Asia on research and development;[508]

[497] NT Government, 'Territory 2030: Strategic Plan 2009', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 31 January 2011, p 35
[498] NT Government, 'Territory 2030: Strategic Plan 2009', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 31 January 2011, p 37
[499] NT Government, 'Territory 2030: Strategic Plan 2009', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 31 January 2011, p 39
[500] NT Government, 'Territory 2030: Strategic Plan 2009', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 31 January 2011, p 57
[501] NT Government, 'Territory 2030: Strategic Plan 2009', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 31 January 2011, p 58
[502] NT Government, 'Territory 2030: Strategic Plan 2009', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 31 January 2011, p 59
[503] NT Government, 'Territory 2030: Strategic Plan 2009', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 31 January 2011, p 60
[504] NT Government, 'Territory 2030: Strategic Plan 2009', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 31 January 2011, p 62
[505] NT Government, 'Territory 2030: Strategic Plan 2009', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 31 January 2011, p 67
[506] NT Government, 'Territory 2030: Strategic Plan 2009', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 31 January 2011, p 67
[507] NT Government, 'Territory 2030: Strategic Plan 2009', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 31 January 2011, p 67

The NTHA listed the following opportunities for government to provide direction and support to the industry towards sustainable development:

- Promoting the industry to the community;
- Investing in and supporting research, starting with developing the existing research farms at Coastal Plains, Douglas Daly, Katherine and Ti Tree;
- Improving collaboration with other states and other countries who are dealing with similar challenges;
- Establishing plans for the sustainable development of the industry that set achievable targets, are adequately resourced, and supported by sound policy and regulation.[509]

The NTHA emphasised the importance of ensuring that people in the industry and the community are involved and engaged in government processes of setting the direction for the industry.[510]

The NT Cattlemen's Association advised the Committee that government's role in planning, scoping and identifying resources, infrastructure requirements, prospective areas for conservation and development is the key to increasing the capacity of the NT to progress environmentally sustainable agriculture. Further, the Association added that this requires greater harmonisation of government departments, not just related to the environment and primary industries but also health, education and housing and this coordinated approach is the best way to finding long-term solutions for the NT as a whole not just agriculture or the protection of the environment. The NT Cattlemen's Association added that the government's long term vision for the growth of primary industry in the NT needs to be consistent with the vision of the industry participants and other stakeholders.[511]

[508] NT Government, 'Territory 2030: Strategic Plan 2009', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 31 January 2011, p 68
[509] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association
[510] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association
[511] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association

Research

As discussed above, understanding the nature of the environment and the impact and output of differing production techniques in different situations is the starting point for sustainable agriculture.

The Government has set increasing both government and business expenditure on research as targets under *Territory 2030*. A significant proportion of that expenditure needs to be spent on agriculture if the Territory is to increase production without damaging the environment.

Submissions from the NTHA and NTAgA drew attention to the need to know the full extent of the NT environmental resources that can be developed for agriculture and developed without environmental detriment. This includes having a clear picture of the extent of arable soils and freshwater resources in the NT. The Committee was advised that NRETAS has been conducting the assessment and mapping work to capture this information.

Territory 2030 identifies the need to identify land suitable for agriculture based on an audit of what is available.[512] The Committee believes that an audit is a necessary first step to allow for planning and development, including finalising policies that are being developed to progress environmentally sustainable development. Consequently, the audit of suitable land should be made a priority.

Recommendation 4

The Committee recommends that the Government provide the necessary resources to NRETAS to complete capability assessments and an audit and mapping of land and water suitable for long term sustainable food production as soon as possible.

The NT Horticultural Association spoke about the need to develop the capacity of the existing research farms with the establishment of a Cooperative Research Centre (CRC) or similar collaboration for sustainable development that would bring together the capacity of the existing research farms, stations and centres to focus on research and development of sustainable farming systems in wet-dry tropics. The CRC would cover north Australia and include expertise from WA, Queensland and the NT. The Association explained that

[512] Northern Territory Government, 'Territory 2030 Strategic Plan 2009 - 2030', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 13 December 2010, p 37

the CRC would promote an integrated and collaborative approach to sustainability and work in direct partnership with governments and their agencies in the implementation of their frameworks for sustainable development. The Association also explained that this CRC would be able to use its knowledge to assist developing countries of wet-dry tropics with food production and environmental management. The Association informed the Committee that it has been working with the relevant NT Government departments to develop the proposal guidelines for this project.[513]

The Committee also notes that the establishment of the CRC is in keeping with the *Territory 2030* target to build or further develop a number of major centres of research and teaching.

Recommendation 5

The Committee recommends that the Government complete the proposal guidelines to progress the establishment of a north Australia Cooperative Research Centre for environmentally sustainable development as soon as possible.

The NT Cattlemen's Association believes that the NT Government must take the lead in dispelling the myths about the extent to which the NT can be developed for agriculture. The Association believes that this leadership includes and will be supported by obtaining accurate data on soils, water and other resources and mapping the true potential for development alongside the areas necessary for conservation.[514]

From the results of its investigations and the comprehensive review of land and water science of issues relevant to the sustainable development of north Australia's land and water resources, the NALWT recommended that Australian governments:

> significantly increase investment in climate, water, land and environment data collection and analysis to support land and water use planning, catchment level water planning and local decision making.[515]

[513] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association
[514] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[515] North Australia Land and Water Taskforce, 2009, 'Sustainable Development of Northern Australia', http://www.nalwt.gov.au/files/NLAW.pdf, at 27 January 2011, p3

Further the NALWTF recommended that Australian governments:

> support a comprehensive geophysical survey program to quantify groundwater resources and salinity risks in priority groundwater provinces of northern Australia, particularly where new consumptive uses, such as for intensive agriculture, are most prospective.[516]

The Committee learnt that this NALWTF recommendation is being implemented under the National Groundwater Action Plan.[517]

The Senate Committee inquiry into food production in Australia found that the declining level of commitment from state and federal level governments to agricultural research and development may be hindering innovation that is critical to maintaining productivity particularly in climatic conditions that have not occurred for 100 years and may be altered in the very near future.[518]

The Committee was pleased to see the range of research projects that were presented to it. However, it remained apparent that the rate the Territory could increase its agricultural production sustainably depended on its ability to develop and identify improved production techniques. Focussing well targeted research therefore remains a priority.

The Committee also notes that targeting research on matters most likely to increase production requires a good exchange of information between researchers and producers.

Recommendation 6

The Committee recommends that the Government develop a five to 10 year research strategy that identifies research and development priorities to strengthen the Territory's capacity to progress environmentally sustainable agricultural in the Territory. The strategy must align with national research and development priorities for rural research and

[516] North Australia Land and Water Taskforce, 2009, 'Sustainable Development of Northern Australia', http://www.nalwt.gov.au/files/NLAW.pdf, at 27 January 2011, p3
[517] Australian Government National Water Commission, 'National Groundwater Action Plan', http://www.nwc.gov.au/www/html/157-national-groundwater-action-plan-projects.asp, at 2 February 2011
[518] Parliament of Australia, Senate Select Committee on Agricultural and Related Industries, August 2010, 'Food production in Australia' http://www.aph.gov.au/Senate/committee/agric_ctte/food_production/report/report.pdf, at 28 January 2011

development and connect directly to the work of the proposed north Australia CRC for environmentally sustainable development of the region.

Collaboration and communication

The Committee believes that the benefits from developing and identifying improved production techniques can only be realised through the application of that knowledge by producers. This requires:

- a collaborative approach so that research is adapted to the needs of producers;
- research results being communicated to producers; and
- producers having an appropriately skilled workforce to implement the techniques.

Collaboration

The Committee found that on the whole, good collaboration existed between government agencies. The Committee also found that although collaboration between government departments and agricultural sectors was occurring, improvements could be made to improve interactions and strengthen relationships.

DRDPIFR gave the Committee the following example of good inter-agency collaboration:

> For the projects that I am very familiar with, I think there are no barriers. If I could use an example: yesterday, to progress the very matter of getting the infrastructure on site at AZRI and the licences in place, the person who has day-to-day responsibility for the overall management of that convened a meeting in the conference room at AZRI at relatively short notice and within a couple of days there were representatives from NRETAS, from Health Raghu was there. I sat in on the meeting to get an update as to where it is at and this morning, as an outcome of that meeting, there are various applications at various stages so I inquired of my colleague at the Health Department in Darwin as to where it was at and I had a response back by 10 o'clock.[519]

[519] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute, p19

When asked by the Committee whether there appeared to be any difficulties with two separate government departments dealing with aspects of pastoral management, DRDPIFR answered that the two agencies have a very strong relationship particularly at an operational level and it reflects the understanding across both agencies of the importance of having an ecologically sustainable industry to maintain the longevity of the resources and the industry. Further DRDPIFR explained that each agency's work plans where they need to align with that of the other agency's, are worked through for better integration. NRETAS in setting stocking densities for example are given the advice of DRDPIFR scientists to support their decisions.[520]

The Committee heard from the NTHA that it works closely and well with NT Government Departments, in particular by contributing to the development of policy and legislation that affects its industry. One example of this was the Association's contribution to the development of the NT Land Clearing Guidelines. In relation to the draft of the land clearing guidelines, the Association felt that having a number of planning protocols for the different environmental issues is unworkable for growers. The NTHA suggested a better way is to draw all the components together under one protocol that considers environmental factors interdependently.[521]

The NTHA also told the Committee that it had a good and close working relationship with the Primary Industry group (now under the Department of Resources).[522] The Association has been actively involved in the development of the NT Government's planning processes for water allocation.

Speaking about their relationship with the pastoral industry, DRDPIFR believes that it is a strong and good working relationship. The Committee was informed that the department has a number of mechanisms to engage with the industry. Work is prioritised through the three Ministerial advisory committees, namely the Alice Springs Pastoral Industry Advisory Committee, the Barkly Regional Advisory Committee and the Katherine Pastoral Industry Advisory Committee. All three committees provide input into long-term strategic direction of the NT Government for research, provide comments on the current work and plans and sit on a national body that provides funding into some of the research

[520] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[521] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association
[522] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association

programs of the Department.[523] DRDPIFR undertook a survey of the Pastoral Industry in 2004 that gave the Department a clear picture of how far the industry had developed since the last survey in the 1990s. The Department firmly believes that a great deal of that improvement has resulted from programs undertaken by the Department with the industry over that time.[524]

DRDPIFR explained to the Committee that it works closely with producers by providing assistance through research conducted on their research farms and on farmers' properties to gain technical data they might need to make decisions about growing crops, for example the Katherine Research Farm is working with the Peanut Company of Australia in the Katherine region to determine which crops are best to rotate with peanuts.[525]

The Committee was informed that collaboration between agricultural sectors was continually being strengthened. The NTHA told the Committee that with the commencement of its new Chief Executive Officer, a number of pastoralists have become involved in and participated in a number of the NTHA's programs and workshops. This has included a few farmers with mixed farm properties. The Association also told the Committee that more collaboration was occurring with the NTAgA.[526]

The Committee found that the revised edition of the publication 'Striking the Balance: Conservation Farming and Grazing Systems for the Semi-arid Tropics of the Northern Territory' is a good guide to conservation agriculture and provides good information to support the development of sustainable agriculture in the Top End. The Committee heard from several submissions of the potential for the development of sustainable agriculture of the Alice Springs region so a similar publication concentrating on that region would be of great benefit.

[523] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[524] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[525] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[526] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association

Recommendation 7

The Committee recommends that the Government facilitate the production of a 'Striking the Balance' type publication for the Central Desert region of the NT.

The Committee found that communication between government and agricultural sectors with other interest groups and users of natural resources needs to be improved. The NT Cattlemen's Association spoke to the Committee about the interaction of the agricultural sector with other users of natural resources. The Association identified the need for greater collaboration between all stakeholders in planning for regional development to prevent the possibility of one industry expanding but cutting off another industry's opportunities in the process.[527]

DRDPIFR told the Committee that in the past, in relation to Indigenous communities, such as for developing market gardens, the department's efforts could be categorised as 'modest' and that coordination with other government departments to provide assistance to Indigenous communities could be better. Further the department told the Committee that the incorporation of the regional development function within the same department as the primary industry function gave a much needed strategic focus to the work of the Primary Industries Group.[528] The Primary Industries group engages with Indigenous communities with market gardens in collaboration with its regional development colleagues by visiting their gardens and providing extension advice to help develop their production systems.[529]

DRDPIFR told the Committee that collaboration between WA, Queensland and NT pastoral industry departments to share expertise has been occurring for many years. The Committee heard about the example of Queensland officers with expertise in growing mangoes working with a NT producer to conduct some experimental work to improve mango production.[530]

[527] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[528] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute, p17
[529] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute, p17
[530] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources

Recommendation 8

The Committee recommends that the Government ensure that it has an effective mechanism to foster communication and collaboration between government, agricultural industry groups, other natural resource management groups and the wider community on the development of environmentally sustainable agriculture in the NT, either through the *Strategy for Guiding Public Sector Extension in Primary Industries in the Northern Territory (2010-2015)* or by some other means.

The NTHA spoke to the Committee about the Federal Government *Caring for Our Country* program. Funding from the Federal Government under the *Caring for Our Country* program is for natural resource management projects of communities, farmers and other land managers for the protection of the environment and sustainable agriculture. The program is delivered 'in partnership with regional natural resource management groups, local, state and territory governments, Indigenous groups, industry bodies, land managers, farmers, Landcare groups and communities.'[531] A total of $2 billion is allocated for the first stage of funding which commenced in 2008 and continues until 2013.[532] The 56 regional Natural Resource Management Boards were allocated base funding for the first five years. The Natural Resource Management Board NT was allocated $1,143,460.[533] There were no cuts to the allocation of base-level funding to any regional Natural Resource Management Boards from the changed funding structure.[534]

The NTHA expressed to the Committee that one of the difficulties of the Caring for our Country program was the number and range of people and organisations that the funding caters for. The NTHA considered the amount allocated to the NT in the last round of funding to be insufficient. The Committee was informed that federal funding for the National Landcare program was subsumed into *Caring for Our Country,* further reducing the pool of available funds. The NTHA told the Committee that the Association has found it difficult to succeed with project applications and business plans for this federal funding. The NTHA also believes that the funding is largely reactive

[531] Australian Government, 'Caring for our Country, Outcomes', http://www.nrm.gov.au/publications/books/caring-outcomes.html, at 25 February 2011
[532] Australian Government, 'Caring for our Country', http://www.nrm.gov.au/, at 19 January 2011
[533] Australian Government, 'Caring for our Country Business Plan 2010-11, Frequently Asked Questions', http://www.nrm.gov.au/business-plan/10-11/faq.html#overviewappprop, at 25 February 2011
[534] Australian Government, 'Caring for our Country Business Plan 2010-11, Frequently Asked Questions', http://www.nrm.gov.au/business-plan/10-11/faq.html#overviewappprop, at 25 February 2011

and biased towards southern states.[535] The NTHA told the Committee that it is exploring funding opportunities from other government sources, including the Federal Government Department of Climate Change.[536]

One of the six national priority areas identified in the *Caring for our Country* program was natural resource management in northern and remote Australia.[537] The projected outcomes for this priority were :

- Protect important natural assets in northern and remote Australia, particularly the National Reserve System (and Indigenous Protected Areas within it).
- Assist at least 30% of land managers in northern and remote Australia to increase their uptake of sustainable grazing and land management practices.
- In priority areas in northern and remote Australia, reduce the impact of invasive species including, in particular, cane toads, tramp ants and camels.
- Expand traditional fire management regimes, across at least 200,000 square kilometres of northern Australia's savannas, to reduce the incidence of unmanaged fires, and position Indigenous land managers for entry into emerging voluntary or other emissions trading markets.[538]

The Committee believes it is important that the regional focus in this priority is adequately resourced to achieve these important natural resource management outcomes. The Federal Government is currently reviewing the Caring for Our Country program.[539]

The NALWTF recommended that the Commonwealth Government establish a representative body of WA, Queensland and NT to 'build institutional capacity, improve compliance with the National Water Initiative and advocate for the

[535] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association
[536] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association
[537] Australian Government, 'Caring for Our Country Outcomes', http://www.nrm.gov.au/publications/books/pubs/caring-outcomes.pdf, p3, at 25 February 2011
[538] Australian Government, 'Caring for our Country, Northern and Remote Australia', http://www.nrm.gov.au/about/caring/remote.html, at 25 February 2011
[539] Australian Government, Caring for Our Country, ' Reviewing Caring for Our Country', http://www.nrm.gov.au/review/index.html, at 25 February 2011

needs and interests of northern Australia.'[540] The Committee learnt that the Federal Government has committed to establishing a Northern Australian Sustainable Futures Program as a direct response to the NALWTF recommendation.[541] The NALWTF also recommended that a ministerial council, chaired by the Prime Minister be established to 'develop an integrated vision for the sustainable development of northern Australia and provide leadership on key priorities.'[542]

Recommendation 9

The Committee recommends that the Government actively participate in the establishment and operation of regional bodies, such as a north Australia regional body or ministerial council, to build institutional capacity and develop an integrated vision for sustainable development of the region.

Recommendation 10

The Committee recommends that the Government implement the recommendations of North Australia Land and Water Taskforce where they are applicable to the Northern Territory.

The NT Cattlemen's Association estimates that 25% of primary producers are involved in benchmarking and best practice activities. There are a range of benchmarking groups in the NT made up of people in the industry who are implementing best practice in production and business practice. The NT Cattlemen's Association told the Committee about one such benchmarking group comprised of people affected by drought and who have managed to survive and prosper as a result.

> And it is about people having a higher degree of awareness about where they actually are both economically and environmentally, dealing with risk more effectively, dealing with their production system more effectively, dealing with their human resource management issues more successfully, dealing with succession more successfully and having some perspective on where they need to go in the future

[540] North Australia Land and Water Taskforce, 2009, 'Sustainable Development of Northern Australia', http://www.nalwt.gov.au/files/NLAW.pdf, at 27 January 2011, p4
[541] Department of Regional Australia, Regional Development, and Local Government, 'Office of Northern Australia', http://www.regional.gov.au/regional/ona/index.aspx, at 31 January 2011
[542] North Australia Land and Water Taskforce, 2009, 'Sustainable Development of Northern Australia', http://www.nalwt.gov.au/files/NLAW.pdf, at 27 January 2011, p4

> which includes, in some cases; investment in off-property ventures and enterprises, which in itself is breeding a high level of resilience.[543]

The NT Cattlemen's Association believes that this type of collaboration has the potential to change the nature of the pastoral industry in the NT but it requires sufficient investment from government to encourage people to become involved and feel confident to change their practices.[544]

Under the objective of managing NT's natural resources according to ecologically sustainable development principles, a key action identified in *Territory 2030* is to increase the number of agricultural enterprises that adopt best practice in their environmental management plans.[545] The Committee believes that government through their agencies can influence the uptake of sustainable agricultural practice by providing producers and industry groups with information and support to undertake benchmarking or other activities aimed to establish industry standards.

The EPA spoke to the Committee about its community consultations on the idea of strategic environmental impact assessment. The idea of strategic environmental impact assessment was referred to in the EPA discussion paper on its review of environmental impact assessment in the NT. The Committee learnt that strategic environmental impact assessment considers the appropriate land use for an entire area, not just looking at the environmental protection feasibilities of a particular project in isolation but within the context of intended use for an entire area. The EPA advised that a strategic approach to environmental impact assessment can better support planning and resource allocation decisions by considering environmental impacts for an entire area long before development proposals are put forward for consideration.[546]

Communication of research results

The Committee heard that communication of research project information and results could be better communicated to producers. The NTHA believes that engaging producers in the processes of research and development is the most

[543] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association, p11
[544] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[545] Northern Territory Government, 'Territory 2030 Strategic Plan 2009 - 2030', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 13 December 2010
[546] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Environment Protection Authority

effective way to connect farmers directly with the research results. Providing extension services and technical assistance will help to translate the research results into practical outcomes for sustainable agriculture. The Association pointed out that producers have a vested interest in understanding environmental patterns and processes and the link with their own agricultural practices so that they can adapt and improve their production systems.[547] The Association believes that gaps in knowledge should be seen as opportunities to improve, adding that the information may already be available but not in a form that can be easily communicated to producers. The Association believes that with the involvement of producers, determining the most suitable process for communicating information will be as beneficial as the result.

The Committee found that the key industry organisations such as the NTHA, the NTAgA, Landcare Australia and the NT Government have been working collaboratively on a number of projects to improve the quality and availability of information for producers. One such project produced the NT Sustainable Land Use Guidelines. The first booklet in the series sets the focus on sustainable agriculture providing the best practice principles and terms that underpin the guidelines. The guidelines also cover all of the important environmental areas for sustainable land use; air, biosecurity, carbon, chemicals, climate, ecosystems, energy, fire, nutrients, soils, waste, water and weeds. The Committee believes that the guidelines are a comprehensive and easily accessible source of valuable information for producers and the community for the development of the sustainable agriculture in the NT.

The NT Horticulture Association told the Committee that it has programs in place to address knowledge gaps, provide information and measure the impact of improved practices. Information has been gathered and resources developed to communicate best practice natural resource management to growers. The Association also has an ongoing process of updating and improving data. The NTHA told the Committee that more than half of NT horticultural enterprises have adopted improved natural resources management and are accessing information through extension services by NTHA and Department of Resources. The NTHA and the Department of Resources are working closely in partnership to develop further resources, implement extension programs and measure positive changes from the adoption of natural resource management practices.[548]

[547] Submission No. 3, Northern Territory Horticultural Association, 5 May 2009
[548] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'

From the results of one of their projects, the NTHA identified that growers wanted to better understand the biological, physical and chemical properties of their soils. Some of the growers questioned whether the soil additives developed for southern climates were actually effective under Territory conditions and would like to see more research being conducted to develop products that are suitable for the Territory and that are more environmentally safe. Many growers also told the NTHA that they wanted to learn more about soil health and biology in order to reduce their dependence on fertilisers. Growers were also very concerned about soil erosion and wanted to know the best management techniques to control and prevent it.[549] The Association believes that a designated soil conservation branch within NRETAS or the Department of Resources, as previously existed, providing practical extension services to producers, would be of great benefit in this regard.[550]

Extension services

The role of government in providing extension services and programs was covered by several submissions. The NTHA spoke about the need for extension programs to assist producers gain the necessary knowledge and skills needed to accelerate the implementation of environmentally sustainable food production, including programs to help with converting to more sustainable farming systems and to monitor and evaluate the effectiveness of changed systems.[551]

The NT Cattlemen's Association explained to the Committee that the current approach of the NT Government to extension services focuses on producers helping themselves through the development of their strategic operational business goals. The NT Cattlemen's Association believes that this approach has resulted in the removal of technical extension officers being available on the ground to give producers the assistance they need. The NT Cattlemen's Association recommended the NT Government consider a new approach to extension services based on the needs of all stakeholders and to better support environmentally sustainable agriculture.[552] The Association believes that is

[549] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'
[550] Committee Hansard, Public Hearing, 22 February 2010, Northern Territory Agricultural Association Incorporated
[551] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association
[552] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association

becoming more imperative as the industry adapts to climate change and participates in the growing carbon economy.[553]

The NTAgA expressed to the Committee that over the past 22 years the Association has witnessed 'a steady erosion of government funding' for research, development and extension services for the agriculture industry and the situation has reached a critical stage that needs Government attention.[554] The NTAgA informed the Committee that it has become the practice of the NT Government to refer new entrants to the industry to the Association for extension services rather than the other way around.[555] The Association also stated that research and development needs to be better delivered and communicated through good extension officers, who are well trained locals with the knowledge to communicate broadly with the horticultural community.[556] The Association is actively seeking more government assistance and funding to be able to carry out this role more effectively.[557]

DRDPIFR and its research institute AZRI informed the Committee that there are approximately 200 staff in its Primary Industries Group. Although there are not many officers with the word 'extension' as part of their job titles, more than half of the officers in the Group spend a great deal of time working directly with people in agriculture providing advice and information on such matters as chemicals and markets requirements. These officers include veterinarians, stock officers working on animal health, and biosecurity officers working on plant health.[558]

DRDPIFR advised the Committee that the nature of extension services has broadened since the 1980s and 90s and become more complex so that one individual issue to do with one crop for example, requires the expertise of more than one person to be able to provide the extension service required. The example given to the Committee was that of a mango grower in the Top End with a pest or disease problem who will need the assistance of a biosecurity officer as well as a plant industries officer. Further, DRDPIFR explained that

[553] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[554] Committee Hansard, Public Hearing, 22 February 2010, Northern Territory Agricultural Association Incorporated, p3
[555] Committee Hansard, Public Hearing, 22 February 2010, Northern Territory Agricultural Association Incorporated., p3
[556] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Horticultural Association
[557] Committee Hansard, Public Hearing, 22 February 2010, Northern Territory Agricultural Association Incorporated., p3
[558] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute

providers of technical advice in the public or private sector have to be absolutely certain of their advice because people make significant business decisions based on that advice.[559] In the arid zone of the NT, the Department aims for each property to be visited at least three times a year by its officers to provide extension services.[560]

In December 2010, the Department of Resources released *Projects and Partnerships: A Strategy for Guiding Public Sector Extension in Primary Industries in the Northern Territory (2010-2015)*. The aim of the strategy is to 'sustainably develop NT primary industries by building capacity to develop new ways of achieving production, environmental sustainability and biosecurity protection.'[561] The strategy has five components:

1. Determination of the target audience.
2. Prioritisation of extension effort.
3. Service delivery methods.
4. Project management, reporting and evaluation.
5. Ensuring professionalism in extension.

The Committee welcomes the release of the strategy, which reflects a systematic and targeted approach to the delivery of extension services that involves stakeholders. The strategy has not been in place long enough for the Committee to comment on its operation, but the Committee notes that it includes actions for evaluation and reporting of outputs annually to government and industry. Given the importance of effective extension services to the promotion of sustainable agriculture, the Committee also considers that the results of the implementation of the strategy should also be reported to Parliament.

Recommendation 11

The Committee recommends that the Government continue to implement its *Strategy for Guiding Public Sector Extension in Primary Industries in the Northern Territory (2010-2015)* and report annually to the Legislative Assembly on the outcomes of the strategy.

[559] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[560] Committee Hansard, Public Hearing, 27 November 2009, Arid Zone Research Institute
[561] NT Government, 'Projects and Partnerships: A Strategy for Guiding Public Sector Extension in Primary Industries in the Northern Territory (2010-2015)', p 3, http://www.nt.gov.au/d/Content/File/p/pi/Primary_Industries_Extension_Strategy.pdf, at 1 February 2011

Regulatory Environment

The Committee found that the NT has the full complement of necessary legislation to support the progress of environmentally sustainable agriculture. Industry comments were received however about impediments arising from existing legislation to the NT realising its potential capacity to progress sustainable agriculture in the NT. Specific issues that were raised included:

- constant reviews and changes of the regulatory environment add uncertainty and complexity;
- restrictions on diversification under the *Pastoral Land Act*;
- unnecessarily burdensome provisions of the NT land clearing guidelines;
- water regulation;
- requirements for collective decision making on Aboriginal land;
- requirements for resource management plans for wild harvest of plant products;
- length of time required to obtain permits to harvest wildlife on Aboriginal owned land;
- conflicts between the principles of management of feral animals under the *Territory Parks and Wildlife Conservation Act* and proposals for the sustainable farming of those animals;
- need for Federal Government approval of export of crocodile products;
- permits for wild capture of native species for commercial purposes;
- restrictions on the management of feral animals.

The NT Cattlemen's Association spoke to the Committee about the number of reviews and changes to the policy environment under which its members have been operating adding uncertainty to the complexities of the challenges already faced by the industry. This includes the changes to the *Pastoral Land Act*, land clearing and development, environmental policies including native vegetation legislation. There is also concern from the Association's membership that changes to the *Pastoral Land Act* will have dramatic effects on the capacity of its industry to develop in the future.

The NT Cattlemen's Association also pointed out some of the constraints of the *Pastoral Lands Act* in relation to tenure restricting diversification. The Association believes that diversification in off-farm or off-property enterprises is good risk management and provides some level of resilience for the long term. Further, the Association believes that removing land tenure restrictions and allowing for subdivision of pastoral leases to reduce the size of operations and

improve the level of efficiency and management can achieve improved outcomes from less area. The Association explained that the current system considers each subdivision as a separate piece of land rather than one part of an entire property or enterprise. The Association believes that this system hinders development and efficiency and this is further frustrated by decisions being made by officials who are far removed from the properties and its operations.[562] The Association also believes there can be opportunities from the reallocation of boundaries and allowances made for leaseholders to restructure boundaries to amalgamate or cooperate better with neighbouring properties for more efficient use of resources.[563]

Several submissions referred to the impact of the NT land clearing guidelines and how their implementation would affect agriculture. Centrefarm believes that the guidelines do not take into account land type being cleared. Centrefarm stated that they are developing on sand plains where the impacts are different from the impacts of clearing lowland associated ranges. Centrefarm believes that it is already implementing a range of best practice environmental management actions, including bore field management, weed control, fire management, and native vegetation management. The requirement to produce an Environment Impact Statement (EIS) for an area of 200 ha adds to the cost of establishing the enterprise with little benefit. Centrefarm told the Committee that the requirement for an EIS should apply to areas of 500 ha or more. Centrefarm also believes that provision for small developments such as theirs on 200 ha or less can be effectively covered by approvals under the *Planning Act* (s46).[564]

The Committee heard that one of the issues with applications for permits for sustainable harvest of wildlife on Aboriginal owned land is the length of time it can take to obtain land council sign-off. NRETAS explained that the Department cannot issue permits without landholder approval and it is necessary and important for land councils to complete their processes, such as anthropology clearances and consultations with the correct traditional owners to obtain the proper approvals of the landholders for an area.[565]

[562] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[563] Committee Hansard, Public Hearing, 16 October 2009, Northern Territory Cattlemen's Association
[564] Public Hearing, 27 November 2009, Centrefarm Aboriginal Horticulture Ltd
[565] Committee Hansard, Public Hearing, 13 May 2009, Department of Natural Resources, Environment and the Arts

NRETAS explained that with feral animals, the principles of management under the *Territory Parks and Wildlife Conservation Act* conflict with the idea of sustainable use. Feral animals can cause untold damage to the environment and agriculture so commercial use for economic gain has to contribute to defined management goals and be one of the tools to help with mitigation. NRETAS gave the example of feral camels proposed as stock animals for commercial gain. NRETAS explained that feral camels in Central Australia number over one million and their impacts on the environment, human settlements and agriculture are severe so their management must be about reducing their impacts. If they are to become a stock animal then they must be herded, fenced and managed in a similar way to cattle.

Balancing a range of competing principles to provide an efficient and effective regulatory framework is an ongoing challenge. Compromises must be made between consistency over time and adapting to changing needs; preventing environmental damage and facilitating development; and rigour of process and efficiency, to name but a few issues. It is nevertheless vital that this work is done to enable sustainable development.

Of particular concern to the Committee were the reports of arguably needless constraints on diversification of the use of land under pastoral lease. While changing the rules of land tenure is apt to raise a range of complex issues, the Committee understands that the Government has been conducting a review of the *Pastoral Lands Act* for some years.

Recommendation 12

The Committee recommends that the Government complete and implement its review of the *Pastoral Lands Act* as soon as possible with a view to removing any inappropriate restrictions on diversifying the use of pastoral land.

Transport infrastructure

Transport is a major issue for any primary industry. In the Territory, this is made more complex by long distances and wet season flooding.

Given both the significant cost of developing transport infrastructure and its vital importance to communities and industries, it is important that the Government

rigorously plan for and implement the maintenance and development of transport infrastructure.

In recognition of the importance of transport, one of the earliest targets in *Territory 2030* is to "Identify new solutions to the key infrastructure challenges in the Northern Territory by 2010 for rural roads and highways[566], with a plan for rural roads and highways to be released in 2010.

The Committee understands that the plan has not yet been released.

Recommendation 13

The Committee recommends that the Government release and implement its plan for rural roads and highways as a matter of priority.

Accessing new markets

The development of markets occurs at numerous levels and is primarily the responsibility of those wishing to sell produce. Nevertheless, the Territory as a whole benefits from a stronger economy as producers find and secure markets. Also, the development of some markets requires coordination between producers and suppliers, the provision of transport and other infrastructure, and an appropriate regulatory framework. The Government can play an important role in developing policies that facilitate market development, and assisting with coordination, infrastructure and regulation.

One strategy for market development the Committee heard about was sustainability certification. Certification reinforces industry standards and is also a marketing brand. The NTHA Natural Resource Management Strategic Plan 2009-2013 states that more than 25% of horticultural producers in the NT brand and actively promote their produce as originating from the NT.[567] Although the Committee did not receive any evidence directly on certification systems, the Committee considers that the development of certification and branding in the Territory has potential for creating access to new markets for the agricultural industry. One option would be the creation of a Northern Territory brand that certifies that the producer has met certain standards for environmentally

[566] NT Government, 'Territory 2030: Strategic Plan 2009', http://www.territory2030.nt.gov.au/doc/T2030_Strategic_Plan.pdf, at 31 January 2011, p 35
[567] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'

sustainable agriculture. The NTHA's strategic plan suggests the brand name 'SustaiNT' for consideration.[568]

Recommendation 14

The Committee recommends that the Government explore options for work with the agricultural industry to develop the concept of a Territory wide system of certification and branding that is based on environmentally sustainable principles, standards and industry codes for agricultural production.

Recommendation 15

The Committee recommends that the Government where possible, assist producers aiming to achieve certification from existing national and international industry bodies for environmentally sustainable agricultural production.

Encouraging investment

DRDPIFR spoke about the influence of political and corporate timeframes on long-term investment in the industry. For corporations, return on investment is measured annually or over two to three year cycles whereas pastoral returns need around 10 year investments to take advantage of complete seasonal cycles. DRDPIFR told the Committee there are financial investment concerns about land values and finance during the current period of financial uncertainty.[569] The Committee found that several submissions expressed the need for governments to respond by supporting the industry to grow with investment in infrastructure such as roads, transport and energy. DRDPIFR placed importance on markets and the need for investment in infrastructure to support access to markets particularly the live export markets of South-east Asia.[570]

DRDPIFR spoke to the Committee about energy becoming an issue in the future so strategic investment of industry in properties closer to markets, and

[568] Appendix A to Submission No. 3, Northern Territory Horticultural Association, 'Natural Resource Management Strategic Plan 2009-2013'
[569] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources
[570] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources

transporting animals at different times to get them closer to market will be required.[571]

Recommendation 16

The Committee recommends that the Government continue to encourage investment in the Territory's agricultural industries by, among other things, maintaining a commitment to the maintenance and development of necessary transport infrastructure.

[571] Committee Hansard, Public Hearing, 24 November 2008, Department of Regional Development, Primary Industry, Fisheries and Resources

6. CONCLUSION

Increasing sustainable agricultural production in the Northern Territory is a massive undertaking. While there is considerable potential, there are many challenges. Meeting these challenges requires:

- a better understanding of the environment;
- the identification and development of improved production practices;
- effective communication, education and training between producers, researchers, government, communities and industries;
- an evidence based, efficient and effective regulatory framework;
- transport infrastructure;
- market development; and
- investment.

However, while there is significant work to do to unlock the Territory's potential for sustainable agriculture, the Committee is encouraged by the foundational work that is being done.

The Committee did not uncover any problems that had not been thought of or find any new initiatives that had not been considered.

The Committee did find developing relationships between government, producers, industries and communities. It also found encouraging policy statements and frameworks.

What is now required is to implement the good intentions; to build on the foundational work that has been done. This will require sustained effort in research and following through on projects underway. The Committee's recommendations aim to assist the Government in advancing this process.

APPENDICES

Appendix A: Committee Terms of Reference

Extract from *Daily Hansard*, Tuesday 09 September 2008

MOTION
Environment and Sustainable Development Committee
Establishment, Terms of Reference and Appointment of Membership

Ms LAWRIE (Leader of Government Business) (by leave): Madam Speaker, I move that during the present session of the Assembly –

1. A Sessional Committee to be known as the Environment and Sustainable Development Committee be appointed.
2. The membership of the Environment and sustainable Development Committee comprise three government members, two members of the opposition and one Independent member.
3. the following members, unless otherwise ordered, be appointed to the committee: Ms Walker, Mr Gunner, Mr McCarthy, Mr Chandler, Mr Styles, and Mr Wood.
4. The committee shall elect a government member as chairman.

Madam Speaker, I move further that during the present session of the Assembly–

1. The Environment and Sustainable Development Committee shall be empowered unless otherwise ordered to inquire into and from time to time report upon and make recommendations on matters referred to it by the relevant minister or resolution of the Legislative Assembly:
   (a) any matter concerned with the environment or how the quality of the environment might be protected and improved;
   (b) any matter concerned with the sustainable development of the Northern Territory.

2. The committee be empowered to send for persons, papers and records to sit in public or in private session, notwithstanding any adjournment of the Assembly, to adjourn from place to place and have leave to report from time to time its proceedings from the evidence taken and make such interim recommendations as it may deem fit, and to publish information pertaining to its activities from time to time.

3. The committee shall be empowered to consider, disclose and publish the minutes of the proceedings, evidence taken and records of similar committees appointed in previous Assemblies.

4. The committee be empowered to publish from day to day such papers and evidence as may be ordered by it, and unless otherwise ordered by the committee a daily *Hansard* be published of such proceedings as to take place in public.

5. The committee have the power to appoint subcommittees consisting of two or more of its members and to refer to any such subcommittee any matter which the committee is empowered to examine, and that the quorum of a subcommittee shall be two.

6. The foregoing provisions of this resolution, so far as they are inconsistent with the standing orders, have effect notwithstanding anything contained in the standing orders.

Motion agreed to.

Appendix B: Inquiry Referral from the Minister

Recd 15/09/08

MINISTER FOR NATURAL RESOURCES,
ENVIRONMENT AND HERITAGE

Parliament House
State Square
Darwin NT 0800
minister.anderson@nt.gov.au

GPO Box 3146
Darwin NT 0801
Telephone: (08) 8901 4132
Facsimile: (08) 8901 4134

Chairperson
Environment and Sustainable Development Committee
Legislative Assembly of the Northern Territory
DARWIN NT 0800

RE: COMMITTEE TERMS OF REFERENCE - 11TH SESSION

Dear Chairperson,

I note that on 9 September 2008 the Legislative Assembly passed a motion that, inter alia, provided that a Sessional Committee to be known as the Environment and Sustainable Development Committee be appointed and that:

....

1. *The Environment and Sustainable Development Committee shall be empowered unless otherwise ordered to inquire into and from time to time report upon and make recommendations on matters referred to it by the relevant minister or resolution of the Legislative Assembly:* [emphasis added]

(a) any matter concerned with the environment or how the quality of the environment might be protected and improved;

(b) any matter concerned with the sustainable development of the Northern Territory

Accordingly, I refer the following matters to the Committee to report upon in the 11th Session of the Legislative Assembly:

1. **The Northern Territory's capacity to progress agricultural production in an environmentally sustainable manner.**

2. In its Inquiry the Committee will:

(a) consider the environmental issues, including opportunities and constraints, facing various types of agricultural production in the different geographical and climatic areas of the Northern Territory;

Northern Territory Government

(b) examine best practice agricultural production in the Territory and other locations with similar geographical and climatic characteristics to that of the Territory and the ways in which best practice can be supported through appropriate policy, regulation and education;

(c) draw upon existing and emerging scientific research from a wide range of sources;

(d) consult widely with relevant stakeholder groups;

(e) adopt an inquiry methodology that considers long-term, inter-generational impacts of agricultural production on the Territory's environment;

(f) include an analysis of carbon reduction schemes and their likely impact on agricultural enterprise in the Northern Territory;

(g) examine the current and possible future contribution of agriculture and agricultural-based products to the Northern Territory economy, including the provision of employment and enterprise opportunities to indigenous people living in remote and regional areas;

(h) examine implications of progressing agricultural production on other enterprises reliant upon the natural environment; and

(i) as a result of the Committee's inquiries and analysis, recommend relevant strategies to progress agricultural production in an environmentally sustainable manner.

Yours sincerely

A. Anderson
15/9/08.

ALISON ANDERSON

Appendix C: Written Submissions Received

Submission No. 1 - Department of Regional Development, Primary Industry, Fisheries and Resources

Submission No. 2 - Department of Natural Resources, Environment, the Arts and Sport

Submission No. 3 - NT Horticultural Association
Appendix A to NT Horticultural Association Submission

Submission No. 4 - Environment Protection Authority

Appendix D: Oral Evidence Received

1. Water Resources Division, Department of Natural Resources Environment, the Arts and Sport, 19 August 2010

2. Northern Territory Agricultural Association, 22 February 2010

3. Supplementary Answer, Department of Regional Development, Primary Industry, Fisheries and Resources

4. Department of Natural Resources, Environment, the Arts and Sport, 13 May 2009

5. NT Horticultural Association (together with PowerPoint presentation), 16 October 2009

6. NT Environment Protection Authority, 16 October 2009

7. NT Cattleman's Association (together with PowerPoint presentation), 16 October 2009

8. Centrefarm Aboriginal Horticulture Ltd., 27 November 2009

9. Arid Zone Research Institute, 27 November 2009

10. Department of Regional Development, Primary Industry, Fisheries and Resources, 24 November 2008