

Donkey Business

Potential of the donkey industry in the Northern Territory

DRAFT FOR DISCUSSION
September 2016



Summary

There is a tradition in Asian and European countries of farming donkeys for milk and meat. In some Asian countries donkeys are grown for hides which are then processed into gelatin and used in edible preparations, traditional Chinese medicine and cosmetics.

The Northern Territory (NT) of Australia has a large population of feral donkeys which are considered pest animals. The number of feral donkeys varies from year to year dependent on seasonal conditions and culling conducted by landholders.

The value of harvesting feral donkeys in the NT has been considered over many years. However the practicalities and financial returns on harvest and processing have proved a deterrent.

There has been a renewed interest in donkey farming and the Northern Territory Government (NTG) has recently fielded a number of enquiries from potential investors. This is thought to be driven by a decline in the availability of donkeys in China and an increase in the demand for donkey gelatin.

The NTG commissioned David Warriner's Agricon in 2015 to undertake a review of the potential for donkey farming in NT. This report draws on the findings of the Agricon review to assess the potential for donkey farming and includes a gross margin analysis which has been conducted by the Department of Primary Industry and Resources (DPIR).

NTG supports the development of a profitable donkey industry in principle. Of particular interest is donkey farming to provide future diversification opportunities for pastoralists.

The NTG can assist industry development through facilitation of government approval processes, however it is not in a position to provide financial capital or detailed individual business planning services. More information is available from the NTG website nt.gov.au/industry/agriculture/livestock/keeping-horses-donkeys-and-mules/Donkey-control-and-commercial-farming

This report finds that **donkey farming is potentially viable as a stand-alone business or as a complimentary venture operated in conjunction with cattle production. However the development of a commercial business case will require rigorous assessment based on the particular circumstances of the enterprise.**

The NTG cautions that detailed business planning is required to carefully consider the opportunities and challenges summarised below.

Summary of the opportunities and challenges for the donkey industry in the NT

Opportunities	Challenges
<p>There is a strong demand for export meat and gelatin and it can command a high price in the Chinese market at present.</p>	<p>Meat and hides for export to China need to be processed in an accredited Tier 2 abattoir facility.</p> <p>There is no obvious facility for this in the NT. A new facility would require a large capital outlay, estimated to be approximately \$50-100 million dependent on specifications and location.</p> <p>There is no operational protocol for export of meat and hides to China.</p> <p>The Chinese market may change over time.</p>
<p>A multi-species abattoir could be developed for diversified product lines – buffalo, camel, horse, pigs, in addition to donkeys.</p>	<p>There is only limited domestic demand for these meat products.</p> <p>Some international markets would accept donkey products processed in a Tier 1 facility. However these markets may not offer the premium price that the Chinese market currently does.</p> <p>For export to China a large capital outlay would be required to establish a Tier 2 facility.</p>
<p>Feral donkeys represent a low cost resource available for opportunistic harvest or capture for a foundation herd.</p>	<p>Opportunistic harvest can be problematic and expensive due to the remote and difficult terrain in which donkeys live and their feral behaviour.</p> <p>The quality of meat and hide from local donkeys is untested. Genetics may need to be introduced to improve productivity, requiring new import protocols. This could be a considerable task and would be at the discretion of the Australian Government.</p> <p>Feral donkey harvesting is not a long term proposition since the resource is effectively being 'mined'.</p>
<p>Steady state farming of mammoth donkeys selected for meat and hide quality could be viable.</p> <p>This could provide a complimentary diversification activity for pastoral leaseholders, as well as provide indigenous landholders with an opportunity to develop donkey farming or agistment.</p>	<p>Donkey farming is unproven in the NT.</p> <p>A donkey farm would require 5-10 years to reach 'steady state' production during which time large capital investment in farm infrastructure and breeding would be needed.</p>

Have your say

This report provides information for interested parties undertaking preliminary feasibility studies.

We would be pleased to hear your feedback. Please contact Mrs Lorraine Corowa at DPIR on lorraine.corowa@nt.gov.au

1. The donkey

The donkey (*Equus asinus*) is native to Africa and Asia. Donkeys have been domesticated for more than 4,000 years and used for packing, carting and tillage. There is record of import into Australia for use in construction and wool transport in the early 1800s (Parsonson 1998). The renowned Scottish-Australian pastoralist Sir Thomas Elder is credited with the first substantial import of donkeys from India in 1866 for cartage and station work in central Australia (DAFWA 2014). He then established a donkey breeding stud with donkeys supplied for riding and work teams from Spanish stock. A small export trade was subsequently established to South Africa and Mauritius (Parsonson 1998).

Donkeys were particularly useful in the Kimberley, Western Australia and Victoria River (NT), where the occurrence of a native toxic plant affected work horses. The use of donkeys was replaced with motorised transportation in the early 1900s and almost entirely phased out by the 1930s. Donkeys were at that point released to the wild where, along with previous escapees, they formed feral herds.

1.1. Habitat

Donkeys can survive, reproduce and produce meat and milk in difficult environmental conditions. (Polidori *et al* 2008). They are able to travel further than cattle to water and populations can increase rapidly under favourable conditions (DSEWPaC 2011).

Donkeys are serious environmental pests. They can increase erosion of soil; trample native vegetation and eat native seedlings; erode and pollute waterways; spread weeds through seeds carried in their dung, manes and tails; and compete for food and water resources with native animals and cattle. For more information refer to nt.gov.au/environment/animals/feral-animals/feral-donkey.

The NTG has conducted culling programs to reduce the size of the donkey herd and there are ongoing control programs in the Kimberley and Pilbara regions of Western Australia. Some culling is also conducted by NT pastoralists to reduce detrimental effects on cattle enterprises.

1.2. Current donkey population

In 2006 an area of 130,000 square kilometres was surveyed in the NT with an estimated population of 50,000 to 60,000 donkeys. Anecdotal evidence suggests that this population could have halved since the 2006 survey was conducted. Refer to Figure 1 for indicative densities in the NT.

Population numbers in the NT are currently estimated to be 50,000. However this estimate requires verification.

The highest population of donkeys in the NT are in the Victoria River District, and to a lesser extent the area to the east of Mataranka, in the Hodgson and Cox River regions.

1.3. Resource ownership and land tenure

Feral donkeys are the property of the Crown represented by the NTG. Under the *Pastoral Land Act* (NT) 2016, unless otherwise specified in the lease, farmed donkeys (i.e. not in a feral state) fall under the definition of livestock.

Access to feral donkeys on Aboriginal Land Trust or pastoral lease require permission from the land owners/ managers.

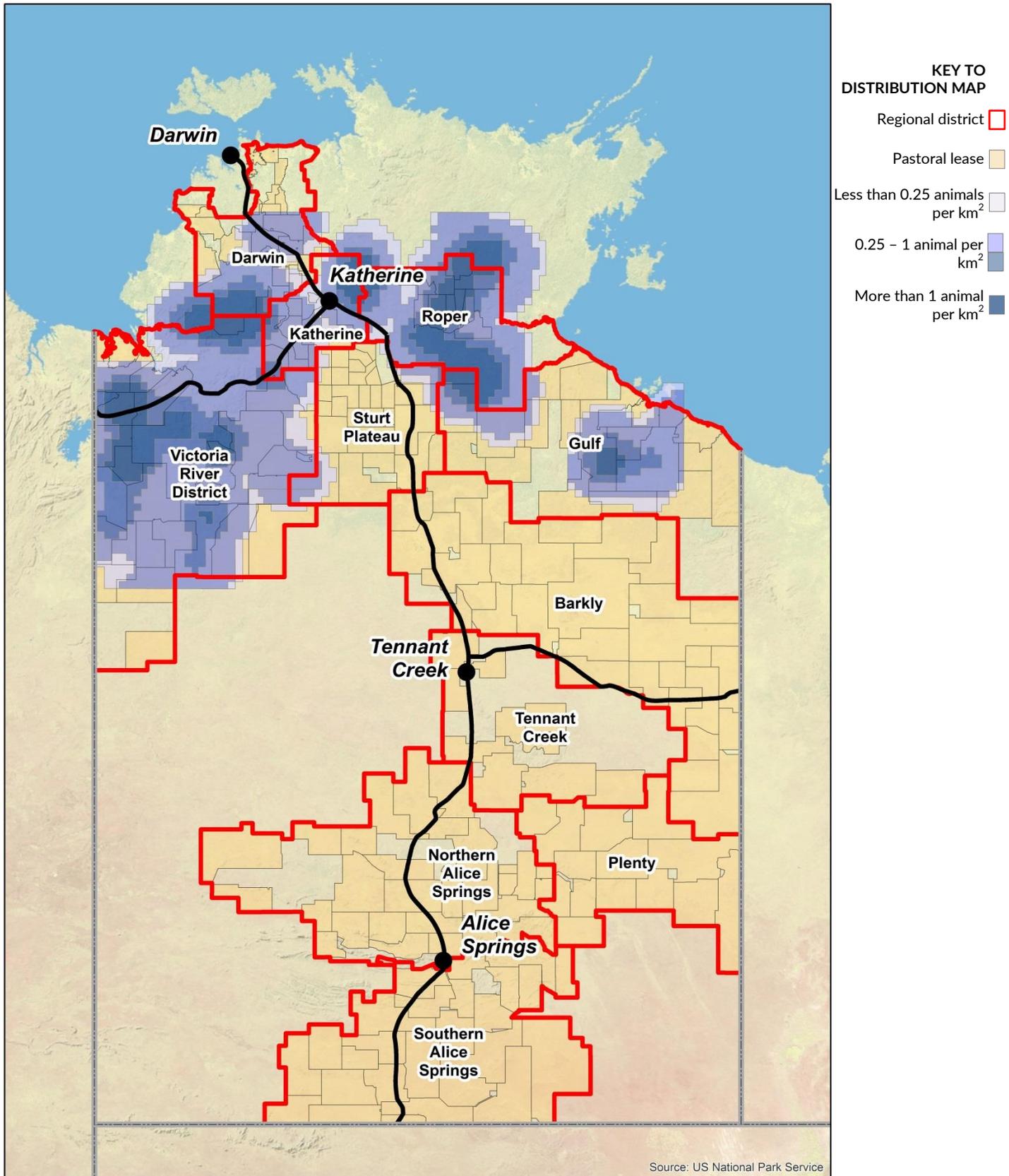


Figure 1: Distribution of donkeys in the NT.

Source: DPIF, based on DLRM survey data 2006 and 2001.

Available online nt.gov.au/industry/agriculture/livestock/keeping-horses-donkeys-and-mules/Donkey-control-and-commercial-farming

1.4. Donkey products

Donkeys are usually farmed for meat and milk. They also provide a range of by-products briefly described below.

Donkey meat

Donkey meat is the culinary term for the flesh of donkey which is used as an ingredient in many dishes.

In countries where donkeys are still used for work or milk production (largely North Africa and Middle East), they are slaughtered at an older age when they have reached the end of their useful working life. This may account for the reputation that donkey meat has gained for being unacceptably tough and suitable for salted meat-based products (Polidori *et al* 2008).

Recent research has increased awareness of the high quality of the meat. It has been demonstrated to be high in protein (compared to beef, mutton, pork and chicken) and high in essential minerals such as iron, zinc, potassium and phosphorus (Aganga *et al* 2003). Other studies have shown donkey meat products to be lower in saturated fatty acids, higher in polyunsaturated fatty acid (omega 3 and omega 6) content and to have comparatively better nutritional indices (Marino *et al* 2015).

Donkey meat is priced according to the quality of the meat. The mammoth donkey derived from European breeds is the preferred breed for meat production. This breed weighs around 400 kg, which is large in comparison to a feral donkey in NT which weighs around 200 kg (180 – 225 kg).

Donkey meat is sold fresh and in dehydrated slabs. Whilst difficult to substantiate exact prices, donkey meat in Asian markets does appear to attract a premium compared to beef, most likely due to low supply into small niche markets.

Donkey by-products

Donkey by-products include the brain, eyelashes, heart, hooves, intestine, kidney, liver, pizzle (penis), tails, tendon, tongue and tripe. Offal is not widely used. Pizzles are prized for their aphrodisiac properties and the processed (powdered) product can attract a high price. Estimates of around \$66.50 per pizzle have been quoted by industry sources.

Milk

Donkey milk is drunk fresh or in powdered form. It is considered a good alternative for consumers with dairy allergies and has been used as a replacement for breast milk as it is reportedly "... the closest thing to human breast milk" (see Hardman 2012).

Donkey milk has also been used to make cheese and liqueur, as well as soap and cosmetics.

Donkey hide gelatin

Donkey hide leather has traditionally been used to manufacture garments including shoe soles.

Donkey hides can be soaked and rendered to extract a gelatin. Edible gelatin (or jelly) is consumed alone or taken with hot water or wine. It is also combined with dried fruit, nuts and seeds to make snacks. Gelatin is also used as an ingredient in a number of traditional Chinese medicines to treat a variety of conditions including improving blood circulation and energy; and reducing dizziness, insomnia and coughing. It is also thought to have anti-ageing and beautifying agents and is in cosmetics such as traditional skin-lightening creams.

Gelatin is also used to attach paper-like reed membranes to the traditional Chinese flute (dizi).

In China the gelatin is referred to as ejiao, named in Dong'e County of Shangdong Province where it was originally made. Dong'e continues to be renowned for its production, although it is also produced in Jiangsu and Zhejiang Provinces.

Again although difficult to substantiate, gelatin prices can range from A\$550 up to \$1,000 per kg, dependent on quality. Black skinned donkeys provide, by a large margin, the highest quality gelatin. Donkey hides from the NT are unlikely to provide a comparative quality of gelatin as they are predominantly lighter skinned. However potential investors have indicated that it could be used to 'bulk up' gelatin from Chinese farmed herds. Improving donkey herds through breeding of more black skinned animals over time is possible.

The price for donkey hide gelatin has reportedly increased up to 1,000% in the 2-3 year period to October 2014 (CPhI.con 2009). Personal communication with potential proponents indicates that it has increased again since 2014.

1.5. Market demand for donkey products

The majority of commercial inquiries regarding donkey production and import have been from Chinese interests. It has been reported that in the past up to 1 million donkeys were slaughtered annually in China and this figure has dropped to 300,000. This is a result of both a reduced supply from a decreased Chinese donkey herd and increased demand from a broadening middle class in China able to afford donkey meat and by-products.

Advice from these potential importers has not revealed any market specifications – all donkeys can be used. However, as market economics dictate, higher prices will be paid for higher quality.

From research conducted to date it appears that there is a consistent demand across seasons, with a slight increase in northern hemisphere winter months.

It is prudent to caution against planning only for specific demand in one export market. Diversification of products and markets will assist in mitigation against the risk of market failure.

2. Farming Models

There are a number of different farming models that have been explored. Production of donkey products for export have been summarised in Figure 2. More detailed information is provided in the discussion below.

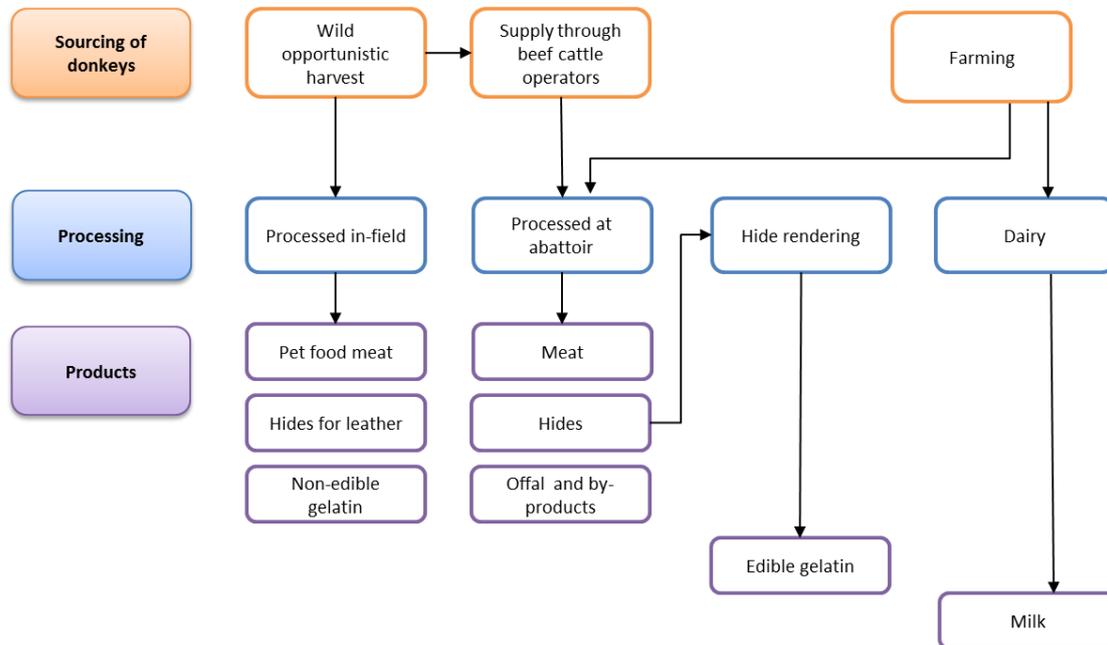


Figure 2: Schematic of donkey farming export products

2.1. Sourcing of donkeys

Opportunistic harvest (field shooting and feral capture) of feral donkeys provides a short term resource. However it is unlikely that this could sustain a profitable industry in the longer term due to the large capital investment required for product processing and the need for consistent, quality-assured supply.

Opportunistic harvesting has a number of logistical challenges related to remote and inaccessible terrain and the temperament of feral donkeys. Feral donkeys are difficult to handle and even experienced operators report that this is a challenging undertaking. Harvesting or mustering in the wet season may not be possible due to logistics and the potential for animal welfare issues. Mustering costs are unpredictable.

Farming of a domesticated herd is likely to be more sustainable in the longer term. Initially, opportunistic harvest for farming and could be complimentary where feral donkeys could be used to source breeding stock and foals grown out for slaughter.

Where donkey farming was undertaken in conjunction with existing cattle operations, the existing grazing and watering demands would need to be factored into future business planning.

Whilst farming production would plan to supply product all year round, this could be hindered by the logistical challenges of operation during the wet season including disruption of access on property, public road access, electricity and gas supply, and telecommunication services. A 'depot' property with all-weather access close to transport corridors is a potential solution to this issue.

In the long term breeding programs could be established to select for particular animal attributes (size, meat quality, hide quality). This could be achieved through animal selection, using mares as surrogates

and artificial breeding programs. In addition, breeding programs will be high cost and require special yard facilities.

It is envisaged that farming will take several (in the order of ten) years to get to a steady state production system. At this point, dairying could be further considered.

Culling for biodiversity outcomes and a reduction in grazing pressure would need to be balanced with the opportunity to harvest or capture feral donkeys.

2.2. Processing

The *Meat Industries Act (NT) 1996* regulates the control of meat industries in the NT.

In field processing

To comply with Meat Industry Regulations meat and offal slaughtered in-field can only be used for pet food.

Regulations specify that for pet food purposes, an animal must be bled immediately after slaughter, butchery of the carcass must be commenced 30 minutes after slaughter and be completed without delay. It is also a requirement that the meat is placed in refrigeration within 4 hours of it being butchered. This would require mobile (vehicle-mounted) refrigeration units to collect and transport meat to a pet food processor.

Skinning of carcasses in the field is best achieved within 2-4 hours of slaughter, dependent on ambient temperature. Once the carcass has begun to swell it is unpleasant for the skinner, however it could be 24-48 hours before the hide is damaged by insect infestation or scavenging animals.

Hides removed in the field can only be used for leather production (since gelatin is an edible product and hygiene standards are not satisfied by this method).

Hides would need to be folded and transferred to a 'salting camp'. Transfer may not be possible by four wheel drive vehicle due to the inaccessible terrain. A helicopter could be used although the latter is likely to be cost prohibitive. Once salted, hides would be palletised and potentially containerised for further transport.

Processing for domestic consumption

Where donkeys are mustered they would be contained in yards and drafted to separate those suitable for slaughter.

The Meat Industries Act includes feral donkey in the definition of game meat. This means that meat can be processed at a domestic abattoir with a domestic game meat processing licence or sold via a game meat slaughter licensee. However it is considered that there would be a limited market for domestic consumption of donkey meat as none is currently sold in the NT.

Meat Export

Agricultural export protocols are negotiated by the Australian Government's Department of Agriculture and Water Resources (DWAR) and the importing countries' relevant organisations.

Tariffs may be imposed on import of meat and gelatin, dependent on the implementation status of any free trade agreement with the import country.

To facilitate export of meat, skins and gelatin some markets (including China) require that export accreditation and oversight of the establishment is administered by the Australian Government (rather than NTG) and this is referred to as a Tier 2 facility. A Tier 2 facility has strict controls for meeting food hygiene, environmental and animal welfare standards.

A protocol between Australia and China for the export of donkey meat and edible hides does technically exist. However it has not been operationalised by government to government agreement on health certification which defines processing, refrigeration, packaging and transport requirements. This means that even where donkey products are processed in a Tier 2 facility the protocol does not enable export.

Some importing countries will accept product processed in a Tier 1 abattoir. However only limited quantities of meat will be accepted by these countries and it cannot be on-sold into higher value markets.

At present there is no processing facility in the NT that would facilitate the export of donkey meat and by-products. A number of options have been suggested although each has its own challenges:

- Refurbishment of disused facilities, for example the Katherine or Tenant Creek North abattoirs; or the Tenarra Meatworks at Batchelor. These abattoirs will require a very high level of investment to reach appropriate standards.
- A service kill arrangement at the Northern Beef Abattoir at Livingstone. This is unlikely to represent an attractive commercial arrangement for the operator as they would need to change the process from beef to accommodate donkeys requiring substantial investment in new quality systems and infrastructure.
- Upgrade of the Wamboden abattoir north of Alice Springs to a Tier 2 facility. This would require a large capital investment for refurbishment.
- The yet to be completed Never Never Meatworks at Mataranka. This would require a capital investment for completion of construction and negotiation with the current owners.
- Construction of a new donkey specific or multi-species abattoir, with access to the Darwin port. To be practical from an access, labour and logistics perspective, this would need to be located around Katherine or Darwin. The capital cost of establishing a Tier 2 abattoir is estimated to be \$50-100 million. Accreditation for export to China can only occur post-operation of the abattoir. This effectively means that the facility may need to operate for a considerable period (many months) without the ability to export the processed product.
- Construction of a new donkey-specific mobile abattoir. This would not meet licensing requirements of the NTG or accreditation requirements of the Australian Government.
- Use of existing abattoir facilities capable of processing horses at Samex in Peterborough, South Australia; or Miramist near Caboolture, Queensland. Transport to these facilities involves long distances: approximately 2,540 km (28 hours) from Katherine to Peterborough; and 3,120 km (35 hours) from Katherine to Caboolture. The need to spell the animals during transport over this distance will add additional costs.

2.3. Live Export

There are no specific protocols for the live export of donkeys to any international market. As the same genus as horses (*Equus*), donkeys would be considered as an equivalent commodity.

Importing country requirements for horses to China have been agreed. However there has been some challenge with the demonstration of meeting these requirements over a number of years.

For other countries where import protocols have not been negotiated it would be possible to organise an import permit. DAWR would need to certify that the export met all the requested import requirements.

Horses are not considered 'livestock' under the Exporter Supply Chain Assurance System. It would be particularly important to demonstrate that animal welfare issues were fully considered and addressed to maintain a 'social licence' for live export.

3. Gross margin analysis

A gross margin analysis i.e. the gross income produced less the variable costs of production, was undertaken to assess the relative profitability of different donkey farming options, as well as beef cattle farming.

The gross margin analysis is based on a steady state donkey production farm at a hypothetical pastoral property (Jennet Station) in the NT. The station is located 600 km south-west of Katherine in the Victoria River District since this is one of the areas containing the highest density of feral donkey in the NT.

Since there is no published information on donkey farming in the NT a number of assumptions were necessarily made. These assumptions are based on overseas experience, local experience in feral donkey management, local experience in management of cattle farming and expert opinion. All assumptions are listed in Appendix 1.

The analysis was undertaken using the Breedcow software package. It is available from the Queensland Department of Agriculture and Fisheries website (www.daf.qld.gov.au/animal-industries/beef/breedcow-and-dynama-software).

A number of scenarios were developed to address the inter-related issues of export requirements, potential products and farming systems. These issues are briefly described below.

3.1. Variables considered in modelling

Export requirements

The demand for donkey hides is driven by the Chinese market. Export of meat and hides to China requires processing in a Tier 2 facility which has strict controls for meeting food hygiene, environmental and animal welfare standards.

The utility and workforce requirements of a Tier 2 facility mean the most likely location for this type of facility is around Darwin. The cost of transport of donkeys from the station to Darwin (900 km) has been included in the analysis where appropriate. To test the effect of the cost of transport on the gross margin a scenario has been included where donkeys are purchased at the property (farm gate) and the cost of transport is considered further along the value chain.

Hides could be processed in a Tier 1 abattoir and sold into an alternative export market. A Tier 1 abattoir could be serviced in a regional centre such as Katherine. The cost of transport of donkeys from the station to Katherine (600 km) has been included in the analysis where appropriate.

Donkey meat and by-products

Where donkeys are processed in a Tier 2 facility meat and by-products (brain, eyelashes, heart, hooves, intestine, kidney, liver, penis, tails, tendons, tongue and tripe) could be exported to China.

Where donkeys are processed in a Tier 1 facility meat and by-products could be consumed domestically. However there is currently only a very limited domestic market for donkey meat or by-products in Australia.

To test the effect of income from meat on by-products on the gross margin a range of scenarios have been used – export to China; sale for pet meat; and disposal as waste at no cost.

Local donkeys

Donkey farming systems in operation in China use a large (mammoth) breed of donkey which weighs up to 400 kg. The donkeys also have black hides which reportedly contain a higher percentage of gelatin.

The quality of the donkey hides for gelatin production from the local smaller NT donkey population is yet to be tested.

There is potential to use Chinese donkey genetics to select for favourable characteristics in the 'hardy' feral donkey population. Selective breeding practices including artificial insemination will introduce a range of costs which have not been considered in the current analysis. There is also a range of risks to production since these breeding techniques have not been previously trialled in Australia.

Income from donkey products

Information on the price received for unprocessed donkey products is limited. The income from donkey products assumed in this analysis is summarised in Table 1 below. This is the price of the products received by the farmer i.e. at the farm gate. Note that more detailed information on price assumptions is provided in Appendix 1.

Table 1: Income from donkey products assumed in the gross margin analysis.

Product	Price Estimate (A\$/kg)	Enterprise income			
		Local donkey (A\$ per head)		Mammoth donkey (A\$ per head)	
Hide	\$26.50	\$450.50	(17 kg)	\$66.30	(30 kg)
Meat for human consumption	\$10.60	\$424.00	(40 kg)	\$116.20	(70 kg)
Meat for pet consumption	\$1.00	\$40.00	(40 kg meat)	Not considered	
By-products for pet consumption	\$1.00	\$120.00	(120 kg offal)		
By-products		\$150.00		\$150.00	

Reaching steady state farming

The modelling undertaken here assumes a steady state farming system which will require 5-10 years to achieve. Even where a traditional beef production property is used there may be additional capital costs to transform it to a donkey enterprise or mixed species operation. For example, additional or different configurations of fencing and yard systems may be required.

A steady state farmed system would initially rely on capture of feral donkeys. Anecdotal evidence suggests that these donkeys can be especially difficult to handle. There are also particular animal welfare considerations relating to transport and overheating. These behavioural and physiological characteristics are likely to result in additional (as yet unquantified) costs compared with beef production to the primary producer in order to reach a steady state farming system.

Carrying capacity

Feral donkeys have been observed to eat grasses to ground level then uproot them, promoting soil erosion and land degradation. This could lead to a greater impact on the native pasture resource for a given level of pasture utilisation than for cattle. This grazing behaviour has been assumed to be associated with forage scarcity and the impact could be managed through pasture utilisation strategies.

As such the grazing pressure expressed in adult equivalents has been estimated only on the weight of the donkey (and intake requirements).

Transport

Donkeys will need to be handled, loaded, transported and unloaded in a manner that minimises risks to welfare and in accordance with the [Australian Animal Welfare Standards and Guidelines – Land Transport of Livestock](#) under which donkeys are considered as horses. In the NT this is regulated under the Livestock Act. Loading densities on a road train need to make allowance for donkeys to move apart from each other to avoid conflict. However a lower density of loading may present a risk of injury due to movement in transit.

More studies are required to identify the optimal transportation methods to ensure animal welfare standards are upheld.

3.2. Scenarios

Seven scenarios were modelled. These are described below and summarised in Table 2:

- Scenario 1. Steady state farming of local donkeys at Jennet Station. Donkeys are trucked to a Tier 2 abattoir in Darwin for processing and hides are exported to China for gelatin production. Meat and by-products are considered as waste products.
- Scenario 2. Steady state farming of local donkeys at Jennet Station. Donkeys are purchased at the farm gate on the basis of a price per kilogram of hide.
- Scenario 3. Steady state farming of local donkeys at Jennet Station. Donkeys are trucked to a Tier 2 abattoir in Darwin for processing and hides are exported to China for gelatin production. Meat and by-products are purchased for pet foods.
- Scenario 4. Steady state farming of local donkeys at Jennet Station. Donkeys are trucked to a Tier 2 abattoir in Darwin for processing. Hides, meat and by-products are exported to China.
- Scenario 5. Steady state farming of local donkeys at Jennet Station. Donkeys are trucked to a Tier 1 abattoir in Katherine for processing. Hides are exported to a non-specified international market for gelatin production. Meat and by-products are purchased for pet foods.
- Scenario 6. Steady state farming of local donkeys at Jennet Station. Donkeys are trucked to the established Tier 2 abattoir in Peterborough, South Australia for processing. Hides, meat and by-products are exported to China.
- Scenario 7. Steady state farming of mammoth donkeys at Jennet Station. Donkeys are trucked to a Tier 2 abattoir in Darwin for processing. Hides, meat and by-products are exported to China.
- Scenario 8. Steady state farming of beef cattle farming at Jennet Station. Heavy cattle transported to Darwin based abattoir. Feeder steers and heifers transported to Darwin for live export.

Table 2: Summary of modelled scenarios.

Scenario	Product	Market	Processing	Notes
1	Hides	China	Darwin	
2	Hides	China	Darwin	No transport cost included (i.e. buyer pays transport costs)
3	Hides	China	Darwin	
	Meat and by-products for pet food	Domestic		
4	Hides, meat, by-products	China	Darwin	
5	Hides	International	Katherine	
	Meat and by-products for pet food	Domestic		
6	Hides, meat, by-products	China	Peterborough	
7	Mammoth hides, meat, by-products	China	Darwin	
8	Beef	International	Darwin	

The following was calculated for each scenario:

- Gross margin – the total sales revenue to the enterprise minus the cost of stock sold, on a per animal basis.
- Total gross margin – the total sales revenue to the enterprise minus the cost of stock sold, on an annual basis.

Donkey and beef cattle enterprises have been analysed on a Gross Margin per Adult Equivalent (AE) basis to allow comparison.

Limitations

No account has been made of the inputs and outputs downstream of the enterprise. So for example, while an estimate of the income from a hide has been included, the impact of a change in the price of the downstream product (gelatin) is not considered in this analysis.

The analysis only includes steady state farming donkeys or beef cattle. It does not consider a combined enterprise.

The analysis has not been adjusted for the cost of interest on capital investment which may be a significant cost.

This analysis has been based on the best available information but necessarily relies on a number of assumptions listed in Appendix 1, which have not been validated.

3.3. Results

The results of the modelled scenarios are presented in Table 3.

Table 3: Summary of estimated gross margin analysis for donkey farming

Scenario	Gross margin		Total gross margin at Jennet Station (A\$/herd)
	(A\$/adult equivalent)	(A\$/head)	
1. Local donkeys farmed and transported to Darwin based abattoir for processing. Hides exported to China.	\$158.39	\$69.42	\$2,375,452
2. Local donkeys farmed and purchased at farm gate (nil transport cost). Hides exported to China.	\$194.08	\$85.07	\$2,911,517
3. Local donkeys farmed and transported to Darwin based abattoir for processing. Hides exported to China. Meat and by-products sold for pet food.	\$230.92	\$101.21	\$3,464,022
4. Local donkeys farmed and transported to Darwin based abattoir for processing. Hides, meat and by-products exported to China.	\$428.64	\$183.46	\$6,429,137
5. Local donkeys farmed and transported to Katherine based abattoir for processing. Hides are exported to unspecified international market for gelatin production. Meat and by-products are sold for pet foods.	\$248.65	\$106.42	\$3,730,336
6. Local donkeys farmed and transported to Peterborough, South Australia abattoir for processing. Hides, meat and by-products exported to China.	\$334.46	\$143.15	\$5,016,610
7. Mammoth donkeys farmed and transported to Darwin based abattoir for processing. Hides, meat and by-products are exported to China.	\$452.77	\$308.48	\$6,790,072
8. Cattle farmed for beef. Heavy cattle transported to Darwin abattoir. Feeder steers and heifers transported to Darwin for live export.	\$132.95	\$111.25	\$1,994,395

The analysis indicates that if access to the Chinese market were available the farming of donkeys for hides, meat and by-products in the NT could in the long term be commercially viable. However, this conclusion needs to be considered in the context that reaching a steady state farming system may require high capital costs and a long period (5-10 years) of low return on investment at the enterprise level. A farming enterprise is also dependent on access to a Tier 2 abattoir in South Australia (existing) or an NT that can process donkeys.

It also needs to be reinforced that there is currently no operational protocol for market access to China.

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Appendix 1 – Assumptions used to calculate gross margins for donkey farming.

Note that all prices are A\$.

Production Parameter	Description
Abattoir	The hypothetical abattoir is located in Darwin which is a distance of approximately 900 km from Jennet Station. The abattoir is capable of processing donkey hides for human consumption (Tier 2 accredited).
Adult Equivalent	The standard conversion ratio to allow comparison between enterprises. A standard cattle adult equivalent (1 AE) refers to a 450 kg non-lactating cow. A local donkey is assumed to be equal to 0.54 AE. A mammoth donkey is assumed to be equal to 0.78 AE.
Age at maturity	Assumed to be 3 years for both jacks and jennies.
Age at weaning	Assumed to be 5 months. Reported range of 4-6 months.
Age at culling	Jennies culled at 15 years old.
Annual turn off rate	Assumed to be 20-25 %. The calculated rate for these scenarios is 24 %.
Birth weight	Assumed to be 25 kg for local donkey and 50 kg for mammoth donkeys.
Breeding age	Assumed to be 2 years old.
Foaling rate	Assumed to be 65 %.
Donkey by-products	The price received for all other by-products (brain, eyelashes, heart, hooves, intestine, kidney, liver, penis, tails, tendons, tongue and tripe) is assumed to be \$150 per head. Where by-products are used for pet food an offal yield of 120 kg has been assumed.
Donkey hide	The weight of the hide from a local donkey is assumed to be 17 kg and 30 kg from a mammoth donkey. The price received is assumed to be \$26.50 per kg.
Donkey meat	The yield of meat from a local donkey carcass is assumed to be 40 kg and 70 kg from a mammoth donkey. The price received for human consumption is assumed to be \$10.60 per kg. The price received for pet meat is assumed to be \$1.00 per kg.
Growth rate	Jennies are assumed to gain 50 kg per year for local donkeys and 100 kg for mammoth donkeys (more in first year prior to weaning). Jacks are assumed to be 10 % heavier, and to grow more slowly after castration (at weaning).
Herd size	A carrying capacity of 15,000 AEs was used to undertake the comparison. This results in a local donkey herd size of 32,100 head and a beef herd of 8,877. Assuming an average carrying capacity of 7 AE/km ² the area of Jennet Station is calculated to be 2,143 km ² which is in line with the scale of a commercial operation in the Katherine region.
Jack studs	All jack studs are assumed to be home bred. Non-stud jacks are turned off at 3 years old.
Joining ratio	A jack: jenny ratio of 7% has been assumed.
Mammoth donkey	Refers to a large donkey which could be one of several breeds that are commercially farmed in China. Production parameters are assumed to be the same as for local donkeys except where indicated.
Mortality rate	A rate of 5% has been assumed for both jacks and jennies.
Transport cost	Donkeys will be transported on single decks to comply with land transport of livestock requirements. A load rate of 75% of cattle loading density has been assumed. This

Production Parameter	Description
	<p>equates to 40 head per deck for local donkeys and 28 head per deck for mammoth donkeys.</p> <p>Transport of donkeys from Jennet Station to Peterborough is a distance of approximately 3,150 km or 35 hours. To meet land transport of livestock requirements donkeys will be spelled at Alice Springs for 12 hours. A \$6/head cost has been assumed for unloading and reloading, water and 5 kg/head of hay feed.</p>
Treatments	Cydectin treatments have been included for tick and worm control.
Weight at maturity	<p>For local donkeys assumed to be 200 kg. Reported range of 180-225 kg.</p> <p>For mammoth donkeys assumed to be 350 kg. Reported range of 300- 400 kg.</p>

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