



final report

Project code: B.GOA.0112
Prepared by: Agripath Pty Ltd
Date published: 27 June 2016

PUBLISHED BY
Meat and Livestock Australia Limited
Locked Bag 1961
NORTH SYDNEY NSW 2059

Benefits of mixed grazing with goats

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

This publication is published by Meat & Livestock Australia Limited ABN 39 081 678 364 (MLA). Care is taken to ensure the accuracy of the information contained in this publication. However MLA cannot accept responsibility for the accuracy or completeness of the information or opinions contained in the publication. You should make your own enquiries before making decisions concerning your interests. Reproduction in whole or in part of this publication is prohibited without prior written consent of MLA.

Executive Summary

A management package has been developed to assist new entrants to the industry and to facilitate a more managed approach to goat production in order to increase both production and also the continuity of supply and quality of goat meat. This managed approach will result in a decreased focus on opportunistic goat harvesting.

The management package consists of:

- An analysis report on the economic impact of the integration of goats into six existing sheep and cattle producing businesses in both the pastoral/rangeland and high rainfall/farmland zones in eastern and south eastern Australia.
- An annual goat management plan template for the high rainfall/farmland and pastoral/rangeland production zones developed and tested in conjunction with an advisory panel of goat producers.
- Three producer case studies outlining how goats have been successfully integrated into existing livestock systems. The case studies developed highlight the various motivations for going into goats, how goats were integrated into the existing livestock business and how goats have been managed in these businesses.
- Nine Fact Sheet resources developed based on topics resulting from suggestions made during a session themed- "If you were to do it all again, what information would you want to know?" as part of the one-day advisory panel workshop.

The objectives of this project are to assist the goat industry to:

- Build sustainable supply from the rangelands, with goats being recognised and managed as a resource – not as either an opportunistic harvest or a pest animal to be controlled.
- Increase high-value goat production from agricultural areas – with goats being integrated into current mixed farming systems.
- Manage supply chains for increased reliability so markets may be developed with confidence and opportunities to grow the industry realised.
- Build the number and capacity of Australian goat producers.

The analysis undertaken demonstrates that the integration of goats into existing livestock production systems across a range of production environments is competitive with the economic return from alternative livestock production systems available. Based on the economics producers should be considering goats in the rangeland and in the higher rainfall environments. Goats are especially well adapted to produce economic return much higher than what is available from other livestock enterprises in situations of rough unimproved feed sources. With more intensive management to maintain high kidding rate and survival, returns are competitive with traditional high performing enterprises such as lambs and trading cattle. The evidence from these case studies suggests that these competitive returns can be achieved with higher carrying capacity on lower quality pastures.

Economically, there are few barriers to entry. The capital cost of breeding does is relatively inexpensive when compared to other livestock enterprises. While fencing may be perceived to be a barrier to entry the producers in the case studies all pointed to other improvements as a result of the investment such as management of grazing pressure, ease of handling and mustering and exclusion of competing grazing from wildlife plus improvement in forage species due to better grazing management.

The ability of goats to enhance whole of farm performance through the control of weeds, maintenance of cropland fallows, and utilisation of feed not grazed by other livestock is

difficult to quantify empirically and therefore not well understood. Quantification of these grazing benefits would assist in increasing adoption of goats into existing farming systems. Producers need to remain focussed on productivity factors such as fertility, growth rates to meet market specifications, and improved understanding of expenditure relative to the anticipated income generated. Industry needs to remain focussed on price maximisation, with provision of pricing premiums to reflect carcase quality differences where applicable.

One of the major challenges throughout this project was limited availability of good financial data regarding gross margins and subsequent cost of production in the goat industry. The data collected during the Case study interviews to undertake the economic analysis became the only data available to make cost of production comparisons across the range of goat production systems reviewed. By comparison, this type of data is readily available for the traditional livestock systems.

The development of a pilot benchmarking program to develop gross margin benchmarks for the different goat production regions and enterprise types is recommended. This will enable the establishment of benchmark comparisons for the goat industry.

Based on feedback from the producer meeting conducted as part of the project, concerns were raised regarding the use of currently available DSE rates to determine carrying capacity and stocking rates for goats in rangeland systems. Producer experiences in applying current DSE rates for goats to grazing systems in Total Grazing Management programs often resulted in overgrazing of the feed resource or underfeeding of the animals being managed. The area of concern was the use of rates which may not accurately reflect the grazing activity of goats in a rangeland grazing environment. There is additional work required in order to develop DSE values that better reflect the energy requirements for goat production in the Australian production environments. It is recommended that these revised values be incorporated into a useful resource tool to assist in making more aligned grazing management decisions to ensure both the sustainability of the rangeland feed resources and optimising productivity for the goat production system. There is also a need to understand the impact of population dynamics in the rangeland to enable the goat harvesting industry to remain sustainable or even increase certainty of supply.

It is recommended that the management package developed in this project be available to existing and potential new industry participants via the MLA website and in addition, the fact sheet resources incorporated into the existing Going into Goats manual. There is scope also to utilise the annual goat management plan templates as the basis of facilitated regional discussion groups to assist industry participants to develop and refine individual production objectives and key performance indicators in line with management best practice. These management plans and discussion group workshops should be aimed at increasing both production and the continuity of supply and quality of goat meat as well as facilitated information sharing between producers.

Table of Contents

1	Background.....	6
2	Project objectives.....	6
3	Method.....	7
3.1	Economic analysis report.....	7
3.1.1	Case study business.....	7
3.1.2	Interviews	7
3.1.3	Economic analysis	7
3.1.4	Gross Margin budgets.....	8
3.1.5	Partial budgets.....	8
3.1.6	Net present value (NPV) and Internal rate of return (IRR).....	9
3.2	Annual goat management plan template.....	9
3.2.1	Advisory panel	9
3.2.2	Management plan template.....	10
3.2.3	Fact Sheets	10
3.2.4	Producer case studies	10
4	Key findings	11
4.1	Economic analysis	11
4.2	Summary of case study businesses	12
4.2.1	Case Study 1	12
4.2.2	Case Study 2A.....	12
4.2.3	Case Study 2B.....	13
4.2.4	Case Study 3	13
5	Conclusions/recommendations	14
5.1	Goats are a profitable livestock enterprise	14
5.2	Understanding what drives profit is critical	15
5.3	Additional work required.....	16
5.3.1	DSE Ratings	16
5.3.2	Limited access to goat business performance data.....	17
5.4	Delivery of information - presentation and extension.....	17
5.4.1	Annual management plan template.....	17
5.4.2	Producer case studies	18

5.4.3	Fact sheet resources	18
6	Appendix.....	19
6.1	Economic analysis report.....	19

1 Background

Agripath Pty Ltd was engaged by Meat & Livestock Australia (MLA) to undertake a business and economic analysis of a range of meat goat production systems with the aim to develop a "management package" for the successful integration of goats into sheep and/or cattle enterprises in both pastoral/rangeland zones and high rainfall/farmland areas in Australia.

The MLA Goat RD&E Strategy 2012, outlines that one of the main issues confronting the Australian goat industry is maintaining an adequate supply of appropriate quality goat meat. Therefore to help overcome this challenge, a greater emphasis on managed production and less opportunistic harvest is required. This could be achieved through demonstrating the practical opportunities and benefits of goat production by showcasing examples of successful producers who include goats within their existing production system in pastoral/rangeland as well as high rainfall/farmland environments. Initiating a change of practice could help to stabilize, and increase a base level of production. In addition, the supply of goat meat is typically seasonal due an emphasis on rangeland production in Australia and the resulting climatic impacts on goat reproduction in this environment. Other meat industries have faced similar problems and overcome them with improved management techniques.

This project aims to facilitate a more managed approach to goat production and a decreased focus on opportunistic goat harvesting in order to increase production as well as the continuity of supply and quality of goat meat.

2 Project objectives

The objectives of this project are to assist the goat industry to:

- Build sustainable supply from the rangelands, with goats being recognised and managed as a resource – not as either an opportunistic harvest or a pest animal to be controlled.
- Increase high-value goat production from agricultural areas – with goats being integrated into current mixed farming systems.
- Manage supply chains for increased reliability so markets may be developed with confidence and opportunities to grow the industry realised.
- Build the number and capacity of Australian goat producers.

More specifically, the project aims to develop a "management package" for the successful integration of goats into sheep and/or cattle enterprises in both pastoral/rangeland zones and higher rainfall/inland areas. This will be achieved through developing:

- An independent economic analysis of six mixed grazing enterprises that have successfully integrated goats to their existing business
- An annual management template for both high rainfall/farmland and pastoral/rangeland zones to be used by producers to assist in strategically integrating goat production activities within their existing operations
- Three detailed producer case studies that demonstrate how goats were successfully integrated into these businesses
- Industry resources to summarise and highlight new industry information/learnings generated through the project

3 Method

3.1 Economic analysis report

An economic analysis report has been developed to analyse the impact of the integration of goats into six existing sheep and cattle producing businesses in both the pastoral and high rainfall zones in eastern and south eastern Australia.

3.1.1 Case study business

Case study participants were identified primarily in conjunction with the MLA as well as through Agripath's internal grower networks. A minimum of six candidates were sought and selection criteria included:

- Diversity of purpose for goat integration
- Geographic diversification
 - pastoral versus high rainfall zones
 - spread across production regions
- Commercial goat operations
- Willingness and availability to be involved in the project
- Availability of financial information and willingness to disclose

3.1.2 Interviews

On-farm visits were conducted with each of the selected businesses. The visits included interviews with key managers and collection of farm financial data in order to gain a good understanding of the overall business and the impact on business performance from the integration of goats.

Interview discussions were based on but not limited to the following questions:

- What was the motivation for goat integration? What other options did they consider? Why did they choose goats?
- What did the business look like before they got into goats? What does the business look like now? (enterprises, target markets, labour requirements, operations)
- How did they go about integrating goats into their business? What were the processes involved? Where did they source information? What resources did they use? What pathway did they follow for integration? (buy herd or build up herd over time)
- What challenges/issues did they face in terms of resources (physical, financial & human), husbandry practices, and grazing management?
- How did they overcome the challenges/address the issues?
- How has the integration of goats impacted the business? Physical and economic impacts
- Current management practices/husbandry- calendar of operations

3.1.3 Economic analysis

Financial data collected during the on-farm visits was used to construct a financial analysis of the business in order to assess the financial impact of goat integration. Financial data collected included cash books, balance sheets and farm profit and loss and where available, was collected over a number of production years.

Motivation for an investment into goats was found to be driven by a variety of reasons such as:

- Profit and diversification of income
- Profit from an unutilised resource
- Pest control, managing rangeland goat populations to reduce grazing pressure, control of weeds
- Complimentary benefits of multi species grazing
- Land type and feed on offer
- Passion for the animal

Farmers contemplating diversifying into goats had three options available, defined on the basis of an existing investment in land and capital allocation:

1. Complete substitution of an existing enterprise with goats.
2. Integration of goats into the business as a complementary enterprise to enhance profitability
3. Introducing goats to utilise an existing resource more profitably

Based on the above criteria financial returns were tested against a number of different measures to better encapsulate the impact of goats financially on the business and to allow comparison with alternative enterprise opportunities that owners had available to them.

3.1.4 Gross Margin budgets

The gross margin (GM) of an activity is the gross income generated by that activity minus the variable (direct) costs incurred in earning the income from that activity. The gross margin is calculated to identify the contribution the activity makes towards farm total gross margin.

Income from a livestock activity is made up of sales of animal products and profit or loss from trading of animals and changes in animal inventories over the period. The variable (direct) costs for a livestock activity can be broken into three general categories:

1. Feed: purchased feed, maintenance cost of improved pastures, agistment and the opportunity cost of home-grown grain or forage crops, hay and silage.
2. Husbandry: animal health care and breeding costs, identification methods, and associated contractor costs.
3. Marketing: transport, selling charges and levies, brokers, agents and saleyard fees.

Gross margin analysis forms the basis on which resources such as land, capital and labour are directed to enterprises with the highest returns. This measure is typically before interest, taxation, drawings and abnormals. Additionally, improved gross margin performance due to increased efficiency or improved price can act as a trigger to increase the value of the asset over time.

3.1.5 Partial budgets

A partial budget is a common technique used to evaluate a change in a farm business that can be fully operational in a relatively short period (1-2 years), and where other aspects of the business are not greatly affected by the change. In partial budgeting, only those aspects affected by the change are investigated and all favourable aspects are balanced against the unfavourable aspects of the change to indicate if there is a net gain or loss from the change.

In a partial budget, the extra profit is expressed as a percentage return on the additional capital invested.

3.1.6 Net present value (NPV) and Internal rate of return (IRR)

In some situations the decision to introduce goats into a farming operation involves significant investment into infrastructure such as fencing and yards which would not need to be made otherwise. There is also the consideration of modelling impacts from goats on weeds over time in comparison to other methods such as chemical control which have a more immediate impact on the farming system and different cost. To account for this the preferred method was to use the NPV measure, which examines the lump sum at present worth - with future income and expenses discounted for inflation and risk. This method takes account of the time value of money and provides a current value perspective. A NPV of zero means that the investment is neither creating nor destroying wealth. Negative NPV indicates that the investment is eroding wealth and a positive NPV creating wealth. The Internal rate of return (IRR) measures the rate of return for capital invested and is the discount rate at which the NPV is zero.

The availability of sound financial information with regards to potential returns and also a willingness for financial information to be publicly available was an issue in constructing the case study analyses.

3.2 Annual goat management plan template

An annual goat management template was developed to assist livestock producers in strategically integrating goat production activities within their existing operations in both pastoral/rangeland as well as high rainfall/farmland areas.

The templates have been designed to alert producers to key decision points in the management year and to focus on the performance indicators that need to be met in order to achieve high performance.

3.2.1 Advisory panel

An advisory panel of goat producers was formed and a one-day workshop in Sydney was conducted to assist in the development of the annual goat management plan template.

The panel included 4 producers with operations across both the pastoral/rangeland and high rainfall/farmland goat production regions.

The aim of the one day workshop was to:

- Identify and agree on key management issues and profit drivers for both farmed and rangeland goat production systems.
- Identify the information necessary to support producers in developing and maintaining best practice in both farmed and rangeland goat production systems decisions and where that can be found
- Identify the required features of the template
- Identify the template's form and function
- Identify and discuss current information gaps to assist in the development of a series of management focussed fact sheets and other appropriate information sources.

3.2.2 Management plan template

A beta version of a goat annual management plan template has been developed for both the pastoral/rangeland and high rainfall/farmland goat production systems to assist producers in strategically integrating goat production activities within their existing operations and incorporating best practice guidelines.

The template is designed to alert producers to key decision points in the management year in order to focus on necessary performance indicators that need to be reached (i.e. body weight and condition scores) to achieve high performance. The management themes considered were sourced from the economic analysis of six goat businesses conducted as part of Milestone 2 which were then discussed and validated as part of the one day advisory panel workshop.

The performance targets required at each key decision point were sourced from a desktop review of existing best management practice resources as well as through discussions held as part of the workshop session.

The template format has been aligned with the Beef and Sheep production target tools developed in Project E.INF.1404 “Key decision point management wheel MLA Challenge”.

3.2.3 Fact Sheets

Nine factsheet resources have been developed for the goat industry. Fact sheet topics were sourced from a session held as part of the one-day workshop themed- “If you were to do it all again, what information would you want to know?”

The factsheets are relevant to both existing goat producers as well as new entrants to the industry and build on existing best management practice themes in addition to introducing new learnings as part of this project.

3.2.4 Producer case studies

Three detailed producer case studies have been developed based on producers involved in the economic analysis (objective 1) incorporating the producer voice, how goats were successfully integrated into the enterprises, key learnings and critical success factors.

The case studies are based around on-farm interviews conducted with goat producers and include examples of both pastoral/rangeland and high rainfall/farmland goat producing regions.

The case studies highlight:

- The various motivations for going into goats
- How goats were integrated into the existing livestock business and
- How goats have been managed in these businesses

Interview discussions were based on but not limited to the following questions:

- What was the motivation for goat integration? What other options did they consider? Why did they choose goats?

- What did the business look like before they got into goats? What does the business look like now? (enterprises, target markets, labour requirements, operations)
- How did they go about integrating goats into their business? What were the processes involved? Where did they source information? What resources did they use? What pathway did they follow for integration? (buy herd or build up herd over time)
- What challenges/issues did they face in terms of resources (physical, financial & human), husbandry practices, and grazing management?
- How did they overcome the challenges/address the issues?
- How has the integration of goats impacted the business? Physical and economic impacts
- Current management practices/husbandry- calendar of operations

Case Study 1 outlines how a rangeland producer has integrated goats to maintain profit margins through the most cost effective use of available feed.

Case Study 2 provides two examples of goat producers, who have integrated goats for weed management.

Case Study 3 provides an example of a goat producer who has integrated goats in order to utilise lower value land more effectively and in turn increase total carrying capacity.

4 Key findings

4.1 Economic analysis

The introduction of goats in five of the six businesses analysed was found to have provided increased economic benefit to the landholder. Returns on the extra capital ranged from 16-49% indicating that the introduction of goats were more profitable than prior enterprise use and land utilisation. In one case study, goats were used to control blackberries rather than chemically. The analysis indicated that there was little difference in the economic benefits meaning that producers could choose either control method based on preference.

The analysis undertaken demonstrates that the integration of goats into existing livestock production systems across a range of production environments is competitive with the economic return from alternative livestock production systems available. Based on the economics, producers should be considering goats in the rangeland and in the higher rainfall/farmland environments, particularly in situations of rough, unimproved feed sources. In these environments, goats are especially well adapted to produce an economic return much higher than what is available from other livestock enterprises. With more managed approach to goat production in order to maintain high kidding rates and kid survival, returns are competitive with traditional high performing enterprises such as lambs and trading cattle in high rainfall/farmland environments. The evidence from these case studies suggests that these competitive returns can be achieved on lower quality pastures.

Apart from fencing there are few barriers to entry with capital cost of breeding does relatively inexpensive when compared to other livestock enterprises. The ability of goats to enhance whole of farm performance through the control of weeds, maintenance of cropland fallows, and utilisation of feed not grazed by other livestock is difficult to quantify empirically and therefore not well understood. A better understanding of the nutritional requirements for

goats across both rangeland and high rainfall/farmland production environments will assist livestock producers to match total livestock carrying capacity to the feed production base of the grazing system. This would help to reinforce the complimentary grazing behaviour of goats in a traditional livestock grazing system.

The goat producer needs to remain focussed on price maximisation for the product sold through management of turn off weight and turn off condition scores to meet market specifications. At present there is no provision for pricing premiums within the industry to reflect carcase quality differences. A change in this situation may make goat production more attractive in a high rainfall/farmland livestock environment requiring higher inputs.

In rangeland production systems, there is also a need to better understand the impact of population dynamics to enable the goat industry to transition from a wild harvest mentality to a managed and sustainable level of supply. This could be achieved by taking a more managed approach to production and less of an opportunistic harvest focus.

4.2 Summary of case study businesses

4.2.1 Case Study 1

- Matching livestock productivity to pastoral carrying capacity is the key to effective livestock management in a rangeland environment.
- Understanding the relationship between total animal numbers, animal feed demand and feed resources available is essential for effective grazing management.
- Growth rates are a key profit driver in the rangeland system
- Understanding the carrying capacity of the rangeland takes time and experience but is a crucial part of a rangeland management system
- Overstocking, overgrazing and reducing the range of feed types can be detrimental to enterprise performance and long term sustainability
- Variation in seasons make it important for a business to have flexibility in enterprise choice with regard to fencing, paddock layout, water supply and pastures in order to take opportunities when they present
- The ready supply of goats at a cost effective price to utilise surplus feed or to respond to market prices is a critical success factor for this business
- Goat supplies at favourable prices may become harder to source when more livestock producers begin to value goats as a commodity and supply tightens. This could make the economics of growing out goats less favourable in the future. A selection of wild harvested does are being retained in the breeding herd to be joined to meat goat sires. This is to offset the risk of reduced access to feeder goats as the industry adjusts.

4.2.2 Case Study 2A

- Goats can be successfully integrated into a mixed cropping and livestock system if the principles of best practice goat management for reproduction are applied to the breeding goat flock, parasites are managed through strategic drenching based on faecal egg counts and ensuring adequate dry matter intake during periods of winter feed stress.
- Complimentary grazing by goats within the sheep system has the potential to increase total carrying capacity. Goats have the ability to graze rougher areas where grazing of sheep or cattle may be limited.
- Grazing goats on crop stubbles through summer has the potential to deliver cost savings for the cropping system through reduced reliance on chemical weed control.

- Reproductive performance and growth rate to turn off are key drivers of profitability in both goat and sheep breeding enterprises. Adequate nutrition to maintain body condition scores pre joining and pre kidding and access to good quality water are critical components and need to be well understood.
- Fibre supplementation may be required on lush autumn/winter pastures to maintain growth performance of does and kids where a natural browse is not available to ensure a balanced diet is maintained and parasite burden can be managed.
- Market product definition and product pricing may limit the introduction of a goat breeding enterprise in a farmed system. A good understanding of the target market specifications and cost of production is necessary to mitigate this risk.

4.2.3 Case Study 2B

- Economic analysis shows goats are a viable alternative to chemical or mechanical weed removal, dependent upon scale, accessibility of affected area, preferred time frame of control, and personal preference.
- Introducing rangeland goats into high altitude, high rainfall country is difficult. Internal parasites and bad feet are an issue on improved pasture and in wetter areas and require additional management. Selection of breeding stock to match the environment has resulted in goats with improved parasite resistance and reduced animal health costs. These issues have also been managed by restricting goats to the hillier country through strategic fencing of wet areas.
- Timing of kidding to avoid extreme winter conditions increases survival and kidding rates.
- Goat proof fencing is a long term capital improvement and has been beneficial for all grazing enterprises. Resources spent checking the electric fences have decreased with experience, and now take approximately half an hour per week.
- Although [KIDPLAN](#) is not currently in use in this business, it may be an opportunity to assist with selection over time
- Goats introduced for the purpose of land development cleared initial blackberry infestations and are containing any subsequent regrowth. Previously marginal grazing land has now been sown to pasture, with some phalaris and cocksfoot establishing where groundcover had previously been blackberries.
- Goats are reducing nodding thistle populations. This, along with competition by pasture species is reducing seed set, though there is a large seed bank.
- The change in paddock species change has reduced the resources spent on mechanical and chemical weed control. Improved pastures are now spot sprayed once in three years, taking one man one hour per 1.6 hectares. The reduced requirement for broad-spectrum spraying has resulted in improved pasture quality and diversity with broadleaf species like chicory, clover, plantain and vetch now prevalent.

4.2.4 Case Study 3

- The introduction of goats into a mixed cropping livestock system has increased carrying capacity in this business due to the complementary grazing by goats. Goats utilise low cost scrub grazing areas to produce profits while the wool production grazing system is based on arable crop grazing land.
- Key management targets such a body condition score (BCS) pre joining and pre kidding (as used in sheep production) are important for optimum reproductive performance of goats.
- Joining is controlled to ensure that the feed requirements of the goat flock best match the pasture supply curve.

- Worm control in lush winter feed conditions is a key management requirement for breeding does pre kidding and for young growing kids. Worm infestations can cause deaths quickly if does or kids are feed or cold stressed and undrenched.
- Kids may need supplementary feeding with hay or straw during winter to offset low fibre intakes from pasture, but breeding does grazing scrub will need limited supplementary feeding.
- The cost of goat proof fencing needs to be considered, however fences which contain crossbred or dorper sheep will generally contain goats.
- Goat handling requires different skills and facilities to handling an equivalent number of sheep.
- Labour input for a breeding goat system is low when compared with an equivalent number of sheep which require shearing, crutching, summer fly control and supplementary feeding.
- There are fewer clashes in the labour required for the cropping enterprise and the labour needed for the goat enterprise, compared with the labour required for the breeding ewes and wool production.
- While Cashmere-based genetics provided a solid base for the introduction of meat genetics from Boer goats, the maintenance of a crossbred herd to maintain hybrid vigour will become a challenge in the future. There may be a requirement to buy in rangeland breeding does.
- There is a limited ability in this business to supply farmed goats year round to a wholesaler due to seasonality of supply.

5 Conclusions/recommendations

5.1 Goats are a profitable livestock enterprise

The analysis undertaken demonstrates that the integration of goats into existing livestock production systems across a range of production environments is competitive with the economic return from alternative livestock production systems available. Based on the economics producers should be considering goats in the pastoral/rangeland, and in the higher rainfall/farmland environments. Goats are especially well adapted to produce economic return much higher than what is available from other livestock enterprises in situations of rough unimproved feed sources. With more intensive management to maintain high kidding rate and survival, returns are competitive with traditional high performing enterprises such as lambs and trading cattle. The evidence from these case studies suggests that these competitive returns can be achieved on lower quality pastures and higher carrying capacities.

Economically apart from fencing there are few barriers to entry with capital cost of breeding does relatively inexpensive when compared to other livestock enterprises. The ability of goats to enhance whole of farm performance through the control of weeds, maintenance of cropland fallows, and utilisation of feed not grazed by other livestock is difficult to quantify empirically and therefore not well understood. Quantification of these grazing benefits would assist in increasing adoption of goats into existing farming systems.

While fencing may be perceived to be a barrier to entry the producers in the case studies all pointed to other improvements as a result of the investment such as management of grazing pressure, ease of handling and mustering and exclusion of competing wildlife. Industry needs to remain focussed on price maximisation, with provision of pricing premiums to

reflect carcass quality differences between farmed and rangeland products. There is a need to understand the impact of population dynamics in the rangeland to enable the goat harvesting industry to remain sustainable or even increase certainty of supply.

Producers need to remain focussed on productivity factors such as fertility, growth rates to meet market specifications, and improved understanding of expenditure relative to the anticipated income generated.

5.2 Understanding what drives profit is critical

Profit is the annual gross income less the annual costs, or what is left over after covering the costs of running a goat operation for a production year. Operating profit is calculated by deducting the fixed costs from the farm total gross margin. Fixed costs don't vary greatly, so increasing operating profit relies on generating a higher farm gross margin. Calculating a gross margin for a meat goat enterprise involves **identifying the enterprise's income and the variable costs involved in generating that income.**

Enterprise Income = Quantity of product produced (kg) x Price/unit of product (\$/kg)

Quantity of product sold

The quantity of goat meat sold is directly related to the number of animals that can be stocked sustainably, and their weight gain across the production year. **Stocking rate and carrying capacity are crucial.** The more animals grazed and the higher their weight gain, the greater the potential quantity of meat produced (kg/ha). Producing goat meat sustainably depends on **an understanding of animal-land-forage relationship.** Good grazing system management is crucial to meet animal husbandry in terms of energy requirements across the year in line with the land's carrying capacity.

Turn off to sale (numbers sold) and turn off weight (sale weight) are key drivers in the quantity of product sold. Management of breeding doe fertility to maximise pregnancy rates, kidding rates and kid survival rates are critical in the number of kids surviving to sale weight. Feed quantity and feed quality are the key to ensure good growth rates for kids post weaning. Parasite control is also critical in high rainfall environments to ensure growth performance. Maintaining growth rates projected to turn off dates depends on feed availability and feed quality. The time of kidding (spring vs autumn) will influence growth rates. Kids born in spring can experience limited growth rates due to limited feed quality and quantity in the summer and autumn.

Price per kilogram (market price)

The price received per unit of product sold has a direct impact on income in a meat goat enterprise. The higher the price per unit of product, the greater potential for increased enterprise income. Producing goats for a market involves understanding market specifications and relating this back to the liveweight of your animals using a dressing % calculation. This means weighing and fat scoring sale animals on farm to establish live weight groups and management options to sale.

Product consistency: A producer's ability to supply consistent lines of goats is the basis for establishing a sound marketing relationship with a processor. Wide variations in carcass weight and fat score make the task of processing and marketing the product more difficult.

On farm weighing and establishing drafts of animals at similar stages of growth and fat score enable marketing of a more consistent product.

Supply consistency: Goats are seasonal breeders with most does kidding in spring. Kids generally reach market turn off at the same time and therefore, concentrate supply to one time of the year. Rangeland systems with year round joining can manage breeding does to kid twice in the one season. This spreads the turn off across the year but may result in lower growth rates during the out of season period which increases the time taken to turn off a saleable product and puts feed pressure across the breeding doe flock.

Out of season finishing systems such as feed lotting, crop grazing or saved rangeland grazing may enable goats to meet market specifications but the production costs need to be offset by a sufficient margin for the out of season product to be profitable.

Variable costs change with the level of production. Higher stocking rates or increased weight gains generally involve a cost - this might be due to additional chemical or fertiliser costs for improved pastures or increased supplementary feed costs. Extra animals also increase animal husbandry costs. It is important to understand the relationship between the additional cost and any subsequent additional income due to increased productivity. Successful producers understand their margins, that is, the difference between the additional cost and the likely additional gain.

Cost of production: Knowing how much it costs to produce a kilogram of goat product (carcase or live weight) provides a benchmark for establishing the price you need to achieve in the market place to cover costs and show a profit.

The Cost of Production (CoP) is the total cost involved to produce a unit of any given product and is expressed in the same terms for which the product is sold (e.g. \$/kg or \$/head). A profitable business sells products for more than the CoP. A low CoP is the basis for a profitable goat enterprise and will also provide a buffer against a fall in market price.

5.3 Additional work required

5.3.1 DSE Ratings

Based on feedback from the producer meeting conducted as part of the project, concerns were raised regarding the use of currently available DSE rates to determine carrying capacity and stocking rates for goats in rangeland systems. Producer experiences in applying current DSE rates for goats to grazing systems in TGM programs often resulted in overgrazing of the feed resource or underfeeding of the animals being managed. The area of concern was the use of rates which may not accurately reflect the grazing activity of goats in a rangeland grazing environment.

This area of concern initiated the consideration of developing a set of DSE rates which may be more applicable to goats in Australian grazing systems.

Following the project managers recommendation, contact was made with Dr Julian Hill to discuss the work he is undertaking relating to goat nutrition and the effect on goat DSE ratings. As stated our concern was that the average DSE rates currently used do not accurately reflect the variation in feed requirement due to activity associated with grazing. Julian Hill confirmed that the "activity increments" used in the GiG data doesn't reflect goat grazing capacity but is based on sheep activity and DSE rates currently used would

understate the feeding requirements for goats. He suggested that while the NRC 2007 data contained in “Nutrient Requirements for Small Ruminants” was a closer representation of the feed requirements for grazing goats it was still not ideal for Australian grazing conditions.

Dr Hill made reference to a USA website “the Langston Goat Calculator” and suggested that it is probably the best one to use to calculate the energy requirements for goats under managed and free range conditions.

Based on these initial discussions and preliminary investigations, we recommend there is additional R&D required in this area in order to develop DSE values that better reflect the energy requirements for goat production in the Australian production environments.

We suggest these revised values be incorporated into a useful resource tool to assist in making more aligned grazing management decisions to ensure both the sustainability of the rangeland feed resources and optimising productivity for the goat production system.

5.3.2 Limited access to goat business performance data

One of the major challenges throughout this project was limited availability of good financial and production data for the goat industry. The data collected during the case study interviews to undertake the economic analysis in Milestone 2 of the project became the only available data to make cost of production comparisons across the range of goat production systems we reviewed.

In order to manage production effectively and to identify opportunities for business improvement growth rate data and reproductive performance data at each stage of reproduction for both the rangeland and farmland production environments is imperative.

By comparison, this type of data is readily available for the traditional livestock systems.

We recommend the development of a pilot benchmarking program to develop production and gross margin benchmarks for the different goat production regions and enterprise types. This will enable the establishment of benchmark comparisons for the goat industry.

5.4 Delivery of information - presentation and extension

5.4.1 Annual management plan template

The annual goat management plan templates developed for the pastoral/rangeland and high rainfall/farmland zones should be made available via the MLA website as part of the tools and resources pages. In addition, it is recommended that these templates be used as an extension tool for running facilitated workshop discussions for existing and prospective goat producers in the respective regions, to devise and implement individual management plans in line with management best practice and to assist growers to develop and refine objectives and key performance indicators. The project team received strong support for this from the producers who attended the advisory board workshop on the management template with most stating it was the first time they had an opportunity to sit down with fellow producers and discuss production issues that effect their goat operation.

5.4.2 Producer case studies

It is recommended that the producer case studies delivered as part of this project be accessible on the MLA website as part of a web interface for existing potential new goat industry entrants alongside links to the GiG Manual and the goat fact sheet resources developed.

Additionally, the case studies could be included in the MLA's Feedback magazine to demonstrate the benefits of goat integration.

5.4.3 Fact sheet resources

It is recommended that the fact sheet resources delivered as part of this project be accessible on the MLA website as part of a web interface for existing potential new goat industry entrants alongside links to the GiG Manual and the producer case studies developed. Additionally, the fact sheet resources should be incorporated into the relevant chapters of the Going Into Goats manual.

6 Appendix

6.1 Economic analysis report

Executive Summary

This report is the first stage in the development of a “management package” to assist new entrants to the industry and to facilitate a more managed approach to goat production and a decreased focus on opportunistic goat harvesting to not only increase production but also the continuity of supply and quality of goat meat.

The purpose of this report is to analyse the economic impact of the integration of goats into six existing sheep and cattle producing businesses in both the pastoral and high rainfall zones in eastern and south eastern Australia. The six case studies have been chosen to determine if goat production is an economically viable livestock enterprise alternative or addition in traditional livestock production environments.

This report is consistent with the overall project objectives to assist the goat industry to:

- Build sustainable supply from the rangelands, with goats being recognised and managed as a resource – not as either an opportunistic harvest or a pest animal to be controlled.
- Increase high-value goat production from agricultural areas – with goats being integrated into current mixed farming systems.
- Manage supply chains for increased reliability so markets may be developed with confidence and opportunities to grow the industry realised.
- Build the number and capacity of Australian goat producers.

An independent case study analysis of six goat businesses was carried out with participants selected based on the following criteria:

- Diversity of purpose for goat integration
- Geographic diversification
 - pastoral versus high rainfall zones
 - spread across the eastern states of Australia
- Willingness and availability to be involved in the project
- Availability of financial information and willingness to disclose

Contacts were primarily sourced through consultation with Meat & Livestock Australia (MLA) in addition to Agripath’s grower networks in order to efficiently identify participants known to have adopted and applied best management practices. A summary of the case study participants is presented in the table 1.1 below.

Table 1.1: Descriptive summary of six case study farms

Case Study	Total area (Ha)	Business	Region	Rainfall (mm)	Total DSE	Goat enterprise	Target market	Motivation for goat integration
1	920	Cropping, mixed grazing	SA	375	985	Goat breeding Goats 28% of total DSE Goats 4% of GFI	Carcase trade- domestic abattoirs	Alternate revenue source, summer weed control
2	16,200	Depot & Mixed grazing	SW Qld	300	6,700	Goat depot & grow-out Goats 90% of total DSE Goats 89% GFI	Carcase trade- domestic abattoirs	Alternate revenue source
3	1,450	Cropping, mixed grazing	CW NSW	520	3,290	Goat breeding Goats 16% of total DSE Goats 12% of GFI	Domestic market- Value added meat products	Lifestyle, alternate revenue source
4	1,462	Mixed grazing	New England, NSW	877	18,900	Goat breeding Goats 5% of total DSE Goats 2% of GFI	Carcase trade- domestic abattoirs	Land development
5	100,000	Opportunity cropping, mixed grazing	Western division, NSW	300	36,820	Goat breeding, trading & wild harvest Goats 12% of total DSE Goats 6% of GFI	Carcase trade- domestic abattoirs	Profitable utilisation of available feed
6	2,800	Cropping, mixed grazing	Sth Wimmera, Vic	500	5,860	Goat breeding Goats 17% of total DSE Goats 7% of GFI	Carcase trade- domestic abattoirs	Increased carrying capacity through better utilisation of low value grazing country

Analyses were constructed from on-farm visits with each business and included interviews with key managers and the collection and interrogation of available farm financial data.

The introduction of goats in five of the six case studies was found to have provided increased economic benefit to the landholder. Returns on the extra capital ranged from 23- 49% indicating that the introduction of goats were more profitable than prior enterprise and land utilisation. In one case study goat were used to control blackberries rather than chemically. The analysis indicated that there was little difference in the economic benefits meaning that producers could choose either control method based on preference.

The analysis undertaken demonstrates that the integration of goats into existing livestock production systems across a range of production environments is competitive with the economic return from alternative livestock production systems available. Based on the economics, producers should be considering goats in the rangeland and in the higher rainfall environments in situations of rough, unimproved feed sources. In these environments, goats are especially well adapted to produce economic return much higher than what is available from other livestock enterprises. With a more managed approach to goat production in order to maintain high kidding rates and kid survival, returns are competitive with traditional high performing enterprises such as lambs and trading cattle. The evidence from these case studies suggests that these competitive returns can be achieved on lower quality pastures.

Apart from fencing there are few barriers to entry with capital cost of breeding does relatively inexpensive when compared to other livestock enterprises. The ability of goats to enhance whole of farm performance through the control of weeds, maintenance of cropland fallows, and utilisation of feed not grazed by other livestock is difficult to quantify empirically and therefore not well understood. A better understanding of the nutritional requirements for goats across both rangeland and farmed production environments will assist livestock producers to match total livestock carrying capacity to the feed production base of the grazing system. This would help to reinforce the complimentary grazing behaviour of goats in a traditional livestock grazing system. Quantification of these grazing benefits would assist in increasing adoption of goats into existing farming systems.

The goat producer needs to remain focussed on price maximisation for the product sold through managing of turn off weight and turn off condition scores to meet market specifications. At present there is no provision for pricing premiums within the industry to reflect carcass quality differences, particularly between farmed (high rainfall) production turn off and wild harvest rangeland harvest. A change in this situation may make farmed goat product more attractive to produce in a high rainfall livestock environment.

In rangeland production systems, there is also a need to understand the impact of population dynamics in the rangeland to enable the goat industry to move from a wild harvest to a managed and sustainable level of supply. This could be achieved by taking a more managed approach to production and less of an opportunistic harvest focus.

Table of Contents

1	Background.....	25
2	Project objectives.....	25
3	Methodology	26
3.1	Case Study Selection.....	26
3.2	Interviews	27
3.3	Economic analysis	27
3.3.1	Gross margin budgets.....	28
3.3.2	Partial budgets.....	28
3.3.3	Net present value (NPV) and Internal rate of return (IRR).....	28
4	Case study 1.....	29
4.1	Business summary.....	29
4.2	Catalyst for going into goats.....	29
4.3	Integration of the goat enterprise	29
4.4	Management of goats	30
4.5	Economic Analysis.....	31
4.6	Lessons learned	34
4.7	Challenges and advantages of going into goats.....	34
5	Case study 2.....	35
5.1	Business summary.....	35
5.2	Catalyst for going into goats.....	35
5.3	Integration of the goat enterprise	35
5.4	Management of goats	36
5.5	Economic analysis	36
5.6	Lessons learned	38
5.7	Challenges and advantages of going into goats.....	38
6	Case study 3.....	39
6.1	Business summary.....	39
6.2	Catalyst for going into goats.....	39
6.3	Integration of the goat enterprise	39
6.4	Management of goats	39
6.5	Economic analysis	41
6.6	Lessons learned	44
6.7	Challenges and advantages of going into goats.....	44

7	Case study 4.....	44
7.1	Business summary.....	44
7.2	Catalyst for going into goats.....	45
7.3	Integration of the goat enterprise	45
7.4	Management of goats	45
7.5	Economic analysis	46
7.6	Lessons learned	47
7.7	Challenges and advantages of going into goats.....	48
8	Case study 5.....	48
8.1	Business summary.....	48
8.2	Catalyst for going into goats.....	48
8.3	Integration of the goat enterprise	49
8.4	Management of goats	49
8.5	Economic analysis	50
8.6	Lessons learned	53
8.7	Challenges and advantages of going into goats.....	53
9	Case study 6.....	54
9.1	Business summary.....	54
9.2	Catalyst for going into goats.....	54
9.3	Integration of the goat enterprise	54
9.4	Management of goats	55
9.5	Economic analysis	56
9.6	Lessons learned	59
9.7	Challenges and advantages of going into goats.....	60
10	Discussion	60
10.1	Motivation	60
10.2	Integration.....	61
10.3	Management.....	62
10.4	Financial benefits.....	64
10.4.1	Gross margin analysis	64
10.4.2	Partial budget analysis.....	65
10.4.3	Discounted cash flow analysis	66
10.5	Key success factors contributing to economic performance	67
10.5.1	Rangeland production system profit drivers	67
10.5.2	High rainfall/inland production system profit drivers	69
10.6	Advantages of integration of goats.....	70

10.7	Constraints to integration of goats.....	70
11	Key messages	71
12	Conclusions/recommendations	73
12.1	Conclusions	73
12.2	Recommendations.....	74
12.2.1	Market development	74
12.2.2	On farm productivity.....	74
12.2.3	Research and development.....	74
13	Bibliography	76
14	Appendix.....	77
14.1	Case study 4 assumptions and data	77

1 Background

Agripath Pty Ltd was engaged by Meat & Livestock Australia (MLA) to undertake an economic analysis of a range of meat goat production systems with the aim to develop a “management package” for the successful integration of goats into sheep and/or cattle enterprises in both pastoral/rangeland zones and high rainfall areas in Australia.

The MLA Goat RD&E Strategy 2012, outlines that one of the main issues confronting the Australian goat industry is maintaining an adequate supply of appropriate quality goat meat¹. Therefore to help overcome this challenge, a greater emphasis on managed production and less opportunistic harvest is required. This could be achieved through demonstrating the practical opportunities and benefits of goat production by showcasing examples of successful producers who include goats within their existing production system in rangeland as well as farmed and high rainfall environments. Initiating a change of practice could help to stabilize, and increase a base level of production. In addition, the supply of goat meat in Australia is typically seasonal due an emphasis on rangeland production in Australia and the resulting climatic impacts on goat reproduction in this environment. Other meat industries have faced similar problems and overcome them with improved management techniques.

This project aims to facilitate a more managed approach to goat production and a decreased focus on opportunistic goat harvesting in order to increase production as well as the continuity of supply and quality of goat meat.

The purpose of this report is to review why and how goats were integrated into mixed grazing businesses and to quantify the financial benefits in order to assist potential industry participants to assess whether goat production is a viable alternate livestock grazing system. This was achieved by undertaking six case studies across the pastoral and high rainfall production regions examining the contribution of goat integration to farm profitability.

This report builds on existing RD&E work for the goat industry, including MLA publications such as, Going into Goats: Profitable producers best practice guide, the MLA cost of production tool and working collaboratively with the Producer-initiated Demonstration Sites (PDS) to provide cost-effective extension of the project findings and best management practice techniques identified.

2 Project objectives

The objectives of this project are to assist the goat industry to:

- Build sustainable supply from the rangelands, with goats being recognised and managed as a resource – not as either an opportunistic harvest or a pest animal to be controlled.
- Increase high-value goat production from agricultural areas – with goats being integrated into current mixed farming systems.
- Manage supply chains for increased reliability so markets may be developed with confidence and opportunities to grow the industry realised.
- Build the number and capacity of Australian goat producers.

¹ MLA 2012, Australian Goat Industry RD&E Strategy

More specifically, the project aims to develop a "management package" for the successful integration of goats into sheep and/or cattle enterprises in both pastoral/rangeland zones and higher rainfall areas. This will be achieved through developing:

- An independent economic analysis of six mixed grazing enterprises that have successfully integrated goats to their existing business
- An annual management template for both high rainfall and rangeland/pastoral zones to be used by producers to assist in strategically integrating goat production activities within their existing operations
- Three detailed producer case studies that demonstrate how goats were successfully integrated into these businesses
- Industry resources to summarise and highlight new industry information/learnings generated through the project

The objective of this report is to assess the potential benefits or otherwise of goat integration into existing businesses. Findings from this report will be used to support a series of fact sheets aimed at assisting producers who are considering introducing goats into their operations. The fact sheets will highlight benefits of goats (economic and other), key management issues that need to be considered to ensure success and other learnings.

3 Methodology

3.1 Case Study Selection

Case study participants were identified primarily in conjunction with the MLA as well as through Agripath's internal grower networks. A minimum of six candidates were sought and selection criteria included:

- Diversity of purpose for goat integration
- Geographic diversification
 - pastoral versus high rainfall zones
 - spread across production regions
- Commercial goat operations
- Willingness and availability to be involved in the project
- Availability of financial information and willingness to disclose

A descriptive summary of the selected case study farms is outlined in the table below.

Table 3.1: Descriptive summary of six case study farms

Case Study	Total area (Ha)	Business	Region	Rainfall (mm)	Total DSE	Goat enterprise	Target market	Motivation for goat integration
1	920	Cropping, mixed grazing	SA	375	985	Goat breeding Goats 28% of total DSE Goats 4% of GFI	Carcase trade- domestic abattoirs	Alternate revenue source, summer weed control
2	16,200	Depot & Mixed grazing	SW Qld	300	6,700	Goat depot & grow-out Goats 90% of total DSE Goats 89% GFI	Carcase trade- domestic abattoirs	Alternate revenue source
3	1,450	Cropping, mixed grazing	CW NSW	520	3,290	Goat breeding Goats 16% of total DSE Goats 12% of GFI	Domestic market- Value added meat products	Lifestyle, alternate revenue source
4	1,462	Mixed grazing	New England, NSW	877	18,900	Goat breeding Goats 5% of total DSE Goats 2% of GFI	Carcase trade- domestic abattoirs	Land development
5	100,000	Opportunity cropping, mixed grazing	Western division, NSW	300	36,820	Goat breeding, trading & wild harvest Goats 12% of total DSE Goats 6% of GFI	Carcase trade- domestic abattoirs	Profitable utilisation of available feed
6	2,800	Cropping, mixed grazing	Sth Wimmera, Vic	500	5,860	Goat breeding Goats 17% of total DSE Goats 7% of GFI	Carcase trade- domestic abattoirs	Increased carrying capacity through better utilisation of low value grazing country

3.2 Interviews

On-farm visits were conducted with each of the selected businesses. The visits included interviews with key managers and collection of farm financial data in order to gain a good understanding of the overall business and the impact of goat integration.

Interview discussions were based on but not limited to the following questions:

- What was the motivation for goat integration? What other options did they consider? Why did they choose goats?
- What did the business look like before they got into goats? What does the business look like now? (enterprises, target markets, labour requirements, operations)
- How did they go about integrating goats into their business? What were the processes involved? Where did they source information? What resources did they use? What pathway did they follow for integration? (buy herd or build up herd over time)
- What challenges/issues did they face in terms of resources (physical, financial & human), husbandry practices, and grazing management?
- How did they overcome the challenges/address the issues?
- How has the integration of goats impacted the business? Physical and economic impacts
- Current management practices/husbandry- calendar of operations

3.3 Economic Analysis

Financial data collected during the on-farm visits was used to construct a financial analysis of the business in order to assess the financial impact of goat integration. Financial data collected included cash books, balance sheets and farm profit and loss and where available, was collected over a number of production years.

Motivation for an investment into goats is driven by a variety of reasons such as:

- Profit and diversification of income
- Profit from an unutilised resource
- Pest control, managing rangeland goat populations to reduce grazing pressure, control of weeds
- Complimentary benefits of multi species grazing
- Land type and feed on offer
- Passion for the animal

Farmers contemplating diversifying into goats have three options available, defined on the basis of an existing investment in land and capital allocation:

1. Complete substitution of an existing enterprise with goats.
2. Integration of goats into the business as a complementary enterprise to enhance profitability
3. Introducing goats to utilise an existing resource more profitably

Based on the above criteria it was decided to test the financial returns against a number of different measures to better encapsulate the impact of goats financially on the business and to allow comparison with alternative enterprise opportunities that owners have available to them.

3.3.1 Gross margin budgets

The gross margin (GM) of an activity is the gross income generated by that activity minus the variable (direct) costs incurred in earning the income from that activity. The gross margin is calculated to identify the contribution the activity makes towards farm total gross margin.

Income from a livestock activity is made up of sales of animal products and profit or loss from trading of animals and changes in animal inventories over the period. The variable (direct) costs for a livestock activity can be broken into three general categories:

1. Feed: purchased feed, maintenance cost of improved pastures, agistment and the opportunity cost of home-grown grain or forage crops, hay and silage.
2. Husbandry: animal health care and breeding costs, identification methods, and associated contractor costs.
3. Marketing: transport, selling charges and levies, brokers, agents and saleyard fees.

Gross margin analysis forms the basis on which resources such as land, capital and labour are directed to enterprises with the highest returns. This measure is typically before interest, taxation, drawings and abnormals. Additionally, improved gross margin performance due to increased efficiency or improved price can act as a trigger to increase the value of the asset over time.

3.3.2 Partial budgets

A partial budget is a common technique used to evaluate a change in a farm business that can be fully operational in a relatively short period (one to two years), and where other aspects of the business are not greatly affected by the change. In partial budgeting, only those aspects affected by the change are investigated and all favourable aspects are balanced against the unfavourable aspects of the change to indicate if there is a net gain or loss from the change.

In a partial budget, the extra profit is expressed as a percentage return on the additional capital invested.

3.3.3 Net present value (NPV) and Internal rate of return (IRR)

In some situations the decision to introduce goats into a farming operation involves significant investment into infrastructure such as fencing and yards which would not need to be made otherwise. There is also the consideration of modelling impacts from goats on weeds over time in comparison to other methods such as chemical control which have a more immediate impact on the farming system and different cost. To account for this the preferred method was to use the NPV measure, which examines the lump sum at present worth - with future income and expenses discounted for inflation and risk. This method takes account of the time value of money and provides a current value perspective. A NPV of zero means that the investment is neither creating nor destroying wealth. Negative NPV indicates that the investment is eroding wealth and a positive NPV creating wealth. The Internal rate of return (IRR) measures the rate of return for capital invested and is the discount rate at which the NPV is zero.

The availability of sound financial information with regards to potential returns and also a willingness for financial information to be publicly available was an issue in constructing the case study analyses

4 Case study 1

4.1 Business summary

Total area (Ha)	Business	Region	Rainfall (mm)	Total DSE	Goat enterprise	Target market	Motivation for goat integration
920	Cropping, mixed grazing	SA	375	985	Goat breeding Goats 28% of total DSE Goats 4% of GFI	Carcase trade- domestic abattoirs	Alternate revenue source, summer weed control

4.2 Catalyst for going into goats

Following a decline in wool prices in the late 1980's, this business diversified into goats for fibre production as an alternate revenue source to wool production. Considered to be lower maintenance, without the need for fly-strike management, goats were a lower cost fibre production alternative to wool. However, a downturn in the cashmere price during the early 2000's, resulted in a shift in focus from fibre to goat meat production with the introduction of Boer genetics into the herd with older age group of cashmere does joined to Boer bucks. There is now no income generated from fibre production with goat meat the main focus for the goat enterprise with the majority of the breeding does being $\frac{3}{4}$ Boer.

The availability of cashmere based does has been an important part of the transition. The ease of management, lowered fencing costs to contain domesticated animals and improved mothering were considered significant advantages over a rangeland doe alternative.

The integration of goats in this business has also benefitted the cropping system. Goats are used in conjunction with sheep as an alternate method for summer weed control, reducing the reliance on chemical control. It is estimated that an annual saving in chemical costs of approximately 30% has been achieved. The co-grazing of goats with sheep has provided improved control resulting from the browsing habits of goats and subsequent grazing pressure of the goat herd.

4.3 Integration of the goat enterprise

Prior to the integration of goats, this business was focused on a merino ewe breeding enterprise running 500 ewes plus replacements, producing 21 micron wool and turning off cast for age (cfa) ewes plus store weaners.

The integration of goats into the business was relatively cheap as goat breeding stock were less expensive to purchase than sheep. In regards to fencing, management found that if fences were sheep proof, they were also generally goat proof, particularly for the Cashmere breed that tend to be quieter in nature. Fences were of a seven wire, Mallee type construction with 30cm high hot wire offset.

Before introducing goats, the carrying capacity of the Merino sheep enterprise was 800 DSE.

The current grazing system, with 400 ewes and 160 does has a combined carrying capacity of 1000 DSE, representing a 25 per cent increase due to introduction of goats. Goats complement the sheep grazing operation rather than compete with it as a result of different grazing habits.

Fertility transfer and weed areas, which are typically associated with sheep stock camps, can have implications when using livestock to graze cropping areas as a method for weed control. This is less of a problem with goats due to their browsing habits. Over extended periods, goats will establish two to three camps compared with one major stock camp for sheep. In addition, a goat's requirement for a high fibre diet means it will browse woody

weeds as a preference. The use of goats for summer weed control in the cropping program has been very effective for this business.

4.4 Management of goats

Currently 160 breeding does are run in two groups of 80 for ease of paddock management and grazing pressure. Replacement does are joined at 15 to 18 months.

Joining starts on April 1 with two bucks per 80 does and lasts until late May or early June. Stock handling has to fit in with the cropping program and sowing is the priority at this time, so the joining periods have been flexible. This business plans to better control the joining length in the future to allow for better feed utilisation for more even grow-out rates in the kids than is currently being achieved. Kidding commences in spring and kidding percentages are averaging approximately 150%. A mature doe (kidding at around 24 months or more) can be expected to produce twins, triplets or more, while maidens will generally produce a single kid or twins². Therefore, the kidding percentage for this business are considered to be in line with best practice and acceptable considering the environment.

The management of doe body condition score (BCS) prior to joining and kidding are key factors to maximising kidding percentages. For an autumn joining, management is targeting a BCS of 2.5 to 3.0 for the doe flock. A pre kidding target BCS of 3.0 to 3.5 is achievable given adequate pasture growth conditions over winter. The property's annual pastures of ryegrass, clovers and grasses can grow to produce an early green pick with a break to the season. While these pastures provide adequate protein they can lack energy and fibre causing a condition known as "winter stasis" where does drop in body condition score and kids have reduced growth rates.

Goats selectively graze grass before clover in lush pasture and the early green pick is balanced by providing hay or straw in early autumn and winter so the goats have adequate fibre and a balanced diet to maintain growth rates and body condition score in kids and breeding does. However, once the dry matter content in the pasture feed starts to increase growth rates in kids will also increase without the need for supplement feeds. The availability of a natural browse can offset the need for hay or straw and will result in reduced labour and feed costs.

Does are generally drenched prior to kidding. This is based on faecal egg counts. High worm burdens have not been an issue in this business historically. Does also receive a 5 in 1 vaccination for the prevention of Clostridia diseases such as Pulpy Kidney and Tetanus. Kids also receive a 5 in 1 vaccination and a Vitamin B supplement at marking. Kids receive a follow up 5 in 1 vaccination at weaning.

Overgrown hooves in adult does are becoming an issue and the hooves of all does are inspected prior to kidding and hooves are trimmed where required. Milk production can be adversely impacted if goats are not able to walk properly and access feed and water.

Typically, when grazing paddocks with sheep for the control of summer weeds, high grazing pressures are required to force sheep to eat less palatable summer weed species. Management's experience has shown this is not necessary when using goats due to the difference in grazing habit. Goats are preferential grazers of the woody weed component in pasture. Smaller mob sizes (up to 100 does) have proved to be more effective for weed control than crash grazing but this means a longer time frame for grazing stubbles with goats to achieve weed control is required when compared to sheep.

² Goat Notes A3- Introduction to Boers, <http://www.acga.org.au/goatnotes/A003.php>

Grazing of stubbles with a high grain content can present health problems for goats, due to potential for grain poisoning (acidosis) if large amounts of grain are ingested in a short timeframe. Anecdotally, goats appear more susceptible to grain poisoning than either sheep or cattle. While sheep and cattle may require a 10 to 14 day introduction period to a high grain diet in a cereal stubble, goats may require a period of 14 to 21 days to allow them to acclimatise to the change in diet³. If the general aim is to use goats for summer weed control, then the option to graze sheep through the paddocks prior to introduction of goats, to reduce the grain content, has proven successful. Access to buffering agents, to balance the acid build-up from grain digestion, may also assist goats to adapt to the grain content in stubble grazing.

Kids are turned off at approximately eight months and the average growth rate to turn off is 140 to 150 grams per day which is considered to be in line or slightly above the industry standard for a grazing operation in <400mm rainfall. Pasture grazing across the production year is based on annual rye grass, sub clover pastures and annual grasses, with access to stubble grazing over the summer autumn period.

Kids are sold direct to works, over the hooks, targeting the 14 to 16kg carcass weight range, equivalent to 32-35kg live weight. The target market is the domestic abattoir for carcase trade.

Target live weights to turn off in the range of 32-35kg are achievable given the regions average seasonal rainfall to support pasture growth. A late break to the pasture growing season may see the need to incorporate some grain supplementation to maintain average growth rates over winter for weaner kids. Provision of additional fibre intake in the form of hay or straw supplement will also support maintenance of growth rates over the winter feed period. Matching the kidding season to the pasture supply curve is a management strategy which is being targeted with the introduction of a controlled joining period to ensure that the majority of kids are born into the spring feed period.

Management aims to sell all kids prior to August. The average price received over the long term is \$3.50/kg carcass weight – skin off. This is equivalent to approximately \$45 to \$55 per head live weight. The price received is above the two year (Jul 2013- Jun 2015) average over the hooks (OTH) price of approximately \$3.05/kg cwt but below the most recent 12 month (July 2014-June 2015) average price of \$3.72/kg cwt.

Culled does are also sold direct for slaughter at a similar carcass weight price, averaging around \$65 to \$70 per head.

4.5 Economic analysis

The over the hooks (OTH) price used for the sale of goats in the analysis was \$3.50/kg hot standard carcase weight (HSCW).

Cost of production for this enterprise was calculated to be \$0.80 per kg live weight or \$1.80 per kg cwt giving a profit margin of \$1.70 per kg cwt at average market price.

The gross margin return for the breeding goat production system in this case study is calculated as \$29.56/DSE. Direct costs used to establish this gross margin are based on average of two years financials.

³ www.agric.wa.gov.au/feeding-nutrition/grain-overload-acidosis-or-grain-poisoning-stock

Table 4.1 Goat gross margin

Goat Breeding Enterprise	Total	\$/DSE	Price @ \$4.00 per kg cwt	Price @ \$3.10 per kg cwt
Total DSE's based on 160 does plus replacements	280			
Livestock Sales				
152 kids @ approx. 14kg cwt @ \$3.50/kg	\$7,600		\$8,512	\$ 6,612
30 cfa does @ \$ 70 per head	\$2,100		\$2,640	\$ 1,395
TOTAL	\$ 9,700	\$34.65	\$39.85	\$28.60
Variable costs				
Vaccination@ \$ 0.35 per doe	\$56			
Marking and tags @ \$0.65 per kid	\$99			
Supplementary feed @ \$3.60 per doe	\$576			
Vit B @ \$ 1.00 per kid R&M	\$184			
MLA Goat levy @\$0.38/head sold	\$69			
Purchase – 1 buck	\$400			
TOTAL	\$1,424	\$5.10	\$5.10	\$ 5.10
TOTAL GROSS MARGIN	\$8,276	\$29.56	\$ 34.75	\$23.50

A partial budget analysis of the change from a ewe breeding flock of 500 Merino ewes to 400 Merino ewes plus 160 breeding does is outlined in Table 4.2. This analysis has been undertaken to assess if this business is better off financially after the integration of goats.

Table 4.2 Partial budget- Replacing 100 wool ewes with 160 meat does

Returns:				Gains				Losses			
Increase in Income								Increase in Costs			
Goat income								Goat costs			
152	kids	\$ 50	/hd	7,600	160	does	\$ 8.90	/hd	1,424		
30	cfa does	\$ 70	/hd	2,100							
			A	\$9,700			c	Total	\$1,424		
Decrease in Costs (Saved)								Decrease in Income			
Sheep Variable costs								Sheep income			
Shearing	120	\$ 3.00	/hd	\$ 360	Wool income - 100 less ewes				\$ 4,977		
Shearing	2	\$ 5.62	/hd	\$ 11	Lambs	110	\$ 75	/hd av	\$ 8,250		
Crutch	100	\$ 0.82	/hd	\$ 82	CFA ewes	20	\$ 65	/hd	\$ 1,300		
Lice control	100	\$ 0.81	/hd	\$ 81							
Feeding	100	\$ 11.30	/ewe	\$ 1,130							
Health	120	\$ 2.10	hd	\$ 252							
Wool Packs	4	\$ 10.60	/bale	\$ 42							
Wool Freight	4	\$ 10.00	/bale	\$ 40							
Rams	2	\$ 500	/hd	\$ 1,000							
Broking	715	\$ 0.22	/kg	\$ 157							
Selling costs	130	\$2.75	/hd	\$ 358							
Sheep freight	130	\$ 3.50	/hd	\$ 455							
Summer weed control saving				\$ 4,244							
			B	\$ 8,212				D	Total	\$ 14,527	
Total Gains/Losses				A+B = AA				C+D = BB			
Change in Returns: Net Gain/Loss				\$ 1,961				\$15,951			
Capital:				Gains				Losses			
Capital Inflows								Capital Out Flows			
Sheep sales								Goat purchases			
100	ewes sold	\$75	/hd	\$ 7,500	160	does	\$70	/hd	\$ 11,200		
2	rams sold	\$40	/hd	\$ 80	4	bucks bought	\$400		\$ 1,600		
			E	\$ 7,580			F	Total	\$ 12,800		
Capital Required				\$ 5,220							
Gain				\$1,961							
Capital Required				\$5,220							
Gain on Marginal Capital				38%							
Assumptions/Comments:											
Merino ewes cut 6.0 kg GFW - 21 micron wool - price 700 c/kg GFW (July 2015)											
Summer weed control - chemical cost reduced by \$4244 due to strategic goat grazing											
Kids sold for slaughter @ 14 kg cwt for \$50 per head											
- average price \$3.50 to \$4.10 per kg carcass wt											
Current price (July 2015 - \$ 4.30/kg cwt)											

Table 4.2 demonstrates that for this change in enterprise:

- There is a 38% return to the capital required to make the change
- A net gain to the business of \$1,961 due to savings in sheep husbandry costs and savings in summer weed control.
- A low capital requirement of \$5,220 to replace 100 ewes with 160 does

The capital cost (\$70/hd) to purchase the breeding does as well as the salvage value for the sale of surplus sheep are both factors which could alter this analysis. Additional capital for improved fencing may also be required in other businesses.

4.6 Lessons learned

- Goats can be successfully integrated into a mixed cropping and livestock system if the principles of best practice sheep management for reproduction are applied to the breeding goat flock, parasites are managed through strategic drenching based on faecal egg counts and ensuring adequate dry matter intake during periods of winter feed stress.
- Complimentary grazing by goats within the sheep system has the potential to increase total carrying capacity. Goats have the ability to graze rougher areas where grazing of sheep or cattle may be limited.
- Grazing goats on crop stubbles through summer has the potential to deliver cost savings for the cropping system through reduced reliance on chemical weed control.
- Reproductive performance and growth rate to turn off, are key drivers of profitability in both goat and sheep breeding enterprises. Adequate nutrition to maintain body condition scores above 3 score at pre joining and pre kidding are key to achieving high kidding percentages and growth rate for kids to weaning.
- Fibre supplementation may be required on lush autumn/winter pastures to maintain growth performance of does and kids where a natural browse is not available to ensure a balanced diet is maintained.
- Market product definition and product pricing may limit the introduction of a goat breeding enterprise in a farmed system. A good understanding of the target market specifications and cost of production is necessary to mitigate this risk.
- The combination of Cashmere does and Boer bucks has provided a solid base for the introduction of a goat meat production system in this business due to hybrid vigour. However, as doe replacements are retained in the herd, the Cashmere genetic component has become diluted and the decline of the fibre industry has meant that Cashmere genetics have become more difficult to access. This may result in the stabilisation of a hybrid crossbred doe as the basis of the breeding flock. There may be advantages to introducing rangeland does into the system to maintain hybrid vigour.

4.7 Advantages and challenges of going into goats

The advantages goats have brought to this business are as follows:

- Complimentary grazing of goats and sheep has increased the efficacy of weed control on farming country.
- An increase in farm stocking rate has been achieved without a corresponding increase in grazing pressure.
- At current prices, there is a lower capital requirement to replace sheep with goats
- Goats have provided flexibility in grazing management in this sheep cropping environment.
- The use of domesticated breeding does from a fibre production background provides ease of handling, lower fencing costs and a hybrid vigour advantage in mothering ability in this goat production system.
- Less competition for labour at the peak time of crop sowing due to a lower labour requirement to manage the breeding goat enterprise compared to the breeding ewe enterprise.

The challenges goats have brought to this business are:

- Limited potential for price premiums where higher costs are incurred due to more intensive management practices which offer better quality and consistency of product.
- A limited ability to supply farmed goats on a year round basis due to seasonality of production
- Limited anthelmintic products for worm control in goats mean higher costs of health treatments.

5 Case study 2

5.1 Business summary

Case Study	Total area (Ha)	Business	Region	Rainfall (mm)	Total DSE	Goat enterprise	Target market	Motivation for goat integration
2	16,200	Depot & Mixed grazing	SW Qld	300	6,700	Goat depot & grow-out Goats 90% of total DSE Goats 89% GFI	Carcase trade- domestic abattoirs	Alternate revenue source

5.2 Catalyst for going into goats

The prolonged dry period during the early to mid 2000's necessitated a change of focus for a traditional sheep and cattle operation. The lack of feed meant the property had to be destocked, except for the core cattle breeding herd, and the focus of management turned to generating income outside the farm gate. However, during this time the opportunistic harvest and sale of goats continued, demonstrating to the business owners the resilience and adaptability of the rangeland goat. In addition to the off-farm income, wild goat harvests were generating enough cash flow over this period to keep the farm operating and the breeding cattle fed. It was this realization that prompted management to consider getting into goats in a more structured, permanent way. Goats have now become the major focus for this business and account for approximately 90% of farm income on average over the past three years (2012-2014).

5.3 Integration of the goat enterprise

At the time the focus changed, there was strong demand for goats, numbers were plentiful in the local environment and there was only one major buyer of goats in the region. Management recognised an opportunity to take a more managed approach to supplying goats to market while at the same time providing increased buying competition to ensure producers had greater confidence in receiving a "fair price".

A number of local producers were harvesting small quantities of goats on a semi-regular basis. However, freight costs tend to make the option of selling direct to abattoirs cost prohibitive for smaller producers. This business recognised an opportunity to achieve economies of scale by accumulating goats locally and supplying a larger, more consistent volume of goats more regularly to customers. The decision to commence a goat depot and grow-out operation was inevitable.

A goat depot can be defined as a holding area where goats are brought together or accumulated before they are transported for slaughter, export or distribution to other businesses.

The change of focus for the business from a cattle and opportunistic goat harvest operation to depot and goat grow-out enterprise required additional capital investment in fencing. Hinge joint and three plain wire electric offset fencing was erected on selected paddocks. An

effective set of yards, in terms of livestock flow and ease of management is also important to reduce the time required for drafting.

Goat depots play an important role in the supply chain acting as the conduit between the processor and the producer. Essentially the business model is reliant on accessing plentiful supplies of goats locally with the objective to produce the required volume of saleable goats of a consistent size and weight as efficiently as possible.

The success of this business is “dependent on strong relationships” at both ends of the supply chain (customer and suppliers) so they can secure the maximum price for the product presented but also to ensure access to the volumes of goats required. The price offered to purchase goats from suppliers is linked to the price secured for the product after taking into account the operational costs incurred in accumulating and preparing goats for market.

To ensure an ongoing relationship with suppliers, depots can't afford to be too discerning regarding the size or type of goat they buy. Therefore, not all of the goats purchased by this business are immediately saleable and often require additional growing out. Small suppliers of goats to depots generally don't have the facilities nor the desire to grow animals out to a saleable weight. Instead they are looking to reduce competition for feed by goats for their primary livestock enterprise. As a result, this business incurs additional costs such as freight, labour and fodder in growing undersized goats to a saleable product.

5.4 Management of goats

Management of goats in the rangeland environment is kept to a minimum with mustering and drafting the primary activities undertaken and these are quite labour intensive. Depending on the time of year and availability of pasture some supplementary feeding may also be required.

In this particular operation, a large component of time is required in understanding the demand for goats and sourcing and coordinating adequate supply of goats to meet this demand and to ensure throughput, that is, goats coming into and going out of the business. Therefore, a good understanding of pricing and market specifications is also critical in order to generate margin.

5.5 Economic analysis

The focus of this analysis is on the goat grow-out component of this business to enable direct comparisons with alternate livestock enterprises in south western Queensland and determine if the goats have added value to the business. The analysis explores the average gross margin generated from goats over the two year period 2013-2014 compared to the average gross margins achieved from alternate enterprises over the same period in a similar environment. Comparison data has been taken from Agripath's farm business performance benchmarking dataset for the north western New South Wales region. The alternate livestock enterprises compared are cattle breeding, cattle trading and sheep. The dataset includes 26 livestock enterprises in the region for the period with cattle breeding the main activity undertaken.

A gross margin for the goat grow-out enterprise in this business has been compared. The analysis is based on approximately one third of the goats accumulated for the depot requiring additional grow-out in order to reach a saleable weight of approximately 16kg carcass weight (cwt) equivalent to 32-33kg live weight. The average over the hooks (OTH) price (HSCW) for the two year period achieved by this business was \$2.50/kg cwt. The goats when purchased are between 7-10kg live weight (lwt) and assumed growth rates are

approximately 100 grams per day based on historical performance. This is similar to the industry average for goats in a rangeland environment. Therefore, at this rate of growth, the goats will take approximately six months to reach the required market specification.

The key costs incurred in this goat enterprise relate to purchases, freight, labour and contract payments for mustering, levies and feed/fodder expenses. Husbandry costs for the period the goats are on farm are negligible due in part to the enterprise type, management style and environment.

Table 5.1 compares the average livestock gross margins achieved for the region by businesses in Agripath's dataset against the gross margin for goats in this business.

Table 5.1: Livestock enterprise gross margins- north western New South Wales

	NW NSW 2 Yr Av. (\$/DSE)			
\$/DSE	Cattle - Breeding	Cattle - Trading	Sheep - lambs	Goat grow - out
Gross Income	\$27.06	\$40.03	\$34.44	\$44.78
Variable Costs	\$17.09	\$28.87	\$19.00	\$19.28
Gross Margin	\$9.97	\$11.16	\$15.44	\$25.49

The table demonstrates that over the two year period 2013-2014:

- The gross margin achieved for goats is higher than the average gross margin achieved for other enterprises analysed in the region over the same period.
- The income generated for the goat grow-out enterprise is the highest, and the costs incurred in generating that income are higher than cattle breeding and similar to lamb trading.

It should be noted that the depot component has helped this business to achieve good economies of scale in the grow-out operation and therefore contributed to its low variable costs and therefore cost of production. This has had a direct benefit on the gross margin.

Using the percentage of gross income method for allocating overhead costs, the cost of production for this goat enterprise is calculated to be \$1.31/kg carcass weight or approximately \$0.64/kg lwt. Based on this, the enterprise would still have achieved a profit of \$0.27/kg cwt at the lowest price achieved over the two year period.

Table 5.2 demonstrates the sensitivity of this goat enterprise to price.

A range of +/- 10% around the price achieved has been used.

Table 5.2: Gross Margin sensitivity to price

\$/DSE	\$2.25/kg cwt	\$2.50/kg cwt	\$2.75/kg cwt
Gross Income	\$40.30	\$44.78	\$49.25
Variable Costs	\$19.28	\$19.28	\$19.28
Gross Margin	\$21.01	\$25.49	\$29.97

The table shows that:

- At the low price range, the resultant gross margin for goats would be still be above the average gross margin achieved for all other enterprises in the region.
- At the high price range, the resultant gross margin for goats would be well above that achieved by other enterprises in the region.
- The variation around the gross margin in relation to price over the period is approximately \$9/DSE.

5.6 Lessons learned

- Depots are an important part of the goat supply chain and good relationships with both buyers and suppliers are critical success factors.
- Throughput of animals is important in the operation of a depot and grow-out operation. Location and access to suppliers and abattoirs is an important consideration for sourcing product and minimizing freight costs. In addition, managing the logistics of animals throughout the season can provide additional challenges to ensure demand can be met and to avoid overstocking.
- The adaptability and resilience of goats has provided a profitable, low maintenance livestock alternative for this business by a demonstrated ability to perform in marginal conditions.
- The grow-out of undersize goats can deliver superior gross margins as compared with alternate enterprises for the region. The ability to generate higher revenue from the sale of goats at a lower cost of production is a contributing factor.
- A very strong understanding of their target market and supply chain has benefitted this business.
- A good understanding of pricing and market specifications is also critical in order to generate margin.
- An effective set of yards, in terms of livestock flow and ease of management is important to reduce the time required for drafting.

5.7 Advantages and challenges of going into goats

The advantages goats have brought to this business are as follows:

- The goat enterprise has increased the profitability of this business
- Strong relationships and a greater understanding of the market and supply chains has enabled this business to recognise opportunities and the flexibility to take advantage of them when they present.
- Goats provide a regular source of cash flow in this business

The challenges goats have brought to this business are as follows:

- Anecdotally, the pool for sourcing rangeland goats in the region appears to be contracting and drifting south. Predation and recent seasonal conditions are thought to be contributors of this. A better understanding of the sustainability of current practices of opportunistic goat harvests may be required. Sourcing goats from further afield will result in increased competition and higher freight costs.
- Animal welfare is an important consideration particularly wherever goats are contained for a period of time and can result in additional business costs for labour

and infrastructure. Consideration must be given to ensuring that smaller goats and bucks and does are kept separate where possible and shade and adequate water are available to minimise stress on the animals.

6 Case study 3

6.1 Business summary

Total area (Ha)	Business	Region	Rainfall (mm)	Total DSE	Goat enterprise	Target market	Motivation for goat integration
1,450	Cropping, mixed grazing	CW NSW	520	3,290	Goat breeding Goats 16% of total DSE Goats 12% of GFI	Domestic market- Value added meat products	Lifestyle, alternate revenue source

6.2 Catalyst for going into goats

Having farmed in the district for most of their life, and traditionally managed cattle, these producers were reluctant to pursue a goat enterprise after virtually stumbling into goats with the adoption of a single Boer doe. However, after slowly building goat numbers, one of the attractions was how easy goats were to work with. The other attraction was the ability to better manage cash flow across enterprises, and not being as reliant on highly variable grain revenue at the end of each season.

6.3 Integration of the goat enterprise

Goats were first introduced to the business in 2007. The approach to integration has been to grow the herd through the retention of does as opposed to sourcing breeders externally. This ensures that the integrity of the herd genetics is maintained and there is full control and traceability of the breeding stock used. The owners believe that Boer goat genetics results in a superior product, better suited to their target market. The time taken to build the herd has enabled the business to build their market and also spread the capital cost of goat infrastructure such as fencing and yards over time. The business is currently assessing the viability of additional investment in yard infrastructure including sheltered pens and the availability for electronic tagging and weighing equipment.

The business is focussed on producing goat meat and value added products such as gourmet sausages, mini-balls, burgers, smoked meats and prosciutto to the high end domestic market under a premium brand. The processing component is mostly outsourced. The primary products produced are Capretto and Chevon supplied direct to providers, restaurants, specialty butchers and cafes in Sydney and nearby major regional centres.

Capretto is a specialty gourmet meat product from farmed, young, milk fed goats with a hot standard carcass weight (HSCW) of less than 12kg meaning they are typically between four and eight weeks of age.⁴

Chevon is produced from animals typically up to 16 months of age with less than 2 permanent teeth and no sign of secondary sexual characteristics.

6.4 Management of goats

The goat herd is based on Boer genetics. A selection of the does weaned each year are retained in the herd for breeding. Breeders are selected based on body composition, feet,

⁴ <http://www.ausmeat.com.au>, Handbook of Australian Meat 7th edition: Caprine categories and descriptions

teeth and their dams' ability to produce twins and maternal instinct. Visual assessments in conjunction with monitoring and recording of these traits in excel based programs are the basis for these decisions currently. However, the business intends to use [KIDPLAN](#)⁵ in the future to increase the accuracy of the selection process and hopefully reduce the time commitment. The potential for the use of electronic tags to reduce the workload for recording this information is another technological advancement to be explored by this business going forward.

Kidding percentage has averaged 175% over the last two years, which is high by industry standards. Kidding tends to be a very hands-on exercise in this business with the herd monitored twice daily throughout the period to minimise losses through mismothering and to improve traceability of offspring back to does and assist with breeder selection decisions. While attention to management at kidding may be a contributing factor to the above average kidding rate for this flock it is an additional labour requirement and therefore a subsequent cost.

Does are joined over a five month period through autumn with kidding commencing in August/September. The extended kidding period prolongs the period that animals will be available for sale.

Does are generally drenched prior to kidding if worm tests deem it necessary and usually receive a 5 in 1 vaccination, for the prevention of Clostridia diseases such as Pulpy Kidney and Tetanus. Feet are trimmed when necessary. The key operational costs of the goat enterprise in this business are feed, wages, animal husbandry and freight (refer to Table 6.1).

Offspring are weaned at around seven months of age onto grain supplementation if season dictates to maintain daily weight gains. At the same time the does are re-joined. Castration of males occurs at between two to three months of age once the capretto market specifications have been exceeded. This is to avoid any potential set-back in daily weight gains. The aim of this business is to sell all of the kids before the eruption of two permanent incisor teeth.

Supplementary feeding of grain occurs during the period of September to October but the amount of grain and the period fed is highly seasonal dependent. Buffers are also included to avoid the potential for acidosis as a result of too much grain intake, barley straw is available on an ad-lib basis for fibre to assist in grain digestion.

In order to compare the financial performance of this business with alternate enterprise options in the region, this investigation has assumed that all goats are sold to the value added business on a commercial basis and a dressing percentage of 49%. The over the hooks (OTH) price achieved for the sale of goats in the analysis was \$3.72/kg HSCW which was the average OTH price in the eastern states for the 12-16kg cwt range for the 12 month period according to MLA market reports.

⁵ http://www.sheepgenetics.org.au/files/95fd7331-46a0-4e35-a219-a3f700ffbd67/Intro-to-KP-_web.pdf

6.5 Economic analysis

The gross margin for the goat enterprise for the last financial year has been compared with the gross margin for the cattle breeding enterprise, also run as part of this business. The gross margin is calculated by deducting the total variable costs from the gross income. Gross margins for the two current livestock enterprises have been compared in Table 6.1.

Table 6.1: Goat and cattle breeding gross margin comparison 2014 PY.

\$/DSE	Goat Breeding Enterprise	Cattle Breeding Enterprise
Area (ha)	113	817
Total DSE's	540	2,750
Gross Income (\$/DSE)	\$56	\$38
Animal Husbandry	\$3.61	\$0.11
Home Grown Feed	\$8.54	\$2.10
Fodder supplements	\$3.35	
Freight	\$1.43	\$0.87
R&M	\$1.76	\$1.77
Selling Expenses	\$0.27	\$2.85
Wages	\$10.93	\$8.90
<i>Total Variable Costs/DSE</i>	<i>\$29.89</i>	<i>\$16.60</i>
Gross Margin/DSE	\$26.23	\$21.40

The gross margin comparison demonstrates that:

- For the 2014 production year, the goat breeding enterprise was more profitable than the cattle enterprise.
- The high kidding percentage (175%) for this flock is the biggest driver of income. High fertility has contributed to the competitiveness of this production system.
- Home grown feed and wages were the biggest costs for the goat enterprise.

Using the percentage of gross income method for allocating overhead costs, the cost of production for this goat enterprise is calculated to be \$2.23/kg carcass weight or approximately \$1.09/kg lwt. Based on this, the enterprise would have made a loss of \$0.16/kg cwt at the lowest price achieved over the 12 month period.

Based on the gross margin analysis a partial budget has been developed to explore what the benefit to the business would be if 1,000 DSE of cattle were replaced with an addition 1,000 DSE of goats. This analysis can be seen in Table 6.2.

Table 6.2: Partial Budget- Replace 1,000 DSE cattle with 1,000 DSE of goats

Returns: Gains				Losses			
Increase in Income				Increase in Costs			
Goat income				Goat variable costs			
1000	\$ 56 /DSE	\$	56,120	1000	Animal Husbandry \$ 3.61 /DSE	\$	3,608
					Home Grown Feed \$ 8.54 /DSE	\$	8,540
					Fodder Supplements \$ 3.35 /DSE	\$	3,349
					Freight \$ 1.43 /DSE	\$	1,431
					R&M \$ 1.76 /DSE	\$	1,761
					Selling Expenses \$ 0.27 /DSE	\$	271
					Wages \$ 10.93 /DSE	\$	10,930
					annual cost of fencing maintenance		1,500
	A Total		\$56,120		C Total		\$31,391
Decrease in Costs (Saved)				Decrease in Income			
Cattle variable costs				Cattle income			
1000	Animal Husbandry \$ 0.11 /DSE	\$	110	1000	\$ 38.00 /DSE	\$	38,000
	Home Grown Feed \$ 2.10 /DSE	\$	2,100			\$	-
	Freight \$ 0.87 /DSE	\$	870			\$	-
	R&M \$ 1.77 /DSE	\$	1,770			\$	-
	Selling Expenses \$ 2.85 /DSE	\$	2,850			\$	-
	Wages \$ 8.90 /DSE	\$	8,900			\$	-
	B Total	\$	16,600		D Total	\$	38,000
Total Gains/Losses			A+B = AA	Total Gains/Losses			C+D = BB
			\$ 72,720.00				\$ 69,391
Change in Returns: Net Gain/Loss				\$ 3,329			
Capital: Gains				Losses			
Capital Inflows				Capital Out Flows			
Cattle Sales				Goat purchases			
1000	\$ 38.00 /DSE	\$	38,000	1000	\$ 56.12 /DSE	\$	56,120
		\$	-	200	Fencing annualised over 10 yrs \$140 /Ha	\$	2,800
	E	\$	38,000		F Total	\$	58,920
Capital Required			\$	20,920			

Gain	\$3,329
Capital Required	\$20,920

Gain on Marginal Capital	16%
--------------------------	-----

Assumptions/Comments:

Average sale price for goats at \$3.51/kg cwt & 49% yield

Assumes that a 200ha paddock requires 9km of fencing at \$5/m materials & labour

The partial budget demonstrates that for the 2014 production year:

- The net return on the additional capital is 16%.
- An additional \$3,329 would be generated annually in the business by switching from cattle to goats.
- An additional \$20,920 of capital, after selling the surplus cattle, would be required to purchase the additional goats and to re-fence the additional paddocks required for goats, assumed to be approximately 200 hectares at a cost of \$140/ha. As the fencing is a long term investment, the cost has been annualised but an ongoing maintenance cost (equivalent to approx. 1hr/wk) has been included as an annual expense.

This analysis is based on financial data for the 2014 production year. However, it is important to consider long term trends in relation to pricing and costs when making strategic management decisions.

- Profitability in the goat enterprise is sensitive to the sale price and total turn off weight. A drop in either could adversely impact this analysis.
- Feed and fodder costs were high in the year investigated due to poor seasonal conditions and will not necessarily represent the cost of fodder on a long term basis.

Agripath benchmarks a number of mixed farming businesses in the central west region of NSW. The following analysis compares the gross margin generated from goats for the 2014

production year to the average gross margins achieved from alternate enterprises in a similar environment. Comparison data has been taken from Agripath's farm business performance benchmarking dataset for the central western New South Wales region. The alternate livestock enterprises compared are cattle breeding, cattle trading and sheep. The dataset includes 31 livestock enterprises in the region for the period with cattle breeding the main activity undertaken. The gross margins produced for this business in the last financial year are similar to those achieved in the central west region on average over the last two years as depicted in Table 6.3.

Table 6.3: Livestock enterprise gross margins- Agripath data for central west New South Wales

	CW NSW 2014 PY. (\$/DSE)			
\$/DSE	Cattle - Breeding	Cattle - Trading	Sheep - Lambs	Sheep- Breeding
Gross Income	\$40.43	\$70.39	\$64.95	\$50.79
Variable Costs	\$39.17*	\$20.76	\$32.92	\$27.66
Gross Margin	\$1.26	\$49.63	\$32.03	\$23.12

*Dry conditions during this period have increased feed costs by as much as \$15/DSE

The table shows that for the 2014 production year:

- Cattle trading enterprises have achieved the highest gross margins in the region on average over the period, followed by lambs.
- The gross margin for goats achieved by this business (refer Table 6.1) in the last financial year (\$26.23) is higher than both cattle and sheep breeding.

Table 6.4 demonstrates the sensitivity of this goat enterprise to price.

A range of +/- 10% around the price achieved has been used.

Table 6.4: Gross Margin sensitivity to price

\$/DSE	\$3.10/kg cwt	\$3.72/kg cwt	\$4.00/kg cwt
Gross Income	\$50.26	\$56.12	\$58.77
Variable Costs	\$29.89	\$29.89	\$29.89
Gross Margin	\$20.37	\$26.23	\$28.88

The table shows that:

- At the low price range, the resultant gross margin for goats would still be higher than cattle breeding but less than the average gross margin achieved for all other enterprises in the region.
- At the high price range, the resultant gross margin for goats would be higher than sheep and cattle trading, slightly below lamb trading but less than that achieved for the average cattle trading enterprises analysed in the region.

- The variation around the gross margin in relation to price over the period is approximately \$8/DSE.

6.6 Lessons learned

- Commercially managed goats can compete with other traditional enterprises in the wheat sheep zone. High reproduction rates are a key driver in maintaining competitiveness
- While attention to management at kidding may be a contributing factor to the above average kidding rate for this herd there is extra labour and feed requirement and therefore additional costs incurred.
- Selecting for twinning has underpinned the kidding percentages achieved.
- This business has utilised home grown grain in order to maintain doe body condition scores to promote high fertility and to finish progeny quicker. This is reflected in higher feed costs. Additional expenditure should always be considered relative to the perceived benefit anticipated from the additional expense.

6.7 Advantages and challenges of going into goats

The advantages goats have brought to this business are as follows:

- Once goat habits are understood they are easily integrated into a livestock management system
- The goat enterprise has provided cash flow flexibility in a traditional cropping/livestock system.
- Gradual build up in breeding doe numbers provides the time to establish markets and to spread the capital costs of infrastructure for goat production.

The challenges goats have brought to this business are as follows:

- Perception of the general public (domestically) of goat meat being a specialty product as opposed to a direct substitute for beef or lamb provides a challenge in terms of limited domestic demand. In addition, a lack of awareness of how to prepare and cook goat and the differentiation of different cuts is also thought to be a contributor to the lack of market expansion.
- Tracing and managing reproduction records is a time consuming process and may be improved in time through the implementation of KIDPLAN and/or use of electronic recording software. However, there are additional costs associated with these.
- Local abattoirs close at certain periods throughout the year for several weeks due to a lack of supply of goats for slaughter in the area. This has created challenges through increased risk for the business in managing logistics in order to meet their market demand.
- Limited anthelmintic products for worm control in goats and requirement for feet trimming means higher labour costs in the high rainfall environment.

7 Case study 4

7.1 Business summary

Case Study	Total area (Ha)	Business	Region	Rainfall (mm)	Total DSE	Goat enterprise	Target market	Motivation for goat integration
4	1,462	Mixed grazing	New England, NSW	877	18,900	Goat breeding Goats 5% of total DSE Goats 2% of GFI	Carcase trade- domestic abattoirs	Land development

7.2 Catalyst for going into goats

GOATS are proving highly effective in controlling blackberries and thistles for this business in the NSW tablelands.

When initially purchased, the property's ground cover consisted of unimproved pasture and blackberries. Blackberry infestations varied from 5 per cent of groundcover up to 50 per cent in the worst paddocks. The property also had a significant nodding thistle infestation.

Previous control of weeds in one paddock involved using a helicopter at a cost of \$9500. Within three years the thistles and blackberry canes had returned. Goats offered an economic alternative to reclaiming land infested with blackberries. Blackberries are of high palatability to goats, and nodding thistle is of medium palatability, in particular the flowers.

The aim was to use goats to remove blackberries from the naturalised tussock and red grass pastures so they could then be over sown with improved pasture species to lift carrying capacity. The strategic grazing of goats is cutting the reliance on herbicides and helicopter spraying and increasing the property's profitability and carrying capacity.

The decision to use goats for this purpose came after realising how well the goats thrived, even in the tough conditions, at another family property. The other key decision points were the low capital cost to get into goats and the low level of ongoing maintenance.

7.3 Integration of the goat enterprise

The original goats introduced to the property were rangeland does from Dirranbandi (QLD), which were mated to Boer bucks purchased from Bollon (QLD) as well as locally. An individual paddock was set stocked with goats at 10 DSE per ha for a twelve month period to reduce the blackberry population. The aim being to reduce the level of blackberry infestation through heavy grazing pressure and to generate revenue through the sale of surplus goats.

Once this was achieved, the paddock was then co-grazed with cattle (at five DSE per ha) and a small proportion of goats (at 2 DSE/ha) long term to contain any subsequent blackberry regrowth. The goats have also been used in other areas of the property to reduce the number of nodding thistles. Goats are now a fully integrated, smaller part of the grazing enterprise, co-grazing alongside beef cattle.

The key role for goats is for weed control but now improved management and husbandry has resulted in income from the sale of surplus goats.

The main capital outlay, in preparation for introducing goats, was fencing renovation. Hinge joint was added to the existing fence and an electrified off set wire erected, to make the paddock both goat and kangaroo proof which provided additional total grazing pressure benefits. The original paddock, 50% of which was covered in blackberries, took four days to clear the perimeter fence for (approx. 2.5 km), and another two days to fence it. The aim was to fence 50-80 hectares at a time with kangaroo and goat proof fencing, get the paddocks back to natural pastures, and then to improve them from there. The goat proof fencing is essentially a perimeter fence with smaller paddocks now within that perimeter and has been beneficial to the whole grazing system.

7.4 Management of goats

The goat enterprise in this business is designed to be low maintenance and low cost.

The key selection criteria for breeding stock is survivability in the Northern Tableland's cooler and wetter climate, rather than more common traits such as growth rates, fertility or carcass characteristics.

Selection pressure for survivability includes good feet and internal parasite resistance. Resistance to worms is important as there are only a limited range of registered products for control of parasites in goats and the cost associated with regular drenching is expensive.

The initial introduction of Boer bucks was unsuccessful due to their poor performance in the cooler high rainfall conditions. The herd now uses home bred bucks. Going forward, the use of KIDPLAN as a genetic selection tool could be considered in this business to assist breeding replacement stock which will suit the Tablelands environment.

Goat husbandry involves only necessary treatments including two fluke and worm drenches a year - one in May and one before kidding in September in order to minimize worm burdens.

Unmanaged joining periods when the goats were first introduced resulted in kidding year round with high mortality rates for kids born in winter. After the first 12 months the kidding percentage was estimated to be approximately 88 per cent.

Joining is now restricted to five weeks, with kidding starting on October 10 and kidding percentages around 110 per cent.

Weaning is completed in mid-January when kids are 14 weeks of age and 18-20kg live weight. All kids are vaccinated with 5 in 1 and the majority of male kids are castrated.

Around 50 of the most promising male weaners are left entire and assessed on selection criteria throughout the year after which approximately five bucks are either kept on farm or if surplus to requirements, sold as breeders.

Surplus goats are sent for sale over the hooks to the abattoirs in Albury for export, at 17 months of age targeting 33-34kg live weight or around 15-16kg carcass weight.

7.5 Economic analysis

As a result of the time involved for the benefits of this investment to be fully realised, a discounted cash flow analysis was considered to be the most appropriate method for analysis. A discounted cash flow (DCF) analysis is used for more complex changes to farming enterprises to help determine the profitability of an investment which produces cash flows in the future. The technique involves budgeting all the expected flows of cash out and cash in and adjusting the flows back to the equivalent present value. A 15 year DCF analysis was undertaken to compare the use of goats to reclaim blackberry infested areas versus the use of chemical control (Refer Appendix 1). The following assumptions formed the basis of the analysis.

Scenario 1: Goats stocked at 10 DSE per ha in year one to control blackberry then reduced to two DSE per ha thereafter for ongoing weed control alongside cattle stocked at 5 DSE/ha. The assumptions for this scenario are outlined in Table 7.1.

Table 7.1 Assumptions for Scenario 1

Upfront capital cost	\$56,320	purchase 800 goats at av. \$70/hd		
	\$7,963	construction of goat proof fencing @ \$100/ha across 80ha		
Goat income	\$79,680	sale of surplus goats at end of year 1- 1393 hd @ \$57/hd		
	\$3,244	annual goat gross margin		
Fence maintenance	\$634	annual cost based on 30 mins/wk		

Scenario 2: Cattle stocked at 5 DSE/ha and helicopter application of chemical at high rates required every three years due to regrowth of blackberry. The assumptions for this scenario are outlined in Table 7.2

Table 7.2 Assumptions for Scenario 2

Chemical costs	\$9,500	every 3 years for helicopter application of chemical
Cattle GM	\$4,218	Annual cattle gross margin

Table 7.3 demonstrates the cash flows for the business under both scenarios

Table 7.3 Scenario cash flows

Description:	Assumptions	Incremental Cash Flows:				
		Year 0	Year 1	Year 2	Year 3	Year 4
Scenario: Accept or reject the 2008/09 investment						
What is the economic life of the investment?	15					
What is the estimated value of the investment at the end of the economic life?						
What is the initial cost of the investment at Year Zero?	Insert +ve value	64,283	(64,283)			
What are the incremental working capital requirements of the investment over the economic life? Consider maintenance costs, direct costs.						
With new investment	Fencing Mtc + 2DSE GoatDirectCosts		(4,430)	(634)	(634)	(634)
Without new investment	2DSEBeefDirectCosts + 3 Yearly Chem Cost		(9,500)			(9,500)
Incremental working capital requirements	Insert costs as -ve values		5,070	(634)	(634)	8,866
What incremental revenues, if any, will be produced over the economic life of the investment?						
With new investment	(Yr1only 1340 goats) then 2DSE GoatsGM		79,680	3,244	3,244	3,244
Without new investment	5DSE CattleGM		4,218	4,218	4,218	4,218
Incremental revenues	Insert revenues as +ve values		75,462	(974)	(974)	(974)

The discounted cash flow analysis demonstrates a 2.12% internal rate of return (IRR) per annum over the fifteen year period.

Initial outlay on fencing and goat purchases was offset by the sale at the end of the first year of all but a small proportion of does once the majority of blackberries had been controlled. In addition, the ongoing income stream from the sale of surplus weaners supplements the total farm business income.

The alternate method for weed control compared in the analysis was to use chemical application via helicopter once every three years at a cost of \$9,500. The regrowth of blackberries over the three year period accounted for the difference in carrying capacity of the paddock if not fully cleared by goats initially (cattle at five DSE per ha as opposed to seven DSE per ha).

The analysis demonstrates that goats are a viable method to reclaim and improve previously underutilised land areas infested with blackberries. This was the expected outcome for the producer, who believes it comes down to personal preference of running goats or using chemicals and/or mechanical methods of control.

7.6 Lessons learned

- Economic analysis shows goats are a viable alternative to chemical or mechanical weed removal, dependent upon scale, accessibility of affected area, preferred time frame of control, and personal preference.
- Introducing rangeland goats into high altitude, high rainfall country is difficult. Internal parasites and bad feet are an issue on improved pasture and in wetter areas and require additional management. Selection of breeding stock to match the environment has resulted in goats with improved parasite resistance and reduced animal health costs. These issues have also been managed by restricting goats to the hillier country through strategic fencing of wet areas.
- Timing of kidding to avoid extreme winter conditions increases survival and kidding rates.
- Goat proof fencing is a long term capital improvement and has been beneficial for all grazing enterprises. Resources spent checking the electric fences have decreased with experience, and now take approximately half an hour per week.
- Although KIDPLAN is not currently in use in this business, it may be an opportunity to assist with selection over time.

- Goats introduced for the purpose of land development cleared initial blackberry infestations and are containing any subsequent regrowth.
- Goats are reducing nodding thistle populations. This, along with competition by pasture species is reducing seed set, though there is a large seed bank.
- The change in paddock species change has reduced the resources spent on mechanical and chemical weed control. Improved pastures are now spot sprayed once in three years, taking one man one hour per 1.6 hectares. The reduced requirement for broad-spectrum spraying has resulted in improved pasture quality and diversity with broadleaf species like chicory, clover, plantain and vetch now prevalent.

7.7 Advantages and challenges of going into goats

The advantages goats have brought to this business are as follows:

- The change paddock species as a result of goat integration has resulted in a significant reduction in resources spent on mechanical and chemical methods of weed control.
- Goats have provided a cost effective weed control alternative to chemical application and the reduced requirement for broad-spectrum spraying has improved pasture quality and diversity with broadleaf species like chicory, clover, plantain and vetch now prevalent.
- Goats are reducing nodding thistle infestation through their selective grazing habits. This along with competition from establishing pasture species is reducing seed set.

The challenges goats have brought to this business are as follows:

- Internal parasites and bad feet are an issue on improved pasture and in wetter areas and require additional management.
- In the first two years due kidding was occurring year round due to unmanaged joining. A large percentage of kids born during the winter months did not survive. A change in management required the timing of kidding to avoid extreme winter conditions.
- The lack of anthelmintic products registered for application to goats.
- The over the hook carcase trade for the export market is considered immature, with no differentiation between attributes such as carcase quality.

8 Case study 5

8.1 Business summary

Total area (Ha)	Business	Region	Rainfall (mm)	Total DSE	Goat enterprise	Target market	Motivation for goat integration
100,000	Opportunity cropping, mixed grazing	Western division, NSW	300	36,820	Goat breeding, trading & wild harvest Goats 12% of total DSE Goats 6% of GFI	Carcase trade- domestic abattoirs	Profitable utilisation of available feed

8.2 Catalyst for going into goats

Having enterprise flexibility to enable management to make the most of opportunities is this businesses underlying philosophy.

Goats have been integrated as a smaller part of the overall business, with the main enterprise being organic Dorper lamb production. Goats comprise 12 per cent of the total carrying capacity, while organic Dorper lamb production comprises 68 per cent. Dorper

sheep contribute 85 per cent of the business profit, while goats account for nine per cent and cattle six per cent.

This approach has meant goats are now part of the mix, along with Dorper lamb production and a beef breeding herd. The switch in enterprise mix has cut operating costs, particularly labour and husbandry costs, in an attempt to maintain profit margins.

One of the positives of goat enterprise is the ability to buy in goats in large numbers, cost effectively, when there is surplus feed available. This has been a catalyst for going into goats for this business operation.

8.3 Integration of the goat enterprise

The wild harvest of goats has always contributed to the farm cash flow in this business. However, the recognition that goats are a profitable part of their business has increased in the last few years with the improved prices and a more managed approach to production.

Containment is a key consideration for management, whether running Dorpers or goats, in order to manage the animal but also to be able to manage the pastures and grazing pressures. In the last 10 years, a large amount of effort has been focussed on farm infrastructure including, yards and fences to ensure the ability/flexibility to run multiple species off a single fence. Approximately 600km of total grazing pressure (TGP) fencing has been erected at a cost of approximately \$3-4,000 per kilometre. TGP fencing is often hinge-joint based but can include electric fencing or multiple plain wires. Ongoing maintenance is required to ensure fencing integrity. The capital outlay on fencing has been beneficial for this business by eliminating predation and reducing overall total grazing pressure and therefore further fencing will continue.

Management has also put a lot of thought into the strategic placement of water points within paddocks. Paddock design and paddock size as well as yard design has ensured that enterprise productivity and labour efficiency is maximised. A core herd of goats, consisting of 3-500 breeders has been successfully integrated into the livestock grazing system. Depending on the markets and feed availability additional goats are also sourced locally for trading and/or grow-out either through wild harvest using contract mustering (which occurs on average two to three times per year) or sourced from neighbours.

8.4 Management of goats

A similar approach is used in the management of both Dorper lambs and goats. Livestock are handled only when necessary. Low stocking rates, combined with a low rainfall environment, eliminate the need to drench or vaccinate goats in most years. Management believe that stocking animals at too high densities is one of the biggest limitations to productivity in this region. Stocking rates are based on running a 20kg animal per three hectares and total carrying capacity for the property is 33,000 DSE.

Mustering and drafting of goats is the main husbandry practice and usually occurs two-three times per year depending on the market and seasonal conditions. A gyrocopter, in conjunction with motorbikes, are used for mustering goats and an area of 10-15,000 hectares can be covered in approximately 12 hours by air.

There is no set joining period and bucks are left to run with the core goat herd all year round. Mating usually occurs about twice a year but is seasonally dependent. The average kidding percentage is 120% which is similar to the Dorper enterprise. Offspring are grown out and

sold direct to abattoirs targeting the carcass trade export market. Growth rates are approximately 100 grams per day compared to around 150 grams per day for the Dorpers.

8.5 Economic analysis

The average gross margin for the goat enterprise for the 2013 and 2014 production years has been compared with the gross margin for the Dorper sheep and beef cattle enterprises also run as part of this business. In generating this analysis the following two year average sale prices for each of the respective enterprises was been used:

- Sheep- \$107/hd
- Cattle- \$665/hd
- Goats- \$35/hd

Gross margins have been compared in Table 8.1.

Table 8.1: Goat, sheep and cattle enterprise gross margin comparison

	Sheep Enterprise	Cattle Enterprise	Goat Enterprise
Total DSE's	25,000	7,600	4,250
Gross Income (\$/DSE)	\$53.11	\$12.16	\$33.64
Contract livestock ops	\$12.62	\$1.80	\$0.00
Dips, Tags & vet supplies	\$0.28	\$0.20	\$0.00
Fodder & licks	\$0.03	\$0.00	\$0.00
Freight & cartage	\$2.62	\$3.81	\$1.00
Lamb & cattle marking	\$0.07	\$0.19	\$0.00
Mustering	\$0.28	\$0.35	\$1.58
Selling Costs & commissions	\$1.38	\$1.90	\$0.19
<i>Total Variable Costs/DSE</i>	<i>\$17.29</i>	<i>\$8.25</i>	<i>\$2.77</i>
Gross Margin/DSE	\$35.82	\$3.91	\$30.87

Table 8.1 shows that for the time period in question (2012-2014):

- The sheep enterprise has had the highest gross margin on average over the last two years, followed by the goat enterprise and then cattle.

Using the percentage of gross income method for allocating overhead costs, the cost of production for this goat enterprise is calculated to be \$2.07/kg carcass weight or approximately \$0.93/kg lwt. Based on this, the enterprise would break even at the lowest price achieved over the 2 year period analysed.

The analysis explores the average gross margin generated from goats over the two financial years (2012/13 - 2013/14) compared to the average gross margins achieved from alternate enterprises over the same period in a similar environment. Comparison data has been taken from Agripath's farm business performance benchmarking dataset for the central western New South Wales region. The alternate livestock enterprises compared are cattle breeding, cattle trading and sheep. The dataset includes 28 livestock enterprises in the region for the period with cattle breeding the main activity undertaken. The gross margins produced for this business are similar to those achieved in the central west region on average over the last two years as depicted in Table 8.2.

Table 8.2: Two year livestock enterprise gross margins- Agripath data from central west New South Wales

	CW NSW 2 Yr Av. (2013 & 2014 PY) (\$/DSE)			
\$/DSE	Cattle - Breeding	Cattle - Trading	Sheep-Lambs	Sheep Breeding - Wool
Gross Income	\$28.67	\$57.61	\$71.88	\$50.65
Variable Costs	\$27.88	\$20.86	\$33.44	\$28.71
Gross Margin	\$0.79	\$36.76	\$38.44	\$21.94

Table 8.2 shows that:

- Prime lambs and cattle trading enterprises have achieved the highest gross margins in the region on average over the last two years
- The gross margins (\$/DSE) achieved by this business (refer table 8.1) are similar to the gross margins achieved in the region on average over the last two years
- The Gross margin/DSE return for the goat enterprise in Table 8.1 is lower than the average sheep-lamb enterprise but higher than the sheep breeding- wool enterprise

Table 8.3 demonstrates the sensitivity of this goat enterprise to price.

A range of +/- 10% around the price achieved has been used.

Table 8.3: Gross Margin sensitivity to price

\$/DSE	\$2.20/kg cwt	\$2.56/kg cwt	\$3.00/kg cwt
Gross Income	\$29.90	\$33.64	\$38.14
Variable Costs	\$2.77	\$2.77	\$2.77
Gross Margin	\$27.13	\$30.87	\$35.37

The table shows that:

- At the low price range, the resultant gross margin for goats would be higher than the gross margin achieved for sheep and cattle breeding but less than the average gross margin achieved for lamb and cattle trading in the region.
- At the high price range, the resultant gross margin for goats would be similar to cattle trading but still below the average gross margin achieved in the region for trading lambs.
- The variation around the gross margin in relation to price over the period is approximately \$8/DSE.

When seasonal conditions result in additional pasture the owners introduce trading stock as an opportunity to utilise the additional feed on offer. Traditionally this has been sheep but more recently goats have been utilised due to the lower capital cost. To demonstrate the process behind the management's decision making, a partial budget has been developed in

The above analysis is highly dependent on the assumed purchase and sale price for both goats and lambs as well as growth rate and yield as demonstrated by the following sensitivity analysis.

Price

A 10% increase in the goat purchase price will reduce the difference in the margin by 13%

A 10% decrease in the goat sale price will reduce the difference in the margin by 47%

A 10% decrease in the lamb purchase price will reduce the difference in the margin by 39%

A 10% increase in the lamb sale price will reduce the difference in the margin by 67%

Growth rate

A 10% reduction in growth rate for goats will reduce the difference in the margin by 47%

A 10% increase in the growth rate for lambs will reduce the difference in the margin by 32%

Yield

A 1% decrease in the goat yield will reduce the difference in the margin by 12%

A 1% increase in the lamb yield will reduce the difference in the margin by 14%

8.6 Lessons learned

- Goats are economically competitive with Dorpers in the region.
- Matching livestock productivity to pastoral carrying capacity is the key to effective livestock management in a rangeland environment.
- Understanding the relationship between total animal numbers, animal feed demand and feed resources available is essential for effective grazing management.
- Growth rate is a key profit driver in the rangeland system.
- Understanding the carrying capacity of the rangeland takes time and experience but is a crucial part of a rangeland management system.
- Overstocking, overgrazing and reducing the range of feed types can be detrimental to enterprise performance and long term sustainability.
- Variation in seasons make it important for a business to have flexibility in enterprise choice with regard to fencing, paddock layout, water supply and pastures in order to take opportunities when they present.
- The ready supply of goats at a cost effective price to utilise surplus feed or to respond to market prices is a critical success factor for this business.

8.7 Advantages and challenges of going into goats

The advantages goats have brought to this business are as follows:

- The integration of goats in this business has helped to cut operating costs, particularly labour and husbandry costs, in an attempt to maintain profit margins.
- Goats have provided a profitable alternative to Dorper lambs for the use of available feed.
- The ability to buy in goats, in large numbers, cost effectively, when there is surplus feed available has enabled this business to more profitably utilise surplus feed.

The challenges goats have brought to this business are as follows:

- Due to the seasonal variation that occurs in this region the business needs to be flexible enough to take opportunities when they present. Additional infrastructure costs have been incurred to enable flexibility in enterprise choice with regard to fencing, paddock layout and pastures.

- A good understanding of carrying capacity is required to avoid using stocking rates which are too high and not providing a variety of feed. This can be detrimental to enterprise performance.
- Historically goats have been easy to source as they have been perceived to be “not worth much”. The prices used in the partial budget analysis are high in historical terms. At these prices, goats may become harder to source or goat producers may need to be prepared to pay more in order to source them.

9 Case study 6

9.1 Business summary

Total area (Ha)	Business	Region	Rainfall (mm)	Total DSE	Goat enterprise	Target market	Motivation for goat integration
2,800	Cropping, mixed grazing	Sth Wimmera, Vic	500	5,860	Goat breeding Goats 17% of total DSE Goats 7% of GFI	Carcase trade- domestic abattoirs	Increased carrying capacity through better utilisation of low value grazing country

9.2 Catalyst for going into goats

Goats have been an integral part of the grazing system in this mixed cropping livestock business since the introduction of cashmere does onto the property in 1985 in response to falling wool prices. As the property backs onto a major State Park and lighter sandy soils of the scrub country don't support cropping and have limited potential for sheep grazing, goats were seen as a viable option to better utilize this low value grazing country.

However, a downturn in the cashmere fibre market saw a gradual change to meat production with the introduction of Boer bucks. Cashmere bucks are still being used to produce replacement does as management believe the Cashmere based cross breeding program offers more resilience and productivity than a pure Boer goat breeding program.

The current livestock system comprises a mixture of wool and meat sheep, beef cattle and goats. The inclusion of the goat enterprise into the grazing system in this business has resulted in an increased total carrying capacity. This is due to the grazing patterns of goats and their ability to utilise the scrub browse much more effectively than sheep.

Access to low value scrub country may be unique to this particular business however, it highlights that the introduction of a low cost, low input grazing system such as meat goats on low cost land has the potential to improve the profitability of an existing grazing/cropping system due to increased carrying capacity.

9.3 Integration of the goat enterprise

The ability of the goat grazing system to utilise the scrub grazing areas means that 600 breeding does have been added to the livestock system without adversely impacting on grazing pressure. However, if the goats were removed from the grazing system, only a maximum of 120 additional dry sheep (wool wethers) could be run on the same area.

Containment is an issue for this business given the proximity of the State park area. Additional capital was required to ensure that fencing is goat proof. Fencing in the goat grazing areas is based on four electric and three earth wires while fencing in the sheep grazing areas is supplemented by a single offset electric wire approximately 30mm from the ground. Power supply for most of the fencing is mains supply supported by solar chargers and batteries.

Fence damage by emus and kangaroos trying to access the property from the State Park is an ongoing issue as goats are very quick to take advantage of any area of fencing which has

been compromised. Therefore, continual monitoring and maintenance is a priority for management.

9.4 Management of goats

The goat enterprise consists of 600 breeding does, 470 of which are joined to Boer bucks and 130 to Cashmere bucks to breed replacements. Management are trying to maintain the Cashmere influence as they believe the Cashmere based cross breeding program offers more resilience and productivity than a pure Boer goat breeding program. Replacement does are joined at 15 to 18 months of age with an 80 to 85% of mature body weight joining target. Increasingly, first cross does are being joined to Boer bucks as a source of replacements due to lack of availability of cashmere bucks.

Mob sizes of 100 to 150 does form a management group and does kid in these groupings. A fixed joining period of seven weeks commences from 1st April and the joining percentage is based on 1 to 1.5 bucks per 100 does. Generally bucks are replaced following three joining periods.

The management of doe body condition score (BCS) prior to joining and kidding are key factors to maximising kidding percentages. For an autumn joining, management is targeting a BCS of 2.5 to 3.0 for the doe flock. A pre kidding target BCS of 3.0 to 3.5 is achievable given adequate pasture growth conditions over winter. However, if pasture growth is limiting over this period, then grain and roughage supplementation may be required.

Goats however are seen to manage the seasonal variability and maintain BCS better than the breeding ewe flock providing an advantage in lower supplementary feeding requirements.

Kidding occurs in spring with average kidding percentages of approximately 105 to 110%. This is lower than the industry standard and reflects the environment in which the goats are run and the low-input approach to management. Loss at kidding is an issue with fox and eagle predation pressures due to proximity of State Park with reduced ability to conduct baiting programs.

Kids are weaned at 12 weeks of age in late spring early summer with the aim to turn off 450 to 500 kids for sale per year. Animals are sold direct to works targeting the 13 to 16kg carcass weight range (approx. 30 to 35kg live wt.). The average price achieved in the period 2013/14 was approximately \$3.80/kg cwt skin off or equivalent to approximately \$45 to \$50 per head. According to MLA market reports, the two year average OTH price in the eastern states for the 12-16kg cwt range was \$3.70/kg cwt.

Turn off age of sale animals is around 12 to 14 months based on an average growth rate to turn off of 90 to 100 grams /day. Lower growth rates are generally experienced during the winter period.

Worms are a major issue and all does are drenched prior to kidding and also receive a 5 in 1 vaccine for the prevention of Clostridia diseases such as Pulpy Kidney and Tetanus. High doe losses can occur in un-drenched animals grazed on lush pastures during a wet and cold winter with both does and kids being drenched at this time based on worm burdens assessed through faecal egg counts.

Cashmere based does are susceptible to a cold snap after they have shed their fleece – usually July to August. As fleece shedding occurs prior to kidding, breeding does are run in the scrub/grazing areas at this time to provide shelter.

For ease of working, yards need height for containment and also sight penetration to minimise goats attempting to escape with bugle design sheep yards being modified to increase yard height and also to remove blank blocking walls. Goats need time to adjust to yard layout and working - they need to find their way through the yards rather than be forced.

Movement of mob sizes of 100 to 150 does takes time as goats wander rather than move as a mob like sheep. Where possible laneway systems are employed to allow goats to move at their own pace. Temporary /portable yards are also used to minimise the need to move goats to a centralised yard facility for drenching and husbandry.

The goat herd requires minimal labour input compared to sheep. For example, an April drop for the sheep flock provides a clash with the cropping program- particularly for supplementary feeding prior to lambing. By comparison, a spring drop for the goat herd requires minimal labour supervision and no supplementary feeding, shearing, or crutching requirements allowing management to focus on other areas of the business.

Over the summer period, young sheep and goats have access to the limited stubble grazing as older sheep are generally agisted off-farm. However, stubble grazing for goats is limited due to the lack of adequate fencing for containment in the cropped areas. Goats exhibit "paddock preference" where goats grazed in paddocks with similar pasture and scrub grazing will prefer to graze one paddock compared to another. However, there appears to be no obvious logic to the grazing pattern. Goats will browse the paddocks rather than mob graze with two or three stock camps in a grazing area rather than single stock camps as exhibited with sheep grazing.

Pre-feeding of hay as an attractant to draw goats from the scrub areas prior to muster is used as a normal management strategy.

9.5 Economic analysis

The livestock production system utilises 2,303 ha of mixed arable and scrub grazing. Goats make use of the lighter, low value grazing land not suited to either cropping or sheep grazing. The current grazing system has a carrying capacity of 5858 DSE at a stocking rate of 2.5 DSE/WGH⁶. The integration of goats into the grazing system has increased the carrying capacity of the property while the overall grazing pressure (stocking rate) has only increased marginally.

The over the hooks (OTH) price used for the sale of goats in the analysis was \$3.80/kg HSCW. According to MLA market reports, the two year average OTH price in the eastern states for the 12-16kg cwt range is \$3.70 /kg cwt.

Cost of production for this enterprise was calculated to be \$1.30 per kg live weight or \$2.95 per kg cwt giving a profit margin of \$0.85 per kg cwt at average market price

⁶

Table 9.1 Goat gross margin

Goat Breeding Enterprise	DSE	\$/DSE	Price @ \$4.20 per kg cwt	Price @ \$3.40 per kg cwt
Total DSE's based on 600 does plus replacements	1016			
Livestock Sales				
650 kids @ approx. 12kg cwt @ \$3.80/kg	\$29,640		\$32,760	\$26,930
122 cfa does @ \$ 80 per head	\$ 9,760		\$11,224	\$ 9,150
TOTAL	\$ 39,400	\$38.80	\$43.30	\$35.50
Variable costs				
Vaccination@ \$ 0.35 per doe	\$210			
Drench @ \$0.25 (2) per head	\$ 354			
Marking and tags @ \$0.65 per kid	\$430			
Supplementary feed @ \$3.60 per doe	\$2160			
MLA Goat levy @\$0.38/head sold	\$256			
Purchase – 3 bucks	\$2200			
Transport @ \$3.00 per head	\$2020			
TOTAL	\$7630	\$7.50	\$7.50	\$ 7.50
TOTAL GROSS MARGIN	\$31,770	\$31.27	\$ 35.58	\$28.00

An alternate grazing system without goats would only support an additional 120 wool producing merino wethers. This would reduce the carrying capacity to 5,112 DSE at a stocking rate of 2.2 DSE/WGH.

The carrying capacity comparison for the two grazing systems is summarised in Table 9.2

Table 9.2 Carrying capacity comparison of substituting 120 wool wethers for 600 breeding does

	Wool sheep	Meat sheep	Cattle	Meat goats	Total	Stocking rate
Current system including 600 does	3,030 DSE	1,232 DSE	580 DSE	1,016 DSE	5,858 DSE	2.5 DSE/WGH
Current system – substituting 600 does for 120 wool wethers	3,300 DSE	1,232 DSE	580 DSE	0	5,112 DSE	2.2 DSE/WGH

This higher stocking rate for the current system does not represent an increased grazing risk with seasonal variability as the goat flock is better adapted to poor pasture conditions than a sheep breeding flock and is better able to utilise the scrub browse to maintain productivity.

Table 9.3 below compares the difference in gross margin of the two grazing system alternatives.

Table 9.3 Gross margin comparison - \$ /DSE

	Income	Variable Costs	GM/DSE	Margin
Current system incl. 600 does	\$54.02	\$18.58	\$35.44	\$207,607
Substitute goats with 120 Merino wethers	\$56.72	\$21.56	\$35.16	\$179,737

Table 9.3 demonstrates that:

- The current grazing system based on 600 breeding does provides a marginally higher GM/DSE
- This results in an additional \$27,870 of margin due to the higher carrying capacity of the current system.

The following assumptions have been used to develop a partial budget analysis to explore the impact on this business of replacing 120 wool wethers with 600 meat producing breeding does.

Assumptions/Comments:			
Merino wethers cut 7.0 kg GFW - 20 micron wool - price 840 c/kg GFW (July 2015)			
3yo wethers sold to live sheep at \$85 per head			
Kids sold for slaughter @ 12-14 kg carcass wt for \$50 /\$55 per head			
- average price \$3.50 to \$4.10 per kg carcass wt			
Current price (July 2015 -\$ 4.30/kg carc wt)			
120 wethers - extra 144 DSE to carrying capacity			
600 does - extra 1016 DSE to carrying capacity			

Table 9.4 Partial budget: Replacing 120 wool wethers with 600 meat does

Returns:				Gains				Losses				
Increase in Income								Increase in Costs				
Goat income								Goat costs				
550	kids	\$ 53	/hd	29,150		600	does	\$ 1.45	/hd	870		
95	cfa does	\$ 80	/hd	7,600		fencing maintenance				3,000		
				A	\$36,750					Total	\$3,870	
Decrease in Costs (Saved)								Decrease in Income				
Sheep Variable costs								Sheep income				
Shearing	120	\$ 2.81	/hd	\$ 337		Wool income - 120 less wethers				\$ 7,056		
Crutch	120	\$ 0.82	/hd	\$ 98		Sale wthrs - 3yo 40 \$ 85 /hd av				\$ 3,400		
Lice control	120	\$ 0.87	/hd	\$ 104						\$ -		
Health	120	\$ 1.50	hd	\$ 180						\$ -		
Wool Packs	5	\$ 10.60	/bale	\$ 53						\$ -		
Wool Freight	5	\$ 10.00	/bale	\$ 50						\$ -		
Freight sales	40	\$ 4	/hd	\$ 160						\$ -		
Broking	840	\$ 0.22	/kg	\$ 185						\$ -		
				B	\$ 1,168					D	Total	\$ 10,456
Total Gains/Losses				A+B = AA	\$ 37,918	C+D = BB				\$ 14,326		
Change in Returns: Net Gain/Loss												\$ 23,592
Capital:				Gains				Losses				
Capital Inflows								Capital Out Flows				
Sheep sales								Goat purchases				
120	wethers sold	\$75	/hd	\$ 9,000		600	does	\$85	/hd	\$ 51,000		
								7	bucks	\$400	\$ 2,800	
								capital cost of fencing (annualised over 6 yrs)				3,000
				E	\$ 9,000					F	Total	\$ 56,800
Capital Required												\$ 47,800
Gain												\$23,592
Capital Required												\$47,800
Gain on Marginal Capital												49%

The partial budget demonstrates that:

- The net benefit to the business of replacing 120 wool wethers with 600 meat does on the scrub country is \$23,592.
- The purchase of 600 rangeland breeding does and meat bucks and the sale of 120 wethers would require \$47,800 in additional livestock capital. A significant reduction in the capital required for breeding does could be achieved through the purchase of rangeland does.
- The capital requirement for fencing has been annualised resulting in an additional total requirement of \$47,800.
- The return to the business on the additional capital will be 49%.

9.6 Lessons learned

- The introduction of goats into a mixed cropping livestock system has increased carrying capacity in this business due to the complementary grazing by goats. Goats utilise low cost scrub grazing areas to produce profits while the wool production grazing system is based on arable crop grazing land.
- Key management targets such a body condition score (BCS) pre joining and pre kidding (as used in sheep production) are important for optimum reproductive performance of goats.
- Worm control in lush winter feed conditions is a key management requirement for breeding does pre kidding and for young growing kids. Worm infestations can cause deaths quickly if does or kids are feed or cold stressed and have not been drenched.

- Kids may need supplementary feeding with hay or straw during winter to offset low fibre intakes from pasture, but breeding does grazing scrub will need limited supplementary feeding.
- The cost of goat proof fencing needs to be considered for successful goat integration, however fences which contain sheep will generally contain goats.
- Goat handling requires different skills and facilities to handling an equivalent number of sheep.

9.7 Advantages and challenges of going into goats

The advantages goats have brought to this business are as follows:

- Labour input for a breeding goat system is low when compared with an equivalent number of sheep which require shearing, crutching, summer fly control and supplementary feeding.
- There are fewer clashes in the labour required for the cropping enterprise and the labour needed for the goat enterprise, compared with the labour required for the breeding ewes including wool production.

The challenges goats have brought to this business are as follows:

- A lack of product differentiation in the market place for eating quality and therefore opportunity for price premiums may restrict the introduction of a goat breeding enterprise in a higher input, farmed goat system. A good understanding of the target market specifications and cost of production are necessary to mitigate this risk.
- While Cashmere-based genetics provided a solid base for the introduction of meat genetics from Boer goats, the maintenance of a crossbred herd will become a challenge in the future.
- There is a limited ability in this business to supply farmed goats year round to a wholesaler due to seasonality of production.
- Limited supply outlets – slaughter is main focus of the industry. There is potential to develop a live export trade for breeding does. Limited consignments with prices up to \$120 per doe have been suggested. Accessing sufficient numbers to make a shipment is cited as a limiting factor and would need industry based coordination to help this market mature.
- Limited anthelmintic products for worm control in goat's means higher costs of health treatments. Efficacy of existing dose rates for worm treatment in sheep do not apply to goats. Grazing strategies over summer which reduce worm burdens in sheep can also be used to limit worm burden in goats.

10 Discussion

The integration of goats into six real life examples of mixed grazing businesses were analysed in the form of case studies. Each case provided insight as to why and how goats were integrated, and assessed the financial benefits of goat integration for each scenario. The purpose of this report is to assist potential industry participants to assess the benefit:cost relationships for their own situation.

10.1 Motivation

In case studies 1, 2 and 3 the key motivation for getting into goats was an alternate revenue source, due to falling wool prices, the impact of drought or better management of cash flows. The integration of goats in Case study 1 also provided the additional benefit of summer weed control when co-grazing crop stubbles with sheep. This was largely due to the

differences in grazing habits of the species. Lifestyle was a secondary motivation in Case study 3 based on the ease with which goats could be handled once understood, similar to cattle with which they were familiar.

In Case study 4, the use of goats as an alternative to chemical weed control for developing land was the primary reason for integrating goats into the business. Goats were a low capital outlay option and provided ongoing weed control, a revenue stream and required a low level of maintenance when run in conjunction with cattle on hiller country.

The profitable utilisation of available feed was the catalyst for going into goats in Case study 5. Seasonal variability in the western division of New South Wales means to be successful, businesses have to be able to be flexible in the type of enterprise they run to ensure they maximise profit. The ease with which goats can be sourced and the low capital cost of entry allows this business to increase stocking rates when surplus feed is available.

Goats enabled the business in Case study 6 to fully utilise low value grazing land and to increase to overall carrying capacity as compared to sheep. This was due to the fact that goats were better suited to the lighter, sandier soils of the scrub country as they were a low cost low input grazing enterprise.

Therefore, the case studies highlight that the motivation for investment into goats is varied and can include:

- Profit and diversification of income
- Profit from an unutilised resource
- Complimentary benefits of multi species grazing
- Land type and feed on offer

10.2 Integration

There are two alternatives when integrating goats, to purchase or to grow the herd through time. Three of the businesses purchased the majority of their goats. In Case study 4, the core herd was purchased outright in order to achieve the required numbers (10 DSE/ha) to allow them to control the blackberry infestations in the first 12 months. The businesses in Case study 2 and 5 had a core breeding herd but also purchased additional quantities of goats for grow-out when the opportunity presented. The lower capital cost for goats as compared to sheep or cattle means that this can be a cost effective option to build numbers in a short period of time either for trading or for a particular role.

The three other businesses investigated purchased their initial breeding stock and then built their herd through time. The advantage of building the herd over time is that fit for purpose animals can be bred. In the example of Case study 3, the integrity of the herd genetics was able to be maintained and management had full control of the breeding stock used in order to meet market specifications. In addition, selection pressure could be applied to reduce issues associated with feet and internal parasites. In all 3 cases of building the herd through time, the capital cost of fencing was able to be spread across years to assist cash flow.

Fencing was a key consideration for goat integration in four of the six businesses investigated. In the two cases where it wasn't, these businesses were already running Dorper sheep enterprises and were confident that existing fences were adequate. In the other four cases, fencing considerations were largely for containment of goats but also to ensure that total grazing pressure was minimised by keeping pest species out. For these businesses hinge joint was the common fence base and was usually supported by two or three electrified plain offset wires. However, the business in Case study 6 used a seven wire

fence for their goat paddock boundaries bordering the State Park, consisting of four electrified and three earth wires. The reason for this was to minimise cost and for ease of maintenance.

In each of the case studies investigated, goats were integrated alongside an existing livestock enterprise, either cattle or sheep and in many cases co-existing. In Case study 1, goats complemented the sheep grazing operation rather than competed with it as a result of different grazing habits and a marginal gain in overall carrying capacity was achieved. In addition, the browsing habits of goats meant that issues with soil fertility and weed transfer, commonly associated with sheep, was less of an issue with goats and their requirement for high fibre meant they were more effective in controlling woody weeds as they were grazed in preference. Similar benefits were achieved in Case study 6 where goats were better suited to grazing the lighter scrub country and their integration to the grazing operation increased total carrying capacity through utilisation of forage that is not utilised by other livestock.

The co-grazing of goats and cattle in Case study 4 enabled the ongoing control of blackberry and nodding thistle. The co-grazing meant that 7 DSE/ha of stock were run where only 5 DSE/ha could otherwise run due to regrowth.

Therefore the case studies highlight that:

- Goats can be successfully integrated into an existing livestock operation
- The capital requirement for fencing is a key consideration to ensure goats are contained effectively and total grazing pressure is minimised by keeping pest and predatory animals out.
- Goats can be purchased or the goat herd grown over time. The capital requirement to purchase goats is much lower than for other livestock alternatives making entry and integration more affordable.
- Integration of goats can result in an overall increase in carrying capacity due to a more effective use of land type and/or reduction in weed pressure

10.3 Management

Husbandry requirements of goats were higher in a farmed environment as compared to rangeland production but the costs from a managed production system were lower than the cost/DSE from the traditional livestock operations.

Managed goat production systems were more able to control and influence kidding performance, growth rate to market, animal health and carcass quality than a rangeland system.

Kidding performance in the Case study properties with managed programs ranged from 110 to 175%. Case study 3 kidding rate of 175% reflected a high degree of management at kidding to ensure kid survival. This result requires extra labour input not seen in the other managed goat operations and this was reflected in the gross margin achieved.

In all managed systems control of joining weights and management of doe body condition score pre joining and pre kidding were seen as key contributors to reproductive performance.

Controlled joining periods were a factor of the managed systems compared to the rangeland “wild harvest” continuous kidding regimes. Does in case study 5 are joined over a five month period through autumn with kidding commencing in August/September. The extended kidding period prolongs the period that animals are available for sale.

Joining periods in Case study 1 and 6 were in autumn between 5 and 8 weeks in duration to enable peak feed demands at kidding to match spring pasture availability. This approach not only limited the need for supplementary feeding of does but also provided optimum growth conditions for young kids. In case study 4 large losses were experienced when kidding occurred in colder months in New England. Changing joining periods substantially improved kidding percentages. Understanding the relationship between total animal numbers, animal feed demand and feed resources available is the key to effective grazing management.

Buck joining rates in the managed systems were significantly lower than those in rangeland systems. Buck to doe ratios of 1.5 to 2.0 bucks per 100 does joined were normal compared to 5 to 6 bucks per 100 does joined in those rangeland systems which used introduced bucks. Control of grazing in the managed systems ensured buck/doe contact was maintained during the breeding season while high buck numbers are required to ensure buck/doe contact in rangeland system in which breeding does graze in segmented cluster groups.

Management of replacement does and control of pregnancy was a feature of the managed systems. Target joining weights for first joining at 25 to 35kg live weight at 15 to 18 months of age ensured that young does were able to kid at body weights which optimised both kid and doe survival.

This contrasted with the rangeland system in which young does joining at light body weights ran an increased risk of loss of kids and does at kidding. Wild harvest also meant that does which may be pregnant were being harvested for sale, potentially depleting the rate of natural increase in the rangeland flocks.

Farmed systems also provide the opportunity to introduce and manage cross bred genetics to improve kidding performance, growth rates and carcase quality traits. This has been a feature of case studies 1, 3, 4 and 6 with the introduction of Boer genetics into the breeding flock.

Control of internal parasites such as worms and fluke was an extra cost factor associated with farmed production systems. Feed stress ("winter stasis") on lush winter pastures or with low dry matter content was felt to trigger worm outbreaks, resulting in high losses in pregnant does. Management of worm burdens through faecal egg monitoring was a key feature of the management strategy for case studies 1, 4 and 6. Management of winter grazing nutrition through the provision of roughage in the form of hay or browse was used by case studies 1 and 6 to assist in reducing the impact of worm outbreaks due to nutritional or lactation stress

Case study 4 placed emphasis on selection for resistance to worm infestation as a tool to assist in parasite management.

Feet trimming was additional husbandry in managed flocks. This ensured that does were not restricted in their grazing prior to kidding.

Containment of goats in a managed system was generally in conjunction with existing livestock fencing with the addition of electric wires to sheep or cattle fencing to restrict goats.

Ability to control grazing pressure in a managed high rainfall system ensures that nutritional requirements better match production demands such as kidding and growth to market target. Matching the kidding season to the pasture supply curve is a management strategy which is being targeted with the introduction of controlled joining periods to ensure that the majority of kids are born into the spring feed period.

In all farmed case studies handling and the use of yards which support easy goat movement have reduced on farm labour costs for the goat system.

Therefore, the case studies highlight that:

- Goats are a lower cost, lower maintenance livestock option to traditional grazing enterprises, particularly sheep. This was due to reduced feeding requirements, lower husbandry costs and lower labour costs.
- Similar to other livestock systems, management of goats for fertility, growth rate and carcass quality are key profit drivers
- Control of nutrition through capacity to manage grazing pressure provides management control of key traits such as kidding rate, growth rate and parasites in the goat flock.

10.4 Financial benefits

For producers to adopt a change in business practice, in this case, a move from one enterprise to another or the integration of a new enterprise, they must recognise that the change will provide benefit.

The purpose of this investigation was to assess the financial benefits for the integration of goats in each of the Case study situations.

The financial benefits of goat integration were measured using the following techniques:

1. gross margin analysis
2. partial budgets and
3. discounted cash flow modelling

10.4.1 Gross margin analysis

A gross margin analysis for the goat enterprise has been included for Case studies 1, 2, 3, 5 and 6. Where possible, this has been compared to other livestock enterprises being run in the business over the same period of time and/or average livestock gross margin benchmarks for a similar region sourced through Agripath's internal farm performance datasets in central and north western New South Wales.

Table 10.1 provides a summary of the goat enterprise gross margins in each business. Where available the gross margin is the average of the 2013 and 2014 production years.

Table 10.1 Summary of Case study - Two year average goat gross margins

	Goat GM/DSE	Enterprise	Location	Sheep GM/DSE	Cattle GM/DSE
Case study 1	\$29.56	Goat breeding	SA		
Case study 2	\$25.49	Depot grow out	SW Qld		
Case study 3	[#] \$19.52	Goat breeding	CW NSW		\$21.40
Case study 5	\$30.87	Goat breeding	Western division, NSW	\$35.82	\$3.91
Case study 6	\$31.27	Goat breeding	SW Vic		

[#]Based on financial data for 1 year only

The table demonstrates that for the two year period:

- Goat gross margins ranged from \$19.52/DSE in a goat breeding enterprise in central west NSW to \$31.27/DSE in a goat breeding enterprise in SW Victoria.

- The highest gross margin achieved was \$35.82/DSE for a sheep-lamb enterprise in western division NSW.

Table 10.2 provides a summary of the average enterprise gross margins achieved for alternate livestock enterprises sourced from Agripath's benchmarking dataset in central and north western New South Wales. The following data is the average gross margin achieved averaged for the 2013 and 2014 production years and provides a basis for comparison of the economic performance measured for the case study goat enterprises.

Table 10.2 Average enterprise gross margins- Agripath benchmark dataset

GM \$/DSE	2 Yr Av. (GM\$/DSE)			Sheep Breeding - Wool
	Cattle - Breeding	Cattle - Trading	Sheep - lambs	
NW NSW	\$9.97	\$11.16	\$15.44	
CW NSW	\$0.79	\$36.76	\$38.44	\$21.94

The table demonstrates that for the two year period:

- Gross margins ranged from \$0.79/DSE in a cattle breeding enterprise in central west NSW to \$38.44/DSE in a dual purpose sheep enterprise in central west NSW.
- The highest goat gross margin for goats in Table 10.1 (\$31.27/DSE) is below the sheep - lambs (\$38.44/DSE) and livestock trading (\$36.76/DSE) gross margins achieved in the central west NSW.
- The lowest goat gross margin achieved for the period for goats in Table 10.1 is higher than all comparison gross margins except sheep - lambs and cattle - trading and sheep - breeding in CW NSW.

Therefore, based on gross margin analysis for the case studies compared:

- Gross margins for goat enterprises are lower than those achieved for sheep-dual and cattle trading in the central west NSW but are competitive with or exceed all other livestock gross margin comparisons.
- Both cattle trading and sheep-lambs traditionally rely on improved pastures and fodder crops to achieve production margin. Goats therefore represent a good alternative in situations where high quality pastures and fodder crops are not available.

10.4.2 Partial budget analysis

A partial budget analysis has been included for case studies 1, 3, 5 and 6 to determine whether the business investigated is better off by integrating goats into the existing business. Table 10.3 provides a summary of the analyses.

Table 10.3 Summary of Goat enterprise Partial budget analysis

	Net gain	Capital required	Gain on capital	Enterprise change
Case study 1	\$1,961	\$5,220	38%	Replace 100 merino ewes with 160 breeding does
Case study 3	\$3,329	\$20,920	16%	Replace 1,000 DSE of cattle with 1,000 DSE of goats
Case study 5	\$42,185	\$100,750	42%	Replace 2,000 DSE of store lambs with 2,000 DSE of goats for grow-out
Case study 6	\$23,592	\$47,800	49%	Replace 120 wool wethers with 600 breeding does

Table 10.3 demonstrates that:

- Increased gains on marginal capital were achieved in all cases investigated.
- Gains ranged from 16% to 49%
- The highest gain achieved was in Case studies 6 largely due to increasing the carrying capacity for the total grazing system by fully utilising the grazing areas by replacing sheep with goats on those areas. In all four cases the gain on capital was largely influenced by the lower cost of livestock capital when substituting goats for more traditional livestock.

Therefore, the partial budget analysis for the four case studies analysed shows that:

- The integration of goats has achieved gains on marginal capital of between 16% and 49% and demonstrates that in each case investigated, the business would be better off following the integration of goats.

10.4.3 Discounted cash flow analysis

A discounted cash flow analysis was undertaken for Case study 4 due to the fact that cash flow benefits from the integration of goats and cash outlays are occurring over a number of years and must therefore be adjusted to a present day values. The details of the analysis can be referred to in Appendix 1.

The analysis compared two scenarios for the control of blackberry and nodding thistle in order to redevelop grazing area to native pasture species. The first scenario involved the use of goats, stocked at high rates (10 DSE/ha) in the first 12 months for blackberry control, then reduced to a stocking rate of 2 DSE/ha grazed in unison with cattle at 5 DSE/ha. The second scenario involves the application of high rates of chemical applied every three years by helicopter for the control of blackberry. The subsequent regrowth in between applications means that cattle can only be run at 5 DSE/ha under this weed control option.

The resulting analysis demonstrates a marginal benefit (IRR 2.12%) for the integration of goats for the control of weeds. This was due largely to the lost grazing potential (7 DSE/ha viz 5 DSE/ha) under the chemical control regime and the high costs for the application of chemical. In addition, the sale of approximately 8 DSE of goats after year one, once blackberry control is achieved, mostly offsets the initial livestock capital required. Chemical cost savings due to the ongoing control of blackberry and nodding thistle by goats is also a

financial benefit in this scenario. The capital cost of fencing (\$100/ha) has been included in the analysis as well as an annual cost of maintenance.

Therefore, the case study highlights that:

- Goats are a viable method to reclaim and improve previously underutilised land areas infested with weeds (blackberries & nodding thistle), for those seeking an alternate method to chemical control.

10.5 Key success factors contributing to economic performance

The Case study analysis of six businesses where goats have been integrated into an existing livestock system has demonstrated financial benefits to the overall business performance in each.

The economic performance of any livestock business is measured by the level of profit generated from the capital invested.

Profit is a combination of 3 key drivers:

- The quantity of product produced per hectare or turn-off
- The price received for a unit of product produced
- The costs incurred in producing product

In the following section the characteristics that relate to the above profit drivers are documented for each of the case study businesses in relation to their geography. For reporting purposes, rangeland production systems include, wild harvest, depots as well as managed rangeland herd. A farmed production system includes all high rainfall/inland managed herds.

10.5.1 Rangeland production system profit drivers

Maximising Product turn-off

- Managing economies of scale to ensure turn off of the maximum amount of saleable live weight from the goats captured. This has incorporated depot management systems to provide a supply of goats to slaughter which will meet market specification.
- Managing the timing of muster to minimise the number of NCV (No Commercial value) animals which are mustered but don't make the minimum market specifications of 23kg live weight. Management options for these light weight animals include "harvest and hold" within the grazing system or "on sell to" a depot for grow out.
- Depot systems also provide the opportunity to "harvest and hold". With management of turn-out of goats which do not meet market specification at first muster to grow out to attain market target. This can be achieved through rangeland grazing or through feed lotting. Analysis of the additional cost that might be incurred in relation to the additional gains to be achieved through carry over or feed lotting should be made before a carryover strategy is implemented.
- The capacity to manage Total Grazing Pressure (TGP) provides opportunities to more closely manage doe breeding body weights and body condition scores with resulting lifts in fertility and kidding survival rates. Seasonal pasture conditions are often marginal in the rangeland environment. The management of stocking rate through fencing for containment of goats and restriction of grazing competition will

assist in maintaining growth rates and fertility rates. In rangeland grazing systems the management of water points to control overgrazing of forage species ensures optimisation of growth rates for production. Introduction of bucks at 5 per 100 breeding does assists in a rangeland joining environment to have adequate buck contact to ensure pregnancy and improve the introduction of improved genetics for production traits such as growth rate. This increased buck joining capacity may also ensure that the maximum number of does are joined when cycling as a result of seasonal conditions or photo periodic effect. Early joining in the breeding cycle will result in a more controlled spread at kidding with improved growth rate performance on available pasture resulting in achievement of earlier turn off target weights. Control or removal of rangeland bucks is a key element in the introduction of improved genetics into a rangeland herd

- Reducing losses at muster and in depot holding by minimising animal stress through the use of handling facilities which allow goats to flow through yards rather than being forced, and by understanding and using goat patterns of behaviour to muster and move goats
- Managing the stress of transport by monitoring loading densities of goats transported.
- Introduction of cross bred genetics, bred for purpose to improve growth rates to turn off.
- Ability of rangeland goats to produce and thrive with an ability to adapt to marginal conditions more effectively than traditional sheep breeds.
- Low capital cost of goats make them an ideal and comparatively profitable trading option to utilise excess feed on offer in good seasons.

Cost of production

- Low husbandry, marketing and transport costs from turn off to slaughter (or sale), assist a goat production system to achieve low cost of production.
- Turn off to slaughter is a combination of the reproduction rate of the breeding doe herd, the weaner kid survival rate to turn off and the weight gain of kids from birth to sale.
- Maintaining profit margin through a low cost of production provides a buffer against a fall in market prices.
- Mustering, drafting and handling pre-transport and transport to processor are significant costs in a rangeland harvest system. Ensuring that the maximum kilograms of live weight can be sold following each muster will reduce the overall costs of production.
- Rangeland systems typically have low husbandry costs in comparison to farmed systems due to minimal health treatments and supplementary feeding requirements.
- Managing turn off to slaughter with a minimal labour cost through the use of handling facilities (yards, laneways etc.) which assist in the flow of animals during handling.
- Managing the depot to match animal supply and demand ensures that the cost of carry over goats is not a major factor.

Sale price received

- Minimisation of the NCV component of a market consignment and providing animals for slaughter which match market specifications.
- Improvement of carcase yield through the use of cross bred genetics.

- Establishment and maintenance of strong relationships along the supply chain.

10.5.2 High rainfall/inland production system profit drivers

Maximising product turn off

- Measured as kg live weight or carcase weight per grazed hectare.
- Ability to run higher stocking rates of goats compared to traditional livestock systems due to goats grazing habits.
- Matching kidding period to pasture growth curve to ensure optimum growth rates for kids to reach market turn off target at minimal age.
- Managing does BCS to above 2.5 to optimise fertility rates and increase kidding percentage.
- Ability to manage timing and length of joining period to minimise losses at kidding due to seasonal weather conditions.
- Targeting high levels of fecundity (170 to 180% kidding) from seasonal breeding patterns and management of doe BCS pre joining and pre kidding.
- Ability to provide supplementary feeding to maintain growth performance during periods of adverse pasture growth.
- Management of worm burdens, particularly in high rainfall production systems. Whilst the grazing habit of goats can reduce the likelihood of worm burden goats have less natural resistance and are therefore more predisposed to parasite infestation. A holistic approach is required and faecal egg counts as an indicator of worm burden are an important management tool to maintain growth rates in kids and does.
- Capacity to manage the introduction of bucks with improved genetic traits for growth rate and carcase yield.
- Utilising bred for purpose genetics to increase growth rates to turn off.

Cost of Production

- Low capital cost to establish a breeding herd if based on a readily available source of breeders from rangeland harvest. Breed up from fibre base does is also an option but these may be limited in availability and at higher cost.
- Meat goat production systems have lowered husbandry costs compared to sheep with less animal health treatments, no shearing and crutching or flystrike management.
- Selection of breeding stock to match the environment can result in goats with improved parasite resistance and a consequent reduction in animal health costs. Measuring and monitoring is required.
- Lower levels of supplementary feeding in comparison to traditional sheep breeds.
- Handling of animals to minimise stress of yard management hence lower labour costs. This would also have potential flow on effects for improved meat quality.
- Increased utilisation of poorer, undeveloped grazing country and forest, which with traditional livestock systems do not support as high a carrying capacity as that which can be achieved by goats.

Sale price received

- Increased capacity to market animals which meet market specification for both carcase weight and fat cover through management of growth rates on improved pasture growing species.

- Less stress due to reduced distance of transport to slaughter.
- Improvement of carcase yield from the introduction of cross bred genetics and hybrid vigour.
- Establishment and maintenance of strong relationships along the supply chain.

10.6 Advantages of integration of goats

The case study analysis highlighted some advantages across the businesses investigated that have potential to increase the integration of goats across existing livestock grazing operations.

Key factors include:

- The goat enterprise has the potential to increase profitability through the better utilisation of an existing resource, increased carrying capacity, more productive use of surplus feed or as a cost effective weed control alternative to chemical application and can provide a regular source of cash flow. An increase in farm stocking rate can be achieved without a corresponding increase in grazing pressure through better resource utilisation by goats.
- Lower capital requirement for breeding and replacement stock compared to other livestock alternatives.
- The change paddock species as a result of goat integration and grazing habits has resulted in a significant reduction in resources spent on mechanical and chemical methods of weed control.
- The ability to buy in goats, in large numbers, cost effectively, when there is surplus feed available has enabled management flexibility.
- Labour input for a breeding goat system is low when compared with an equivalent number of sheep which require shearing, crutching, summer fly control and supplementary feeding. This has helped to cut operating costs, particularly labour and husbandry costs, in an attempt to maintain profit margins.
- There are fewer clashes in the labour required at peak times for the cropping enterprise and the labour needed for the goat enterprise, compared with the labour required for the breeding ewes including wool production.

10.7 Constraints to integration of goats

The case study analysis highlighted some factors common across the businesses investigated that have potential to limit or constrain the widespread integration of goats across existing livestock grazing operations.

Key factors include:

- A limited ability by producers to supply goats on a year round basis due to seasonality of breeding patterns particularly in a managed breeding herd.
- Local abattoirs may close at certain periods throughout the year for several weeks due to a lack of supply of goats for slaughter in a local area. This creates challenges through increased risk for the business in managing logistics to arrange slaughter in order to meet market demand often at extra transport cost. Additional supply could help to alleviate this issue.
- Limited anthelmintic products for worm control in goats resulting in higher costs of health treatments in the high rainfall farmed environment.
- Anecdotally, the pool for sourcing rangeland goats in the east coast of Australia appears to be contracting and drifting south. Predation and recent seasonal

conditions are thought to be contributors of this. A better understanding of the sustainability of current practices of opportunistic goat harvests may be required.

- Management of grazing pressure is one of the biggest limitations to productivity in a rangeland production system. Capital expenditure to provide good quality fencing allows management to control this pressure through the control of unwanted grazing competitors with the added benefit potentially of additional predation control.
- Capital cost of containment of goats in both the rangeland and farmed systems needs consideration.
- The over the hook carcass trade for the export market is considered immature, with no differentiation between attributes such as carcass quality. A lack of product differentiation in the market place and therefore opportunity for price premiums for quality assured product may restrict the introduction of a goat breeding enterprise in a higher input, managed goat system. Therefore, a good understanding of the target market specifications and cost of production are necessary to mitigate this risk.
- Management control of the rangeland buck population to allow the proliferation of introduced genetics is a challenge for improved productivity in rangeland systems.
- Identifying the density of goats and livestock which provides an environmentally sustainable and economically viable grazing system.

11 Key messages

Market price is a key driver in the profitability of the goat enterprises studied in this analysis. For example, in one of the case study properties a GM/DSE of \$25.96 based on average market prices of \$3.00 per kg carcass weight was raised to \$47.70 /DSE with market pricing at January 2015 levels of \$5.30/kg cwt. Returns at this level would be significantly higher for the goat production systems than the traditional livestock production systems providing an incentive to integrate goats into a livestock system.

Whilst management has very little control over the market price, they can still influence the price they accept by managing the quality of the product they produce and through careful evaluation of their marketing options.

The cost of production drives the profit margin and this is a factor which the goat producer can control through the amount of product turned off and the variable and overhead costs associated with producing goat meat. A low cost of production provides the opportunity to maintain profit margins against a fall in market price.

Table 11.1 provides a summary of the cost of production calculated for the case study farms. The table compares CoP against the lowest and highest prices offered during the period (1/7/13 – 30/6/15) according to the MLA market price reports.

Table 11.1 Cost of Production summary

	CoP \$/kg cwt	Margin at \$2.07/kg cwt	Margin at \$4.29/kg cwt
Case study 1	\$1.80	\$0.27	\$2.49
Case study 2	\$1.31	\$0.76	\$2.98
Case study 3	[#] \$2.23	-\$0.16	\$2.06
Case study 5	\$2.07	\$0.00	\$2.22
Case study 6	\$2.95	-\$0.88	\$1.34

[#]Based on financial data for 1 year only

The table shows that:

- At the lowest price offered, two businesses would have made a loss, one business would be break even and two would still be profitable
- At the highest price offered, all businesses analysed would make good profit margins.
- The highest CoP relates to the businesses in the high rainfall/ inland zones with a higher input farming system.

If marginality of production, due to change in climatic conditions, becomes a feature of rangeland and farmed livestock systems, goats may offer greater flexibility due to a lower production risk. This is due to their ability to adapt to a marginal environment better than alternate livestock enterprises and a lower cost of production.

Key messages for the development and management of a sustainable and economically viable goat production system based on this investigation include:

- Establishment and maintenance of strong relationships along the supply chain are important to maintaining pricing competitiveness in all goat production systems.
- Depots are an important part of the goat supply chain and good relationships with both buyers and suppliers are critical success factors for a depot.
- A lack of product differentiation in the market place, and therefore opportunity for price premiums, for goats managed in a high rainfall/inland production system compared to rangeland goats, may restrict the introduction of a goat breeding enterprise in a higher input, system. Therefore, a good understanding of the target market specifications and cost of production are necessary to mitigate this risk in a high rainfall/inland environment.
- In a high rainfall/inland production system, goats can be successfully and cost effectively integrated into a mixed cropping and livestock system and can complement existing enterprises. Rangeland livestock systems provide an ideal opportunity for the integration of goat production due to a readily available and cheap supply of breeding stock or marketable product.
- Grazing complementarity by goats within the both rangeland and farmed livestock systems have the potential to increase total carrying capacity of the livestock system as goats have the ability to graze rougher areas where grazing of sheep or cattle may be limited.
- Economic analysis shows the use of goats as a viable alternative to chemical or mechanical weed removal but is dependent upon scale of weed problem, accessibility of affected area, preferred time frame of control and personal preference.
- A good understanding of animal growth rates, target market specifications, subsequent margin and its impact on enterprise profitability is critical for management to make informed decisions regarding goat integration in both rangeland and farmed environments.
- Maintaining target body condition scores at joining and kidding is a key driver in profitable goat breeding systems. In both rangeland and farmed systems this is easier to manage in the breeding does than breeding ewes due to the goat's ability to utilise lower quality pastures unavailable to sheep.
- Selection of fit for purpose breeding stock has resulted in goats with improved internal parasite resistance and a reduction in animal health costs. It has also resulted in improved productivity from introduced cross breed genetics. The development and promotion of KIDPLAN as a genetic selection tool within the goat seed stock sector will assist with selection improvement over time.

- Goat proof fencing is a long term capital improvement and has been beneficial for all grazing enterprises. In rangeland production systems containment of goats and restriction of grazing competitors has resulted in ability to manage Total Grazing Pressure (TGP) and has resulted in improved growth rates and decreased levels of predation.
- In rangeland grazing systems the capacity to manage Total Grazing Pressure (TGP) through fencing provides opportunities to more closely manage doe breeding body weights and body condition scores with resulting lifts in fertility and kidding survival rates and kid growth rates to turn off. In addition capacity to manage growth performance of “harvest and hold” goats has also been an important result of TGP control in rangeland systems
- In a high rainfall/inland goat system the labour requirement for a goat breeding enterprise is less than for a sheep breeding enterprise with an equivalent number of sheep due to the reduced need for shearing, crutching, summer fly control and supplementary feeding.

12 Conclusions/recommendations

12.1 Conclusions

The analysis undertaken demonstrates that the integration of goats into existing livestock production systems across a range of production environments is competitive with the economic return from alternative livestock production systems available. Based on the economics producers should be considering goats in the rangeland and in the higher rainfall environments. Goats are especially well adapted to produce economic returns much higher than what is available from other livestock enterprises in situations of rough unimproved feed sources. With more intensive management to maintain high kidding rate and survival, returns are competitive with traditional high performing enterprises such as lambs and trading cattle. The evidence from these case studies suggests that these competitive returns can be achieved on lower quality pastures.

Economically apart from fencing there are few barriers to entry with capital cost of breeding does relatively inexpensive when compared to other livestock enterprises. The ability of goats to enhance whole of farm performance through the control of weeds, maintenance of cropland fallows, and utilisation of feed not grazed by other livestock is difficult to quantify empirically and therefore not well understood. Quantification of these grazing benefits would assist in increasing adoption of goats into existing farming systems.

While fencing may be perceived to be a barrier to entry the producers in the case studies all pointed to other improvements as a result of the investment such as management of grazing pressure, ease of handling and mustering and exclusion of competing wildlife. Industry needs to remain focussed on price maximisation, with provision of pricing premiums to reflect carcass quality differences between farmed and rangeland products. There is a need to understand the impact of population dynamics in the rangeland to enable the goat harvesting industry to remain sustainable or even increase certainty of supply.

Producers need to remain focussed on productivity factors such as fertility, growth rates to meet market specifications, and improved understanding of expenditure relative to the anticipated income generated.

12.2 Recommendations

12.2.1 Market development

- Efforts should be directed towards maintaining market stability and increasing market confidence through the development of quality assurance programs in order to maintain upward pressure on prices for goat meat. At current price levels, (>\$5.00/kg cwt) goat gross margins can compete with or exceed other alternative livestock enterprise options.
- Farmed goat production systems have a higher cost of production than rangeland and could therefore limit goat integration in these regions. Opportunities to explore product differentiation in the market place or to identify where price premiums could be achieved for farmed goat product may help to increase margin and therefore uptake in this region.
- Continuing to build and maintain strong relationships along the supply chain for efficient transfer of market information regarding supply and demand.
- Increased understanding of rangeland population dynamics is required to ensure continuity of supply in this region.

12.2.2 On farm productivity

- Whole of farm grazing benefits of goats need to be further quantified to demonstrate their capacity to utilise feed not available to other livestock, manage weeds, and maintain crop land fallow.
- An industry led benchmarking program should be developed to assist growers to identify the key drivers of profit in their business and the management decisions that impact on them.
- Assist growers to build a good understanding of target market specifications and key influencers of animal growth rates and the impacts on profitability.
- Assist growers to understand their true cost of production.
- Kidding percentages and survival rates underpin productivity. Further work on management techniques for improved fertility and survival to turn off is required in both farmed and rangeland production systems.

12.2.3 Research and development

- Provide goat producers with a clear understanding of the nutritional requirements for goats in both farmed and rangeland grazing systems rather than adaptation of sheep nutritional standards
- Link these nutritional standards to management systems for both growth rates and reproductive performance in rangeland and farmed grazing systems.
- Additional R&D is required for anthelmintic registrations for goats.
- More work is required to identify the benefits of hybrid vigour in the goat flock and how it can be maintained.
- Integration and trialling of the work from the SMART FARM INNOVATION Centre at the University of New England relating to GPS tracking of tagged goats in grazing mobs. This would assist in lowering muster costs in rangeland systems by being able to control water points and trap facilities through a better understanding of numbers and location of grazing goats. In addition the monitoring of grazing patterns will enable a better understanding and planning of the carrying capacity capability of the

rangeland pasture area. Control of grazing pressure and overgrazing of rangeland species will ensure sustainability of the rangeland grazing system.

The integration of spatial technology to map biomass quantity and quality will enable better management of grazing pressure and animal growth rates in rangeland systems

- MLA Cost of Production calculator needs modification to more accurately reflect the inventory conditions of the breeding goat flock. Inclusion of replacement does as a livestock category and identification of the time period over which the analysis is calculated in relation to opening and closing numbers and values. Inclusion of an inventory calculation for DSE would allow identification of total carrying capacity and based on the variable costs which are calculated would enable Gross Margin per DSE to be calculated.

Majority of sales are on a carcass weight basis but the sales data analysis should be flexible enough to include both live weight sales and a carcass weight sales. Both should include number sold for each category, live weight at sale, carcass weight conversion and price per kg cwt or live weight to calculate sale price per head rather than current \$ per head – this would make the program more interactive and more accurately reflect industry practice. This would be similar to the” harvest “cost of production analysis.

13 Bibliography

- AUSMEAT Limited, (2005) Handbook of Australian Meat, Murarrie, Qld. International red meat manual 7th edition: Caprine categories and descriptions. Available at <http://www.ausmeat.com.au>
- Australian Cashmere Growers Association (2001), Kellyville, NSW. Australian Goat Notes, A3- Introduction to Boers, Available at <http://www.acga.org.au/goatnotes/A003.php>
- Department of Agriculture and Food, Western Australia. Grain overload, acidosis or grain poisoning in stock. Available at www.agric.wa.gov.au/feeding-nutrition/grain-overload-acidosis-or-grain-poisoning-stock
- Meat and Livestock Australia Limited (2014), Sydney, Australia. An introduction to KIDPLAN. Available at <http://www.sheepgenetics.org.au/files/95fd7331-46a0-4e35-a219-a3f700ffbd67/Intro-to-KP- web.pdf>
- Meat and Livestock Australia Limited (2012), Sydney, Australia. Australian Goat Industry RD&E Strategy. Available at [MLA Goat Industry RD&E Strategy](#)
- Lane J. et al, (2015) Priority list of endemic diseases for the red meat industries, Final Report, B.AHE.0010, Meat and Livestock Australia.
- Simmonds H. et al (2000), Rural Industries Research and Development Corporation, Canberra, ACT. The palatability and potential toxicity of Australian weeds to goats

14 Appendix

14.1 Case study 4 assumptions and data

Description:	Assumptions	Incremental Cash Flows:																
		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	
Scenario: Accept or reject the 2008/09 investment																		
What is the economic life of the investment?	15																	
What is the estimated value of the investment at the end of the economic life?	-																	
What is the initial cost of the investment at Year Zero?	64,283	(64,283)																
What are the incremental working capital requirements of the investment over the economic life? Consider maintenance costs, direct costs.																		
With new investment	Fencing Mtc + 2DSE GoatDirectCosts		(4,430)	(634)	(634)	(634)	(634)	(634)	(634)	(634)	(634)	(634)	(634)	(634)	(634)	(634)	(634)	(634)
Without new investment	2DSEBeefDirectCosts + 3 Yearly Chem Cost		(9,500)				(9,500)				(9,500)				(9,500)			(9,500)
Incremental working capital requirements	Insert costs as -ve values		5,070	(634)	(634)	8,866	(634)	(634)	8,866	(634)	(634)	8,866	(634)	(634)	8,866	(634)	(634)	(634)
What incremental revenues, if any, will be produced over the economic life of the investment?																		
With new investment	(Yr1only 1340 goats) then 2DSE GoatsGM		79,680	3,244	3,244	3,244	3,244	3,244	3,244	3,244	3,244	3,244	3,244	3,244	3,244	3,244	3,244	3,244
Without new investment	5DSE CattleGM		4,218	4,218	4,218	4,218	4,218	4,218	4,218	4,218	4,218	4,218	4,218	4,218	4,218	4,218	4,218	4,218
Incremental revenues	Insert revenues as +ve values		75,462	(974)	(974)	(974)	(974)	(974)	(974)	(974)	(974)	(974)	(974)	(974)	(974)	(974)	(974)	(974)
Assumptions:																		
Cost of capital	8.00%	Per Annum																
Tax rate. Note: include pre-tax incremental cashflows above.	30.00%	Per Annum																
Inflation: assume zero inflation.	-																	
Prime Cost tax depreciation rate: assume per asset class.	0.00%	Per Annum																
Depreciation																		
Tax effect of depreciation																		
All capital investments are financed from working capital. Financing decision is a separate exercise to capital project evaluation.																		
	After Tax Effect of Cash Flows		(64,283)	56,372	(1,126)	(1,126)	5,524	(1,126)	(1,126)	5,524	(1,126)	(1,126)	5,524	(1,126)	(1,126)	5,524	(1,126)	(1,126)
	IRR	2.12%	Per Annum															