final report

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Trial design development to determine expected growth rates of young goats

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Abstract

Meat and Livestock Australia (MLA) contracted the New South Wales Department of Primary Industries (NSW DPI) to design a series of experiments to study the potential growth rate of rangeland goats and to compare the economic and environmental impact of goat and Dorper enterprises. This report details four experimental designs intended to achieve the objectives of MLA and the Goat Industry Council of Australia (GICA). A review of literature on goat growth and factors affecting their growth rate is also included.

Contents

1 Background

Although, the majority of goats sold from the rangelands are harvested rather than 'farmed', it is increasingly common for landholders to fence a portion of their property into a 'goat paddock'. The proportion of goat captured that are over 24 kg liveweight (the threshold below which harvested goats are considered of 'no commercial value') ranges from 50 to 80%. The underweight animals may be released or sold (usually to a depot) for an undefined spot market price. Producers may retain these animals in holding paddocks until they attain marketable weight. However, they do not know what growth rates to expect and thus how long they will need to be retained before marketing. The financial return to expect from the enterprise and how this compares to other enterprises (e.g. meat sheep) is unclear. Clarification of this knowledge will assist producers in making decisions to cost-effectively improve their management practices.

2 Project objective

By 01 March 2015 the following will have been achieved:

1. Comprehensive consultation with industry representatives such as GICA and MLA to ensure all parties are clear on the trial objectives and design requirements.
2. Comprehensive literature review to identify existing knowledge, research gaps and to avoid duplication of previous research.
3. Comprehensive operational plan for experimental trials developed and delivered.
4. Final report submitted and approved detailing the results of this project.

3 Methodology

3.1 Literature Review

National and international scientific and 'grey' literature was searched to identify existing knowledge and research gaps on goat growth and management.

3.2 Consultations

Several consultations were undertaken with GICA, goat producers and industry experts to:

- Agree on key research questions and additional requirements.
- Determine experimental design elements to meet priorities and outcomes.
- Determine the number of trials and production zones where the trials will be conducted.
- Determine the practicality of the various operational plans (with experts in each field)

Two industry consultation meetings were held with the Goat Industry Council of Australia (GICA). Consultation one was held in Sydney on November 11 2014 and consultation two was convened via teleconference on December 11 2014.

The purpose of consultation one was to:

- Agree on key research questions and additional requirements.
- Determine experimental design elements to meet priorities and outcomes.
- Determine the number of trials and production zones where the trials will be conducted.

The major outcomes that had implications on the trial design were:

- GICA would prefer an enterprise comparison study between growing young goats and a self-replacing Dorper ewe flock, rather than comparing the growth rates of weaner lambs, other goat breeds and rangeland goat.
- Industry is interested in assessing the benefits of summer spelling rangeland pastures in a conjunction with a growing goat enterprise. This could be incorporated as part of the enterprise study.
- Industry's preferred regional trial locations were identified.

The purpose of consultation two was to:

- Gain industry endorsement for the four experiments.
- Discuss trial limitations, alternative approaches and researcher recommendations.
- List and address issues associated the practical implementation of the experimental design.
- The major outcomes that had implications on the experimental design included:

Experiments endorsed through this consultation included:

- 'Growing out' rangeland goats (experiment 1) to be undertaken in Rangeland, Marginal mixed-farming and Higher Rainfall zones.
- Quantifying the potential growth rate of rangeland goats accounting for age (experiment 2) to be undertaken in Rangeland, Marginal mixed-farming and Higher Rainfall zones.
- Assessing the Impact of weaning weight on growth rate (experiment 3) to be undertaken in rangeland sites only.
- Enterprise comparison (experiment 4); 'growing out' rangeland goat enterprise verses self-replacing Dorper enterprise. Rangeland sites only.

Furthermore:

- Researchers argued the need to account for age in determining growth rate in young goats and gained support from industry for experiment two.
- It was decided that experiment three should be designed in this suite of experiments for later use as industry develops.
- The need for replication of the experiments was supported on the recommendation of the project team.
- For experiment four, a recommendation that for a desk-top methodology be developed to model the comparison before implementing the experiment was supported by industry.
- Mustering and tagging herds of kidding does for determining the age of kids, was not supported by industry due to the risk of mismothering.

- It was agreed trial paddocks should represent typical commercial sizes.
- Trial should include male and female goats.

The project team conducted further one-on-one consultations to inform the development of the experimental design and the operational plans with industry experts drawn from NSW DPI, LLS, private consultants and producers (Appendix 2).

3.3 Experimental design development

Four experiments were designed using sound experimental principles and detailed operational plans were included.

4 Result and discussion

A comprehensive literature review and a document containing four experimental designs are attached.

The literature review examined the main factors that influence growth rate in goats such as breed, birth weight, sex, nutrition and season. Other factors relevant to goat growth rates such as genetic improvement, diet selection and grazing behaviour were assessed and knowledge gaps identified.

The four experiments are:

Experiment 1 - Measuring the growth rate of underweight goats

This experiment will quantify the growth rate of underweight goats in three agricultural production zones and evaluate the effect of supplementary feeding on growth rate. The growth rate of 300 rangeland goats, ranging in weight from 10 to 24 kg, will be monitored for twelve months. There will be two treatments (supplemented or un-supplemented) and at least two replicates in each region. A comprehensive operational plan including randomisation procedures and data collection methods are outlined.

Experiment 2 - Measuring the growth rate of underweight goats- accounting for age

Experiment two has been designed to determine the potential pre and post-weaning growth rate of rangeland goats of known age. In three production zones, the growth rate of 300 rangeland goats of known age will be monitored for twelve months. There will be two treatments where goats are either supplemented or un-supplemented and the experiment will be replicated at least twice in each region. As is in experiment 1 above, comprehensive operational plan including randomisation procedures and data collection methods are outlined.

Experiment 3 - The impact of weaning weight/age on the growth rate of rangeland goats

This experiment is designed to determine the impact of weaning age/weight on the post-weaning growth rate of rangeland goats. In each region, 150 kid goats of known age will be run in two paddocks (two replicates; 75 goats per paddock). At weaning, the kids will range in age and weight and will be weaned as one group at the same time. The design includes procedures of acquiring the necessary age group and number of kids, randomisation and data collection methods.

Experiment 4: Enterprise comparison; comparing goat growing and self-replacing Dorper enterprises

This document lays out the experimental design to compare growing out goat enterprises with a self-replacing Dorper enterprise. In designing this experiment a two-phase approach is used.

- Phase one will compare the Gross Margin (GM) per area ($/ha), per animal ($/ewe or $/goat) and per DSE ($/DSE). Desk top analysis will be used to model a comparison of both enterprises. The parameters used in calculating the GM for each enterprise will be developed using industry data, pasture growth modelling and expert opinion. If the results of the GM calculations undertaken using the best industry knowledge showed that there are clear and wide differences, then producers could make decisions based on the GM outcomes. If on the other hand the GM calculations for the two enterprises are close, then a second study (phase 2) would be undertaken. Template for GM analysis is attached.
- Phase two will involve running self-replacing Dorper enterprise side by side with growing out goat enterprise. The two enterprises will be run in comparable sized paddocks with similar land systems and water distribution. The trial paddocks will be representative of regional commercial paddock sizes. Enterprises will be managed to maintain a comparable number of DSE days per ha per year. The trial will run for three years.

5 Success in achieving objectives

The objectives are fully achieved.

6 Impact on meat and livestock industry

Successful implementation of the trials presented will have significant contribution to the growth of the goat meat industry.
In particular, successful implementation of these trials will answer the following questions:

- What growth rate can be expected from ‘growing out’ of underweight rangeland goats with and without supplementation?
- Does supplementation improve weight gain in rangeland goats?
- What is the genetic growth potential of Australian rangeland goats?
- Does weaning weight/age have an impact on the post weaning growth rate of goats and time required to reach marketable weight?
- How does goat enterprise compare with Dorper enterprise under rangeland conditions?
- What are the environmental impacts of the goat production system?

7 Conclusions and recommendations

- Experiments one to four represent a logical sequence of experiments that the goat industry could undertake to address growth rates in goats.

- Experiment two and three have similar set up protocols and data collection requirements. Efficiencies could be achieved by running both together.
- It is recommended that experiment four is undertaken in two phases. Desktop analysis of Gross Margin (phase one) need to be completed first and proceed with phase two only if the differences between the GM's of the two enterprises are not significant.
- Phase one of experiment four could be conducted in conjunction with experiment one, if addressing its objectives is a priority for industry.
- The experiments be implemented by a management group with a structure outlined in Appendix 6 of the trail design document.
- The management group note the biosecurity, animal welfare and workplace health and safety requirement and recommendation outlined in Appendix 1.
- Recognizing how male sexual maturity impacts on growth rate and the age/ weight at which maturity occurs. This may have important implication for management option for improving growth rate such as running males and females separately.
- Goats' exhibit seasonal deterioration in growth rate associated with increased reproduction activity, decline in appetite as well as photoperiodism regardless of availability or quality of feed. In Australia, autumn seems to be when these happen and thorough understanding would assist in making improved marketing decisions.
- Scientific and 'grey' literatures indicate that goats are more accepting of saline water than other class of livestock. Measuring water quality used by goats and relating results to productivity would positively contribute to goat management.

8 Appendices

8.1 Appendix 1 - Factors Affecting Growth in Goats: Review of Literature

Refer to separate document

8.2 Appendix 2 - Goat growth rate trial design

Refer to separate document