final report

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Prepared by: Ben Swain
BCS Agribusiness

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Boer select buck evaluation program

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Other commercial partners including Allflex, Stockwatch, Riverina Co-op and Te Pari have also greatly assisted in making the program possible.

Boer Select members who contributed their genetics to the trial have clearly been an integral part of the program and it is hoped they have received back much knowledge and experience to compensate for the time and effort of being involved.

Sheep Genetics for the analysis and production of KIDPLAN results.

Paul Hamilton of Semtech for the expert advice and professionalism leading up to and during the AI program.

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The largest acknowledgement though must go to Colin and Rob Ramsay who provided their property as a trial location and gave a generation of their breeding over to the trial. Their ongoing commitment to the trial from the beginning to the end has been unmatched. Their attention to detail in every process to ensure the integrity of the data and the welfare of the animals at all times has been first class. The industry owes a great deal of gratitude to the Ramsay's for the commitment and effort they have contributed.

Abstract

In 2013 the Boer Select Buck Evaluation Program was established to improve genetic linkage between a group of Boer breeders, increase uptake of the KIDPLAN service and to showcase the genetic variability within the Boer breed.

11 Boer bucks were mated to individual doe groups with the resulting progeny assessed for a wide range of measured and visual traits over a 12 month period.

Large variations in traits were observed between the progeny groups and resulting Estimated Breeding Values (EBVs).

Significant variation was observed in the key production trait of growth, measured as body weight at various stages. This variation demonstrates that large gains can be made by the goat industry by selecting genetics that are superior for growth, leading to higher value carcases in a shorter time.

Worm egg count was similarly variable. With resistance to all of the few goat drenches currently available already recorded, breeding for worm resistance needs to be an important part of the industry's objective.

The challenge for the goat industry is to continue on with the work of the Boer Select Buck Evaluation Program and to increase the adoption of performance based breeding in both the seedstock and commercial industries.

Executive summary

In 2011 a group of dedicated and like-minded Boer goat breeders formed the Boer Select breeders group. One of the primary focuses of the group is to encourage the adoption of performance breeding in the goat industry.

To help achieve this goal, in 2013 the Boer Select group commenced the Boer Select Buck Evaluation Program. In what is considered to be the first of its kind in the Australian goat industry, 9 Boer bucks, from 8 different seedstock producers around Australia, were mated to 40 does each at Dudauman Park, near Bethungra in NSW. In addition, a further 2 bucks were used as backup bucks, bringing the total of bucks in the trial to 11.

The resulting progeny were measured for a wide range of traits commencing at birth, where dam, birth weight and litter size were recorded. Subsequent weights were also recorded at weaning, early post weaning, post weaning and yearling stages. All progeny had individual worm egg counts carried out as well as being scanned for fat and eye muscle depth.

All measured data was submitted to KIDPLAN, the goat genetic evaluation system operated by Sheep Genetics. Estimated Breeding Values (EBVs) were calculated along with indexes.

At the yearling stage a thorough visual assessment was carried out on individual progeny. Each goat was independently assessed by a classer for 8 traits (Jaw, Legs and Feet, Shoulder and Back, Head and Horns, Colour, Non-fibre Pigmentation, Testicles, Udder and Teats) and a Classer's Grade.

Both measured and visual results were reported in a trial report that was released at the program field day which was held at Condobolin, NSW in October 2014. All progeny were displayed at the field day, penned in individual buck groups with EBV and visual trait information provided.

The results of the trial demonstrate the large genetic variation within the Boer breed. Post weaning weight EBVs ranged from a high of 4.8kg to a low of -0.5kg. Eye muscle depth ranged from +1.1mm to -0.3mm and Post weaning worm egg count (PWEC) from -30% to +45%.

Likewise, variability in visual traits was also shown to be large. Percentage deviation of Tops, as graded by the classer, ranged from a high of +16% to a low of -13% for different bucks. Similarly percentage deviation of Culls ranged from a high of -8% to a low of +7%.

This genetic variability is good news for Boer breeders and commercial breeders using Boer genetics as either maternal or terminal sires. Higher genetic variability allows for the ability to place greater selection emphasis on key production traits. Greater selection emphasis leads to larger and faster rates of genetic gain.

For the breeders involved in the trial additional benefits include improvements in linkage between their herds, leading to more accurate EBVs. Breeders also gained first-hand experience with the processes of trait measurement, data management, submission to KIDPLAN and understanding of the results that are generated. This will assist them to increase their own rates of genetic gain and in turn the productivity of the commercial industry that they supply.

The challenge for the goat industry is to continue with the work of the Boer Select Buck Evaluation Program so as not to lose the benefits of the linkage created or the momentum and enthusiasm created by the program.

To ensure that linkage is maintained and continues to be developed it is recommended that breeders are encouraged to undertake their own linkage programs between themselves by using outside genetics or by sharing genetics between groups of breeders. Furthermore, it is recommended that additional buck evaluation programs be investigated in order to increase linkage throughout the industry and involve a larger range of breeders in performance breeding.

Genetic demonstration sites are recommended to be considered in commercial and rangeland environments. Goat producers in these areas will benefit from gaining first-hand experience in the productivity increases that can be achieved by utilising superior, performance bred genetics in their environments. Finding suitable locations and management for such sites will be the necessary first step to ensure such sites are successful.

It is recommended that the indexes currently available to the goat industry through KIDPLAN be reviewed in consultation with breeders to resolve issues surrounding isolating and influencing the composite traits included in Number of Kids Weaned (NKW) to better manage litter sizes and improve the survivability of kids. Breeders are also interested in increasing Fat Depth at 'C' Site (FAT) and there may be some learnings to be taken from the current review of Maternal LAMBPLAN indexes by the Sheep Genetics team.

In addition to the genetic related results and recommendations from the trial, the issues of post weaning nutrition as well kid survival were key issues that were encountered. Recommendations are made to undertake further work in these areas and to consider the research outcomes that have been made in the sheep industry in recent years as to its appropriateness for the goat industry.

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1 Background

The Australian goat seedstock industry is dominated by small producers focusing on selecting animals based on visual traits, with little or no use of objective measurements.

These types of seedstock producers are having limited impact on commercial goatmeat producers in agricultural or rangeland areas, as they see no connection with the type of animal the seedstock producers are breeding with their own commercially focused animals.

This presents a significant challenge to the Australian goatmeat industry as it aims to provide regular supplies of appropriate quality meat, at a competitive price.

Practices adopted in the lamb and beef industries over the past three decades relating to the use of performance recorded animals in commercial environments to improve both the quantity and quality of the product, are yet to be adopted in the goat industry.

KIDPLAN is the goat industry's vehicle to adopt these practices, however until recently it has had very low levels of uptake which is stifling genetic gain in the goat industry, which in turn is impacting on potential productivity and profitability of the goatmeat industry.

MLA had identified this area of work as a key component of its 2012 Goat R&D Strategic Plan. A goal from the plan was increase the number of breeders using KIDPLAN and the establishment of genetic evaluation trials.

As a component of achieving this goal, MLA commenced the Boer Select Buck Evaluation Program in 2013 under the Producer Demonstration Site (PDS) program.

The Boer Select Breeders Group (Boer Select) is a group of dedicated Boer goat seedstock producers that are committed to the adoption of performance breeding in the goat industry.

Boer Select was formed in 2011 and is not a formal organisation or association, but a group of like-minded producers who aim to improve the genetics of the Boer breed and subsequently the rangeland goat herd by supplying commercially focused, performance recorded, fit for purpose animals to commercial herds.

The Boer Select Buck Evaluation Program was aimed at increasing the uptake of KIDPLAN and the monitoring of traits such as carcase attributes, worm resistance and reproduction. The end goal of the program was to improve the genetics of the Boer breed and subsequently the rangeland goat herd by supplying commercially focused, performance recorded, fit for purpose animals to commercial herds.

Specifically, the Boer Select Buck Evaluation Program was designed to showcase the genetics available to commercial goat meat producers that have the potential to increase productivity and therefore profitability in the commercial farming and rangeland environments.

Through the improvement of linkage in the KIDPLAN system, the Boer Select Buck Evaluation Program will also allow breeders to more easily benchmark their own genetics and therefore realise higher rates of genetic gain.

Many breeders are currently only focused on growth. Carcase attributes, worm resistance and reproduction are other important production traits that are currently not commonly recorded due to a lack of understanding in the process of measuring these traits and the cost / benefit relationship of doing so. Including these traits in the program has allowed breeders and the commercial industry to be more informed on the benefits of assessing these traits.

2 Project objectives

Most of the objectives of the program were clearly met and in many cases exceeded. The detail of which is provided below.

1. To provide 8 Boer breeders with direct genetic linkage to KIDPLAN.

Table 2 details the owners of the breeders of the bucks (8 in total) that were entered in the program. With all bucks achieving sufficient progeny to create sound linkage across all traits measured, the owners' herds that those bucks have been used in, now have direct linkage for those traits in KIDPLAN.

The continued development of this linkage needs to be a focus of both the breeders involved in the trial and those that were not. If activities to maintain and improve the linkage created by the trial are not undertaken, the effectiveness of the linkage will decrease over subsequent generations.

Additional trials, similar to this one, would provide the best option to continue to develop linkage.

2. To train 10 goat seedstock enterprises in the principles of objective breeding and selection techniques, data collection, data management and the use of KIDPLAN results.

In addition to the 8 Boer breeders that have bucks entered in the program, there were several other seedstock producers that took an active involvement in the program and were involved in the ongoing discussion within the group in relation to selection techniques, data collection, data management and the use of KIDPLAN results.

In addition, these topics were the focus of the field day held at Condobolin on 23 October 2014, where many other seedstock producers were present and able to seek information in this area.

3. To provide KIDPLAN with a minimum of 320 individual records for progeny on a wide range of traits.

Ultimately 411 individual progeny records were provided to KIDPLAN on a wide range of traits at the yearling stage. Additional traits were provided at younger stages (birth, weaning and post weaning) on an even greater number of animals, however due to losses experienced during the trial, the number of progeny decreased from birth through to the final yearling assessment.

4. To encourage up to 5 group members to undertake their own Artificial Insemination (AI) program in 2014 to further improve industry linkage.

Unfortunately none of the group undertook their own AI program in 2014. This was due to the fact that many of them were waiting for the results of the trial to become clearer before committing to specific bucks. Given most of the group join in autumn, it was perhaps unrealistic to expect them to commit to an AI program using semen from one of the bucks at such an early stage.

It is hoped that going forward into 2015 and beyond that members of the group, as well as those breeders not directly involved in the trial, will continue to build on the linkage that the trial has established.

The sharing of genetics has been greatly enhanced by the establishment of a sire and semen catalogue on the KIDPLAN website. 5 group members have placed available genetics for sale via this method.

The table below details specific milestone criteria to be achieved, whether it was achieved or not and where additional information on the milestone can be located.

Table 1: Milestone criteria

Milestone	Achieved	Further Information
AI program undertaken	Yes	5.3
1st communication story written	Yes	5.9
Kidding completed	Yes	5.4
Kidding results submitted to KIDPLAN	Yes	5.4
Weaning assessment undertaken	Yes	5.5
Weaning results submitted to KIDPLAN	Yes	5.5
Post weaning assessment undertaken	Yes	5.6
Post weaning results submitted to KIDPLAN	Yes	5.6
1st information and data collection day held	No	5.10
Yearling assessment undertaken	Yes	5.7
Yearling results submitted to KIDPLAN	Yes	5.7
2nd information and data collection day held	Yes	5.10
2nd communication story written	Yes	5.9
Final trial results reported	Yes	5.8
On-farm field day completed	Yes	5.8

3 Methodology

During 2012, MLA commenced discussion with the Boer Select group to gauge the interest and practicality of running a buck evaluation program in conjunction with the members of the group and on one of their properties.

These discussions led to the formation of the Boer Select Buck Evaluation Program. Specific detail on the property, seasonal condition and how the trial goats were managed are provided below.

1. Property

For the first half of the trial, the animals were run at “Dudauman Park”, approximately 20kms West of Cootamundra, NSW. Dudauman Park is owned by Colin and Rob Ramsay. The country has rocky hills falling to arable slopes and the rainfall averages 600mm per year but is extremely variable by year and by season.

“Dudauman Park” was sold in late 2013 and the stock were moved in early 2014 to leased country about 20kms away, “Englefield”, near Bethungra, NSW. Weather conditions there are the same as at Dudauman Park but the country is flatter and more arable, with improved pastures, in contrast to the rocky, unimproved pastures of Dudauman Park.

2. Seasonal conditions

2013 was a dry year (375mm) with most of the rain falling in late Autumn and Winter. The 380 Boer does of the breeding herd were mated in April/May 2013 and were maintained on unimproved green pastures of grasses and broadleaf weeds, usually wet.

In early Spring, before kidding started, they were moved to fresh pasture of ryegrass, barley grass, capeweed, paterson’s curse, lucerne and clover, in generally good condition but with some lameness.

The trial kids were born in September and October, initially with ample pasture and milk available.

By November it was becoming dry, and a very hot, dry Summer ensued with feed and water at critical levels by late February 2014. By that time, the kids were in drought-lot with only hay, staying reasonably healthy but losing weight.

A sudden, early Autumn break brought relief in the last days of February, pastures recovered through March and there was an excellent Autumn and Winter with the animals gaining weight and condition into Spring 2014.

3. Does and mating

The Dudauman Park breeding herd (about 380 full-blood and purebred Boer does with a few lower crosses) was committed to the trial.

In 2013, the herd was young with 26% maidens and 30% second-kidders. Nine mating groups of about 40 does were allocated to AI groups by age and index ranking so as each buck was mated to groups that were as close to identical as possible. The remaining 15-20 does were retained for non-trial purposes but continued to run with the same mob.

AI matings were conducted on 10th, 11th and 12th of April 2013 by Paul Hamilton of Semtech, Berwick, Vic, using frozen semen from 7 studs (Cadenza, Winfield, Macgregors, Terraweena,

Davel, Tambookie and Kurrajong) plus fresh semen from a Dudauman buck which was also used as a backup buck to provide data linkage between AI and backup management groups. The Kurrajong semen was from a historical 1997 sire to improve data linkage to the historical KIDPLAN data.

Dudauman bucks were introduced to three backup doe groups on 26th April.

4. Pregnancy and kidding

All does were pregnancy scanned for dries, singles, twins and multiples on 19th June with about 62% reporting pregnant to the AI mating. They were vaccinated (Glanvac 6in1+Sel+B12) a month before start of kidding and drenched with Zolvix two weeks before. The use of Zolvix as a drench for goats requires off label approval by a veterinarian. This was received prior to drenching in all cases throughout the trial.

AI and backup does were kidded in separate but adjacent paddocks of about 25 ha and 15 ha respectively with similar feed. Most AI kids were born from 4th-11th September. Backup kids were mostly born from 26th Sept to 7th October with the weather favourably warm throughout.

Apart from tagging and taking weights within 24 hours of birth, there was no human interference in kidding or kid survival. There were no major weather events but worm burdens built up gradually due to pasture conditions until marking.

Approximately 700 kids were born (in the total kidding group) with about 15% not surviving the first couple of weeks. This percentage of loss is considered usual amongst goat breeders and anecdotal evidence suggests it is in line with industry averages.

All kidding results were submitted to KIDPLAN.

5. Marking and weaning

536 kids were marked on 14th November for a marking rate of 142%. At the same time, scores were recorded for colour, teats, testicles and mouths, and purebred males with serious faults were wethered. There were minor losses as worm burdens built up to over 780 epg but there were delays in treatment due to harvest and the mob (380 does with 530 kids at foot) was drenched with Zolvix on 6th December.

With the weather getting hotter and drier, and no good pasture available, about 519 kids were weaned on 9th January and weighed on 21st January, healthy but light (average WWT of 21.7 kg). In late January they were given their second vaccination (Glanvac 6in1+Sel+B12) and moved into a drought-lot with hay. There were further minor losses and substantial loss of weight; by late March, the average weight had fallen 14% to 18.7kg.

All weaning results were submitted to KIDPLAN.

6. Post weaning

By late March, when the kids were at the post weaning stage, pasture conditions were improving, the kids started recovering, and loss rates stabilised. In early June, 475 kids were weighed for an average of 25.9 kg.

The worm burden was allowed to build up through winter to facilitate Worm Egg Count (WEC) calculations. When individual WEC samples were taken in late July, the worm counts ranged from less than 100 epg to over 5000 epg. The kids were then drenched with Pyrimide 3+ with Se and Co and put on good improved pasture.

All post weaning results, including WEC, were submitted to KIDPLAN.

7. Final yearling assessment

All the trial progeny were classed on 24th September by Allan Casey (NSW DPI), recording scores for 8 visual traits (Jaw, Legs and Feet, Shoulder and Back, Head and Horns, Colour, Non-fibre Pigmentation, Testicles, Udder and Teats) and a Classer's Grade.

On 25th September, Stefan Spiker (Advanced Livestock Services) measured eye-muscle, fat depth, scrotal circumference and weight (average YWT 39.2 kg). The buck average was substantially heavier than does, with bucks averaging approximately 46 kg, wethers 38 kg, does 34 kg.

All yearling results, including carcase scanning, were submitted to KIDPLAN.

8. Trial results and field day

A comprehensive trial report was prepared detailing the process and results from the trial. The report was publically released and distributed at the field day held for the program on 23 October 2014 at the Condobolin Agricultural Research Station. The trial report is attached as an appendix.

The field day attracted approximately 60 attendees. This is considered a good attendance rate given the industry and location. The attendees at the field day represented a reasonable cross-section of the industry, however attendance from rangeland producers was low.

The change of location from the trial property to Condobolin for the field day was made necessary due to the sale of the Ramsay's property where the trial was originally run. The subsequent property purchased by the Ramsay's did not have suitable infrastructure to facilitate the field day.

The Condobolin Agricultural Research Station provided an excellent location for the field day with excellent infrastructure and helpful staff. However, it did present several challenges that needed to be overcome. Firstly, NSW DPI has stringent biosecurity controls in place to protect their research station. This required that the goats were inspected for footrot, as well as receive an additional internal parasite drench, prior to being allowed on the research station.

Whilst the footrot inspection was carried out in conjunction with the visual assessment, the additional drench was a process that was most likely unnecessary from a management perspective and costly to the producer. Furthermore, with limited products available to the producer as part of their drench rotation, this additional drench will result in changes to the rotation in the short term.

The biggest cost of the change of venue of the field day was the transport costs of taking the goats to and from Condobolin. This cost was borne by the Ramsay's and was considerable.

At the field day the goats were penned in individual sire groups with EBV and visual information provided for each.

The trial report circulated at the field day (attached as an Appendix) included information on the process of the trial, the entrants and the results.

Feedback from the attendees has been very positive with one attendee commenting via email, "Thanks for a good day, best goat field day that I have been to, we started in goats in 2000."

9. Communications

Three communication stories were prepared throughout the course of the program and published to the industry.

In April 2013, an article was written for the Goats on the Move newsletter. This article was designed to provide an introduction to the program and outline the objectives of the trial.

A trial update story was prepared in July 2014 and also released Goats on the Move.

Finally a story was prepared for Goats on the Move in September 2014 to provide awareness of the final results and the upcoming field day.

10. Information and data collection days

The first information and data collection day was planned for April 2014 when the post weaning assessment was originally planned. Unfortunately this was not possible, as due to seasonal conditions WECs remained very low and their collection was not possible until late winter. At this stage it was decided to combine the 2 information and data collection days.

The information and data collection days were held in conjunction with the yearling assessment in September 2014. This gave entrants and other interested people first-hand experience of the processes involved.

11. Goat industry webinar

In November 2014 a webinar was held in which the results from the trial were promoted to the industry, together with some general information and advice in relation to genetics.

The webinar provided an excellent opportunity for producers that were unable to attend the field day to gain first-hand knowledge of genetics and the relevance of the trial to their own business.

12. Slaughter of wethers and cull goats

At the conclusion of the trial an option to slaughter the wethers, cull does and cull bucks, to gain some carcase information was examined. Whilst not in the original trial design, it was considered a useful ‘add-on’ to measure traits such as carcase yield, fat, eye muscle depth, and meat colour on the limited number of animals available, if the exercise could be done cost effectively.

Ultimately this activity was not undertaken due to the lack of a nearby processor willing to cut the carcases in order for the appropriate measurements to be made. Whilst carcase weight could have been recorded, providing a yield result, it was considered that the exercise was too expensive for such a small return. Likewise, the transport of such a small number of goats to a processor further away that was prepared to cut the carcases, was also deemed too expensive for the limited data that would be gained from the small number of animals.

Table 2: Bucks details entered in trial

Breeders herd, Buck name KIDPLAN ID	**Owner Details**
Terraweena, Abraham ABM-3255 360ABM2003033255	**Celia Burnett-Smith** 13803 New England Hwy, Cambooya, Qld 4358 M: 0407 739 484, E: boergoat@terraweena.com W: www.terramacboers.com
MacGregors, Karoo TI-7132 360ABM2007077132	**Fleur Tarlinton** 13803 New England Hwy, Cambooya, Qld 4358 P: 07 4696 1122, M: 0419 770 364, E: tarlinton@optusnet.com.au W: www.terramacboers.com
Cadenza, Bart CA-0006 360CA12010100006	**Carole Axton** 26 Sibbald Lane, Stratford, Vic 3862 P: 03 5145 6259, M: 0429 661 369, E: cadenzaboers@bigpond.com W: www.cadenzaboergoats.com
Cadenza, Barney CA-0058 360CA12010100058	**Carole Axton** 26 Sibbald Lane, Stratford, Vic 3862 P: 03 5145 6259, M: 0429 661 369, E: cadenzaboers@bigpond.com W: www.cadenzaboergoats.com
Dudauman Park, Digger DPK-9167 360DPK2009099167	**Colin & Rob Ramsay** East Bland Station, Morangarell Road, Quandialla, NSW M: 0417 404 799, E: colin.ramsay@bigpond.com W: www.dudaumanpark.com
Dudauman Park, Shosa DPK-0018 360DPK2010000018	**Colin & Rob Ramsay** East Bland Station, Morangarell Road, Quandialla, NSW M: 0417 404 799, E: colin.ramsay@bigpond.com W: www.dudaumanpark.com
Dudauman Park, Aryan DPK-0215 360DPK2010000215	**Colin & Rob Ramsay** East Bland Station, Morangarell Road, Quandialla, NSW M: 0417 404 799, E: colin.ramsay@bigpond.com W: www.dudaumanpark.com
Kurrajong, Peter KHB-1072* 360KHB1997971072	**Peter & Jeanette Firth** (No longer in industry)
Davel, Nixon RAD-0361 360RAD2003030361	**Ayala Davies** 7/50 Spinifex Avenue, Tea Gardens, NSW 2324 P: 02 4910 0197 , E: davies@hermitage55.com.au
Tambookie, Gordon TAM-8029 360TAM2008088029	**Isobel & Ian Palmer** RMB 1244 Boyup Brook Rd, Mumballup, WA 6225 P: 08 9732 2142, E: tambookie@activ8.net.au
Winfield, Sam WIN-9089 360WFD2009099089	**Heather Osborn** Merrimans Farm, PO Box 701, Sale, Vic 3850 P: 03 5146 8234, F: 03 5146 8234

***** Historical buck used to provide linkage to previous KIDPLAN records

Table 3: Assessment and management program

Activity		**Date/s**	**Age** (average)
Selection of does		1 March 2013	
AI of does		10 – 12 April 2013	
Backup bucks joined		26 April 2013	
Pregnancy scanning		19 June 2013	
AI Kidding: start – finish		31 August - 13 September 2013	
Backup Kidding: start – finish		20 September – 7 October 2013	
Marked kids		14 November 2013	60 days
Weaning		9 January 2014	116 days
Body weighing	W P P Y	21 January 2014 18 March 2014 5 June 2014 25 September 2014	4 months 6 months 9 months 12 months
Worm egg count sampling	Y	22 July 2014	10 months
Visual Trait Assessment	Y	24 September 2014	12 months
Carcase Scanning	Y	25 September 2014	12 months
Vaccination		14 November 2013 (Glanvac 3in1) 25 January 2014 (Glanvac 6in1+Sel+B12)	
Drench		6 December 2013 (Zolvix) 27 July 2014 (Prymide) 15 October 2014 (Dectomax Injection)	
Supplementary feeding		Confined to drought lot during February 2014	
Field day		23 October 2014 (Condobolin)	

4 Results

Table 4 shows Estimated Breeding Values (EBVs) calculated by Sheep Genetics for the bucks evaluated in this report. The EBVs are based on all available information each buck has in KIDPLAN, not just the results of this trial.

EBVs express the expected performance of progeny of a buck relative to another buck in the evaluation when mated to the same standard of does. EBVs improve the accuracy of buck results because they account for the heritability of the different traits, the association between traits, adjustment for birth type and rear type effects and the performance of all known relatives that a buck has in the analysis as well as that animals own performance for a trait.

The highest 2 performing bucks (or more if their performance is equal) for each trait and index (trait leaders) are highlighted by shading.

The index values reported are based on measured trait EBV performance with varying emphasis on key traits. See following information for index descriptions.

Table 4: Measured Traits, Indexes and Classer's Grade

Breeders herd, Buck name	Number of progeny	Estimated Breeding Values								Indexes		Classer's Grade[1]	
		WT kg				FAT mm	EMD mm	SC cm	WEC %	SRC $	C+ $	Tops %	Culls %
		B^	W	P	Y	Y	Y	Y	P			Y	Y
Terraweena, Abraham ABM-3255	32	-0.1	-0.2	-0.3	0.3	0.7	0.4	0.1	15	100	100	-13	-8
MacGregors, Karoo TI-7132	23	0.0	1.3	2.4	3.9	0.5	1.1	0.6	4	105	120	13	-4
Cadenza, Bart CA-0006	39	0.1	1.8	2.7	3.2	0.3	0.0	0.9	45	104	113	3	-7
Cadenza, Barney CA-0058	19	0.3	1.3	2.0	1.9	-0.3	0.3	0.7	5	104	114	-4	-1
Dudauman Park, Digger DPK-9167	60	-0.1	0.6	1.5	1.8	0.3	0.0	-0.9	2	97	105	0	5
Dudauman Park, Shosa DPK-0018	46	0.2	0.4	0.0	0.7	-0.4	-0.3	0.0	0	89	99	-3	5
Dudauman Park, Aryan DPK-0215	41	0.0	-1.2	-1.3	-0.1	0.2	-0.2	-0.3	-30	88	89	-4	7
Kurrajong, Peter KHB-1072	33	0.4	1.1	1.9	2.2	-0.2	-0.2	-0.3	2	102	108	-2	7
Davel, Nixon RAD-0361	42	-0.1	0.3	1.0	2.2	-0.4	0.0	0.9	35	102	105	5	4
Tambookie, Gordon TAM-8029	31	0.1	1.5	3.4	4.8	0.3	0.8	0.3	-3	107	122	16	-7
Winfield, Sam WIN-9089	48	0.0	0.2	-0.3	-0.5	0.9	0.8	-0.2	-19	95	104	-6	-7

^ B = Birth (0 to 24 hours) W = Weaning (42 to 120 days); P = Post Weaning (210 to 300 days); Y = Yearling (300 to 400 days)

[1] Classer's Grade is expressed as the percentage deviation of average Tops% and Culls%.

A full explanation of traits and stages is provided on the next page.

Table 5: Explanation of Traits

Number of progeny:	The number of progeny a buck had in the trial at the final assessment.
Estimated Breeding Values:	Estimated Breeding Values (EBVs) calculated by Sheep Genetics for the bucks evaluated in this report. EBVs describe the relative breeding value (genetic performance) of the bucks. A buck passes half of its genes on to its progeny, therefore half of the EBV is passed on. EBVs do not necessarily reflect the buck's observed performance, which is a combination of both genetic and environmental influences. EBVs are an estimate of the genetic component of the buck's performance.
Traits: Abbreviation, trait and the (units reported)	WT: Body weight (kg) EMD: Eye muscle depth at the 'C' site (mm) FAT: Fat depth at the 'C' site (mm) WEC: Worm egg count (% deviation in worm burden of sire's progeny) SC: Scrotal circumference (cm) NKW: Number of Kids Weaned (%) MWWT: Maternal Weaning Weight (kg)
Age at assessment:	B = Birth - 0 to 24 hours W = Weaning - 42 to 120 days (6 weeks to 4 months of age) P = Post Weaning - 210 to 300 days (7 to 10 months of age) Y = Yearling - 300 to 400 days (10 to 13 months of age)
Indexes:	**SRC: Self Replacing Index** Based on a self-replacing herd with a strong emphasis on growth and carcase traits. This index places emphasis on BWT, WWT, MWWT, PWT, PEMD, PFAT, NKW and PWEC. **C+: Carcase Plus Index** Based on a meat production herd that seeks to produce goats with high growth and muscle, while maintaining carcase leanness. This index places emphasis on WWT, PWT, PEMD and PFAT.
Classer's Grade:	A classer grades all progeny as either, Tops, Flocks or Culls based on their visual assessment of all traits relative to the site's Breeding Objective (see page 7). The percentage deviation from the average of Tops and Culls is presented in this report.

In addition to EBVs, the average performance of all the progeny of a buck was also calculated. No account was made for factors that can improve the breeding value accuracy.

Table 6: Buck Averages

Breeders herd, Buck name	Number of progeny	Litter Size	Sire Averages (deviations from the average)						
			WT kg				FAT mm	EMD mm	SC cm
			B^	W	P	Y	Y	Y	Y
Terraweena, Abraham ABM-3255	32	2.4	-0.2	-0.9	-0.3	-0.1	0.1	-0.1	-0.2
MacGregors, Karoo TI-7132	23	2.4	-0.1	1.3	1.1	1.3	0.2	1.4	0.5
Cadenza, Bart CA-0006	39	2.2	-0.2	1.1	1.1	2.5	0.2	0.2	-0.1
Cadenza, Barney CA-0058	19	1.5	0.7	2.7	2.6	3.8	0.1	1.4	1.2
Dudauman Park, Digger DPK-9167	60	2.0	0.0	-0.5	0.1	-1.2	-0.1	-0.7	-0.6
Dudauman Park, Shosa DPK-0018	46	2.0	0.3	-0.9	-0.1	-0.9	-0.1	-0.7	0.0
Dudauman Park, Aryan DPK-0215	41	2.0	0.2	-1.8	-1.9	-2.4	0.0	-1.2	0.0
Kurrajong, Peter KHB-1072	33	2.3	0.0	0.0	-0.8	-0.8	0.0	-0.7	-0.6
Davel, Nixon RAD-0361	42	2.2	-0.3	-0.7	0.4	0.4	0.0	0.1	0.0
Tambookie, Gordon TAM-8029	31	2.1	-0.1	-0.5	-0.7	-0.1	0.0	0.6	-0.4
Winfield, Sam WIN-9089	48	2.1	-0.1	0.2	-1.1	-2.5	-0.1	-0.1	-0.2
Average Performance	**38**	**2.1**	**3.6**	**21.4**	**25.7**	**39.6**	**1.9**	**23.1**	**27.1**

^ B = Birth (0 to 24 hours) W = Weaning (42 to 120 days); P = Post Weaning (210 to 300 days); Y = Yearling (300 to 400 days)

A range of visual traits were also scored by Allan Casey (NSW DPI) with support from Sally Martin (Sally Martin Consulting) and Ben Swain (BCS Agribusiness). These traits were scored against a set of “Visual Goat Scores” that were established as part of the program. A copy of the “Visual Goat Scores” are attached as an Appendix. A summary of the “Visual Goat Scores” is provided below:

Table 7: Summary of “Visual Goat Scores”

Jaw and Teeth	Soundness of the jaw structure, including the alignment of the lower jaw and its teeth relative to the top jaw and its pad that the lower teeth bite onto, the placement of the teeth, structure of the muzzle and lower jaw. **1** (very well aligned) to **5** (heavily undershot or overshot).
Legs and Feet	Soundness of the front and back leg and feet structure, in particular the orientation of the legs, the angulation of the hocks and pasterns to the feet and the shape of hoof and toes. **1** (very straight) to **5** (very angulated).
Shoulders and Back	Soundness of the shoulder blades, their positioning in relation to the neck and spine and the shape of the topline. **1** (very square) to **5** (very dipped or high).
Head and Horns	Shape of the head and placement of horns. **1** (wide head, horns set well apart) to **5** (narrow head, horns that are set very close together?
Colour	The closeness of the goats hair colour to the Boer breed standard. **1** (red-brown head and a white body) to **5** (Largely or entirely solid colours).
Non-fibre pigmentation	The percentage of pigmentation on two areas, the bare skin under the tail and hooves. **1** (75 to 100% pigmented area on both of the bare skin areas) to **5** (0% pigmentation on any the bare skin areas).
Udder and Teats	Shape and soundness of the udder plus the number, placement and shape of the teats.**1** (well shaped, even udder with up to 2 teats on either side) to **5** (uneven udder with more than 2 teats on either side).
Testicles	Structure and soundness of the testicles and scrotum. **1** (large, no spilt in scrotum) to **5** (small, twisted or excessive split in scrotum).

The following tables detail the results for each of the traits assessed. A deviation from the average trait score for all progeny is reported as well as the percentage of the buck’s progeny recorded for each trait.

The highest 2 performing bucks (or more if their performance is equal) for each trait and (trait leaders) are highlighted by shading.

For the majority of breeder’s objectives a negative deviation would be considered favourable and the larger the deviation the better.

Table 8: Visual trait assessments – Conformation

Breeders herd, Buck name	Conformation																							
	Jaw						Legs and Feet						Shoulder and Back						Head and Horns					
	Dev	1	2	3	4	5	Dev	1	2	3	4	5	Dev	1	2	3	4	5	Dev	1	2	3	4	5
Terraweena, Abraham ABM-3255	0.0	100	0	0	0	0	-0.3	55	30	9	6	0	-0.1	88	9	3	0	0	-0.1	36	64	0	0	0
MacGregors, Karoo TI-7132	0.0	100	0	0	0	0	0.0	48	26	17	4	4	0.0	87	4	9	0	0	-0.2	43	52	4	0	0
Cadenza, Bart CA-0006	0.0	100	0	0	0	0	-0.2	49	33	15	3	0	0.0	85	5	10	0	0	0.1	23	64	10	3	0
Cadenza, Barney CA-0058	0.0	100	0	0	0	0	-0.2	63	5	21	11	0	-0.2	95	5	0	0	0	0.1	26	58	16	0	0
Dudauman Park, Digger DPK-9167	0.0	98	0	0	0	2	-0.1	52	17	23	8	0	0.1	77	13	7	3	0	0.0	42	42	17	0	0
Dudauman Park, Shosa DPK-0018	0.0	100	0	0	0	0	0.3	24	37	26	11	2	0.0	85	9	4	2	0	0.0	35	57	9	0	0
Dudauman Park, Aryan DPK-0215	0.2	95	0	0	0	5	-0.1	46	24	24	5	0	0.0	88	0	12	0	0	0.2	27	51	17	5	0
Kurrajong, Peter KHB-1072	0.0	100	0	0	0	0	-0.1	61	9	18	12	0	-0.1	91	3	6	0	0	-0.2	45	48	6	0	0
Davel, Nixon RAD-0361	0.0	100	0	0	0	0	0.4	26	31	24	17	2	-0.1	95	0	5	0	0	0.1	31	50	17	2	0
Tambookie, Gordon TAM-8029	0.0	97	0	3	0	0	-0.1	45	26	29	0	0	0.0	84	6	10	0	0	-0.2	55	35	10	0	0
Winfield, Sam WIN-9089	0.0	100	0	0	0	0	0.1	44	21	21	10	4	0.1	79	10	8	2	0	0.0	35	52	10	2	0
Average performance	**1.0**	**99**	**0**	**0**	**0**	**1**	**2.0**	**45**	**24**	**21**	**8**	**1**	**1.2**	**86**	**7**	**7**	**1**	**0**	**1.8**	**36**	**52**	**11**	**1**	**0**

Table 9: Visual trait assessments – Colour and Pigmentation

Breeders herd, Buck name	Colour and Pigmentation											
	Colour						Non-fibre pigmentation					
	Dev	1	2	3	4	5	Dev	1	2	3	4	5
Terraweena, Abraham ABM-3255	0.2	58	21	9	3	9	-0.1	88	9	0	3	0
MacGregors, Karoo TI-7132	-0.1	74	13	0	4	9	0.0	87	9	0	4	0
Cadenza, Bart CA-0006	-0.1	59	28	10	3	0	-0.1	95	0	3	3	0
Cadenza, Barney CA-0058	-0.4	89	0	5	5	0	0.1	89	0	5	0	5
Dudauman Park, Digger DPK-9167	-0.1	72	15	5	3	5	0.2	78	8	5	5	3
Dudauman Park, Shosa DPK-0018	0.1	65	17	4	7	7	0.2	85	2	4	4	4
Dudauman Park, Aryan DPK-0215	0.5	46	24	10	10	10	0.4	76	7	7	0	10
Kurrajong, Peter KHB-1072	0.3	61	12	12	0	15	-0.2	94	6	0	0	0
Davel, Nixon RAD-0361	-0.2	62	26	12	0	0	-0.2	100	0	0	0	0
Tambookie, Gordon TAM-8029	0.0	58	29	3	3	6	-0.2	97	0	3	0	0
Winfield, Sam WIN-9089	-0.3	75	19	0	4	2	-0.1	92	6	2	0	0
Average performance	**1.7**	**65**	**20**	**7**	**4**	**6**	**1.2**	**88**	**5**	**3**	**2**	**2**

Table 10: Visual trait assessments – Reproduction

Breeders herd, Buck name	Reproduction											
	Testicles						Udder and Teats					
	Dev	1	2	3	4	5	Dev	1	2	3	4	5
Terraweena, Abraham ABM-3255	-0.2	100	0	0	0	0	-0.1	80	10	10	0	0
MacGregors, Karoo TI-7132	0.3	88	0	0	0	13	0.0	86	0	7	0	7
Cadenza, Bart CA-0006	0.2	91	0	0	0	9	-0.4	100	0	0	0	0
Cadenza, Barney CA-0058	-0.2	100	0	0	0	0	0.4	71	0	14	0	14
Dudauman Park, Digger DPK-9167	-0.2	100	0	0	0	0	0.0	86	4	4	0	7
Dudauman Park, Shosa DPK-0018	0.0	95	0	0	0	5	-0.1	93	0	0	0	7
Dudauman Park, Aryan DPK-0215	0.0	92	0	8	0	0	0.2	76	0	18	0	6
Kurrajong, Peter KHB-1072	0.5	83	0	0	0	17	0.3	75	5	0	10	10
Davel, Nixon RAD-0361	-0.2	100	0	0	0	0	-0.1	91	0	0	0	9
Tambookie, Gordon TAM-8029	-0.3	100	0	0	0	0	0.0	88	0	6	0	6
Winfield, Sam WIN-9089	0.1	94	0	0	0	6	0.0	83	4	0	9	4
Average performance	**1.2**	**95**	**0**	**1**	**0**	**4**	**1.4**	**85**	**2**	**4**	**2**	**6**

5 Discussion/conclusion

The majority of the project objectives and milestones were met. Results were published on genetic performance of the bucks and commercial producers made aware of the benefits that genetics can bring to their own enterprises.

In addition to this, there were several other outcomes that the program delivered that were noted by the producer group. Whilst not all based on genetics, they are important observations / findings from the trial. They included:

1. Post weaner nutrition

The property on which the trial was run operates their goat enterprise similarly to their main sheep enterprise. That is, as commercially as possible with no unnecessary interventions other than tagging and weighing at birth and other measurement processes as dictated by the trial design. The goats are not routinely supplementary fed and survive on paddock feed only.

The season that the trial was presented with was a roller-coaster. Kidding conditions were good, however by the time weaning came around the conditions had deteriorated significantly to the point where the progeny were weaned into drought lots in February 2014. At this stage the progeny slipped in condition and lost weight.

Whilst the progeny recovered later in the trial when pasture conditions improved, it is apparent that they probably would have done better if they were fed a higher diet post weaning and had not lost weight.

As all progeny were treated the same, there was no effect on the genetic outcomes, however post weaning nutritional management of the progeny is an area in which the trial manager (owner of goats), as well the broader group, believe there is currently a knowledge gap in and is an area which is particularly important for goat breeders to understand both the short term and long term effects of.

2. Genetic variability

The genetic variability between the sire groups for the traits measured and scored was high.

At the beginning of the trial, the producers involved were looking for the highest performing buck, or the buck that they would all use in their own programs. However, as is the case in all genetic evaluation programs, there was no one trait leader across the board. Rather, individual bucks displayed different results for specific traits. Meaning that the majority of the bucks in the trial are useful for different purposes.

This finding led the group to coin the phrase ‘bucks fit for purpose’, or select the right buck with the right attributes for the right job.

What is clear from the trial, is the large variation in genetics that is currently being bred and used in the goat industry. This presents great opportunities for breeders to select animals based on this genetic variability and to make rapid and large genetic gain in a range of traits.

3. Kid survival

Kid survival emerged as a particularly interesting and important area. Goats habitually produce twins and triplets, however perinatal losses of between 10-50% are common, according to breeders. In this trial, the main losses were immediately after birth – kids born but not cleaned

and raised or dying within days of birth. Aggregate losses to weaning were sire-dependent - typically 24-29% for most sires but one sire lost 36% of his kids and another only 15%. There are evidently big gains to be made by understanding this better.

An area that should be of particular interest to examine is that of kid survival in relation to maternal effects and the contribution that the dam's sire makes to the trait.

4. Indexes

Some trial participants, as well as field day attendees, commented on the use of the 2 standard indexes in the report. The general consensus was that whilst publishing the Self Replacing and Carcase Plus indexes were better than having no indexes at all included, it was considered by many that they were merely copied from the lamb industry without any acknowledgement or understanding of the many differences between the lamb and goat industries.

There are issues surrounding isolating and influencing the composite traits included in Number of Kids Weaned (NKW) to better manage litter sizes and improve the survivability of kids. Several breeders involved in this program have voiced practical and welfare based concerns with managing litters of kids that can be as high as 4 or 5 and the response to this has been to target a decrease in the NKW.

This is not ideal given the number of saleable animals is a primary profit driver for producers. Currently NKW is a composite trait that includes fertility, fecundity/litter size and kid survival. Ideally each trait would be reported separately and the Sheep Genetics team is currently working to develop methods to allow this. However, at this stage NKW is the only option and unfortunately by selecting for lower NKW the producer could be decreasing any one, or all, of these component traits.

Breeders are also interested in increasing Fat Depth at 'C' Site (FAT) and there may be some learnings to be taken from the current review of Maternal LAMBPLAN indexes by the Sheep Genetics team.

As such, there appears to be a strong case for the review of the KIDPLAN indexes in line with breeder's requirements and new developments identified above, which may have some reasonable application for the goat industry.

6 Recommendations

1. Linkage

For the trial to have long lasting effects, the linkage that it has created needs to continue to be developed. There are two ways in which it is recommended that MLA achieve this goal.

a. Encourage independent linkage between the group

It is recommended that breeders who entered bucks in the trial, together with those outside of the trial, are encouraged to utilise at least one of the bucks entered in the trial (that they don't own) in their own herds over the next 2-3 years. This will ensure contemporary linkage is maintained at least in the short term.

Whilst linkage could also be achieved by any buck having progeny in more than one herd or by using the son of a link buck, it is considered appropriate to use one the trial bucks as they have been thoroughly performance recorded in an independent trial and can be used specifically to improve one or more traits in other herds.

In order to do this MLA should consider promoting the results of the trial more widely and funding the development of a genetic advisory service to assist breeders in understanding the results and to select a buck that matches their breeding objective. This genetic advisory service could use the existing network of genetic service providers that currently service the sheep industry to meet with goat breeders and to provide services in the area of genetic selection.

Whilst funds would be required to subsidise this service, at least in the short term, it does offer MLA a low cost option to leverage of the linkage already generated by the trial.

b. Run one or more additional buck evaluation trials

By duplicating the Boer Select Buck Evaluation Program in different areas, further linkage would continue to be developed. Ideally, the bucks entered in further evaluation trials would come from different seedstock breeders in order to increase the effectiveness of the linkage. "Link Bucks" would need to be included in the trial design to ensure that linkage to the current trial is maintained.

Further buck evaluation trials would not only provide increased linkage but would expose a greater number of breeders to the processes of performance breeding which would ultimately lead to a greater uptake of KIDPLAN.

Perhaps the biggest challenge in running further buck evaluation trials is locating suitable commercial goat breeders that are willing to host a trial on their property. To run a trial with 10-12 bucks entered, at least 400-500 commercial does would be required.

In order to address these challenges, it is recommended that MLA fund the completion of a scoping study into the feasibility of running further buck evaluation trials in differing locations around Australia.

2. Extension of superior genetics into the commercial and rangeland environment

The largest impact that high performance genetics will have on the goat industry is through the commercial adoption of those genetics in the commercial and rangeland environments. High performance genetics will lead to commercial animals with higher growth rates, better carcase characteristics and less animal welfare issues than what is currently being bred for the commodity driven goat meat industry.

In order to encourage the uptake of performance bred genetics in the commercial and rangeland environment, demonstrations of its potential needs to be made in those environments.

Ideally, a demonstration trial run in the commercial or rangeland environment would be commenced that joined bucks bred in a performance selection based system to large numbers of commercial does (rangeland or crossbred). The performance of the progeny resulting from this joining would be compared with 'control' progeny, or those from the traditional non-selective joining. A range of performance traits would be measured, including carcase characteristics.

Similarly to commencing additional buck evaluation trials, perhaps the largest challenge in this area is finding a suitable property and manager to run the demonstration trial. Therefore, it is recommended that MLA fund the completion of a scoping study into the feasibility of running a demonstration trial to showcase the benefits of using high performance genetics in the commercial or rangeland environment.

3. Visual goat scores

The Visual Goat Scores developed as part of the project were based on the needs of the trial and possibly do not accommodate the entire requirements of the industry. For this reason it is recommended that the Visual Goat Score be further developed prior to being released to the industry.

4. Review of indexes

The KIDPLAN indexes currently available to the goat industry appear, at least partly, to be at odds with what many goat breeders are aiming to do with their herds.

It is that recommended that MLA, either directly or through Sheep Genetics, instigates a review of the current KIDPLAN indexes, through engaging with breeders and collating their feedback, in order to establish and promote a range of new goat industry specific indexes that better match the common breeding objectives in use throughout the industry.

5. Post weaning nutrition

The project highlighted the sensitively to nutrition in the post weaning stage to the overall productivity of the animal and therefore the profitability of the goat enterprise. Post weaning management has been a major focus of the sheep industry over the last 5 years, with resulting decreased weaner mortality and increase productivity being achieved across many sectors of the industry.

It is recommended that a similar focus be provided to the goat industry to examine management practices that could improve weaner growth rates and subsequent survival throughout the goat industry. In many cases, these may be in line with sheep practices and could simply be extended to goat producers.

6. Kid survival

The period from birth to weaning, in particular immediately after birth is a key area of productivity loss in the goat industry. Again, this has been a major focus of the sheep industry over recent years with has resulted in many newly developed management practices now being common place on commercial sheep properties.

It is recommended that further work is carried out to determine the most likely reasons for kid losses in the immediate post birth stage and to extend to producers the key management practices that they can be put in place to limit this loss.

7 Appendices

7.1. Appendix – Visual goat scores

Visual Goat Scores

October 2014

Summary

Trait Name	Trait Abbreviation	Stage recorded from	Scores to be used	Page
Jaw and Teeth	JAW	Weaning	A single score of 1, 2, 3, 4 or 5	3
Head and Horns	HEAD	Post weaning	A single score of 1, 2, 3, 4 or 5	4
Shoulders and Back	BACK	Post weaning	A single score of 1, 2, 3, 4 or 5	5
Legs and Feet	LEGS	Weaning	A single score of 1, 2, 3, 4 or 5	6
Colour	COL	Weaning	A single score of 1, 2, 3, 4 or 5	7
Non-fibre pigmentation	NFPIG	Weaning	A single score of 1, 2, 3, 4 or 5	8
Udder and Teats	UDDER	Weaning	A single score of 1, 2, 3, 4 or 5	9
Testicles	TEST	Weaning	A single score of 1, 2, 3, 4 or 5	10
Hocks	HOCK	Weaning	A single score of 1, 2, 3, 4 or 5	11
Classer’s Grade	GRADE	Post weaning	A single score of 1, 3 or 5	12

Stage Codes

Stage Name	Code	Age*
Birth	B	Birth to 24 hours
Weaning	W	42-120 days (7-16 weeks)
Early post weaning	E	120-210 days (4-7 months)
Post weaning	P	210-300 days (7-10 months)
Yearling	Y	300-400 days (10-13 months)
Hogget	H	400-540 days (13-18 months)
Adult	A	540 days or older (18 months or older)

* The average age of the goats in the management group.

Trait Name	Jaw and Teeth	**How to Score**	A single score of 1, 2, 3, 4 or 5
Trait Abbreviation	JAW	**Rule of Thumb**	The upper and lower jaws of a Score 1 goat line up squarely at the teeth i.e. teeth rest 'on the pad' with a wide muzzle and lower jaw, whereas a Score 5 goat has either a heavily 'overshot' jaw, a heavily 'undershot' jaw, severely misplaced teeth or a narrow muzzle and lower jaw.
Stage	Weaning onwards		
Description	Jaw and Teeth is a combined trait. It refers to the soundness of the jaw structure, including the alignment of the lower jaw and its teeth relative to the top jaw and its pad that the lower teeth bite onto, the placement of the teeth, structure of the muzzle and lower jaw.		

Score 1	Score 2	Score 3	Score 4	Score 5
Upper and lower jaws line up squarely at the teeth i.e. teeth rest 'on the pad'. Teeth properly placed and developed for the age. Wide muzzle and lower jaw.		Jaw is slightly 'undershot' or 'overshot'; lower jaw is slightly shorter or longer than the upper jaw and as a result the teeth are either slightly behind or in front of the pad. Narrow muzzle and lower jaw.		Heavily 'undershot' or 'overshot' jaw; lower jaw is significantly shorter or longer than the upper jaw and as a result the teeth are either well behind or in front of the pad. Teeth badly misplaced. Very narrow muzzle and lower jaw.

Trait Name	Head and Horns	**How to Score**	A single score of 1, 2, 3, 4 or 5.
Trait Abbreviation	HEAD	**Rule of Thumb**	A goat with Score 1 has a wide head and horns that are set well apart and curve backwards leaving a wide gap between the horns and the head. A Score 5 goat has a narrow head shape, or horns that are set very close together or do not leave a gap between the horns and the head.
Stage	Post weaning onwards		
Description	Shape of the head and placement of horns.		

Score 1	Score 2	Score 3	Score 4	Score 5
Wide head. Horns that are set well apart, curve backwards and leave a wide gap between the horns and the head.		Slightly narrow head. Horns that are set slightly close together or leave only a narrow gap between the horns and the head.		Narrow head. Horns that are set very close together, do not curve backwards, or do not leave a gap between the horns and the head.

Trait Name	Shoulders and Back	**How to Score**	A single score of 1, 2, 3, 4 or 5.
Trait Abbreviation	BACK	**Rule of Thumb**	A goat with Score 1 has firm and angular shoulders and a straight back between the top of the shoulder blades and hips. A Score 5 goat has shoulder blades that are loose or sit well above (or well below) the spine or an extremely 'dipped' backline, or a very steep rump.
Stage	Post weaning onwards		
Description	Shoulders and Back is a combined trait. It refers to the soundness of the shoulder blades, their positioning in relation to the neck and spine and the shape of the topline.		

Score 1	Score 2	Score 3	Score 4	Score 5
Shoulder blades are firmly attached and sit squarely either side of the spine, i.e. no trough or ridge between the shoulders; back straight or slight smooth curve between shoulders and hips and a well-rounded rump.		Shoulders positioned below the spine to create a 'ridge' or above the spine to create a 'trough' between the shoulder blades; back dips moderately behind the shoulders (relative to the shoulders and hips). Rump moderately steep and rounded.		Extremely high and wide shoulder blades that are loose and create a deep 'trough' above the spine or extremely low and narrow shoulder blades that create a sharp 'ridge' above the spine and /or back dips severely behind the shoulders (relative to the shoulders and hips). Short rump falls away steeply.

Trait Name	Legs and Feet	**How to Score**	A single score of 1, 2, 3, 4 or 5. The highest score across the leg and feet component of all four legs is recorded.
Trait Abbreviation	LEGS	**Rule of Thumb**	If the hocks and pasterns of the back legs and feet have moderate angulation (Score 1), but the pasterns of the front legs have extreme angulation (Score 5), then Score 5 is the overall score recorded for the trait.
Stage	Weaning onwards		
Description	Legs and Feet is a combined trait. It refers to the overall soundness of the front and back leg and feet structure, in particular the orientation of the legs, the angulation of the hocks and pasterns to the feet and the shape of hoof and toes.		

Score 1	Score 2	Score 3	Score 4	Score 5
Straight legs that stand squarely on their feet; no distortion of the hoof shape; moderate angulation of hock and pastern.		Significant hock angulation, and/or legs and feet orientating slightly inwards or outwards, and/or moderate distortion of the hoof shape, and/or significant, or small angulation of the pasterns.		Extreme hock angulation, and/or legs and feet orientating inwards with hocks touching or ‘bowed’ outwards, and/or extreme distortion of the hoof shape, including long toes, and/or extreme, very small or no angulation of the pasterns.

Trait Name	Colour	**How to Score**	A single score of 1, 2, 3, 4 or 5.
Trait Abbreviation	COL	**Rule of Thumb**	A Score 1 goat has colour that exactly matches the Boer breed standard. A Score 5 goat has colour that in no way resembles the Boer breed standard.
Stage	Weaning onwards		
Description	Colour refers to the closeness of the goats hair colour to the Boer breed standard. *This Visual Score should only be used for Boer goats. A different scoring system should be used for other breeds.*		

Score 1	Score 2	Score 3	Score 4	Score 5
A red-brown head and a white body.	As score 1 but with patch/es of red-brown on the white area that in total add up to 100mm in diameter. Or more than 70% of the red-brown area of the head, white in colour.	Minor patches, spots or colour difference over the entire body.	Substantial patches, spots or colour difference over the entire body. Does not conform at all to the Boer breed standard.	Largely or entirely solid colours with no shading in the head area normally red-brown.

Trait Name	Non-fibre Pigmentation	**How to Score**	A single score of 1, 2, 3, 4 or 5, is recorded for two **sites** – hooves and under tail.
Trait Abbreviation	NFPIG	**Rule of Thumb**	A Score 5 goat has no pigmentation on the bare skin under the tail or hoofs. If a goat has 50-74% (Score 2) of the total hoof area pigmented but has no pigmentation (Score 5) under the tail, then Score 5 is the overall score recorded for the trait.
Stage	Weaning onwards		
Description	Non-fibre pigmentation refers to the percentage of pigmentation on two areas, the bare skin under the tail and hooves.		

Score 1	Score 2	Score 3	Score 4	Score 5
75–100% pigmentation on the bare area under the tail and/or 75-100% of the total hoof area.	50–74% pigmentation on the bare area under the tail and/or 50-74% of the total hoof area.	25–49% pigmentation on the bare area under the tail and/or 25-49% of the total hoof area.	1–24% pigmentation on the bare area under the tail and/or 1-24% of the total hoof area.	No pigmentation on the bare area under the tail and no pigmentation on on hooves.

Trait Name	Udder and Teats	**How to Score**	A single score of 1, 2, 3, 4 or 5. The highest score across the udder and teats is recorded.
Trait Abbreviation	UDDER	**Rule of Thumb**	A goat with Score 1 has a well shaped and even udder and no more than 2 teats on either side that are evenly placed. A Score 5 goat has an uneven, low hanging or excessive large udder, or more than 2 teats either side that are either unevenly placed, misshapen or extremely under or oversized.
Stage	Weaning onwards		
Description	Udder and Teats is a combined trait. It refers to the shape and soundness of the udder plus the number, placement and shape of the teats.		

Score 1	Score 2	Score 3	Score 4	Score 5
Udder is well shaped and even on both sides. Up to 2 teats on either side of the udder that face downwards or slightly outwards that are evenly placed and not misshapen.		Udder is slightly uneven, or small. Up to 2 teats on either side of the udder that are unevenly placed, or slightly under or oversized, or slightly misshapen.		Udder is uneven, excessively large or hangs low to the ground. More than 2 teats on either side, or teats that are misshapen, misplaced, blunt, or extremely under or oversized or extremely misshapen.

Trait Name	Testicles	**How to Score**	A single score of 1, 2, 3, 4 or 5.
Trait Abbreviation	TEST	**Rule of Thumb**	A goat with Score 1 has large, firm testicles that sit straight in a scrotum that does not have a substantial split. A Score 5 goat has severely undersized or twisted testicles, or a severely split scrotum or twisted scrotum.
Stage	Weaning onwards		
Description	Testicles refers to the structure and soundness of the testicles and scrotum.		

Score 1	Score 2	Score 3	Score 4	Score 5
Testicles are large and firm and sit straight. Scrotum does not have a substantial split.	Testicles are large and firm and sit straight. Scrotum is very slightly split (up to 10% of the length of the testicle).	Testicles are slightly undersized, twisted or soft. Scrotum is slightly split (10 to 20% of the length of the testicle).	Testicles are moderately undersized, twisted or soft. Scrotum is moderately split (20 to 30% of the length of the testicle).	Testicles are severely undersized, twisted or soft. Scrotum is severely split (in excess of 30% of the length of the testicle).

Trait Name	Back Legs	**How to Score**	A single score of 1, 2, 3, 4 or 5. The highest score across the leg and feet component of all four legs is recorded.
Trait Abbreviation	LEGSB	**Rule of Thumb**	A goat with Score 1 has good width or stance, straight hind legs that have slight angulation at the hock and stand squarely over the feet. A Score 5 goat has hind legs that have extreme angulation at the hock either inwards or outwards and feet that either splay or are pigeon toed.
Stage	Weaning onwards		
Description	Back Legs refers to the soundness of the hind leg structure, in particular the orientation of the back legs and angulation of the hocks joint in relation to the feet.		

Score 1	Score 2	Score 3	Score 4	Score 5
Good width or stance, straight hind legs that are have slight angulation at the hock and stand squarely over the feet.		Significant angulation at the hock either inwards or outwards and feet that are moderately splay or are pigeon toed.		Hind legs that have extreme angulation at the hock either inwards or outwards and feet that either splay or are pigeon toed.

Trait Name	Classer's Grade	**How to Score**	The goat should be assessed in a classing race or box that allows good access and ability to clearly observe each goat as an individual.
Trait Abbreviation	GRADE	**Rule of Thumb**	A goat with a Score 1 is a TOP and is in the top 10-30% of the group. A Score 5 goat is a CULL and is in the bottom 10-30% of the group.
Stage	Post weaning onwards		
Description	Classer's Grade describes the overall standard of the goat for both visual and available measured performance relative to the herd's breeding objective.		

Score 1	Score 2	Score 3	Score 4	Score 5
TOP Goat is the top 10-30% of the goats in the group.		FLOCK Goat is the middle 40-80% of the goats in the group.		CULL Goat is the bottom 10-30% of the goats in the group.

Breeding Objective for PDS Herd

The breeding objective is to produce a goat that is Boer in appearance and commercially robust so that bucks can be used as sires in rangeland or extensive farming environments. Sound conformation, good carcase shape, high growth rates, high worm resistance and reproductive soundness are the focus of the breeding program.

7.2. Appendix – Report on measured and visual traits

Boer Select Breeders Group
Buck Evaluation Program

Report on Measured and Visual Traits

Condobolin Agricultural Research Station
New South Wales
23 October 2014

With support from

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

Acknowledgments

The Boer Select Breeders Group Buck Evaluation Program would not have been possible without the industry funding made available by Meat & Livestock Australia (MLA) through its Producer Demonstration Site (PDS) program.

Other commercial partners including Allflex, Stockwatch, Riverina Co-op and Te Pari have also greatly assisted in making the program possible.

Boer Select members who contributed their genetics to the trial have clearly been an integral part of the program and it is hoped they have received back as much knowledge and experience to compensate for the time and effort of being involved.

Sheep Genetics for the analysis and production of KIDPLAN results.

Paul Hamilton of Semtech for the expert advice and professionalism leading up to and during the AI program.

Allan Casey and NSW DPI for the visual assessment of all progeny and the hosting of the field day at Condobolin Agricultural Research Station.

The largest acknowledgement though must go to Colin and Rob Ramsay who provided their property as a trial location and gave a generation of their breeding over to the trial. Their ongoing commitment to the trial from the beginning to the end has been unmatched. Their attention to detail in every process to ensure the integrity of the data and the welfare of the animals at all times has been first class. The industry owes a great deal of gratitude to the Ramsay's for the commitment and effort they have contributed.

Foreword

The Boer Select Breeders Group (Boer Select) is a group of dedicated Boer goat seedstock producers that are committed to the adoption of performance breeding in the goat industry. They were formed in 2011. Boer Select is not a formal organisation or association, but a group of like-minded producers who aim to improve the genetics of the Boer breed and subsequently the rangeland goat herd by supplying commercially focused, performance recorded, fit for purpose animals to commercial herds.

In April 2013, with the assistance of funding from Meat and Livestock Australia (PDS), the Boer Select Buck Evaluation Program was commenced with the joining of 9 Boer bucks via AI to a group of 349 does at Dudauman Park, Bethungra NSW. The AI program was carried out by Paul Hamilton, Semtech. Dudauman Park is owned by Colin and Rob Ramsay. The does joined in the program were Dudauman Park bred. A further 2 backup bucks were joined, resulting in a total of 11 bucks entered in the trial.

In September 2013 a total of 590 kids were born as part of the Boer Select Buck Evaluation Program. Over the following 12 months the progeny were been thoroughly assessed for both measured and visual traits. All measured data was analysed by Sheep Genetics' KIDPLAN program to produce Estimated Breeding Values (EBVs).

The Boer Select Buck Evaluation Program is designed to showcase the genetics available to commercial goat meat producers that have the potential to increase productivity and therefore profitability in the commercial farming and rangeland environments.

Through the improvement of linkage in the KIDPLAN system, the Boer Select Buck Evaluation Program will also allow breeders to more easily benchmark their own genetics and therefore realise higher rates of genetic gain.

Participants in the program have also gained first-hand experience with the processes of trait measurement, data management, submission to KIDPLAN and understanding of the results that are generated. This will assist them increase their own rates of genetic gain and in turn the productivity of the commercial industry.

Many breeders are currently only focused on growth. Carcase attributes, worm resistance and reproduction are other important production traits that are currently not commonly recorded due to a lack of understanding in the process of measuring these traits and the cost / benefit relationship of doing so. Including these traits in the program has allowed breeders and the commercial industry to be more informed on the benefits of assessing these traits.

Contents

For further information regarding this report please contact:

Ben Swain

BCS Agribusiness

'Gartmore'

1534 Prairies Road

Gunnedah NSW 2380

Mobile: 0427 100 542

Phone: 02 6743 2306 Fax: 02 6743 2307

Email: ben_swain@bigpond.com

Buck and Owner Details

Breeders herd, Buck name KIDPLAN ID	Owner Details
Terraweena, Abraham ABM-3255 360ABM2003033255	**Celia Burnett-Smith** 13803 New England Hwy, Cambooya, Qld 4358 M: 0407 739 484, E: boergoat@terraweena.com W: www.terramacboers.com
MacGregors, Karoo TI-7132 360ABM2007077132	**Fleur Tarlinton** 13803 New England Hwy, Cambooya, Qld 4358 P: 07 4696 1122, M: 0419 770 364, E: tarlinton@optusnet.com.au W: www.terramacboers.com
Cadenza, Bart CA-0006 360CA12010100006	**Carole Axton** 26 Sibbald Lane, Stratford, Vic 3862 P: 03 5145 6259, M: 0429 661 369, E: cadenzaboers@bigpond.com W: www.cadenzaboergoats.com
Cadenza, Barney CA-0058 360CA12010100058	**Carole Axton** 26 Sibbald Lane, Stratford, Vic 3862 P: 03 5145 6259, M: 0429 661 369, E: cadenzaboers@bigpond.com W: www.cadenzaboergoats.com
Dudauman Park, Digger DPK-9167 360DPK2009099167	**Colin & Rob Ramsay** East Bland Station, Morangarell Road, Quandialla, NSW M: 0417 404 799, E: colin.ramsay@bigpond.com W: www.dudaumanpark.com
Dudauman Park, Shosa DPK-0018 360DPK2010000018	**Colin & Rob Ramsay** East Bland Station, Morangarell Road, Quandialla, NSW M: 0417 404 799, E: colin.ramsay@bigpond.com W: www.dudaumanpark.com
Dudauman Park, Aryan DPK-0215 360DPK2010000215	**Colin & Rob Ramsay** East Bland Station, Morangarell Road, Quandialla, NSW M: 0417 404 799, E: colin.ramsay@bigpond.com W: www.dudaumanpark.com
Kurrajong, Peter KHB-1072 360KHB1997971072	**Peter & Jeanette Firth**
Davel, Nixon RAD-0361 360RAD2003030361	**Ayala Davies** 7/50 Spinifex Avenue, Tea Gardens, NSW 2324 P: 02 4910 0197 , E: davies@hermitage55.com.au
Tambookie, Gordon TAM-8029 360TAM2008088029	**Isobel & Ian Palmer** RMB 1244 Boyup Brook Rd, Mumballup, WA 6225 P: 08 9732 2142, E: tambookie@activ8.net.au
Winfield, Sam WIN-9089 360WFD2009099089	**Heather Osborn** Merrimans Farm, PO Box 701, Sale, Vic 3850 P: 03 5146 8234, F: 03 5146 8234

Manager's Report

INTRODUCTION

Goats have been run at Dudauman Park since 1999 when 3000 feral does and 70 full-blood bucks were bought in to begin a crossing-up program to produce goat meat for domestic and export markets. There were serious production problems and, by about 2007, it was evident that many of these were related to genetics, particularly survival, conformation, growth rate and worm resistance. Initial evaluations in KIDPLAN confirmed that the genetics of the replacement bucks we were using were highly disparate and inadequate for production purposes. Meantime, KIDPLAN entries (following an excellent start from the late 1980s to the mid-1990s) had virtually ceased, with only the Tambookie Stud in WA persisting. Our need to use KIDPLAN in our selection process coincided with MLA's wish to reinforce goat data in the KIDPLAN database and find viable genetics for extensive grazing operations. The Boer Select Breeders Group Buck Evaluation Trial was conceived in late 2012 with Blair Brice (MLA), Tom Hooke (Sheep Genetics) and Ben Swain (BCS Agribusiness) showing the way.

LOCATION

For the first half of the trial, the animals were run at Dudauman Park, a dorper/crop/goat property of 2500 acres, about 20kms West of Cootamundra, NSW. The country has rocky hills falling to arable slopes and the rainfall is supposedly about 600mm per year but extremely variable by year and by season. Good rain in Autumn and Spring are essential to good crops and pastures. Summer can be very hot and dry with periods around 40 degrees and intermittent storms. Winter is typically very cold with short green feed. Management of internal parasites and feed levels are essential to animal health but not always easy to do in the highly variable seasons.

The Dudauman Park property was sold in late 2013 and the stock were moved in early 2014 to leased country about 20 kms away at Englefield, near Bethungra, NSW. Weather conditions there are the same as at Dudauman Park but the country is flatter and more arable, with improved pastures, in contrast to the rocky, unimproved pastures of Dudauman Park.

SEASONAL CONDITIONS

2013 was a fairly dry year (375 mm) with most of the rain falling in late Autumn and Winter. The 380 Boer does of the breeding herd were mated in April/May 2013 and were maintained on unimproved green pastures of grasses and broadleaf weeds, usually wet. In early Spring, before kidding started, they were moved to fresh pasture of ryegrass, barley grass, capeweed, paterson's curse, lucerne and clover, in generally good condition but with some lameness. The trial kids were born in September and October, initially with ample pasture and milk available. By November, however, it was becoming dry, and a very hot, dry Summer ensued with feed and water at critical levels by late February 2014. By that time, the kids were in drought-lot with only hay, staying reasonably healthy but losing weight. A sudden, early Autumn break brought relief in the last days of February, pastures recovered through March

and there was an excellent Autumn and Winter with the animals gaining weight and condition into Spring 2014.

DOES AND MATING

The Dudauman Park breeding herd (about 380 full-blood and purebred Boer does with a few lower crosses) was committed to the trial. In 2013, the herd was young with 26% maidens and 30% second-kidders. Nine mating groups of about 40 does were randomised to be as close to identical as possible. The remaining 15-20 does were retained for non-trial purposes but continued to run with the same mob. AI matings were conducted on 10th, 11th and 12th of April 2013 by Paul Hamilton of Semtech, Berwick, Vic, using frozen semen from 7 studs (Cadenza, Winfield, Macgregors, Terraweena, Davel, Tambookie and Kurrajong) plus fresh semen from a Dudauman buck which was also used as a backup buck to provide data linkage between AI and backup management groups. The Kurrajong semen was from a historical 1997 sire to improve data linkage to the historical KIDPLAN data. Dudauman bucks were introduced to three backup doe groups on 26th April.

PREGNANCY & KIDDING (IN GOOD CONDITIONS)

All does were pregnancy scanned for dries, singles, twins and multiples on 19th June with about 62% reporting pregnant to the AI mating. They were vaccinated with Glanvac 3-in-1 with Se and B12 a month before start of kidding and drenched with Zolvix two weeks before. AI and backup does were kidded in separate but adjacent paddocks of about 25 ha and 15 ha respectively with similar feed. Most AI kids were born from 4th-11th September. Backup kids were mostly born from 26th Sept to 7th October with the weather favourably warm throughout. Apart from tagging and taking weights within 24 hours of birth, there was no human interference in kidding or kid survival. There were some fox attacks and an ordinary number of kid deaths. There were no major weather events but worm burdens built up gradually until marking.

Approximately 700 kids were born (in the total kidding group) with about 15% not surviving the first couple of weeks. Survival by sire was notably variable – 27% of the kids by one sire did not survive the birth period, while only 8% of the kids by another sire failed to survive.

MARKING & WEANING (IN A HOT, HUNGRY SUMMER)

536 kids were marked on 14th November for a marking rate of 142%. At the same time, scores were recorded for colour, teats, testicles and mouths, and purebred males with serious faults were wethered. There were minor losses as worm burdens built up to over 780 epg but there were delays due to harvest and the mob (380 does with 530 kids at foot) was drenched with Zolvix on 6th December.

With the weather getting hotter and drier, and no good pasture available, about 519 kids were weaned on 9th January and weighed on 21st January, healthy but light (average WWT of 21.7 kg). In late January they were given their second vaccination and moved into drought-lot with

hay. There were further minor losses and substantial loss of weight; by late March, the average weight had fallen 14% to 18.7kg (EPWT).

GROWTH (IN A GOOD AUTUMN & WINTER)

By late March, pasture conditions were improving, the kids started recovering, and loss rates stabilised. In early June, 475 kids were weighed for an average of 25.9 kg (PWWT).

The worm burden was allowed to build up through winter to facilitate WEC calculations. When individual WEC samples were taken in late July, the worm counts ranged from less than 100 epg to over 5000 epg. The kids were then drenched with Pyrimide 3+ with Se and Co and put on good improved pasture.

FINAL ASSESSMENTS

All the trial progeny were classed on 24th September by Allan Casey (NSW DPI) and his team, recording scores for 8 visual traits (Jaw, Legs and Feet, Shoulder and Back, Head and Horns, Colour, Non-fibre Pigmentation, Testicles, Udder and Teats) and a Classer's Grade.

On 25th September, Stefan Spiker measured eye-muscle, fat depth, scrotal circumference and weight (average YWT 39.2 kg). Bucks were substantially heavier than does, bucks about 46 kg, wethers about 38 kg, does about 34 kg.

Though not required under the protocol for the trial, stud classifications were conducted on 3rd October by Celia Burnett-Smith (Classimate Services).

COMMENTARY, CONCLUSIONS & LESSONS

Nutritional and weather conditions were a roller-coaster through the trial period. Kidding conditions were good, with ample feed, moderate worm burdens, and no major storms or high wind-chill episodes, any of which can be deadly. In contrast, the tightening Spring and the lack of good feed in the hot, dry Summer period was a major setback. After that, growing-out conditions were good and weights recovered on good pasture.

Management. The animals were run as similarly as possible to dorpers in an extensive farmed system. Apart from the necessary interventions for tagging, weighing and other testing, the only assistance or supplements they received was hay when they were forced into drought lot in February 2014. It is clear in hindsight that the kids were under-fed at that stage. Though they recovered well on later pastures, they would probably have done much better if they had not lost weight after weaning. It seems particularly important to understand post-weaning nutrition better.

Genetic variability in the group seems to be high, as exemplified by the huge spread in WEC counts and sire YWECs. However, no one sire has emerged as superior across the board. Rather, different sires appear, at this stage, to have different genetic merits and be suited for different purposes. Careful and appropriate sire selection with the purpose in mind will be important.

Kid survival emerged as a particularly interesting and important area. Goats habitually produce twins and triplets, following which perinatal losses of 10-50% are common, according to the literature. In this trial, the main losses were immediately after birth – kids born but not cleaned and raised or dying within days of birth. Aggregate losses to weaning were sire-dependent - typically 24-29% for most sires but one sire lost 36% of his kids and another only 15%. There are evidently big gains to be made by understanding this better.

Assessment and Management Program

Activity		Date/s	Age (average)
Selection of does		1 March 2013	
AI of does		10 – 12 April 2013	
Backup bucks joined		26 April 2013	
Pregnancy scanning		19 June 2013	
AI Kidding: start – finish		31 August - 13 September 2013	
Backup Kidding: start – finish		20 September – 7 October 2013	
Marked kids		14 November 2013	60 days
Weaning		9 January 2014	116 days
Body weighing	W	21 January 2014	4 months
	P	18 March 2014	6 months
	P	5 June 2014	9 months
	Y	25 September 2014	12 months
Worm egg count sampling	Y	22 July 2014	10 months
Visual Trait Assessment	Y	24 September 2014	12 months
Carcase Scanning	Y	25 September 2014	12 months
Vaccination		14 November 2013 (Glanvac 3in1) 25 January 2014 (Glanvac 6in1+Sel+B12)	
Drench		6 December 2013 (Zolvix) 27 July 2014 (Prymide) 15 October 2014 (Dectomax Injection)	
Supplementary feeding		Confined to drought lot during February 2014	
Field day		23 October 2014 (Condobolin)	

Rainfall

Rainfall as recorded at Cootamundra, NSW during the trial period.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
2013	11	42	25	4	36	78	62	43	21	18	17	18	**375**
2014	19	76	95	82	34	100	34	23	31				**494**

Visual Trait Assessment and Herd Breeding Objective

Visual trait assessment

The visual traits recorded were assessed by Mr Allan Casey, NSW DPI.

Herd Breeding Objective used to assess the Classer's Grades

The Breeding Objective used by the classer/s when selecting the Classers Tops, Flock and Cull Grades is described below. The Breeding Objective for both measured and visual assessed traits that is described below was developed by the owner of the trial herd in consultation with the classer prior to the grading.

The Breeding Objective is to produce a goat that is Boer in appearance and commercially robust so that bucks can be used as sires in rangeland or extensive farming environments. Sound conformation, good carcase shape, high growth rates, high worm resistance and reproductive soundness are the focus of the breeding program.

Understanding the Measured Results and Indexes

Measured Traits, Indexes and Classer's Grade – Table 1

Buck Code:	The buck's code used throughout the report.
Number of progeny:	The number of progeny a buck had in the trial at the final assessment.
Estimated Breeding Values:	Estimated Breeding Values (EBVs) calculated by Sheep Genetics for the bucks evaluated in this report. EBVs describe the relative breeding value (genetic performance) of the bucks (in this case based on the performance of their progeny). A buck's progeny will express half of their bucks EBV. EBVs do not necessarily reflect the buck's observed performance, which is a combination of both genetic and environmental influences. EBVs are an estimate of the genetic component of the buck's performance. More information of EBVs can be found on page 15.
Traits: Abbreviation, trait and the (units reported)	WT: Body weight (kg) EMD: Eye muscle depth at the 'C' site (mm) FAT: Fat depth at the 'C' site (mm) WEC: Worm egg count (% deviation in worm burden of sire's progeny) SC: Scrotal circumference (cm) NKW: Number of Kids Weaned (%) MWWT: Maternal Weaning Weight (kg)
Age at assessment:	B = Birth - 0 to 24 hours W = Weaning - 42 to 120 days (6 weeks to 4 months of age) P = Post Weaning - 210 to 300 days (7 to 10 months of age) Y = Yearling - 300 to 400 days (10 to 13 months of age)

Indexes:	**SRC: Self Replacing Index** Based on a self-replacing herd with a strong emphasis on growth and carcase traits. This index places emphasis on BWT, WWT, MWWT, PWT, PEMD, PFAT, NKW and PWEC. **C+: Carcase Plus Index** Based on a meat production herd that seeks to produce goats with high growth and muscle, while maintaining carcase leanness. This index places emphasis on WWT, PWT, PEMD and PFAT.
Classer's Grade:	A classer grades all progeny as either, Tops, Flocks or Culls based on their visual assessment of all traits relative to the site's Breeding Objective (see page 7). The percentage deviation from the average of Tops and Culls is presented in this report.

Table 1: Measured Traits, Indexes and Classer's Grade

This table shows Estimated Breeding Values (EBVs) calculated by Sheep Genetics for the bucks evaluated in this report. The EBVs are based on all available information each buck has in KIDPLAN, not just the results of this trial.

The highest 2 performing bucks (or more if there is a dead heat) for each trait and index (trait leaders) are highlighted by shading.

The index values reported are based on measured trait EBV performance with varying emphasis on key traits. See page 8 for more information.

Buck Code	Breeders herd, Buck name	Number of progeny	Estimated Breeding Values								Indexes		Classer's Grade[1]	
			WT kg				FAT mm	EMD mm	SC cm	WEC %	SRC $	C+ $	Tops %	Culls %
			B	W	P	Y	Y^	Y	Y	P			Y	Y
1	Terraweena, Abraham ABM-3255	32	-0.1	-0.2	-0.3	0.3	0.7	0.4	0.1	15	100	100	-13	-8
2	MacGregors, Karoo TI-7132	23	0.0	1.3	2.4	3.9	0.5	1.1	0.6	4	105	120	13	-4
3	Cadenza, Bart CA-0006	39	0.1	1.8	2.7	3.2	0.3	0.0	0.9	45	104	113	3	-7
4	Cadenza, Barney CA-0058	19	0.3	1.3	2.0	1.9	-0.3	0.3	0.7	5	104	114	-4	-1
5	Dudauman Park, Digger DPK-9167	60	-0.1	0.6	1.5	1.8	0.3	0.0	-0.9	2	97	105	0	5
6	Dudauman Park, Shosa DPK-0018	46	0.2	0.4	0.0	0.7	-0.4	-0.3	0.0	0	89	99	-3	5
7	Dudauman Park, Aryan DPK-0215	41	0.0	-1.2	-1.3	-0.1	0.2	-0.2	-0.3	-30	88	89	-4	7
8	Kurrajong, Peter KHB-1072	33	0.4	1.1	1.9	2.2	-0.2	-0.2	-0.3	2	102	108	-2	7
9	Davel, Nixon RAD-0361	42	-0.1	0.3	1.0	2.2	-0.4	0.0	0.9	35	102	105	5	4
10	Tambookie, Gordon TAM-8029	31	0.1	1.5	3.4	4.8	0.3	0.8	0.3	-3	107	122	16	-7
11	Winfield, Sam WIN-9089	48	0.0	0.2	-0.3	-0.5	0.9	0.8	-0.2	-19	95	104	-6	-7

^ B = Birth (0 to 24 hours) W = Weaning (42 to 120 days); P = Post Weaning (210 to 300 days); Y = Yearling (300 to 400 days)

1 Classer's Grade is expressed as the percentage deviation of average Tops% and Culls%.

Understanding the Visual Results

Scored trait performance – Tables 2a, 2b, 2c

The following description of trait scores is a summary of the detailed word description of these scores developed as part of the Boer Select – Buck Evaluation Program.

A deviation from the average trait score for all progeny is reported as well as the percentage of the buck's progeny recorded for each trait.

The highest 2 performing bucks (or more if there is a dead heat) for each trait and (trait leaders) are highlighted by shading.

■ Jaw and Teeth:	Soundness of the jaw structure, including the alignment of the lower jaw and its teeth relative to the top jaw and its pad that the lower teeth bite onto, the placement of the teeth, structure of the muzzle and lower jaw. **1** (very well aligned) to **5** (heavily undershot or overshot).
■ Legs and Feet:	Soundness of the front and back leg and feet structure, in particular the orientation of the legs, the angulation of the hocks and pasterns to the feet and the shape of hoof and toes. **1** (very straight) to **5** (very angulated).
■ Shoulders and Back:	Soundness of the shoulder blades, their positioning in relation to the neck and spine and the shape of the topline. **1** (very square) to **5** (very dipped or high).
■ Head and Horns:	Shape of the head and placement of horns. **1** (wide head, horns set well apart) to **5** (narrow head, horns that are set very close together?
■ Colour:	The closeness of the goats hair colour to the Boer breed standard. **1** (red-brown head and a white body) to **5** (Largely or entirely solid colours).
■ Non-fibre pigmentation:	The percentage of pigmentation on two areas, the bare skin under the tail and hooves. **1** (75 to 100% pigmented area on both of the bare skin areas) to **5** (0% pigmentation on any the bare skin areas).
■ Udder and Teats:	Shape and soundness of the udder plus the number, placement and shape of the teats.**1** (well shaped, even udder with up to 2 teats on either side) to **5** (uneven udder with more than 2 teats on either side).
■ Testicles:	Structure and soundness of the testicles and scrotum. **1** (large, no spilt in scrotum) to **5** (small, twisted or excessive split in scrotum).

Table 2a. Visual trait assessments – Conformation

Visually assessed traits reported were scored at the yearling assessment with the exception of Testicles which was scored at marking as well as the yearling assessment.

Traits are reported as a deviation (Dev) from the average trait score for all progeny. The percentage of a bucks's progeny assessed for each score is also reported.

For the majority of breeder's objectives a negative deviation would be considered favourable and the larger the deviation the better.

Breeders herd, Buck name	Conformation																							
	Jaw						Legs and Feet						Shoulder and Back						Head and Horns					
	Dev	1	2	3	4	5	Dev	1	2	3	4	5	Dev	1	2	3	4	5	Dev	1	2	3	4	5
Terraweena, Abraham ABM-3255	0.0	100	0	0	0	0	-0.3	55	30	9	6	0	-0.1	88	9	3	0	0	-0.1	36	64	0	0	0
MacGregors, Karoo TI-7132	0.0	100	0	0	0	0	0.0	48	26	17	4	4	0.0	87	4	9	0	0	-0.2	43	52	4	0	0
Cadenza, Bart CA-0006	0.0	100	0	0	0	0	-0.2	49	33	15	3	0	0.0	85	5	10	0	0	0.1	23	64	10	3	0
Cadenza, Barney CA-0058	0.0	100	0	0	0	0	-0.2	63	5	21	11	0	-0.2	95	5	0	0	0	0.1	26	58	16	0	0
Dudauman Park, Digger DPK-9167	0.0	98	0	0	0	2	-0.1	52	17	23	8	0	0.1	77	13	7	3	0	0.0	42	42	17	0	0
Dudauman Park, Shosa DPK-0018	0.0	100	0	0	0	0	0.3	24	37	26	11	2	0.0	85	9	4	2	0	0.0	35	57	9	0	0
Dudauman Park, Aryan DPK-0215	0.2	95	0	0	0	5	-0.1	46	24	24	5	0	0.0	88	0	12	0	0	0.2	27	51	17	5	0
Kurrajong, Peter KHB-1072	0.0	100	0	0	0	0	-0.1	61	9	18	12	0	-0.1	91	3	6	0	0	-0.2	45	48	6	0	0
Davel, Nixon RAD-0361	0.0	100	0	0	0	0	0.4	26	31	24	17	2	-0.1	95	0	5	0	0	0.1	31	50	17	2	0
Tambookie, Gordon TAM-8029	0.0	97	0	3	0	0	-0.1	45	26	29	0	0	0.0	84	6	10	0	0	-0.2	55	35	10	0	0
Winfield, Sam WIN-9089	0.0	100	0	0	0	0	0.1	44	21	21	10	4	0.1	79	10	8	2	0	0.0	35	52	10	2	0
Average performance	**1.0**	**99**	**0**	**0**	**0**	**1**	**2.0**	**45**	**24**	**21**	**8**	**1**	**1.2**	**86**	**7**	**7**	**1**	**0**	**1.8**	**36**	**52**	**11**	**1**	**0**

Table 2b. Visual trait assessments – Colour and Pigmentation

Traits are reported as a deviation (Dev) from the average trait score for all progeny. The percentage of a bucks's progeny assessed for each score is also reported.

For the majority of breeder's objectives a negative deviation would be considered favourable and the larger the deviation the better.

Breeders herd, Buck name	Colour and Pigmenation											
	Colour						Non-fibre pigmentation					
	Dev	1	2	3	4	5	Dev	1	2	3	4	5
Terraweena, Abraham ABM-3255	0.2	58	21	9	3	9	-0.1	88	9	0	3	0
MacGregors, Karoo TI-7132	-0.1	74	13	0	4	9	0.0	87	9	0	4	0
Cadenza, Bart CA-0006	-0.1	59	28	10	3	0	-0.1	95	0	3	3	0
Cadenza, Barney CA-0058	-0.4	89	0	5	5	0	0.1	89	0	5	0	5
Dudauman Park, Digger DPK-9167	-0.1	72	15	5	3	5	0.2	78	8	5	5	3
Dudauman Park, Shosa DPK-0018	0.1	65	17	4	7	7	0.2	85	2	4	4	4
Dudauman Park, Aryan DPK-0215	0.5	46	24	10	10	10	0.4	76	7	7	0	10
Kurrajong, Peter KHB-1072	0.3	61	12	12	0	15	-0.2	94	6	0	0	0
Davel, Nixon RAD-0361	-0.2	62	26	12	0	0	-0.2	100	0	0	0	0
Tambookie, Gordon TAM-8029	0.0	58	29	3	3	6	-0.2	97	0	3	0	0
Winfield, Sam WIN-9089	-0.3	75	19	0	4	2	-0.1	92	6	2	0	0
Average performance	**1.7**	**65**	**20**	**7**	**4**	**6**	**1.2**	**88**	**5**	**3**	**2**	**2**

Table 2c. Visual trait assessments – Reproduction

Traits are reported as a deviation (Dev) from the average trait score for all progeny. The percentage of a bucks's progeny assessed for each score is also reported.

For the majority of breeder's objectives a negative deviation would be considered favourable and the larger the deviation the better.

Breeders herd, Buck name	Reproduction											
	Testicles						Udder and Teats					
	Dev	1	2	3	4	5	Dev	1	2	3	4	5
Terraweena, Abraham ABM-3255	-0.2	100	0	0	0	0	-0.1	80	10	10	0	0
MacGregors, Karoo TI-7132	0.3	88	0	0	0	13	0.0	86	0	7	0	7
Cadenza, Bart CA-0006	0.2	91	0	0	0	9	-0.4	100	0	0	0	0
Cadenza, Barney CA-0058	-0.2	100	0	0	0	0	0.4	71	0	14	0	14
Dudauman Park, Digger DPK-9167	-0.2	100	0	0	0	0	0.0	86	4	4	0	7
Dudauman Park, Shosa DPK-0018	0.0	95	0	0	0	5	-0.1	93	0	0	0	7
Dudauman Park, Aryan DPK-0215	0.0	92	0	8	0	0	0.2	76	0	18	0	6
Kurrajong, Peter KHB-1072	0.5	83	0	0	0	17	0.3	75	5	0	10	10
Davel, Nixon RAD-0361	-0.2	100	0	0	0	0	-0.1	91	0	0	0	9
Tambookie, Gordon TAM-8029	-0.3	100	0	0	0	0	0.0	88	0	6	0	6
Winfield, Sam WIN-9089	0.1	94	0	0	0	6	0.0	83	4	0	9	4
Average performance	**1.2**	**95**	**0**	**1**	**0**	**4**	**1.4**	**85**	**2**	**4**	**2**	**6**

Table 3. Buck Averages for Measured Traits

Buck averages are the average performance of all the progeny of a buck. No account is made for factors that can improve the breeding value accuracy.

The highest 2 performing bucks (or more if there is a dead heat) for each trait and (trait leaders) are highlighted by shading.

Buck Code	Breeders herd, Buck name	Number of progeny	Litter Size	Sire Averages (deviations from the average)						
				WT kg				FAT mm	EMD mm	SC cm
				B^	W	P	Y	Y	Y	Y
1	Terraweena, Abraham ABM-3255	32	2.4	-0.2	-0.9	-0.3	-0.1	0.1	-0.1	-0.2
2	MacGregors, Karoo TI-7132	23	2.4	-0.1	1.3	1.1	1.3	0.2	1.4	0.5
3	Cadenza, Bart CA-0006	39	2.2	-0.2	1.1	1.1	2.5	0.2	0.2	-0.1
4	Cadenza, Barney CA-0058	19	1.5	0.7	2.7	2.6	3.8	0.1	1.4	1.2
5	Dudauman Park, Digger DPK-9167	60	2.0	0.0	-0.5	0.1	-1.2	-0.1	-0.7	-0.6
6	Dudauman Park, Shosa DPK-0018	46	2.0	0.3	-0.9	-0.1	-0.9	-0.1	-0.7	0.0
7	Dudauman Park, Aryan DPK-0215	41	2.0	0.2	-1.8	-1.9	-2.4	0.0	-1.2	0.0
8	Kurrajong, Peter KHB-1072	33	2.3	0.0	0.0	-0.8	-0.8	0.0	-0.7	-0.6
9	Davel, Nixon RAD-0361	42	2.2	-0.3	-0.7	0.4	0.4	0.0	0.1	0.0
10	Tambookie, Gordon TAM-8029	31	2.1	-0.1	-0.5	-0.7	-0.1	0.0	0.6	-0.4
11	Winfield, Sam WIN-9089	48	2.1	-0.1	0.2	-1.1	-2.5	-0.1	-0.1	-0.2
	Average Performance	**38**	**2.1**	**3.6**	**21.4**	**25.7**	**39.6**	**1.9**	**23.1**	**27.1**

^ B = Birth (0 to 24 hours) W = Weaning (42 to 120 days); P = Post Weaning (210 to 300 days); Y = Yearling (300 to 400 days)

Estimated Breeding Values

Estimated Breeding Values (EBVs) are reported by Sheep Genetics (SG). EBVs express the expected performance of progeny of a buck relative to another buck in the evaluation when mated to the same standard of ewes. EBVs improve the accuracy of buck results because they account for the association between traits, adjustment for birth effects and the number of progeny a buck has in the analysis.

True Breeding Values would be achieved if the number of progeny evaluated for each buck were infinite. Because the number of progeny in the evaluation is not infinite, performance shown in this report is described as *Estimated* Breeding Values.

Without progeny test information the correlation between the *Estimated* and *True* Breeding Value of bucks from different sources would be zero (0.0%). The correlation between *Estimated* and *True* Breeding Value improves rapidly from 0.0% with no progeny to 77% with 10 progeny. The rate of improvement in correlation slows from 86% with 20 progeny, to 90% with 30 progeny and 92% with 40 progeny. With an infinite population the correlation is 100%. Note that the correlation used in the above example is for a trait with a high heritability (0.5).

A heritability of 0.5 indicates that half or 50% of the measured performance is passed onto offspring. A heritability of 0.35 indicates 35% is passed on. The EBVs that are shown in this report have already accounted for heritability and therefore describe the performance that can be expected from a buck' progeny.