MLA Feedback on Regional Priorities Submitted to the 2020-21 MLA Investment Call

Contents

2020-21 SHEEPMEAT AND GRASSFED BEEF RD&A PRIORITY

SHEEP PRODUCTIVITY

1. Description

Region	Priority	MLA comments	To be addressed in 2020-21 Annual Call?
Southern	(1) Quantify the impact of 'lamb survival' RD&E investment to date - make recommendations for enhancing the future RD&E focus for investment.	MLA is currently engaged with Sheep Producers Australia, Wool Producers Australia and AWI and work is being progressed to address this priority. Tenders are currently being assessed to deliver against four key objectives: 1. Review and assess completed and ongoing industry projects (see section 3.7) and initiatives against the objectives of the SRRIP strategy, the Wool Industry National RD&E Strategy 2018-2022 (WIRNS), the Meat Industry Strategic Plan 2020 (MISP), the Sheepmeat Industry Strategic Plan 2015-2020 (SISP), the National Animal Welfare RD&E Strategy and the Sheep CRC. The criteria includes consistency across strategies in objectives and targets. 2. Assess, define and make recommendations for future industry collaborations. The criteria targets efficient use of funds such as the structures for project management of co-invested projects that reduce duplication, IP arrangements between the RDCs that benefit wool and meat levy payers, shared communication, leverage of resources (cash and in kind) and evaluation of investment. 3. Assess and define the predicted economic impact of investments made to date, based on assumptions on adoption, on-farm productivity benefits and the cost of implementation. This is to be based on the MLA output (product) based impact assessment framework. 4. Provide a detailed assessment of any remaining research and/or adoption gaps, and provide a series of recommendations for RD&A investments based on an economic impact assessment of the key priority areas	Yes

		and potential opportunities for delivering further industry impact.	
Western	(2) The underlying physiology and pathology of maternal dystocia.	Amended to: *Understanding the causes of maternal dystocia. To incorporate consideration of uterine inertia and maternal exhaustion.* A two stage approach should be employed 1) a review of current literature and knowledge 2) development of targeted applied research intervention.	Yes
Western	(5) Lamb survival – what are the big hitters?	There is a need to identify the major drivers of lamb loss by region and production system and identify the performance gap between low and high performing enterprises by region. Then identify key practice differences between high and low performing enterprises.	Yes

2. Completed or current RD&A relevant to this priority

MLA has invested in various projects relevant to this RD&A priority including:

Sheep, as detailed below (MLA investment ONLY, RO cash and in-kind not included)

- $11,073,173 has been invested in recent and current projects.
- $3,271,023 from the 2016-17 Open Call has been contracted from the previous round.
- $2,346,538 from the 2017-18 Open Call has been contracted from the previous round.
- $2,202,616 from the 2018-19 Open Call has been endorsed as further investment.

The table below shows recent and current investment in relation to this priority area.

PROJECT CODE	TITLE	STATUS	PLANNED AUD $
B.LSM.0053	Participatory research evaluating and demonstrating the impact of green feed (particularly Lucerne) on conception	Completed	$496,000
B.LSM.0064	Lifetime Maternals - development of management guidelines for non-Merino ewes.	Completed	$1,278,359
L.LSM.0001 & 0007	Improving the reproductive performance of ewe lambs — Management guidelines, economic analysis and decision support tools	Completed	$112,000
L.LSM.0002	Fail safe guides to grazing pregnant and lambing ewes on cereals	Completed	$127,817
L.LSM.0004	Improving lamb survival by optimising lambing density.	Completed	$233,790 MLA ($973,000 total)
L.LSM.0008	Lifetime Maternals — Phase II: Feeding Standards for Maternal Ewes	Current	$600,000

E.REP.1404	Informing future sheep extension strategies to improve reproduction and related welfare outcomes	Completed	$405,000
16/17 Annual Call projects underway			
L.LSM.0011	Maximising the value of existing technology for sheep producers	Completed	$114,700
B.AHE.0318	Reducing foetal and lamb losses in young ewes	Current	$955,680
L.LSM.0014	Boosting lamb survival by supplementing ewes with vitamins and minerals	Current	$543,627
L.LSM.0015	New approaches for increasing weaning rate of the national sheep-flock	Current	$803,012
L.LSM.0013	Managing fecund flocks to improve survival of triplet dams and their lambs	Current	$854,004
18-19 Annual Call projects underway			
L.LSM.0018	No more gaps with superior shrubs systems	Current	$598,438
L.LSM.0016	What is the nutritive value of modern crop stubbles?	Current	$350,130
L.LSM.0019	Unlocking the keys to ewe survival	Current	$600,000
P.PSH.1180	More lambs from ewe lambs through developing and extending best practice	Current	$798,000
19-20 Annual Call projects – Under contracting/contracted			
L.LSM.0020	Refining body condition score for region, season, breed and responsiveness	Current	$425,078
L.LSM.0021	Increasing lambing percentages through better use of pregnancy scanning technology	Current	$803,416
L.LSM.0022	Sheep Feedlotting and Containment Management Guidelines Update*	Current	$13,950
L.LSM.0024	A review of the impact of heat stress on reproductive performance in sheep	Contracting	$79,691
j15753	A novel amino acid approach to lamb survival	Contracting	$880,481

*Not contracted through the annual call but developed and contracted at the request of Sheep Producers Australia. This focuses on the immediate need to provide producers with up to date information on best practice management of stock in containment areas or feedlots.

3. RD&A gaps under this priority

The following gaps remain for this priority:

Reproductive success, including both lamb and ewe survival, remains a key priority for the sheep industry due to its impact on profitability, and as a key welfare issue.

The 2019-20 investment call has seen projects endorsed with focus on improving the targeted nutrition of ewes during gestation. Investments will focus on improving the uptake of pregnancy scanning and scanning for multiples facilitating management of ewes based on nutritional requirements. As well as focusing on potential nutritional constraints limiting twin lamb development, viability and survival and the reproductive responsiveness of a flock to changes in nutrition and body condition score. These projects represent a significant opportunity to re-focus on the importance of ewe nutrition to improve pregnancy outcomes, increase the efficiency of resource allocation (feed, labour etc.) and to target specific barriers to the viability of twin lambs.

As per the 2019-20 investment call the recommendation remains that the balance of investments are weighted towards D&E activities to improve the uptake of breeding and management practices known to improve ewe and lamb survival. There are also, as evidenced by the above list of investments, a large number of targeted projects underway which will significantly enhance the current understanding of the timing and causes of reproductive losses as well as the interventions that can reduce these losses.

Further gap areas for investment in the program include:

Flock rebuild strategies
With the national flock at a historical low there is a need to identify, investigate and prioritise options for flock rebuild for implementation when seasonal conditions across the eastern states improve. Options for achieving an increase in the breeding flock numbers will vary by flock type (breed, fecundity), region and enterprise mix i.e. role of the sheep enterprise in the wider business. This will include joining ewe lambs, increasing flock fecundity, increasing the frequency of breeding and retention of older ewes.

Improving the eco efficiency of the national flock – kg/ha – kg/head
The last 30 years have seen significant increases in the kg of sheepmeat produced per hectare and per head. However, given dwindling national ewe numbers, increased input costs and long term forecasts for a reduction in pasture growth across the southern states, there is an ongoing need to focus on resource utilisation efficiency and on improving the productivity per hectare and per head. This will also contribute to reduced greenhouse gas emissions per kg of sheepmeat produced.

Ewe nutrition – consolidating best practice and new frontiers –
Covering both merinos and higher fecundity maternal/composite ewes there is an opportunity to draw on overseas research insights, build on existing domestic investments, consolidate best practices and identify gaps in current knowledge. This however, requires a new more collaborative and facilitative approach to engagement with key industry research providers and stakeholders. Subject to endorsement by the RMP, MLA proposes to develop an investment strategy in this area through engagement with key existing research partners and via establishment of new collaborations with domestic and international partners.

The first stage of this strategy formation would be the convening of a group of key research providers to review existing/current investments and identify through an iterative process opportunities for combining insights and developing new research recommendations. Outcomes will then be reviewed by key stakeholders and consultation groups and an approach developed to address priorities through either a consortium or call based approach.

Influences of the microbiome on productivity, metabolism and immune response
This is an emerging area of interest and relevance to the sheep industry. The rumen and intestinal microbiota, its development, dietary induced changes and impact on productivity, metabolism and immune response (dam and lamb) are as yet poorly understood. Recent research conducted by the University of Adelaide, in other animal sectors and human medical research has shed light on the importance of the microbiota for health and productivity.

For example, the composition of the rumen and intestinal microbiota may have implications for an animal's capacity to perform on a higher roughage based diet. It has also been demonstrated that the rumen microbiota

varies significantly between breeds, within breeds and as a result of dietary influences (high vs low roughage diets). Furthermore, it has been evidenced that the rumen microbiota can be manipulated on a long term basis by inoculation of animals with rumen fluid from other individuals. This has important implications for further research and should be an ongoing priority for further research, representing an area for potential step change in the understanding of animal immune response, nutritional requirements and dietary based productivity capacity. Breakthroughs in this area are likely to require collaboration with other ruminant and non-ruminant animal sectors and may also benefit from drawing on insights developed in human medical research.

Climate adaptation

Aside from a major disease outbreak, failure to adapt to a changing and increasingly variable climate represents the biggest risk to productivity of the sheep industry principally through effects on feed supply and direct impacts on animal productivity and reproductive performance. Whilst, there is some investment in specific areas such as the impact of heat stress on reproduction there is an ongoing need to develop strategies to adapt to changes in climate and to manage the predicted increase in environmental extremes.

Options will vary significantly by region but will include feedbase perennialisation, changes in management practices, adoption of higher levels of feed conservation, increased use of sheep feedlots and alteration in genetic selection criteria. Improving the understanding and management of landscape function can also improve resilience to climate change but this will require cross functional multidisciplinary approach.

4. Actions

A terms of reference document will be developed as per request from the Red Meat Panel, towards the end of September/early October, following the completion of L.LSM.0022 which will provide an overview of ongoing research, to call for projects targeting:

i. Optimisation of reproduction outcomes (joining and gestation) and animal health in containment/drought lots.
ii. Optimised feeding strategies for pregnant ewes in containment areas.

Subject to endorsement by the RMP, MLA proposes to develop an investment strategy to address ewe nutrition through broad engagement research partners. The first stage will be to convene a workshop to review existing/current investments and identify opportunities for combining insights and developing new research recommendations. Outcomes will be shared with the Red Meat Panel.

2020-21 SHEEPMEAT AND GRASSFED BEEF RD&A PRIORITY

GRASSFED BEEF PRODUCTIVITY

5. Description

Regional issues contributing to this national RD&A priority

Region	Priority	MLA comments	To be addressed in 2020-21 Annual Call?
Northern	(3) Reducing losses from pregnancy to weaning.	This will not be addressed in the 2020-21 investment call, due to current development of the Northern Breeder Herd Efficiency coalition.	No
Northern	(9) Remote, real-time pasture quantity analysis for improved pasture and herd nutrition management	Significant activity in this space – also through MDC namely the project "Pasture efficiency through determining optimum stocking rates using remote sensing, on-the-ground observations and modelling" and "P.PSH.1027 - LPP - Developing a framework for tactical decision making to address feed deficits". Some work independent of MLA – requires a co-ordinated approach not a series of small disconnected projects.	No

6. Completed or current RD&A relevant to this priority

MLA has invested in various projects relevant to this RD&A priority including:

- Calf Loss - B.GBP.0001 - Development of candidate management interventions to reduce foetal and calf loss in beef herds in northern Australia; B.NBP.0382 - Cash Cow - Northern Australian Beef Fertility Project; E.INF.1502 - CMA 2014/15 Cash Cow Communication Activities.
- Heifer efficiency - B.GBP.0038 - Optimising heifer development and management to increase whole herd profit; B.GBP.0005 - Target dry season weight gains for weaner heifers.
- CalfAlert- B.NBP.1619 - Remote calving alert for beef cattle – Technology development (Phase 3); B.NBP.0666 - Remote calving alert for beef cattle – technology development and testing.

Table 1. Recent and current R&D investment related to this priority area.

PROJECT CODE	TITLE	STATUS	PLANNED AUD
B.NBP.1619	Remote calving alert for beef cattle – Technology development (Phase 3)	Completed	$12,000
B.GBP.0001	Development of candidate management interventions to reduce foetal and calf loss in beef herds in northern Australia	Completed	$197,720
B.GBP.0003	Development and validation of novel tools to assess reproductive traits and improve beef cattle reproductive efficiency	Current	$62,400

B.NBP.0761	New genetic predictors for improving cow reproduction	Completed	$296,000
B.GBP.0005	Target dry season weight gains for weaner heifers	Completed	$177,822
B.LSM.0053	Participatory research evaluating and demonstrating the impact of green feed (particularly Lucerne) on conception	Current	$496,000
2017-18 Annual Call projects underway			
B.GBP.0023	Improving herd production through managing plant toxins	Current	$1,518,298
B.GBP.0025	Grazing with self herding to improve productivity	Current	$350,000
B.GBP.0027	Investigating the causes of calf loss	Current	$674,170
B.GBP.0029	'The Sweet Spot' improving breeder herd performance through optimal pasture utilisation.	Current	$737,206
B.GBP.0030	A novel semen extender to accelerate genetic improvement programs	Current	$483,632
B.GBP.0031	Reducing calf loss due to exposure	Current	$407,864
2018-19 Annual Call projects underway			
B.GBP.0032	Fit for Purpose Biochar to improve efficiency in ruminants	Current	$951,886
B.NBP.0813	Increased pasture intake and reduced supplement requirements	Current	$563,280
B.GBP.0038	Optimising Heifer development and management to increase whole herd profit	Current	$972,416
B.GBP.0039	"Paddock Power": increasing reproductive productivity through evidence-based paddock design – A pilot study"	Current	$416,000
L.LSM.0018	No more gaps with superior shrubs systems	Current	$598,438
2019-20 Annual Call projects to be contracted			
	Quantifying neonatal mortality and reproductive performance in Southern beef herds	Contracting	$83,000
L.NAB.1903	Northern Australia strategic partnership to address calf loss	Current	$100,000 ($500k total)

7. RD&A gaps under this priority

Previous investment has captured some key projects with R&D providers in northern Australia who have a good appreciation of extensive grazing systems and associated challenges. The real "gap" continues to be in translating this R&D into practice change on farm. The priority does identify a need to "Deliver extension and adoption opportunities across industry...", this could readily complement activities that are yet to be scoped out under the NABRC Breeder Efficiency Coalition.

8. Actions

The Northern Breeder Herd Efficiency Coalition (NBEC) is an initiative that will manage projects collectively to maximise collaboration between R&D providers to address calf loss and northern breeder efficiency priorities. Activities will be captured under a co-investment model which reduces the reliance on levy funds to deliver a better outcome.

NBEC will continue to be the driver of investment in the grassfed beef portfolio for this year. NBEC is currently being led by NABRC and is utilising the coalition to develop a strategic program of work to address major investments across the grassfed beef productivity area. As a result, this year's investment call will not include specific priorities for beef productivity, however grassfed cattle levies are included within the feedbase, environment and animal wellbeing Terms of Reference.

2020-21 SHEEPMEAT AND GRASSFED BEEF RD&A PRIORITY
SUSTAINABLE FEEDBASE

9. Description

Region	Priority	MLA Comments	To be addressed in the 2020-21 Annual Call?
Northern	(5) Refine satellite technology used to improve producer understanding and awareness of ground cover and pasture and improve stocking rate to carrying capacity.	Requires large scale delivery program that generates crowd sourced data to refine calibrations. Promote existing technologies and service providers. FarmMap proposal (not MDC supported) was to add to biomass & cover, Stocktake app & Safe carrying calc	**No**
Northern	(8) Developing and trailing alternative grass/legume species to extend protein digestibility and animal performance into the dry season	Evaluating new plants targeting weaner production has been contracted since 2012 (dry and wet tropics (QLD)). Now to next stage: - Large scale demos of candidate *commercial* lines (recommendations from current project) - Development needed of non-commercialised shortlisted lines from evaluation project - Demos can be levy, seek MDC and partners for development - No work progressed in NT	**Yes**
Southern	(1) Breed, develop and evaluate temperate and tropical pasture and shrub species and systems that are persistent (under dry and variable climates) and optimise year-round dry matter production.	No breeding underway. Evaluation project PTN (MDC) just completed, new project to be developed. If secure a new PTN project agree with SAMRC comments to link to PTN; expanding north and south, and species - No shrub development underway - This is a major initiative, and needs planning if simply going to an open call - LPP climate modelling, species (grass, legume)	**No**

		evaluation trials southern to northern tablelands underway.	
Southern	(3) Quantify the regional impacts (in terms of farm productivity, livestock welfare and wildlife ecology) of competitive grazing species (kangaroos, deer, goats and rabbits) and predators (wild dogs, foxes, cats, and pigs). Refine tools and develop novel techniques for cost-effective and humane control and/or exclusion. Demonstrate best practice application of current techniques to increase uptake within industry.	TGP was a Round 1 priority. Business plan developed, not funded, only small preparation project progressed in 2019-20 call. Propose to progress implementation of the plan first, pending availability of funding. Then call for implementation or building the tool, monitoring network, NRM and productivity reporting, nodes for delivery.	**Yes**
Southern	**(4)** Develop new legume cultivars and management guidelines to improve performance in terms of production, nodulation, persistence and low-bloat traits.	The big need is for concerted extension efforts to build awareness of existing pasture management impediments. There has been work to understand resowing decisions (and why not). These are adoption constraints - small scale work on comparing sowing rates would assist. New plants are available, management guidelines usually developed well after release. Completion of "Not enough nodules: impact of herbicides, pesticides and other farm management tactics" will inform research needs for the future, and therefore will not be addressed in this investment call.	**Yes**
Southern	**(4)** Develop feedbase species and systems specifically for low and medium rainfall mixed farming zones (<400mm pa).	Targeting lower rainfall zone.	**Yes**
Southern	**(4)** Develop new and improved support tools and address barriers to producers using these tools to actively match land capability and feed resources to stocking rate and animal nutritional requirements.	Two elements here – develop new tool, and address barriers. Existing tools are being used, but not actively promoted, nor evaluated. Need a concerted effort say on feed demand calculator, couple with demonstrations, test review.	**Yes**

Western	(2) Feed Gap Research • A systems-based approach to understanding the feeding value of the existing feedbase and possible future opportunities in the Mediterranean zone – given predicted climatic variability. This incorporates traditional pastures, crops and perennial options (in cropping and marginal land). Given all of the recent research and development – where are the nutrient gaps and how to they fit sheepmeat and beef production systems? • New species or varieties of existing species with greater capacity to provide high-quality feed from late summer to winter. This incorporates annual legumes, ryegrass, woody and herbaceous perennials and forage brassicas. • Better cereal and brassica grazing systems in cropping based businesses for higher red meat output. • Development and demonstration of low-cost systems to address fiscal constraints to establishment. New and improved species and productive mixed annual/perennial systems for soils that are marginal for cropping e.g. deep sands that have had incorporation of clay.	As above, would like to see awareness raising on existing knowledge. Could reliably assume (from past modelling) extremes will result in shorter springs, longer summers, and impact feedbase supply. Focus on point 2. This could be breeding or evaluation. Start with evaluation. Utilisation question in a system context is relevant – when/how do I use these options? Low cost establishment – do desk top study/case studies on approaches contrasting success, and cost on short and long term (compared to simply resowing) Presumes existing species do not work in this context. Refer back to point 1 in this marginal cropping enviro. Evaluation and demonstration would be beneficial such as a WA version of B.PAS.0311 Getting more from sowing less.	**Yes**
Western	(2) Wheatbelt Pastures • A review and whole-farm modelling exercise investigating the future feedbase needs for the mixed crop/livestock zone of WA. • R&D into new resilient legume species that are adapted to the mixed crop/livestock zone, able to use rainfall for a greater part of the season and inexpensive to establish. • R&D investigating control	Test interest with GRDC (and AWI) first to check Grain & Graze modelling. Open ended questions ('future needs') Capacity issue in WA (breeding), public out of this area, private not yet moved in a big way. Nationally have now a 10-15 'hole' in delivery of (better) new plants. Could stimulate this with MDC investment. Opportunity with GRDC / AWI to co invest.	**No**

	options the major weeds that require herbicides that impact on legume persistence. • A review into options to deliver ryegrass pastures that are ARGT safe and not a weed risk for cereal crops.	Broadleaf control options needed. Is constraint to new legumes (bred in ~2000)	
Western	(5) Back to Basics – increased productivity of pastures to increase beef and lamb output • New species and cultivars which deliver more DM production of high conversion value into output (meat). • Species which are resilient to grazing and adverse seasonal conditions • More responsive in DM production to out of season rainfall. Pasture species which offer health and welfare benefits via enhanced screening with heavy negative assessments of those which limit animal performance. A greater multidisciplinary approach may be required to achieve this.	WALRC state need as producers are concerned about the lack of ongoing new investment in high quality pasture dry matter production and systems to better utilise it. See breeding initiative as above.	**Yes**
Western	(7) Addressing gaps in Rhizobial ecology for N fixation in a mixed farming system.	Required first is completion of 2019-20 call project, which is currently being contracted. This project will inform next steps in RD&E.	**No**

10. Completed or current RD&A relevant to this priority

MLA is investing western, southern and northern projects relevant to this RD&A priority including:

- "New" plants, adaptation (evaluation), constraints to production and utilisation.
- The southern feedbase investment plan is nearing completed with investment in improved plants and evaluation, agronomy and management (new legumes phosphorus efficiency, grazing crops, and root disease), grazing management via the EverGraze project, multi-purpose shrubs (via FFI and Enrich).
- Pasture Updates have been implemented across southern Australia and BeefUp forums in the north) to raise awareness and signpost. These will be replaced by a new national awareness program 'MeatUp' which will cover more broadly and be rolled out in 2019-20.
- A 'harvesting' process has been completed for southern feedbase R&D. MLA board has approved a Feedbase Adoption and Delivery plan, which is under implementation with several projects underway.
- Northern investment in feedbase has a current focus on evaluating and incorporating legumes in the grass based systems. A new project was supported from the last annual call.
- B.NBP.0766 and NBP.0749 (grass and legume evaluation in Queensland) have recommended lines for large scale demonstration, commercialisation and development (breeding).
- B.PBE.0037 and B.PBE.0038 – genomics annual legume and phalaris completed. Product to be developed with industry. New breeding programs are needed.

- LPP program of projects on tropical and temperate species include evaluation and agronomy across NSW. Delivery of this output could be via a new Pasture Trialing Program website (if a new project is supported)
- B.CCH.6621 – Agronomy package for Tedera – progressing well. Tedera commercialised in Oct 2018. Large scale demonstrations, delivery could be supported to drive utilisation
- P.PSH.0018 Phosphorus use efficiency – serradellas in NSW, WA and trialling in Vic
- B.PSP.0001 - tropicals in northern NSW and southern WA – completed, to be delivered. Value adding via new LPP projects.
- B.GSM.0008 grazing crops (Victoria, central/ NSW) – information to be extended. LPP P.PSH.1045 developing grazing crops opportunity for northern NSW.P.PSH.1136 low rainfall zone legumes, rural profit commenced.
- B.PSP.0013 Pasture legumes in the mixed farming zones of WA and NSW – to be delivered – case studies of animal performance and crop benefits.
- B.ERM.0107 Wambiana Grazing trial – collation of past work completed. Delivery required.
- T.TGP.1702 Total grazing pressure business plan completed. Small development project being commissioned from last year's priorities to cost the tool.
- L.LSM.0006 Mixed farming systems business plan completed but not supported financially for implementation.
- L.MXD.0001 benchmarking mixed farms completed.

PROJECT CODE	TITLE	STATUS	PLANNED AUD $
P.PSH.0730	DAFWA Mosaic Agriculture	Complete	MDC
P.PSH.0690	Optimising leucaena-based forage productivity	Complete	MDC
P.PSH.0884	Development of a sterile Leucaena to enhance red-meat production in new regions of Australia	Current	MDC
P.PSH.1039	Autonomous Map and Zap Weed Program Application (stage 1)	Current	MDC
P.PSH.1044	LPP Improving the use of forage brassicas in mixed farming systems	Current	MDC
P.PSH.1050	LPP Phosphorus management and requirements of tropical legume pasture swards	Current	MDC
B.GBP.0025	Grazing with Self Herding to Improve Performance of Pastoral Cattle	Current	$350,000
P.PSH.1029	LPP – Increasing livestock production by integrating tropical pastures into farming systems	Current	MDC
P.PSH.1030	LPP – Extending the boundaries of legume adaptation through better soil management	Current	MDC
P.PSH.1044	LPP – Improving the use of forage brassicas in mixed farming systems	Current	MDC
P.PSH.1048	LPP – Perennial pasture & forage combinations to extend summer feed for Southern NSW	Current	MDC
P.PSH.1136	RRDfP Novel Pasture Legumes in Dry Areas	Current	MDC
L.LSM.0006	Developing a mixed farming systems RD&A program	Complete	$347,031
P.PSH.1138	Phase 1 – Maximising the reproductive potential of the meat sheep industry by eliminating high oestrogen clovers, more live lambs on the ground	Current	MDC

P.PSH.0917	Aerodyne – intelligent Livestock and Asset Management System (iLAMS)	Current	MDC
B.WBC.0080	Weed Biological Control: Silverleaf Nightshade RnD4Profit-14-01-040	Current	$636,958
B.WEE.0141	Facilitated RD&E in weed management – improving strategies for summer perennial weeds	Complete	$585,714
B.NBP.0749	Evaluating promising stylo lines for southern Queensland	Current	$829,226
B.NBP.0812	Progressing superior tropical grasses and legumes in seasonally-dry Queensland	Current	$781,940
L.LSM.0018	No more gaps with superior shrub systems	Being contracted	$598,438 (AWI $225,000)
B.TGP.1702	Addressing feed supply and demand through total grazing pressure management (business plan)	Current	$249,994
B.PBE.0039	National Pasture Genetic Resource Centre	Current	$1,563,6588
B.NBP.0639	Improving productivity of rundown sown grass pastures	Completed	$1,259,710
B.NBP.0555	Spelling Strategies Spelling strategies for recovery of pasture condition	Completed	$817,373
B.NBP.0766	Assessment of promising pasture legumes and grasses	Current	$1,244,250
B.PAS.0355 (startup); B.PAS.0354	Legume best management practice in the Brigalow belt bio-region. (Stage 2)	Current	($154,290) $1,343,988
Various	Wambiana grazing trial	Completed	($1.48m across 4 projects)
B.ERM.0108	Wambiana – Grazing strategies and tools to improve profitability and land condition	Current	$797,298
B.PAS.0236	FFI - Enrich 2: Building the enabling knowledge and technical capacity for multi-purpose forage shrub systems	Completed	$600,000
B.ERM.0127 & P.PSH.0840	Farm Map Australia – Business Planning & Setup (Stage 1)	Current	$200,000 MLA ($300k cash from partners); MDC
B.PBE.0027	Sheep production from Tedera in medium and high rainfall environments in Western Australia	Completed	$552,072
B.CCH.6621	Advancing the agronomy package for Tedera to fill feed-gaps	Current	$1,097,960
B.PSP.0001	Increase feedbase production and quality of subtropical grass based pastures (East and west)	Current	$1,395,370
B.PSP.0104	Phosphorus-efficient legume pasture systems	Completed	$2,189,802
B.PSP.0018	Rural Profit Project: P Efficient Pastures (East and west)	Current	$5,130,003
B.PSP.0005	Managing Soil-borne Root Disease in Sub-clover Pastures	Completed	$1,280,722

B.PSP.0013	Pasture legumes in the mixed farming zones of WA and NSW: shifting the baseline	Current	$1,091,975

11. RD&A gaps under this priority

Clear definition of research needs is required, and much more targeted extension to enable utilisation of 'best management messages' specific issues.

The devised ToR, across research and delivery seeks to address these needs and generally addresses stated regional priorities. To address new plants to fill feed gaps, a breeding plan is needed, then executed. However, this call does not support implementation of a breeding program.

Outstanding are:

- Mixed farming systems needs as specified by WALRAC are not directly addressed, and work is not progressing from this previously identified need (eg application was submitted for a Rural Profit project but not subsequently supported).
    - Towards WALRAC's "*A systems-based approach to understanding the feeding value of the existing feedbase and possible future opportunities in the Mediterranean zone – given predicted climatic variability*", a proposed project is being called based on modelling, and testing future adaption options (to minimise business risk) with producers. MLA already has a proposal on this work area for eastern States, so seeking to expand the scope and so partners.
    - The above is to address the priority "*A review and whole-farm modelling exercise investigating the future feedbase needs for the mixed crop/livestock zone*" in association with previous modelling undertaken by the Grain & Graze project
- "Refine satellite technology used to improve producer understanding and awareness of ground cover and pasture and improve stocking rate to carrying capacity". There is related work being undertaken by RDI on use of 'support tools', however not a large scale focus.

- The Feedbase Business Plan has 3 key elements, each need attention:
    - Better Plants
    - Better Management
    - Better Utilisation (for livestock production and managing the natural resources base)

The priorities in this call are largely around Better Plants.

Better management work is underway

Better Utilisation - system application / integration of the Better Plants and Better Management for multiple benefits, remains an ongoing need.

Recommendation

Key feedbase priorities have been included in this year's call across two terms of references: Total Grazing Pressure, and Matching Feed Supply to a Changing Climate. Projects must link to animal productivity and include adoption activities.

2020-21 SHEEPMEAT AND GRASSFED BEEF RD&A PRIORITY
ON-FARM ENVIRONMENT

12. Description

Region	Priority	MLA comments	To be addressed in the 2020-21 Annual Call?
Northern & Southern	Northern - (4) Managing for climate variability/drought/ weather extremes. Southern – (2) Invest with the Bureau of Meteorology and other agricultural sectors to improve skill (accuracy) in weather and climate forecasting. Simplify and improve the presentation and interpretation of weather and climate outlooks to industry. An increased focus on education and extension is required.	Substantial investments already underway; B.CCH.8000, B.CCH.2104, P.PSH.0951.	**No**
Northern	(6) Understanding the importance of plant and animal biodiversity to enhance grazing land management and profitability.	A worthwhile exercise given current and planned future climate change impacts of agricultural systems. Sustainable carrying capacity indicators would also be of use to producers in light of changing rainfall patterns.	Yes
Northern	(7) Causes, consequences and management of woodland thickening.	More investment in remote monitoring to inform land management decisions could be of benefit. MLA will follow up on this priority in collaboration with the beef industry sustainability framework.	No
Southern	(1) Undertake physical and economic modelling to identify optimal enterprise mixes and risk management strategies - by region - under different climate change outlooks. Existing research needs to be reviewed and evaluated. Development into useable tools that are relevant at the regional level. Ensure adequate investment in extension and education of the findings to industry.	Covered to some extent as part of B.CCH.8000, however more work required. And should be linked, via PICs, to state and federal drought strategy processes and program currently underway. A strategy to be developed before this priority will progress.	No
Western	(1) An audit to prepare us for carbon neutrality by 2030.	MLA plans to have 50 producer case studies showing carbon	Yes

		balances on-farm and options to reduce GHG emissions and store carbon. However, confirmation of levy support from producer consultative committees helps validate the need for the investment and use of producer levies.	

13. Completed or current RD&A relevant to this priority

MLA investment of ~$8.5M is in projects relevant to this RD&A priority including:

- Beef Sustainability Framework
- Managing Climate Variability Program
- Forewarned is Forearmed Rural R&D for Profit program
- Dung Beetles Rural R&D for Profit program
- Fire and Grazing business plan
- Northern Australian Climate Program
- Wambiana long-term Grazing Trial

PROJECT CODE	TITLE	STATUS	PLANNED AUD $
B.CCH.7712	Exploring profitability and resilience through novel livestock and pasture adaptation to future climates	Current	$1.3M (MLA $599K)
B.NBP.0755	Business and RD&E plan to determine the value proposition for greater use of fire in the grazing lands of northern Australia	Completed	
B.ERM.0108	Wambiana - Grazing strategies and tools to improve profitability and land condition	Current	797,298
E.CEN.1807	Technical expert group for balance of tree and grass cover	Current	57,000
P.PSH.1145	Construction and testing of the first commercial-scale SCANS unit for measuring soil carbon in the Australian red meat industry	Current	246,000
B.CCH.8000	Forewarned is forearmed: managing the impacts of extreme climate events	Current	$9.9M (MLA $811k)
P.PSH.0951	Northern Australian Climate Project (NACP) - Innovative drought and climate variability RD&E to enhance business resilience and build producer capacity to manage climate risk across the northern Australian red meat industry.	Current	$8.1M (MDC $4M)
B.CCH.2104	Managing Climate Variability Program – Phase 5	Current	$3.3M (MLA $1.3M)
P.PSH.0918	Enhancing grazing profitability through improving soil health	Current	$750k (MDC 75% under PIFT program)
B.CCH.2046	Climate Research Strategy for Primary Industries CRSPI 2017-2019	Current	$22,500
B.CCH.2110	Biological-based or biological models for methane capture	Current	$42,372

B.CCH.2110	GHG mitigation potential of the Australian red meat production and processing sectors	Completed	$100,000
P.PSH.0793	Sustainable pasture systems under climate extremes	Current	$3,204,671
P.PSH.0823	Key research to assist the development of Emissions Reduction Fund carbon sequestration methods for savanna fire management in Northern Australia	Current	540,270
V.SCS.0008	Facilitation of the Australian Red Meat Industry Carbon Neutral 2030 Innovation Challenge	Completed	70,200
P.PSH.1195	Measuring soil carbon in grazing system s using non-destructive flux techniques	Current	246,380
P.PSH.1196	Simplifying carbon footprint assessments of red meat producers	Current	189,473
B.CCH.2109	Beef Industry 35 year environment impact trends analysis	Completed	182,760
B.PAS.0002	Research into pasture dieback	Current	5,534,545
P.PSH.1055	Desmanthus pasture in grazed pastures and its role in methane emissions	Current	905,104
P.PSH.1134	RRDfP Dung beetle ecosystem engineers – enduring benefits for livestock producers via science and a new community partnership model	Current	13,380,314
P.PSH.1136	RRDfP Novel Pasture Legumes in Dry Areas	Current	2,057,039
P.PIP.0770	Cape Grim Sustainable Development Framework	Current	22,304

14. RD&A gaps under this priority

A gap not identified would be to develop a better understanding of hydrological systems in areas of the country where grazing systems are dependent on underground water, such Barkly Tablelands – however this is a regional specific issue. In particular, sustainable extraction rates relative to recharge of the aquifer plus water quality and impact on production (not all underground water is the same).

15. Actions

A number of priorities worth addressing subject to available funds.

2020-21 SHEEPMEAT AND GRASSFED BEEF RD&A PRIORITY

ANIMAL HEALTH AND WELLBEING

16. Description

Region	Priority	MLA COMMENTS	To be addressed in the 2020-21 Annual Call?
Northern & Southern	(1, 4) Establish evidence of - and guidelines to help improve - the usage, cost efficiency and efficacy of registered pain relief products (cattle and sheep) in industry.	It is too early to draw meaningful inferences from such a survey. Only one of the three registered pain relief products is available OTC – usage levels cannot yet be used as a criterion for adoption. Efficacy can only be assessed empirically in an experimental situation. Project P.PSH.0818 (MDC funded) is looking at the efficacy of different pain management regimes in the most aversive husbandry procedures. Project B.PRS.2001 is investigating and then demonstrating the benefits of the use of Metacam and Tri-Solfen for castration and dehorning in northern cattle production systems.	NO, but pain management to progress in some form
Northern	(2) Alternatives to traditional sterilization (castration and spaying)	Two immuno-contraceptive options (ZP and GnRH) are under current or recently completed MLA project investigation. Genomic manipulation cannot yet be considered ready for market.	**No**
Southern	(4) Establish practical and accurate objective measures of animal welfare and quantify behavioural, physiological and production / commercial responses of animals to stress.	Compromised animal wellbeing is wider than exposure to stress. MLA has 7 current (and one planned) MDC co-funded projects, worth $>9M to develop objective assessment methods of the wellbeing state.	**No**
Southern	Demonstrate at farm level the benefits (economic, animal wellbeing, producer satisfaction) of using registered pain relief products (e.g. tri-solfen, buccalgesic, numnuts, metacam) in conjunction with routine animal husbandry practices for	This objective cannot be achieved with just one project. It is also too early – current analgesic options are not yet sufficiently tried and proven. A failed demonstration now could make later adoption efforts very difficult.	**No**

	sheep and cattle, such as mulesing, tail docking, castration and de-horning.		
Western	(9) Parasitic hypersensitivity scours in 1-2 year-old sheep	Path to market not clear – when lambs are exposed to scour worm larval challenge, they scour – it is unlikely to simply be due to hypersensitivity. MLA to check with AWI if they have progressed this area.	**No**
Western	(10) Bull Posthitis Cause and Prevalence	It is possible that a Bovine Herpesvirus (BHV) can be involved. Project B.AHE.0227 'Balanitis in beef herds in southern Australia' provides background to balanitis which was caused by a previously unknown BHV.	**No**

17. Completed or current RD&A relevant to this priority

PROJECT CODE	TITLE	STATUS	PLANNED AUD $
B.AHE.0308	Designing farm specific nematode control programs for sheep	Underway. Planned completed date July 2019	1,096,460
B.AHE.2020	Strategic and novel approaches to reducing flystrike in sheep	Underway. Planned completion	92,000.00
B.AHE.0262	Formulating a research pathway to provide new options for flystrike control	Underway. Planned completion	137,000.00
B.AHE.0325	The potential for vaccines against gastrointestinal nematodes of small ruminants	Completed	99,950
B.AHE.0261	Evaluation of the Sterile Insect Technique for Sheep Blowfly Control	Underway. Planned completion	196,000.00
B.AHE.0318	Reducing foetal and lamb losses in young ewes	Underway. Planned completed date August 2021	955,680.00
B.AWW.0006	Phasing out of mulesing: costs, benefits and opportunities	Contracting	639,503.00
B.AHE.0316	Testing and verification of a single-dose cattle tick vaccine	Underway – planned completion 01-Jul-2019	727,800.00
j14701	Evaluation of anti-tick vaccines for tick immunological control (novel antigen, with wider spectrum than just Cattle Tick)	Due to be contracted and conducted in latter half of 2019.	120,000.00
P.PSH.0800	A cattle tick vaccine using the silica vesicle self-adjuvanting delivery platform (could possibly be single dose).	Co-funder (UK) withdrawn. New funding source being sought.	700,000.00 MDC

B.AHE.0242	Area-wide control of buffalo fly and prevention of southward spread using *Wolbachia*	Underway – planned completion 31-Dec-2019	905,266.00
B.AHE.0038	PCR survey of *Theileria* type prevalence	Completed	154,202.00
B.AHE.0048	Buparvaquone (BPQ) efficacy against *T orientalis*	Completed	29,952.00
B.AHE.0076	*Theileria* vaccine feasibility	Completed	20,500.00
B.AHE.0078	BPQ tissue residue assay method	Completed	16,485.00
B.AHE.0194	BPQ tissue residue depletion	Completed	244,840.00
B.AHE.0213	PCR diagnostic refinement	Completed	351,560.00
B.AHE.0240	*Theileria* tick vector	Completed	32,250.00
P.PSH.0832	Chemotherapy and vaccine possibilities	Underway – planned completion 02-Mar-2020	309,950.00 MDC
B.AHE.0058	Economic impacts and epidemiological risks associated with sheep measles	Project complete. Some wild dog examinations still underway.	429,004.00
B.AHE.0236	Photosensitisation in sheep grazing *Biserrula pelecinus*	Project complete. Final report under review.	351,597.00
P.PSH.0804	Identifying public and producer attitudes to sheep and cattle animal welfare to inform education strategies	Underway – planned completion Jun 2021	1,689,082.86 MDC + levies
P.PSH.0808	New approaches to the understanding of underlying causes for neonatal lamb mortality	Underway – planned completion Dec 2021	1,415,697.92 MDC
P.PSH.0654	Pain management during aversive procedures in extensively raised beef cattle	Completed. Some pain amelioration seen, but further improvements to analgesic therapies should be investigated	300,000.00 levies
P.PSH.0676	Development of a transdermal technology to deliver analgesia to cattle undergoing surgical husbandry procedures	Completed – seeking commercialisation partner	510,912.00 MDC
P.PSH.0818	Improving animal welfare in the red meat industry — pain relief	Project underway.	832,332.00 MDC

18. RD&A gaps under this priority

At some stage, solutions and delivery methods for **parasite management** (new chemical, vaccine, sterile males, biological control) require third party collaboration to ensure successful registration (if required) and commercialilsation. These negotiations can take time.

Developing the means to **measure** livestock's state of wellbeing **objectively** and efficiently is increasingly important for underpinning claims of good husbandry, providing benchmarking for continual improvement, and enabling timeous intervention where necessary. Industry adoption of objective measurement systems and practices will need further investment.

Whereas **pain management** is an important step in refining husbandry procedures, it is a short to medium term solution, which current products do not adequately address. **Alternatives** for currently aversive procedures to achieve e.g. contraception and behaviour mitigation, need to be developed.

Immuno-contraception is a high priority as a **replacement** for castration, flank spaying, webbing, and the Willis DOT for sterilisation.

19. Actions

All these RD&A gaps are being addressed with a combination of levy and MDC investments in the projects listed in the table above. A terms of reference will be included in the 2020-21 investment call to specifically address innovations in pain mitigation, and to develop a pocket guide to the National Animal Welfare Standards & Guidelines. These actions have been identified as achievable and in line with current priorities.

2020-21 SHEEPMEAT AND GRASSFED BEEF RD&A PRIORITY

PRODUCER ADOPTION

20. Description

Region	Priority	MLA comments	To be addressed in 2020-21 Annual Call?
Northern	(10) $/FTE – value of retaining staff - demonstration of the impact of staff turnover on profitability.	Significant research has been completed in this space. Two MLA projects – B.NBP.0370 and B.NBP.0747 focus on attracting and retaining staff in Australia's beef, sheep and pastoral wool industries. Significant research has also been completed by external parties in this space. The People in Ag website offers guidance and resources: www.peopleinag.com.au	No

21. Completed or current RD&A relevant to this priority

- 1669 producers (this figure needs updating) have engaged in influence activities across Edge Workshops (477), BredWell FedWell Sheep & Cattle (Southern), Profitable Integration of Cropping and Livestock and Participatory Research Sites in 2018/19.
- The 'Business Mentoring for the Australian Meat Industry' program (MDC, P.PSH.0745) has engaged participants across the country.
- People In Ag website – provides guidance on employment in agriculture.

Capability building:

MLA invests in a number of industry capacity building projects. These projects support the promotion of careers in the red meat industries, education, mentoring new industry entrants and supporting SME in employing new entrants and providing a career path. Examples include:

- (Pilot) Producer Innovation Fast Track (MDC) – accelerating innovation capability and adoption in red meat producers.
- MLA Livestock Advisor Updates - a national program designed to better connect market ready research outputs with people in industry who have the capacity to fast track their adoption.
- MLA Red Meat Industry Professional Program (RIPP) is a competitive, 12 month scholarship program for livestock advisor' to participate in MLA focused professional development that increases the utilisation of MLA RDE&A outputs, tools, programs and training resources.
- People In Ag website – provides guidance on employment in agriculture.
- Rural R&D for Profit across RDC Stimulating the Private sector extension to increase returns from R&D – Rural R&D for Profit – B.INV.1501
- 'A Leg Up' provides mentor support for new red meat RD&A entrants in the work force by pairing them with an experienced industry professional. This project will facilitate effective communication, enable skill transfer, and build a professional network to assist RD&A entrants to set goals and achieve them.- B.STU.0310
- MLA has Business EDGE running in both Southern and Northern Australia delivered by one provider in the North and three in the South with training of two additional deliverers being undertaken in a separate project (B.GFB.1735).

- A number of 'train the trainer' activities to ensure consistent messaging, including EDGE Train the Trainer - B.GFB.1735 and B.GFB.1727, and training of PGS coordinators and coaches.
- Fast Tracking Future Livestock Consultants - P.PSH.0683 and P.PSH.0842
- The Beef and sheep industry veterinary residency program (Mackinnon), P.PSH.0719
- RAD Meat project - Developing the talent of Red Meat RD&A professionals - B.STU.0311
- PHD Scholarships, Post Graduate awards, post-doctoral mentoring
- 16 Pasture Update events have been delivered across southern Australia over the last 12 months – and these will continue into early 2019. Following that there will be a new system supporting regional awareness of MLA RDE&A
- Both the FAP and GAP address specific capability building elements for key stakeholders in this area.

Current, completed and planned Adoption projects:

PROJECT CODE	TITLE	STATUS	PLANNED AUD $	DESCRIPTION
Levy Funds				
L.ADP.1601-12	Profitable Grazing Systems including 2016/17 pilot project L.ADP.1601	Current	$10M/4 yrs ($1,472,000 2016/17 and 2017/18 projects)	A platform to achieve skill development, practice change and adoption, and improved business performance, linked with a measure to manage, whole farm systems approach and linkages with value chain.
N/A	EDGEnetwork Courses: Business EDGE Nutrition EDGE Breeding EDGE GLM EDGE Grazing Fundamentals	On going	Commercial product	Service providers operate under an MLA Deed of Delivery
B.STU.0310	Leg – up	Current	$97,372	Provide mentor support for new red meat RD&A entrants in the work force by pairing them with an experienced industry professional.
B.STU.0311	RAD Meat - Developing the talent of Red Meat RD&A professionals	Current	$96,272	Review the challenges and develop strategies for attracting and retaining RD&A professionals in the red meat industry
B.MMS.1503	BredWell FedWell for Sheep	Current	$357,000	Aim is to increase the knowledge, skills and confidence of producers to achieve nutritional and genetic improvements in the flock.
B.SBP.1501 & B.GFB.1728	Develop and pilot Bredwell Fedwell for the southern beef industry & Bredwell Fedwell for Southern Beef	Completed & Current	$89,648 & $249,600	B.SBP.1501 Develop and pilot Bredwell Fedwell for the southern beef industry. B.GFB.1728 Deliver 60 workshops to link genetics and nutrition in producer decision making for increased productivity and profitability.

B.GFB.1735	Southern Business EDGE Train the Trainer	Current	$25,000	Train two new Business EDGE deliverers in southern states
B.GFB.1727	Facilitating industry practice change via service provider EDGENetwork training	Completed	$203,460	Update current deliverers in updated material, train 6 new presenters for the north and train 40 to 60 early and mid-career adoption officers in EDGE principles.
Various	PHD Scholarships, Post Graduate awards, post-doctoral mentoring	Current		Build industry R&D capability
E.PDS.1410 L.PDS.1803	Enhanced Producer Demonstration Site	Completed Current	$450,000 $610,609	Phase 1 & 2 of Enhanced Producer Demonstration program. Phase 1 had 8 projects, final reports for these projects are under review will be published in due course. Phase 2 will see an additional 7 projects under this program, 2 calls have been held, with projects development underway.
L.MMS.1803 L.MMS.1801 L.MMS.1802 L.ADP.1900	Its Ewe Time Forums	Completed Current Completed Completed	$146,016 $149,600 $88, 646 $208,278	Its Ewe Time forums commenced in Aug 2017 to highlight, integrate and contextualise the business value of R&D messages and create overt pathways to MLAs adoption programs. The purpose of Its Ewe Time forums is to motivate and challenge sheep producers to attain highly productive, profitable and sustainable systems by presenting the business value of R&D messages, reaffirm key drivers of productivity gain and creating overt pathways to MLA adoption programs. 24 forums (full & Half day) across QLD, NSW, VIC, TAS, SA & WA engaged more than 1100 participants.
Various	Producer Demonstration Site Program	Completed/Current Planned	>$1.6M (16/17 – 19/20) >$18M (20/21 -27/28	The PDS program underpins MLA's research, development and adoption (RD&A) programs by supporting groups of producers to demonstrate, adapt and validate the triple bottom line benefits of integrating new management practises, research and development outputs and associated skills within the context of their commercial production systems. The key outcome of a PDS is producer adoption of the demonstrated management

				practices resulting in improved business performance. As at June 30 2019, 739 Core Producers, 5127 observers were engaged in the PDS Program. More than 280 individual sites across 51 individual projects (includes EPDS). An investment of $18M over 7 years was approved by the MLA Board for the PDS program commencing 2021.
L.MXF.0001	The profitable integration of cropping and livestock in southern Australia	Completed	$475,810	Define and extend the unique capabilities and profit drivers in mixed farming systems that optimise available synergies between cropping and livestock enterprises.
L.MXF.0002	Southern Beef and Prime Lamb Situation Analysis 2017 -	Completed	$152,000	Updated situation analyses of productivity and profitability in southern beef and lamb production systems.
B.AHE.0314	Paraboss for Cattle	Current	$486,102	This project will align parasite management resources for grassfed beef producers into an existing successful framework used by sheepmeat producers. While still offering regionalised IPM strategies, ParaBoss for cattle parasites will consolidate Australia's available cattle parasite management resources into one centralised national database. ParaBoss for cattle parasites will be the key platform for the development and extension of national best practice management for cattle exposed to mixed parasite infections which will ultimately reduce its economic impact and improve animal welfare.
L.MMS.1703	Making More From Sheep (MMFS) Website Maintenance	Current	$41,387	Making More From Sheep is an online best practice package of information and tools for Australian sheep producers. A history of investment in research and development means that much of the information, technologies and tools exist that allow sheep and wool producers to significantly increase their productivity, profitability and sustainability. This investment is to ensure that the MMFS website remains current and the

				go-to-place for the most recent, high quality, principle & procedure based sheep information for profitable and productive sheep businesses until 2020.
L.MMS.1702 L.ADP.1901	Productivity & Profitability Webinars	Completed Current	$105,600	Delivery of a 12 month national webinar series for sheep producers covering topics aligned to the online MMfS manual, providing participants with fundamental information to support practice change and increase their productivity and profitability (2017/18 & 2018/19). Continuation of the delivery of a national webinar series for sheep producers during the last 12 months, expanding on L.MMS.1702 to include goat and beef topics over 18 months, 30 webinars in total. Participants will receive fundamental information to support practice change.
L.ADP.1903	Productivity (On Farm) and Feedlot Impact Assessment	Current	$89,063	An evaluation of the potential and actual productivity impact from the adoption and outputs arising from MLAs investments in the on-farm productivity (including producer adoption and feedlot) programs. Through a consultant, the work will be carried out closely with the MLA evaluation and on-farm productivity teams to ensure strategic investments are being made into the red meat industry.
L.MMS.1610	Wean More Lambs - Pastoral	Current	$11,900	Development of a Wean More Lambs – Pastoral publication.
L.FAP.1910	MLA Livestock Advisor Updates	Current	$563,382	10 MLA Livestock Advisors Update events, with geographical spread across Australia will deliver producer led, regionally relevant communication materials (e.g. podcasts, short videos, case studies, etc.) annually to promote key messages from MLA RDE&A. The investment will engage 300 industry influencers (advisors and pioneering producers with 60% of participants increasing their utilisation of MLA RD&E outputs, tools and resources. Outcomes to include participation pathways to engage in PGS and PDS.

L.FAP.1911	MLA Red Meat Industry Professional Program (RIPP)	Current	$411,180	Phase 1 - Design and pilot a training program which responds to market gap and enhances participation in the PGS program and relevant MLA tools and resources. Annually 20 program participants will be selected to complete a 12 month professional development program that introduces them to MLA RDE&A outputs and opportunities. Ten attendees will go on to participating in Involve and Partner program (PDS, PGS or MLA R&D Updates) to demonstrate development.
L.FAP.1901-04	Feedbase Four	Current	$740,250	Producer capacity building for improved feedbase (healthy soil, improved plant N, pasture weed management and persistence) arising from the FIP R&D outcomes. These projects will deliver a grazing pressure decision support tool called Pasture Paramedic – supported by a series of on –farm and advisor soil and pasture best management demonstrations and/or training events across southern Australia – with phase two replicating the themes and deliverables into northern Australia commencing 2020.
L.FAP.1905	FAP technical writer project	Current	$35,000	The project will create and update MLA content using R&D outcomes identified within the FIP. The new and reviewed content will be used to underpin content supplied in Pasture Paramedic and subsequent training and project delivery.
L.FAP.1906-7	FAP e –modules and e-tools.	Current	$538,700	These e-projects update MLA pasture related decision support tool (DST) and provide online alignment of these tools with Feedbase Four content and a pathway to implementing Pasture Paramedic recommendations.
	Northern Beef Farm Innovation Network	Planned	$475,000 over 3 years	This project will pilot a benchmarking system for the northern beef industry to record business performance and share information among producers to improve productivity, profitability and sustainability.
L.PDN.1701	Lay Spaying Accreditation Scheme	Current	$75,690 over 3 years	This proposal addresses the request from Cattle Council of Australia that MLA undertake the

				final step in establishing an accreditation scheme for lay-spayers to comply with the impending change in legislation. This project will develop an accreditation process for lay-spayers by establishing the criteria for initial accreditation, monitoring of accredited spayers, renewal of accreditation, refusal of accreditation and review of accreditation.
B.PRS.2001	Northern Beef Pain Relief Project	Current	$99,086 over 3 years	This project will investigate the use of analgesics at the time of castration and/or dehorning, and the resulting impacts on welfare and production outcomes in beef cattle. An initial pilot study will be conducted on Douglas Daly Research Station and consist of 400 weaners that will be randomly allocated to four treatment groups. Results from the pilot will then inform a PDS project involving 6 NT properties in years 2 and 3.
	Regional Extension and Adoption Project - Qld	Planned	$180,000	The project will employ 1 beef extension specialist to work in central and northern Qld to assist development of project applications to establish Producer Demonstration Sites (PDS), and increase the uptake of the Profitable Grazing Systems (PGS), EDGE-Network and Genetics programs by northern beef producers.
	Regional Extension and Adoption Project - NT	Planned	$180,000	The project will employ 1 beef extension specialist to assist Northern Territory beef producers develop project applications to establish Producer Demonstration Sites (PDS), and increase the uptake of the Profitable Grazing Systems (PGS), EDGE-Network and Genetics programs.
	Regional Extension and Adoption Project – WA (Kimberly Pilbara)	Planned	$180,000	The project will employ 1 beef extension specialist to assist beef producers in the Kimberly Pilbara develop project applications to establish Producer Demonstration Sites (PDS), and increase the uptake of the Profitable Grazing Systems (PGS), EDGE-Network and Genetics programs.
E.CEM.1927	RSHA	Current	$60,000 over 3 years	The Rural Safety Health Alliance (RSHA) has been established to

				drive cross-sectoral collaboration on research, development and adoption (R D & A) initiatives to lower injury and fatality rates in Australian agriculture. Contributing to this project will facilitate the initiation of projects to improve on-farm health and safety and lower the injury and fatality rates in Australian agriculture.
L.GFB.1802	FutureBeef web site delivery	Current	$599,270 over 3 years	This project will provide a coordinated approach to the delivery of online information and industry engagement, and continue to give the northern beef industry access to a 24/7 one-stop shop for beef information. Project partners are (MLA, DAF, Northern Territory Department of primary Industries ((NTDPI)) and Department of Primary Industries and Regional Development ((DPIRD)).
	BeefUp Forums	Planned	$1,542,609 over 3 years	Awareness raising events for northern beef producers
	MeatUp Forums	Planned	$2,689,774 3 years	Awareness raising events for southern red meat producers
L.GEN.1809	Breedplan and Sheep Genetics Short Videos	Current	$87,965	Develop a short video series aimed at upskilling commercial producers about genetics. These will be delivered as part of the genetics marketing campaign and housed on the new genetics hub. These videos cover breeding values, Index's, breeding objectives and what to do prior, at and after the sale. They are a first step resource.
L.GEN.1810	Proof of Profit from EBV based Selection	Current	$87,655	This project will utilise existing business performance data from the Australian Beef Report to develop a tool that aims to generate a response to genetic selection and estimate herd productivity and financial gain. Project outputs will be utilised in existing and future extension activities to reinforce the importance of genetic selection as a tool to increase key on-farm profit drivers.
L.GEN.0001	Sheep Genetics Database interface upgrade	Current	$1,500,000	This project aims to simplify the search, filter and display functions through MERINOSLECT and LAMBPLAN databases i.e. simplifying the language and tools for producers who are new to the

				space. The project also aims to increase the ease of uploading catalogues and presenting animals (in both catalogues and pen cards) for Sheep Genetics clients.
L.GEN.1805	Northern Beef Producer case studies	Complete	$55,930	Collection of commercial producer case studies for the genetics marketing campaign
L.GEN.1813	Southern Beef and sheep commercial producer case studies	Current	$34,685	Collection of commercial producer case studies for the genetics marketing campaign
	Northern Beef genetics project	Planned		This planned project aims to drive adoption of breeding values in the northern beef industry. Planned to run similar to P.PSH.0961. Firstly may begin as a PDS.
MDC funded				
P.PSH.0745	Business Mentoring for the Australian Meat Industry	Current	MDC	Piloting an Agribusiness Development Program for producers to increase the rate of adoption of more profitable business models.
P.PSH.0683 P.PSH.0842	Fast Tracking Future Livestock Consultants	Current	MDC	Develop the capacity in livestock consulting industry by fast-tracking skills of new consultants.
P.PSH.0719	The Beef and sheep industry veterinary residency program	Current	MDC	Build consulting capability with future livestock veterinarians
	Producer Innovation Fast-Track program	Current	MDC and levy	It aims to identify the industry trailblazers and provide the support and expertise required for them to innovate faster and further.
E.INV.1408 P.PSH.0792	Paraboss - Sheep	Completed Current	$215,804 (L) Levy & MDC	Establishment of ParaBoss, a national resource for sheep parasite control (i.e. worms, flies and lice) in Australia. ParaBoss will manage the three websites that currently provide national sources of information for major parasites (WormBoss, FlyBoss and LiceBoss). In addition, ParaBoss will provide the national link for industry communication about major endemic parasites of sheep from which will emerge independent and industry-proofed recommendations. ParaBoss structure will have governance provided by an industry Steering Committee with fractional positions for Executive Officer (EO) and Technical Officer (TO). Technical Committees will be enabled by EO and TO and ensure

				the scientific and technical basis of recommendations and actions are sound and nationally relevant. Continuation of ParaBoss, which will maintain and improve the websites, support a national technical committee for worms, flies and lice and provide national coordination for sheep and goat parasite management. Other deliverables include: ParaBoss News; hosting of the ParaBoss Technical Forum and the biennial Technical Workshop; development of "off-line" tools, a national training process to up-skill trainers, advisors, service providers and producers and a national database of DrenchTest results.
P.PSH.0923	EiD Enabled – Stimulating the information supply chain	Current	MDC	Increase the capability of value chain participants to make informed decisions, improving whole-of-chain productivity and business performance using a data driven approach by leveraging mandatory introduction of individual electronic identification (EID) for sheep in Victoria.
P.PSH.0961	Accelerating rates of genetics gain in Merinolink with DNA testing	Current	MDC	This project aims to increase the adoption of genetic tools for the merino industry through workshops, conferences, face to face with partnered service providers over a period of 5 years. Stud producers– maximise genetic gain through breeding program design and genomics Commercial producers – increase the knowledge, use and understanding of ASBVs and indexes to increase productivity on-farm
P.PSH.0847	A bull selection decision support tool	Current	MDC	The purpose of this project is to develop a decision support tool (DST) which aims to simplify the bull selection process, increase the number of bull buyers who effectively utilise genetic performance measurement information.
P.PSH.1063	Enhancing Technology and adoption across the angus genetic	Current	MDC	This project aims to implement an integrated suite of R&D, adoption and supply chain communication activities designed to harness disruptive technologies and to

	improvement pipeline			accelerate the application of continuous genetic improvement programs among breeders of Angus and Angus-influenced cattle.
P.PSH.0714	Southern Beef technology services	Current	MDC	This project delivers the BREEDPLAN extension services for southern beef breeds.
P.PSH.0786	Tropical beef tecnnology sevices	Current	MDC	This project delivers the BREEDPLAN extension services for tropical beef breeds.
Rural R&D for Profit funded				
E.INV.1601	People In Ag	Current	Initial MLA contribution $106,000 (total $476,000) from other RDCs Ongoing contribution for 3 years to 2020 of $28 000/an	Web site for guidance on employment in agriculture www.peopleinag.com.au
B.INV.1501	Stimulating private sector extension	Completed	MLA contribution: $260,000	

22. RD&A gaps under this priority

Adoption has been broadly integrated in the programs of work identified for the 2020-21 Investment Call. Further, for the first time, MLA this year asked the Research Councils to identify priorities specifically for the Producer Demonstration Site (PDS) open call, which is currently underway. An evaluation will be conducted after this first round to assess how this process can be improved in the future, to ensure Research Council adoption priorities have a clear line of progression.

23. Actions

A standalone Terms of Reference document will not be developed for this area, as it is preferential to have adoption activities integrated in the R&D programs of work. Each R&D project that is successful through the Investment Call, will involve key MLA research and adoption staff working with the service provider to develop an adoption plan at the initiation of the project. This will be built into the schedule and be reported on, in the relevant milestones.

2020-21 SHEEPMEAT AND GRASSFED BEEF RD&A PRIORITY

GENETICS

24. Description

Regional issues contributing to this Southern RD&A priority

Region	Priority	MLA comments	To be addressed in 2020-21 Annual Call?
Western	Are big cows (and ewes) more profitable than small ones?	There has been extensive work done to understand the relationship between maintenance costs, cow size and genetic correlation to production traits. This includes modelling continually conducted and improved through BreedObject, which has recently been updated to v6 which will limit the increases in mature cow weight when using the indexes compared to previous versions.	No

25. Completed or current RD&A relevant to this priority

MLA has invested significantly across various programs relating to this priority theme.

PROJECT CODE	TITLE	STATUS	PLANNED AUD $	DESCRIPTION
L.GEN.1704	Advanced genetic evaluation tools and systems enabling faster and more valuable genetic gain in the red meat industries	Current	$8.3M	This project will significantly enhance the genetic evaluation tools and systems used in BREEDPLAN and Sheep Genetics. Including BreedObject, which is a tool for formalising breeding objectives and indexes that can help producers breed more profitable cattle. This takes into account the factors influencing key biological components of maternal productivity in cattle as well as the current genetic correlations between traits expressed in the Australian cattle population. Recent updates to BreedObject in v6 allow for better understanding of mature cow weight and responses than in the past, where commonly responses from using $indexes resulted in increases in mature cow weight.
P.PSH.0847	Genetics R&D: A bull selection decision support tool	Current	$790K	A decision support tool (DST) which aims to simplify the bull selection process, increase the number of bull buyers who effectively utilize genetic performance measurement information. The DST is directly linked to the newest version of BreedObject v6 which takes into account feed costs associated with different mature cow

				sizes. Currently, the sheep industry have a similar tool in sheep, developed by the Sheep CRC called Ramselect.com.au
P.PSH.0714 and P.PSH.0786	Southern Beef Technology Project and Tropical Beef Technology Services	Current	$4.7M	Two projects focusing on extension and adoption of the tools available to evaluate genetic merit of animals outside of environmental impacts across the country. Including individual Estimated Breeding Values (EBV's) for mature cow weight, feed-use efficiency and all other major production traits. As well as BreedObject v6
P.PSH.0869	Optimising temperate cow herd efficiency	Current	$5.2M	This projects goal is to help producers to improve cow maternal efficiency at the same time as producing high value carcases. It aims to do this through a number of pillars within the project. Including 1. Identifying approaches to improve the description of maternal cow trains in BREEDPLAN 2. Measure and develop reference populations for young heifer traits in both research and industry herds 3. Assess the genotype by environment interactions for cow efficiency traits 4. Assess the genotype by breed interactions in trans-Tasman datasets 5. Identify new approaches to setting breeding objectives and potentially develop new $indexes where appropriate for cow efficiency and environment 6. Develop a package around maternal efficiency for future delivery in Australia and New Zealand cattle farmers 7. Building of industry capacity through producer involvement throughout the projects life
L.GEN.1710	Female reproduction phenobank and validation herds	Current	$2.2M	This project will use stored DNA samples to genotype animals with existing phenotypic records which will reduce the time to validate gEBVs. Accurate gEBVs can transform the rate of genetic gain and the pathways to

				adoption of improved genetics in Australia. A Female Reproduction Phenobank will address the needs for improved reproduction performance in Bos indicus influenced herds. The Phenobank will: 1) Standardize the language used for reproduction traits to facilitate development and adoption of new gEBVs; 2) Create an easy-to-use platform for data sharing; and 3) Recommend on the most suitable phenotypes, genotypes and analytical methods to produce gEBVs across breeds. The project has begun and has already looked at including Bos Taurus datasets where applicable. There is opportunity for work to be completed on mature cow weight and overall cow performance through the phenobank dataset.
	Beef CRC – Program 2 Feed efficiency, maternal productivity and responsible resource use. As well as the Maternal Productivity Project	Complete		The Southern Maternal Project aimed to follow concerns from breeders that while there had been genetic improvement in feedlot and abattoir performance of cattle, it may have led to a decline in maternal productivity due to a change in maternal physiology. With two divergent selection lines setup in different locations (SA and WA) where both fat and residual feed intake were used as the lines. Keeping Mature cow weight as a trait measured across both. Results and findings can be found in the Animal Production Science Special Edition *Animal Production Science,* 2017, **58**, i-ii https:dpo.org/10.1071/ANv58n1_FO
Under development with commercial collaborators (MDC)				
J14563	Delivering resource populations for multi-breed genomic evaluation in beef cattle	Approved	$7.5M	This project will develop the first head-to-head reference population for the major temperate breeds. Allowing for the development of a multi-breed dataset for production, efficiency and reproductive performance. The project will be monitoring cattle over their lifetime and will develop a dataset that will be used in BREEDPLAN analyses and allow for updated correlations and

				parameters to be calculated for traits that are infrequently measured on-farm – such as mature cow weight and days to calving.
Significant work completed as add-ons or outside of MLA R&D projects.				
Methods and consequences of including feed intake and efficiency in genetic selection for multiple-trait merit	Journal Article *The Author(s) 2018. Published by Oxford University Press on behalf of the American Society of* *Animal Science. All rights reserved. For permissions, please e-mail: journals.permissions@oup.com* J. Anim. Sci. 2018.96:1600–1616 doi: 10.1093/jas/sky049 Where industry production environments vary, and feed cost for trait change varies with the environment, we recommend that industry indexes be derived for more than one level of feed cost. Cow condition score did not decline while biological and economic efficiency of the production system and individual animal were improving, suggesting that efficiency can be improved under multiple-trait selection without compromising breeding cow welfare.			
Extended Cow Liveweight Modelling For Beef Cattle Breeding Objectives	Journal Article **Animal Breeding and Selection** Proc. Assoc. Advmt. Breed. Genet. 21: 13-16 An extended procedure is described for modelling cow liveweight change over the production year for valuing cow liveweight in breeding objectives. The pattern of change, before and after trait change, is able to be approximated from breeder-described variables for any production system. Examination of seven datasets showed cow liveweight changes systematically over age in many herds and breeds. Analyses showed liveweight loss from pre-calving to mating and cow liveweight at mating both change in proportion to the liveweight of the cow pre-calving. Differences in cow liveweight pre-calving are thus larger than are the differences at mating, which affects feed costs in valuing cow liveweight at mating. Adoption of the procedure will increase the precision with which feed cost is associated with cow liveweight in beef cattle breeding objectives.			
A review of factors influencing key biological components of maternal productivity in temperate beef cattle	Journal Article *Animal Production Science*, 2018, **58**, 1–19 http://dx.doi.org/10.1071/AN12428 This review examines key components and definitions of maternal productivity. Management decisions as well as cow and calf traits have important interacting impacts on maternal productivity. Achieving a calving interval of 365 days represents the single most important production issue affecting maternal productivity and is dependent on heifer development during early life and energy reserves (i.e. body condition score) in subsequent years.			

Brad Walmsley PHD	Chapter 2 – literature Review Looks at the push to increase efficiency and profit while decreasing the impact they have on environment. The review addresses a. Introduction b. Characteristics of Animals Growth c. Decision support systems **d.** Growth Functions
GxE for beef cattle breeding objectives as a consequence of differences in cow feed cost	*Proceedings of the World Congress on Genetics Applied to Livestock Production, 11.866* The presence of genotype by environment interactions (GxE) affects the decisions made by livestock producers when selecting breeding animals. Studies have traditionally focussed on selection criteria, and on a single trait basis, with most finding little evidence of GxE. This study demonstrates that substantial GxE occurs for the beef cattle breeding objective. When the length of the feeding period or cow feed price varies, or they vary in combination, the correlations between sire rankings decrease. Ignoring the occurrence of this GxE in selection risks compromising commercial production system profitability.