Livestock

Overview

Western Australia produces and exports a wide range of meat – beef, lamb, mutton, goat, pork and poultry – as well as wool and milk. The state is Australia's largest exporter of live sheep and also supplies international markets with premium chilled and frozen meat products.

Dr Bruce Mullan

DIRECTOR, LIVESTOCK RESEARCH AND INDUSTRY INNOVATION

THE SECTOR HAS A GROSS VALUE of production of over $3 billion, of which about 60 per cent is exported. The sheep industry — meat, live exports and wool — generates about half of this value and the beef and dairy industries just over $1 billion. Pork, poultry and goat products contribute the remaining $500 million (Figure 17).

WA is known internationally as a reliable supplier of high-quality animal products produced in a clean environment to high animal welfare standards. With a growing global demand for animal protein, the WA livestock industry is well placed to sustain its export growth.

The state's livestock supply chains are major employers, with many positions in regional areas. It is estimated that more than 7700 people are directly employed in livestock production and a further 4300 people are employed in processing sectors.

Australian consumption of meat products has almost doubled in the past 40 years. Per capita consumption has increased for poultry and pork but fallen for beef and sheep. However, global demand for red meat has more than compensated for the fall in domestic consumption. Chilled and frozen beef, lamb and mutton meat is exported from WA to more than 50 countries.

Wool production is one of WA's largest and oldest agricultural sectors and the state produces about 70 million kilograms of wool each year with 90 per cent of this destined for high end apparel. Increased global demand in recent times has stimulated record wool prices and the industry has a current gross value of production of more than $900 million.

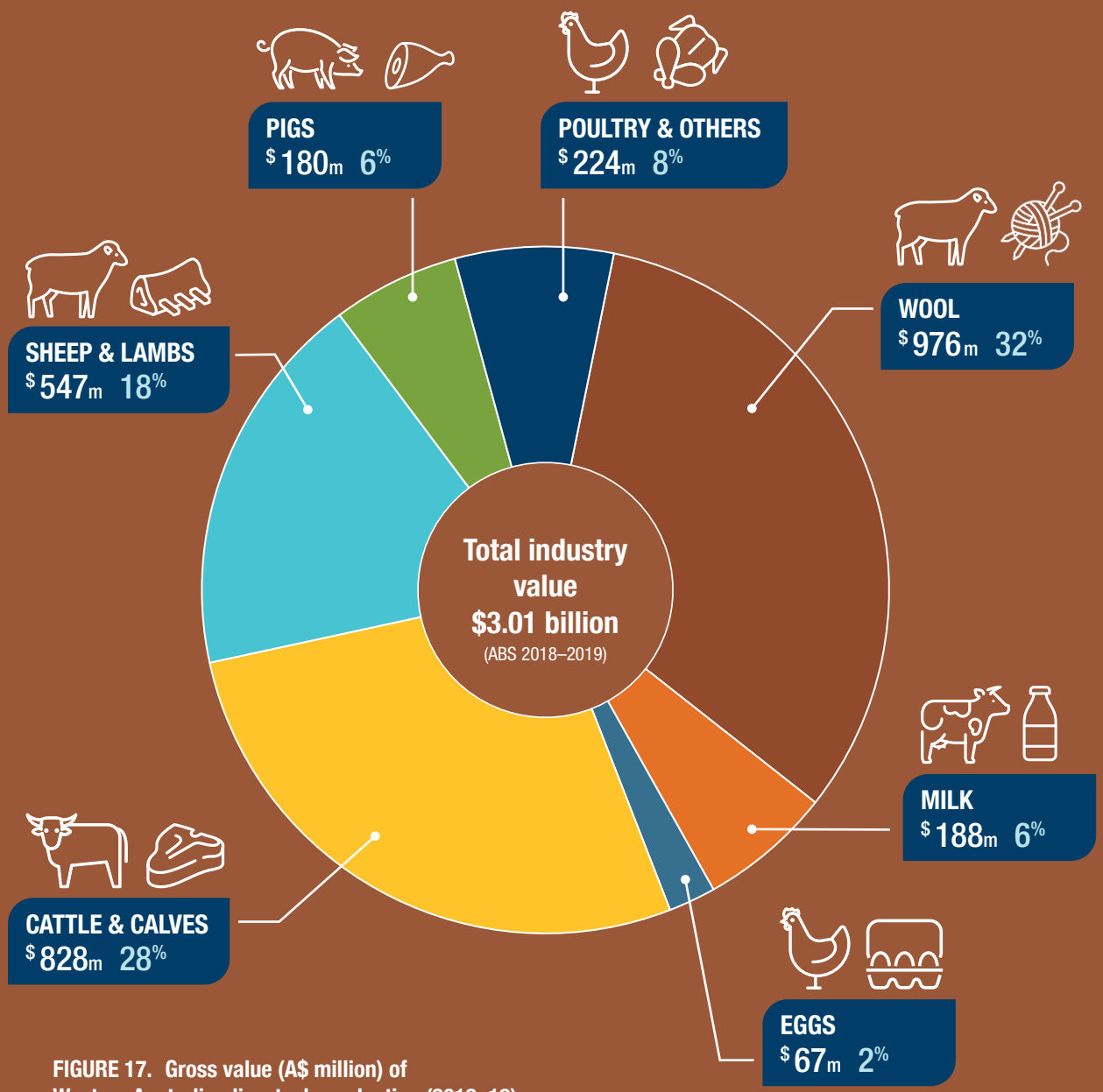


FIGURE 17. Gross value (A$ million) of Western Australian livestock production (2018–19)

Livestock

Livestock

To sustain and diversify our export market growth the WA livestock industry must maintain a productivity growth of at least two per cent per year and continue to meet consumer demands in relation to environmental, animal welfare and food provenance expectations.

DPIRD research and development has a proven record of increasing the efficiency and productivity of the sheep industry.

Despite WA sheep numbers having declined significantly in recent decades, the gross value of the industry has increased over the past 20 years through research-led improvements in meat quality, carcase weights, breeding rates and wool quantity and quality.

DPIRD's livestock team is now focused on the next leap in productivity gains required of the sheep and cattle industries.

Research is underway to:

- lift the diversity and productivity of livestock feed systems by breeding more nutritious and productive annual and perennial pastures and implementing irrigated systems to ensure year-round feed supplies
- lift livestock productivity through genetic selection of animals with higher feed efficiency
- trial and develop agricultural technologies to streamline livestock production processes and enable automation of management activities to reduce costs of production
- assess and implement ways to reduce livestock greenhouse gas emissions and ensure the red meat industry reaches its goal of becoming carbon neutral by 2030
- develop traceability systems to support the marketing of premium livestock products
- add value along WA livestock supply chains by working with industry to increase onshore processing and find new markets for fresh and processed meat products.

Livestock

While the live sheep and cattle trades dominate the bulk of the export industry there has been a steady increase in the value of exported meat from WA over the past 10 years.

Processing meat locally means more jobs in regional WA, and more money into local economies and communities.

DPIRD is working with the northern cattle industry through the Northern Beef Development Program to drive profitability, economic growth and resilience, and facilitate industry modernisation and diversification. The program is helping producers increase productivity across their land, livestock and labour resources and has a particular focus on helping Indigenous pastoralists to transition to improved business models that attract investment and create job opportunities.

Livestock

DPIRD's livestock research and development activities are organised under the following themes:

Livestock productivity:

Page 176

Research and development to lift productivity and increase the value of extensive and intensive livestock industries in WA.

A key focus of the research is to increase the efficiency with which sheep and cattle convert feed into products while reducing greenhouse gas emissions.

Livestock systems:

Page 194

Developing and assessing digital technologies for livestock farming systems that lift productivity and lower costs of production. Research is also supporting the red meat industry's goal of reducing its carbon footprint and becoming carbon neutral by 2030.

Livestock

Feedbase productivity: Page 206

Identifying new feedbase options and management practices that optimise profits of sheep and cattle producers.

An important area of research is the development of legume-based forage systems, which generate nitrogen for mixed cropping systems and offer high value livestock feed.

Value chains: Page 224

Conducting and communicating market analysis to drive new product development and create new markets.

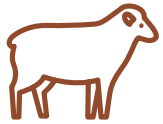
Global demand for quality meat products is increasing at unprecedented rates, particularly in the premium-paying Asian and Middle Eastern markets.
To capture these growing market opportunities, the Western Australian livestock industry must continue to innovate by adopting new technologies and developing sophisticated value chains.

DR BRUCE MULLAN

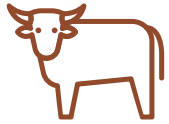
LIVESTOCK PRODUCTIVITY

LIVESTOCK PRODUCTIVITY

Purpose: research and development to grow the value of extensive and intensive livestock industries in WA.



SHEEP



BEEF

INTENSIVE INDUSTRIES

UNDERSTAND

Understand the interactions between animals, feedbase and the environment to increase animal performance.

MANAGE

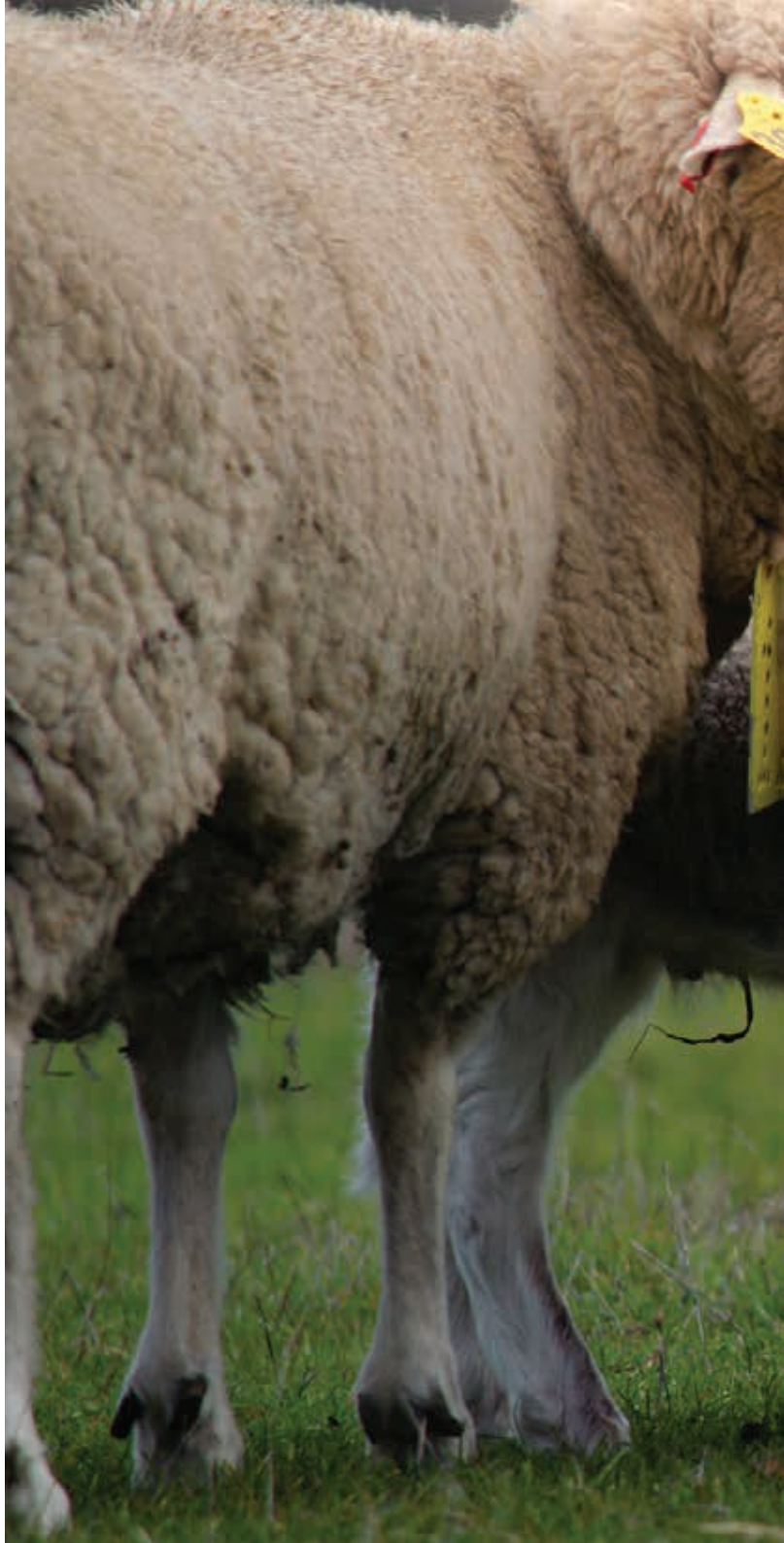
Lift livestock productivity through the most efficient management of land, labour and capital resources.

GROW

Develop new market opportunities and reduce cost of production to grow the value of livestock industries.

LIVESTOCK PRODUCTIVITY

The economic success of Western Australia's livestock industries is underpinned by animal performance and product quality. Production potential is driven by genetics, nutrition, health, climate and environment.



Livestock

NOTE: These sheep have additional tags for research purposes which will be removed before they leave the Katanning Research Facility.

DPIRD'S LIVESTOCK TEAM undertakes applied research to increase meat and wool productivity and the reproductive performance of sheep and cattle across WA's agricultural and pastoral regions. This includes the development of grazing management systems that maximise profit per hectare.

The team also works with the dairy, pig and poultry industries to support industry development in collaboration with the Agribusiness and Food Directorate.

Genetics underlie the potential performance of livestock, and DPIRD's livestock team has a long history of developing improved genetics for high-value traits such as growth rate and meat quality. Through its management of one half of the Australian Genetic Resource Flock at its Katanning Research Facility, DPIRD plays a central role in ensuring WA's flock of 14 million sheep has continual access to new and improved genetics for on-farm breeding programs.

A key focus of DPIRD's current livestock research is increasing the efficiency with which sheep and cattle convert feed into products while also reducing the carbon footprint and costs of animal production.

A specialised feed efficiency unit at Katanning is being used to select for animals which are genetically superior in converting feed into meat and wool.

Less feed, more meat and wool

Breeding sheep with higher feed efficiencies means producers can generate more meat and wool from less feed.

Research capacity to increase feed efficiency and reduce methane production across the WA sheep industry has been boosted through the development of a purpose-built feed efficiency unit at DPIRD's Katanning Research Facility.

DPIRD IS INVESTIGATING the feed efficiency of sheep to increase the profitability of the Western Australian sheep industry while reducing methane emissions.

Livestock industries depend on animals converting the feed they eat into meat, milk or wool. Production from WA livestock was valued at just over $3 billion in 2018–19.

Feed represents the largest cost to a sheep livestock system. Supplementary feed and pasture management costs can make up 35 per cent of total variable costs, depending on the production system.

Livestock Productivity

Sheep that eat less feed to make the same amount of meat and wool are more efficient and more profitable. Increasing the efficiency of energy use by 10 per cent in a Merino flock could increase profit by 20 to 44 per cent.

If the feed efficiency of the national flock could be increased by 10 per cent it would result in an annual benefit to the industry of $220 to $510 million per year.

Feed-efficient animals generate less methane, which will help the red meat sector meet its goal of becoming carbon neutral by 2030.

*NOTE: These sheep have additional tags for research purposes which will be removed before they leave the property.

DPIRD manages one half of the Australian Genetic Resource Flock, which has been developed to increase the productivity of the nation's sheep flock.*

Studies indicate there is enough genetic variation in the WA flock to improve feed efficiency through breeding programs.

However, selecting for feed efficiency requires measuring the feed intake of individual animals, which is difficult to do on-farm with large mobs of sheep.

The purpose-built feed efficiency unit at DPIRD's Katanning Research Facility will enable scientists to measure the individual feed intake of up to 300 sheep at one time with minimal effect on feeding behaviour. Specialised equipment will measure methane emissions.

The first project at the new unit is investigating the feed efficiency of DPIRD's Genetic Resource Flock. Research scientists Beth Paganoni and Claire Payne, with support from senior technical officer Claire Macleay and her team, will manage and collect the feed intake, body composition and methane emission data from progeny of the Genetic Resource Flock.

Measurement of feed intake will enable development of Australian Sheep Breeding Values (ASBVs) for feed efficiency. Sheep breeders can then use the ASBVs to breed sheep that are more feed-efficient and produce less methane, without needing to measure feed intake on-farm.

To help sheep breeders and commercial producers select sires for their breeding programs, DPIRD evaluates the genetic performance of sheep sires for the Yardstick project. Yardstick is run by the Federation of Performance Sheep Breeders WA. The project benchmarks the progeny of WA rams. Lambs born into the Yardstick flock at Katanning are evaluated for a range of production traits.

DPIRD's Katanning Research Facility is helping breed more productive sheep with lower carbon footprints.

Research facility speeding genetic gain

DPIRD's Katanning Research Facility is delivering faster genetic gain in the WA sheep flock.

The 2100-hectare research farm has recently been updated with specialised feed efficiency and methane measuring capabilities. The new additions will speed the breeding of sheep with improved feed efficiencies, which will reduce the industry's carbon footprint while lifting productivity. The research facility operates under the highest animal welfare standards and offers world-class research capability to the Australian research community.

DPIRD staff at Katanning measure a range of sheep production traits to develop breeding values that sheep farmers can then use in their breeding programs.

Yardstick hoggets penned into sire groups for inspection by attendees at the DPIRD Katanning sheep field day.

WA sheep improving the national flock

DPIRD manages one half of Meat & Livestock Australia's Australian Genetic Resource Flock, which is being used to improve the genetics of the nation's sheep flock. The second half of the flock is in Armidale, New South Wales.

At each site, 1000 ewes are inseminated with semen from about 100 industry sires. The progeny are measured for a range of traits at birth, weaning and slaughter.

Many of the traits are too difficult to quantify on commercial farms. The traits include meat qualities such as tenderness, intramuscular fat concentration, colour and lean meat yield, and more traditional productivity traits such as fecundity and growth rate. Meat quality traits are measured in collaboration with scientists from Murdoch University.

Trait data, pedigree and DNA information are analysed by the national breeding evaluation service, Sheep Genetics, to produce Australian Sheep Breeding Values (ASBVs) (Figure 18). Breeders then use the ASBVs in their sheep breeding programs.

Recently developed DNA technologies enable researchers to link the sires in a breeder's flock to the genetic resource flock progeny, increasing the accuracy of ASBVs and resulting in faster gains. To enable the linkage, a ram must have progeny in both the genetic resource flock and the breeder's flock.

Breeders select for difficult-to-measure traits in their own flock by simply taking blood samples from the sheep. DNA sequencing is used to estimate ASBVs for the traits that the breeder then uses in their program.

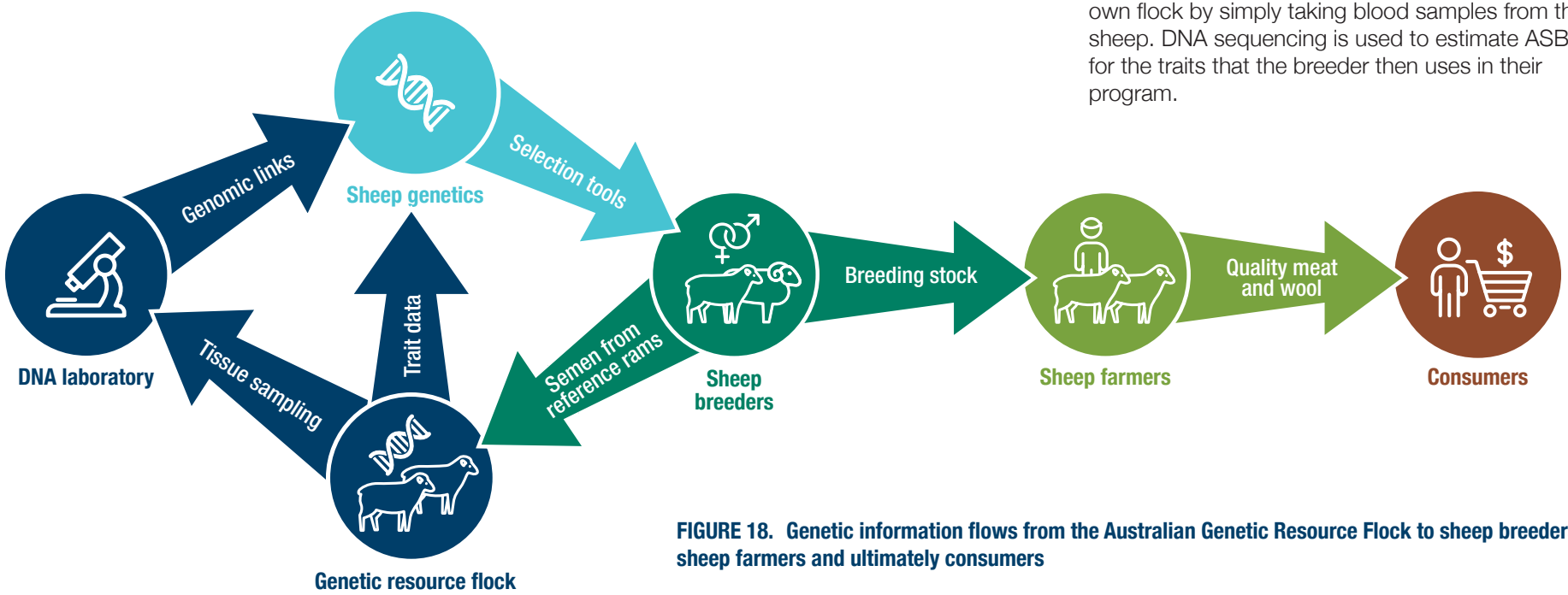


FIGURE 18. Genetic information flows from the Australian Genetic Resource Flock to sheep breeders, sheep farmers and ultimately consumers

WA vaccine protecting sheep worldwide

DPIRD's Albany laboratory produces the Barbervax vaccine to protect sheep against barber's pole worm in Australia and overseas.

DPIRD'S LABORATORY IN ALBANY, Western Australia, manufactures a recently developed vaccine that controls an important gastrointestinal parasite of sheep.

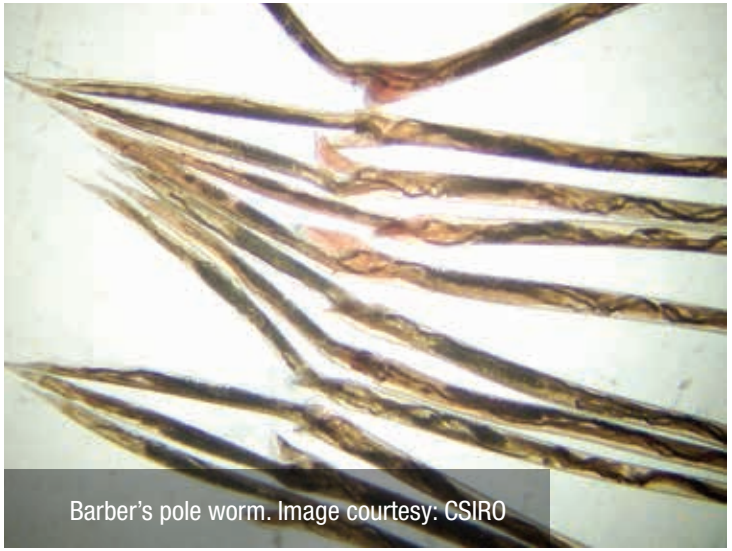
Barber's pole worm costs the Australian sheep industry about $50 million each year.

DPIRD livestock staff Jill Lyon and Darren Michael, and Brown Besier, formerly of DPIRD and now a private consultant of Brown Besier Parasitology, producing a batch of sheep worm vaccine Barbervax. The vaccine is produced commercially at DPIRD's Albany laboratory and sent to sheep producers in Australia and overseas.

Barbervax is made by Wormvax Australia, a subsidiary of the Moredun Research Institute in Scotland, for the control of barber's pole worm, a roundworm parasite that can cause the disease haemonchosis and death. Young sheep are particularly vulnerable before their immunity develops.

DPIRD and the Moredun Research Institute formed a partnership in 2008 to develop Barbervax, the world's first vaccine against gut nematodes.

Barbervax is now being supplied to South Africa, the United Kingdom and Brazil. About 1.5 million to 1.8 million doses are sold each year and DPIRD receives a share of the royalties.



Barber's pole worm. Image courtesy: CSIRO

Livestock Productivity

Vaccinating with Barbervax for the control of barber's pole worm

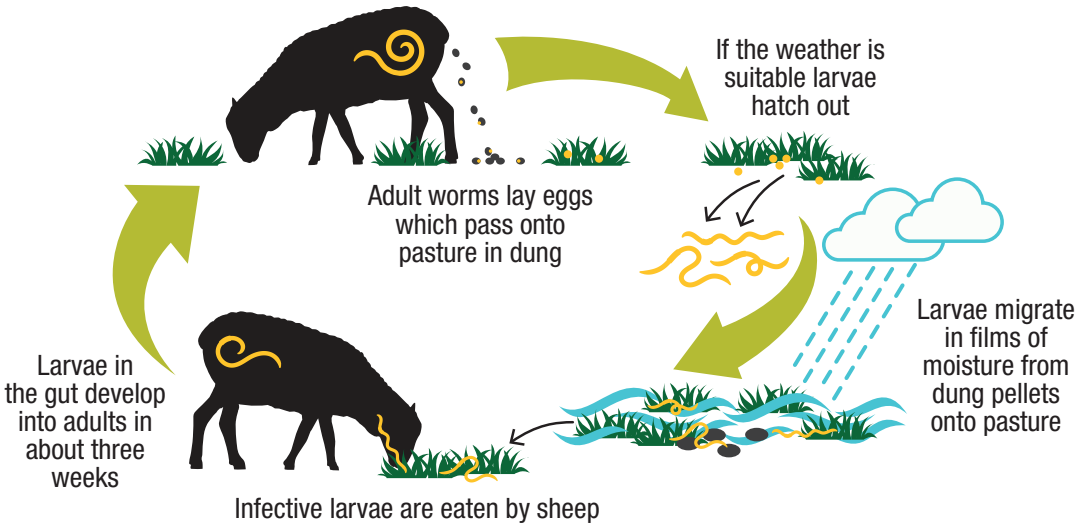


FIGURE 19. Life cycle of sheep worms

DPIRD senior technical officer Jill Lyon manages the vaccine laboratory, which has produced the vaccine commercially for the Australian sheep industry since 2014. The laboratory is the only facility producing the vaccine commercially in the world. WA is well suited to producing the vaccine as it is free of many sheep diseases and low worm-burden sheep can be sourced to make the vaccine.

Although barber's pole worm can occur in any Australian state, it is most significant in New South Wales. Globally it is the most important parasite of sheep.

Barber's pole worm is usually controlled by anti-parasitic drugs but strains resistant to these chemicals are common and widespread in endemic areas. The vaccine provides a control method with no risk of resistance.

Egg counting saves costs and lifts production

The Albany laboratory also provides a worm egg counting service for the WormBoss program, which helps Australian farmers implement worm control programs that are targeted to their specific region. The egg counting service is endorsed by the ParaBoss Worm Egg Count Quality Assurance Program, which began in 2019.

Inaccurate worm egg counts can cause producers to miss the optimum drench time. Drenching too early means drenching costs are not justified; too late and there will be loss in productivity and impacts on animal welfare. The inaugural round of testing for the ParaBoss Worm Egg Count Quality Assurance Program found 70 per cent of worm egg count providers were within the accepted limits, but 30 per cent returned results that were too low, too high or too variable.

Cost-effective drenching is achieved with accurate worm egg counting

More northern beef through land, labour and livestock efficiencies

The Northern Beef Development Program is helping the Western Australian northern beef industry to increase production efficiency and become more resilient and prosperous.

DPIRD's Northern Beef Development Program is working closely with producers to accelerate the adoption of industry best practice.
Image courtesy: Double R Helicopters

WESTERN AUSTRALIA'S NORTHERN pastoral industry continues to evolve, with significant opportunities to increase production efficiency.

To remain globally competitive, northern beef producers must manage the costs of production by driving efficiencies in livestock quality and performance, labour inputs and land management practices. Diversifying markets, value-adding and reducing reliance on a single live export market remain a priority.

DPIRD's Northern Beef Development Program is working closely with producers to accelerate the adoption of industry best practice. This will improve enterprise production efficiency and maximise profitability and sustainability of the northern beef industry.

Each year about 100 enterprises consisting of 150 pastoral stations in the Kimberley and Pilbara regions send between 250 000 and 320 000 cattle to the live export market, domestic processing or to other properties to prepare them for market.

The northern pastoral industry represents 47 per cent of the WA beef herd and contributes over $300 million each year to the state's gross value of agricultural product. About 15 per cent of the pastoral industry workforce identifies as Indigenous, which is significantly higher than other states and territories.

The first phase of the Northern Beef Development Program identified the constraints and growth opportunities of the northern cattle industry through a group of studies that are summarised in the *Joining the Dots* report. The report's recommendations guided the development of the program's second phase.

To remain globally competitive, northern beef producers must reduce reliance on a single live export market.

Livestock Productivity

The program also undertook research to improve the feedbase through irrigated fodder production and development of a sterile form of the forage legume, leucaena.

[see related stories *Irrigation delivers year-round cattle feed* and *Seedless forage legume to boost northern beef production*]

The program's Business Improvement Grants helped pastoral enterprises boost productivity, improve business management skills and increase profitability. About two-thirds of northern pastoral enterprises participated and used the Business Improvement Grants to access professional business advice and implement business improvement strategies.

The Northern Beef Development Program, managed by Trevor Price, is now in its second phase.

The program is helping producers drive enterprise productivity across land, livestock and labour resources through accelerating the adoption of proven, regionally relevant research and development, and industry innovation. Areas of focus to improve pastoral enterprise performance are herd productivity, adoption of new technology, sustainable rangeland management and irrigated fodder research. Indigenous pastoral enterprises are being helped to assess and transition to improved business models that attract investment and create job opportunities.

Producers can improve herd productivity through a range of management options to increase kilograms of beef produced. Key drivers include increasing the reproductive rate, reducing the mortality rate and increasing the sale weight per head sold.

Introducing improved genetics into herds could open up alternative markets and reduce the market risk exposure of northern beef enterprises. Many enterprises focus on producing cattle suitable only for a single live export market. However, breeding programs could introduce improved genetics that maintain adaptation to the environment while improving growth, meat yield and meat quality.

Introducing improved genetics into herds could open up alternative markets and reduce the market risk exposure of northern beef enterprises.

This could produce sale cattle that are universally marketable, that is, able to meet specifications for both domestic and export markets.

By adopting appropriate new technologies and innovations, pastoral enterprises could increase their productivity and reduce operating costs, particularly the costs of labour.

Even though northern pastoral enterprises are large operations there is room to improve labour efficiency.

The Northern Beef Development team uses two main extension platforms to accelerate adoption. The team's 'Twilight Forums' are small gatherings of producers from local pastoral stations who come together on a host station to hear key extension messages in a relaxed, social environment. Producer demonstration sites for integrated research and development provide a forum for peer groups to pursue new skills, knowledge and management practices that add value to commercial livestock production systems.

Sustainable rangelands management practices enable pastoralists to look after their pastoral leases by making timely decisions with good information. For example, satellite imagery and meteorological data including rainfall records can be used to make early decisions about the likelihood of seasonal conditions. This prompts early intervention to adjust stocking rates to maintain animal welfare and prevent damage by overgrazing. DPIRD's Pastoral Remote Sensing application provides pastoralists with information for decision-making and is accessed through the DPIRD website (**https://prs.dpird.wa.gov.au/#/**).

Producers from local pastoral stations meet on host stations to discuss ways to lift production efficiencies.

The Northern Beef Development Program is helping Indigenous pastoral enterprises to improve their businesses.

Livestock Productivity

The program's Pastoral Agriculture project is building on previous research into intensive irrigated fodder production systems (also called mosaic agriculture) in a partnership between DPIRD's Horticulture and Irrigated Agriculture directorate and the Livestock directorate. Irrigated fodder can contribute to the nutrition available to cattle, reducing the pressure on native pastures and the time it takes cattle to reach a marketable weight.

DPIRD researchers Geoff Moore and Samuel Crouch are leading the first two research trials at DPIRD's Skuthorpe irrigated research site near Broome to investigate tropical fodder crops.

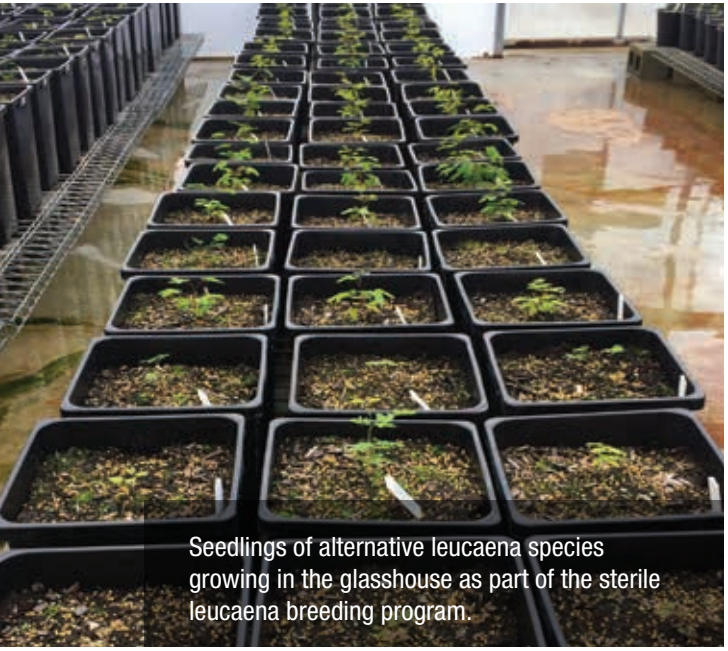
[see *Irrigated fodder in WA's North West,* Horticulture and Irrigated Agriculture section]

DPIRD research scientist Dr Daniel Real is evaluating alternative leucaena species at Kununurra for the sterile leucaena breeding program.

DPIRD research scientist Geoff Moore is evaluating the potential of new grass species for irrigated forage production

Cattle with access to better-quality fodder can reach a marketable weight in less time.

Irrigation of suitable pasture species can increase the quantity and quality of fodder produced. DPIRD development officer Mariah Maughan with pasture trials at Broome.



Seedlings of alternative leucaena species growing in the glasshouse as part of the sterile leucaena breeding program.

Cutting perennial grass fodder trials near Broome.

Better preparation improves sale returns

Aggie and Kim Forrester of Winning Station in the southern Pilbara introduced new technology to their pastoral business that allowed them to address weight loss of their sale cattle during transport to the saleyards.

Weight loss during transport is a concern because cattle are sold based on their weight at the saleyards, which is a key profit driver. Cattle lose weight when transported long distances from remote stations to saleyards because they do not feed while on the truck and the unfamiliar situation is stressful.

The Forresters used a Business Improvement Grant they received through DPIRD's Northern Beef Development Program to purchase hardware to undertake electronic herd recording. With the new equipment they could weigh individual sale cattle before they left the property for the saleyards.

Aggie and Kim Forrester, Winning Station.

When the Forresters compared the weights of their sale cattle before they left the station with the weights at the saleyards, they found the cattle were losing about 10 per cent of their weight during transport.

To better prepare sale cattle for transport, the Forresters changed their management and feeding of the cattle. They found that feeding the sale cattle with commercially available pellets for between seven and 10 days before trucking reduced weight loss from 10 per cent to seven per cent. Over a $100 000 consignment of cattle, this improved weight retention increased income by $3000.

LIVESTOCK SYSTEMS

LIVESTOCK SYSTEMS

Purpose: modernise livestock farming systems to incorporate digital technologies and adapt to a changing climate.

CARBON NEUTRAL

TECHNOLOGY

INFORMATION

INNOVATE

Explore opportunities for livestock systems to become carbon neutral.

ADAPT

Accelerate use of digital technologies for more efficient livestock production.

COMMUNICATE

Provide timely advice and information on current livestock industry issues. Foster industry relationships.

LIVESTOCK SYSTEMS

Livestock systems are continually evolving in the face of financial, environmental and social drivers.

CLIMATE CHANGE, DECLINING terms of trade and growing consumer demand relating to food provenance are major influences along livestock supply chains.

A key focus of DPIRD's livestock team is to provide industry with the necessary tools and knowledge to assist with timely decision-making to optimise business opportunities.

Digital technologies to automate animal management and collect real-time production data are being rolled out and assessed at DPIRD's Katanning Research Facility. The work will streamline livestock production systems while reducing costs and lifting productivity.

The Katanning facility is also being used to analyse and showcase management practices that can reduce greenhouse gas emissions from livestock systems. The work will help meet the red meat industry's goal of becoming carbon neutral by 2030.

(From L to R): DPIRD research scientist John Paul Collins and development officers Mandy Curnow and Perry Dolling compare satellite estimates of pasture growth with what is in the paddock.

Digital intelligence allows for remote decision-making

Movement monitors, satellites measuring pasture growth rates and sensors on a digital network acting as virtual labour could one day enable remote monitoring and management of large farms.

Sensors match lambs to dams

LAMBS LOST BETWEEN EARLY PREGNANCY and weaning represent lost profit for sheep producers. DPIRD researchers are using sensor technology to quickly identify ewes that have failed to produce a live lamb in large lambing flocks. Identifying ewes that have lost a lamb since the pregnancy was first scanned will enable producers to make timely management decisions to lift ewe fertility and lambing rates.

Research scientist Beth Paganoni fitted lambs and ewes with proximity sensors*.

*NOTE: These lambs have additional tags for research purposes which will be removed before they leave the property.

According to the 2018 WA Sheep Producer Survey the average reproductive rate of the state's flock ranges from 1.15 to 1.35 foetuses per ewe, depending on the season. However the number of lambs identified at marking is only about 0.9 lambs per ewe, which equates to about 175 lambs lost between scanning and marking in a 500-ewe flock.

In the past 10 to 15 years, the number of lambs weaned per ewe mated in the WA Merino flock has risen slowly at only one to two per cent per year.

DPIRD researcher Beth Paganoni is using devices similar to those used in the fitness industry to monitor lamb movement and location. The devices — called proximity sensors — are fitted to collars on ewes and lambs and use Bluetooth technology to record the location of lambs in relation to ewes. Lambs that generate the most hits in relation to a specific ewe are assumed to be her lambs. The method allows for identification of ewes of single, twin and triplet lambs from birth through to weaning at about 100 days.

After sensors were fitted and the flock returned to the paddock, Beth found the sensors could identify the lamb(s) belonging to specific ewe mothers within 20 to 24 hours with 95.4 per cent accuracy.

Identifying ewes that have lost a lamb since scanning enables the cause of the loss to be investigated. Producers might decide to cull ewes with no lamb or implement practices to increase survival of future lambs. Matching lambs to their ewes also helps with the collection of breeding value data for reproductive traits.

The sensors are also being used to record the frequency of ewe and ram interactions to predict the birth date of lambs. Such data can be used to improve the accuracy of breeding values and the ranking of sires for early growth traits.

Currently available proximity sensors do not transmit data and need to be removed from the animals before downloading the stored information. Improved internet access and battery life would enable sheep movements to be transmitted in real time and would open up the management applications of the technology.

For example, real time information about sheep movements could be compared to a library of movement signatures allowing growers to log in to a computer or mobile device to identify problems such as a sheep displaying the movement signature of flystrike, lambing difficulties, lameness or feeding issues.

This area of research is being advanced through the development of several Australian-developed devices including the Australian Wool Innovation 'smart tag'.

Disclaimer: Mention of product names should not be taken as endorsement or recommendation.

Eyes in the sky provide feed budget data

DECISION-SUPPORT TOOLS that provide early warning of fodder shortages are helping producers make timely feed management decisions.

Pastures from Space is a web-based tool that allows producers to use satellite data to monitor weekly pasture growth on their properties for livestock feed budgeting and land management decisions (Figure 20).

Producers can access the Pastures from Space tool through the DPIRD website to view the latest green feed on offer (FOO) and pasture growth rate (PGR) images for their landholdings. The images, provided by Landgate and CSIRO, are updated weekly. FOO and PGR are important measures for land management decisions and livestock feed budgeting.

To further improve the tool, DPIRD researchers are calibrating data from a newer satellite that will allow more accurate estimates of pasture biomass down to areas of 10m x 10m (0.01 of a hectare). This represents a significant improvement on the current area of 6.25 hectares.

*NOTE: Sheep have additional tags for research purposes which will be removed before they leave the property.

DPIRD development officer Perry Dolling is working to enhance the Pastures from Space tool.

DPIRD's John Paul Collins and Mandy Curnow compare paddock FOO levels with the estimate on the Pastures from Space tool.

DPIRD development officers Perry Dolling and Mandy Curnow are working with Landgate and CSIRO to develop Pastures from Space so that it includes charts of pasture production from the previous year along with year-to-date pasture production.

Producers can use Pastures from Space to determine supplementary feeding rates, develop feed budgets and set stocking rates for livestock — especially early in the growing season when relatively small changes in FOO can have a critical effect on the feed supply for lambing ewes.

The FOO and PGR information from Pastures from Space can be combined with other DPIRD decision-support tools such as the '**Supplementary feeding calculator for pregnant and lactating ewes**' and the '**Feed cost calculator**'.

For northern pastoralists, the Pastoral Remote Sensing tool provides pastoral leaseholders with vegetation growth trends. It allows pastoralists to view weekly greenness indices (estimated normalised difference vegetation index) and total green biomass (TGB) for individual stations. This enables pastoral managers to remotely access vegetation growth information across vast pastoral leases and to monitor the impact of management and season on feed availability. Timely management decisions can then be made for the productivity and welfare of their stock. The tool is accessed through the DPIRD website.

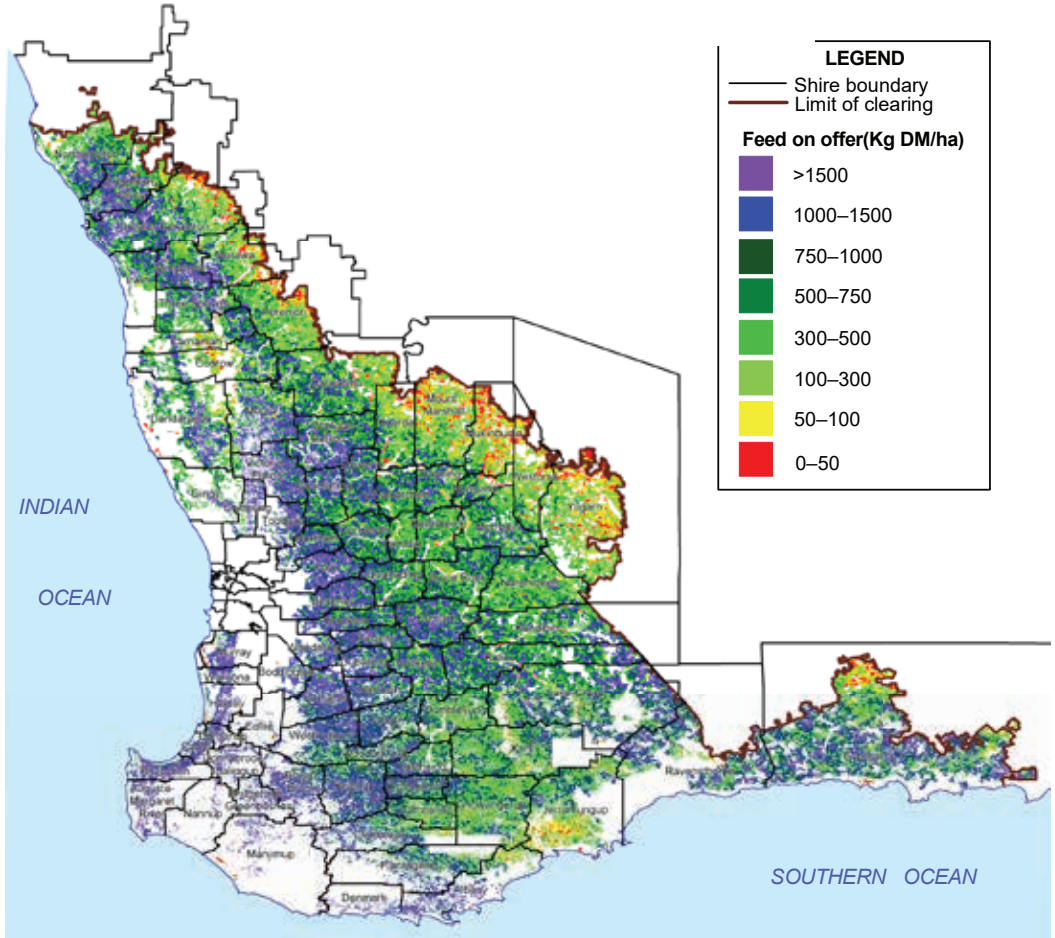


FIGURE 20. Pastures from Space shows weekly 'feed on offer' (FOO) ranges for southern WA

Smart farms established using digital networks

AGRICULTURAL TECHNOLOGY, OR 'AG-TECH', is regarded as the next leap in agricultural evolution, providing data-driven solutions and remote monitoring to aid decision-making and boost productivity.

DPIRD has employed a range of Internet of Things (IoT) sensors across the Katanning and Merredin Research Facilities.

The IoT devices include water and fuel tank level monitors, temperature, moisture and level sensors for grain silos, soil moisture probes, sensors on gates to show open/closed status and automated weather stations.

Data from the devices is viewed via a web-based dashboard (see image).

IoT devices — physical devices that are connected to the internet — can communicate data from on-board sensors in real time and may be controlled remotely. From a security light switched on from a smartphone app, to a smart trap that collects and relays information about trapped moths, to a driverless truck, IoT devices are benefiting businesses and consumers.

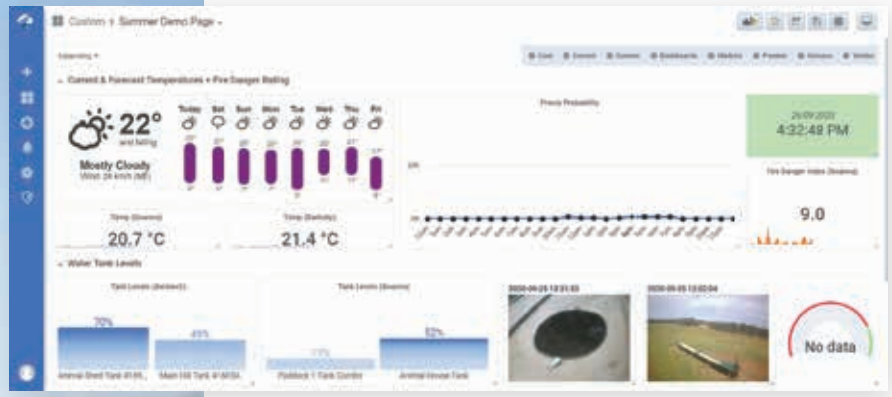
DPIRD is developing internal capability in relation to IoT devices and sensors to demonstrate how data can be generated and used to benefit the state's grains and livestock industries.

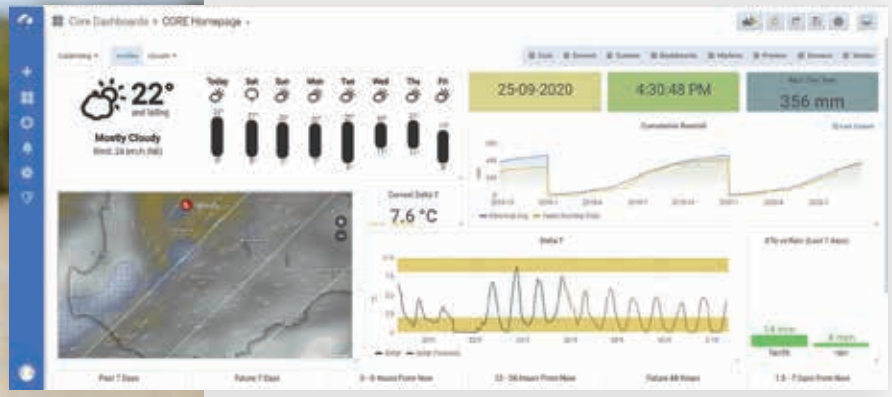
The new technology systems will help producers manage ever-larger enterprises with less labour while satisfying a growing consumer-driven need for information about food supply chains. It is likely that farm offices will evolve into 'command centres' in the future, where managers can monitor assets, inventory, animals and staff via web-based dashboards.

DPIRD project manager Darren Gibbon coordinated the IoT device program through the department's broader E-connected Grainbelt project. The aim is to transform the Merredin and Katanning Research Facilities into whole-of-farm digital reference sites or 'smart farms'. A long-range, low-power, wide-area network (LoRaWAN) has been installed at each facility to link the IoT devices.

The sites will demonstrate the operational benefits of IoT devices on-farm while providing DPIRD staff with tools to undertake leading research across a range of disciplines.

The digital reference sites will explore the potential role of on-farm digital connectivity in asset tracking, facility monitoring, perimeter security, environmental monitoring, inventory management, animal welfare and staff occupational health and safety.





DPIRD research scientist John Paul Collins views the readings from the automatic weather station at the Katanning Research Facility.

RIGHT: Various Internet of Things devices on the farm communicate data that appears on the web-based dashboard in the office. *Images courtesy of Pairtree.*

Counting carbon to reduce emissions

DPIRD researchers are evaluating livestock management systems that produce fewer greenhouse gas emissions to help the red meat sector reach its target of becoming carbon neutral by 2030.

GREENHOUSE GAS (GHG) emissions from agriculture make up about nine per cent of Western Australia's total GHG emissions. The red meat sector is responsible for about 80 per cent of these agricultural emissions, which result mostly from methane production as sheep, cattle and other ruminants digest their feed.

DPIRD development officer Mandy Curnow is leading a program to reduce emissions from the red meat sector and help the industry meet its goal of becoming carbon neutral by 2030.

The Carbon Neutral Livestock Systems program has two aims:

1. lower the net GHG emissions from DPIRD's Katanning Research Facility
2. use emissions reduction techniques developed and tested at the facility to help WA broadacre livestock farmers adopt carbon neutral production systems.

The Western Australian Government has a target of net zero GHG emissions by 2050. DPIRD is working to reduce emissions across all of its operations and aims to achieve carbon neutrality at Katanning by 2030.

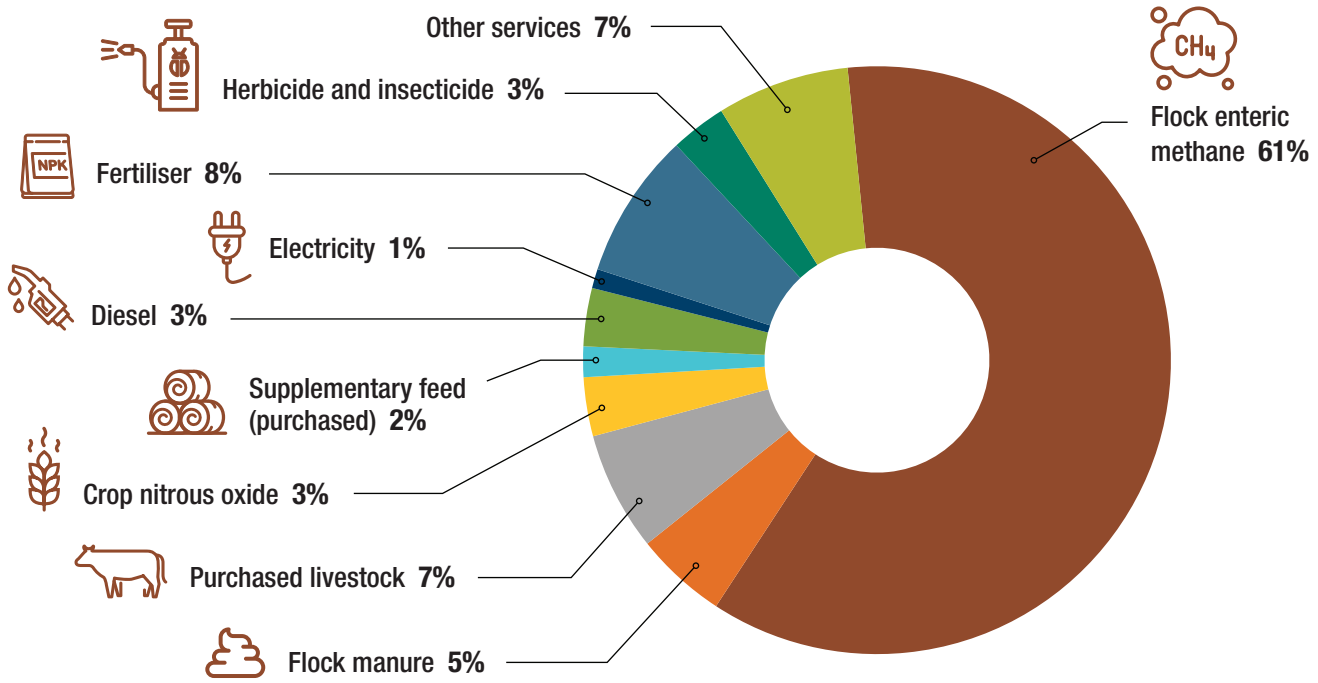


FIGURE 21. Baseline greenhouse gas emissions from the Katanning Research Facility. The data will be used to develop an emissions reduction strategy to achieve carbon neutrality at the facility by 2030.

A baseline carbon footprint of the Katanning facility has been calculated and it shows that 61 per cent of current emissions are due to sheep methane production (Figure 21).

The baseline footprint will be used to develop an emissions reduction strategy to achieve carbon neutrality at the facility by 2030. The strategy will include changes to animal husbandry and the incorporation of pastures, shrubs and forages with proven capacity to reduce GHG emissions. Emerging technologies such as methane-mitigating feed additives and low-methane genetics will also be trialled.

As part of the program, local producers are being trained in carbon accounting so they can calculate the GHG emissions from their own properties. The program will also provide practical demonstrations of ways to reduce GHG emissions on-farm.

FEEDBASE PRODUCTIVITY

FEEDBASE PRODUCTIVITY

Purpose: research new feedbase options and management practices that fit into whole farm systems, optimising farm profit, environment and social aspirations.

GRAINBELT | IRRIGATION | RANGELANDS

CREATE

Breed and select new forages to fill feed gaps in livestock production systems.

INTEGRATE

Develop and test management guidelines to optimise pasture productivity for grazing and conserved feed.

EXTEND

Engage with growers and industry to extend best practice information for pasture management.

FEEDBASE PRODUCTIVITY

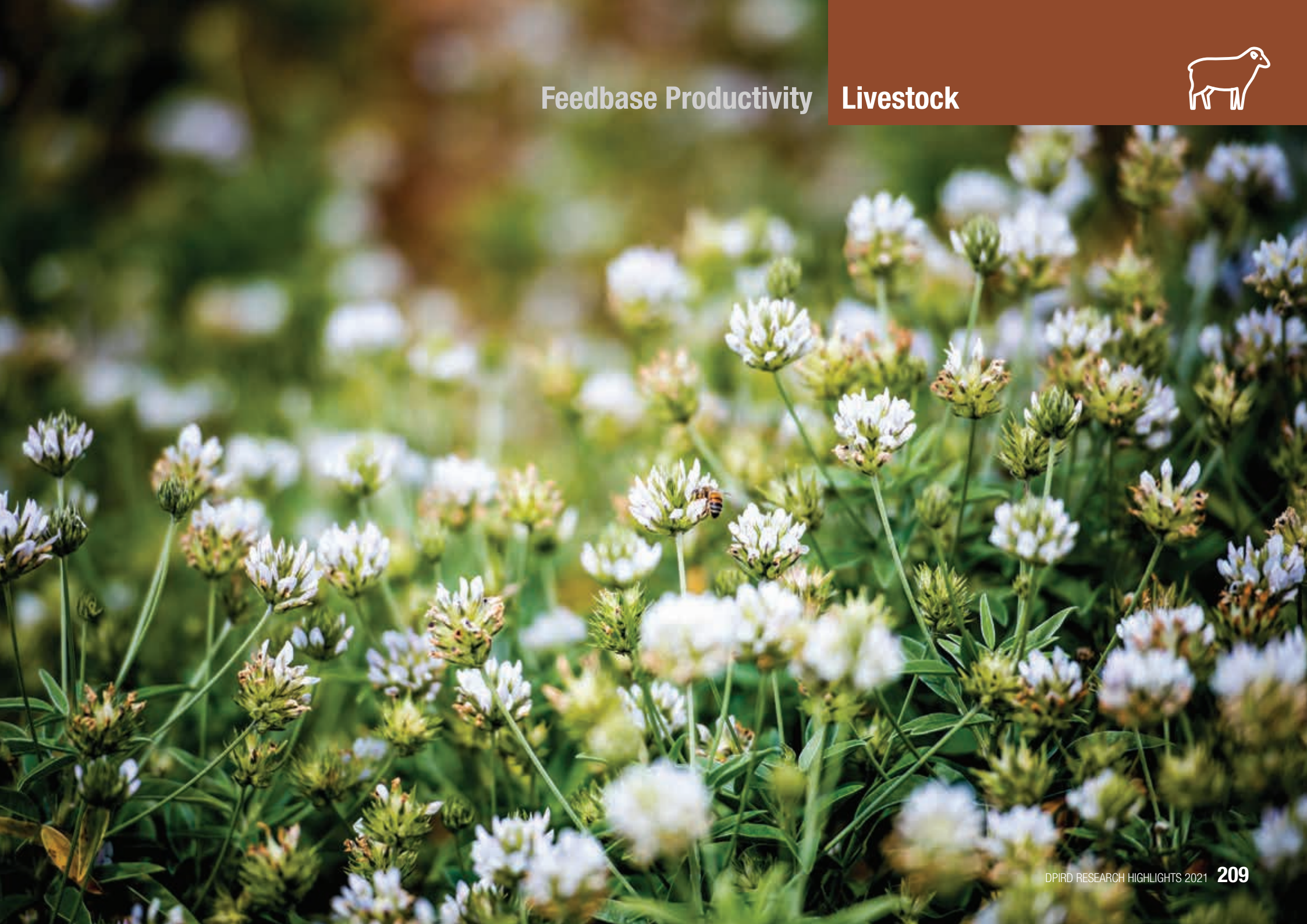
Livestock feedbase refers to the mix of pastures, shrubs, grazing crops and crop residues used to produce livestock.

FEEDBASE PRODUCTIVITY IS influenced by plant genetics, soil type, climate, livestock enterprise and management. Across the south-west of WA, pastures cover up to half of farmland in low to medium rainfall areas and more than two-thirds in high rainfall areas.

DPIRD's livestock team undertakes applied research to increase the productivity and quality of the feedbase in rain-fed (dryland) and irrigated farming systems.

The team domesticates promising forage species collected from across the world and undertakes breeding programs to deliver new production traits into existing forage species.

A key focus of the research is the development of legume forage systems, which take atmospheric nitrogen and turn it into a form that plants can use. Legume-based forage systems generate high animal growth rates while building soil fertility and contributing valuable disease and nutritional advantages to crops in mixed farming systems.



Irrigation delivers year-round cattle feed

Irrigation developments in the Kimberley and Pilbara mean pastoralists can now produce high-quality forage for 12 months of the year. DPIRD is working with industry organisations and station managers to integrate irrigated forage production into pastoral businesses, which traditionally have been based solely on grazing of native vegetation.

Perennial Rhodes grass is currently the most widely grown species in commercial irrigated operations. It can readily produce 35–40 tonnes per hectare.

MOSAIC AGRICULTURE USES small areas of irrigated forage to supplement the feed gap caused when native pastures die off during the dry season. The irrigated forage is either grazed directly or harvested to conserve as hay or silage.

The Mosaic Agriculture team, led by project manager Dr Clinton Revell, is working with pastoralists in northern WA to develop skills in forage species selection and irrigation scheduling.

Until recently, the pastoral cattle industry was based solely on extensive grazing of native and naturalised pastures and shrubs. But a better understanding of regional groundwater hydrology has recently stimulated interest from pastoralists in irrigated forage production.

Irrigated forage systems could lift annual growth rates of northern pastoral cattle in WA by as much as 50 per cent according to DPIRD's Mosaic Agriculture project.

Sowing trials to evaluate different pasture varieties for production and feed quality at Woodie Woodie east of Marble Bar.

The area under irrigation across the Pilbara and West Kimberley (which is outside the Ord River precinct) has increased from about 600ha in 2006 to more than 4000ha in 2020. The irrigation area continues to expand, with several pastoral stations planning new developments.

Existing irrigation developments range from a single centre pivot irrigating 40ha to operations that run more than 18 centre pivots.

Cattle that graze irrigated forage reach marketable weight more quickly than on native pastures. For example, steers can reach a weight of 360kg in 15 months instead of taking 24 months (two seasons) on native pastures.

Typical daily growth rates of cattle weighing between 200kg and 400kg and grazing irrigated Rhodes grass for 12 months of the year are 0.6–0.7kg.

By comparison, cattle grazing on native pasture can gain 0.4kg liveweight per head per day but only for about three to five months during the wet season when the pasture is fresh. Seasonal fluctuations in plant growth and feed quality mean cattle on native pastures lose weight when the forage dries off from April.

Irrigated forage makes the supply of cattle more consistent across the year. It also means calves can be weaned earlier to allow cows to breed again sooner.

However, irrigation systems require considerable investment and development is constrained by finite water resources.

Feedbase Productivity

Dr Clinton Revell (right) discusses millet and sorghum trials at Fitzroy Crossing with visiting CSIRO research agronomist Tony Webster.

DPIRD has produced a guide for pastoralists called *Mosaic Agriculture – A guide to irrigated crop and forage production in northern WA* that describes the feasibility of investing in irrigation, system design and management requirements to optimise performance.

As part of the Mosaic Agriculture project Clinton and University of Western Australia Masters student Renata Tognelli analysed the economics of a single centre pivot irrigation development. They found that a fully integrated, small-scale (40 ha) irrigation system producing high-quality feed could be profitable, depending on feed quality, the liveweight sale price of cattle and pasture production (particularly hay yield).

The analysis indicated that development costs can be as high as $25 000 per hectare depending on location and system design, and that it can take between seven and 13 years to recoup the investment in a single 40 ha pivot irrigation system. The payback period could be shortened if the irrigation enterprise were viewed as part of a risk-management strategy against drought.

Selecting the best forage species

Perennial Rhodes grass is currently the most widely grown species in commercial irrigated operations, due to its productivity, resilience and environmental adaptation. It can readily produce 35–40 t/ha of biomass per year (dry weight). However, when grown for hay Rhodes grass can be less nutritious than the best of the fresh native grasses.

To generate more choice of irrigated forage species, Clinton and DPIRD research scientist Geoff Moore, with the support of development officers Chris Ham and Sam Crouch, assessed a range of forage species under commercial pivots. The Water Corporation (Broome North) provided one of the irrigated research sites.

The trials quantified the seasonal growth rates of the forage species for feed budgeting purposes and provided a better understanding of the trade-off between yield and feed quality.

Warm season perennial and annual grasses proved to be the best adapted to the hot temperatures of the wet season, when daytime temperatures are often over 40°C.

Panic grass was found to be a productive and palatable alternative to Rhodes grass. It was consistently more nutritious than Rhodes grass and achieved similar annual hay yields although it had a higher soil fertility requirement.

Maize and the annual hybrid sorghums were suited to irrigated silage production and produced 15–25 t/ha of biomass depending on soil type and conditions.

In further field trials across the West Kimberley and Pilbara, Geoff assessed more than 30 non-indigenous forage grass and legume species for their environmental weed risk. The potential distribution of each species was mapped in collaboration with Dr Rachel Whitsed from Charles Sturt University in New South Wales.

Most of the forages did not persist in the medium term without irrigation and therefore present a low weed risk. Rhodes grass, panic grass, pearl millet, lablab, cowpea and a range of stylos were assessed as low to moderate weed risk.

Data from the field trials – collected in partnership with Christine Munday from the Department of Biodiversity, Conservation and Attractions – is contributing to a revised weed-risk assessment system for the WA Rangelands.

DPIRD research scientist Geoff Moore assessed the seasonal growth rates of a range of forage species under irrigation. Information collected was used to generate a better understanding of the trade-off between yield and feed quality.

DPIRD research scientist Dr Clinton Revell beside a stand of leucaena, a forage legume with great promise for the northern cattle industry.

ABOVE: DPIRD-bred sterile leucaena seedlings ready for planting out at Carnarvon, Kununurra and Broome.

Seedless forage legume to boost northern beef production

The cattle forage leucaena holds great potential for the northern WA pastoral industry provided its tendency towards weediness can be overcome. DPIRD researchers are exploiting genetic differences between leucaena species and using gene editing to generate infertile, non-weedy varieties of the legume.

LEUCAENA IS A PRODUCTIVE animal forage adapted to tropical and subtropical areas.

When fed as a leucaena–grass mix the legume can double the annual weight gain of cattle compared to feeding grass alone.

However, leucaena has a dark side. The commercial species is a prolific seed producer and if left uncontrolled, it can escape into the environment. In Queensland the livestock industry has responded by applying a code of conduct to control escaped seedlings and restrict where the legume can be sown.

Currently, seed-producing forms of leucaena are not approved for use on pastoral leases in WA due to their weed risk.

As leucaena cannot propagate naturally from vegetative or root material, the key to eliminating its weed risk lies in the development of sterile varieties incapable of viable seed production.

DPIRD researchers are using genetic technology to develop sterile versions of the forage legume. The specially bred seedlings are being grown-out at three secure sites in the north of WA and their growth and development monitored over time.

Exploiting differences

DPIRD research scientist Dr Daniel Real and his team are using conventional plant breeding and biotechnology tools to generate sterile lines of leucaena.

The breeding strategy is exploiting a difference in chromosome numbers between leucaena species to create sterile crosses.

The team has made thousands of crosses between the leucaena species.

The first of the potentially sterile leucaena seedlings were planted at Carnarvon, Kununurra and Broome in 2020 by the team. More than 300 sterile plants were planted across the three trial sites and growth and development will be observed over the next few years.

Editing genes

Daniel and his team are also using a second method to breed sterile leucaena. The research team will use the genetic inventories of other legume species to predict and identify the locations of flower-related leucaena genes. They plan to edit the flowering genes of the commercial leucaena species to remove its ability to flower or develop fertility, thereby preventing seed formation. The resultant plant will be a non-flowering variety.

Broome nursery of leucaena.

New forage options for mixed-farming systems

Lanza® tedera was released commercially in 2018 and was grown across 500 hectares of grazing land in 2020. Pictured (left to right) Dr David Beatty (Meat and Livestock Australia), Agriculture and Food Minister Alannah MacTiernan, DPIRD research scientist Dr Daniel Real and Dandaragan farmers David and Richard Brown.

DPIRD research is matching the nutritional demands of livestock with pasture systems based on new and established forage species.

A DPIRD-bred perennial forage, Lanza® tedera, is filling the feed gap that occurs over summer and autumn in southern WA and providing valuable green feed for sheep production.

Tedera fills feed gap in drier, warmer months

A DPIRD-bred forage species, tedera, is being used to fill the feed gap that occurs in southern Western Australia from October to June when annual pastures have finished, and perennials become dormant or die.

DPIRD bred the first cultivar of tedera, Lanza®, through the Future Farm Industries Cooperative Research Centre and it was released commercially in October 2018. All available seed was sold, resulting in about 400 ha being planted in 2019 and 500 ha in 2020 in WA and eastern Australia.

Tedera is a perennial forage legume with similar nutritional value to lucerne but with a higher feeding value as it retains green leaf for longer during drought. DPIRD research scientist Dr Daniel Real and collaborators are developing management guidelines for the newly domesticated species.

Several years of DPIRD grazing trials on properties at Dandaragan and Kojonup show that wethers grazed on tedera can gain more than 200 grams per head per day without supplementary feeding.

The research indicates that high-quality forage can provide a financial benefit of up to 20 per cent of the value of the sheep by bringing the tail of the mob up to the same condition as the best quality sheep.

New pasture lifts autumn stocking rate

Dandaragan farmers David and Richard Brown are impressed with the carrying capacity of their 40-hectare paddock of the DPIRD-bred pasture legume tedera.

Their property was the site of DPIRD trials of the new pasture legume.

Starting with a mob of 225 sheep, the Brown brothers increased the stocking rate to 605 sheep over the six-week autumn grazing period.

The tedera provided enough forage and recovered well after grazing despite having been harvested for seed production just 12 weeks before the sheep entered the paddock.

New forage cereals for challenging soils

In low rainfall environments many common pasture species struggle to grow on sandy, acidic soils which leads to a shortage of early winter feed for livestock.

Cereal rye and triticale are better adapted to the hostile conditions and lines bred specifically for forage might generate more feed in early winter. Cereal grasses can be relatively low cost to establish and provide faster early upright growth that is easier for sheep to graze than the more prostrate clover pasture. Mixed farms in the grainbelt could potentially use the cereal crops to fill an early winter feed gap.

A partnership between DPIRD and the University of Florida is breeding cereal rye and triticale for forage production in WA.

Dr Daniel Real (DPIRD) evaluated the first breeding lines of cereal rye and triticale from the partnership at the Wongan Hills Research Station in 2020. The new lines were compared with commercial varieties of cereal rye, triticale, barley, oats and wheat.

When the 21 cereal lines were ranked for forage production, five of the top six cereal lines were cereal rye or triticale from the breeding program. The new lines of cereal rye and triticale were equally or more nutritious than the commercial cereals at the six-week growth stage. The preliminary results indicate that cereal rye and triticale specially bred for forage production compare well with commercial cereals for early winter grazing.

The lines will now be evaluated for grain production, grain quality and stubble quality.

DPIRD's Dr Daniel Real (left) and Dr Clinton Revell examining forage cereals at Wongan Hills Research Station.

Annual legumes to reduce cropping risk

Over the past three decades, many farmers in the low and medium rainfall zones of southern and western WA have shifted from integrated crop–livestock production to a system based solely on continuous cropping.

Sowing improved legume pastures and retaining livestock on farms in low and medium rainfall zones could boost long-term profits while offsetting some of the risks associated with continuous cropping.

The Dryland Legume Pasture Systems is a collaborative project between DPIRD, Murdoch University and the CSIRO and has been established to address continuous cropping constraints and lift livestock productivity. DPIRD research scientist Dr Angelo Loi and colleagues from across Australia are developing legume pasture, forage and hay options that will benefit both crop and livestock production on a range of soil types.

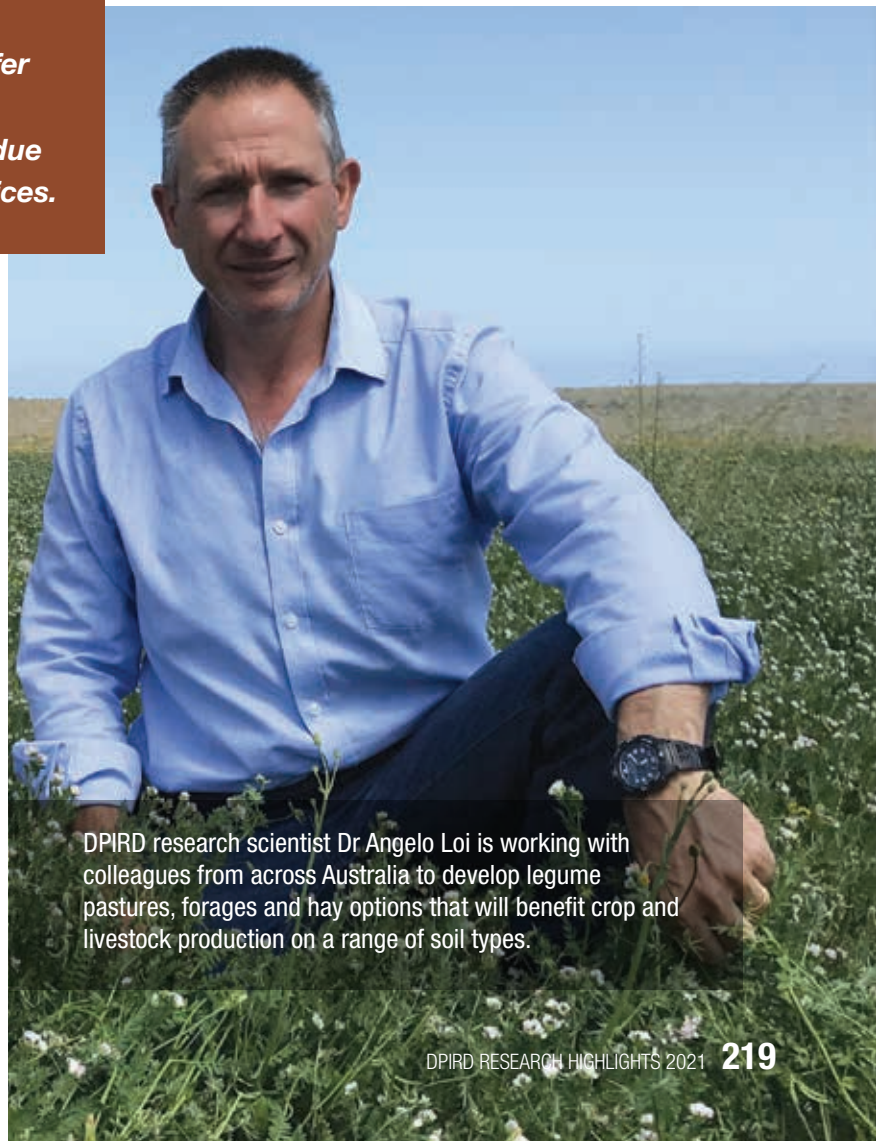
Legume pastures can deliver nitrogen benefits to following cereal crops worth $40 to $60 per hectare in foregone fertiliser costs. Grazed pastures also offer weed control benefits leading to a lower requirement for herbicides in the cropping system. A pasture phase provides a break that can reduce diseases and pests in subsequent crops.

The project is developing legume pastures well adapted to the soils in dry regions. The legume pastures will integrate well with mixed cropping systems, fixing nitrogen to benefit crops while producing quality forage to fill feed gaps for livestock.

Continuous cropping can be highly profitable but the system can also suffer serious constraints such as herbicide resistant weeds and financial shocks due to frost, dry conditions or low grain prices.

The project will use whole-farm economic modelling of enterprises, prices, soil type and labour requirements to quantify the effect of legume pastures on farm profit over a range of seasons.

The Dryland Legume Pasture Systems team recently evaluated the new Murdoch-bred serradella variety, Fran$_2$O™, and found it has a good fit in mixed crop–livestock systems in low rainfall areas of WA where pasture options have been limited to date. Fran$_2$O™ is early flowering, which means it can set seed before the soil profile dries out at the end of the growing season. The new serradella also generates a persistent seed bank enabling it to lie dormant under a cropping phase and then regenerate to create a pasture phase once the crop has been harvested. Fran$_2$O™ produces good winter feed for stock and is suited to at least a million hectares of sandy soils across the low and medium rainfall areas of the WA grainbelt.



DPIRD research scientist Dr Angelo Loi is working with colleagues from across Australia to develop legume pastures, forages and hay options that will benefit crop and livestock production on a range of soil types.

Saline land returned to production

DPIRD is helping farmers regenerate non-arable salt-affected land and return suitable areas to production.

The three-year project is a joint initiative with the Gillamii Centre based in Cranbrook. The project was developed in response to renewed demand from growers for ways to improve the productivity of marginal, non-arable and salt-affected soils across south-west WA.

About 203 000 hectares of marginal, non-arable and salt-affected soils in the south-west have potential to be more productive.

DPIRD staff led by senior development officer Justin Hardy are working closely with local grower groups and individual farmers to share knowledge, skills and experience between farmers and scientists.

The project is also translating soil, hydrology and fodder research into practical decision-support tools and resources. Fodder systems being investigated include salt-tolerant and salt-sensitive forage shrubs, grasses and legumes for all rainfall zones.

Aerial photos of Tony and Peta White's Miling property showing the salt-affected valley floor before (October 2006, above) and after planting with salt-tolerant plants (August 2020).
Note: Images have been taken from different angles.

Case studies showcase rehabilitation success

A collaboration between DPIRD, Gillamii Grower Group and farmers has resulted in a series of case study videos to help farmers regenerate their salt lands into productive pastures.

The case studies are part of a broader three-year project to share the latest salinity management research, tools and resources with grainbelt farmers.

Miling farmers Tony and Peta White own one of eight farms showcased in the case studies.

Over the past 20 years the Whites have used salt-tolerant plants to transform large areas of bare, saline land into productive pastures that have increased the overall profitability of their farm.

In 2001 they had a bare salt scald that spread across about 50 hectares of a broad valley floor. Clearing the valley for cropping decades earlier allowed the water table to rise, bringing salt to the surface. Water from the creek was adding to the problem.

Over two decades Tony worked on four zones of salinity severity across the valley floor. On low-salinity soil furthest from the creek he planted productive but salt-sensitive pastures. As the soil salinity increased towards the creek, a zone of oil mallee trees was followed by a zone of saltbush. In the valley floor where the salinity was highest, the exclusion of stock allowed the native salt-tolerant succulent samphire to return.

The plants reduced evaporation from the soil and tapped into the underground water from the creek, lowering the water table and stopping the spreading salt scald. As the soil salinity fell, more productive salt-sensitive plants grew. The plants protect the soil and produce sheep feed that can be grazed for part of the year.

DPIRD development officers Justin Hardy (left) and Ron Master with established plants of river saltbush near Jerramungup.

DPIRD and grower group staff with a well-established river saltbush plant near Jerramungup.

Banking on stored pasture seed

DPIRD is regenerating stocks of aging pasture seed to ensure that more than 1000 Mediterranean pasture lines adapted to acidic soils remain available to WA livestock systems and plant breeding programs well into the future.

The Svalbard Global Seed Vault on the Norwegian island of Spitsbergen is carved into solid rock. Seeds are stored more than 100m inside the mountain at a constant storage temperature of -18°C.

DPIRD IS CONTRIBUTING TO an international seed conservation effort to guarantee against the loss of pastures and forages in the face of a large-scale regional or global crisis.

The Australian Pastures Genebank Germplasm Regeneration program is a national project to conserve and regenerate pasture seed for the benefit of Australian agriculture.

The Australian Pastures Genebank (APG) donates duplicate samples of the seed stored in its genebank to the Svalbard Global Seed Vault on the Norwegian island of Spitsbergen.

The vault is a secure seedbank designed to preserve plant seeds, including those of major food crops, for potentially hundreds of years.

Darryl McClements (DPIRD) in a field plot of subterranean clover grown for seed production at the department's South Perth facility.

Senior research scientist Dr Clinton Revell and senior technical officer Darryl McClements oversee the Western Australian component of the program, which by the end of 2020 had successfully replenished fresh seed stocks of just over 1000 annual pasture legume lines. The pasture lines were at high risk of being lost, due to either low quantity or sub-optimal quality of stored seed.

Long-term seed storage of pastures ensures the continuation of productive lines and provides a source of genetic material from which to breed better-adapted varieties.

The APG is managed by the South Australian Research and Development Institute and began operations over five years ago. It brings together existing native and exotic forage seed collections from around Australia. Many of the collections were poorly conserved, so stored samples had to be regenerated and replaced with fresh seed.

With funding from the APG, DPIRD focuses mainly on important Mediterranean pasture species adapted to acidic soils (such as subterranean clover) and aims for 15 000 seeds for each line.

VALUE CHAINS

VALUE CHAINS

Purpose: industry analysis of product quality and supply to meet consumer expectations.

SUPPLY CHAIN

PROVENANCE

ANIMAL WELFARE

ANALYSE

Undertake industry analysis to inform policy, and research and development priorities.

CONNECT

Increase the value of livestock products through highly transparent and traceable production systems.

PROTECT

Help industry meet consumer and community expectations on animal welfare.

VALUE CHAINS

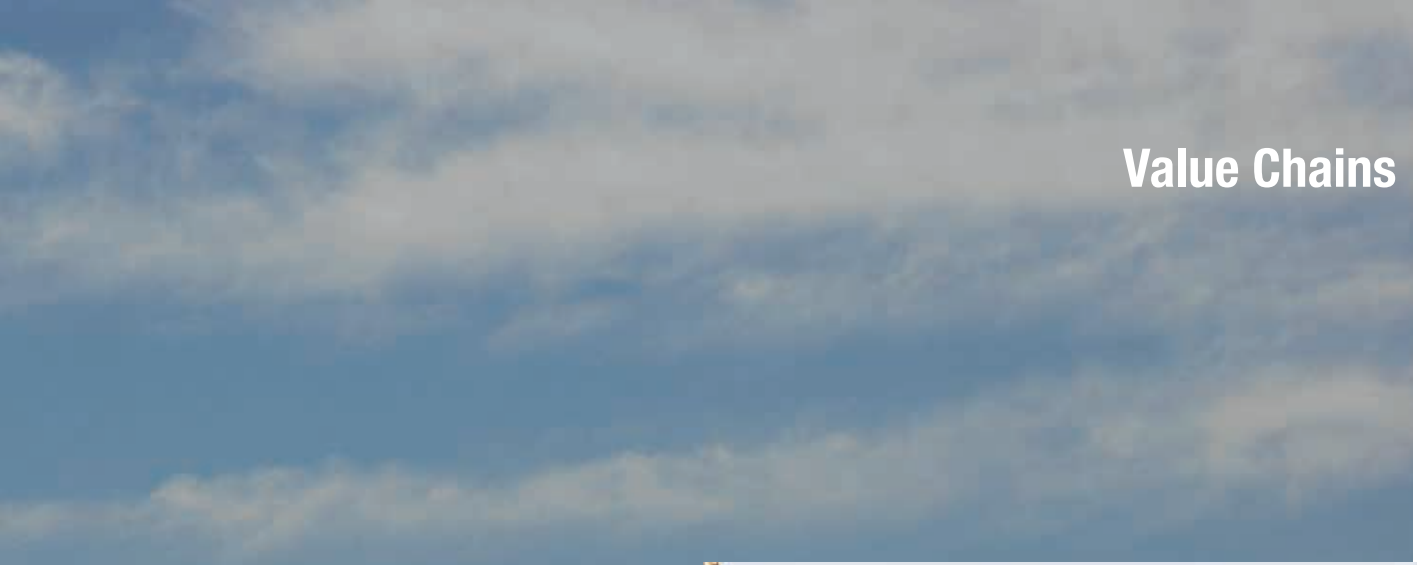
Livestock value chains encompass a broad range of players, from plant and animal breeders through to producers, processors, marketers, retailers and consumers.

FLOW OF INFORMATION along the value chain is critical to the industry's success.

DPIRD's livestock team works to connect participants across the entire industry value chain by analysing and communicating production and market information and identifying gaps requiring investment.

The team has a particular focus on the sheepmeat value chain in south-west WA and the pastoral beef sector across the Kimberley and Pilbara.

Livestock



Livestock data provides industry insights

Livestock industry analysis and modelling is providing DPIRD and the WA livestock industry with a clearer picture of livestock supply chains and enabling more informed decision-making and policy development.

A RECENTLY LAUNCHED DPIRD webpage is delivering up-to-date analysis and demographic information about the WA sheep industry to producers, processors, exporters and the general public.

The interactive webpage: www.agric.wa.gov.au/sheep/western-australian-sheep-and-wool-industries is maintained by DPIRD's Livestock Industry Analysis and Modelling group.

DPIRD research officer Kate Pritchett analyses industry data to provide information on the production and trade of sheepmeat, wool and beef in WA (Figure 22). Kate delivers her findings through the webpage, the Sheep Notes and Beef Commentary reports, and directly to industry.

The industry data and analyses can be used to make evidence-based decisions and develop policies.

For example, meat processors use the information to monitor interstate sheep movements and assess likely effects on the local supply of animals.

Kate sources data from agencies such as Meat & Livestock Australia and the Australian Bureau of Statistics (ABS) as well as from producers, saleyards, processors and exporters. She also manages the ABS trade databases including the ABS export and import data.

The Livestock Industry Analysis and Modelling group also performs flock, herd and production modelling to make projections and forecasts about the effect of supply chain interventions and the influence of specific scenarios on WA's livestock sectors.

For example, for the 2019 report *Implications of management decisions on the WA sheep flock in response to changing markets*, Kate modelled the integrated effect of management decisions by individual producers on the size, structure and productivity of the entire WA sheep flock.

Of the four scenarios investigated over a 10-year period, the largest reductions in flock size and productivity occurred when there was an increase in the proportion of wethers in the state flock from seven per cent to 15 per cent at the expense of the breeding ewe flock.

The modelling showed that although WA sheep producers act independently of each other, their collective decisions can result in large changes to the state's flock. It is the net result of these decisions that determines sheepmeat and wool production, with flow-on effects to other sheep producers, rural communities and support industries.

The analysis showed that a decline in flock size or change in structure must be identified early as livestock breeding has a long turnaround time.

The modelling work helps DPIRD, industry players and producers make more informed decisions about livestock policy development and on-farm management.

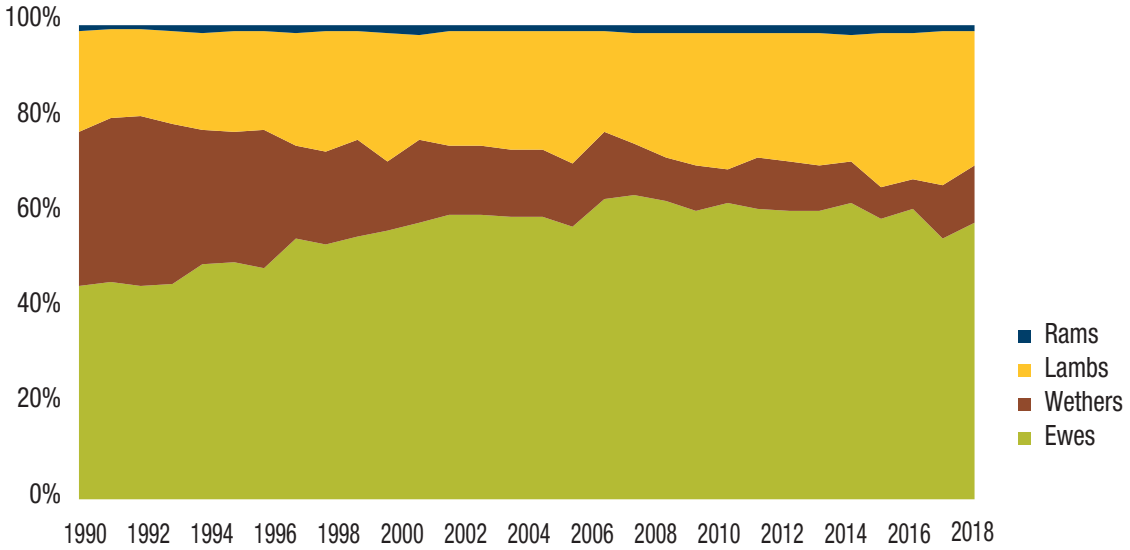


FIGURE 22. Visual representation of the changing composition of the WA sheep flock since 1990

Note: Over the years, ewe and lamb percentages have increased, with a corresponding decrease in the relative size of the wether flock. Rams have remained at a consistent proportion of the total flock.