



# final report

Project code: B.SGN.0138  
Prepared by: Margaret Sheddon  
Sheep CRC  
Date published: 29 October 2015

PUBLISHED BY  
Meat & Livestock Australia Limited  
Locked Bag 991  
NORTH SYDNEY NSW 2059

## **The management of the Resource Flock for 2012 and 2013 joining programs**

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

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

## Abstract

The Resource Flock program was designed to enable breeders and commercial producers to use information from hard to measure traits in breeding values to achieve rapid genetic improvement in their flocks. The 2012 and 2013 joinings were conducted at UNE (Kirby, NSW) & DAFWA (Katanning, WA), with the Sheep CRC conducting the management and co-ordination of the programs. The Resource Flock has allowed researchers to test progeny of key young industry sires for an extensive range of traits in differing environments. The phenotypic and genomic information on progeny and industry sires has been used to estimate and test SNP panels as predictors of breeding values. Genetic information has been generated about new and novel traits and traits that were difficult or expensive to measure on-farm that may be related to meat quality, disease resistance and reproductive fitness.

## Executive summary

The Sheep CRC (CRC) Information Nucleus Flock (INF) program integrated sophisticated genetic design and analysis with comprehensive measurement of biological and production traits. It allowed researchers to test progeny of key young industry sires for an extensive range of traits in differing environments. Research has analysed and used genotypic information on progeny and industry sires to estimate and test SNP panels as predictors of breeding values. Genetic information has been generated about new and novel traits, and traits that are difficult or expensive to measure on-farm, that may be related to wool and meat quality, disease resistance and reproductive fitness. The data generated by the INF was also integral to the of management, wool and meat research being undertaken in the other CRC research programs.

The CRC INF program conducted joining's from 2007 to 2011 and it evolved into the MLA funded Resource Flock program from 2012 onwards. The 2012 and 2013 joinings were conducted at UNE (Kirby, NSW) & DAFWA (Katanning, WA), with the Sheep CRC conducting the management and co-ordination of the programs..

In summary across the 2 sites:

- In 2012
  - 256 young industry sires were joined to 5714 ewes,
  - with 5087 lambs born and 4316 weaned.
- In 2013
  - 154 sires were joined to 3586 ewes,
  - with 3253 lambs born and 2626 weaned.

The following actions have been implemented:

- A Steering Committee involving all partners has been established to coordinate the programs.
- An Annual Industry Planning meeting now occurs to manage the next joining
- A Resource Flock Coordinator has been appointed to oversee all activities
- A coordinated approach to Industry Sire Nomination has been implemented
- Safeguards are in place to ensure all sires genotyped
- A communication strategy including a newsletter has been introduced
- A consistent & accountable budget has been delivered
- An Operation Manuals for the breeding programs, trait protocols and slaughter program has been delivered

The management of the Resource Flock by the Sheep CRC ceased on 31<sup>st</sup> March 2014. Coordination of the future joining programs is now under the management of the Resource Flock Steering Committee. All future activities are managed under contract between MLA & UNE (B.SGN.142).

## Contents

<b>1</b>	<b>Background</b> .....	<b>5</b>
<b>2</b>	<b>Project objectives</b> .....	<b>5</b>
<b>3</b>	<b>Resource Flock core activities</b> .....	<b>5</b>
3.1	Design and mating .....	5
3.2	Genotyping .....	7
3.3	Management and Administration .....	8
3.4	On Farm Management .....	10
3.5	Slaughter Phenotypes & Summary .....	10
3.6	Budget .....	11
<b>4</b>	<b>Conclusion and recommendations</b> .....	<b>11</b>

## 1 Background

The Sheep CRC Information Nucleus Flock program conducted joinings from 2007 to 2011 and it evolved into the Meat & Livestock Australia funded Resource Flock program from 2012 onwards.

## 2 Project objectives

- To develop a National Sheep Research Resource Flock (NSRRF) that generates data for sheep research and development, and to achieve greater efficiency and coherence among the various investments in sheep research data.
- A core Resource Flock that supplies reference data for genomic selection for hard to measure traits. The flock contains a balance of data from research flocks, and from ram breeder flocks that are selected based on set objective criteria, such as the number of phenotypes currently collected, connections to industry and appropriate data quality standards.

## 3 Resource Flock core activities

### 3.1 Design and mating

Funding has been provided by MLA for the mating costs of sires used in the Resource Flock program. The design of the Resource Flock and the procedures for the selection of sires used in the annual mating are based on the methods outlined in the UNE Sheep Hub Concept.

The design of the Resource Flock for the 2012 & 2013 joining's was conducted by Sheep Genetics with input from AGBU and the research station sites.

The design of the resource flock was changed on an annual basis as required, including increasing or decreasing the number of females mated to produce progeny. These design changes were required to account for additional research, development and extension programs that utilise the MLA Resource Flock, or environmental changes such as extreme drought.

The design team defined the overall mating plan in terms of numbers of sires used, breed distribution of sires, progeny per sire and breed composition of dams. Sires used in the Resource Flock have been nominated by breeders, and selected on a combination of high genetic merit and diversity of pedigree by Sheep Genetics and UNE staff. The dams joined at the research station sites consisted of Merino & Border Leicester x Merino breed composition.

Coordination of the acquisition and transport of semen from key industry sires used in the Resource Flock was conducted by Sheep Genetics staff for 2012 & 2013.

### **Katanning – DAFWA – Summary of joinings**

In 2012 the AI program had a few setbacks with semen arriving late delaying the insemination dates by 6 weeks until the weeks of 14<sup>th</sup> & 21<sup>st</sup> March. This delayed the rest of the program with lambing and weaning.

The lambs were weaned into management groups based on sire breed, because a number of the sires were not genotyped. Mothering up was not conducted, and after the lamb blood samples were taken, it was realised that a large number of dams did not have a genotype. These dams subsequently were genotyped. Therefore there was a delay in determining parentage, which coupled with a dry season and a delay in slaughter, meant that Katanning amassed extra expenses in feeding.

The 1<sup>st</sup> slaughter was conducted on the 8<sup>th</sup> April 2013, accounting for 300 head, with the lambs much heavier than the target weight. The 2 remaining kills of 299 and 272 were conducted in June and July respectively.

In 2013, the joining ran more smoothly with Katanning conducting physical mothering up which improved the parentage assignment. The conception result wasn't as high as normal, and was put down to a 2-3 day period of extremely hot weather (40°C +) 5 days after insemination. Parentage results were received in a timelier manner and there were minimal delays. The 3 slaughters were conducted in May, June & July.

### **Kirby – UNE – Summary of joinings**

In 2012, the AI Program went well with a split joining conducted on 16<sup>th</sup> April & 7<sup>th</sup> May. Kirby made the decision not to mother up and had similar issues with parentage, as outlined in the Katanning summary.

In 2013, the AI program was conducted on the 22<sup>nd</sup> April & 14<sup>th</sup> May. 1944 ewes were joined, though seasonal conditions unfavourable. 244 more ewes were joined than required in order to make up for any shortfall in conception and lambing. 75% ewes were scanned in lamb. Seasonal conditions continued to worsen, with the 2013 progeny being fed extensively throughout the drought and target weights were hard to meet.

### **Summary of 2012 & 2013 joining and lambing**

Joining Year	No of Sires Used	No of Ewes Joined		No of Lambs Born		No of Lambs Weaned	
		Kirby	Katanning	Kirby	Katanning	Kirby	Katanning
2012	256	2826	2988	2629	2458	2308	2008
2013	154	1944	1642	1939	1314	1529	1097

### Summary of Sires by breed in 2012 & 2013

	2012	2013
<b>Border Leicester</b>	21	12
<b>Poll Dorset</b>	65	33
<b>Texel</b>	2	
<b>Suffolk</b>	3	
<b>White Suffolk</b>	55	39
<b>Booroola</b>	2	
<b>SAMM</b>	1	
<b>Merino</b>	35	27
<b>Dohne</b>	13	2
<b>Poll Merino</b>	54	32
<b>NZ Merino</b>	1	
<b>NZ Poll Dorset</b>	2	
<b>Charolais</b>	1	
<b>Il de France</b>	1	
<b>Coopworth</b>		2
<b>Composite Maternal</b>		7
<b>TOTAL</b>	<b>256</b>	<b>154</b>

### Annual planning meeting

In November 2013, the first Annual planning meeting was held. The final mating design was reported to the Resource Flock Steering Committee and key stakeholders.

The annual planning meeting provided a platform for feedback into the design and operation of the Resource Flock by reviewing the previous year's activity and identifying any key learning's or issues that impact on the Resource Flock programs ability to meet its objectives. This meeting reviewed the requirements for the next cohort of Resource Flock progeny, including any changes to the design of the flock, the number of phenotypes to be collected and the protocols for recording these phenotypes.

### 3.2 Genotyping

The genotyping strategy for the 2012 Resource Flock Joining was as follows:

- Sires            50k SNP test
- Dams            Parentage test
- Progeny        Parentage test

In 2013, the genotyping strategy was altered slightly with the progeny being genotyped using the 12k SNP tested instead of the parentage test.

When the AI programs were conducted at both Katanning & Kirby, an extra straw or pellet of semen was not retained for genotyping. Following the completion of the 2012 & 2013 AI programs Sheep CRC Genomics staff contacted breeders that had nominated sires to obtain a straw / pellet for genotyping. Unfortunately, the consequence was that not all the sires were successfully genotyped. A summary table is below.

## Summary of Sires Genotyped

	Genotyped	Not Genotyped
2012	188	68
2013	119	35

The following safeguards have been put into place for all future joining's to ensure that wherever possible a straw / pellet of semen for every sire is retained for genotyping purposes.

- All breeders are notified that an extra dose is needed for genotyping
- The Resource Flock Coordinator/s liaises with the AI centres ensuring that the extra dose is despatched with the other doses
- The AI centres conducting the AI programs at Katanning & Kirby ensure that a dose is retained
- The doses are then transferred directly to the Resource Flock Coordinator/s
- The Resource Flock Coordinator/s then check the semen doses off the final sire list before despatching the semen to University of QLD for DNA extraction and then a sample is sent Geneseek for Genotyping. DNA is then stored at UNE for future use if necessary.
- Any genotyping failures are re tested

### 3.3 Management and Administration

#### Resource Flock Steering Committee

In July 2013, the Resource Flock Steering Committee was formed to oversee the management and coordination of the Resource Flock.

The aim of the Steering Committee is to provide a critical role in communicating and representing the views and requirements of the Resource Flock stakeholders and the wider sheep industry to MLA, and to ensure that the operational performance of the Resource Flock meets the MLA requirements. The Committee also performs an important role in the annual review of operational performance.

The committee consists of representatives from all funding partners and interested parties including:

- Meat & Livestock Australia (MLA)
- Sheep CRC
- University of New England (UNE)
- Murdoch University, WA
- Department of Agriculture and Food Western Australia (DAFWA)
- Animal Genetics & Breeding Unit (AGBU)
- Sheep Genetics Manager
- Kirby, UNE Farm Manager
- Katanning, DAFWA Farm Manager

#### Resource Flock Coordinator

In November 2013, a Resource Flock Coordinator was appointed to coordinate day to day management activities and the annual sire nomination and joining's. This position was jointly shared between Margaret Sheddon and Rebecca Macarthur-Onslow. The key requirements for this position are listed below:



1. Be responsible for managing the day to day aspects of the Resource Flock.
2. Coordinate the Young Sire Nomination & Artificial Insemination programs each year including liaison with breeders (ram nominations, ram collection & semen releases), Sheep Genetics, AI centres, AI technicians and the Research Sites.
3. Be the first point of contact and provide support and advice to the site scientists and technical officers at Kirby & Katanning research stations.
4. Review and compile monthly reports from the research stations.
5. Update the Operations Manual for data collection at the research stations.
6. Develop and update the Operational Plan and compile reports for the Resource Flock steering committee.
7. Develop & update the data collection protocols for the Resource Flock progeny at each of the research stations.
8. Develop an industry public relations strategy for the Resource Flock particularly targeted at breeders including email updates, newsletters and possibly field days.
9. Be responsible for the logistics of genotyping the young sires including:
  - Shipment of semen to the University of Qld for DNA extraction.
  - Liaison with UQ to send DNA to Geneseek for genotyping
  - Database management – creation of batches and correct sire ID entry, ensuring genotyping results are loaded into the database and results are forwarded to breeders.
10. Be responsible for data entry, quality control and logistics for the genotyping of Resource Flock dams and progeny.
11. Be responsible for database audits and reporting in conjunction with the database manager.
12. Coordinate and contribute to regular meetings with the Resource Flock Steering Committee including agenda, minutes and action tables.
13. Be the first point of contact for overlay projects.
14. Coordinate an annual meeting to discuss potential projects and data collection protocols between all relevant parties for the Resource Flock (i.e. MLA, Sheep CRC, AWI, UNE & DAFWA).

## **Database Management**

All data collected from the 2012 & 2013 joining's has been stored on the INF database. The process for data storage and retrieval uses the protocols developed for the Information Nucleus Flock (INF).

Database management of the Resource Flock is managed by contract with AGBU, and access to data is in line with the Information Nucleus and Resource Flock Data licence agreement between Sheep CRC and MLA. The database is hosted on a server at AGBU, Armidale, and can be accessed on [INFdata.une.edu.au](http://INFdata.une.edu.au) with access arranged through Resource Flock manager or database manager Klint Gore ([kgore4@une.edu.au](mailto:kgore4@une.edu.au)).

The role of the Database Manager is:

- To ensure the core data of the resource flock is adequately captured
- To provide bi-monthly data audit reports and notification of any data issues to the Resource Flock Steering Committee

- To provide a link to sheep CRC database to provide data for ASBV runs
- To provide data in a timely manner to researchers involved with the Resource Flock

### 3.4 On Farm Management

Funding was provided for the on-farm management of Resource Flock dams from mating through to lambing, and from Resource Flock progeny from lambing through to slaughter. Data has been collected on dams and progeny according to the data recording protocols (Annexure 2), and includes information on mating, pregnancy, lambing and health and growth traits. The research station ensures this data is entered into the research database within 60 days of data collection.

On-farm management has been based on the protocols developed by the Sheep CRC for the Information Nucleus Flock Operational Manual. Protocols include trait definition; data storage and retrieval; data collection; meat phenotyping; feeding and management; biological samples; quality assurance and the collection of slaughter phenotypes. With the introduction of the Resource Flock Steering Committee and the Annual Planning meeting, these protocols are able to be revised and modified as required.

### 3.5 Slaughter Phenotypes & Summary

Under the Sheep CRC partnership agreements with UNE, DAFWA & Murdoch University, the coordination and collection of slaughter and meat science phenotypes was sub-contracted (B.SGN.0144). The subcontract ensures that the Resource Flock progeny are managed and slaughtered according to protocol and that the slaughter and meat science data is entered into the Resource Flock database in a timely manner.

For the 2012 & 2013 progeny, mainly wethers were slaughtered. Surplus female progeny were transferred to the CRC funded follower flock or to the research station. It is anticipated for future joining's that all progeny will be slaughtered either as lambs or yearlings.

A summary of animals slaughtered for each year is below:

	Katanning	Kirby
2012	892	1052
2013	596	941

The subcontract for slaughter phenotypes ensures:

- Management of the relationship with the collaborating abattoirs (WAMMCO International – Murdoch University; Thomas Foods, Tamworth - UNE) including checking that the electrical stimulation parameters are optimal and that all commercial abattoir carcass data are collected (fat score, HCW, grade scores, etc.).
- Manage the slaughter of approximately 2,000 slaughter animals in lots of about 2-300 according to protocol. This includes assuring tracing identity from live to dead through to final meat samples.
- On the day of slaughter measure pH decline so as an estimate of temperature at pH 6 can be determined
- On the day following slaughter measure cold GR, C fat and C muscle depth and width

- Fresh colour (L, a, b) with a Minolta spectrophotometer on the short loin.
- Take samples of the short loin for shear force 5, intramuscular fat and minerals (Fe/Zn)
- Measure pH24 in the short loin and eye round.

The following laboratory meat science measurements have also be included:

- Measure retail colour (reflectance at 630/580nm) using a Hunter Spectrophotometer under standardised lighting and overwrap packaging daily for 4 days after first aging for 5 days under vacuum packaging and storage at 1-2°C.
- Measure Fe/Zn – undertaken by Murdoch on approximately 2,000 samples from both resource flocks
- Measure shear force after 5 days aging – undertaken by UNE on approximately 2,000 samples from both resource flocks
- Measure IMF – undertaken by Murdoch on approximately 2,000 samples from both resource flocks

### **3.6 Budget**

The budget is broken into general management, on farm, genomics and meat projects. The design for year 2 joining (2013 joining) was refined to address concerns in the budget from year 1 (2012 joining). These concerns were the costs associated with feeding and extra genotyping.

Within the budget there was an agreement with Australian Wool testing Authority (AWTA) for any wool measurement testing conducted, including a 50% discount.

## **4 Conclusion and recommendations**

Outcomes from the 2012 and 2013 joining's has been reviewed, and the appropriate changes to address issues have been introduced. These changes (listed below) have substantially improved the operations and management of the Resource Flock. They are:

- The Resource Flock Steering Committee
- The Annual Industry Planning meeting
- The Resource Flock Coordinator/s
- Sire Genotyping Safeguards

With the adverse drought conditions in NSW in the last few years the steering committee has recommended that the Site Advisory groups (that operated with the Sheep CRC - INF project) be re-implemented to advise the Research Stations with their management.

The following recommendations are also advised for the ongoing management of the Resource Flock:

- The Resource Flock Steering Committee continues to operate in the same capacity
- The changes made to the management and operations continue to operate in the same capacity