



# AWSA Satellite Flock Project Final Report



Australian White Suffolk Association



Meat and Livestock Australia



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Feb 2022



## Abstract

Eating quality of lamb can now be measured at chain speed and a premium is being paid to lamb producers for better eating quality. Eating quality traits such as Intramuscular Fat (IMF) and Shear Force (SF5) can only be measured in lambs after they have been slaughtered. These tests are expensive and require specialist equipment and meat scientists to conduct the testing and as such are considered “hard to measure” traits.

All lambs produced in the MLA Resource Flock are measured for all traits, including carcass and eating quality traits post slaughter. The allied genomic testing of those lambs means the genomic predictions for closely related animals are more accurate.

This Satellite flock project is attempting to broaden the footprint of sires used widely in the White Suffolk breed that have had lambs slaughtered and measured for eating quality traits. This will increase these sires accuracy for eating quality traits and allow breeders with animals related to these sires to use genomic tests to receive more accurate ASBVs for eating quality.

The project selected 1 link sire (already used in the MLA Resource Flock) and 14 sires that have been used widely in the White Suffolk breed but had the least relationship to the sires in the MLA Resource Flock. These sires were joined to commercial Merino ewes and the progeny measured, slaughtered and tested for eating quality traits.

The results showed a large increase in accuracy on average for these sires of 18.6% for IMF and 16.1% for SF5. In February 2022, the sires in the project have been used in 158 White Suffolk flocks and have 7555 progeny recorded in Lambplan. This project will allow White Suffolk breeders who have animals related to the 15 sires in the project to receive much more accurate ASBVs for eating quality through genomic testing. This will then allow stud breeders to make better selection decisions and faster genetic gain.

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## Background

The MLA Resource Flock collects reference data (phenotypes – physical measurements) for use in genomic testing, as well as providing a resource for additional R&D projects. The data collected is used for the purpose of generating Australian Sheep Breeding Values (ASBV's) and other genetic and genomic information, for delivery to sheep breeders through Sheep Genetics.

Carcase traits such as Lean Meat Yield and Dressing Percentage and eating quality traits such as Intramuscular Fat and Shear Force cannot be measured in the live animal. These traits can only be measured from a carcass and by conducting laboratory tests on meat from a carcass.

Eating quality traits are vitally important to the future of the lamb industry. These traits can now be measured at chain speed and a premium is being paid to producers for superior eating quality. It is vital that seed-stock producers include these traits in their breeding objectives.

MLA Resource Flock lambs are measured for every trait possible as well as their carcasses being measured for carcass and eating quality traits. Genomic tests using the Resource Flock population as the reference, allow eating quality ASBVs to be produced for live animals. Animals that are closely related to the sires used in the Resource Flock therefore get much more accurate ASBVs for eating quality traits through Genomic tests.

A key component of the Resource Flock project is to seek additional co-investment from industry into the collection of genotypes matched to hard-to measure phenotypes on progeny from commercial (non-research) flocks known as Satellite Flocks

The major aim of this White Suffolk Satellite Flock project is to assist in the accuracy of selection for hard to measure traits for the White Suffolk breed. These traits include carcass and eating quality traits.

Past trials have demonstrated that large scale Genomic testing by itself does not increase the accuracy of these hard to measure traits. Accuracy is dependent on the degree of the pedigree relationship to animals that have had actual phenotypic tests.

Research was conducted into the benefits to the White Suffolk breed in applying for the Satellite Flock proposal. It was found there were a significant number of Sires used widely in the breed that did not have a close relationship to the Resource Flock. By broadening the footprint of White Suffolk lambs that are related to the Resource Flock it would allow more breeders to use Genomic tests and receive more accurate ASBVs for eating quality traits.

The Australian White Suffolk Association was successful in its application to run a Satellite Flock project in 2021.

## Project Objectives

### Aim

The aim of the Satellite Flock project is to increase the number of White Suffolk sires in the MLA Resource and Satellite Flocks. This will increase the accuracy of ASBVs for eating quality traits for those sires and all their progeny and relatives across the breed. Breeders are then able to make better selection decisions and increase the rate of genetic gain for these traits. This will ultimately improve returns for stud breeders and lamb producers and ensure quality lamb for consumers.

### Objectives

1. Increase the number of White Suffolk sires represented in the Resource and Satellite Flocks. This will broaden the footprint of lambs born across the breed that are closely related to animals that have been measured for eating quality traits.
2. Join the selected sires to an even line of commercial ewes. Measure and record these lambs for sire, sex, birth type, weights, fat and muscle depth. Slaughter all lambs and measure the carcasses for carcass and eating quality traits. Enter lambs and data into the Sheep Genetics database.
3. Increase the accuracy of carcass and eating quality traits of these sires and therefore all lambs that are related to them.

## Methodology

In November 2020 the AWSA Federal Council appointed a Project Manager and Steering Committee to manage this project

- Project Manager – Debbie Milne “Richmond Hill Agribusiness P/L”
- Steering Committee – Anthony Hurst “Seriston”, Andrew Heinrich “Ella Matta”, Ian Gilmore “Baringa” and Steve Milne “Waratah”.

AWSA members were advised of the success of the application for the project and invited to nominate sires for the project.

Sires were selected by the steering committee based on a list compiled from,

- A “search” of the animals in the Sheep Genetics database that had progeny in more than one flock and they or their sire and sire of dam had not been used in the Resource flock and had semen available for the project (23 rams)
- Sires nominated by members (11 rams)
- The unsuccessful White Suffolk nominations for the 2021 MLA Resource Flock (28 rams)

From this list of 62 rams a relationship program run by AGBU was then utilized to rank the nominated sires with the least relationship to the MLA Resource Flock. This list was further reviewed to ascertain whether semen was available for the project and the number of White Suffolk flocks each sire had been used in.

Sires were selected by the steering committee based on the,

1. Greatest diversity of bloodlines,
2. Sires used in the most number of White Suffolk flocks,
3. Sires with the least relationship to the MLA Resource Flock.

The 15 sires selected by the steering committee for the project were,

Link Sire - Somerset 160067, Baringa 16W300, Yonga Downs 170386, Kurralea 160231, Warburn 140512, Bundara Downs 179821, Koonawarra 140259, Aylesbury Farm 177408, Anden 150277, Wheetlande 148159, Langley Heights 160054, Fairburn 180567, Mertex 170575, Booloola 170093 and Gemini 170171.

The Somerset sire was selected as the link sire as he had been used in the Resource Flock, had been used in 20 White Suffolk flocks, had been genotyped and had semen available.

Of the other 14 sires, 6 had already been genotyped and 8 required a genomic test.



Inserting CIDRs for AI program

Table 1: Genotyping of Sires

Sire	Genotyped prior to the project
ANDEN-150277	N
AYLESBURY FARM-177408	N
BARINGA-16W300	N
BOOLOOLA-170093	N
BUNDARA DOWNS-179821	Y
FAIRBURN-180567	N
GEMINI-170171	Y
KOONAWARRA-140259	Y
KURRALEA-160231	N
LANGLEY HEIGHTS-160054	Y
MERTEX-170575	Y
SOMERSET-160067 - Link	Y
WARBURN-140512	N
WHEETELANDE-148159	N
YONGA DOWNS-170386	Y

The Satellite Flock was located at “Seriston” in the South East of SA. Seriston is a five-thousand-acre mixed farming operation situated at Avenue Range in the south east of South Australia. The property is owned and operated by Anthony Hurst with a focus on producing stud and commercial livestock for the sheep and beef industries. Seriston runs 4500 Merino ewes, 600 stud White Suffolk and Suffolk ewes and 600-head cattle. It trades 1000 cattle per year and feedlots up to 16,000 prime lambs.

The ewes selected for this trial were commercial, 2.5 year old Terrick West MN3 accredited Merino ewes. The ewes came from one line of breeding, were all the same age and very even in type.

The AI program took place on the 4<sup>th</sup> and 5<sup>th</sup> of January 2021. 312 ewes had been programmed but at AI only 295 were found to be suitable. The decision was made to randomly AI 10 sires to 20 ewes and 5 sires to 19 ewes. All ewes were tagged with an Electronic and Visual tag and joining sire recorded.

On the 6<sup>th</sup> January a bushfire impacted “Seriston” and some livestock, pasture and infrastructure were lost. The project ewes were not directly affected.

In March the ewes were pregnancy scanned for singles and multiples (see Table 2). Of the 295 ewes joined, 209 were in lamb with 276 lambs identified. This is a 70.8% conception rate, about industry standard.



Tagging and Recording Ewes at AI



AI crew

Prior to lambing the ewes were separated into 2 mobs, ewes bearing singles and ewes bearing multiples. This separation continued until marking and enabled birth type of the lambs to be recorded.

Ewes lambed at the beginning of June. Unfortunately a severe

cold weather event impacted lambing and again shortly after lambing. This affected the survival rate and 208 lambs were present at marking.

At marking, the lambs were tagged with a "Shearwell" EID and visual tag and a TSU was taken for genomic and sire parentage testing. DOB, sex and birth type of the lambs were also recorded. Parentage test results were received in August 2021. Lamb numbers per sire were less than hoped due to unexpected and unavoidable events including the bushfire and severe weather events during lambing. Table 2 shows the number of Ewes and lambs identified and measured at different stages of the project.

**Table 2: Number of Ewes and Lambs per event throughout the project**

Sire	Number of Ewes Joined	Number of Ewes in lamb	Number of lambs preg scanned *	No of Lambs marked	No of lambs weaned	No of lambs scanned	No of lambs PSWT ***	No of lambs sent to JBS ****
ANDEN-150277	20	12	15	10	10	9	10	9
AYLESBURY FARM-177408	20	14	22	14	14	14	14	10
BARINGA-16W300	19	9	10	6	5	5	5	5
BOOLOOLA-170093	20	16	22	17	17	16	17	15
BUNDARA DOWNS-179821	19	12	18	12	12	11	12	10
FAIRBURN-180567	20	14	17	14	13	13	13	11
GEMINI-170171	20	15	22	16	16	16	16	10
KOONAWARRA-140259	20	16	20	13	12	11	12	10
KURRALEA-160231	19	12	16	11	11	11	11	11
LANGLEY HEIGHTS-160054	20	14	16	11	10	11	11	7
MERTEX-170575	20	12	17	15	15	14	15	10
SOMERSET-160067 - Link	20	17	21	12	12	12	12	11
WARBURN-140512	19	17	21	21	21	21	21	17
WHEETELANDE-148159	20	15	19	16	16	16	16	12
YONGA DOWNS-170386	19	14	20	18	17	17	17	16
Sire unknown **				2	2	2	2	2
<b>Total</b>	<b>295</b>	<b>209</b>	<b>276</b>	<b>208</b>	<b>203</b>	<b>199</b>	<b>204</b>	<b>166</b>

70.8%

\* Only singles and multiples were identified (twins and triplets were identified as twins)

\*\* Sire unknown, 2 lambs had sire identified as "Not present"

\*\*\* Pre slaughter weight

\*\*\*\* JBS Bordertown (only lambs > 40kg sent to slaughter)

There was a fairly even spread of lambs per sire as shown in Table 2. All semen was checked prior to the AI and deemed suitable. There were still more than enough lambs to complete the project and give statistically relevant information.

Sires were allocated by genomic parentage tests for all lambs with the exception of 4 tests. Of these, 2 tests did not have enough tissue and required re-testing (this information was received in January 2022) and 2 tests came back “Sire not present”. There would appear to have been some semen used, other than that requested for these 2 lambs in this project. One of these lambs was completely black – skin, hair and wool. The dams of these 2 lambs could not be identified and it is therefore not possible to identify who the sire of these lambs should have been.

On the 23<sup>rd</sup> September 2021, 203 lambs had a weaning weight taken. On the 28<sup>th</sup> October 2021 199 lambs were weighed and fat and muscle scanned. On 16<sup>th</sup> November 2021, 204 lambs were weighed and 166 lambs sent to JBS Bordertown for slaughter. Lambs needed to be at least 40Kg live weight to go for slaughter.

Carcase evaluation at JBS was done by the Meat Science team from Adelaide University. Due to Covid restrictions the Meat Science team from the University of New England who would normally do this was unable to travel to SA. Loin samples taken by the Adelaide University team were sent to

UNE for the laboratory testing.

Unfortunately due to Covid no-one other than the Adelaide University people were able to be present at JBS. (Usually the owner and other interested people are able to assist in the carcass testing at the abattoir) Eating quality testing was finalised and data sent to Sheep Genetics on the 13<sup>th</sup> December 2021.

The 2 repeated parentage test results were received on the 11<sup>th</sup> January and parentage for these lambs submitted to Sheep Genetics.



Lamb marking



Weight, Fat and Muscle scanning

## Results

### Changes in ASBVs and Accuracies

The ASBVs and Accuracies for the sires over the term of the project are in the following 2 tables.

Table 3: ASBVs and Accuracies for Growth, Fat and Muscle traits – Weaning Weight (WWT), Post Weaning Weight (PWWT), Post Weaning Fat (PFAT) and Post Weaning Eye Muscle Depth (PEMD)

Table 4: ASBVs and Accuracies for Carcase and Eating Quality traits and Indexes – Lean Meat Yield (LMY), Intramuscular Fat (IMF), Shear Force (SF5), Dressing Percentage (D%) and Indexes Total Carcase Production (TCP) and Lamb Eating Quality (LEQ).

These tables show the information for the sires in the project on the

- 15<sup>th</sup> December 2020 at the start of the project,
- 15<sup>th</sup> November 2021 after genotypes for all sires and live animal weights and scans had been included and
- 1<sup>st</sup> February 2022 after lamb slaughter and carcase testing when carcase and eating quality information were added to Lambplan and the 2 repeated sire parentage test results were known.

Table 3: ASBVs and Accuracies for Growth, Fat and Muscle

Analysis Date: 15/12/2020		ASBVs and Accuracy prior to the Satellite Flock project							
Name	WWT	WWT Acc	PWT	PWT Acc	PFAT	PFAT Acc	PEMD	PEMD Acc	
ANDEN-150277	11.0	98	17.1	98	-0.7	98	1.2	98	
AYLESBURY FARM-177408	12.0	92	19.3	93	-0.3	89	1.4	91	
BARINGA-16W300	12.0	94	17.1	94	-0.2	93	1.3	93	
BOOLOOLA-170093	11.1	97	17.7	98	0.2	98	2.5	98	
BUNDARA DOWNS-179821	13.1	96	19.4	96	-0.5	96	1.0	96	
FAIRBURN-180567	10.8	93	16.2	93	0.1	93	3.6	94	
GEMINI-170171	11.6	95	18.4	95	1.2	93	3.1	94	
KOONAWARRA-140259	9.7	95	16.4	95	-0.7	95	1.3	95	
KURRALEA-160231	10.7	94	16.9	95	-0.6	93	1.6	94	
LANGLEY HEIGHTS-160054	11.1	96	18.6	96	0.3	96	4.8	96	
MERTEX-170575	7.5	95	12.2	95	-0.2	94	1.8	95	
SOMERSET-160067	10.1	98	17.1	98	1.1	97	4.6	98	
WARBURN-140512	11.5	97	17.3	97	-0.2	97	2.2	97	
WHEETELANDE-148159	11.9	98	18.5	98	-0.5	98	1.6	98	
YONGA DOWNS-170386	12.9	94	20.3	94	-0.4	94	2.2	95	
Analysis Date: 15/11/2021		ASBVs and Accuracy after all sires have been genotyped and "live" animal WWT, EPWT and EP scan data added to Lambplan							
Name	WWT	WWT Acc	PWT	PWT Acc	PFAT	PFAT Acc	PEMD	PEMD Acc	
ANDEN-150277	10.6	98	16.6	98	-0.8	98	1.1	98	
AYLESBURY FARM-177408	11.1	95	18.2	95	-0.4	92	1.4	93	
BARINGA-16W300	11.8	95	17.5	95	-0.4	94	1.4	95	
BOOLOOLA-170093	11.0	97	17.2	98	0.1	98	2.5	98	
BUNDARA DOWNS-179821	12.8	96	19.1	96	-0.6	96	0.9	96	
FAIRBURN-180567	11.1	94	16.5	94	0.0	93	3.5	94	
GEMINI-170171	11.3	95	17.9	95	1.0	95	3.2	96	
KOONAWARRA-140259	9.5	95	15.9	95	-0.8	95	1.4	95	
KURRALEA-160231	11.2	95	17.6	96	-0.7	94	1.3	95	
LANGLEY HEIGHTS-160054	11.6	97	18.4	97	0.3	97	4.7	97	
MERTEX-170575	7.3	96	12.5	96	-0.1	96	2.0	97	
SOMERSET-160067	10.2	98	17.1	98	1.1	98	4.5	98	
WARBURN-140512	11.3	97	16.9	97	-0.2	97	2.2	97	
WHEETELANDE-148159	11.5	98	17.9	98	-0.6	98	1.3	98	
YONGA DOWNS-170386	12.9	95	20.1	95	-0.4	94	2.1	95	
Analysis Date: 01/2/2022		ASBVs and Accuracy after project lambs have been slaughtered and carcass and eating quality data added to Lambplan							
Name	WWT	WWT Acc	PWT	PWT Acc	PFAT	PFAT Acc	PEMD	PEMD Acc	
ANDEN-150277	10.7	98	16.4	98	-0.8	98	1.1	98	
AYLESBURY FARM-177408	11.2	95	18.2	95	-0.4	93	1.4	94	
BARINGA-16W300	11.8	95	17.5	95	-0.4	94	1.4	95	
BOOLOOLA-170093	10.8	97	17.0	98	0.2	98	2.5	98	
BUNDARA DOWNS-179821	12.6	96	18.5	96	-0.7	96	1.0	97	
FAIRBURN-180567	10.6	94	15.2	95	-0.2	94	3.7	95	
GEMINI-170171	11.0	95	16.9	96	1.2	95	3.1	96	
KOONAWARRA-140259	9.6	95	16.2	95	-0.9	95	1.4	96	
KURRALEA-160231	11.2	95	17.9	96	-0.8	95	1.5	96	
LANGLEY HEIGHTS-160054	11.5	97	18.2	97	0.4	97	4.5	97	
MERTEX-170575	7.3	97	12.7	97	0.2	97	2.2	97	
SOMERSET-160067	10.1	98	17.1	98	1.0	98	4.4	98	
WARBURN-140512	11.0	97	16.7	97	-0.2	97	2.3	97	
WHEETELANDE-148159	11.3	98	17.6	98	-0.6	98	1.4	98	
YONGA DOWNS-170386	12.9	95	20.3	95	-0.5	95	2.2	95	

Table 4: ASBVs and Accuracies for Carcase and Eating Quality traits and Indexes

Analysis Date: 15/12/2020 ASBVs and Accuracy prior to the Satellite Flock project												
Name	LMY	LMY Acc	IMF	IMF Acc	SF5	SF5 Acc	D%	D% Acc	TCP	TCP Acc	LEQ	LEQ Acc
ANDEN-150277	4.1	92	-0.6	76	3.8	76	1.9	90	141.9	70	132.8	76
AYLESBURY FM-177408	4.0	81	-0.8	62	4.0	60	2.2	72	145.5	58	136.3	60
BARINGA-16W300	3.3	85	-0.4	64	5.2	63	1.8	76	134.6	60	127.5	63
BOOLOOLA-170093	2.9	82	-0.5	62	4.6	61	2.8	78	143.0	62	138.0	64
BUNDARA DNS-179821	3.6	84	0.2	67	2.1	66	1.8	77	147.5	63	149.1	67
FAIRBURN-180567	4.3	79	-0.7	55	3.1	54	2.7	71	150.5	57	141.4	56
GEMINI-170171	2.2	81	-0.3	65	2.0	64	3.1	73	148.9	60	145.1	65
KOONAWARRA-140259	4.1	87	-0.4	69	4.0	68	2.0	82	139.6	64	134.8	71
KURRALEA-160231	4.3	82	-0.7	57	3.8	56	2.2	74	143.2	58	133.4	58
LANGLEY HTS-160054	4.9	88	-0.7	71	2.7	69	4.0	81	161.6	64	154.3	71
MERTEX-170575	2.6	82	-0.4	64	-1.1	62	1.8	74	140.0	60	133.6	63
SOMERSET-160067 - Link	4.3	90	-0.6	83	-1.0	79	4.3	85	167.3	70	158.9	80
WARBURN-140512	4.4	89	-0.7	72	5.6	72	2.0	86	140.8	67	126.5	73
WHEETELANDE-148159	3.6	93	-1.0	80	4.3	79	2.3	90	143.4	71	127.5	79
YONGA DNS-170386	4.5	83	-0.7	64	3.19	63	2.7	75	154.1	60	140.9	64
Analysis Date: 15/11/2021 ASBVs and Accuracy after sires have been genotyped and "live" animal WWT, EPWT and EP scan data added to Sheep Genetics												
Name	LMY	LMY Acc	IMF	IMF Acc	SF5	SF5 Acc	D%	D% Acc	TCP	TCP Acc	LEQ	LEQ Acc
ANDEN-150277	3.8	94	-0.6	83	3.0	83	1.8	92	140.9	72	133.7	82
AYLESBURY FM-177408	4.1	82	-0.7	63	2.9	61	2.2	73	144.8	59	135.1	62
BARINGA-16W300	3.7	88	-0.3	72	3.9	71	2.0	82	141.0	65	134.9	71
BOOLOOLA-170093	3.1	88	-0.5	72	4.3	72	2.7	83	142.9	67	138.1	73
BUNDARA DNS-179821	3.3	86	0.2	69	1.8	68	1.8	79	146.4	64	148.2	69
FAIRBURN-180567	4.4	80	-0.8	60	2.7	59	2.9	71	153.6	59	143.5	61
GEMINI-170171	2.4	84	-0.4	66	1.7	65	3.0	75	149.6	62	145.0	66
KOONAWARRA-140259	4.1	87	-0.4	70	3.6	69	1.9	83	139.4	64	134.8	72
KURRALEA-160231	4.3	84	-0.7	64	2.9	64	2.2	77	146.1	62	137.1	65
LANGLEY HTS-160054	4.4	90	-0.6	75	2.6	74	3.6	85	159.5	67	152.0	76
MERTEX-170575	2.5	86	-0.5	68	-0.9	68	2.0	79	140.9	64	133.1	68
SOMERSET-160067 - Link	4.1	92	-0.6	85	-0.9	83	4.2	88	165.3	72	160.0	84
WARBURN-140512	4.4	91	-0.5	77	5.4	77	2.0	88	139.6	69	124.8	77
WHEETELANDE-148159	3.4	94	-1.0	83	4.7	83	2.2	92	139.6	72	123.4	82
YONGA DNS-170386	4.5	84	-0.7	66	3.3	66	2.6	77	153.2	62	140.5	66
Analysis Date: 01/2/2022 ASBVs and Accuracy after project lambs have been slaughtered and carcase and eating quality data has been added to Sheep Genetics												
Name	LMY	LMY Acc	IMF	IMF Acc	SF5	SF5 Acc	D%	D% Acc	TCP	TCP Acc	LEQ	LEQ Acc
ANDEN-150277	3.9	95	-0.8	89	3.2	87	1.7	93	140.7	74	130.5	86
AYLESBURY FM-177408	4.2	84	-0.7	83	4.7	78	2.2	77	141.6	66	131.3	77
BARINGA-16W300	3.9	89	-0.5	81	5.1	77	2.2	83	140.0	67	130.9	77
BOOLOOLA-170093	2.5	91	-0.2	87	1.9	84	2.7	88	145.0	72	143.9	84
BUNDARA DNS-179821	3.8	89	-0.2	84	4.9	80	1.4	83	139.0	69	136.0	80
FAIRBURN-180567	4.6	84	-0.6	83	1.2	78	2.6	77	155.5	66	147.6	77
GEMINI-170171	1.1	86	1.1	84	-2.8	79	2.6	79	151.4	67	163.0	79
KOONAWARRA-140259	4.5	89	-0.6	84	6.9	80	2.2	84	136.0	69	129.3	82
KURRALEA-160231	4.3	87	-0.4	84	1.4	79	2.3	82	150.6	68	144.8	79
LANGLEY HTS-160054	4.7	92	-0.8	84	3.8	81	3.6	86	157.0	70	147.1	83
MERTEX-170575	2.3	89	-0.8	89	-2.8	85	2.1	84	144.3	72	132.9	84
SOMERSET-160067 - Link	4.5	94	-0.4	92	3.0	89	4.2	91	157.6	75	154.3	90
WARBURN-140512	4.8	92	-1.5	89	8.1	86	2.1	89	135.7	73	110.6	86
WHEETELANDE-148159	2.9	94	-0.7	90	3.7	88	2.4	92	140.6	74	127.4	87
YONGA DNS-170386	4.8	88	-1.0	87	3.8	83	2.7	82	154.0	69	138.4	82

## Analysis of ASBV changes

The tables below show the changes in ASBVs, Indexes and Accuracies from the start of the project, analysis date 15/12/20 to the end of the project, analysis date 1/2/22. The analysis date 15/11/21 is also included as there were some variations for some sheep as other data apart for the Satellite flock data was added to Lambplan.

**Table 5: Change in ASBVs for WWT and PEMD**

Sire	15/12/20	15/11/21	1/02/22	Change in WWT ASBV	15/12/20	15/11/21	1/02/22	Change in PEMD ASBV
	WWT	WWT	WWT		PEMD	PEMD	PEMD	
ANDEN-150277	11.01	10.60	10.65	-0.36	1.20	1.13	1.10	-0.10
AYLESBURY FARM-177408	11.95	11.09	11.22	-0.73	1.41	1.40	1.40	-0.01
BARINGA-16W300	12.03	11.77	11.76	-0.27	1.28	1.41	1.37	0.09
BOOLOOLA-170093	11.09	10.99	10.83	-0.26	2.49	2.47	2.51	0.02
BUNDARA DOWNS-179821	13.09	12.84	12.55	-0.54	0.99	0.93	0.97	-0.02
FAIRBURN-180567	10.76	11.06	10.58	-0.18	3.57	3.45	3.67	0.10
GEMINI-170171	11.57	11.32	10.95	-0.62	3.12	3.23	3.13	0.01
KOONAWARRA-140259	9.74	9.51	9.62	-0.12	1.32	1.38	1.40	0.08
KURRALEA-160231	10.65	11.22	11.24	0.59	1.56	1.33	1.45	-0.11
LANGLEY HEIGHTS-160054	11.14	11.60	11.48	0.34	4.82	4.70	4.54	-0.28
MERTEX-170575	7.51	7.32	7.25	-0.26	1.84	2.00	2.16	0.32
SOMERSET-160067 - Link	10.10	10.24	10.12	0.02	4.61	4.45	4.44	-0.17
WARBURN-140512	11.47	11.28	11.01	-0.46	2.23	2.15	2.25	0.02
WHEETELANDE-148159	11.87	11.50	11.33	-0.54	1.56	1.27	1.35	-0.21
YONGA DOWNS-170386	12.87	12.87	12.90	0.03	2.19	2.11	2.21	0.02

Table 6 shows the changes in eating quality traits IMF and SF5 from 15/12/20 to 1/2/22.

**Table 6: Change in ASBVs for IMF and SF5**

Sire	15/12/20	15/11/21	1/02/22	Change in IMF ASBV	15/12/20	15/11/21	1/02/22	Change in SF5 ASBV
	IMF	IMF	IMF		SF5	SF5	SF5	
ANDEN-150277	-0.61	-0.55	-0.84	-0.23	3.78	3.02	3.18	-0.60
AYLESBURY FARM-177408	-0.75	-0.66	-0.71	0.04	3.96	2.88	4.68	0.72
BARINGA-16W300	-0.37	-0.28	-0.51	-0.14	5.24	3.89	5.08	-0.16
BOOLOOLA-170093	-0.47	-0.47	-0.16	0.31	4.60	4.31	1.88	-2.72
BUNDARA DOWNS-179821	0.17	0.18	-0.24	-0.41	2.06	1.80	4.88	2.82
FAIRBURN-180567	-0.71	-0.78	-0.58	0.13	3.10	2.73	1.16	-1.94
GEMINI-170171	-0.28	-0.37	1.07	1.35	1.99	1.68	-2.81	-4.80
KOONAWARRA-140259	-0.40	-0.37	-0.56	-0.16	4.03	3.57	6.94	2.91
KURRALEA-160231	-0.67	-0.65	-0.35	0.32	3.80	2.93	1.40	-2.40
LANGLEY HEIGHTS-160054	-0.71	-0.62	-0.78	-0.07	2.74	2.63	3.78	1.04
MERTEX-170575	-0.35	-0.46	-0.79	-0.44	-1.08	-0.93	-2.81	-1.73
SOMERSET-160067 - Link	-0.64	-0.59	-0.44	0.20	-1.00	-0.88	3.00	4.00
WARBURN-140512	-0.67	-0.51	-1.46	-0.79	5.58	5.39	8.06	2.48
WHEETELANDE-148159	-1.00	-1.01	-0.71	0.29	4.29	4.68	3.68	-0.61
YONGA DOWNS-170386	-0.69	-0.66	-0.96	-0.27	3.19	3.28	3.81	0.62

Table 7 shows the changes in TCP and LEQ from 15/12/20 to 1/2/22.

**Table 7: Change in TCP and LEQ Indexes**

Sire	15/12/20	15/11/21	1/02/22	Change in TCP	15/12/20	15/11/21	1/02/22	Change in LEQ
	TCP	TCP	TCP		LEQ	LEQ	LEQ	
ANDEN-150277	141.9	140.9	140.7	-1.1	132.8	133.7	130.5	-2.3
AYLESBURY FARM-177408	145.5	144.8	141.6	-3.9	136.3	135.1	131.3	-5.0
BARINGA-16W300	134.6	141.0	140.0	5.4	127.5	134.9	130.9	3.3
BOOLOOLA-170093	143.0	142.9	145.0	2.1	138.0	138.1	143.9	5.9
BUNDARA DOWNS-179821	147.5	146.4	139.0	-8.4	149.1	148.2	136.0	-13.1
FAIRBURN-180567	150.5	153.6	155.5	4.9	141.4	143.5	147.6	6.3
GEMINI-170171	148.9	149.6	151.4	2.4	145.1	145.0	163.0	17.9
KOONAWARRA-140259	139.6	139.4	136.0	-3.6	134.8	134.8	129.3	-5.5
KURRALEA-160231	143.2	146.1	150.6	7.4	133.4	137.1	144.8	11.5
LANGLEY HEIGHTS-160054	161.6	159.5	157.0	-4.6	154.3	152.0	147.1	-7.2
MERTEX-170575	140.0	140.9	144.3	4.3	133.6	133.1	132.9	-0.7
SOMERSET-160067 - Link	167.3	165.3	157.6	-9.7	158.9	160.0	154.3	-4.6
WARBURN-140512	140.8	139.6	135.7	-5.1	126.5	124.8	110.6	-16.0
WHEETELANDE-148159	143.4	139.6	140.6	-2.8	127.5	123.4	127.4	-0.2
YONGA DOWNS-170386	154.1	153.2	154.0	-0.1	140.9	140.5	138.4	-2.5

## Analysis of Accuracy changes

The following tables show the variation in Accuracy of selected traits. Table 8 shows the change in accuracy for WWT and PEMD from 15/12/20 to 1/2/22

**Table 8: Change in Accuracy for WWT and PEMD**

Sire	15/12/20	15/11/21	1/02/22	Change in WWT Accuracy	15/12/20	15/11/21	1/02/22	Change in PEMD Accuracy
	WWT Acc	WWT Acc	WWT Acc		PEMD Acc	PEMD Acc	PEMD Acc	
ANDEN-150277	98	98	98	0	98	98	98	0
AYLESBURY FARM-177408	92	95	95	3	91	93	94	3
BARINGA-16W300	94	95	95	1	93	95	95	2
BOOLOOLA-170093	97	97	97	0	98	98	98	0
BUNDARA DOWNS-179821	96	96	96	0	96	96	97	1
FAIRBURN-180567	93	94	94	1	94	94	95	1
GEMINI-170171	95	95	95	0	94	96	96	2
KOONAWARRA-140259	95	95	95	0	95	95	96	1
KURRALEA-160231	94	95	95	1	94	95	96	2
LANGLEY HEIGHTS-160054	96	97	97	1	96	97	97	1
MERTEX-170575	95	96	97	2	95	97	97	2
SOMERSET-160067 - Link	98	98	98	0	98	98	98	0
WARBURN-140512	97	97	97	0	97	97	97	0
WHEETELANDE-148159	98	98	98	0	98	98	98	0
YONGA DOWNS-170386	94	95	95	1	95	95	95	0
			Average	1			Average	1

Table 9 shows the changes in accuracy for eating quality traits IMF and SF5 from 15/12/20 to 1/2/22.

**Table 9: Change in Accuracy for IMF and SF5**

Sire	15/12/20	15/11/21	1/02/22	Change in IMF Accuracy	15/12/20	15/11/21	1/02/22	Change in SF5 Accuracy
	IMF Acc	IMF Acc	IMF Acc		SF5 Acc	SF5 Acc	SF5 Acc	
ANDEN-150277	76	83	89	13	76	83	87	11
AYLESBURY FARM-177408	62	63	83	21	60	61	78	18
BARINGA-16W300	64	72	81	17	63	71	77	14
BOOLOOLA-170093	62	72	87	25	61	72	84	23
BUNDARA DOWNS-179821	67	69	84	17	66	68	80	14
FAIRBURN-180567	55	60	83	28	54	59	78	24
GEMINI-170171	65	66	84	19	64	65	79	15
KOONAWARRA-140259	69	70	84	15	68	69	80	12
KURRALEA-160231	57	64	84	27	56	64	79	23
LANGLEY HEIGHTS-160054	71	75	84	13	69	74	81	12
MERTEX-170575	64	68	89	25	62	68	85	23
SOMERSET-160067 - Link	83	85	92	9	79	83	89	10
WARBURN-140512	72	77	89	17	72	77	86	14
WHEETELANDE-148159	80	83	90	10	79	83	88	9
YONGA DOWNS-170386	64	66	87	23	63	66	83	20
			Average	18.6			Average	16.1

Table 10 shows the changes in accuracy for TCP and LEQ from 15/12/20 to 1/2/22.

**Table 10: Change in Accuracy for TCP and LEQ**

Sire	15/12/20 TCP Acc	15/11/21 TCP Acc	1/02/22 TCP Acc	Change in TCP Accuracy	15/12/20 LEQ Acc	15/11/21 LEQ Acc	1/02/22 LEQ Acc	Change in LEQ Accuracy
ANDEN-150277	70	72	74	4	76	82	86	10
AYLESBURY FARM-177408	58	59	66	8	60	62	77	17
BARINGA-16W300	60	65	67	7	63	71	77	14
BOOLOOLA-170093	62	67	72	10	64	73	84	20
BUNDARA DOWNS-179821	63	64	69	6	67	69	80	13
FAIRBURN-180567	57	59	66	9	56	61	77	21
GEMINI-170171	60	62	67	7	65	66	79	14
KOONAWARRA-140259	64	64	69	5	71	72	82	11
KURRALEA-160231	58	62	68	10	58	65	79	21
LANGLEY HEIGHTS-160054	64	67	70	6	71	76	83	12
MERTEX-170575	60	64	72	12	63	68	84	21
SOMERSET-160067 - Link	70	72	75	5	80	84	90	10
WARBURN-140512	67	69	73	6	73	77	86	13
WHEETELANDE-148159	71	72	74	3	79	82	87	8
YONGA DOWNS-170386	60	62	69	9	64	66	82	18
			Average	7.1			Average	14.9

## Records per sire in Lambplan

This table shows the number of animals with a measurement used in the analysis in Lambplan for traits – WWT, PEMD, IMF and SF5 over the course of the project.

**Table 11: Number of Measurements used in Lambplan per sire, per trait, per date**

	15/12/20				15/11/2021				1/02/2022			
	WWT	PEMD	IMF	SF5	WWT	PEMD	IMF	SF5	WWT	PEMD	IMF	SF5
ANDEN-150277	866	677	0	0	876	677	0	0	876	686	9	9
AYLESBURY FARM-177408	110	36	0	0	196	78	0	0	196	92	10	10
BARINGA-16W300	201	121	0	0	187	123	0	0	187	128	5	5
BOOLOOLA-170093	661	615	0	0	689	615	0	0	690	640	15	15
BUNDARA DOWNS-179821	325	209	0	0	337	209	0	0	337	220	10	10
FAIRBURN-180567	174	107	0	0	228	108	0	0	224	148	11	11
GEMINI-170171	272	102	0	0	291	175	0	0	292	192	10	10
KOONAWARRA-140259	378	153	0	0	390	153	0	0	390	164	10	10
KURRALEA-160231	141	115	0	0	199	162	0	0	199	173	11	11
LANGLEY HEIGHTS-160054	345	236	0	0	433	309	0	0	528	320	7	7
MERTEX-170575	283	208	0	0	410	304	0	0	442	335	20	20
SOMERSET-160067 - Link	753	455	7	7	920	687	7	7	981	745	28	28
WARBURN-140512	422	302	0	0	442	302	0	0	443	323	17	17
WHEETELANDE-148159	595	454	0	0	620	462	0	0	620	478	12	12
YONGA DOWNS-170386	238	140	0	0	254	140	0	0	255	157	16	16
<b>Total</b>	<b>5011</b>	<b>3930</b>	<b>7</b>	<b>7</b>	<b>6472</b>	<b>4504</b>	<b>7</b>	<b>7</b>	<b>6660</b>	<b>4801</b>	<b>191</b>	<b>191</b>

## Sire Footprint

This table show the number of flocks and number of progeny the project sires have in Lambplan on the 15th February 2022.

**Table 12: Sire progeny numbers 15<sup>th</sup> Feb 2022 analysis**

Sire	No of Flocks 15 Feb 2022	No of Progeny 15 Feb 2022
ANDEN-150277	23	1125
AYLESBURY FARM-177408	5	206
BARINGA-16W300	5	243
BOOLOOLA-170093	15	759
BUNDARA DOWNS-179821	11	308
FAIRBURN-180567	7	212
GEMINI-170171	7	272
KOONAWARRA-140259	4	352
KURRALEA-160231	4	293
LANGLEY HEIGHTS-160054	18	644
MERTEX-170575	3	475
SOMERSET-160067 - Link	25	1108
WARBURN-140512	11	445
WHEETELANDE-148159	13	858
YONGA DOWNS-170386	7	255
<b>Total</b>	<b>158</b>	<b>7555</b>

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## Discussion

ASBVs and accuracies changed for the sires over the course of the project. This is shown in Table 3 for growth, fat and muscle traits and Table 4 for eating quality traits and Indexes.

The dates shown in the tables are project commencement 15/11/2020, after live animal weights and scan data added to Lambplan on 15/11/21 and after lambs were slaughtered and carcass and eating quality data added to Lambplan on 1/2/22.

An analysis of the changes in ASBVs over the term of the project is in Tables 5, 6 and 7. Table 5 shows the two traits WWT and PEMD to demonstrate the changes during the project for growth and muscle traits. These 2 traits were selected as being representative of the changes in traits measured in a live animal in an on farm situation.

The results show that on average there was little change in the ASBVs for WWT and PEMD and more change in the ASBVs for IMF and SF5. This is to be expected as all sires had a significant number of lambs that had already been measured for WWT and EMD in Lambplan prior to the project.

The greater changes in IMF and SF5 occur as these sires were selected as they were not closely related to sires in the Resource Flock. They were relying on phenotypic information from distant relatives in the Resource Flock to produce ASBVs for eating quality traits. As more lambs have actual phenotypic eating quality data entered into Lambplan the ASBVs can change and accuracy will increase.

The changes to the ASBVs for TCP and LEQ reflect the relative influence the eating quality traits have in each index. Less change in TCP as “TCP balances increased lean meat yield with modest improvements in eating quality.” More change in LEQ as “LEQ balances large improvements in eating quality with modest increases in lean meat yield.” (*Sheep Genetics, 2020*)

An analysis of the changes in accuracy over the term of the project is shown in tables 8, 9 and 10. “Accuracy is a reflection of how close an animal’s ASBV is to its true breeding value. The more information used to estimate an ASBV the more accurate it is.” (*Sheep Genetics, 2022*) As shown in table 8, the accuracy for WWT and EMD was already extremely high for all sires and did not change much over the course of the project, on average 1% for WWT and 1% for EMD.

The accuracy for IMF and SF5 increased significantly for the sires after actual carcass and laboratory tests for eating quality for the lambs were included in the analysis. IMF accuracy increased on average over the group 18.6% and SF5 16.1% respectively.

The relative emphasis on eating quality in the index was again reflected in the TCP and LEQ index accuracies changes, being an average increase of 7.1% for TCP and 14.9% for LEQ.

Table 11 shows the number of animals in Lambplan with measurements used in the analysis for WWT, PEMD, IMF and SF5 over the course of the project. The Somerset and Mertex rams both had progeny in the Resource flock hence the additional IMF and SF5 records on 1/2/22. The Fairburn ram had 4 lambs less for WWT on 1/2/22 than 15/11/22. These lambs were records from another flock that were removed from the analysis. The Baringa ram also had 14 records removed from the analysis for WWT that were also not Satellite Flock lambs.

As shown in Table 12, the number of progeny that is now closely related to the Satellite flock project sires has increased to at least 7555 in 158 flocks. These records have also increased significantly between the 1<sup>st</sup> February and the 15<sup>th</sup> February 2022 analysis dates. They increased from 6660 to 7555 as measurements from other flocks have been added to Lambplan. Lambs used in non Lambplan flocks are not included in this figure. This is a large number of lambs that will allow breeders to obtain genomic tests that are much more accurate for eating quality traits.

## Conclusion

### Objective 1

*Increase the number of White Suffolk sires represented in the Resource and Satellite Flocks. This will broaden the footprint of lambs born across the breed that are closely related to animals that have been measured for eating quality traits.*

The project selected 14 sires (and a link sire) that were widely used in the White Suffolk breed, not in the Resource Flock and had the least relationship to sires already in the Resource flock. They have now been used in a minimum combined total of 158 flocks with at least 7555 progeny (these figures are flocks and progeny recorded in Lambplan and do not include the non Lambplan flocks and progeny). These figures also do not include the sires own siblings, their progeny and any other related animals.

### Objective 2

*Join the selected sires to an even line of commercial ewes. Measure and record these lambs for sire, sex, birth type, weights, fat and muscle depth. Slaughter all lambs and measure the carcasses for carcass and eating quality traits. Enter lambs and data into the Sheep Genetics database.*

The project successfully completed an AI program, measured and recorded all lambs for all desired traits both live animal and carcass and entered the data into Lambplan.

### Objective 3

*Increase the accuracy of carcass and eating quality traits of these sires and therefore all lambs that are related to them.*

The accuracy of carcass and eating quality traits has been significantly increased for these sires and therefore for their progeny. This means genomic tests on animals related to these sires will be significantly more accurate and allow breeders to make faster genetic gain for these traits.



Satellite Flock lambs Oct 2021



Satellite Flock lambs at JBS Bordertown

## References

Sheep Genetics (2020), *Terminal indexes, A ram breeders guide*, Sheep Genetics Factsheet, September 2020.

Sheep Genetics (2022), *ASBVs and Indexes explained*, Sheep Genetics website, sighted 18/2/2022.

## Appendix

### Calendar of events

<b>Date</b>	<b>Event</b>
<b>2/11/20</b>	AWSA Federal Council approved EOI for the project
<b>25/11/20</b>	MLA approved the AWSA project application
<b>26/11/20</b>	AWSA appoint the Steering Committee and Project Manager
<b>27/11/20</b>	AWSA members advised and invited to nominate sires for the project.
<b>16/12/20</b>	Steering committee select 15 sires for the project including 1 link sire.
<b>4/1/21 and 5/1/21</b>	AI commercial Merino ewes at "Seriston" SA.
<b>Jan 21</b>	Genotype sires (8 had not previously been genotyped)
<b>Feb 21</b>	Report to Federal Council and AWSA members on project progress
<b>10/3/21</b>	Ewes pregnancy scanned, singles and multiples identified.
<b>4/6/21</b>	Ewes lambed – midpoint DOB determined as 4/6/21.
<b>1/7/21</b>	Lambs marked and tagged with an EID and visual tag. TSU's taken for Genomic and parentage testing. DOB, sex and birth type recorded.
<b>July 21</b>	Report to Federal Council and AWSA members on project progress
<b>Aug 21</b>	Parentage test results received and sires allocated
<b>23/9/21</b>	Weaning weight
<b>28/10/21</b>	Lambs weighed and scanned for fat and muscle
<b>16/11/21</b>	Lambs weighed (Pre slaughter weight).
<b>17/11/21</b>	Lambs slaughtered and carcass evaluation conducted by the Adelaide University Meat Science team. Loin samples sent to UNE for laboratory assessment.
<b>13/12/21</b>	Eating quality data on lambs completed and sent to Sheep Genetics
<b>11/1/22</b>	Additional sire parentage results received
<b>Feb 2022</b>	Final project report

## Sponsors

Thanks must go to our very generous sponsors without whom this project could not have proceeded.

The project has been funded by the **Australian White Suffolk Association** and **Meat and Livestock Australia**.



The project was supported by,

Anthony Hurst - Seriston

Sire Semen Donors,

Leroy Hull, Kattata Well  
Kylie Wake, Wakeleigh  
Shane Baker, Booloola  
Barry Lang, Langley Heights  
Ian Gilmore, Baringa  
Lachy McCrae, Somerset  
Steve Funke, Bundara Downs  
Brenton Addis, Yonga Downs  
Craig Mitchell, Gemini  
Peter Angus, Maroola  
Andrew Krieg, Aylesbury Farm  
Tamesha Gardner, Ida Vale  
Ben Prentice, Kurralea  
Tim Jorgensen, Mertex

Shearwell Data – EID and Visual Tags for ewes and lambs

Richmond Hill Agribusiness P/L – Steve and Debbie Milne

