

European Innovation Partnership Wales

Damara Fat-Tailed Project Year 1 Report

Project Aim

This 3 year project aims to research the feasibility of rearing fat-tail sheep in Wales and monitor how they adapt to typical Welsh lowland conditions. The first year of the project focused on the following areas:

- Importing fat-tail sheep embryos and semen.
- Implanting the embryos or artificially inseminating the semen into surrogate ewes.
- Caring for the surrogate ewes throughout their pregnancy.
- Analysis of pregnancy results.
- Assessment of how the lambs adapt to the Welsh climate by recording and monitoring growth rates including other health characteristics.

Timeline of project activities.

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| Prior to May 2019 | - The selection of Damara ewes and rams based primarily on scrapie genotype. |
| 6 May 2019 | - Damara rams and ewes commenced quarantine at the EU approved collection centre. |
| 20 to 24 July 2019 | - During September and October 150 straws of semen frozen from 2 rams. |
| 6 September 2019 | - First embryo collection programme. |
| 14 October 2019 | - Second embryo collection programme. |
| 3 December 2019 | - 29 Damara embryos & 150 straws of Damara semen were shipped to the UK and arrived on 6th December 2019. |
| 10 December 2019 | - 15 embryos were thawed and transferred into 15 recipients. |
| 10 December 2019 | - 25 Welsh half-bred were inseminated with semen. |
| 14 December 2019 | - 25 Welsh half-bred ewes were inseminated with semen. |

Embryo and semen collection

The number of donor rams and ewes available for the project were limited due to the EU requirement that both rams and ewes be scrapie genotype ARR/ARR. The incidence of scrapie genotype ARR/ARR in the Damara breed is low. Semen was collected from two Damara rams over a 4-day period in July 2019. In September and October 2019, embryos were collected from four Damara ewes. Due to a problem with embryo production during the September collection, a second embryo collection programme had to take place in October, resulting in the embryos and semen arriving in the UK a month later than expected.

Embryo transfer

The embryos were collected on day 6 after insemination and frozen in 10% glycerol.

Prior to implanting, the recipients were programmed according to the recipient preparation protocol. Only recipients which had demonstrated standing oestrous (marked by vasectomised Ram) on 3rd December 2019, were implanted.

Day 6 embryos are usually of the late morula to late blastocyst stage. The embryos thawed were early morula to late morula stages, indicating that they were day 5 - 5.5 embryos, early morula embryos do not survive freezing and thawing as well as late morula to late blastocyst embryos. Some of the embryos suffered freeze and thaw damage and were down-graded. (See Table 1) This was reflected in the conception rate achieved. The embryos were thawed using the standard 3-step thaw process.

Table 1. Relationship between embryo stage and pregnancy rate

Embryo stage	No. implanted	No. Pregnancies	% Pregnancy Rate
Early Morula	7	0	0%
Morula Grade 1	4	4	100%
Morula Grade 2	1	1	100%
Morula Grade 3	1	0	0%
Late Morula	2	1	50%

Some embryos showed signs of freezing and thawing damage.

Table 2. Pregnancy rate by donor

Donor identity	No. Embryo implanted	Pregnancy rate
160228	4 (Early Morula)	0%
150168	2	50%
160256	7	43%
160240	2	100%

Table 3. Pregnancy rate by sire

Sire Identity	No. Embryos implanted	Pregnancy Rate
140151	6	17%
170306	9	56%

The data reveal that the donor 160228 produced 4 x early morula stage embryos which resulted in no pregnancies. This is likely to be due to either the donor cycling late or the embryo development suffering due to compromised cell DNA.

In the AI programme, ewes inseminated with semen from 140151 had a lower prolificacy than the ewes inseminated with semen from 170306 (*see Table 4 below*). There may be a connection, 140151 may have semen with DNA fragmentation issues leading to a higher % of degenerate embryos that do not develop to full term.

Under normal circumstances early morula embryos are not frozen, instead are implanted fresh.

Remaining embryos to thaw

There are twelve embryos left to thaw. Three are from the mating 140151 x 160228 which to date has not yielded any lambs. There is a real possibility that the project will only have purebred lambs out of 3 ewes, female progeny from two ewes and very few purebred progeny from ram 140151.

Artificial insemination

Fifty-Four Welsh halfbred ewes were programmed for insemination on 10th and 14th December 2019. The AI protocol using Chronogest 20mg intravaginal sponges was followed on both occasions. Of the 54 ewes commencing the programme, 50 cycled and were presented for insemination. A total of 50 ewes were inseminated, 25 to each ram.

Table 4. Results of the Artificial Insemination:

Ram	No. ewes inseminated	10 th December Conception rate / Prolificacy	14 th December Conception rate / Prolificacy	Overall Conception rate
140151	25	55% / 1.83	86% / 1.58	72% / 1.67
170306	25	38% / 2.4	100% / 2.00	68% / 2.1

Semen quality was deemed adequate. While there was a significant difference between the conception rate achieved between the AI of 10th December and 14th December with the overall conception rate being 70% and overall prolificacy being 1.89. The conception rate difference between rams was not statistically significant, however there appeared to be a significant difference between rams with prolificacy with ewes inseminated with semen from ram 170306 having 20% more lambs.

Ram 170306 also produced better quality frozen embryos which resulted in a better pregnancy rate and more lambs born.

Pregnancy and Birth data

The lambs born to ewes which repeated and were crossed with a Texel ram have been used as controls. The resident flock of sheep lambled earlier in the year and so realistic comparisons could not be made with these ewes.

Pure Damara Data

- The ET of pure Damara embryos resulted in 6 live lambs born 1st to 3rd May 2020 with 1 assisted birth.
- 100% survival to 28th June 2020.
- Colours varied with brown and white, black and white markings typical of the breed (*see photographs*)
- Birth weights ranged from 3.3kg to 6.2kg. Average 4.7kg.
- 4-week weights were also recorded. Range 12kg to 17kg. Average 14.3kg (reared as singles).

Damara X Data

- The AI resulted in 75 lambs born 3rd May to 16th May with 10 assisted births.
- Numbers born: 2 sets of quads, 3 sets of triplets, 21 sets of twins, 16 singles.
- 2 lambs died around birth, 1 died on 12/6/20 (pneumonia).
- Colours varied with black, white and brown markings. Fleece/coat varied with some lambs having more hair rather than wool, others with thick curly wool.
- Birth weights ranged from 2.5kg to 8kg. Average 4.8kg.

Texel X lambs born from ewes not conceiving to Damara insemination

- 17 Texel x lambs born 11th May to 3rd June with 1 assisted birth.
- 6 sets of twins, 5 singles.
- All white lambs, most with woolly, curly coats.
- Birth weights for all 17 Texel x lambs ranged from 1.9kg to 8kg. Average 5.5kg

Vet medicines summary

- All lambs given oral antibiotic prophylactic at birth.
- 1st Damara lamb (4461) born was slow to suckle and given extra colostrum by tube.
- Coccidiosis drench given to Damara lambs at 3 weeks.
- 4466 had intermittent black scour and received coccidiosis drench twice.
- All growing well to 29/6/20.
- Wormer given in case of Nematodirus spike after dry weather in May.
- Damara x lamb – 4482 had mild entropion which cleared with topical eye ointment.
- At 3 weeks old, 2 ewes had mastitis, good response to new generation antibiotic and anti-inflammatory.
- Damara cross lambs 4490 and 4493 were taken off the ewe with quads.
- One lamb 4481 taken off ewe with triplets and reared on bottle.

Conclusion

The collection, importation of and results from the inseminations carried out with the Damara semen proved to be successful. However, the collection and subsequent results from the implanting of Damara embryos was less successful due to some poor quality embryos being implanted. However, the project has proven that artificial insemination using Damara semen resulted in commercially acceptable pregnancy rates and where good quality frozen thawed embryos were implanted, commercially acceptable pregnancy rates were achieved. Getting purebred fat tail ewes on the ground in Wales will be important for the long-term success of the project.

The purebred and crossbred Damara lambs have performed well, birth to 8 weeks of age, under commercial farming management and continue to do so.

Recommendations

A. Health, Welfare, Farming and Promotions

1. Monitoring of general health and growth in varied North Wales weather conditions over the next 12 months.
2. Regular worm egg count sampling to be carried out to monitor worm burdens.
3. Future options could be to try some lambs in upland conditions and if successful use Damara cross ram lambs on Welsh ewes on an upland farm.
4. Slaughtering a few cross bred lambs for taste testing and meat quality, including general promotion of the breed.
5. Establish a breed society.
6. Continue to keep animal welfare paramount in any future management decisions.

B. Artificial Breeding Programme, 2020

1. Do not plan to AI or implant embryos any earlier than November.
2. Freeze semen from the pure Damara rams once they reach 6.5 months of age.
3. Transporting sheep after AI or implanting has not been seen to adversely affect pregnancy rates. If 50+ ewes are to be inseminated and the remaining embryos implanted at the same time then it may be cost effective for the services to be provided on farm. Otherwise we would continue to provide services from the AI Centre.

4. The recipients implanted in 2019 were fine and these ewes can be used again. The pregnancy rate achieved with the frozen embryos while disappointing, was in line with embryo quality.
5. A decision has to be made whether or not to attempt to get the Damara cross ewe lambs pregnant at 8 months of age, via natural service to a pure Damara ram. A teaser ram should be run with all of the ewe lambs (pure and crossbred) from 5 months of age. If they appear to be cycling, ram 4463 can be used over the Damara x ewe lambs sired by 170306 and Ram lambs 4464 and 4465 can be used over the Damara x ewe lambs sired by 140151. Natural service will be more successful than AI. Frozen semen should be held in reserve.
6. Ram 4463 can be used over pure Damara ewe lambs 4466 and 4461. Pure Damara ewe lamb 4462 would need to be inseminated with 140151 semen.
7. If more crossbred Damara are to be produced it would be best to achieve this by a combination of natural service and / or AI using fresh semen.

Looking beyond 2020, importing further Damara embryos is costly and difficult due to the scrapie genotype requirements.