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Performance and Utilization of Northern European Short-Tailed Breeds of Sheep and Their Crosses in North America: A Review

David L. Thomas
Department of Animal Sciences
University of Wisconsin-Madison
Madison, Wisconsin
USA
dlthomas@wisc.edu

First Importations into North America

Finnsheep into Canada from Scotland in 1966 (4 rams, 8 ewes)

Shetland sheep into Canada from the U.K. in 1980 (4 rams, 28 ewes)

Romanov sheep into Canada from France in 1981 (7 rams, 17 ewes)

First Importations into North America

Icelandic sheep into Canada from Iceland in 1985 (2 rams, 10 ewes)

Gotland frozen semen from 1 ram into the USA from England in 2005. First F1 lambs born in 2006 in USA.

Finnsheep evaluations have been a major research topic for the past 35 years

Number of journal articles published on a comparison of Finnsheep with other breeds in the U.S. and Canada.	
Years	Number of journal articles
1970 - 1979	23
1980 - 1989	49
1990 - 1999	38
2000 - 2008	12
Total	122

Laster, D.B., H.A. Glimp, and G.E. Dickerson. 1972. Factors affecting reproduction in ewe lambs. J. Anim. Sci. 35:79-83.

Early Finnsheep Comparisons

USDA, Meat Animal Research Center, Clay Center, Nebraska, USA – Dickerson, Laster, Glimp, Smith, Jenkins, Young, Fogarty, Gama

University of California, Davis, California, USA – Bradford, Meyer, Quirke, Iniguez, Mwai

University of Minnesota, St. Paul, Minnesota, USA – Boylan, Berger, Oltenacu

Oklahoma State University, Stillwater, Oklahoma, USA – Whiteman, Thomas, Dzakuma, Stritzke

Oregon State University, Corvallis, Oregon, USA – Hohenboken, Levine, Norman, Torres-Hernandez, Clarke, Thomas, Lamberson, Saoud, Gallivan, Vavra

University of Idaho, Moscow, Idaho, USA – Dahmen, Hinman, Jacobs

Agriculture Canada, Lethbridge, Alberta, Canada – Vesely, Stanford, Wallins, Swierstra

Agriculture Canada, Lennoxville, Quebec, Canada – Fahmy, Chiquette, Minvielle, Dufour, Castonguay

Montana State University, Bozeman, Montana, USA – Drummond

Virginia Tech, Blacksburg, Virginia, USA – Notter, Copenhaver

Agriculture Canada, Ottawa, Ontario, Canada – Shrestha, Heaney, Peters, Fiser, Langford, Hackett, Wolynetz, Ainsworth

Ewe Lamb Conception Rate, %
(generally with autumn mating)

	Mean Performance		Finn - Domestic		No. of
% Finn	Finn	Domestic	Mean	% change	estimates
Pure Finn	95	70	+25	+36	1
50% Finn	85	55	+30	+54	5
25% Finn	68	38	+30	+77	4

Ewe Conception Rate, %

(all ages, contains some ewe lambs, generally with autumn mating)

	Mean Performance		Finn - Domestic		No. of
% Finn	Finn	Domestic	Mean	% change	estimates
Pure Finn	82	78	+4	+5	4
50% Finn	87	81	+6	+7	12
25% Finn	90	87	+3	+3	8

Litter Size

(number of lambs born per ewe lambing, all ewe ages, all seasons of lambing)

	Mean Performance		Finn - Domestic		No. of
% Finn	Finn	Domestic	Mean	% change	estimates
Pure Finn	2.45	1.45	+1.00	+69	11
50% Finn	1.93	1.43	+0.50	+35	24
25% Finn	1.69	1.41	+0.28	+20	13

Number of Lambs Weaned Per Ewe Lambing

(all ewe ages, all seasons of lambing)

	Mean Performance		Finn - Domestic		No. of
% Finn	Finn	Domestic	Mean	% change	estimates
Pure Finn	2.08	1.17	+0.91	+78	4
50% Finn	1.53	1.11	+0.42	+38	11
25% Finn	1.37	1.19	+0.18	+15	6

Weight of Lamb Weaned Per Ewe Mated, kg

(all ewe ages, generally with spring lambing)

	Mean Performance		Finn - Domestic		No. of
% Finn	Finn	Domestic	Mean	% change	estimates
Pure Finn	21.3	15.7	+5.6	+36	4
50% Finn	26.6	20.3	+6.3	+31	11
25% Finn	28.0	23.3	+4.7	+20	6

Ewe Reproduction Summary

Finnsheep ewes compared to domestic ewes are expected to have:

1. **significantly greater ewe lamb fertility,**
2. **slightly greater fertility as mature ewes,**
3. **significantly greater litter size; approx. 0.01 more lambs for each 1% increase in Finnsheep breeding,**
4. **significantly greater weight of lamb weaned per ewe mated.**

Lamb Survival to Weaning, %

(all dam ages, all seasons of lambing, some nursery rearing, both adjusted and unadjusted for litter size)

	Mean Performance		Finn - Domestic		No. of
% Finn	Finn	Domestic	Mean	% change	estimates
Pure Finn	76	75	+1	+1	5
50% Finn	79	72	+7	+10	10
25% Finn	76	76	0	0	10
12.5% Finn	86	85	+1	+1	8

When adjusted for litter size, Finn and Finn-cross lambs have even higher survival rates than domestic breeds: F = +19%, 1/2F = +20%, 1/4F = +10%, and 1/8F = +4% (% increase from domestic breed mean).

Lamb Birth Weight, kg

(all seasons of lambing, both adjusted and unadjusted for litter size)

	Mean Performance		Finn - Domestic		No. of
% Finn	Finn	Domestic	Mean	% change	estimates
Pure Finn	2.66	4.38	-1.72	-39	10
50% Finn	3.70	4.32	-0.62	-14	11
25% Finn	3.83	4.32	-0.49	-11	14
12.5% Finn	4.02	4.29	-0.27	-6	12

When adjusted for litter size, Finn and Finn-cross lambs still have lighter birth weights than domestic breeds: F = -35%, 1/2F = -11%, 1/4F = -10%, and 1/8F = -8% (% decrease from domestic breed mean).

Lamb Weaning Weight, kg

(all seasons of lambing, both adjusted and unadjusted for litter size)

	Mean Performance		Finn - Domestic		No. of
% Finn	Finn	Domestic	Mean	% change	estimates
Pure Finn	14.7	18.2	-3.5	-19	10
50% Finn	17.2	17.4	-0.2	-1	12
25% Finn	18.5	19.1	-0.6	-3	14
12.5% Finn	20.6	20.8	-0.2	-1	11

Studies that adjusted for litter size reported similar results to those above.

Postweaning Average Daily Gain, kg/d

(all seasons of lambing)

% Finn	Mean Performance		Finn - Domestic		No. of estimates
	Finn	Domestic	Mean	% change	
Pure Finn	0.22	0.25	-0.03	-12	1
50% Finn	0.17	0.17	0	0	1
25% Finn	0.23	0.24	-0.01	-4	3
12.5% Finn	0.25	0.25	0	0	2

Lamb Survival and Growth Summary

Finnsheep lambs compared to domestic lambs are expected to have:

1. **greater lamb survival; significantly greater lamb survival when adjusted for litter size,**
2. **lighter birth and weaning weights,**
3. **similar post-weaning gains**

Lamb Carcass Fat Thickness, mm

% Finn	Mean Performance		Finn - Domestic		No. of estimates
	Finn	Domestic	Mean	% change	
Pure Finn	3.6	3.8	-0.2	-5	3
50% Finn	4.4	4.1	+0.3	+7	6
25% Finn	5.1	5.1	0	0	7
12.5% Finn	5.0	5.0	0	0	4

Lamb Carcass Kidney and Pelvic Fat, %

	Mean Performance		Finn - Domestic		No. of
% Finn	Finn	Domestic	Mean	% change	estimates
Pure Finn	5.2	2.6	+2.6	+100	3
50% Finn	3.7	2.9	+0.8	+28	6
25% Finn	3.5	3.1	+0.4	+13	7
12.5% Finn	3.2	3.1	+0.1	+3	4

Lamb Carcass Loin Muscle Area, cm^2

	Mean Performance		Finn - Domestic		No. of
% Finn	Finn	Domestic	Mean	% change	estimates
Pure Finn	11.5	13.1	-1.6	-12	3
50% Finn	12.4	13.6	-1.2	-9	5
25% Finn	12.6	13.3	-0.7	-5	5
12.5% Finn	12.8	13.5	-0.7	-5	4

Lamb Carcass Traits Summary

Finnsheep lambs compared to domestic lambs are expected to have:

1. **similar subcutaneous fat thickness,**
2. **significantly greater % kidney and pelvic fat,**
3. **significantly smaller loin muscle area**

Fleece Traits of 1/2-Finn Ewes

Trait	Mean Performance		1/2 Finn - Domestic		No. of estimates
	1/2 Finn	Domestic	Mean	% change	
Fleece weight, kg	3.0	3.4	-0.4	-12	8
Fiber length, cm	12.0	10.7	+1.3	+12	6
Fiber diameter, µm	25.8	25.7	+0.1	+0	7

Fleece Summary

Finnsheep ewes compared to domestic ewes are expected to have:

1. **significantly lighter grease fleece weights,**
2. **longer fiber length,**
3. **similar fiber diameter**

Romanov versus Finnsheep

The Romanov was imported in 1981, 25 years after the Finnsheep, so fewer comparative studies have been published with Romanov – approximately 30 papers since 1986.

Romanov Comparisons

Agriculture Canada, Lethbridge, Alberta, Canada – Vesely, Swierstra, Stanford, Wallins, Jones, Price

University of Minnesota, St. Paul, Minnesota, USA – Boylan, Sakul, Shrestha

Agriculture Canada, Lennoxville, Quebec, Canada – Fahmy, Boucher, Poste, Gregoire, Butler, Comeau, Girard, Castonguay, Matte, Robert, Gariepy, Fortin

University of Wisconsin, Madison, Wisconsin, USA – Gallivan, Kemp, Berger, Young, Lupton

USDA, Meat Animal Research Center, Clay Center, Nebraska, USA – Littledike, Young, Wheeler, Koohmaraie, Freking, Leymaster, Casas, Freetly, Lupton

University of Guelph, Guelph, Ontario, Canada – Tosh, Kemp

USDA, Dale Bumpers Small Farm Research Center, Booneville, Arkansas, USA – Burke, Jackson, Robson, Apple, Roberts, Boger, Kegley

USDA, Grazinglands Research Laboratory, El Reno, Oklahoma, USA – Phillips, Brown, Dolezal, Fitch

Reproductive Traits of 1/2-Romanov and 1/2-Finn Ewes, Generally with Autumn Mating

Trait	Mean Performance		1/2 Rom – 1/2 Finn		No. of estimates
	1/2 Rom	1/2 Finn	Mean	% diff.	
Conception rate, %	89	83	+6	+7	1
Litter size, no.	2.16	1.96	+0.20	+10	5
Lambs weaned / ewe lambing, no.	1.95	1.72	+0.23	+13	3
Wt. of lamb weaned / ewe lambing, kg	47.5	43.5	+4.0	+9	3
Wt. of lamb weaned / ewe mated, kg	66.7	55.8	+10.9	+20	1

Body Weights and Survival to Weaning of 1/2-Romanov and 1/2-Finn Lambs

Trait	Mean Performance		1/2 Rom – 1/2 Finn		No. of estimates
	1/2 Rom	1/2 Finn	Mean	% diff.	
Birth weight, kg	4.22	4.15	+0.07	+2	4
Weaning weight, kg	19.0	19.1	-0.1	-1	4
Postwn. gain, kg/d	0.30	0.30	0	0	2
Lamb survival, %	94	93	+1	+1	1

Carcass Traits of 1/2-Romanov and 1/2-Finn Lambs

Trait	Mean Performance		1/2 Rom – 1/2 Finn		No. of estimates
	1/2 Rom	1/2 Finn	Mean	% diff.	
Fat thickness, mm	6.5	6.6	-0.1	-2	3
Kidney & pelvic fat, %	4.3	4.1	+0.2	+5	2
Loin muscle area, cm^2	13.9	13.7	+0.2	+1	3

Performance with Spring-Mating

Both Finnsheep and Romanov breeds have been shown to have greater conception rates to spring matings than most other breeds, with the Romanov superior to the Finnsheep.

Performance of F1 Ewes mated to Suffolk Rams during the Spring

Breed of sire of ewe	Fertility, %	Prolificacy, no.	Lamb survival, %	Lamb wn. wt., kg	Lamb wt./ewe mated, kg
Dorset	73	1.46	80	18.2	15.5
Finnsheep	82	1.98	79	15.2	19.5
Texel	71	1.40	80	16.1	12.8
Romanov	91	2.09	82	15.9	24.8
Montadale	70	1.44	80	17.7	14.3

Adapted from Casas et al. 2005. J. Anim. Sci. 83:2743-2751.

Fleece Traits of 1/2-Romanov and 1/2-Finn Ewes

Trait	Mean Performance		1/2 Rom – 1/2 Finn		No. of estimates
	1/2 Rom	1/2 Finn	Mean	% diff.	
Grease fleece wt., kg	3.4	3.1	+0.3	+10	3
Fiber length, cm	9.6	9.7	-0.1	-1	2
Fiber diameter,	25.5	26.0	-0.5	-2	2
Medullated fibers, %	0.75	0.13	+0.62	+477	1
White fleeces, %	80	97	-17	-18	2

Romanov versus Finnsheep Summary

1. Romanov ewes are superior to Finnsheep ewes for reproductive rate and ewe productivity under both autumn- and spring-mating systems.
2. Lambs of the two breeds are similar for survival, growth, and carcass traits.
3. Finnsheep ewes produce higher quality fleeces than do Romanov ewes.

There are no North American breed evaluation studies in the scientific literature that have included the Shetland, Icelandic, or Gotland breeds.

Most of the animals of these breeds are found in small flocks and are raised primarily for their unique fleeces that are used by fiber craftspeople and artists.

The niche market for unique fleeces is growing, and breeds that produce these types of fleeces are becoming very popular.

Utilization of the Finnsheep – Development of New Breeds

The Outaouais Arcott and Rideau Arcott were developed in the 1970's and 1980' at the Centre for Food and Animal Research, Agriculture and Agri-Food Canada, Ottawa, Ontario, Canada.

Outaouais – 49% Finnsheep, 26% Shropshire, 21% Suffolk, 4% other

Rideau – 40% Finnsheep, 20% Suffolk, 14% East Friesian, 9% Shropshire, 8% Dorset, 9% other

Performance of Arcott Composites and Finnsheep Under Autumn Mating

Breed	Fertility, %	Prolificacy, no.	Lamb survival, %	Lamb wn. wt., kg	Lamb wt./ewe mated, kg
Outaouais	83	2.6	73	27.1	42.7
Rideau	86	2.5	74	27.5	43.8
Finnsheep	90	2.8	79	22.3	44.4

Adapted from Shrestha and Heaney. 1992. Small Rumin. Res. 8:333-344

Utilization of the Finnsheep – Development of New Breeds

The Polypay breed was developed in the 1970's by the U.S. Department of Agriculture at the U.S. Sheep Experiment Station, Dubois, Idaho, USA.

Polypay – 25% Finnsheep, 25% Rambouillet, 25% Dorset, 25% Targhee

Performance of Polypay and Targhee Breeds and Two Crosses Under Autumn Mating

Breed or cross	No. ewes mated	Lambs born/ewe mated, no.	Lambs wn./ewe mated, no.	Wt. of lamb/ewe mated, kg
Targhee	155	1.37	1.07	36.0
Dorset-Targhee	168	1.28	.98	33.4
Finn-Rambouillet	202	1.72	1.11	34.3
Polypay	175	1.43	1.10	36.2

From Hulet et al. 1984. J. Anim. Sci. 58:15-24.

Performance of Polypay and Targhee Breeds and Two Crosses Under Spring Mating

Breed or cross	No. ewes mated	Lambs born/ewe mated, no.	Lambs wn./ewe mated, no.	Wt. of lamb/ewe mated, kg
Targhee	116	.48	.32	10.0
Dorset-Targhee	131	.60	.41	12.9
Finn-Rambouillet	146	.55	.42	12.1
Polypay	141	.79	.62	18.5

From Hulet et al. 1984. J. Anim. Sci. 58:15-24.

Purebred Registrations of NEST, NEST-Composite, and Other Popular Breeds in the USA in 2007 and 2000

2007 Rank	Breed	No. of registrations 2007	No. of registrations 2000	% change from 2000
1	Suffolk	12,519	18,293	-32
2	Hampshire	9,127	10,018	-9
3	Dorset	7,825	11,636	-33
4	Dorper	5,763	2,562	+125
5	Southdown	5,174	5,497	-6
9	Shetland	2,375	1,700	+40
15	Polypay	1,524	1,935	-21
17	Icelandic	1,461	881	+66
21	Romanov	1,047	645	+62
28	Finnsheep	424	264	+61

From: The Banner Sheep Magazine (www.bannersheepmagazine.com), Canadian Livestock Records Corp. (www.clrc.ca), and NA Romanov Sheep Assoc. (personal communication)

Purebred Registrations of NEST, NEST-Composite, and Other Popular Breeds in Canada in 2007 and 2000

2007 Rank	Breed	No. of registrations		% change from 2000
		2007	2000	
1	Suffolk	2,052	2,730	-25
2	Dorset	1,992	2,465	-19
3	Rideau Arcott	849	1,234	-31
4	Polypay	572	1,106	-48
5	Texel	557	203	+174
7	Romanov	499	592	-16
16	Outaouais Arcott	157	464	-66
17	Icelandic	134	108	+24
19	Shetland	103	6	+1,617
22	Finnsheep	87	65	+34

From: Canadian Livestock Records Corporation (www.clrc.ca)

Industry Utilization of the Northern European Short-Tailed Breeds

- The Icelandic and Shetland have been embraced by owners of small fiber-producing flocks.

- The Finnsheep and Romanov are not the primary breeds used in the production of crossbred maternal ewes.
  - Producers dislike their poor meat confirmation. F1 ewes produce too many lambs for many management systems, and systems that would use 1/4-blood ewes are more complicated.

- Some progressive and serious commercial sheep producers are using Finnsheep or Romanov rams to produce commercial ewes with good success.

- The Finnsheep is having its greatest impact through the use of Polypay ewes in the U.S. and Canada and Rideau Arcott ewes in Canada.

Thank you for your attention!