Prairie Shepherd

Finding Nature's Design for Wool that Looks, Feels, and Does Good!

Talk presented at

Great Falls Weavers and Spinners Guild
Autumn Retreat, October 2016

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WESTERN SARE
Sustainable Agriculture Research & Education

Science, Soul, and Serendipity in the Search for Sustainable Prairie Sheep





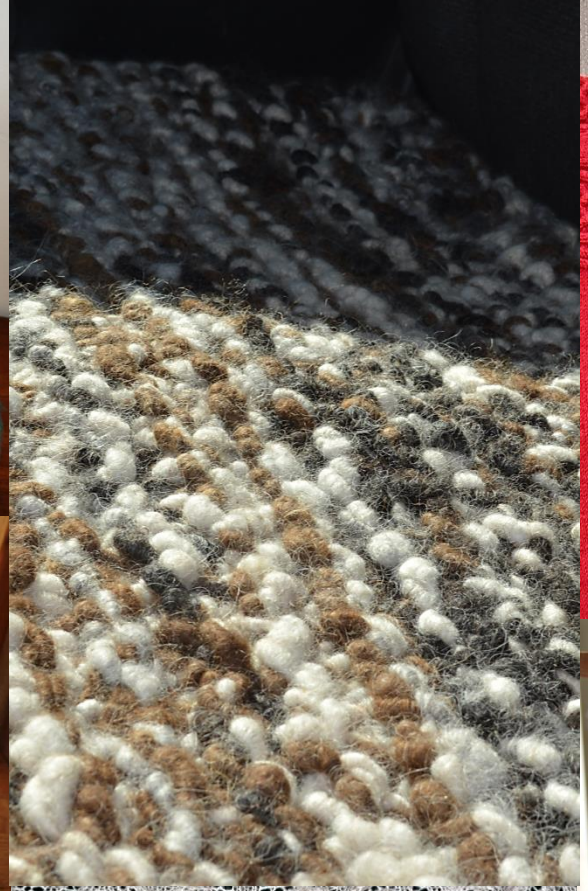
Why raise sheep?

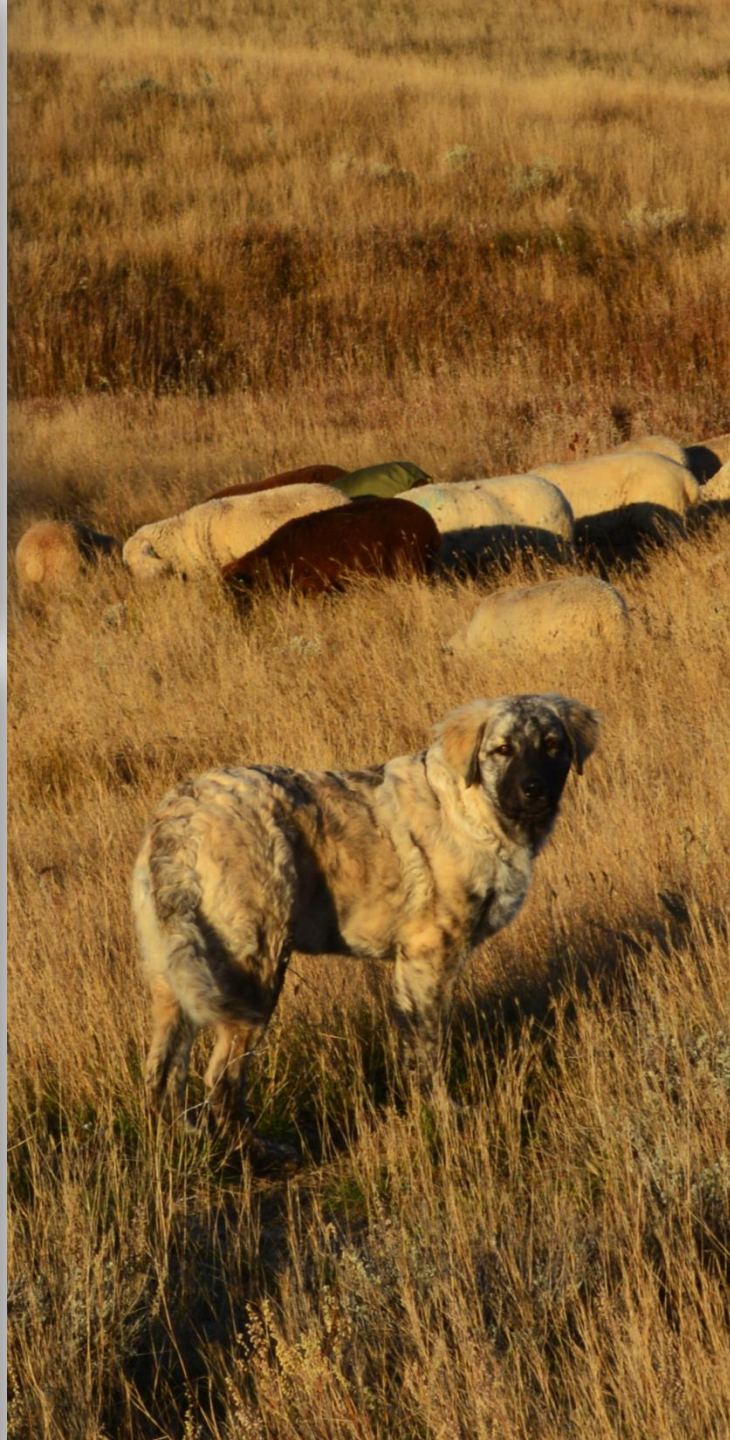
Grassfed lamb!

Truly delicious! And healthful:

- Omega 3 fatty acids
- CLA
- Lean
- Ideal portion size
- Efficient, earth-compatible protein



What type of sheep to raise?

Sustainability = environment + economics + quality of life

- Prairie-adapted
- Robust health
- Plenty of good lambs
- Abundant, high-quality wool
- A joy to shepherds , their dogs, their neighbors, and customers

Purebreds or Crossbreds?

- Crossbred sheep can greatly increase profitability relative to purebreds
- Hybrid vigor and complementarity
- More breeds than ever before can improve efficiency and outcomes of crossbreeding
- Design a better sheep!

Table 6. General Classification of U.S. Breeds of Sheep[a] — More Common Breeds

Breed	Country of Origin	Wool Type	Hardiness[b]	Mature Size[c]	Growth Rate[b]	Prolificacy[b]	Breeding Season[d]	Avg. Fiber Diameter, Microns	Ewe Grease Fleece wt., lb.
Border Leicester	England	Long	M-	L-	M+	M+	S	30-38	8-12
Cheviot	Scotland	Medium	M+	S+	L+	M	S	26-33	5-8
Columbia	U.S.	Medium	M+	L	H	M-	M	23-30	9-14
Coopworth	New Zealand	Long	M	M	M	M+	S	30-36	8-12
Corriedale	New Zealand	Medium	M+	M	M	M-	M	24-31	9-14
Dorset	England	Medium	M-	M	M	M	L	27-33	5-8
Finnsheep	Finland	Medium/Long	L+	S+	L+	H+	L[e]	24-31	3-7
Hampshire	England	Medium	M-	L	H	M	M	25-33	5-8
Katahdin	U.S.	Hair	M+	M-	M	M+	L	—	—
Montadale	U.S.	Medium	M	L-	M+	M	M	25-30	5-9
Oxford	England	Medium	M	L	H-	M	S	30-34	5-8
Polypay	U.S.	Medium	M	M+	M+	H-	L	24-33	6-10
Rambouillet	France/Germany	Fine	H	M+	M+	M-	L	19-24	9-14
Romney	England	Long	M-	M+	M	L	S	32-39	8-14
Shropshire	England	Medium	M-	M+	M+	M	M	25-33	5-8
Southdown	England	Medium	M-	M-	L+	M-	M	24-29	5-8
Suffolk	England	Medium	L	L+	H+	M+	M	26-33	3-7
Targhee	U.S.	Medium/Fine	M+	L-	M+	M	L	21-25	8-14

[a] The evaluations of the breeds for hardiness, mature size, growth rate, and prolificacy are subjective to varying degrees and assume all breeds are performing in a common environment.

[b] Hardiness, growth rate, prolificacy: H-high; M-moderate; L-low.

[c] Mature size: L-large; M-medium; S-small.

[d] Breeding season: L-long (6-8+mos.); M-medium (4-6 mos.); S-short (<4 mos.).

[e] In most cases, long breeding season implies early onset; Finnsheep have a late onset (Aug./Sept.) but a long season.

Sheep Production Handbook, 2002, American Sheep Industry

Table 8. Sample Genetic Evaluation Report for a Targhee Flock (Part 1)

Tag	Active?	Registration	Sex	Birth Date	Sire Tag	Sire Registration	Dam Tag	Dam Registration	Flock Code	NSIP Number	Weaning Wt EPD	Weaning Wt PE
4004216	yes	T5813	E	5/1/91	86565	T39546	87082	T45078	81006002	1108	0	1.5
B043	yes	T5940	E	4/1/92	90081	T55105	86477	T39845	81006002	1221	0.6	1.5
B134	yes	T5943	E	4/11/92	90081	T55105	85147	T39545	81006002	1208	0.7	1.5
B075	yes	T5941	E	4/15/92	89131	T50962	90103	T55133	81006002	1352	-0.6	1.6
C003	yes	64233	E	4/4/93	89131	T50962	87121	T45030	81006002	1482	0.3	1.6
C032	yes	64253	E	4/5/93	88067	T47522	87020	T45055	81006002	1462	-0.2	1.6
D002	yes	64439	E	4/12/94	922198	53877	B116	T59421	81006002	1653	0.5	1.6
D035	yes	64463	E	4/14/94	90081	T55105	90171	T55172	81006002	1760	0.3	1.6
D058	yes	64458	E	4/15/94	922198	53877	A07545	T58122	81006002	1617	-0.6	1.5
D064	yes	64436	E	4/16/94	922198	53877	A11085	T58127	81006002	1623	-0.4	1.5
E007	yes	65770	E	3/31/95	922198	53877	C072	64243	81006002	1853	0.4	1.5
E043	yes	65757	E	4/3/95	T9184	T48525	A08722	T58145	81006002	1782	-0.9	1.5
E031	yes	65768	E	4/3/95	9278	T56290	89195	T50954	81006002	1896	1	1.6
E044	yes	65772	E	4/3/95	T9184	T48525	A08722	T58145	81006002	1783	-0.8	1.5
E050	yes	65739	E	4/4/95	9278	T56290	90007	T55123	81006002	1903	0.7	1.6
F148	yes	68518	E	4/17/96	922198	53877	C187	64269	81006002	2025	0	1.5
F150	yes	68511	E	4/18/96	92224	53989	D056	64425	81006002	2054	1.3	1.6
F151	yes	68507	E	4/19/96	D042	T64406	B072	T59440	81006002	1985	1.1	1.6
F164	yes	68502	E	4/25/96	D042	T64406	B125	T59432	81006002	1992	0.2	1.6
G004	yes	68582	E	3/29/97	5211	59877	D164	64436	81006002	2210	0	1.6
G003	yes	69271	E	3/29/97	5211	59877	E037	65748	81006002	2224	-0.5	1.6

(Part 2)

Yearling Wt EPD	Yearling Wt PE	Maternal Milk EPD	Maternal Milk PE	Milk + Growth EPD	Fleece Wt EPD	Fleece Wt PE	Fleece Grade EPD	Fleece Grade PE	No. born EPD	No. born PE
-0.2	3.2	0.3	1.2	0.3	-0.2	0.2	0	0.3	.072	.062
0.9	3.3	0.1	1.2	0.4	0.2	0.2	-0.4	0.3	.051	.061
1.1	3.2	1.3	1.2	1.7	-0.1	0.2	-0.3	0.3	.074	.061
1.7	3.3	-0.3	1.2	-0.6	-0.1	0.2	0	0.3	.100	.064
3	3.4	0.6	1.2	0.8	0	0.2	0.1	0.3	.025	.064
-0.4	3.4	-0.2	1.2	-0.3	0	0.2	0.3	0.3	.023	.064
2.7	3.3	0.9	1.3	1.2	0.2	0.3	-0.3	0.3	-.010	.073
-1.8	3.2	-0.3	1.3	-0.2	0	0.2	-0.1	0.3	.011	.070
-1	3.2	0.5	1.2	0.2	-0.3	0.2	-0.5	0.3	.073	.067
-0.3	3.1	0	1.2	-0.2	-0.1	0.2	-0.2	0.3	.044	.068
1.2	3.2	0.9	1.3	1.1	0.2	0.3	-0.4	0.3	.009	.071
-3.5	3.3	0.5	1.2	0.1	-0.6	0.2	-0.6	0.3	.029	.066
3	3.3	0.9	1.4	1.4	0.2	0.3	0	0.3	-.030	.072
-2.6	3.2	0.4	1.3	0.1	-0.5	0.2	-0.4	0.3	.005	.069
3.9	3.3	0.7	1.3	1.1	0.2	0.3	0.4	0.3	.028	.073
0	3.2	1.3	1.3	1.3	-0.1	0.3	-0.3	0.4	.019	.072
4.3	3.5	1.1	1.3	1.8	0.3	0.3	0.2	0.4	.103	.073
2.1	3.3	1.6	1.3	2.1	0.1	0.3	-0.4	0.4	.022	.072
0.6	3.5	0	1.3	0.1	0.1	0.3	-0.1	0.4	.098	.072
-0.3	3.3	0.5	1.4	0.5	0	0.3	-0.2	0.3	-.041	.073
-1.3	3.4	1	1.4	0.7	0	0.3	-0.2	0.3	-.034	.074

Sheep Production Handbook, 2002, American Sheep Industry

Rotational Systems

Relative to the average purebred flock, rotational crossbreeding systems improve production by 34 percent in a two-breed rotation and by 43 percent in a three-breed rotation. This improvement results from both lamb and ewe heterosis effects. The two-breed rotation is expected to use 67 percent of both lamb and ewe heterosis, while the corresponding value for the three-breed rotation is 86 percent.

regardless of the size of the breeding flock.

Terminal Crossing Systems

Several terminal crossing systems are presented in Table 20 that take advantage of heterosis and complementarity to varying degrees. The first type (T x A) is a two-way cross that uses effects of lamb, but not ewe, heterosis. The resulting production (122 percent) is the lowest of all crossbreeding systems considered. The three-way cross, T x (AxB), is extremely efficient (150

Table 20. Relative Production of Alternative Crossbreeding Systems

Systems	Mating Type[a]	Replacements[b], %	No. Lambs Weaned	Pounds Weaned	Relative[c], %
Purebreeding	A	29	476	23,800	100
Rotational	AB_R	24	592	31,780	134
	ABC_R	23	624	34,132	143
Composite	AB_C	25	564	29,752	125
	ABC_C	24	584	31,208	131
	$ABCD_C$	23	608	32,908	138
Terminal	T x A	29	536	29,080	122
	T x (AxB)	26	620	35,608	150
	T x AB_R	24	612	34,728	146
	T x ABC_R	23	632	36,304	153
	T x AB_C	25	596	33,472	141
	T x ABC_C	24	608	34,416	145
	T x $ABCD_C$	23	624	35,676	150

[a] A, B, C, D, and T represent distinct breeds.
[b] Percentage of total ewe flock required to produce replacements within a self-contained three-way cross.
[c] Production relative to pounds weaned from a purebred flock.

Notes

Table 18. Heritabilities of Various Traits

Traits	Percentage
Reproductive:	
Ewe fertility	5[a]
Prolificacy[b]	10
Scrotal circumference	35
Age at puberty	25
Lamb survival[c]	5
Ewe productivity[d]	20
Growth:	
Birth weight	15
60-day weight	10
90-day weight	15
120-day weight	20
240-day weight	40
Preweaning gain: birth-60 days	15
Postweaning gain: 60-120 days	25
Carcass:	
Carcass weight	35
Weight of trimmed retail cuts	45
Percent trimmed retail cuts	40
Loin eye area	35
12th rib fat thickness	30
Dressing percent	10
Fleece:	
Grease fleece weight	35
Clean fleece weight	25
Yield (%)	40
Staple length	55
Fiber diameter	40
Crimp	45
Color	45
Dairy:	
Milk yield	30
Fat percentage	30
Protein percentage	30
Fat yield	35
Protein yield	45

[a] May increase to 10% in ewe lambs, in ewes lambed in the fall, and in ewes lambed in the spring in flocks with low fertility.
[b] Lambs born per ewe lambing.
[c] May increase to 10% in flocks with low lamb survival.
[d] Pounds of lamb weaned per ewe exposed.

Sheep Production Handbook, 2002, American Sheep Industry

Targhee

Rambouillet, Lincoln, and Corriedale heritage
1926, USA
3-4 inch staple, 21-24 micron

STRENGTHS:

- Prairie-adapted
- Broodstock nearby
- Soft, fine, crimpy wool and heavy fleeces
- Good flockers
- Easy handling
- Excellent mothers

WEAKNESSES:

- Udder issues
- Rather short-stapled, matte wool
- Not the best meat characteristics
- Lambs usually feedlot finished

Clun Forest

Shropshire, Hill Radnor, and Kerry Hill heritage
1860s, England
2.5-4 inch staple; 25-30 micron

STRENGTHS:

- Wonderful mothers, easy lambers
- Udder-ly fantastic
- Best feet and sturdy legs
- Meaty and delicious
- Wonderful hybrid vigor crossed on white-face breeds

WEAKNESSES:

- Crisp, short, matte wool
- Lightweight fleeces
- Wool doesn't felt easily or at all
- Fence crawlers and flock quitters
- Don't thrive on dry native range

Bond

Lincoln X Peppin Merino

1909, Australia

5 inch staple, 25-27 micron

STRENGTHS:

- Soft handling, long-stapled wool
- Heavy fleeces, with luster
- Moorit genetics
- Easy lambing
- Functional conformation, temperament

WEAKNESSES:

- Wool quality declines on older animals
- Inbreeding depression

Ile de France

Dishley Leicester X Rambouillet
1830s, France
3 inch staple, 23-32 micron

STRENGTHS:

- Good mothers
- Heavy fleeces
- Outstanding lambs
- Robust with lovely temperament

WEAKNESSES:

- Wool crisp and short
- Dystocia due to thick, short-necked lambs

Dohne Merino

German Meat Merino X
Peppin Merino
1938, South Africa
4-5 inch staple, 18-21 micron

STRENGTHS:

- Dreamy, soft, fine, long-stapled wool
- Heavy fleeces, with luster
- Easy lambing
- Good and plenty lambs
- Prairie-adapted, efficient even in drought
- Good temperament

WEAKNESSES:

- Feet need trimming
- US animals not uniform
- Hard to find good stock

Dishley Leicester

1760s, England
Longwool

- Robert Bakewell, sheepbreeder extraordinaire
- Breed is extinct
- Ancestor to Targhee, Dohne, and Ile de France
- Closest living relative: Leicester Longwool (32-38 micron, 10-14 inch staple)


Leicester Longwool

ANCESTORS IN COMMON!

German Mutton Merino

Landrace sheep X Merino
Germany

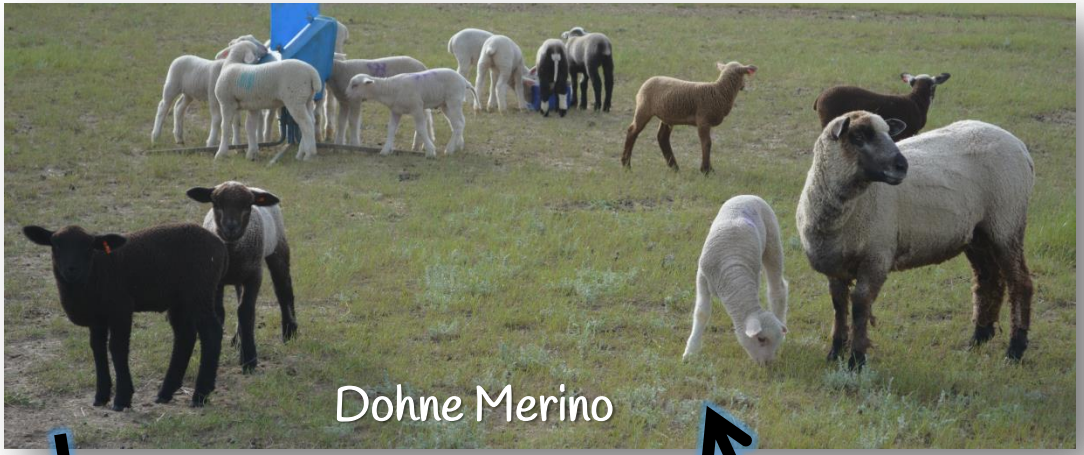
- Some imported to South Africa and renamed SAMM
- Dishley Leicester influence in landrace sheep
- Ancestor to Dohne, Ile de France


Leicester Longwool

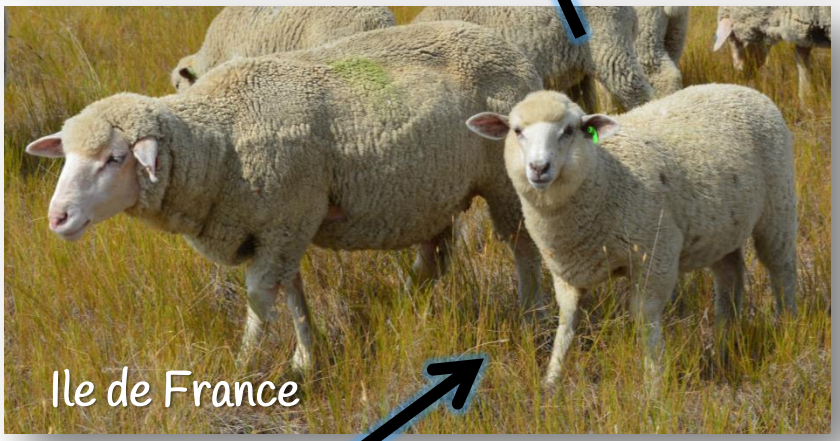
Prairie Shepherd crossbreds:

- Truly dual purpose
- Thrive on grass-only diet
- Good mothers
- 200% lambing rate
- 18-24 micron, 4"+ staple wool
- 10 lb. fleeces without kemp
- Excellent temperaments
- Hardy , healthy, early fertile


Targhee

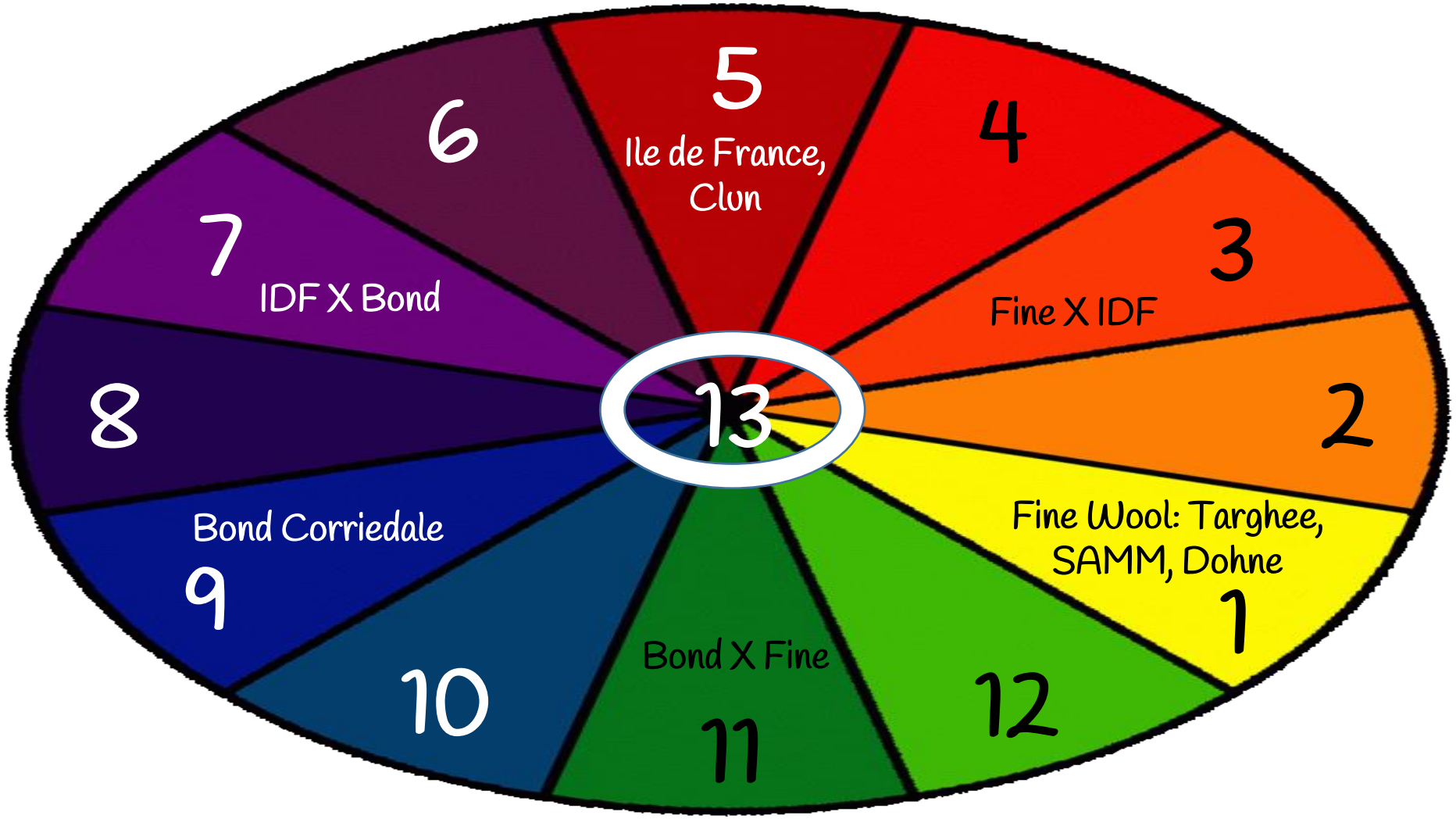

Dohne Merino


Clun Forest


Ile de France


Bond

Prairie Shepherd
Sheep Crossbreeding Scheme, 2016



Rotational three-way crossbreeding is proven to yield close to maximum heterosis.

Most of these are composite breeds composed of some permutation of merino combined with a longwool breed, usually derived from Dishley Leicesters in the 1800s. This foundational similarity may reduce heterosis.

To optimize heterosis, match complementary colors: 1 breeds to 7; 9 breeds to 3; 5 breeds to 11; etc.

Prairie Shepherd
Sheep Crossbreeding Scheme, 2016

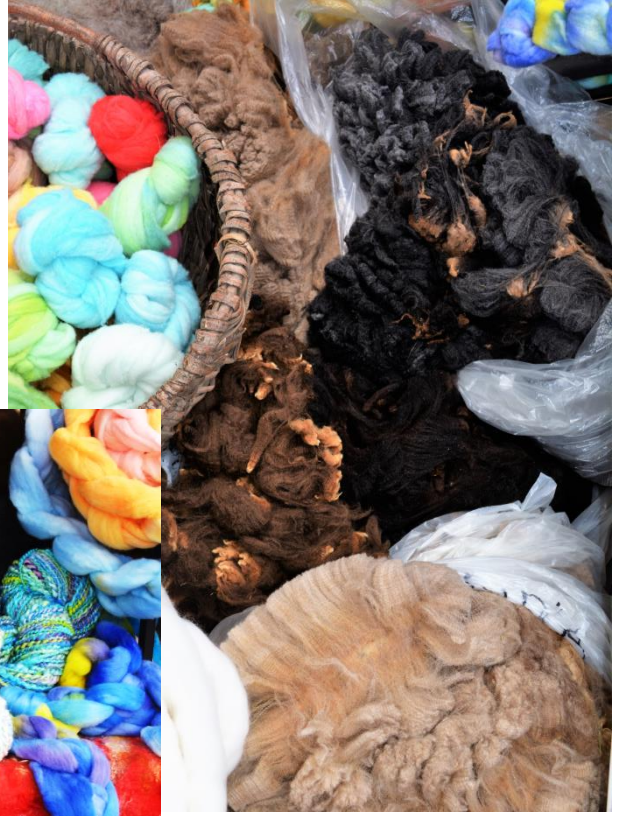
1. FINE WOOL: 18–23 micron, ~3.5" staple; good flocking; prairie-proven
   - Ideal cross is ½ IDF, ½ Bond
   - Maintain best Dohne ewes for purebred program
2. ¾ FINE, ¼ MEAT
   - Cross to Bond or Bond X IDF
3. ½ FINE, ½ MEAT
   - Ideal cross is Bond
4. ¾ MEAT, ¼ FINE
   - Cross to Bond or ½ Bond, ½ Fine
5. ILE DE FRANCE, CLUN FOREST: outstanding mothers, growth rate, and carcass quality
   - Ideal cross is ½ Fine, ½ Bond – but watch ewe size and age
6. ¾ MEAT, ¼ BOND
7. ½ MEAT, ½ BOND
8. ¾ BOND, ¼ MEAT
9. BOND CORRIEDALE: 4.5"+ staple; soft, lustrous wool; color genetics:
   - Ideal cross is ½ Fine, ½ IDF
10. ¾ BOND, ¼ FINE
    - Ewes probably too small for ideal cross to IDF; would cross with ½ IDF, ½ FINE
11. ½ BOND, ½ FINE
    - Ewes probably too small for ideal cross to IDF; would cross with ½ IDF, ½ FINE; can cross *BADGER, RUSTY, or RUFOUS* on IDF ewes
12. ¾ FINE, ¼ BOND
    - Treat as FINE
13. THREE-WAY CROSS:
    - Cross to least-represented bloodline

Genetic holes to fill:

1. BOND X IDF ram or ewes: *Fudge* to MCNALLY; Wowza, Genie, and Wilma to *JAMES;* Jessie and Lass to *JAMES*
2. FINE X IDF ram: Blossom to ANDY or *AMOS*

Prairie Shepherd
Sheep Crossbreeding Scheme, 2016

1. FINE WOOL: 18-23 micron, ~3.5" staple; good flocking; prairie-proven
   - Targhee: Nula, Annie, Chance, Atom Ant, Gus, Maxime, Buttons, Rightie, Softy, *Boots, Hershey*
   - SAMM: Belle, Sammie
   - Dohne: RAFIKI, ANDY, *AMOS*, Ceilidh, Branna, Snow White, Caoimhe, Ouna, Cinderella
   - Crossbred Fine: BRODIE, Beauty, Hope, Meryl, Callie, Peary, Sipsy, Sorcha, Cherry, Molly-cule, Mabel
2. ¾ FINE, ¼ MEAT
   - Meaghan, Murin, Topper, Ailbe, Aisling
3. ½ FINE, ½ MEAT
   - Clun/Targhee: Pebbles, Half Pint, Yvonne, Rowan, Sandy, Goldie, *Pepper*
   - IDF/Fine: Amma, Jovie, Kiwi, Dolly, Berry, Tillie, Alfie, Enda, Fiona, Stella
4. ¾ MEAT, ¼ FINE
   - Wowza, Genie, Wilma, Blossom
5. MEAT: ILE DE FRANCE, CLUN FOREST: outstanding mothers, growth rate, and carcass quality
   - Ile de France: MCNALLY, BOYO
   - IDF/Clun: Jessie, Lass
6. ¾ MEAT, ¼ BOND
7. ½ MEAT, ½ BOND
8. ¾ BOND, ¼ MEAT
9. BOND CORRIEDALE: 4.5"+ staple; soft, lustrous wool; color genetics:
   - *JAMES, HADJI, Sienna, Snipe, Sugar, Spice*
10. ¾ BOND, ¼ FINE
    - *Carmella, Orla, Inkling*
11. ½ BOND, ½ FINE
    - *BADGER, RUSTY, RUFOUS, Black Pearl, Fudge, Giselle, Diva, Moxie, Nestle, Ivy, Zeva, Smudge, Smokey, Rose, Teagan, Vivian*
12. ¾ FINE, ¼ BOND
    - Neila
13. THREE-WAY CROSS:
    - *Wooly Bear, Frost, Gael,* Grace



Prairie Shepherd

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