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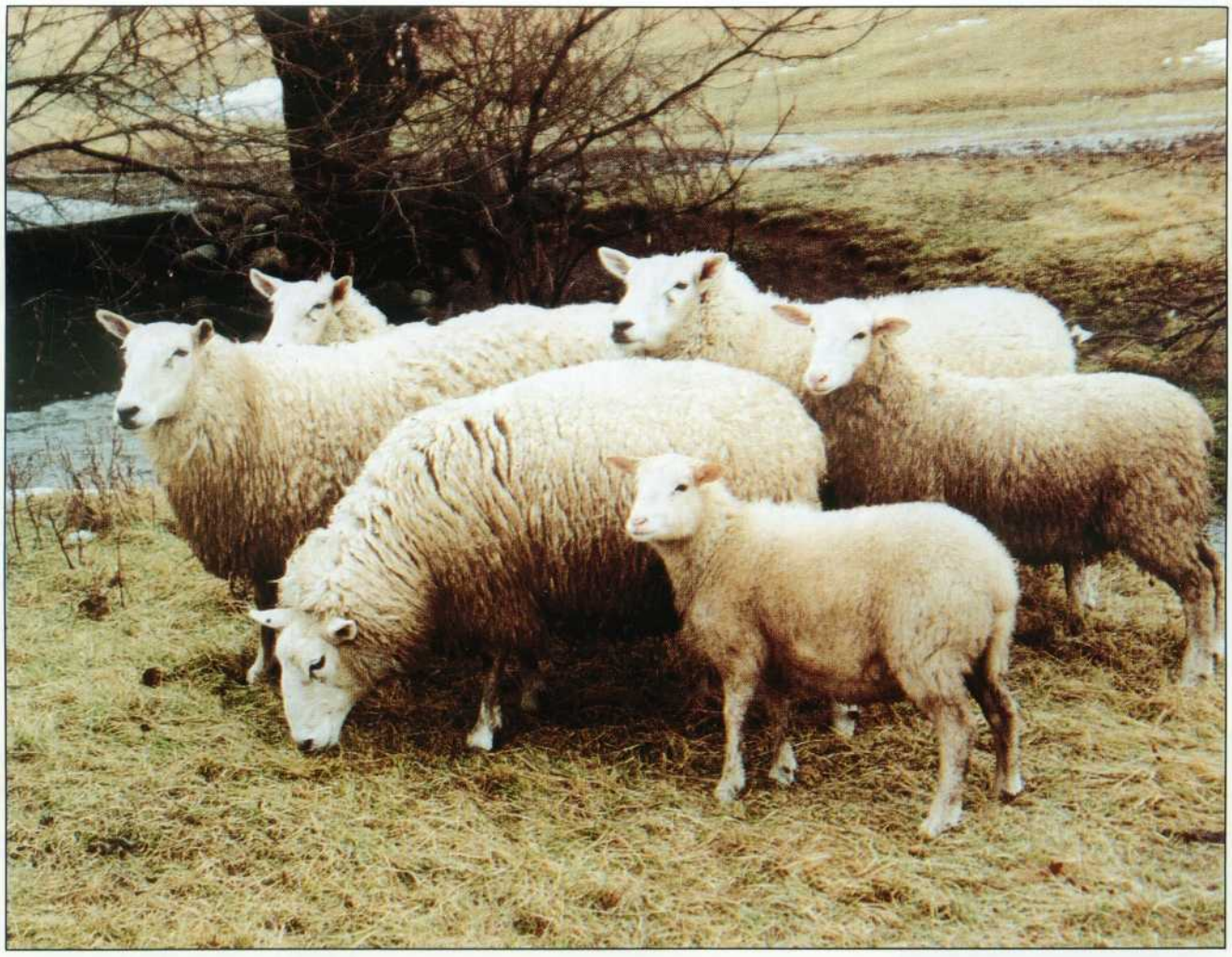
Looking Ready for Winter Winds



The Synthetic Breeds of Sheep: Are They An Alternative To The Hybrid Female[1]

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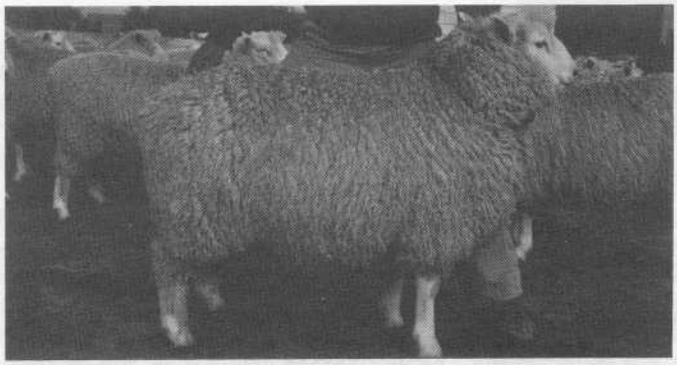
There are no less than 5,000 breeds and strains of sheep in the world. Documentations are available on at least 500 breeds spread all over the world. Until recently each breed originating in one location, lived in that location and adapted well to its environment. In England, where most of the modern breeds of sheep were developed, many sheep breeds of superior performance were introduced to a new location or county for the purpose of crossing with local sheep and developing improved lines or breeds. Many breeds were developed this way; some became so popular that they replaced their parents. Table 1 lists some of the breeds which later gained worldwide recognition and were developed by simple crossing.

TABLE 1
Some important breeds developed in the past centuries

Breed	Country of Origin	Ancestoral Breeds
Hampshire	England	Wiltshire Horn-Berkshire Knots Southdown
Suffolk	England	Southdown-Old Norfolk
Oxford	England	Hampshire-Cotswolds
Border Leicester	England	Leicester-Cheviot
Clun Forest	England	Radnor-Shropshire
Corriedale	New Zealand	Lincoln-Merino
Shropshire	England	Southdown-Cannock Chase-Longmynd, Morle
Ile de France	France	Leicester-Merino
Texel	Netherland	Leicester-Lincoln-(Old Texel)

Coopworth

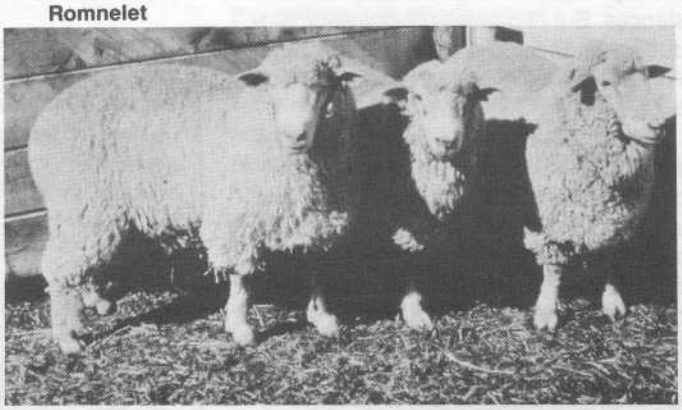


England was where most of the modern breeds of sheep originated during the 18th and 19th century. These were later introduced to countries of the Commonwealth and USA. While breed development was nearly at standstill in England during the first half of the 20th century, it was not so in North America where most breeds were developed for local needs but only few gained national recognition. Ten of these North American breeds are presented in Table 2.

TABLE 2
Breeds developed in North America during the present century

Name	Country	Date Initiated	Breeds Involved
Columbia	USA	1912	Lincoln x American Rambouillet
Canadian Corriedale	Canada	1919	Corriedale x (Lincoln x Rambouillet)
Targhee	USA	1926	Rambouillet-Lincoln-Corriedale
Montadale	USA	1933	Cheviot-Columbia
Romnelet	Canada	1935	Romney Marsh-Rambouillet
Minnesota 100	USA	1937	Rambouillet-Border Leicester-Cheviot
Minnesota 102	USA	1937	Border Leicester-Shropshire-Columbia-Targhee
Morlam	USA	1951	Rambouillet-Dorset-Merino-Targhee-Columbia-Southdale-Rambouillet
DLS	Canada	1965	Dorset-Leicester-Suffolk
Arcott Canadian	Canada	1966	Suffolk-Ile de France-Leicester-N.C. Cheviot and others

Romnelet



During the first half of the present century breeds of equal quality which complemented each other in their characteristics were crossed and bred to develop new breeds. Many of these breeds survived because they offered special characteristics needed by the industry. Others became extinct because after the first generations the new breed drifted back to the level of the parental breeds and the superiority exibited in the first few generations disappeared or simply because the new breed failed to present something new and useful.

During the second half of the 20th century the recognition of the usefulness of prolific breeds stimulated a wave of development of new breeds incorporating genes of these prolifics to increase the productivity of sheep (Table 3). In this article we shall examine some of the North American synthetics and what they

1. An enlarged French version of this article was presented at a workshop on productivity of sheep held in Quebec City on November 11, 1988.

can offer and some of the most promising overseas synthetics which can play a role in North American sheep industry. Also the advantages and disadvantages of synthetic vs. crossbreds.

TABLE 3

Some breeds recently developed utilizing prolific breeds

Breed	Country	
Cambridge	England, 1964	Finnsheep-Clun Forest-Llanwenog Llegn-plus 8 other breeds
Arcott, Rideau and Outaouais	Canada, 1965	Finnsheep-Suffolk-East Fresian-others
Polypay	USA, 1968	Finnsheep-Targhee-Dorset-Rambouillet

Reasons for developing new breeds

Table 4 shows that each breed has its strong points and drawbacks and that the ideal breed does not exist. However, theoretically, strong points from different breeds can be concentrated into one synthetic (or composite) population with proper proportions of the breeds and a careful selection of the resulting breeding animals.

TABLE 4

Strong and weak points of some sheep breeds among functional categories

Category	Breeds	Strong Points	Weak Points
Maternal	Leicester Cheviot	Mothering ability, twinning, fertility, milk production, hardiness	Short breeding season, poor conformation and size, poor wool quality
Terminal	Suffolk Hampshire	Fast growth, good carcasses, moderate prolificacy, hardiness	Short breeding season, fleeces, high maintenance cost
Wool producers	Merino Rambouillet	Heavy fleeces, fine wool, long breeding season	Slow growth, late maturity, poor carcass conformation, horns
Milk producers	Lacune East Friesian	Milk production, good prolificacy	Wool quality, conformation, carcass quality
Prolifics	Romanov, Finnsheep	High prolificacy, early maturing	Poor carcass, conformation, poor wool
Extended breeding season	Dorset	Long breeding season, good growth and carcass, medium prolificacy	Horns, weak legs, small size
The Ideal Breed	?	Early maturity, fast growth, high fertility and prolificacy, good carcass quality, good wool production and fibre characteristics	None

Some of the problems facing breed developers today are:

1. Excessive costs which exclude the individual breeders and breeding companies. The field is left entirely to government establishments which are subjected to budget restraints and bureaucracy.

2. Limited facilities which often result in a small number of foundation animals.

3. Resistance of established breeders to new ideas and new breeds.

New synthetic breeds on the North American scene

A synthetic breed is a combination of at least two breeds which had been intermated (or top crossed) for at least three generations, which is the minimum required to make the breed eligible for registration.

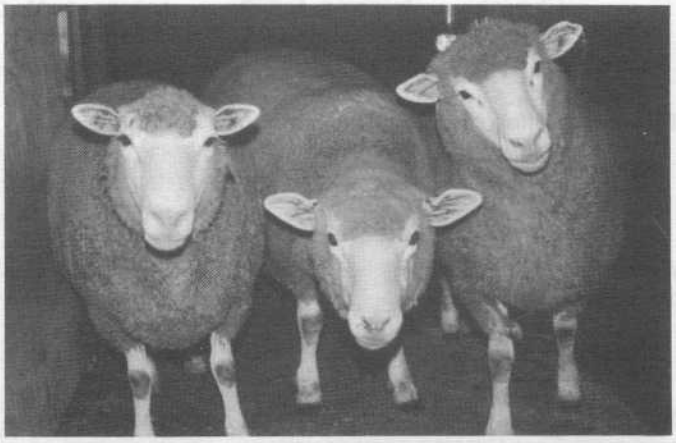
New Breeds:

Breed Name	:Targhee
Country and location	:USA, Idaho
Date of beginning of work	:1926
Date of release	:1934
Breed involved	:Rambouillet-Lincoln-Corriedale
Objective of the project	:Develop a breed thick in natural fleshing, producing high quality apparel type wool and adapted to rugged western conditions with a uniform body type and fleece grade.
Strong points	:Targhee ewes have good mothering and milking ability, raise a high percentage of twins under range conditions (25-35%), excel in kg of lambs weaned per ewe bred, shear heavy fleeces of 4 to 5 kg (7 to 10 kg for rams). The animals are broad and smooth with a level top. The rump and leg are well muscled and developed. The legs are straight with heavy bone. The pasterns are strong and straight. The animals are white and polled.
Formation of the association	:1951

Breed name	:Romnelet
Country and location	:Canada-Lethbridge
Date of beginning of work	:1935
Date of release	:1944
Breed involved	:Romney-grade Rambouillet-Targhee-Romeldale
Objective of the project	:To remedy some of the drawbacks of the Rambouillet such as carcass conformation, staple length, face covering and neck wrinkles.
Strong points	:Better prolificacy than range sheep, longer staples, open face, no neck wrinkles: polled.

Breed Name	:Coopworth
Country and location	:New Zealand, Canterbury
Date of beginning of work	:1950
Date of release	:1960
Breed involved	:Border leicester (½)-Romney (½)
Objective of the project	:Develop a dual purpose breed of high prolificacy and heavy fleeces.
Strong points	:Higher lambing percentage, ease of lambing and superior mothering ability. Heavy fleeces of good quality.
Foundation of the association	:1968

DLS



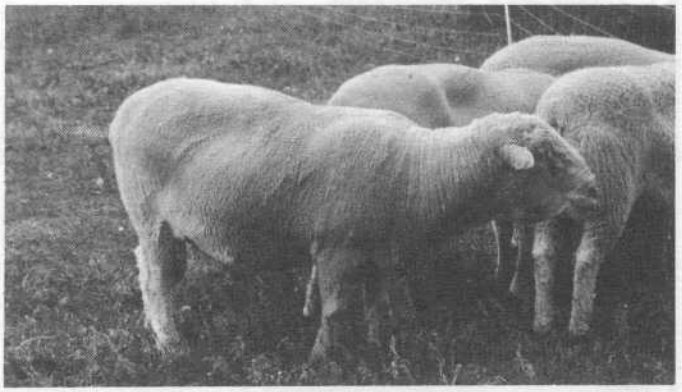
Breed Name	:Cambridge
Country and location	:England-Cambridge
Date of beginning of work	:1964
Date of release	:1985
Breed involved	:Clun Forest, Llanwenog, Lleyn, Finnsheep and minor contribution from eight other breeds
Objective of the project	:Develop a prolific breed with high milking ability and good meat quality. The project started by screening British breeds for ewes with high litter sizes. These were all bred to Finn rams then backcrossed to the foundation ewes.
Strong points	:Excellent prolificacy, 2, 3 and 4 year old ewes averaged 2.4, 2.8 and 3.0 lambs, respectively.
Formation of the association	:1983

This breed is available for importation into North America but is subject to a five year quarantine.

Breed Name	:DLS
Country and location	:Canada, Quebec
Date of beginning of work	:1966
Date of release	:1988
Breed involved	:Dorset (½)-Leicester (¼)-Suffolk (¼)
Objective of the project	:Develop a breed with an extended breeding season so that the ewe can mate during the summer without the need of light or hormone treatment. Thus intensive systems can be applied without artificial means.
Strong points	:Long breeding season of 8 months, good conformation, good carcass quality, prolificacy of 1.3, fertility of 95%.
Weak points	:Poor wool quality, some colored fibres and occasionally, horns.

Breed Name	:Arcott Canadian
Country and location	:Canada, Ottawa
Date of beginning of work	:1966
Date of release	:1988
Breed involved	:Suffolk 37%, Ile de France 28%, Leicester 14%, N.C. Cheviot 7%, Romnelet 6%, others 8%.
Objective of the project	:To develop a sire line for use in terminal crossing as an alternative to Suffolks, Hampshires, Dorsets etc.
Strong points	:Large wilk, long body and well developed heart girth; the rams have wide shoulders smoothly blended into the body, broad loins, squarely placed legs with short and strong pastern.
Weak points	:Intensive coloring.

Polypay



Breed Name	:Arcott (Outaouais)
Country and location	:Canada, Ottawa
Date of beginning of work	:1966
Date of release	:1988
Breed involved	:Finnsheep 49%, Shropshire 26%, Suffolk 21%, other breeds 4%.
Objective of the project	:Develop an early maturing, prolific maternal breed, well adapted to intensive production system.
Strong points	:Large litter size, very good adaptability to intensive systems.
Weak points	:Intensive coloring.

Breed Name	:Arcott (Rideau)
Country and location	:Canada, Ottawa
Date of beginning of work	:1966
Date of release	:1988
Breed involved and proportions of each	:Finnsheep 40%, Suffolk 20%, East Friesian 14%, Shropshire 9%, Dorset 8%, others 9%.
Objective of the project	:Develop an early maturing, prolific maternal breed with good milk production and suitable for intensive production.
Strong points	:Large litter size, adaptability to intensive systems.
Weak points	:Intensive coloring.

Breed Name	:Polypay
Country and location	:USA, Idaho
Date of beginning of work	:1968
Date of release	:1975
Breed involved and proportions of each breed	:[Finnsheep ¼ x Rambouillet ¼] x [Dorset ¼ x Targhee ¼]
Objective of the project	:High lifetime prolificacy, large lamb crop at one year of age, ability to lamb more frequently than once per year, rapid growth rate of lambs and desirable carcass quality.
Strong points	:Prolificacy above 200%-average 103 lb. weaned/120 d. Lambs grown at the rate of .52 to .75 lb./day. Maturity at 5-7 months, ability to mate every 8 months.
Formation of the association	:1980

Which is more advantageous a synthetic ewe or a crossbred ewe?

In order to answer this question adequately there is a need to define the terms used first. Then it will be possible to compare the advantages and disadvantages of each system of breeding.

Definitions:

1. Crossbred F_1 ewe :A ewe resulting from the mating of a ram from breed A to a ewe from breed B or vice versa A x B
2. Synthetic or Composite :Progeny of at least three generations of interbreeding (to be eligible for registration of an initial combination of a number of breeds).

AxB x AxB

AB x AB

AB x AB

AB x AB

3. Heterosis :The superiority of the cross over the average of the 2 parental breeds.
   a) maternal results from using crossbred ewe.
   b) paternal results from using crossbred ram.
   c) individual results from being a cross.
4. Rotational crossing :Two or 3 or more breeds are utilized. The continuous use of rams from one of the parental breeds in a rotational manner on females produced during the previous generation.
5. Terminal crossing :The use of specialized or superior rams from a different breed to produce progeny, which are all destined to be marketed.

Advantages and disadvantages of F_1, and of synthetics

F_1	Synthetic
Advantages	**Advantages**
Highest level of heterosis	No need of maintaining parental breeds. Combining and maintaining in one population the desirable characteristics.
Low capital investment for purchasing crossbred ewes then top crossing to take advantage of heterosis. Ease to change when market demand changes.	Possibility for selection. Possibility for registration.
Disadvantages	**Disadvantages**
Need to keep the parental strains and sometimes the terminal line.	Loss of heterosis due to recombination and drift.

Comparisons among crossbreeding systems

Dr. Nitter, a German geneticist, compared different crossbreeding systems under different levels of production and management. The first approach he used to compare the efficiency of the different mating systems was to consider the average amount of heterosis available in ewes (h M) and slaughter lamb (h I) within the production unit (Table 5). Efficiency was calculated as the percentage of the maximum use of heterosis (increase in heterozygosity in the crosses over purebred parents). For example, as can be seen from Table 6, the F_1 ewes and their lambs in a 3-way cross (T. AB) would show over purebreds 50% increase in maternal heterosis and 50% increase in individual heterozygosity. That is true when no consideration is given to the necessity to keep purebreds to replace the F_1. When replacement is considered the increase in heterozygosity ranged from 58 to 86 for individual and from 28 to 54 for maternal heterosis and it depended on the annual reproduction rate, short reproductive life, high culling rate. So under unfavourable conditions a 3-way cross is less efficient than most other mating systems. With an increase in the production level and favourable replacement conditions (2 more lambs reared annually/ewe, 5 years reproductive period) the 3-way cross almost equals the level of the most efficient mating systems 3-line rotational and terminal rotational. Rotational systems enable the farmer to replace his own females, but it also adds to its organization problems which can be avoided by using non-systematic rotational procedures.

The choice of a mating system is an individual matter. Each breeder should select one according to his objective, the breeds he raises, the traits he judges important etc.

TABLE 5

Types of heterosis in different breeding systems

Mating System	Generations	1 Breed	2 Breeds	3 Breeds
1. Pure breeding	1	A x A		
	2	A x A		
	3	A x A		
Heterosis expressed		[no heterosis]		
2. Synthetic	1		AB x AB	ABC x ABC
	2		AB x AB	AB x AB
	3		AB x AB	ABC x ABC
Heterosis expressed			[I + M + P + ½MM]	[⅔I + ⅔M + ⅔P]
3. Rotational	1		AB x A	AB x C
	2		¾A ¼B x B	ABC x A
	3		3/8A 5/8B x A	ABCA x B
Heterosis expressed		[⅔I + ⅔M	6/7I + 6/7M + ⅔MM]	+ 6/7MM]
Terminal	1	A x T	AB x T	ABC x T
Heterosis expressed		[I]	[I + M]	[I + M + MM]

T—Terminal sire, superior in growth rate and carcass quality.

I, M, P, MM = Individual, Maternal, Paternal, Grand Maternal heterosis, respectively.

AB x T etc.—In this table breed of ewe comes first.

TABLE 6

Increase in heterozygosity for individual and maternal performance in all the animals of the production unit for different mating systems and replacement conditions (%)

Mating System	Annual rate of lambs weaned per ewe exposed in purebreds							
	1.0		1.4		1.8		2.2	
	I[1]	M[2]	I	M	I	M	I	M
Purebred	0	0	0	0	0	0	0	0
AB (Syn)	50	50	50	50	50	50	50	50
ABC (Syn)	67	67	67	67	67	67	67	67
AB (Rot)	67	67	67	67	67	67	67	67
ABC (Rot)	86	86	86	86	86	86	86	86
T.A.	37-66*	0	60-78	0	71-83	0	77-87	0
T.AB	58-86	28-54	82-94	50-67	90-96	62-75	94-98	69-80
T.AB (Syn)	73-85	50	83-90	50	87-93	50	90-94	50
T.AB (Rot)	83-91	67	89-94	67	92-95	67	93-96	67

1-2 Individual and maternal heterosis, respectively.
* Within this range, the first (second) number indicates an average reproductive duration of 4 (5) years and a culling rate of ⅓ (¼) in young replacement females.

New Rules for Dead Animal Disposal

The Iowa Legislature has mandated new rules for disposal of dead animals without a waste disposal permit. These new rules include the following points and procedures:

1. Dead animals must originate from operations on disposal premises.

2. Maximum annual loading rate per acre is 7 slaughter and feeder cattle, 44 butcher and breeding swine, 73 sheep or lambs, 400 poultry carcasses. All other species are limited to 2 carcasses per acre. Animals dying under 2 months of age can be buried without restriction of numbers.

3. Burial pits must be in moderately or well-drained soils or must have artificial drainage to lower the water level to more than 2 feet below burial depth.

4. The lowest elevation is 6 feet or less below the surface.

5. Dead animals are immediately covered by six inches of soil and finally covered with 30 inches of soil.

6. Burial pits must be 100 feet from private wells and 200 feet from public wells, 50 feet from property lines, 500 feet from neighboring residences, outside a flood plain or wetland and 100 feet from surface water.

Livestock producers are also facing increasing limitations with rendering service pickups.

This points up the need for every livestock operation to have disposal plans in place which meet current environmental requirements and health standards. Producers are urged to consult their veterinarian in developing such a plan.

Additional information is available through your local Extension agriculturist on requirements relating to solid waste and dead animal disposal.