# SELECTING AND BREEDING DORSET SHEEP FOR THE 21st CENTURY

**by Charles F. Parker, PhD.**
**Past Executive Director,**
**U.S. Sheep Seedstock Alliance, Columbus, Ohio.**

*(This article has been revised for the CDC Newsletter from "Selecting and Breeding Sheep For the 21st Century" as presented by author at 2001 World Sheep and Wool Congress, Christchurch, NZ.)*

Industry change and producer needs will heighten dependence on seedstock producers to provide superior genetics for improving production efficiency and product quality from sheep in the 21 century. Technology, economic development, demographics, consumer behavior, public interest issues and globalization of the market place are some of the forces of change impacting the sheep industry.

Responsiveness to these forces affects not only survivability, but economic viability and future of the industry. The relative economic importance of sheep products indicates a need for production system assessment and change. Emphasis on sheep meat production, especially for countries with a developed economy, is not only justified but would provide enterprise diversification for greater economic stability.

The purpose of this presentation is to provide thought-provoking ideas for consideration in development/implementation of breeding decisions to improve production efficiency, product quality and profitability of the sheep enterprise.

Adaptation Climatic conditions, availability and seasonal distribution of nutritional resources create the basis for adaptive breed type selection. Matching breed resources with the production/marketing environment, to optimize productivity and product quality determines the success of the enterprise. Breed fitness to the selected management system is best measured by reproductive efficiency. Reproductive performance is also the most important economic factor affecting meat production and combined with lamb growth, flock profitability.

Perhaps this favorite Scottish sonnet states it best:

"ewes yearly by twinning, rich masters do make, the lambs of such twinners for breeders go take" Youatt, 1845

*Note 20th century technology has shown that twin replacements from ewes that have twins three consecutive times have 100 percent greater likelihood of twinning than a twin replacement with an unknown record for the dam.

Obviously the sonnet has real meaning for producers raising sheep in favorable nutritional environments and management systems but likely needs modification under
extensive/harsh production conditions. Matching genetic resources with climatic, nutritional and management resources is basic for successful sheep production.

*What is the adaptable value of Dorsets for commercial lamb meat production in the U.S.?

Breed Resources  Breed choice should not only affect economically important production traits (reproduction, maternal, survival, growth/maturity) but also heritable consumer attributes that enhance salability of end products. Exploitation of breed resources with adaptability, productivity and genetics for product quality will need to be more objectively and intensively pursued in the future.

Breed stagnation  Changing production emphasis, popularity, inbred debility-can create a challenge situation for breed survival. Responsible breeders have options: regeneration of  breed structure where there is a definable crossbred foundation and availability of the original breeds; open the flock book for introduction of more favorable outside genetics and/or establishment of a successor breed population; conserve breed characteristics as a genetic resource; face extinction! In the long run, only signature genes and gene combinations of breeds are likely to have value. Ultimately it is a decision of conservation, regeneration, revitalization or loss. This has become an important issue for many breeds throughout the world.

Selection Never have opportunities been greater for rapid genetic improvement through selection. During the last decade, seedstock breeders have had the technology available for separating genetic and environmental differences. This is a revolutionary happening for the industry! Through the development of genetic theory and evolvement of computer technology, BLUP (Best Linear Unbiased Prediction) procedures can now be used to analyze objective performance data and predict genetic differences on an across flock basis. Thus the ability to identify and locate superior breeding animals on a within breed basis have become reality. In fact a virtual reality where some breed associations have data base programs that search via breeder specifications, identify and locate breeders with prospective individuals. This provides opportunity thru e-commerce to purchase breeding animals in cyberspace on 24/7 time frame throughout the world.

*Question-where would a Dorset breeder interested in locating "best genetics" for improving lamb meat production go for breeding stock: show flocks, flocks where the National Sheep Improvement Program is being used, peer information---would such breeders benefit from having web sites noting their flock objectives and breeding program?

Ram selection is recognized as most important for making genetic improvement through selection. For most traits, 70-90 percent of selection improvement is realized through the use of superior rams. Thus the ability to accurately identify genetic value on an across flock basis is a major technological advancement for locating superior rams. Stacking pedigrees with across flock expected breeding values (EPDs) further increases selection accuracy and predictability and therefore rate of improvement from selection. Assessment of breed value during industry change and/or production transition is important. An understanding  how breeds are/will be used for what purposes is relevant to formulate improvement goals and selection plans.

*What is the place/role of Dorset sheep for commercial lamb production in the U.S.?

Ewe Productivity  Weight of lamb weaned per breeding ewe per year is a heritable trait of great economic value and should be recognized as a biological index in selection for ewe productivity. Analysis of selection study results on ewe productivity show this is a composite trait  and genetically associated/affected by positive changes for ovulation rate, fertility, embryonic loss (lower), percentage of lambs weaned, weaning weight and ewe viability. Selection for quantity of lamb weaned would obviously identify breeding ewes in the flock with greater adaptability to a given environment/management setting.

*Is it possible to assess differences in ewe productivity/maternal ability (as defined) from a traditional five minute per head show ring evaluation?

Balanced Genetics Breeders have long been noted for selection crazes, fads, and trait extremes. This age old approach of pendulum selection has wasted more time and ruined more breeds of livestock than any other type of breeding activity. Sheep breeders have  tried wrinkles, face cover, ultra-low/thick-compact, long and tall extreme profile sheep with purple ribbons galore. And the traditional search still goes on for the perfect ewe and ram as first initiated in the early 18th century. Now the industry has BLUP breeding trait values. Genetically we can get there faster but where and how do we want to go. Balanced genetics, via combining  traits relative their genetic-economic importance should be an exciting and virtual rewarding direction for seedstock breeders in the 21st century. Balanced multi-trait selection will not likely produce extreme appearing animals but ones that have greater net genetic merit and therefore higher economic value. Some say, "you can't sell it if you can't see it". That 19/20th century myth will not get the job done in the 21st century.

*Can we stand to breed sheep without extremes? Perhaps balanced genetics for performance and efficiency of production should be adopted as a "fashion" style for the 21st century.

Maternal/Paternal Breeds Breed differentiation based on function/utility values is the basis for maternal and paternal breed classification. Separation on breed function allows for greater intensity of selection within breed, genetic compatibility among traits and increases genetic diversity resulting in higher levels of heterosis  from crossbreeding.

Generally adaptability, reproductive rate, maternal attributes and wool value are emphasized as traits of greatest importance for maternal breeds.

Paternal breeds, are most commonly utilizer as terminal sires for lamb meat production.  Selection emphasis for terminal sires includes lean growth and efficiency, lamb survival and carcass value. Most likely, the importance of sire breed on lamb survival is undervalued and neglected in selection as an important trait. The same concern should be expressed regarding ram breeding capacity and longevity. A significant percentage of rams are non-breeders. One study indicated 15 percent of straightbred rams were non-breeders during the normal breeding season. Research results have shown that ram serving capacity is affected in utero by number and sex of siblings. Rams born as co-twins had the highest serving capacity and single born rams the lowest. A genetic relationship existed between ram serving capacity and ewe productivity as measured by weight of lamb weaned. Improving flock fertility by selecting for high serving

capacity rams may be beneficial for short as well as long-term genetic improvement.

*Remember the 1845 sonnet-maybe what is "good for the goose is good for the gander!"

A seasonal breeding can be an important maternal and paternal trait for many commercial growers to expand the normal breeding season and improve production and marketing objectives. Two international sheep diseases of major economic importance; gastrointestinal parasites and foot rot are genetically venerable and should receive serious consideration for inclusion in selection programs by breeders in temperate to tropical locations.

*"Winter Lamb" an early 20th century CDC publication written by the breed secretary, Joseph Wing, helped publicize maternal attributes of Dorset sheep, especially for out-of-season lamb production, a signature trait of the breed.

Mating Systems Breeding plans for seedstock and commercial producers are vastly different but should be highly networked. Seedstock breeders create/supply the genetic framework to establish the production potential for the commercial sheep industry. Mating systems are commonly defined on the degree of pedigree relationship. Mating animals more closely related than the average of the breed is defined as inbreeding, conversely matings among animals less related than the average are outbreed. The extreme of outbreeding, that of mating animals from different breeds, is crossbreeding. Inbreeding and linebreeding should only be of interest to stud breeders. Inbreeding does not change the frequency of good genes in a population but does increase homozygous gene combinations, both favorable and unfavorable in a random fashion. Prolonged and/or intensive inbreeding can negatively affect production, especially those lowly heritable traits associated with fitness. Only experienced students of breeding and with elite flocks should seriously consider inbreeding as a mating system.

*Pipestone Minnesota has become the location of a national success story for commercial sheep production in the U.S. During the last twenty-five years, while national sheep numbers declined 46 percent, growers in the Pipestone Sheep project were increasing numbers and average flock size! Producer technology adoption has provided high lamb production efficiency and marketing contracts have reduced price volatility and management risk. Average net profit per ewe for program cooperators has been $50+: for the top third flock owners, $85+ , with top growers realizing a net return of more than $100 per breeding ewe!

Can the Dorset breed provide/improve on the level of productivity achieved by Pipestone sheep producers. Superior genetics is imperative to the foundation of opportunity for a successful commercial sheep industry during this century.

Genetic technologies from the past 25 years provide unprecedented breeding plan innovations for improving the relative economic importance of Dorset sheep in the 21st century.

Be-alert, some of today's biological research will/should be tomorrow's technology.