1911. It has been estimated that more than 85% of cattle now arrive at market by truck transport.

Systems of Production

Systems of production have consistently been altered to include animals at younger age and heavier weights. The utilization of grass has become confined largely to cows and yearling animals. Steer receipts at markets are largely made up of animals weighing under 1100 pounds grading choice and good.

The deferred feeding of beef cattle was developed by Kansas producers, which is a step toward the use of younger more efficient animals in converting roughage and grain into beef.

PROGRESS IN ANIMAL BREEDING

Walter H. Smith

The Trend of the Purebred Livestock Industry.

The purebred livestock industry was well established in the United States 50 years ago. Breed registries were active in promoting breeds and maintaining pedigree records then. Livestock shows were well established in the early 1900's and have continued, with breeders relying on placings made in shows for guidance in livestock selection. More recently, livestock carcass class competition has been introduced and the discrimination has increased against excess external carcass fat as appraised in both live slaughter animals and their carcasses.

During the last 50 years the purebred segment of the United States livestock industry has increased proportionately and considerable "grading up" has been accomplished in the larger commercial cattle herds and sheep flocks. Many type changes have taken place, particularly in cattle and swine, and some breed comparisons have been made. It appears that the major objective of all purebred meat animal breeding has become more closely devoted to efficient production of meat with quality appeal to the consumer. Many of the major livestock breed associations recently have adopted herd-breeding programs based on the measurement of production traits, including carcasses. It appears that breeders have received and applied those plans with sufficient interest to assure future effort in that direction.

Developing New Breeds.

Some new breeds of livestock devoted to meat production have been established. In the main, they have been developed from breed and species crosses. It appears that the main objectives of this effort have involved improved environmental adaptability and increased productivity, commonly measured in terms of growth rate, in our existing livestock. Many of the new breeds have survived commercial preference well; however, only scant evaluative research has been accomplished to date. Many of the general purposes and genetic principles involved do not differ widely from the fundamentals of crossbreeding.

Applying Genetics to Animal Breeding.

The principles of Mendelian genetics were rediscovered at the beginning of of the 20th century. Applying genetic principles to animal breeding has been slow but progressive. Most of the early effort devoted to research on animal genetics concerned the simply inherited qualitative traits including color markings and abnormalities such as lethals and sublethals. Considerable work has continued in this area as circumstances have required, as dwarfism in beef cattle recently. The area of qualitative inheritance is certainly not closed to research; however, the main effort devoted to animal genetics research is in quantitative inheritance, which includes the conventional production traits of farm livestock.

Methods of measuring the genetic relationship between animals and the degree of inbreeding possessed by individual animals were discovered in the 1920's. Statistical techniques to analyze quantitative inheritance were formulated during the 1930's. Methods to measure performance traits in livestock were evaluated during those periods. Those areas of research provided the basis of livestock selection procedures, which have been progressively developed since about 1940.

Studies of Animal Breeding Plans.

Basically there are two animal breeding plans, outcrossing and inbreeding. Outcrossing by crossbreeding has been widely adopted in the commercial swine and sheep industry. The practice is not new; however, research on the subject is fairly recent. Some heterosis or hybrid vigor has been observed with regard to most production traits (the crossbred tends to be superior to the parental average); however, fewer losses of the new born and increased reproductive efficiency seem to be the most important advantages. Studies devoted to research on outcrossing in beef cattle are in progress but findings to date are preliminary and inconclusive. It appears that outcrossing will play an important role in the production of future meat animals.

Technical research studies on the effects and feasibility of the use of inbreeding have been in progress since the 1930's. The development of inbred lines of livestock is expensive and time consuming. Limited commercial use of inbred swine, cattle, or sheep has been made to date; nevertheless, research to evaluate the feasibility of the development and use of inbred lines of livestock will continue.

Studies on the Inheritance of Performance Traits.

Numerous estimates of heritability values for nearly all the production traits of meat animals have been reported by research workers during the last 20 years. Heritability is generally defined as the proportion of the differences measured or observed between animals that is transmitted to their offspring. Single estimates of heritability are subject to considerable error. Enough information is available now to justify reference to average heritability values for production traits in farm livestock selection procedures.

Research has also been done on genetic and phenotypic relationships between production traits. Many research selection projects are currently in progress to further evaluate that area of animal genetics.

Selecting Meat Animals.

Selection in meat animals is complicated by numerous production traits. The traits of high economic value and heritability should be emphasized in selection programs. Selection indices that give two or more production traits for the various meat-producing species need to be developed. Additional information regarding heritability values and phenotypic correlations and genetic correlations for production is needed. Simple ways to measure some production traits, especially those involving the animal carcass, should be developed. Most of the factual information available on these problems has been reported in the last 10 years, so this is still a very active area of animal breeding research.

Considerable research has been accomplished on aids to selection. Progeny testing appears to be an important technique in genetic improvement of carcass traits and other production traits of meat animals that are economically important but low in heritability.